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Segmental and Intonational Analysis of Drogheda English

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Thesis submitted for the Degree of Doctor of Philosophy

Centre for Language and Communication Studies

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Summary

This study is concerned with describing the variety of English used in Drogheda, the main town in the North-East of Ireland. The town of Drogheda is approximately 35 miles away from the capital city, Dublin. It also lies within the linguistic boundary zone that separates the two major Irish English varieties: Northern Irish English and Southern Irish English. The study presents a detailed descriptive analysis of the variety's segmental system including both the vocalic and the consonantal system. A particular emphasis is on the intonational aspects of this variety. Dialectal studies in intonation are increasingly attracting interest and contributing to our understanding of how the intonation system of a language works.

In the first part of the study I carry out acoustic and auditory analysis on the speech of local informants from Drogheda to investigate vocalic and consonantal realizations. The findings suggest that Drogheda English has typical Southern segmental features with few Northern traces. In particular, the analysed vowel system shows a robust vowel length distinction between short and long vowels, which is not evident in many Northern Irish English varieties.

In the second part of the study, I describe the tonal patterns of Drogheda English using a modified version of the ToBI labelling system, by drawing on insights from another system, the IViE. The findings show that the variety has a default nuclear falling contour in statements and different types of questions. This tonal pattern stands in sharp contrast to the typically rising nuclear contours in statements of Northern Irish English varieties. However, very little work has been done on the intonation of Southern Irish English varieties, and it is hoped that this work redresses in some way this gap in the field.

In the third part of the study, I address the question of how speakers of Drogheda English convey interrogative intonation if the tonal patterns in questions lack final rises. To answer this question, I investigate the phonetic markings in the f0 contour of statements and different types of questions. The findings show that fine detailed f0 differences occur between different types of utterances. In particular, the relation between the initial pre-nuclear and nuclear accents is crucial in conveying the type of utterance.

The fourth and last part of the study investigates the actual realization of the initial pre-nuclear and nuclear H* accents. Specifically, I investigate the timing of the peaks with the

segmental string, known as peak alignment. In doing so, I propose that it is useful to differentiate between two kinds of alignment: intrinsic and extrinsic. For the same type of pitch accent and dialect, intrinsic alignment is the default realization of the tonal targets of the pitch accent in the absence of temporal rhythmic constraints. Extrinsic alignment is the shifts away from the intrinsic alignment, of the same pitch accent and dialect, conditioned by the presence of temporal rhythmic constraints. The findings show that the peak of H* accent in Drogheda English is intrinsically aligned at a time point 70%~80% into the vowel of the initial pre-nuclear accent and at 60%~70% into the vowel of the nuclear accent.

In general, the findings of the segmental and the intonational analyses indicate that the variety under study is a typical Southern Irish English variety. Dialectal studies, being inherently rather comparative in nature, are potentially very useful in providing insights as to how intonation and segmental systems of languages work. As is typical in linguistic studies, linguistic borders have generally been defined primarily in terms of segmental characteristics. However, taking the intonation structure as a primary marker of linguistic boundaries would be particularly interesting, given how strikingly different Northern and Southern varieties of Irish English are.

To my mother from whom I learnt the love of speech,

To my father from whom I learnt the love of science,

and to those interested in speech sciences …

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Table of Contents

CHAPTER 1 INTRODUCTION 4

1.1 Introduction 4
1.2 Background to Study 4
1.3 The Irish Substratum 8
1.4 Northern and Southern IrE 17
1.5 The Position of Drogheda 22
1.6 Research Questions 24
1.7 Thesis Structure 25

CHAPTER 2 REVIEW OF LITERATURE: INTONATION 27

2.1 Approaches to Intonation Study 27
2.1.1 Autosegmental-Metrical Approach 31
2.1.2 ToBI System and Framework 33
2.1.3 IViE 36
2.2 Intonation of Irish English 40
2.2.1 Intonation Studies in Northern and Southern IrE 40
2.2.2 Intonation of Northern Varieties 40
2.2.3 Intonation of Southern Varieties 42
2.2.4 Comparing Southern IrE and Norhtern IrE Intonation 46
2.2.5 Intonation of Irish (Gaelic) 51
2.2.6 Irish Influence on English? 53
2.3 Question Intonation 56
2.3.1 The Frequency Code 56
2.3.2 Question Intonation in Different Languages 58
2.4 Alignment 63
2.4.1 Intrinsic and Extrinsic Alignment 64
2.4.2 Extrinsic Alignment Studies 71
2.4.3 Intrinsic Alignment Studies 76
2.4.4 Summary of Alignment 81
2.5 Summary 82

CHAPTER 3 MATERIALS AND METHODS 83

3.1 Introduction 83
3.2 Informants 83
3.3 Corpora 84
3.4 Vowels 86
3.4.1 Corpus A 86
3.4.2 Corpus B 88
3.4.3 Procedure & Analysis for Corpus A & B 93
3.4.4 Vowel Perception Experiment 94
3.5 Consonants 95
3.5.1 Corpus C 95
3.5.2 Corpus D 99
3.6 Intonation 99
3.6.1 Corpus E 99
3.6.2 Corpus F 100
3.6.3 Procedure & Analysis for Corpora E & F 101
3.6.4 Intonation Perception Experiment 102
3.6.5 Corpus G 104
3.6.6 Procedure & Analysis for Corpus G 106
3.6.7 The Labelling System in This Study 107

CHAPTER 4 VOWELS AND CONSONANTS OF DROGHEDA ENGLISH 112

4.1 VOWELS 112
4.1.1 Monophthongs *114*
4.1.2 Weak Vowels *130*
4.1.3 Diphthongs *132*
4.1.4 Vowels in /VɹV/ Contexts *145*
4.1.5 Summary of Vowels *158*
4.2 CONSONANTS 161
4.2.1 Dental Fricatives /θ/ and /ð/ *163*
4.2.2 Lenition of /t/ and /d/ *166*
4.2.3 Liquids /l/ and /ɹ/ *169*
4.2.4 Other Consonants *171*
4.3 SUMMARY 172
CHAPTER 5 THE TONAL PATTERNS OF DROGHEDA ENGLISH 174
5.1 TONAL PATTERNS OF DROGHEDA ENGLISH 174
5.2 STATEMENTS (ST) 176
5.2.1 Initial Pre-nuclear Pitch Accents in ST *178*
5.2.2 Nuclear Pitch Accents & Edge-tones in ST *180*
5.3 WH-QUESTIONS (WQ) 183
5.3.1 Initial Pre-nuclear Pitch Accents in WQ *185*
5.3.2 Nuclear Pitch Accents & Edge-tones in WQ *186*
5.4 YES-NO QUESTIONS (YQ) 188
5.4.1 Initial Pre-nuclear Pitch Accents in YQ *190*
5.4.2 Nuclear Pitch Accents & Edge-tones in YQ *192*
5.5 DECLARATIVE QUESTIONS (DQ) 193
5.5.1 Initial Pre-nuclear Pitch Accents in DQ *195*
5.5.2 Nuclear Pitch Accents & Edge-tones in DQ *197*
5.6 SUMMARY 202
CHAPTER 6 MARKERS OF INTERROGATIVE INTONATION IN DROGHEDA ENGLISH 203
6.1 INTRODUCTION 203
6.2 INTERROGATIVE INTONATION IN DROGHEDA ENGLISH 204
6.2.1 f0 metrics for analysis of Interrogative intonation *205*
6.2.2 Perception Experiment *210*
6.3 RESULTS FOR DROGHE 211
6.3.1 Final rise *214*
6.3.2 f0 of the initial pre-nuclear pitch accent *219*
6.3.3 f0 of the nuclear pitch accent *221*
6.3.4 Relation between the PN peaks and N peaks *224*
6.3.5 Register span and register level *227*
6.3.6 Declination in the global trend *229*
6.4 SUMMARY 232
CHAPTER 7 PEAK ALIGNMENT IN DROGHEDA ENGLISH 234
7.1 INTRODUCTION 234
7.2 PREAMBLE: A PILOT STUDY IN DROGHEDA ENGLISH AND DUBLIN ENGLISH 237
7.3 PEAK ALIGNMENT IN DROGHEDA ENGLISH: REVIEW OF METHODOLOGY 240
7.4 INITIAL PRE-NUCLEAR PEAK ALIGNMENT (PN) 242
7.4.1 Varying the rhythmic context for CVC *243*
7.4.2 Varying the rhythmic context for CV(C) *246*
7.4.3 Is CVC different from CV(C)? *249*
7.5 NUCLEAR PEAK ALIGNMENT (N) 252
7.5.1 Varying the rhythmic context for CVC *252*
7.5.2 Varying the rhythmic context for CV(C) *254*
7.5.3 Is CVC different from CV(C)? *256*
7.6 SYLLABLE STRUCTURE AND ALIGNMENT 259
7.7 PRE-NUCLEAR AND NUCLEAR PEAK ALIGNMENT COMPARED 263

7.8 SUMMARY 268
CHAPTER 8 CONCLUSION 270
8.1 INTRODUCTION 270
8.2 SEGMENTAL STUDY 270
8.2.1 Vowels 270
8.2.2 Consonants 271
8.3 INTONATIONAL STUDY 272
8.3.1 Tonal Inventory of DroghE 272
8.3.2 Question Intonation in Drogh E 273
8.3.3 Tonal Alignment in DroghE 273
8.4 FUTURE DIRECTIONS 275
REFERENCES 278
APPENDICES 285

Chapter 1 Introduction

1.1 Introduction

This study describes the segmental and intonational aspects of the Drogheda English (henceforth DroghE) variety of Irish English (henceforth IrE), with particular emphasis on its intonational aspects. This chapter gives a general background to the present work. Then, the four parts of the description of DroghE are outlined. The first part is a description of the segmental system, vocalic and consonantal. The account of the vocalic system is based on a spectrographic analysis, while the analysis of consonants is auditory. The remaining parts concern the intonational study, carried out in the AM (Auto-segmental Metrical) framework and using a modified version of the ToBI (Tones & Breaks Indices) (Silverman et al., 1992) labelling system. These include a phonological description of the tonal patterns in different types of utterances: statements (ST), wh-questions (WQ), yes-no questions (YQ), and declarative questions (DQ). Moreover, the intonational devices employed by speakers of DroghE to convey interrogative intonation in the different question types are investigated. The last analysis chapter investigates the characteristic features of the timing of the tonal targets in DroghE relative to the segmental string in both pre-nuclear and nuclear pitch accents. This chapter concludes with an outline of the thesis.

1.2 Background to Study

The variety of English used in Ireland has been referred to using varied terminology as a result of the high degree of discontinuity and regional variation that characterises the history of English in Ireland. Hiberno-English (HE) - after *Hibernia*, the Roman name for Ireland - is a term used by dialectologists to refer to the variety of English used in Ireland. For example, Bliss widely uses the term in most of his writings (e.g., 1972, 1976a, Bliss, 1979, Bliss, 1984). The term 'Anglo-Irish' has been used, but less commonly in recent times; it is used more in reference to English literature written by the Irish people. Henry (1958) uses the term Anglo-Irish in a 'neutral' sense. He describes it as "a copulative

compound denoting a fusion of terms on an equal basis, so*: Anglo-Irish trade, relations*, etc." (1958: 56). Another term 'Planter English' refers to the early introduction of English in the 16th and 17th centuries in Ireland, while the term 'Yola' was used to refer to the old form of English that survived in pockets, especially in Wexford, until the 19th century (Britain and Clift, 2003: 73). Following many current researchers in Irish English, such as Kallen and Hickey, in this study the term Irish English (IrE) is chosen to give a general reference with no implications. Moreover, the term IrE is fairly transparent and understood in the wider community of linguists.

The dearth of quantitative studies on IrE has long been commented on e.g. (Barry, 1981a, Bliss, 1977, Filppula, 1999, Henry, 1957, Kallen, 1985a). Moreover, most of the phonological studies and observations on IrE have tended to be on segmental aspects, e.g. (Bliss, 1984, Hickey, 2007, Hughes et al., 2005, Wells, 1982). For example, Wells (1982) describes IrE as a remarkably conservative variety of English, since it has not gone through mergers and processes that have happened in RP and GenAm (General American English) such as the NURSE Merger (*earn* ≠ *urn*).

In comparison to the work available on segmentals, there has been rather little work done on IrE intonation. For example, Wells (1982) comments that the intonation of Southern IrE is not 'strikingly different' from that of RP with the exception of yes-no questions which are normally said with 'a low-fall nuclear tone' as opposed to the low-rise of RP (1982: 436). The intonation of Northern IrE and particularly that of Belfast English has attracted attention more than other IrE varieties because of its rising nuclear contours in statements, a contour which is highly marked in terms of the world's languages. The interest in the intonation of Northern IrE varieties particularly increased after Jarman and Cruttenden's (1976) article 'Belfast intonation and the myth of the fall'. Mclholm (1986) investigated the intonation patterns of Derry English and found that the rising patterns are most common in statements and questions, similar to Belfast English. Rahilly (1997) analysed the intonation of IrE by taking Belfast English as a case study. More recently, Lowry (2001) analysed the tonal patterns of Belfast English as part of the IViE (Intonation Variation in English) project (Grabe et al., 2001).

One of the earliest reports on the intonation patterns in Southern IrE is by Henry (1958), who describes some of the tonal patterns used in certain districts in counties Mayo, Galway, Waterford, Clare, Kerry, Limerick, and Cork. He suggests, based on limited data,

that the majority of these areas have a similar tonal pattern which shows a phrase-final rise often preceded by a falling pitch accent. In Kilkenny, Henry observes that the prevalent tonal pattern is falling.

However, in recent times there have been some analyses of the intonation of Southern IrE varieties. The IViE project (Grabe et al., 2001) which investigated the tonal patterns of British English varieties also included the two IrE varieties of Dublin and Belfast. It should be noted that the Dublin English data came from the town of Malahide, in north county Dublin, and may not be representative of the dialect(s) of Dublin city. There have also been some MPhil or Master's dissertations on aspects of the intonation of southern IrE varieties: Sullivan (2006) describes Wexford English; the M.Phil dissertations by O'Connor (2005) and Dorn (2006) deal with West Cork (Ballyvourney) and Donegal (Dungloe) varieties, respectively. In the latter cases they are based on limited data, but nonetheless indicative of the kinds of differences that can occur.

Figure 1.1 shows the areas in Ireland where relatively recent intonational work has been reported: Belfast English by Rahilly (1997) and Lowry (2001), Derry English by Mclholm (1986), Dublin English (in Malahide) by Grabe et al. (2001), West Cork English (in Ballyvourney) by O'Connor (2005), Donegal English (in Dungloe) by Dorn (2006), and Wexford English by Sullivan (2006). The map also shows the location of the town of Drogheda in the North East of Ireland.

Figure 1.1 Map showing areas where intonation studies on IrE varieties have been reported: Belfast English by Rahilly (1997) and Lowry (2001), Derry English by McIholm (1986), Dublin English (in Malahide) by Grabe et al. (2001), West Cork English (in Ballyvourney)) by O'Connor (2005), Donegal English (in Dungloe) by Dorn (2006), and Wexford English by Sullivan (2006); the location of the town of Drogheda is also shown.

Subsequent to Jarman and Cruttenden's (1976) article, further analyses of English and Scottish varieties suggest that a rising pattern is not only peculiar to Belfast speech, but is found in other Northern British varieties: Tyneside speech (Pellowe and Jones, 1978), Birmingham English (Brown et al., 1980: 19), Glasgow English (Mayo et al., 1997, Cruttenden, 2007), Fife English, eastern central Scotland (Aufterbeck, 1999), and Liverpool English, Scouse (Knowles, 1978, 1984). Cruttenden (1995) refers to these northern varieties of English, which share the rising tones phenomena, as Urban Northern British cities (UNB), in particular Glasgow, Newcastle, Liverpool, and Birmingham (along with the two Northern Irish cities Belfast and Derry). It has often been suggested that the rising pattern in these varieties of English is of a Celtic origin (Cruttenden, 1986: 139, Knowles, 1984: 232-240). Knowles has no doubt in the origin of the rising patterns in Scouse calling them 'Irish falls' (Ibid.: 239).

Such a claim was made at a time when very little was known about IrE intonation or more importantly Irish (Gaelic) intonation. However, since then, analyses of Irish intonation have shown that the Irish dialects show a falling contour even in yes-no questions with the exception of the northern variety of Donegal Irish (Dalton, 2008, Dalton and Ní Chasaide, 2006). Dalton and Ní Chasaide found that Donegal Irish was strikingly similar to Belfast English, being characterised by rising nuclear contours in statements and questions. Clearly in positing Irish influences on varieties of British English, it would be crucial to know what the historic emigration patterns were.

Very little is known about the possible Irish influences in the tonal patterns of southern IrE varieties. Findings of the IViE project (Grabe et al., 1998b, Grabe et al., 2001) which investigated seven urban varieties of English (London, Cambridge, Leeds, Bradford, Newcastle, Belfast, and Dublin) indicate that the intonation of Dublin English has the least occurrence of rises even in different questions types compared to the investigated British English varieties. One would be tempted to speculate that this is an influence of Irish.

As the picture of the intonation of Irish and IrE varieties is still in its early stages, empirical investigation of IrE varieties are of interest not only in their own right, but also in that they may help shed light on questions of cross language influences. These have always been focused on a great deal in segmental studies of IrE.

It is hoped that the findings of the present study would add in some small way to this important but neglected area of IrE dialectology. In *How the Irish Speak English,* O'Farrell invites the reader to "'speak' this [his] book instead of reading it, for it is intonation, emphasis and accent that give our [IrE] sayings and expressions their true charm" (O'Farrell, 1993: 8).

1.3 The Irish Substratum

Much of the interest in IrE focuses on the question of the degree to which IrE is influenced by Irish versus the degree it reflects internal and independent language development. IrE undoubtedly has an Irish influence, particularly at the phonetic and phonological levels (Henry, 1958, Bliss, 1984). IrE displays certain features that are common to all its speakers regardless of their educational, social, or regional backgrounds. However, scholars still

differ on the origins of IrE features. The 'substratumist' view argues that the Irish substratum is the greatest influence on modern IrE. The 'retentionist' view argues that modern IrE has emerged as a result of independent development within the earliest forms of English introduced in Ireland. This study does not represent either view and is mainly concerned with describing the IrE variety of Drogheda English and identifying its most salient segmental and prosodic characteristics.

In *An Anglo Irish Dialect of North Roscommon*, Henry (1957) makes frequent reference to the influence of the substratum of Irish on all aspects of the dialect, particularly in phonology. He states that "there is no room for doubt that the phonological system of our dialect [North Roscommon] is in all essentials that of the Irish dialect which it displaced" (1957: 20). He suggests that the dialect of North Roscommon is "essentially a fusion of Mod.Ir. with chiefly 16th and 17th century E" (Ibid.: 73). For example, he mentions that the inherent aspect of palatalized versus non-palatalized consonants of Irish is reflected in the consonantal system of the dialect (Ibid.: 85). He suggests that lengthened vowels in stressed syllables are frequent in Aran and Donegal Irish, and that the shortening of unstressed syllables is typical of Donegal Irish (Ibid.: 20). Similarly, Bliss concludes his description of Southern IrE as follows:

> In the pronunciation and vocabulary of southern Hiberno-English it is possible to trace the influence both of older strata of the English language and of the Irish language; in grammar, syntax and idiom the peculiarities of southern Hiberno-English depend exclusively on the Irish language. Even in the parts of Ireland where Irish has long been extinct its conscious influence still controls the usage of speakers of English.
>
> (Bliss, 1984: 150)

Harris (1984) places greater emphasis on the influence from Early Modern English and Scots especially in areas where Irish ceased to be spoken long ago and where the English and the Scots settlements have had stronger effects (1984: 115-18). Kallen (1994) also draws attention to the retention of earlier English features in the verbal system of IrE, particularly the use of *after* in sentences referring to future or non-actual states of affairs (1994: 173). Kallen (1985a) emphasises that when studying the influence of the substratum of Irish on IrE, the synchronic effects of bilinguals (in Irish and English) should be

differentiated from the diachronic influence of earlier contact and development of the present day monoglot speakers of IrE (1985a: 3).

Some scholars, such as Filppula, consider IrE a contact vernacular. The closest points of comparison with IrE is with other varieties of English spoken in Celtic lands, otherwise known as 'Celtic Englishes 'such as Hebridean English (HebE) spoken in Hebrides, Welsh English (WE), and Manx English (MxE). There are many significant parallelisms between Celtic Englishes which make the case for the substratum influence strong. Furthermore, similarities between Celtic-influenced languages can be used in distinguishing between Celtic-origin and 'general vernacular' features (Filppula, 1999: 25-26, 281). Todd terms IrE 'Green English' and notes that "the English Planters tried to remake the Irish 'in their image and likeness' but the Irish 'made haste to return the compliment" (Todd, 1999:14).

Many studies on IrE investigate the influence of Irish and 17th century English on modern IrE. Hogan (1927) discusses the spread of English from the Middle Ages onwards and some aspects of morphology and syntax, stating that English did not become widespread until the end of the 18th century and was not prevalent until the middle of the 19th (Ibid.: 54). Hogan (1944) proposed a three-phase program for studying dialects of IrE. The first phase is 'the examination of living speech in various localities' which includes investigating the particular dialect's 'phonology, grammar, and vocabulary'. The second phase is 'the examination of all written records'. The last phase is 'the synthesis of the information thus gathered in a dictionary and grammar, and perhaps an atlas'. He emphasizes the priority of the first phase since dialectal material disappears if not collected and recorded. Written material can be analysed at any time since it is recoded and available in printed form. Only after enough material is available can a compilation of a dictionary or atlas begin (Ibid.: 187).

There are few dialectal studies on IrE. Henry's (1957) *An Anglo-Irish Dialect of North Roscommon* is considered one of the first comprehensive phonological studies of an IrE variety. The Irish Association for Applied Linguistics (IRAAL), established in 1975, has several publications such as *Papers on Irish English, Languages across Cultures*, and publishes proceedings from IRAAL conferences and seminars in the journal *Teanga*. Quin's 'The collection of Irish dialect material' (1977) traces the studies on IrE including the contributions of Joyce, Adams, and Henry. Kallen (1985a) provides a more comprehensive and updated overview of studies on IrE. Bliss published several works that

are considered important references on IrE (e.g.: Bliss, 1972, 1979, 1984). *Spoken English in Ireland 1600-1740* (Bliss, 1979) is a major work which examines written material in IrE. Here, Bliss provides a detailed analysis of the phonology, vocabulary, morphology, and syntax in twenty seven literary texts of IrE from the period 1600 to 1740. A comprehensive reference on studies in IrE is Hickey's *A Source Book for Irish English* (2002).

Dolan (1998) published the first dictionary of IrE, *A Dictionary of Hiberno-English: The Irish Use of English.* Today there are several dedicated websites that focus on IrE. In 2002, Loftus and Dolan established the website *A Hiberno-English Archive* whose main purpose "is to build and maintain an archive of Hiberno-English words, phrases, sayings, and idioms".

The first major contributor in Northern IrE was Adams, who along with other writers, in 1956 started a long series of papers in the journal *Ulster Folklife*. To date, more studies have been published on Northern IrE than on Southern IrE. *Belfast Working Papers in Language and Linguistics* began publication in 1976, started by James Milroy and Lesley Milroy as a sociolinguistic survey in Belfast. The Milroys studied the different varieries of Belfast English and published two books *Regional Accents of English: Belfast* and *Language and Social Networks*. They demonstrated that lower working class Belfast speech fluctuated between localized and more formal forms. They also took into account the contrast in speech between the sexes and found that not only do lower working-class males use more localized forms than do females, but also that young males use more localized forms than do middle-aged males (Milroy and Milroy, 1978). The relatively recent work by Harris is an important contribution in phonological studies on Northern IrE (Harris, 1984, Harris, 1985, Harris, 1996).

There are four linguistic surveys of IrE with varying degrees of coverage and continuity: Henry's survey (1958), the TRS (the Tape Recorded Survey) (late 70's), Hickey's A *Sound Atlas of Irish English* (2004), and the ICE-Ireland project (1990). These surveys are briefly outlined below in chronological order of publication of results.

Henry's Survey of IrE (1958)

In the article 'Linguistic Survey of Ireland: A Preliminary Report' (1958), Henry reports on the results of his preliminary survey of IrE varieties based on data gathered from 31 points scattered all over Ireland. Henry intended to provide an English counterpart to

Wagner's *Linguistic Atlas and Survey of Irish Dialects* (1953-1969). The aims of his survey "are to exhibit the structure and main facts of current AI [Anglo-Irish] in its various local forms, to identify the various dialects, and to delimit them, - this by a comparative study of grammatical and lexical features" (Ibid.: 54). Although an important work on IrE, the survey cannot be representative of the speech of IrE of today. Also, counties not sampled are: Louth, Down, Derry, Sligo, Roscommon, Longford, Offaly, Carlow, and Kildare. Figure 1.2 shows a map of the areas covered by Henry's survey. The survey project did not materialize in published form.

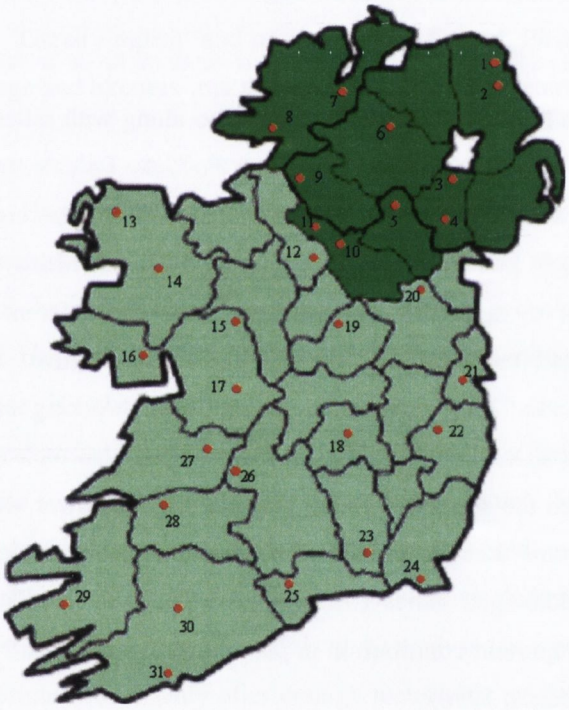


Figure 1.2 The 31 points covered by Henry's survey, adjusted from Henry (1958)

The Tape-Recorded Survey (TRS)

A later major survey was the Tape-Recoded Survey (TRS) initiated by the colloquium of IrE studies in 1972. A tape-recorded survey of IrE dialects was organized by Michael Barry, Philip Tilling and G. Adams, using material from Henry's lexical questionnaire. The TRS started with eleven counties of the north (including Donegal, Cavan, Leitrim, Monaghan, and Louth). The project was later expanded with the support of Bliss

(University College Dublin) and Ó Carragain (University College Cork) to include Leinster, Munster, and part of Connaught. The directors of the TRS hoped that it would complement the work of the Survey of English Dialects (SED) and the Linguistic Survey of Scotland (LSS). The objective was "to record and identify the sounds of Hiberno-English throughout a systematic network of localities, and against the historical development of English in Ireland" (Adams et al., 1985: 74). To give a diachronic and synchronic dimension, it was decided that the survey would include three age groups: 9-12, 35-45, and 65-75 years. This would show to what extent different generations within a single community shared or differed in speech. The questionnaire drawn by the directors covered 379 items (the SED covered 1092). The informants were also interviewed for 30 minutes after finishing the questionnaire.

The most important results of the TRS to be published were Barry's investigation of the north-south linguistic boundary (Barry, 1981b). He shows that the boundary zone between Northern IrE and Southern IrE varieties extends in a wide band from Dundalk and Drogheda in the east to Bundoran and Sligo in the west as shown in Figure 1.3.

Figure 1.3 North-south boundary zone of IrE

Kallen comments that although the TRS project is a unique attempt to do a traditional dialect study, it is strongly biased towards Ulster and that much of its collected data has not been published (1997a: 21). This is apparent when one considers the map in Figure 1.4, reproduced from Hickey (2004) who also provides a digitized sample of the TSR recordings and reconstructs the TSR questionnaire texts as the original documents have been lost (Ibid.: 136). The field work of the TRS ceased after publication of some of its findings, and work was not continued anywhere other than the earlier investigated regions. *Aspects of English Dialects in Ireland* included the first findings of the TRS (Barry, 1981a).

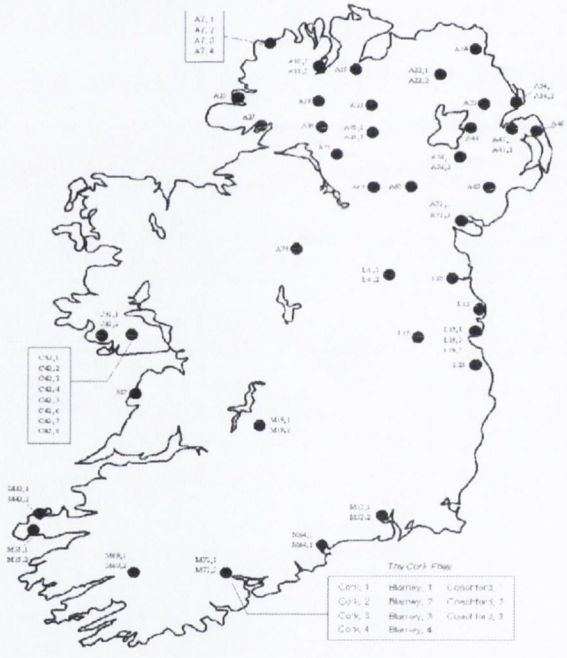


Figure 1.4 Map showing areas covered in TRS, reproduced from Hickey (2004)

Hickey's *A Sound Atlas of Irish English* (2004)

The most recent survey on IrE phonology is *A Sound Atlas of Irish English* by Hickey (2004), who collected the material over a period of several years (1990's-2002). The atlas covers the 32 counties of Ireland and its goal is "to provide a representative snapshot of

contemporary Irish English with particular emphasis on the language of the younger generation" (Ibid.: 10). The recordings comprise a reading list of short sentences, a text, and, sometimes, a list of words. The recordings were made in public places such as streets, shopping malls, and restaurants, which accounts for the background noise in some of the recordings. The atlas consists of over 1500 recordings from nearly 1200 informants. It should be noted that the interviews conducted were completely anonymous. Information on informants' social status, their linguistic background, and the county they come from are all important factors in forming hypothesises and generalisations concerning varieties of IrE. Nonetheless, the atlas provides a large corpus of relatively recent recordings of IrE from all counties and is very useful for anyone interested in IrE dialectology.

The ICE-Ireland Project

ICE-Ireland is a relatively recent project on IrE (Kallen and Kirk, 2006b, 2007, 2008). The project was started in 1990 by Kallen and Kirk as part of a larger international project, International Corpora of English. ICE-Ireland is particularly concerned with surveying the syntactic and lexical salient features of Southern and Northern IrE. Each ICE corpus includes 300 texts of spoken language (however, the actual recordings are not provided in ICE-Ireland) and 200 texts of written language, with a total of one million words, orthographically transcribed and annotated using an ICE annotation (available on the ICE website). The ICE-Ireland corpus has two components; ICE-NI (Northern Ireland) and ICE-ROI (Republic of Ireland). ICE-Ireland includes written texts (in 11 functional domains) and spoken texts (in 15 different situational categories) each consisting of 2000 words.

The purpose of the ICE project is to make available comparable machine-readable written and spoken corpora of the 'Standard' of English as used in the countries participating in the project. Therefore, "ICE is not designed as a study of variation, but as a study of national Englishes" (Kallen and Kirk, 2007:122). Kallen and Kirk explain that their use of the term 'Standard' English is not determined by linguistic content but by a standard methodology to allow for international comparisons across text types and speaker variables (2007: 134). This implies that national standard Englishes differ in many important ways. The ICE-Ireland compilers caution that it is not the ideal place to find information on dialectology, on the effects arising from bilingualism with Irish, nor on the interactions

between Standard English and Ulster Scots (2007: 154). ICE-Ireland tries to answer the question of "what results when educated speakers of English in Ireland generate texts of the same type as those generated by educated speakers of English in other English-speaking countries?" The corpus is predicted to show that IrE has features that are universal to standard English globally and features that are unique to each of its distinct areas; Southern and Northern IrE (Kallen and Kirk, 2008:101).

Although the ICE-Ireland corpus is not intended for phonological research purposes, it is the only ICE project amongst the other ICE-Englishes projects that provides intonational annotation for some parts of its corpus. I have been able to draw on this resource in discussing tonal patterns in IrE in Chapter 2.

It is generally agreed that there is no 'standard' IrE. What could be standard in IrE is precisely what Kallen and Kirk try to investigate via the ICE-Ireland corpus. Harris (1996) explains that institutionalized forms of English and the spoken vernacular forms have remained connected since the 17th century. This resulted in a continuum of varieties ranging from least to most standard. He argues that written IrE is similar to standard British English, when used in formal spoken contexts where it follows the norms of the written standard in grammar and lexis. Hence, Harris concludes that "there is no such thing as a set of codified norms defining a standard IrE accent" (Harris, 1996: 39).

The limited and fragmentary state of research on IrE, as Kallen (1997a) suggests, is likely to be particularly due to the low prestige accorded to many varieties of IrE. The Irish language (Gaelic) was given more attention as a medium for the expression of Irish national culture. Thus,

> [W]hile not everyone would enthusiastically endorse Irish as the "national language", no one views a markedly Irish form of English as an alternative candidate. Though dialect study does not necessarily require that the language to be studied is associated with a sense of nationhood, it may nevertheless, be suggested that the relative lack of study of IrE owes something to its lack of a symbolic or unifying function in society.
>
> (Kallen, 1997a:19)

1.4 Northern and Southern IrE

Although there are numerous regional varieties in Ireland, the greatest divide is between Northern IrE (henceforth NIrE), as spoken in the nine counties of the historical province of Ulster, and Southern IrE (henceforth SIrE) used in the rest of the island. In many early studies SIrE is regarded as a relatively uniform dialect compared to Northern IrE (Barry, 1982: 110). Bliss suggests that Southern IrE is uniform and has a more general division into rural and urban dialects (Bliss, 1977: 18). Nonetheless, Harris comments that the homogeneity of Southern IrE has not been checked and does not appear to be borne out by reports of lay observers (1996: 40). Kallen also emphasizes the need to investigate the claim that Southern varieties are more uniform than Northern varieties of IrE (1994: 175). Filppula (1999) supports the claim that SIrE is relatively a uniform dialect. He finds that the grammatical features, which he investigated, were found in all rural areas examined and even in Dublin, but in varying degrees. He concludes that "the quantitative and qualitative evidence produced by this [his] study suggests a definite direction of development: a process of dialect leveling and eventual fading away of at least some of the most marked or stigmatized features" (Filppula, 1999: 272). Among the features that Filppula found to be on the decline in vernacular Southern IrE are: failure of negative attraction, *after* and *be* perfects, certain types of periphrastic *do*, omission of *yes* or *no* in responses to yes-no questions (especially in eastern dialects), and some forms of clauses introduced by subordinating *and*. On the other hand, some of the features which hold out best against standardizing pressures are: lack of plural subject-verb concord with noun subjects, inversion in indirect questions, certain types of article and prepositional usage, and clefting as means of focusing.

The principal differences between Southern IrE and Northern IrE have been outlined by many (Wells, 1982, Barry, 1981b, Hickey, 2007). Adams (1958) gives two main reasons for the isolation between the two varieties of IrE. First, the expansion of English from the Pale to the lower Shannon hindered the link and the possibility of blending the two varieties of IrE. Second, until the beginning of the 19th century there were Irish-speaking areas in southeast Ulster in Newry (Co.Down/Armagh), Killeshandra (Co.Cavan) and Drogheda (Co. Louth), underlined in Figure 1.5, where English monoglots were a minority. This resulted in blocking of the northern from the southern varieties of central and southeast Leinster. This in turn made Northern IrE more readily influenced by Ulster Scots dialects of English (Adams, 1958: 66). Adams mentions that the northern Irish

dialect that existed between the Boyne River (Drogheda) and Fews baronies (Co. Armagh) has been replaced by Leinster rather than Ulster English (Ibid.: 71).

Henry (1958) observes that Northern IrE features extend into Leinster while the Co. Leitrim 'buffer-strip' absorbs them and prevents their advance into Connaught. He sees that Munster is a relatively homogeneous and 'dynamic' area and that some features of Munster English penetrate into Connaught over the Shannon River in the direction of Mayo (Ibid.: 147). As mentioned earlier, the TRS findings have shown that the N-S border of IrE is a zone between two parallel lines: the first from Bundoran to Dundalk and the other from Sligo to Drogheda, as shown in Figure 1.5. Adams (1977) sees that south of the zone, SIrE manifests homogeneity since its dialects are based on English from England and north of the zone, NIrE exhibits less homogeneity since it had different sources: Lowland Scots and English (Ibid.: 56-57).

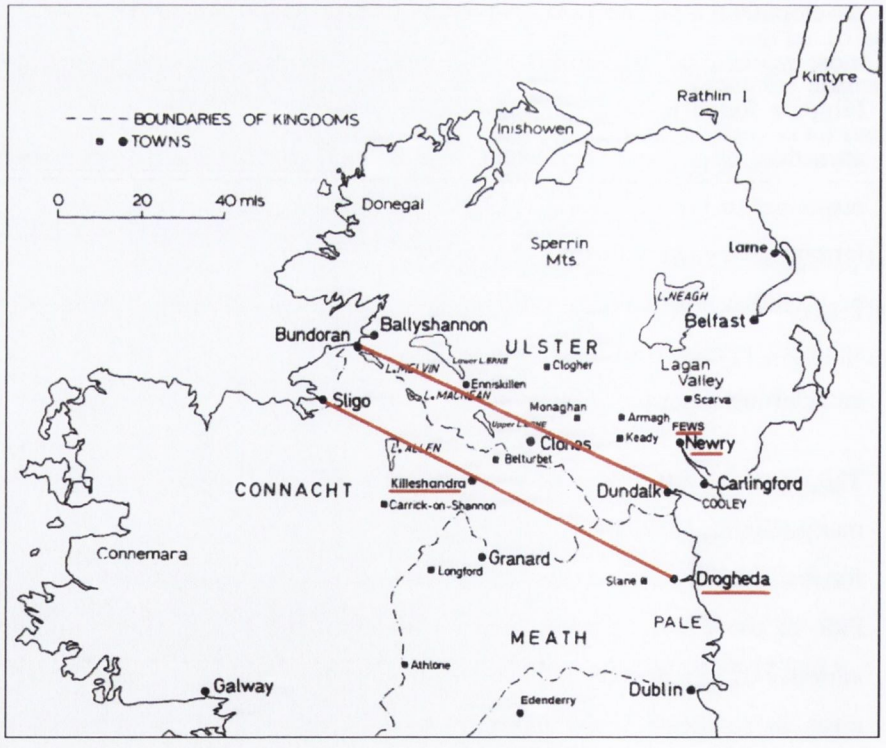


Figure 1.5 The north-south boundary zone delimited by red lines shown in the northern part of the island, reproduced and modified from Adams et al. (1985)

As in English, Irish (Gaelic) dialects are divided into mainly northern and southern varieties. O'Rahilly (1932) suggests that there are two main Irish dialects. However, according to O'Rahilly, the boundary between Northern and Southern dialects is somewhat different to that which is described for IrE. Northern Irish would have been the variety spoken in the North East - Ulster and Co. Louth. Southern Irish comprised the dialects of the rest of the island. According to O'Rahilly, Northern Irish is of two types; Ulster and the northern part of Connaught. The former is heavily influenced by Scottish-Gaelic and is strong on the eastern side where it displaced the more southern dialect in Louth and north Meath. The north-south Irish boundary ran through the present counties of Meath, Westmeath and Longford (O'Rahilly, 1932: 248-64). Figure 1.6 provides a map showing the Irish counties.

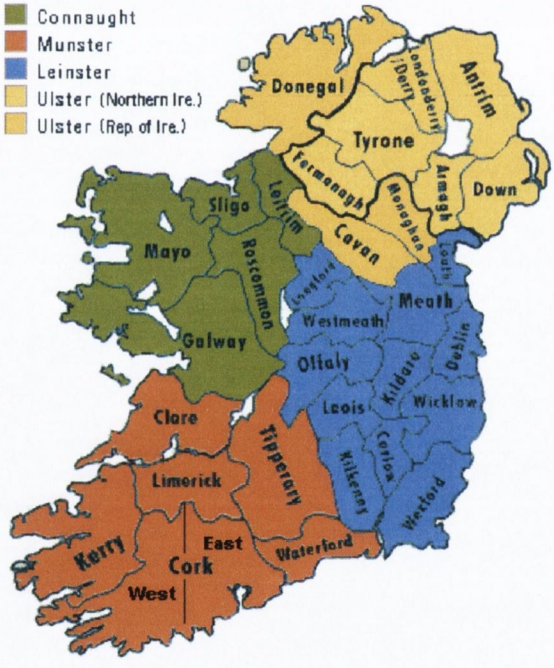


Figure 1.6 Map showing the Irish counties

The most important feature distinguishing Northern Irish from Southern Irish is stress placement. Northern Irish is characterised by retaining the stress on the initial syllable. O'Rahilly suggests that Ulster Irish is also distinguished from Connaught Irish by a strong tendency to shorten long unstressed vowels (Ibid.: 99-101). Southern Irish stresses the second syllable of a word whenever that syllable is long (or heavy). Also, in Southern Irish

the third syllable attracts stress if it is long and the two preceding syllables are short. The term long or heavy refers to syllables composed of particular combinations of vowels and consonants. O'Rahilly reports that the southern stress-system is found throughout Munster, Leinster (including north Dublin, north Kildare, and north Offaly), and some parts of south Meath, Clare, and south Galway. He maintains that in general Connaught and north Leinster held out against the southern stress (Ibid.: 86). O'Rahilly employs the term 'Ulster' to mean the province of Ulster and Co. Louth. In discussing the Northern Irish stress, he continuously indicates in brackets that Ulster includes Co. Louth. This suggests the strong presence of Ulster features in the Irish that was used in Co. Louth (Louth was regarded as part of Ulster until the 17th century). Indeed, O'Rahilly traces Scottish features in Irish as far as Drogheda on the east coast (Ibid.: 165). He shows that the Irish in Leitrim and that of Sligo were southern in character, but that of north Meath and north western Cavan seems to have been of a more northern type. O'Rahilly believes that Irish dialects emerged as early as the 13th and the 14th centuries. He finds the earliest explicit evidence of Irish dialects in 1577 (Ibid.: 248-49). O'Rahilly's words sum up the geographical distribution of the Irish dialects:

> The two protagonists [Northern and Southern Irish] had themselves come to close quarters in the north of Leinster. The Ulster dialect had pushed as far south as the lower Boyne, between Navan and Drogheda; while in the district watered by the upper Boyne Southern Irish was spoken, as, for instance, at Edenderry [Co. Offaly].
>
> (O'Rahilly, 1932: 264)

Based on O'Rahilly's account of the geographical distribution of the two Irish dialects, Barry (1981b) suggests that IrE took over the geographical distribution pattern of Irish during and after the 17th century. Barry puts down the existence of the north-south boundary to the introduction of two different forms of English: the 17th century English that spread from the Pale and the 17th century English which was heavily influenced by Scots English and which spread from east Ulster. He reports that the two forms of English happened to meet around the area where northern and southern Irish dialects divided. The results of the TRS study of the north-south border show that southern features of IrE appear to spread in south-west Donegal, while northern forms extended southwards from

Upper Lough Erne. It also showed that there was a gradual change from northern to southern forms on a line centring from Carlingford in the east to Bundoran in the west. The TRS findings also suggest the emergence of a 'sub-dialect' in the northern Pale and Dublin hinterland characterised by northern forms such as the rounding of the first element in the CHOICE vowel as opposed to the southern form which is usually unrounded (Adams et al., 1985: 76).

Kallen (2006a) investigates the transfer of dialect distribution from Irish to IrE. He uses evidence from eight variables based on Wagner's *Linguistic Atlas and Survey of Irish Dialects* (1953-1969) and on Henry's survey of IrE (1958). Although Kallen points out the limitations of the two sources for this kind of comparison, his investigation shows three main findings. First, he shows that the north-south linguistic border is evident in both Irish and IrE, however, it does not necessarily follow the political border. This he argues is not surprising since settlement and dialectal patterns of the two languages predate the political border between Northern Ireland and the Republic of Ireland. Furthermore, the north-south and intermediate forms in Irish can vary from one variable to another. Second, he finds that the dialect boundaries for each language do not coincide fully, suggesting that the role of transfer from Irish to English is not certain. For example, one of the few variables to match in both languages is the distribution of the /ɛ/ raising into /ɪ/ which seems evident in the IrE of Connacht, Munster, and south Leinster, and which is an 'active principal in Irish phonology' but much less prevalent in Ulster English. Third, he finds that the north-south border is not the only geographical dialect division in IrE but that some variables show an east-west division. For example, the palatalisation of velars observed in Ulster and Leinster is largely lacking in the western part of the island. Moreover, although the lenited forms [t̪] and [d̪] support a north-south division, the word final form [h] seems to be restricted to Leinster.

In an interesting sociolinguistic study, Zwickl (2002) investigates language attitudes and dialect use across the nourth-south political border, in Armagh (which is part of Northern Ireland) and Monaghan (which is part of the Republic of Ireland). Her findings reveal that the political border between Northern Ireland and the Republic has an impact on social identity, attitudes towards language, and social attitude. In Ulster, factors such as belonging to a minority or a majority proved to be crucial in language attitudes. Catholics in Armagh, who are a minority group in Northern Ireland, show more positive attitudes

towards the Irish language and turn to their localised form of IrE speech in order to express belonging to their group. Similarly, Protestants in Monaghan, who are a minority in Monaghan and the Republic, have extremely positive attitudes towards Standard English and try to retain a positive self-image as a minority. Zwickl points out that "the lack of contact between the two religious groups suggests that there may be very subtle differences, such as pronunciation or intonation" (Ibid.: 245) alongside extralinguistic markers such as appearance or name. The present study, although not concerned with identity markers, highlights intonation as a potential dialect marker, which can be as equally important as segmental markers, if not more.

1.5 The Position of Drogheda

Drogheda is the main town of the North East of the Republic. It lies at the border of present day counties Louth and Meath. It is an industrial port town lying at the banks of the River Boyne. Its name comes from Irish *Droichead Átha*, meaning 'bridge of the ford'. It has the seventh largest population in Ireland and it continues to grow, economically, in population, and in numbers of commuters - given its proximity to Dublin (35 miles away). With its suburbs and environs, Drogheda is the largest town in Ireland, excluding the cities, with a population of over 35,000. The town is also located near the M1 road, the main Dublin-Belfast motorway. Drogheda railway station was opened in 1844 acquiring rail links to Dublin and in 1852 to Belfast. The local economy used to depend on traditional Irish industries such as textiles, brewing, and shipping. Today local economy includes retail, services, and technology sectors. However, with the recent impact of recession businesses have slowed and unemployment has increased.

Historically, Drogheda lies in the northern part of the medieval region of what was known as the Pale, shown in Figure 1.7 (http://www.uni-due.de/IERC/general.htm). The physical boundary of the Pale was built around parts of the counties of Louth, Meath, Dublin, and Kildare in medieval Ireland where the influence of English was the strongest. Two historical events are cited in relation to Drogheda. The first is the siege of Drogheda which took place in 1649 when the Parliamentarian army of the English led by Oliver Cromwell defeated the Royalists led by Sir Arthur Aston. The siege ended in the infamous massacre of the Royalist defenders. The second is the Battle of the Boyne in 1690 when the army of the Catholic King James was defeated by the armies of his nephew and son-in-law, the

Protestant King William. By 1850, in eastern Leinster, English had become the first language for most people living within a thirty-mile radius of Dublin (Barry, 1982: 90).

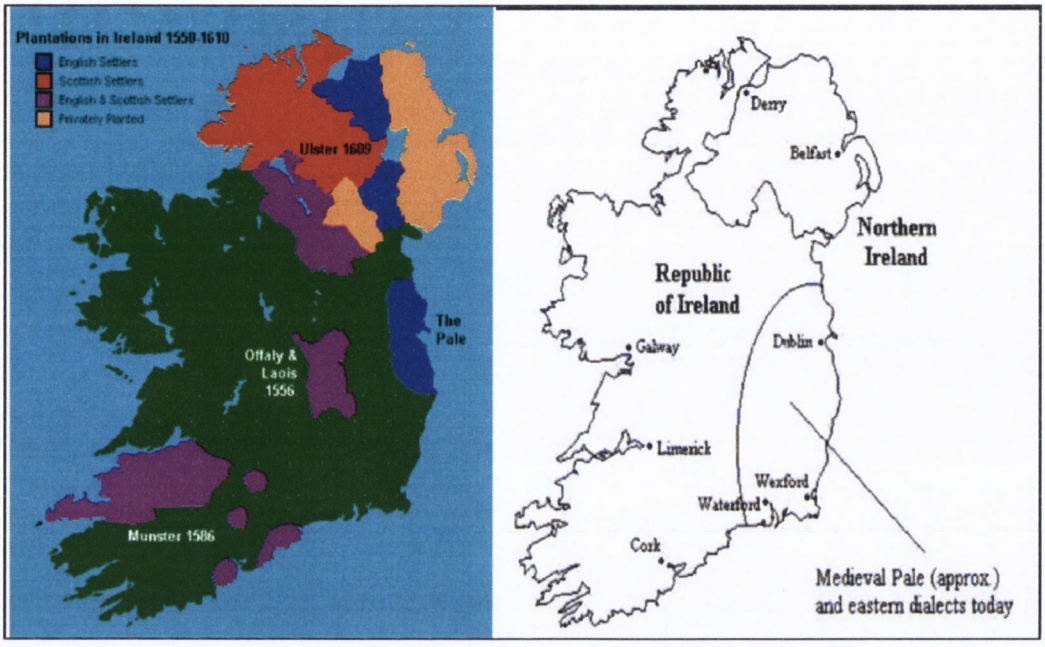


Figure 1.7 The area of the Pale, reproduced from (http://www.uni-due.de/IERC/general.htm).

Barry describes the topography of the northern-southern IrE boundary as extending "S [south] towards Dundalk or even occasionally dipping further S towards the Boyne at Slane and so E [east] to Drogheda." (1981b: 52). The location of Drogheda, in the boundary zone separating northern and southern varieties of IrE, is interesting: although one might expect it to be a southern variety, the segmental and particularly intonational features should provide an indication of the extent to which northern features have spread southwards in the island. Although the present study is mainly concerned with describing and analyzing the intonation of DroghE, the findings of the intonational patterns in this variety can prove to be an important indicator to define linguistic borders, which are usually defined based on primarily segmental descriptions.

1.6 Research Questions

This study is primarily a detailed phonological description addressing four main aspects of a single variety of IrE. The first aspect concerns the main segmental features of the vocalic and the consonantal systems. The vowels are described using Wells'(1982) Lexical Sets, which use RP and GenAm (General American English) as reference varieties of English. However, since certain vowel oppositions are retained in IrE but are lost in RP and GenAm, particularly in /Vɹ/ contexts, I propose some lexical sets for IrE and use them to report on the vocalic system of DroghE. The consonantal system focuses only on the realisation of consonants which have been reported to be different from other varieties of English.

The segmental description answers two questions:

- What are the main characteristics of the vocalic and the consonantal systems and how does this variety of IrE compare with RP and GenAm for which there is very detailed information?

- To what extent do the segmental features of DroghE show features that are characteristic of Northern IrE, considering its location in the linguistic boundary zone separating Northern and Southern IrE varieties?

The second and major aspect concerns the tonal patterns in DroghE. The phonology of the tonal patterns in DroghE in different types of utterances is described. The intonational description is carried out in the AM (Auto-segmental Metrical) framework and uses the ToBI (Tones & Breaks Indices) (Silverman et al., 1992) labelling system, developed building on Pierrehumbert's work (1980) on American English intonation. However, inspired by particular insights from another labelling system, the IViE (Intonation Variation in English) system, developed by Grabe et al (1998b), I propose a modified ToBI labelling system and use it to report on the findings. The tonal patterns found in DroghE are compared to available information on other IrE varieties, particularly that of Dublin English, in an attempt to add another missing piece of the jigsaw of the intonational topology in IrE. In addition to the broad descriptive objective, a research question here would be:

- How do the tonal patterns of DroghE compare to other varieties of IrE?

The third aspect relates to interrogative intonation in different question types. As the findings of the tonal patterns reveal that DroghE lacks rising nuclear contours in different question types (a finding that is being increasingly associated with typical Southern IrE varieties), the question arises:

- What intonational devices do speakers of DroghE employ to convey interrogative intonation?

To answer this question, the phonetic markings of interrogative intonation are investigated. This is done by measuring the f0 scaling at crucial points in the f0 contours of statements and different types of questions.

The fourth and final aspect of the study relates to the phonetic realisation of pitch accents in DroghE. Specifically, the timing of the tonal targets (of pitch accents) with the segmental string, known as alignment, is investigated in both pre-nuclear and nuclear accents. When reporting on peak alignment in DroghE, or any other variety/language, I propose that it is useful to differentiate between two types of alignment features: intrinsic and extrinsic. Intrinsic alignment is the inherent timing of tonal targets with the segmental string in a particular variety. The extrinsic alignment is the shift away from the intrinsic timing conditioned by other factors such as rhythmical constraints. Four questions arise in this respect:

- What is the intrinsic peak alignment in DroghE when there are no contextual timing constraints?
- When there are contextual timing constraints, does peak alignment shift in DroghE?
- If peaks do shift, what is the extent of such alignment shifts?
- Is intrinsic alignment different when the accented syllable has a potentially different structure?

1.7 Thesis Structure

The thesis consists of eight chapters. The first three chapters provide a review of the relevant literature and a discussion of the methodologies and materials used in the present study. The following four chapters present the segmental and prosodic analyses.

Following the present introduction in **Chapter 1**, **Chapter 2** is a literature review on intonation relevant to the chapters of intonational analysis. It gives a brief review of the AM approach, on which the present intonational investigation is based, the ToBI and IViE labelling systems, the current state of knowledge on IrE intonation, the particular literature on interrogative intonation, and finally the literature on alignment studies, where I propose the two types of alignment: intrinsic and extrinsic.

Chapter 3 gives the details of informants, methods and materials of the four major investigations and provides details on two perception experiments, one related to the vowel analysis, the other to the perception of interrogative intonation. In this chapter the modified ToBI system, which will be used to describe the phonology of DroghE intonation, is introduced.

Chapter 4 presents the analysis and findings of the vocalic and consonantal systems of DroghE. The presentation of the vocalic system employs Wells'(1982) Lexical Sets, in addition to the proposed sets for IrE.

Chapter 5 presents the analysis and findings of the tonal patterns in DroghE and compares the results to the available information on other Southern and Northern IrE varieties.

Chapter 6 presents the analysis and findings of the phonetic markings of interrogative intonation in DroghE and relates the results to the intonation of questions in other dialects and languages.

Chapter 7 presents the analysis and findings of peak alignment in DroghE and relates the findings to other alignment studies.

Chapter 8 summarises the main findings and discusses relevant issues that merit future investigation as regards the phonological studies on IrE, as well as intonation studies in general.

Chapter 2 Review of Literature: Intonation

This chapter presents a literature review to the three main chapters (Chapters 5, 6, and 7) which tackle three distinct aspects of the intonation of DroghE. Chapter 5 gives a broad picture, examining which tonal patterns are found in different kinds of utterances. Chapter 6 examines more closely the question of whether/what intonational features differentiate between statements and questions in this variety, given that the tonal patterns are more or less the same. This involves looking in detail at the scaling of f0 at critical points in the utterance. Finally, in Chapter 7, issues of timing, i.e. the question of how the melodic tier attaches to the syllabic and segmental tiers are investigated.

Section 2.1 provides a broad introduction to some of the different approaches that have been adopted for intonational analysis, focusing particularly on the ToBI system used here, with modifications used in this thesis. Section 2.2 reviews the main available intonation studies on varieties of Irish IrE as background to Chapter 5. Section 2.3 reviews the literature on interrogative intonation as background to Chapter 6. Section 2.4 reviews the literature on alignment studies. Here, I propose that it is useful to treat alignment in terms of 'intrinsic' alignment and 'extrinsic' alignment. Intrinsic alignment is essentially the default alignment characteristics that pertain when there are no rhythmic constraints on the realisation of the melody. Extrinsic alignment is the variations that arise when such constraints operate and there may be insufficient time to permit the full realisation of the default. It is further proposed that there is evidence that languages and dialects may differ in terms of both aspects of alignment.

2.1 Approaches to Intonation Study

Intonation is defined as the 'meaningful' variation of pitch in the spoken utterance. As part of prosody, intonation combines with other prosodic features, such as duration and amplitude in order to convey and supplement the 'lexical' message by adding a 'discoursal' dimension to the meaning of a spoken utterance. It is used to differentiate between types of utterances, e.g. statements from questions. It adds linguistic information, showing which parts of the utterance belong together and which parts are more or less important than others. Intonation also adds paralinguistic information by indicating the

speaker's emotions and attitudes relative to discoursal context along with the employment of other factors such as voice quality, loudness, and length. Intonation also gives biological information about the speaker such as gender and age. Acoustically, it is the fundamental frequency (f0), the perceived pitch, which is generally assumed as the main acoustic correlate of intonation.

In the linguistic literature on intonation, two main analytic approaches have been used. The first is the American school which treats intonation as being made up of smaller component parts, such as local pitch 'levels' first proposed by Pike in 1945 and Wells (1945) and later canonized in Trager and Smith in 1951. Many later American phonologists have also considered intonation in terms of pitch levels. In this approach there are usually four levels of pitch numbered from 1 to 4 in an ascending order from lower to higher pitch level. Some reduced the levels into three: L, M, and H (Goldsmith, 1976), while others have used only two: H and L (Pierrehumbert, 1980).

The second is the British school approach which interprets intonation as consisting of a sequence of local pitch 'movements' or 'contours'. Among the earliest British descriptions were Palmer in 1922 and Kingdon in 1958. This tradition has been followed by later British intonologists (Cruttenden, 1986). In this tradition taxonomy and notation of distinct contours have been devised: such as falling (`), rising (´), falling-rising (ˇ) and rising-falling (ˆ). This kind of notation is known as the 'tonetic-stress marks' and was devised by Kingdon. In this approach, the most prominent pitch movement in the contour is called the 'nucleus', the stretch of following syllables is called the 'tail', the stretch from the first stressed syllable preceding the nucleus is called the 'head', and the stretch of unstressed syllables preceding the first pitch accent is called the 'prehead'.

Another important approach to intonation combines a 'local' component with a 'global' one. An utterance may have a global direction of the f0 upon which local highs and lows are superimposed on the relevant segmental string. This was introduced by the so-called 'overlay' or 'superimposition' models. e.g. Fujisaki (2004). A similar approach to intonation has been proposed for Danish (Thorsen, 1980, 1983: see Chapter 7). In Copenhagen Danish, intonation is represented as the f0 slope connecting the stressed syllables of an utterance on which the f0 of the 'stress groups' rides. The pitch contours in Danish are reported to have different slopes according to different utterance types as shown in Figure 2.1.

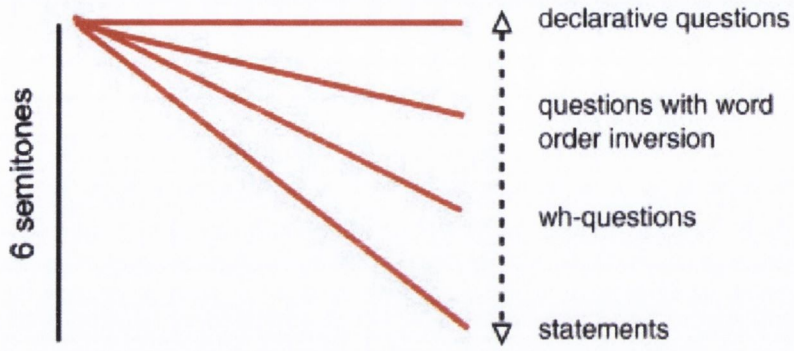
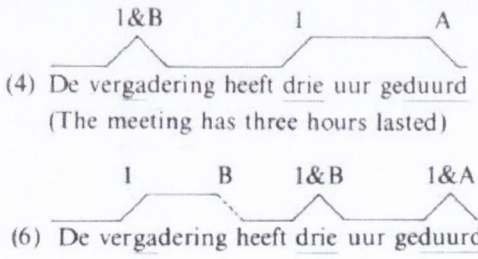


Figure 2.1 Stylized intonation contour slopes in scripted speech as found in different utterance types, reproduced from (Thorsen, 2009: 600)

Another approach to studying intonation has been based on perception. A model for Dutch was developed at the Institute for Perception Research (IPO) in Eindhoven (t'Hart et al., 1990, t'Hart, 1984). This approach constructs a stylized f0 contour which contains the smallest number of straight line segments that sounds indistinguishable from the original f0 contour. The resulting pitch movements are then standardized by giving standard specifications relating to their size, slope, duration, and position in the syllable. Next, a generative grammar of intonation is designed to generate all well-formed pitch contours used in Dutch. This resulted in a coding system of five types of rises (1, 2, 3, 4, and 5) and five types of falls (A, B, C, D, and E). The binary values (+) and (-) are added to each of the ten basic movements to reflect some tonal features such as +/- early, or encompassing the full pitch range or part of it. The movements can also be combined e.g. '1&A' indicates an accentual rise immediately followed by an accentual fall. Finally, the pitch configurations of the utterance are superimposed on an overall f0 downtrend, the 'declination' component. An example of the IPO model notation is given below and a stylized standardized contour is shown in Figure 2.2, both reproduced from t'Hart et al. (1990: 83, 49).



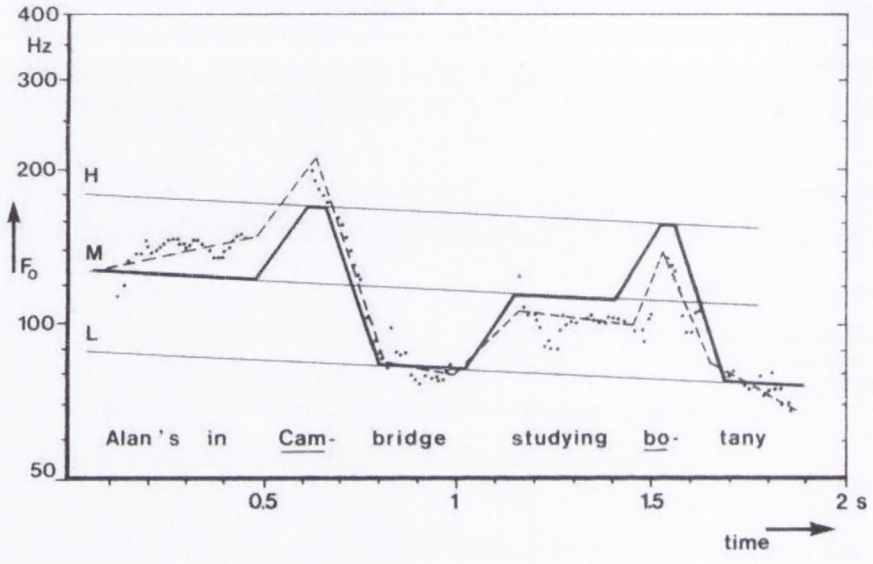


Figure 2.2 Illustration of a close copy (broken line) and standardized stylization in solid line, reproduced from t'Hart et al. (1990: 49)

Another transcription system has been proposed by Hirst and Di Cristo (1998). Hirst and Di Cristo propose that their system, called INTSINT (International Transcription System for Intonation), is a system analogous to the IPA. INTSINT uses symbols to define a pitch movement in two ways. First, there are 'local' characteristics: Higher (↑), Low (↓), same (→), and recurrent characteristics which describe a recurring tonal event as in downstep (>) or upstep (<). Second, there are 'global' characteristics which represent an extreme value of the point in the speakers pitch range; Top (⇑) and Bottom (⇓). Square brackets are used for initial ([ ) and final (]) boundary tones. Although the system was devised as an international system for cross-language comparison, it is not widely used. Figure 2.3 shows an example of Finnish utterance transcribed using INTSINT, reproduced from Hirst and Di Cristo (1998:16).

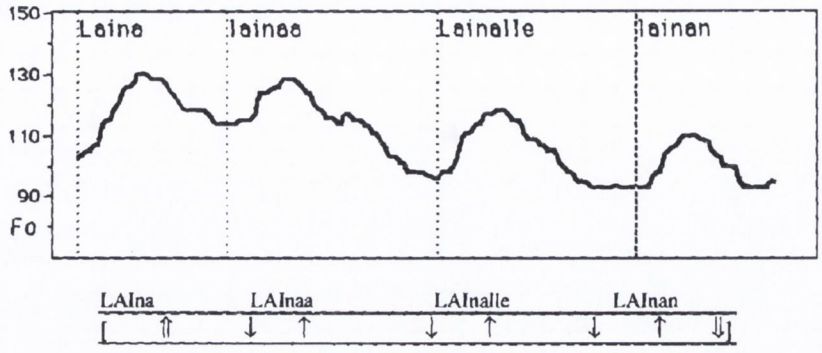


Figure 2.3 f0 track of the Finnish sentence *Laina lainaa Lainalle lainan* 'Laina lends Laina a loan' with an INTSINT transcription under, reproduced from Hirst and Di Cristo (1998:16)

The approach of the present study follows what is called the autosegmental-metrical (AM) approach, which is briefly presented. Two of the most used labelling systems based on this approach, the ToBI and the IViE, are reviewed. These two systems were developed to describe the intonation of varieties of English. For the description of the tonal patterns in DroghE, I use a modified version of the ToBI by drawing on insights from the IViE.

2.1.1 Autosegmental-Metrical Approach

As the name suggests, the AM approach refers to the two major theories on which most of the work on intonation in the past three decades has been based: the autosegmental theory and the metrical theory. In the metrical and the autosegmental theories, intonation is viewed as the tonal sequence of a meaningful phonological structure which is aligned to specific tone-bearing units in the segmental string.

The understanding of the concept of 'lexical' stress as part of the abstract organization of rhythm in time has lead to a whole new understanding of how the segmental string and intonation are related. Intonation is now understood to be a separate phonological structure that is 'associated' with phonemes and syllables via the medium of rhythm.

In his PhD thesis, Liberman (1975) gives an extensive generative approach of the intonation of English. His important contribution is the development of the 'metrical pattern' to account for the behavior of English lexical stress in a way that builds on earlier work, particularly that of Chomsky and Halle's *The Sound Pattern of English* (SPE). By treating lexical stress as basically a 'relational' abstract structure where some syllables are

stronger than others, Liberman could account for English stress patterns using metrical trees in which the syllable nodes are either strong (s) or weak (w). Liberman also introduced the concept of a 'metrical grid' which is necessary to map the intonational structure to the segmental string. This is achieved via the concept of 'congruence' between the metrical pattern and the metrical grid so that tones are associated with the correct 'strong-nodes' of stressed syllables. Liberman argues that, at least in English, the segmental string and the tune are underlyingly separate structures. In support of this he states that "the 'meanings' of tunes do not interact with semantic interpretation of the text, but only serve to define *conditions* [emphasis provided] on its appropriate use in a discourse" (Ibid. 308).

Goldsmith (1976) developed the auto-segmental theory in order to deal with, what is called in structuralist phonology, 'suprasegmental' aspects and their relation with the segmental aspects in phonology. He introduced the idea of parallel independent autosegmental tiers such as the syllabic tier and the tonological tier. The notion of the star '*' notation to denote a pitch-accented syllable was first introduced in the auto-segmental representations. Goldsmith argues and proves that tones are part of a separate structure than that of phonemes and that both structures work simultaneously in time to give the correct, predicted, output utterance of a particular language. Most of the argument for the separate entity of the tonal structure comes from observations of certain tonal phenomena in African tone languages. One of the arguments is that in tone languages when a vowel de-syllabifies or disappears, the tone it was bearing shifts position or shows up on another vowel, what Goldsmith calls the phenomenon of 'stability' of the tone. If the tone was a feature of the vowel just like any feature of roundness or height, then when the vowel is deleted by a phonological rule, the tone should also be deleted.

The AM based analysis of intonation is very much associated with the work of Pierrehumbert (e.g. Pierrehumbert, 1980, Beckman and Pierrehumbert, 1986) since it is based on the general assumption of the autosegmental-metrical approach. The term AM has been used by many after Ladd (1996). ToBI (Silverman et al., 1992) is a widely used AM intonation transcribing system which was developed, building on Pierrehumbert's (1980) work, to transcribe American English, British English and Australian English intonation systems. Many AM intonation systems of other languages and dialects have devised their own transcribing systems by modifying certain aspects of the ToBI. For example, IViE (Grabe et al., 1998b) used for the intonation of British English varieties,

ToDI for Dutch intonation and GLAToBI for Glasgow English intonation (Mayo et al., 1997) are all based on the ToBI. In what follows the two systems ToBI and IViE are described. The transcription system I use to describe the intonation of the DroghE variety of IrE is a modified version of the ToBI based on insights from IViE. This modified system is introduced in Chapter 4.

2.1.2 ToBI System and Framework

ToBI (Tones and Break Indices) was originally the name of an annotation system developed in the period 1991 to 1994 designed for labelling intonation databases of spoken Mainstream American English. It was gradually developed over the course of four workshops with experts from different fields including engineers, psychologists, computer scientists, and phoneticians. Today the term ToBI is used to refer to the developmental framework of this labelling system. The developers of ToBI wanted an efficient system that provides a tool for observing intonation and communicating one's observations to the larger speech community in a common language, a system with a high inter-transcriber consistency, and a system that is practical and easy to use. The ToBI framework is based on a long history of observation and instrumental research on intonation systems of GenAm and Southern British English (SBE) which are among the best understood in the world. Therefore, the originators of the system state that an important lesson for the larger speech community is that any intonation system development or even new sets of ToBI conventions for another language needs to reflect a well-grounded understanding of the intonational and prosodic grammar of the language (Beckman et al., 2005: 12). The developers of ToBI caution that the system does not replace the record of the speech signal with a symbolic record, rather, it provides a symbolic commentary of the phonetic representation of the pitch contour.

The system is based on the work of (Pierrehumbert, 1980) which views intonation as consisting of a sequence of tonal targets, on the treatment of downstep by (Ladd, 1983b), and on the treatment of juncture by Price et al. (1991) and Wightman et al (1992). Price et al. (1991) have shown that listeners can use prosody to separate structurally ambiguous sentence pairs: they associate relatively large prosodic breaks (phonological cue) with larger syntactic breaks. Furthermore, they show that higher break indices are generally associated with greater normalized duration of phones (phonetic cue): syllables tend to be longer in words before major breaks (break index 4) than before smaller breaks (break

indices 0-3), particularly word-final syllables. Wightman et al. (1992) investigated the hypothesis that boundaries are marked by lengthening of the feet that contain them (they take the definition of a foot as beginning with a lexically stressed vowel and includes all segments up to, but not including, the next stressed vowel). They have shown that not only is pre-boundary segment lengthening a cue to boundaries but that the different degrees of lengthening can distinguish among distinct levels of boundaries: mainly four levels of perceptual distinct boundaries (0-1, 2, 3, and 4-6). They find that the domain of pre-boundary lengthening is the rhyme (both vowel and consonant(s)) of the final pre-boundary syllable.

ToBI consists of, at least, six parts: two continuous phonetic records and four symbol tiers. Figure 2.4 shows a sound file (displayed in the Praat speech software) and reproduced from the ToBI online course (http://www.ling.ohio-state.edu/~tobi). The waveform at the top panel is a representation of the recorded sound file. The blue curve superimposed over the spectrogram is a representation of the f0 contour (the standard setting in Praat calculates an f0 tracking algorithm using the auto-correlation analysis method). The **Tones tier** provides different tags for the different tonal events of the intonation contour. The **Words tier** provides an orthographic transcription of the utterance. The **Break Indices Tier** provides number tags that correspond to the perceived strength of junctures within the intonational phrase. The **Miscellaneous tier** provides a commentary space to insert comments such as coughs, disfluencies, and uncertainties concerning labelling. Transcribers working on other languages can add other tiers that are deemed important or necessary to report certain prosodic features that are specific to the intonation of the language under study. For example, the Pan_Mandarin ToBI system (M_ToBI) has a Syllable tier which has a syllable-by-syllable segmentation and another Stress tier that labels each corresponding syllable with a numerical perceived degree of stress (Beckman et al., 2005: 32-33). Another suggested tier was the Phonetic tier for the Korean-ToBI (K-ToBI) used to tag 'non-canonical' tone targets. However, the ToBI developers caution that the term 'phonetic' should not be taken too literally because this will confuse the labels of this tier with a direct phonetic representation as in the case of the f0 contour itself (Ibid.: 35).

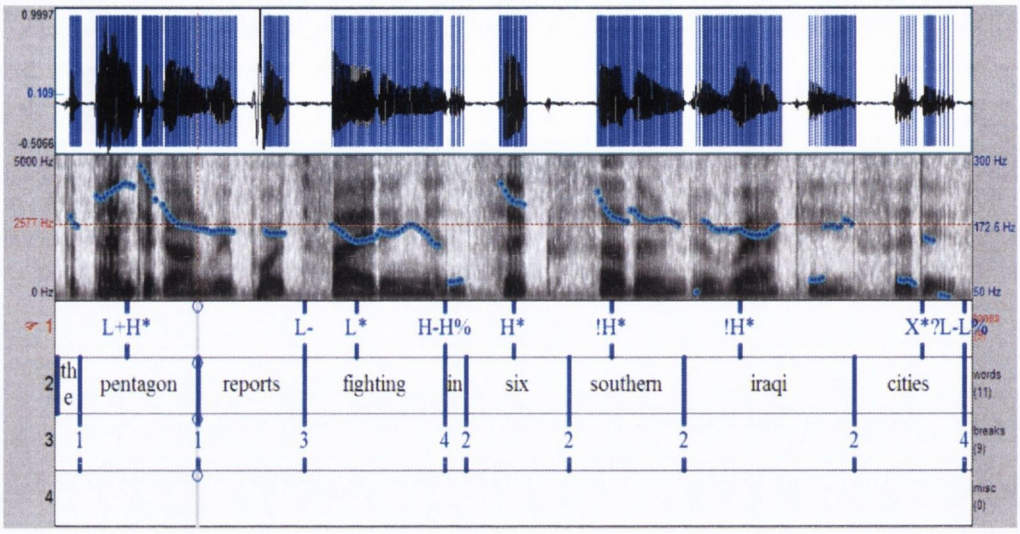


Figure 2.4 An utterance transcribed in ToBI (in Praat) showing the four main tiers: Tones, Words, Breaks, and Miscellaneous, reproduced from the ToBI online course (http://www.ling.ohio-state.edu/~tobi)

In the Tone tier accented syllables are marked with one of the following **pitch accent** labels: H* (non-low accented syllable), L* (accented using a low pitch in the speaker's pitch range) L+H* (a high target on the accented syllable preceded by a sharp rise from a valley), L*+H ("scooped accent", a low tone which is followed by a sharp rise to a high peak), and H+!H* ('!' indicates downstep, a clear step down onto the accented syllable from a high pitch which cannot itself be accounted for by any preceding accent). The two edge tones are the **phrase accent** (to mark the pitch at the end of the intermediate phrase) L- or H-, and the **boundary tone** (to mark the pitch at the end of the intonational phrase) L% and H%. The possible combinations of the phrase accents with boundary tones at the end of the intonational phrase are: L-L% (low ending), L-H% (used for example in questions or as a "continuation rise"), H-H% (high-rising ending), and H-L% (level or sustained ending). There is also a marginal initial boundary tone %H to mark the beginning of the phrase-initial word in an intonational phrase starting with a relatively high pitch.

The inventory of the Break Indices Tier is made up of 4 numerical representations of the strength of the prosodic boundaries in the intonational phrase: (0) indicates a close inter-word juncture as in the clitic *doncha* (*don't you*), (1) marks an ordinary phrase-internal word end, (3) marks an intermediate phrase end, with a phrase accent, (4) marks an intonational phrase end with boundary tone. The break index level (2) is referred to as

'vague' by the ToBI developers (Beckman et al., 2005: 43, 21 footnote 2) since it could be used to indicate (1) or (3) either because there is a phrase tone without the duration lengthening appropriate to (3) or that that lengthening is appropriate for (3) but there is no phrase tone. The former case is illustrated in Figure 2.4.

2.1.3 IViE

IViE (Intonational Variation in English) is an intonation labelling system designed specifically to describe the intonation of British English varieties. IViE was the name of a project developed in Cambridge University (1997-2000) (Grabe et al., 2001, Nolan and Farrar, 1998, Grabe et al., 1998b, Grabe, 2004). Recordings were made for nine varieties of English: London, Cambridge, Cardiff, Liverpool, Leeds, Bradford, Newcastle, Belfast, and Dublin as shown in Figure 2.5. The data in each variety is based on recordings from twelve adolescents (six males and six females). Five speaking styles were recorded: different context-free utterance types, a read passage (Cinderella fairy tale), re-telling of the story from memory (semi-spontaneous speech), an interactive task (map task), and a conversation, 3 ~ 5 minutes, about smoking.

Figure 2.5 Map showing the nine urban centres included in the IViE project, reproduced from Grabe (2004)

The developers state in *The IViE Labelling Guide* that IViE is based on ToBI (Grabe, 2001) with specific modifications. The IViE tiers are basically the same as in ToBI with the addition of two tiers: the **Rhythmic tier** and the **Target/Phonetic tier.** The Tone tier is renamed as the **Phonological tier**. The Break Indices tier is not used. The Rhythmic/Prominence tier marks stressed and accented prominences as well as the rhythmic boundaries (%). The Phonetic tier marks the 'pitch movement' surrounding the prominent syllables. The developers of the IViE clearly state that although broadly termed 'phonetic', the tier is chiefly about alignment. Acoustic phonetic aspects of f0 could include pitch range, declination, alignment, or register. Transcribers can enter labels that transcribe the shape and alignment of the f0 contour in relation to the pitch-accented syllables. Moreover, the domain for transcribing alignment is referred to as the Pitch Accent Implementation Domain (ID). The ID consists of the pre-accented syllable, the accented syllable, and the following syllables up to the next accented syllable. Therefore, the ID corresponds to the foot plus the pre-accented syllable. An illustration of the IViE system is given in Figure 2.6 of an utterance produced by one of the developers (Francis Nolan). It should be noted that in later work the IViE developers refer to the Phonetic tier as the 'pitch movement' Tier (Fletcher et al., 2005: 403).

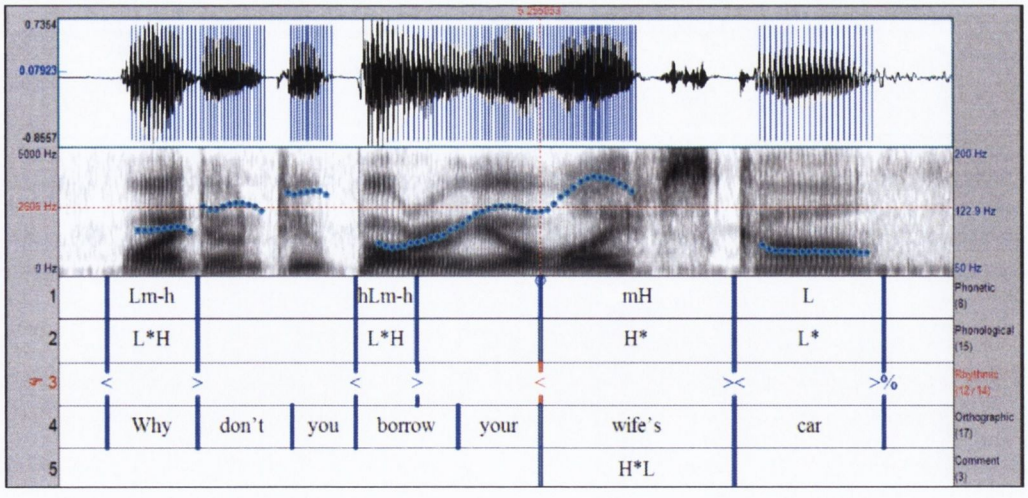


Figure 2.6 An example of Southern British English (male) annotated in IViE (opened in Praat) showing the five main tiers: Phonetic, Phonological, Rhythmic, Orthographic, and Comment

IViE has seven tones as shown in Table 2.1, reproduced from the IViE website (Grabe, 2001). Three intonation phrase boundaries are used on the rhythmic tier: L%, H%, and 0%. The 0% boundary tone indicates that the pitch contour follows the same movement as the previous tone or remains unchanged. Thus, in H*L 0%, pitch either stays low on the same level or drops further (H*L L% is not used in IViE). The level or 0% boundary tone was motivated by nuclear contours investigated in Belfast English where the common nuclear tone is L*H 0% as shown in Figure 2.7. On the Phonetic tier, pitch targets of stressed and unstressed syllables are distinguished by upper case and lower case symbols respectively (H, M, L and h, m, l).

Table 2.1 Tone labels in IViE, with possible Phonetic tier realisations, reproduced from (Grabe, 2001)

IViE option	Contour can look like this (description and possible tone target labels)
H*L	High target on prominent syllable followed by low target in same ID, e.g. H-l, mH-l or mHl-l
H*	High target, common in initial position in so-called flat hats, e.g. lH-h
!H*L	Downstepped high target, low target, e.g. hM-l
L*HL	IP internal or IP final rise-fall: Low target on prominent syllable, high target on next syllable followed by low target, e.g. lLh-l
L*H	Low target on prominent syllable followed by high target, e.g. mLh-h, mL-h, or lL-h
L*	Low target
H*LH	IP internal or IP final fall-rise: high target on strong syllable, low, high, e.g. mHl-h

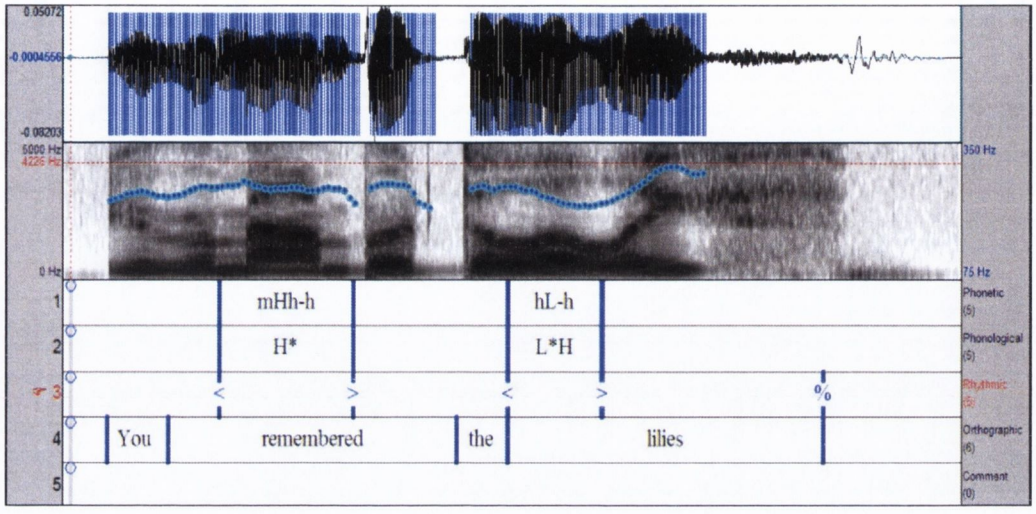


Figure 2.7 An example of Belfast English (female) in the declarative sentence *You remembered the lilies* (in Praat) showing the high plateau of L*H on lilies and a 0% boundary tone, sound file available from IViE website (Grabe, 2001)

The developers of the IViE intended the Rhythmic and the Phonetic tiers to increase the transparency and replicability of the labels on the Phonological Tier. This, they explain, can be achieved through a step by step breakdown of the process which leads to the final decision of labelling the tones on the Phonological tier. Prominent syllables have to be first identified and then labelling can follow. They also suggest that the motivation for a Phonetic alongside a Phonological tier is 'to allow for the transcription of prosodic differences between dialects at different levels of representation' (Grabe, 2001) emphasizing that labellers are more likely to disagree on the phonological labels than the phonetic ones.

An important aspect of the IViE is that all its tonal categories are left-headed in keeping with the British marking of (`) and (´) before stressed syllables. The IViE labels themselves are based on the AM model of English intonation by Gussenhoven (1984). Gussenhoven (1984) outlines three basic tones for British English: fall (H*L), fall-rise (H*LH), and rise (L*H). All other nuclear tones, he suggests, are 'modifications' of these three tones. He proposes 'linking rules' to account for the realisation of pre-nuclear pitch accents, namely partial linking and complete linking. Other rules include deletion,

displacement, and downstep. The introduction of such phonological rules suggests that there are two levels of tonal representation: a surface level and an underlying level.

In this thesis, the ToBI labelling system is adopted, but was modified in some respects, as it was felt that some of the IViE insights were important and merited inclusion. These are presented in the following chapter in Section 3.6.7.

2.2 Intonation of Irish English

This section gives an overview of the available literature on the intonation of the southern and northern varieties of IrE. It also briefly reviews what is known about the intonation of Irish. It is possible that Intonational patterns in IrE varieties are influenced by those in the different Irish dialects.

2.2.1 Intonation Studies in Northern and Southern IrE

Although interest has increased in recent years, the available knowledge to date on the prosody of IrE varieties is in its early stages. Wells (1982: 436) does not have much to say on the prosodic features of Southern IrE except that its intonation "is not strikingly different from that of RP", but he reports that yes-no questions are usually said with a low-fall nuclear tone where it would be a low-rise in RP. Similarly, in their description of Southern IrE phonology Britain and Clift (2003), merely report that "the intonation of SIR [Southern Irish English] is RP-like" (Britain and Clift, 2003: 77). However, as with the trend in the segmental studies on IrE, we know more about the intonation of the northern varieties of IrE than the southern varieties. This is largely attributed to the atypical rising nuclear contours that characterise the tonal patterns in the northern varieties.

In what follows the literature on the intonation of NIrE and SIrE is reviewed separately. Then, the general tonal patterns in both varieties are compared, drawing on previous studies and available data from the SPICE-Ireland intonationally-annotated spoken texts for NIrE and SIrE.

2.2.2 Intonation of Northern Varieties

The intonation of Northern IrE and particularly that of the capital city, Belfast, has attracted attention more than other IrE varieties because of its rising nuclear contours in declarative utterances, a contour which is highly marked in terms of the world's languages.

The title of one of the earliest reports on Belfast English, 'Belfast intonation and the myth of the fall' (Jarman and Cruttenden, 1976), aptly expresses the reason of interest. In their article, Jarman and Cruttenden give evidence that the fall is not the default nuclear tune in Belfast English. Based on the speech of one speaker they find that 70% of the nuclei produced were rises.

Mclholm (1986) investigated the intonation patterns of Derry English, using Halliday's framework and terminology, in the speech of two male speakers from Derry city and found that the rising patterns are the most common in statements and questions, similar to Belfast English. He found that Tone A (low rise) is the most common nuclear contour in sentences and that Tone B (high rise) the most common in yes-no questions. The second most common nuclear pattern was found to be Tone C (rise-fall) which is decribed as a 'rise to high, followed by a fall to mid, or perhaps slightly higher' and is used most commonly to express contrast or reservation, which is functionally equivalent to Tone 4 in Southern Standard English (1986: 34).

Rahilly (1997) argues that using an intonation model for RP and adopting it for studies on IrE results in the misleading assumption that IrE prosody varies from RP in only minor respects and fails to reveal the distinctiveness of IrE. She outlines a model for analyzing the intonation of IrE by taking Belfast English as a case study.

Lowry (2001) is the first intonational study of Belfast English to use the AM approach. Earlier studies of Belfast English used the traditional British approach (Rahilly, 1997, Jarman and Cruttenden, 1976). Lowry's study was part of the IViE project. She introduced modifications to ToBI that were thought to be necessary for annotating the tonal patterns in Belfast English. She gives the following inventory of Belfast English intonation:

The rise-plateau L*+H 0%: used as the default nuclear contour in declaratives

The high rise L*+H H%: used as the default nuclear contour in questions

The rise-plateau-slump L*H L%: used to signal incredulity

The fall H*+L 0%: used interchangeably with the rise-plateau but is more common in formal speech

She also discusses certain phonological processes that the underlying pitch accents undergo before they are realised on the surface phonetic level. Following work by Gussenhoven (1984) and Grabe (1998), Lowry discusses 'delay' and 'deletion' in Belfast

English. In initial pre-nuclear positions the peak of a H*+L pitch accent can be delayed where it is realised on the following unaccented syllable; the delayed pitch accent is transcribed as >H*+L. In the same line of thought, she considers that the single pitch accents (H* and L*) are underlying H*+L and L*+H pitch accents, respectively, which have undergone a process of deletion of their trailing tone. She also finds that in Belfast English, the pre-nuclear pitch accents can be a sequence of the same initial pitch accent whether rises (L*+H) or falls (H*+L), or can be a combination of both rises and falls. These pre-nuclear pitch accents can also be subject to the process of deletion, resulting in mono-tonal pre-nuclear pitch accents.

Lowry (2002) finds that although rising nuclei are by far the most common in Belfast English, other patterns including falls do occur depending on factors such as, gender, social background, context, and speaking style. She finds that in three speaking styles ranging from careful to spontaneous, elicited from twelve seventeen-year-old Belfast speakers of English, there is a tendency to use more falling patterns in a read passage and fewer or none in informal conversational speech.

Dorn (2006) is a recent MPhil. dissertation on the intonation of the Northern IrE variety of Donegal. Dorn analysed the intonation of one female speaker from Dungloe in Donegal using IViE. She found the dominant pre-nuclear and nuclear pitch accent to be L*+H in both statements and questions. She also found that 0% is the most common boundary tone. However, it should be noted that the data of this single speaker might not be representative of the wider area in Donegal. More detailed analysis is currently conducted by the same researcher. The findings by Dorn match those found for Donegal Irish (Dalton, 2008). Collectively, Donegal Irish, Donegal English, and Belfast English are distinct from the Southern IrE varieties and southern British English varieties in that they have rise-plateau nuclear tones. Interrogatives are also similar to declaratives. For example, yes-no questions may end on a high boundary tone (L*+H H%). In Belfast English, initial pre-nuclear accents can be either H* followed by downstepped (!H*) or rises L*+H, whereas in Donegal English the most typical pre-nuclear accent is L*+H (Dorn, 2006).

2.2.3 Intonation of Southern Varieties

The southern varieties of IrE have attracted less attention than the northern ones. However, with the recent increase in dialectal intonation studies more Southern IrE dialects have

drawn interest. The currently available data on IrE intonation is heavily drawn from the IViE project, particularly for Dublin English and Belfast English.

The earliest reports on the intonation of IrE, however, come from Henry's 'A linguistic survey of Ireland' (1958). In the section 'Accentuation', Henry gives a brief commentary on lexical stress and intonation of IrE varieties for some of the areas he recorded for the survey. He confines his brief comments to the dialects 'south of the Sligo-Dublin line'. Henry's notation of intonation employs the 'tadpole diagram' used in the traditional British school framework for intonation analysis. His discussion of lexical stress is mainly for Irish words used in IrE. The examples he gives for the intonation patterns used in certain districts in counties Mayo, Galway, Waterford, Clare, Kerry, Limerick, and Cork suggest that these areas have generally similar tonal patterns. Figure 2.8 shows some examples of the tonal patterns from the areas reported on, reproduced from Henry (1958:174-94). The prevalent tonal pattern in the majority of these areas is reported to be a phrase-final rise often preceded by a falling pitch accent. For example, Henry observes that in Kerry the nuclear contour is a gradual fall followed by a sharp rise on the last syllable so that a three syllable intonational phrase usually has a falling-rising contour and sometimes a rise only. He gives examples from Kerry where statements and questions employ the same contour. In many of these areas, e.g. Ross Carberry in Cork, lexical stress-shifting is common. In Kilkenny, however, Henry observes that the prevalent pitch accents are fairly rapidly falling ones which, he suggests, give a sense of the 'speaker's perpetual wonderment'.

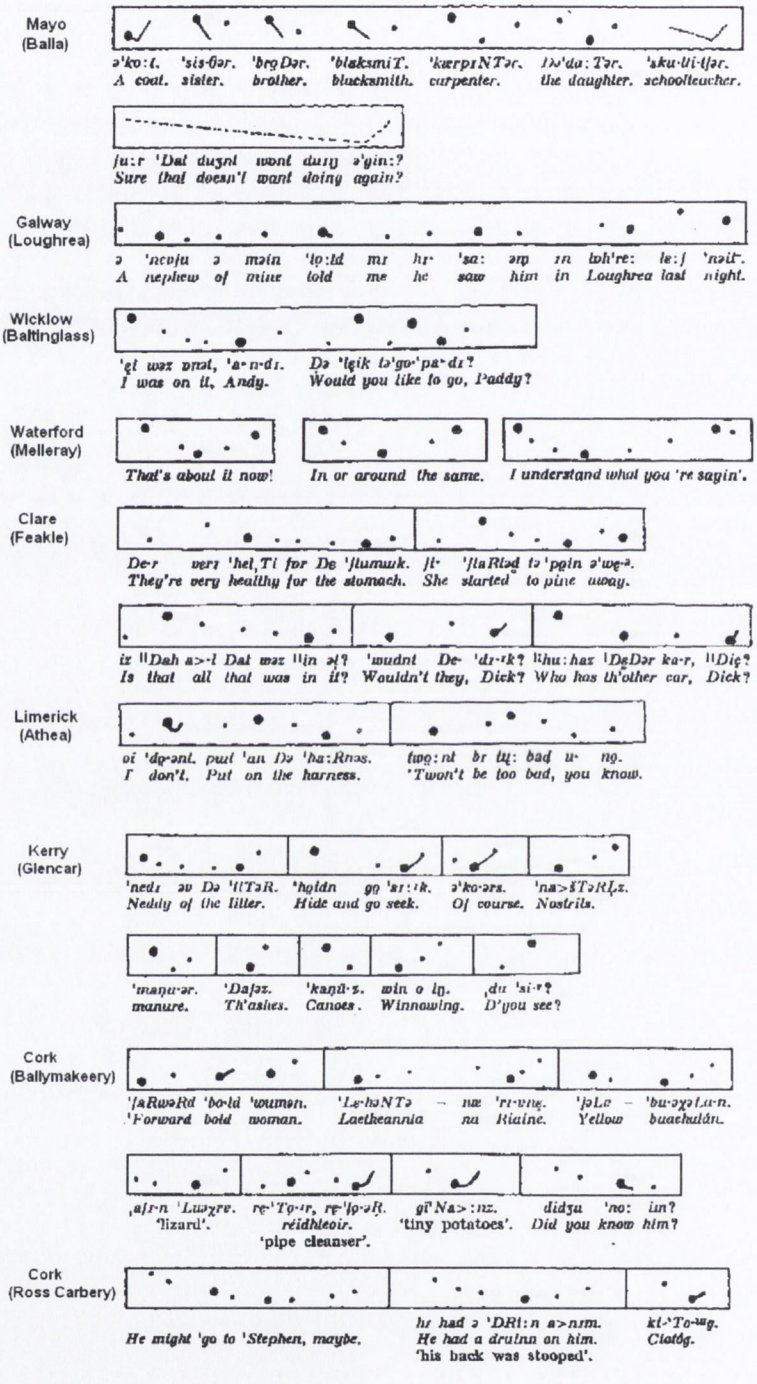


Figure 2.8 Examples of the contours of some areas reported by Henry using the 'tadpole diagram', reproduced from Henry (1958: 174-94), he includes above the orthography his transcription of the utterance.

Henry concludes that "it is clear that in the heart of Connaught prevalent contours are found which differ little from some recorded for the SW [South-West]" (Ibid. 194). He

believes that the assumption that stress-shifting in Southern Irish was accompanied by a rising tone on final syllables is plausible.

In the IViE project, Dublin English was included in comparison with the varieties of English used in Cambridge, Leeds, Bradford, Newcastle, and Belfast. The intonation of Dublin English was not found to be very different from that of British Southern varieties. What is most characteristic of Dublin English is that it has in comparison to other varieties the fewest occurrences of rising nuclear contours, even in different question types. The IViE gives a 'general' representation of Dublin English, it cannot be said to give a comprehensive picture of the amalgam of the different varieties of Dublin English which also differ in segmental phonology. The Dublin English data included in the IViE project was from the town of Malahide, in Fingal, which is considered part of Dublin Metropolitan Area but lies at the hinterland of the Dublin Region, approximately seven miles north of Dublin city center.

The recent work by Sullivan (2006) focuses on aspects of alignment in the IrE varieties of Dublin, Wexford, and Belfast. However, it can be discerned from her study that similar to Dublin English, Wexford English has a falling nuclear contour in statements and does not seem to have rises in yes-no questions. Sullivan's data for Dublin English and Belfast English is based on the available IViE corpus.

O'Connor (2005) is a recent MPhil. dissertation on the intonation of the SIrE variety of West Cork. She analysed the speech of one female speaker from Glengarriff, in West Cork using the IViE labelling system. The findings suggest that the two most common nuclear accents for both declaratives and questions is H*+L followed by either 0% or H%. A higher proportion of questions had a H% boundary (48.6%). O'Connor concludes that what makes this dialect unique is that sometimes in statements a fall is followed by a rise (H*+L H%) as shown in Figure 2.9, reproduced from O'Connor (2005: 32). It should be noted that this nuclear contour is different from the rise-plateau (L*+H 0%), common in Northern varieties, and which makes only (13.4%) of the West Cork English statements. O'Connor uses a right-headed pitch accent e.g. H+L* H%, and L+H* 0% in cases "where the Munster stress shift illustrated in the word "*Eileen*" is present" (Ibid. 91). O'Connor relates her results to some comments on Munster Irish intonation by Ó Cuív who wrote a detailed phonetic study on the Irish of West Muskery Co. Cork in 1944. A common observation in Munster Irish is the shift in stress towards a second or final syllable

whenever that syllable is long (O'Rahilly, 1932) (see Chapter 1, Section 1.4). She looks at some of the borrowed Irish words in West Cork English which illustrate this shift in stress. The findings of O'Connor are in line with the patterns that were observed by Henry (1958) in the south west of Ireland.

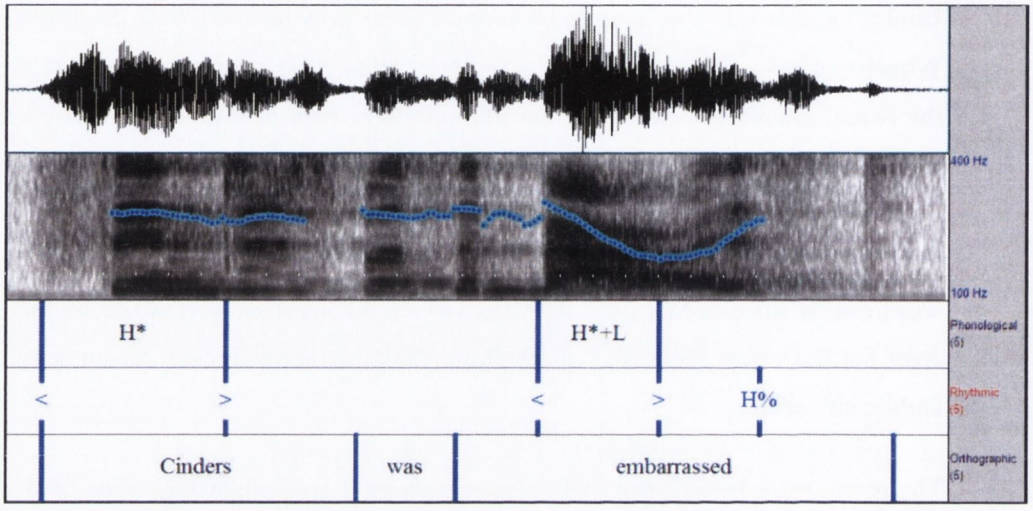


Figure 2.9 Pitch track of the declarative *Cinders was embarrassed,* reproduced from O'Connor (2005: 32)

O'Halpin's (1993) study investigates contrastive focus in the speech of two south Dublin informants. It can clearly be discerned from her study that a fall is the unmarked nuclear contour in statements, in line with other observations on this variety. O'Halpin also points to the importance of studies in IrE intonation for the purposes of teaching English as a foreign language; textbooks designed to help learners acquire intonation patterns as used by speakers of RP 'are of limited value' in Ireland, apparently (Ibid.: 13).

2.2.4 Comparing Southern IrE and Norhtern IrE Intonation

To summarise what is available on both varieties of IrE the nuclear contours of Dublin, West Cork, Belfast, and Donegal is plotted in the four utterance types: statements (ST) and wh-questions (WQ), yes-no questions (YQ) and declarative questions (DQ) separately in Figure 2.10. The graphs show the percentage of rising (red) and falling (blue) nuclear contours in each variety for each utterance type. Data for Belfast and Dublin are adopted from Grabe (2004: 25-6) which is based on six speakers per dialect (three males and three females). The Donegal and the West Cork data (which are based on the limited pilot

studies of a single female speaker each) are shown alongside the more extensive data from IViE on Dublin and Belfast. The Donegal and West Cork studies used similar data to IViE, though not identical, and employed the same labelling system. It should be noted however in the case of the single speaker in the West Cork study that this informant is not necessarily typical. She was chosen for analysis precisely because she exhibited tonal patterns often associated with a Cork accent, even though it may no longer be the dominant type of tonal patterning in the region. In view of this, the West Cork data here is illustrative only, and this is why it is marked with an asterisk. In Figure 2.10, I count a nuclear contour as rising if it ends in (H%) or is a rise plateau (L*H 0%) and as non-rising if it ends in (L%) or is (H*L 0%).

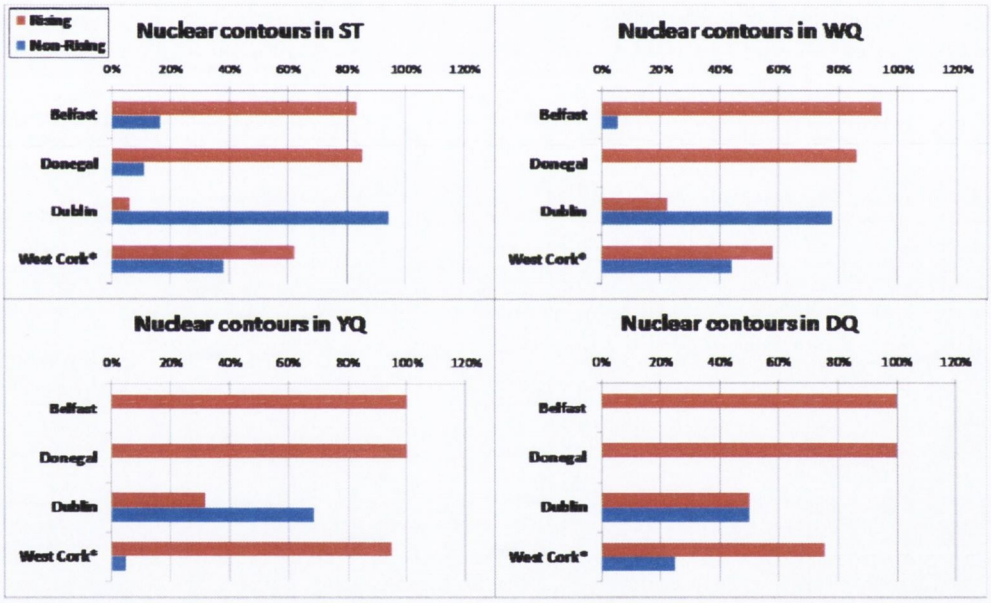


Figure 2.10 Rising and non-rising nuclear contours in statements (ST), wh-questions (WQ), yes-no question (YQ) and declarative questions (DQ) shown for the available data for Belfast and Dublin by Grabe (2004), Donegal by Dorn (2006), and West Cork by O'Connor (2005),

It is noticed that rising nuclear contours (red) are prevalent in Belfast, Donegal, and West Cork in all utterance types. However, unlike Belfast and Donegal, West Cork English exhibits more cases of falling nuclear contours in ST and WQ (around 40%). West Cork English has some cases of falling contours in YQ and DQ which are absent from these types of questions in Belfast and Donegal.

Dublin English has the lowest percentage of rising nuclear contours in all question types: WQ (22%), YQ (32%), and DQ (50%). Dublin English shows a prevalent falling nuclear contour in ST, WQ, and YQ. DQ in Dublin English have 50% cases of falling nuclear contours realised mostly as H*+L 0% (28%) and L*+H L% (22%) (Grabe, 2004: 21). The analysis of tonal patterns of DroghE in Chapter 5 and the treatment of question contours in Chapter 6 will show that DroghE is similar, to some extent, to Dublin English in that it lacks nuclear rising contours even in the different question types.

ICE-Ireland, mentioned earlier in Chapter 1, is part of the larger ICE project (International Corpora of English) and is the only project in the ICE projects to provide intonational annotation for part of its data (102 spoken texts out of 300 spoken texts from both Northern Ireland and the Republic of Ireland). However, only the annotated texts are made available and not the sound recordings. The intonationally annotated corpus is included in SPICE-Ireland (Systems of Pragmatic annotation in ICE-Ireland). The system for annotating prosody in SPICE-Ireland was in part developed by Orla Lowry and is largely influenced by the IViE labelling system. The system has a pool of eleven 'tunes' or tones where each is given a number from 1 to 11 as shown in Table 2.2. However, it should be noted that boundary tones are marked as % at the end of phrases and pre-nuclear and nuclear accents are not marked separately, so they cannot be differentiated when running a concordance search. For example, tune 1 (H*L) could either mean a pre-nuclear fall or a nuclear fall followed by a 0%. Similarly, tune 2 (L*H) could either mean a pre-nuclear rise or a nuclear rise followed by a 0%. However, tune 4 (L*HH) can only be the nuclear contour L*H H%. The conventions of the SPICE-Ireland intonational annotation place the number of the tune immediately before the pitch-accented word, capitalise the pitch-accented syllable (or its vowel), and place (%) at the end of the intonational phrase (Kallen and Kirk, forthcoming):

11Once upon a 2tIme%

3TodAy%

4REAlly%

Table 2.2 The 11 tunes used in the SPICE-Ireland (Kallen and Kirk, forthcoming)

Tune	Label	Name
1	H*L	fall
2	L*H	rise
3	L*HL	rise-fall
4	L*HH	high-rise
5	H*LH	fall-rise
6	H*H	rise from high level
7	L*	low, level
8	H*	high, level
9	!H*	downstepped high
10	!H*L	downstepped fall
11	>H*L	delayed fall

The annotated texts of SPICE-Ireland can provide a general picture of the tones used in the northern and southern varieties of IrE. SPICE-Ireland has 102 annotated texts (52 for SIrE and 50 for NIrE) from a wide range of 15 domains that differ in their degree of formality. I have grouped the 15 various domains of the SPICE-Ireland corpus into formal and informal domains as shown in Table 2.3. Therefore, when doing a concordance search of a particular 'tune' the speech style would be taken into account. Each domain has three intonationally annotated texts (only the 'face-to-face conversation' domain has eight annotated texts). The average number of intonational phrases across the 102 analysed texts was 315.

Table 2.3 The 15 domains of the SPICE-Ireland grouped into formal and informal speech styles

	Formal Domains		Informal Domains
2	SPICE Broadcast interview	1	SPICE Broadcast discussion
3	SPICE Broadcast news	4	SPICE Broadcast talks
5	SPICE Business transactions	7	SPICE demonstrations
6	SPICE Classroom discussion	8	SPICE Face to Face conversation
9	SPICE Legal cross-examination	13	SPICE Spontaneous commentary
10	SPICE Legal presentations	14	SPICE Telephone conversation
11	SPICE Parliament debate		
12	SPICE Scripted speeches		
15	SPICE Unscripted speeches		

I carried out a search on the frequency of the different 'tunes' in the 102 SPICE-Ireland annotated texts using the free online concordance software AntConc (http://www.antlab.sci.waseda.ac.jp/antconc_index.html). Figure 2.11 shows the results of

the search. It should be noted that tunes 6, 7, 9, 10, and 11 (H*H, L*, !H*, !H*L, and >H*L, respectively) are not shown as their occurrences were very low (2% or less). The percentages were calculated as the instances of a particular tune in a particular domain divided by the overall number of intonational phrases in that domain. Percentages of falls (H*L) are above 100% since there are many instances of sequences of falls in a single intonational phrase (so there will be more H*L than intonational phrases) as shown in the following example taken from the text 'English supervision' in the domain 'Classroom discussion' from Northern IrE (tune 1, H*L, is highlighted):

<xpa> And the1kInds of 1Issues about both 1sOcial 1idEntity and 1gEnder
<{> <[> identity% </[> that it 1rAIses% </xpa> <#>

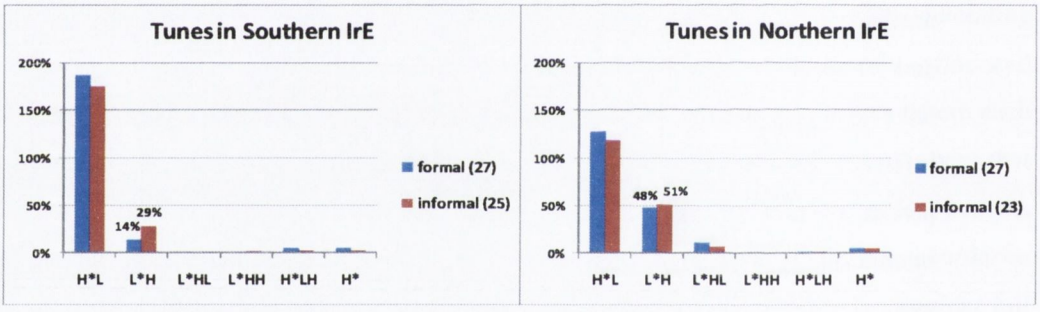


Figure 2.11 The percentage of the different tunes in SPICE-Ireland in formal (blue) and informal (red) texts in the SIrE and the NIrE intonationally annotated spoken texts, the tunes shown are 1, 2, 3, 4, 5, and 8 respectively, the numbers in brackets show the number of texts per speech style

Three main observations can be made based on the tune search. First, the SIrE spoken texts have a higher incidence of falls (H*L) than in the NIrE data, in both formal and informal texts. In contrast, the incidence of rises (L*H) is higher in the northern data than in the SIrE data, in both formal and informal texts. By looking at individual domains, it was found that the NIrE data have the highest occurrences of rises in telephone conversations (94%) and face-to-face conversations (85%). Instances of rises (L*H) were found in declaratives as well as different kinds of questions, listing items, or continuants.

Second, there are slightly more falls in formal speech (blue) than informal speech (red) and more rises in informal speech than in formal speech. This observation is clear in the southern data where there are twice as many rises (29%) in informal speech as in formal

speech (14%) as shown in Figure 2.11. However, in NIrE the percentage of rises (L*H) is almost the same (48% and 51%) in both formal and informal domains as shown in Figure 2.11. This indicates that rises are used predominantly in both formal and informal speech in NIrE.

Furthermore, some cases of tune 2 (L*H) in the informal domains such as 'demonstrations' were continuation rises. This domain consisted of texts such as 'Recipes', 'Home Improvements', and 'Skiing', where many directives, speech acts represented as <dir>, were given. Interestingly, there were more cases of L*H in the 'demonstrations' of SIrE (55%) than in NIrE (36%). The following example of SIrE is taken from the text 'Recipes1' (tune 2 is highlighted):

> <#> <rep> So* 1nOw%* it's 8vEry 2sImple% </rep> <#> <rep> All I 2nEEd% is the 1jUIce of the 2grApefruit% and some 1sUgar% </rep> <#> <dir> And 1All you've got to 2dO% is to 1mIx the 2sUgar%

The third and last observation is that tune 3, termed 'rise-falls', (L*HL), is almost non-existent in the southern data.

All in all, the current data on IrE intonation show that Southern IrE is typically characterised by falling nuclear contours in declarative statements as well as in some question types, particularly WQ and YQ. The nuclear contours in DQ, particularly in Dublin English, exhibit both falling and rising patterns with no clearly dominant pattern. However, reports on some south-west varieties of IrE, particularly Cork English, indicate that a fall can be followed by rise in declaratives. The intonation patterns in Northern IrE varieties has dominant rising nuclear contour in declaratives and has been often reported for Belfast English. Reports on Donegal English indicate that the nuclear contours are not largely different from those in Belfast English.

2.2.5 Intonation of Irish (Gaelic)

A brief overview of the intonation of Irish (Gaelic) is presented since reports on the intonation of IrE and some northern varieties of British English often suggest an influence from Irish. This overview is basesd on the recent AM description of Irish intonation by Dalton {, 2008 #79}. Using the IViE system, Dalton has analysed the four major Irish dialects: Donegal Irish, Irish dialects of south Connaught, Mayo Irish, and Kerry Irish (West Kerry). Figure 2.12 presents the tonal inventories in the analysed dialects and Figure

2.13 represents the nuclear tones of these dialects. Both Figures are reproduced from (Dalton, 2008: Chapter 10).

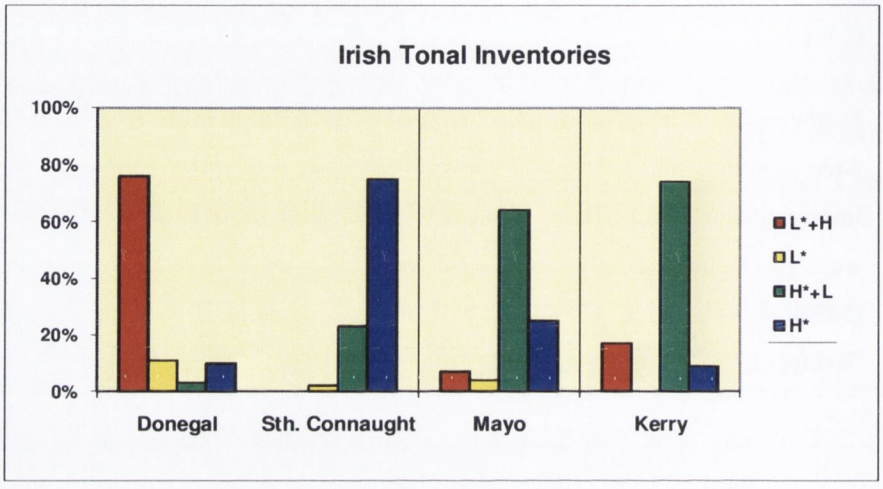


Figure 2.12 The tonal inventories (in IViE) of the four major Irish dialects; Donegal, S. Connaught, Mayo and Kerry, reproduced from Dalton (2008: Chapter 10)

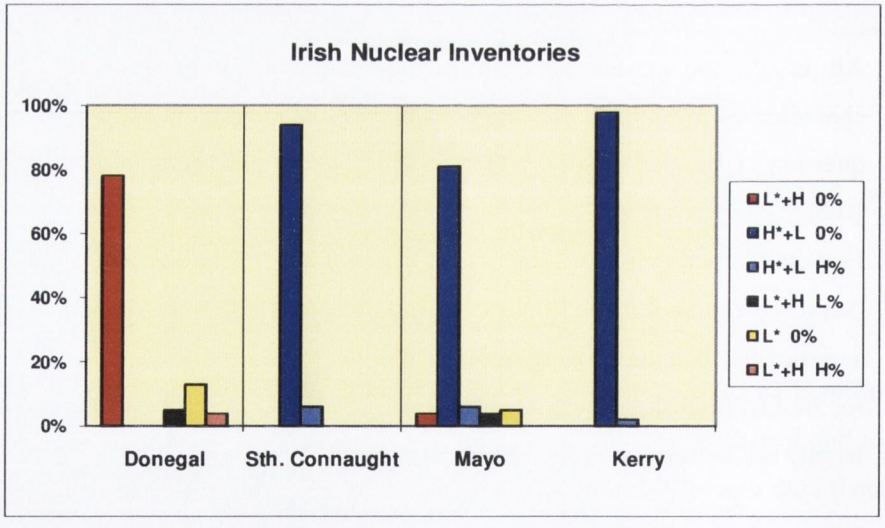


Figure 2.13 The nuclear tones (in IViE) of the four major Irish dialects; Donegal, South Connaught, Mayo and Kerry, reproduced from Dalton (2008: Chapter 10)

The general observation is that the only Irish dialect that has a rising-plateau nuclear tone (L*H) as the unmarked tone is Donegal Irish. The other investigated Irish dialects have a falling nuclear tone as the default in declaratives, wh-questions, and yes-no questions.

Dalton reports that these findings are interesting since Mayo Irish has been traditionally considered to be closer to Donegal Irish, at least segmentally, than the other dialects.

Dalton reports that in the Kerry Irish data, the pitch accents H*L (the more common) and L*H are both used in pre-nuclear position in declaratives and yes-no questions, but that in initial pre-nuclear position there is a preference for rising pitch accents L*H (39% in declaratives and 47% in yes-no questions). Rising initial pre-nuclear pitch accents were often preceded by a high boundary tone (%H). This, Dalton comments, is also interesting since the dominant nuclear tone in yes-no questions in Kerry is H*L (Dalton, 2008: Chapter 8). This suggests the combination %H L*H at the onset of the intonational phrase signals interrogativity in Kerry Irish. The preference in the Kerry data to use L*H pitch accents in initial pre-nuclear position in yes-no questions suggests that it is not always the case that the nuclear tone carries the most important tonal cue for conveying the pragmatic function of an utterance. Pre-nuclear tones can play just as important a part.

2.2.6 Irish Influence on English?

Subsequent to Jarman and Cruttenden's article (1976), further analyses of English and Scottish varieties suggest that a rising pattern is not only peculiar to Belfast speech, but is found in other Northern British varieties: Tyneside speech (Pellowe and Jones, 1978), Birmingham English (Brown et al., 1980: 19), Glasgow English (Mayo et al., 1997, Cruttenden, 2007), Fife English, eastern central Scotland (Aufterbeck, 1999), and Liverpool English, Scouse (Knowles, 1978, 1984). It has often been suggested that the rising pattern in these varieties of English is of a Celtic origin (Cruttenden, 1986: 139, Knowles, 1984: 232-240). To the extent that Knowles has no doubt of the origin of the rising patterns in Scouse he calls them 'Irish falls' (Ibid.: 239).

In her treatment of the prosody of Belfast English, Rahilly (1997) explains that since most studies on IrE were motivated by demonstrating the linguistic influence from Irish, it was difficult to infer substratal prosodic influences from Irish because little was known about the Irish prosody to start with (Rahilly, 1997:110). She believes that it is unwise to accept that IrE rises are an Irish relic since the little evidence (at the time of her writing) from Irish suggests that the most common unmarked tone in Irish is a falling tone. She cites studies on Cork and Galway Irish by Ó Cuív in 1944 and de Bhaldraithe in 1945, respectively. Since then, however, analyses of Irish dialects have shown that northern Donegal Irish is indeed characterised by rising nuclear contours in statements and that it is

strikingly different from the southern dialects which show a falling contour (Dalton, 2008, Dalton and Ní Chasaide, 2006).

Cruttenden (1995) groups the rising tones phenomena in English into two types. The first is reported for what he terms the Urban Northern British cities (UNB), in particular Glasgow, Newcastle, Liverpool, and Birmingham (along with the two Northern Irish cities Belfast and Derry). The second is commonly referred to as the High Rise Tone (HRT) and is relatively new and particular to what he calls the 'Pacific Rim', particularly in Australia, New Zealand, California and Canada, (Cruttenden, 1995).

The HRT is reported to be common among the young and used more by females, although recent data by Fletcher et al. (2005) show that males in Australia use it more than females. Some of the meanings associated with the HRT include: speaker craving for indulgence of the listener, need of re-assurance, deference, politeness, and most commonly seeking validation of the speaker's comprehension (checking meaning) (Cruttenden, 1995).

Cruttenden (1995) presents an account for the difference between these two types of rising tones in English. If a particular semantic meaning is conveyed using a particular tone in two languages or two dialects, but is used more regularly in one language or dialect than in the other, then this tonal difference is a 'conceptual-stylistic' difference. He suggests that the HRT of the 'Pacific Rim' belongs to this kind of tonal variation. If a tonal difference is not used to make a semantic difference in one language or dialect, then this tonal difference is likely to be a 'systematic' difference; phonological. In Derry and Belfast, Cruttenden suggests that the difference is 'systematic' (Ibid.: 170).

Hirst (1998) comments that although attributing the origins of the rising pitch to Celtic origin explains some of the distribution in the West of the British Isles, it would not, however, explain why this pattern is far less common in the rest of Ireland, excluding the north, nor why it occurs in Newcastle area (Hirst, 1998: 73-4). He further points to the possibility of 'a trace of Viking occupation of Britain' since similar patterns have been reported for East Norwegian and West Swedish (Gårding, 1998).

Findings of the IViE project (Grabe et al., 1998b, Grabe et al., 2001) which investigated seven urban varieties of English (London, Cambridge, Leeds, Bradford, Newcastle, Belfast, and Dublin) have also shown that the intonation of Dublin English has the least occurrence of rises, even in different question types, compared to the British English

varieties investigated in the project. Similarly, the alignment study by Sullivan (2006) for Wexford English suggests that the falling pattern is the default nuclear contour. This suggests that the rising pitch contour prevalent in 'northern' varieties of British English and in Northern IrE is likely to be geographically and historically related. More rigorous investigation of the features of tonal patterns of dialects in these regions and their relations with probably Nordic influences are needed in order to account for their origins. Current research at the Centre for Language and Communication Studies at Trinity College is investigating the tonal patterns of two language varieties in the area of County Donegal: Donegal Irish and Donegal English.

The findings by Dalton (2008) concerning the tonal inventories of the Irish varieties cast some doubt on the 'Irish' origin of the rise-plateau phenomenon (characteristic of some western and northern British English varieties and in Northern Ireland). Moreover, contrary to expectation, the investigated Irish varieties (excluding Donegal Irish) have falling contours as the default pattern even in yes-no questions, which often have a rise in other languages.

As the picture of the intonation of Irish varieties and IrE varieties is still in its early stages, the more we know about the intonation of these varieties the better we can account for the differences between the intonation of the northern and southern varieties of Irish and IrE. A better understanding of Irish and IrE intonation provides more insight into the Irish influence hypothesis in similar rising nuclear contours of some northern British English varieties. The intonation findings of this research are a small step forward in that regard. In addition, the location of the town of Drogheda, in the boundary zone separating northern and southern varieties of IrE, is interesting as it can provide evidence to the extent to which northern intonation patterns have spread southwards of the island. The answers to this and other questions are presented in Chapter 5 which describes the tonal patterns in DroghE. Furthermore, as the findings of Chapter 5 show that DroghE lacks rising nuclear contours in the different kinds of questions (a findings that is being increasingly associated with typical Southern IrE varieties as more IrE dialects are being investigated) the question arises as to what intonational cues the speakers of DroghE employ in order to differentiate between questions and statements. The answer to this question is the subject of Chapter 6. However, before discussing question intonation in IrE, a brief overview of the universal situation and literature on question intonation is presented in the following section.

2.3 Question Intonation

One important aspect of understanding how intonation works is through understanding the discoursal meaning it conveys. The linguistic meaning expressed by intonation would seem to relate to the manner the 'conversational knowledge' is shared between listener and hearer. In statements, for example, the speaker has information that is new to the listener (from the speaker's perspective) and is adding to the knowledge of the listener. In questions, however, it is the reverse; the speaker is seeking knowledge from the listener who has more knowledge (from the speaker's perspective). In this way, interrogativity is viewed as one possible discoursal meaning signaled through intonation. Questions are speech acts that represent the optimal means of communication between speaker and addressee. The addressee has the responsibility to respond to the question by switching turn-taking and becoming the speaker in turn. Therefore, questions are a type of speech acts that starts and maintains verbal interaction.

Chapter 6 investigates how interrogative intonation is conveyed in DroghE. To do this, the scaling of the f0 at crucial points is compared in the contours of different questions types and statements. The four utterance types investigated are statements (ST), wh-questions (WQ), yes-no questions (YQ), and declarative questions (DQ). WQ are marked syntactically and lexically. YQ are marked syntactically. However, DQ are not different from declarative statement in syntactic structure. Devices that convey interrogative intonation are relevant to the universal principle of the Frequency Code, reviewed below. The findings of Chapter 6 show how the Frequency Code is exploited in DroghE to differentiate between ST and DQ.

2.3.1 The Frequency Code

Ohala (1994) gives an ethological account as to why high or rising pitch is a universal marker associated with subordination and dependence, whereas low or falling pitch is associated with dominance, confidence, and self-sufficiency. This, he argues, is evidenced from animal communication, where dominance and large size is signaled by low and falling pitch frequencies whereas lack of threat and smallness in size is signaled by high and rising frequencies. Ohala terms this biologically conditioned usage of voice frequency the 'Frequency Code'. Accordingly, the Frequency Code accounts for a number of systematic frequency-meaning correlations in human communication. For example, there is a correlation between sentence type and pitch type; high/rising pitch in questions and

low/falling pitch in statements. The Frequency Code explains why a rising tone is needed in a question; the speaker is dependent on the listener's knowledge and cooperation. The Frequency Code also explains why certain human attitudes and emotions like deference, politeness, submission, and lack of confidence are conveyed via high/rising pitch, whereas assertiveness, authority, aggression, confidence, and threat are conveyed via low/falling pitch.

Building on the Frequency Code of Ohala, Gussenhoven (2002) proposed three biological codes which are employed by speakers of different speech communities to express universal intonational meanings. The intonational meanings are based on aspects of the production process of pitch variation. The three codes are: Ohala's Frequency Code, the Effort Code, and the Production Code. The Frequency Code, as explained by Ohala, is the exploitation of the size of the larynx and the rate of the vocal cord vibration to express power relations. The Effort Code relates to the amount of energy extended on speech production which is exploited for more precise articulatory movements and more numerous pitch movements. The Production Code relates to the energy used in the exhalation phase of the breathing process which is exploited to associate high pitch with beginnings of utterances and low pitch with ends.

Gussenhoven suggests that the form of the three universal codes is grammaticalised and coded in the phonological structure of languages so that their meanings are also systematized. This results in the form-function relation in the intonational system of a language. Gussenhoven explains that intonational forms that are a natural result of the biological codes are subject to the normal forces of language change. Consequently, languages may come to posses form-meaning relations in their grammars which go against the universal biological codes. For example, in some dialects and languages the default nuclear contour of a statement is rising, e.g. Belfast English. Morevover, 'unnatural' form-function relations are 'quite liberally available' in interrogative intonation which could be falling (as will be shown to be the case in DroghE). An extreme case is Chickasaw, a Native American Muskogean language spoken in south-central Oklahoma, whose statements are characteristically marked by a H* H% nuclear contour whereas in WQ and YQ questions it is H* L% (labels as used in study). Interestingly, the pitch range in questions is often higher than that in declaratives (Gordon, 1999).

Gussenhoven mentions that the primary forms used to signal the meanings of the biological codes could be substituted by other features that listeners can associate indirectly with the primary forms. For example, peak delay can substitute high pitch, and signal all the meanings associated with high pitch. A higher pitch peak will take longer to reach than a lower one, if rate of change is the same. Therefore, higher peaks will tend to be later than lower peaks. Hence, peak delay can be used as a substitute or enhancement of raising the pitch. Due to the Effort Code, late peaks sound more prominent than early peaks and could be used to signal focus. In the Frequency Code, later peaks can mark question intonation whereas statement intonation will have earlier peaks. This is reported for Napolitan Italian (D'Imperio and House, 1997) and will be seen to be the case in the declarative questions in DroghE.

2.3.2 Question Intonation in Different Languages

The defining characteristic of question intonation cross-linguistically is usually conveyed via aspects of higher pitch such as final rising or a high register level. However, the presence of cross-linguistic similarities in question intonation does not mean there are no language-specific phonological representations of question contours. For example, a final rise is not the only realisation available to signal a question intonation in different languages. In Finnish both questions and statements lack a final rise, but questions are characterised by a high initial pitch (Iivonen, 1998:318). In Moroccan Arabic, statements and declarative questions are characterised by a rising-falling nuclear contour. However, declarative questions have an overall higher pitch register (Benkirane, 1998: 354). In Swedish, Dutch and Moroccan Arabic, the peaks of nuclear accents in questions are higher than in statements (Gårding, 1983: 21, Hadding-Koch and Studdert-Kennedy, 1964, Haan, 2002, Benkirane, 1998). In Hausa, a tone language, if the final syllable has a high lexical tone it is raised to a super high level in a question (Inkelas and Leben, 1990: 18).

Question intonation can also be encoded using a different type of a nuclear accent. In Neapolitan Italian, statements and yes-no questions have a low boundary tone; however, they differ in the nuclear pitch accent. D'Imperio and House (1997) show that the primary perceptual cue for statements is a fall 'through' the nuclear vowel (with a nuclear label of the sequence HL) whereas the primary cue for yes-no questions is a rise 'through' the nuclear vowel (with a nuclear label of the sequence LH). D'Imperio and House conclude that it is the timing of peak of the nuclear pitch accent that is essential in discriminating

yes-no questions from statements in Neapolitan Italian and based on which they suggest H+L* for falling nuclear accents in statements (in broad focus) and L+H* for the nuclear accent in yes-no questions (Ibid.: 251). In Chapter 5, analysis of the tonal patterns in DroghE suggests that ST and DQ have a low boundary tone; however, they differ in the nuclear pitch accent. In the analysed DQ, the majority of nuclear accents are L+H* (68%) followed by L-L% (75%), a nuclear contour I term a 'scooped-fall'. In the analysed ST, the nuclear tone is almost always H* followed by L-L% (59%), a nuclear contour I term a 'fall'.

Another device used to signal interrogative intonation is high register level, where all high and low tones, accented and unaccented syllables are raised in pitch compared to their pitch in statements. This is evident in Swedish (Hadding-Koch and Studdert-Kennedy, 1964: 175) and (Gårding, 1983: 21), Hausa (Inkelas and Leben, 1990: 18), Finnish (Iivonen, 1998: 319) as well as American English, Hungarian, Vietnamese and Thai (Hirst and Di Cristo, 1998: 25).

Declination, the gradual lowering of f0 in the course of an utterance, is suspended in questions of many languages such as Danish (Thorsen, 1980, 1983: 33 and, 1985, 2009). It should be noted though, with regards to declination, that there are two main hypotheses regarding whether it is a controlled aspect of intonation (phonological) or whether it is involuntary (phonetic). The former view proposes that f0 declination is a purposeful refinement that can be imposed on speech by the speaker to allow for easier parsing by the listener. The latter view proposes that declination is an automatic consequence of physiological constraints; the diminishing air supply in the lungs leads to a decrease in the sub-glottal pressure the magnitude of which can influence f0. In a study by Ohala et al. (2004). The f0 declination was compared in speech produced egressively and speech produced ingressively (where the lungs are being filled with air as the utterance progresses) by ten speakers. 75% of the egressive utterances had negative f0 declination, and only 50% of the ingressive speech did. This gives partial support to the notion that declination is purposefully imposed by speakers. Studies on interrogative intonation can provide insight to these two hypotheses of declination. If questions are produced with less declination, this suggests that declination is a phonological intonational element consciously employed by the speakers to signal certain sentence modes. Thorsen (1980) found that the declination slope of the f0 contour is different for different utterance types in Danish. Figure 2.14 reproduced from (Thorsen, 1983) shows that statements have a steep

slope compared to declarative questions which have a level declination slope. In between these two kinds of slopes there is a continuum of intermediate slopes comprising questions with inversion and/or interrogative particle and continuatives.

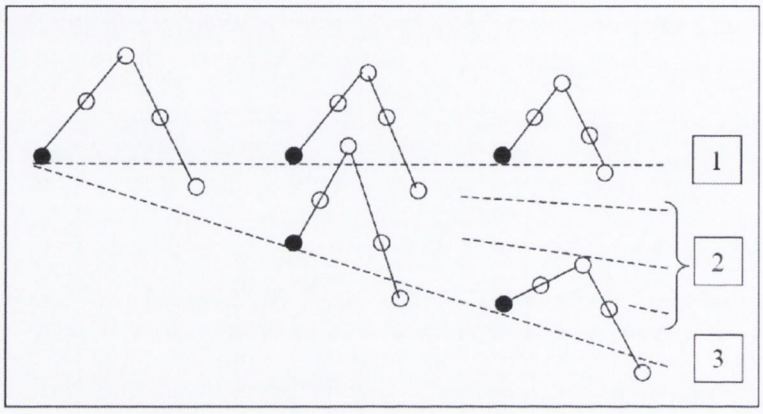


Figure 2.14 Declination slopes in different utterance types in Standard Copenhagen Danish. Black circles are stressed syllables, white circles are unstressed syllables. Lines joining the circles are the recurring f0 pattern of Danish stress groups. Dotted lines are the declination slopes of (1) syntactically unmarked questions, (2) questions with inversion and/or interrogative particle, and continuatives, and (3) statements

In addition, there seems to be a trade-off between lexical and syntactic information and the slope of declination; questions that are lexically or syntactically marked show more steepness in the slope than questions that are not. The trade-off between intonation and morpho-syntax has been reported in Haan (2002) for Standard Dutch and for Estonian by Asu (2002, 2004).

In Estonian, the three most common types of YQ questions are: those beginning with a question particle (*kas* meaning 'whether') without inversion, tag questions formed by adding the article *või* at the end of the declarative utterance, and morpho-syntactically unmarked questions (identical to ST forms). Asu (2004) looks at the slope of the different YQ types in two separate parts of the IP as shown in Figure 2.15. The first part is the slope (calculated as the difference between two peak values) from the first pre-nuclear to the last pre-nuclear (H1- H3). The second part is the slope from the last pre-nuclear to the nuclear accent (H3-H4).

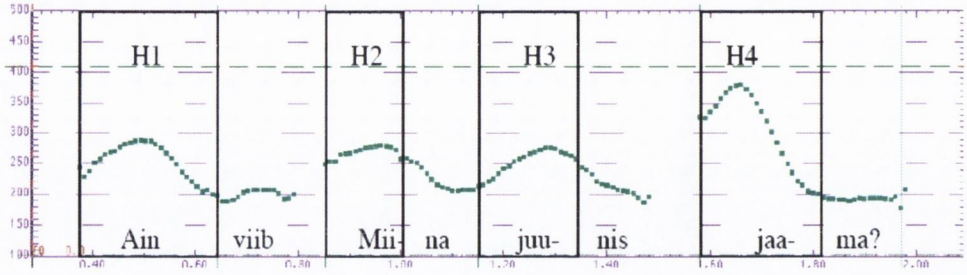


Figure 2.15 f0 trace of an unmarked question *Ain viib Miina juunis jaama?* 'Ain takes Miina in June to the station?' The boxes mark the accented syllables, reproduced from Asu (2004: 82)

Asu finds that tag and unmarked questions have a similar pre-nuclear slope. Both question types have a slope that is less steep than the slope of statements and *kas*-questions as shown in Figure 2.16.

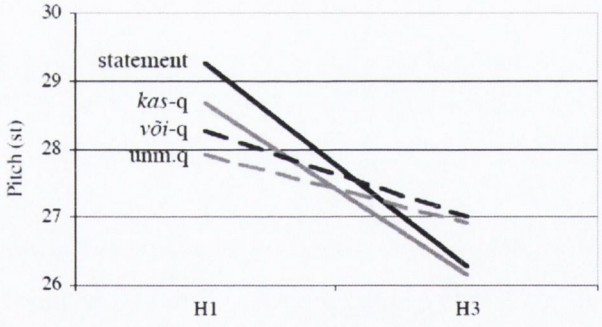


Figure 2.16 Pre-nuclear slopes from (H1) to (H3) in three types of questions and statements. The questions are: kas-q (YQ begging with kas 'whether' without inversion), või-q (YQ ending with või 'or' without inversion, sometimes), and unm-q (unmarked questions), re produced from Asu (2004: 83)

The type of utterance, particularly in tag questions and unmarked questions, is shown to influence the size of the pitch step from the last pre-nuclear to the nuclear accent as shown in Figure 2.17. Asu's findings support the claim that the marking of interrogative intonation is manifested over the whole utterance.

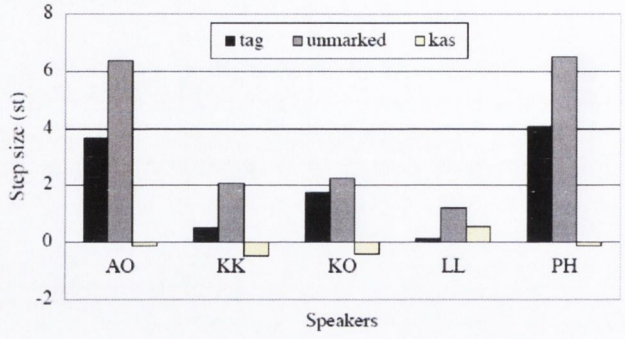


Figure 2.17 Step size in (semitones) from the final pre-nuclear (H3) to nuclear accent (H4) in the three types of question in Estonian for five speakers, reproduced from Asu (2004: 84)

In a study by Gussenhoven and Chen (2000), three groups of listeners, native speakers of Dutch, Hungarian and Chinese, were presented with specifically structured stimuli presented as utterances from a 'little-known' language. The stimuli were CV'CVCV-expressions. The utterances were originally read, by a phonetically trained Dutch female speaker, with non-emphatic penultimate stress. The duration of the stressed (penultimate) vowel was normalized in all test utterances. The nuclear peak was manipulated in three ways: peak height, peak alignment, and the final boundary pitch. Each of three aspects was increased in five increments and combinations of different utterances were produced. Listeners were presented with pairs and asked to judge which one sounded more like a question. Each pair had one manipulated stimuli and an anchor stimuli with average peak height, alignment, and final pitch. Results showed that regardless of language background, listeners selected the utterances with the higher peak, the later peak, and the higher end rise as the ones that signaled questions.

Although the languages chosen differ in the manner interrogative intonation is conveyed, the result supports the Frequency Code and reflect an innate, non-linguistic knowledge of the meaning of pitch variation. Many question contours in Dutch end in H%. Hungarian has no interrogative syntactic construction. The nuclear contour in Hungarian questions is labelled as L* HL% (Ladd, 2008:82) which contrasts with the nuclear contour H* L% in statements. Chinese has no specific question intonation but employs a number of sentence-final question particles, although it may raise pitch for questions (Kratochvil, 1998). However, Hungarian listeners were more strongly influenced by peak height than the other

two language groups. This indicates that language background plays an active component in listeners' interpretation strategies in addition to the universal non-linguistic knowledge. This supports what Ladd (1981) referred to as the Nuclear Tone Hypothesis. This hypothesis suggests that the distribution of contour types over functions is language-specific. Therefore, both biological codes and language-specific intonation systems can be responsible for the way the pitch contour of an utterance is interpreted.

The findings in Chapter 5 will show that differences between utterance types may not be shown on the phonological level (by labelling). In Chapter 6, it will be shown that important differences are also projected via differences in f0 scaling of and between crucial points in the pitch contour. Specifically, it will be shown that the relation between the f0 scaling of the pre-nuclear and nuclear pitch accents within an utterance is crucial in differentiating between ST and DQ in DroghE. However, f0 scaling is only one way in which pitch accents can differ. Chapter 7 looks at the timing of the peaks of pre-nuclear and nuclear (H*) pitch accents with the segmental string (in statements), known in the literature as alignment. The following section, gives a general overview on the literature on alignment studies. In doing so, I propose to distinguish between 'intrinsic' alignment and 'extrinsic' alignment. The two types of alignment are felt to be needed to differentiate between the inherent or default alignment of a particular pitch accent and the modified alignment of the same pitch accent resulting from time constraints of contextual factors.

2.4 Alignment

Two dimensions are important in characterizing a tonal target: its scaling (f0 level) and its particular phonetic alignment with the segmental string (Ladd, 2008: 169). The importance of alignment was highlighted in the work of Bruce's thesis (1977). Bruce arrived at a novel treatment of Swedish melody whereby the melodic line is decomposed using two tones only, H and L. By describing the melody of Swedish using two tones, Bruce could discover that the crucial difference between the two word accents in Swedish (Accent 1 and Accent 2) relates to their alignment. Both accents had the same sequence of H and L. However, in the HL of Accent1, the peak was located before the beginning of the accented syllable. In the HL of Accent 2, the peak was located just after the onset of the accented vowel.

Pierrehumbert's (1980) model of English intonation adopted many of the insights of Bruce's model of Swedish. The various contours of English intonation were described using only two tones, H and L. Pierrehumbert proposed mono-tonal as wells as bi-tonal

pitch accents. Relative alignment was indicated by '*' so that early-aligned accents are phonologically different from late-aligned accents. In Pierrehumbert's model L*+H has L on the stressed syllable with trailing H, while L+H* has H on the stressed syllable with leading L. After Pierrehumbert's (1980) widely accepted model of English intonation, the AM analysis of Swedish intonation analysed Accent 1as H+L* and Accent 2 as H*+L.

Alignment studies are an integral part of intonational studies. This aspect has attracted a lot of interest. There is a growing body of evidence suggesting that what defines intonation is essentially a matter of 'what' is happening and 'when' .i.e. scaling and timing. In the literature on alignment, I propose here that it may be useful to differentiate between two aspects of alignment, intrinsic and extrinsic. This distinction helps in interpreting the extensive literature on the subject and is used to report on our findings of tonal alignment of DroghE in Chapter 7.

2.4.1 Intrinsic and Extrinsic Alignment

Ladd (2008: 179, 2000: 45) explains the importance of and need for making a distinction between 'association' and 'alignment'. He explains that association is the abstract phonological property whereby tonal targets are associated with a particular phonological domain. For example, pitch accents are associated with the pitch-accented syllable of a particular word in an utterance. Alignment is the phonetic timing of the tonal targets with particular points in the segmental string. For example, in Modern Greek the pre-nuclear pitch accent is L*+H where the low is aligned 'before' the accented syllable (in bold face and underlined in Figure 2.18) and the high is aligned 'near' the onset of the syllable following the accented syllable (Arvaniti et al., 1998) as shown in Figure 2.18 reproduced from (Ladd, 2008: 175). Arvaniti et al. find that the rise can have different durations and slopes depending on the segmental material intervening between the low and the high 'turning points' of the rise.

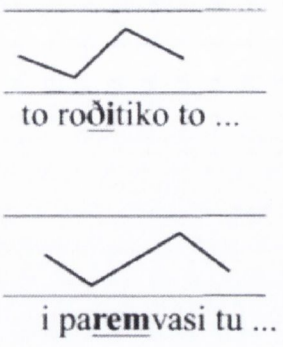


Figure 2.18 Idealized pitch contours illustrating the 'segmental anchoring' in Modern Greek found by Arvaniti et al. (1998) reproduced from Ladd (2008:175).

One can extend the concept of 'association' to include edges tones so that the 'phrase accent' is associated with syllables following the accented syllable of an intermediate phrase and the boundary tone is associated with the last unstressed syllable of the accent-group. Investigating the alignment of the boundary tonal targets with the segmental string, Lickley et al. (2005) carried out a study on Dutch where they looked at the timing of the low 'phrase accent' in a 'fall, rise' question H* L-H% (or H*L H% in ToDI, the ToBI adaptation for the intonation of Dutch). They found that the low turning points following peaks are aligned within the post-nuclear secondary stressed syllable if one is present. This suggests that the low turning points are the phonetic reflex of a 'phrase accent'.

The study of tonal target alignment or timing with the segmental string has been the focus of many studies for the past twenty years. Many factors have been reported to influence the timing of the peak. Bruce (1990) for example cites a number of factors that may influence the timing of the tonal targets relative to the segmental string. Some of the factors that Bruce includes are: the boundaries (proximity to word/phrase boundary), rhythmical organization (e.g. stress clash), focus (prefocal, focal, or postfocal position), tonal environment (e.g. tonal crowding), pitch range (e.g. differences in degree of emphasis), global intonation (e.g. absence/presence of downdrift due to interrogative/declarative structure), segmental context (e.g. vowel length, syllable structure), and speaking rate (e.g. fast, normal, slow tempo). Many past and recent studies have investigated the influence of these and other factors in different dialects and languages. In reviewing the literature on alignment studies, I would like to propose that it is useful to define two aspects of

alignment. For a given syllable structure which has specific component segments there will be intrinsic and extrinsic alignment as defined below.

Intrinsic Alignment:

This is the default alignment of the H (high) and L (low) f0 turning points of a particular pitch accent relative to the segmental string when there are no rhythmic or temporal constraints. Intrinsic is not meant to suggest a single specification of L and H alignments but rather of an alignment which is potentially varying depending on the segmental structure of the accented syllable itself. Furthermore, in specifying intrinsic alignment, I would propose that the pre-nuclear (PN) and nuclear (N) alignments need to be separately specified.

When there are no rhythmic or temporal constraints, I would propose that for the same pitch accent the default intrinsic alignment will be manifest where the accented syllable is preceded and followed by at least two unstressed syllables. This hypothesis I term the '$2^{+}A2^{+}$' hypothesis which means that the accented syllable (A), when preceded and followed by at least two unstressed syllables should yield the default, intrinsic alignment for a given syllable, in so far as it allows for a 'full' realisation of the timing characteristics of the pitch accent. The type of the context proposed in the '$2^{+}A2^{+}$' hypothesis has been partially suggested from results presented in Arvaniti et al. (1998), Nolan and Farrar (1999), Dalton and Ní Chasaide (2006, 2007). Note however, that although these earlier studies are suggestive, specifying the optimal default context was not something they set out to investigate.

However, in the present study, the data has been designed specifically to try and establish whether the '$2^{+}A2^{+}$' context provides the optimal default specification in the dialect under study. The present study also sets out to examine both the potential extrinsic variation that may occur when the '$2^{+}A2^{+}$' context is not available, as well as some potential intrinsic variation that might arise when the syllable structure is varied.

Extrinsic Alignment:

This refers to the shifts away from the default alignment which potentially may arise when there are constraints imposed by the rhythmic context, tonal environment (tonal crowding,

proximity to phrase boundary) and other factors including degree of emphasis, changes in pitch range, and changes in tempo.

When it comes to describing a particular language or even a particular dialect both intrinsic and extrinsic alignment features are important. Languages and dialects may vary in terms of their intrinsic timing differences e.g. (Atterer and Ladd, 2004) or in terms of the extrinsically conditioned variation e.g. (Dalton and Ní Chasaide, 2007). Atterer and Ladd (2004) found that Southern German pre-nuclear rises are aligned later than those in Northern German in the same rhythmic context: these are differences in intrinsic alignment. On the other hand, cross dialect differences in extrinsic alignment are reported in Dalton and Ní Chasaide (2007) who found that in one dialect of Connemara Irish (Inis Oírr) peak alignment shifts when the rhythmic structure is varied, whereas for the other dialect of Connemara Irish (Cois Fharraige) peak alignment is not influenced by the same variation in rhythmic structure.

An example with a context that would reveal intrinsic alignment characteristics is given in Figure 2.19 for the initial pre-nuclear H* pitch accent in DroghE. The accented syllable /man/ is preceded by three unstressed syllables (*there, was* and *a*) and followed by two unstressed syllables (*in* and *the*). The peak (H) is located within the accented syllable. The point (l) refers to the low before the peak. Such a context excludes any tonal crowding and allows the peak to be realised in its characteristic location and in its full form. Therefore, one can conclude that in DroghE the intrinsic location of pre-nuclear H* is within the accented syllable, particularly near the end of the vowel.

An intrinsic alignment feature is specifically what has been termed the constant 'segmental anchoring' of the tonal targets (Ladd et al., 1999). Ladd et al. state that they want to achieve "a better understanding of the *invariant features* of F0 movements in specific languages" (Ibid.: 1545, emphasis provided). These 'invariant features' are the intrinsic alignment features that are specific to each dialect and language.

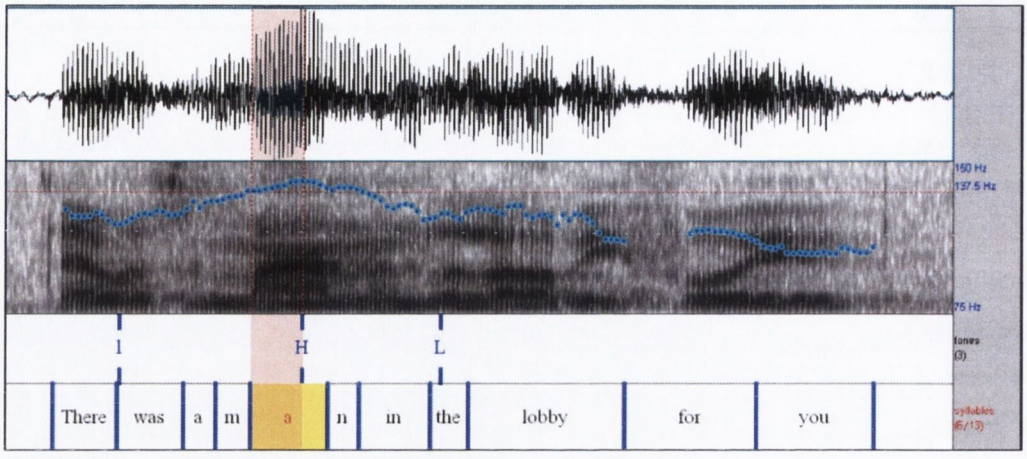


Figure 2.19 Intrinsic alignment features shown in the initial pre-nuclear accent on *man* in *There was a man in the lobby for you*,). The peak (H) is located within the accented syllable. The point (l) refers t to the low precedingthe peak, sound file (3PN_There_was_a_man_in_the_lobby_for_you_1_JG)[1]

Another example of intrinsic alignment is that of the pre-nuclear rise (L*+H) in Modern Greek. The low of the rise is aligned 'before' the accented syllable and the high is aligned 'near' the onset of the syllable following the accented syllable (Arvaniti et al., 1998). These systematic and consistent segmental anchors characterise the pre-nuclear rises in Modern Greek.

The contextual factors that cause **extrinsic alignment** shifts have been investigated and reported in several studies (Silverman and Pierrehumbert, 1990, Bruce, 1990, Nolan and Farrar, 1999, Knight and Nolan, 2006). The contextual factors can be prosodic factors such as the proximity of the word boundary, the rhythmic context, the tonal environment, pitch range, and focus as well as speaking rate. All such factors do not alter the identity of the pitch accent but modify it as a requirement of the contextual factors.

An example of extrinsic alignment is provided in a study on Irish (Dalton, 2008). Dalton investigated the influence of the rhythmic structure on the nuclear peak in Inis Oírr Irish (a variety of Connemara Irish in the Aran Islands). Specifically, she manipulated the number of unstressed syllables following the nuclear syllable /gʸobʸ/ from zero to two. Dalton

[1] Sound files in blue text are provided in the accompanying CD

found that in Inis Oírr Irish the nuclear peak in H*+L[2] (IViE was used in Dalton's study) shifts rightwards (i.e. is later) as the number of following unstressed syllables increases as shown in Figure 2.20. In spite of this shift in peak alignment, the pitch accent is still a fall in all three conditions where the pitch-accented syllable /g$^{\gamma}$ob$^{\gamma}$/ is followed by zero (N0), one (N1), and two (N2) unstressed syllables respectively. Although the peak is realised within the vowel of the following post-accentual syllable in the N2 condition, this does not mask the identity of the pitch accent as a nuclear fall. Hence, these different alignments are extrinsically conditioned and are not intrinsic. They can be regarded as contextually determined shifts to the default nuclear peak alignment in Inis Oírr Irish.

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[2] When referring to other studies, we report the original labels used by the investigators. Whenever relevant, we give the equivalent of our labelling (in ToBI).

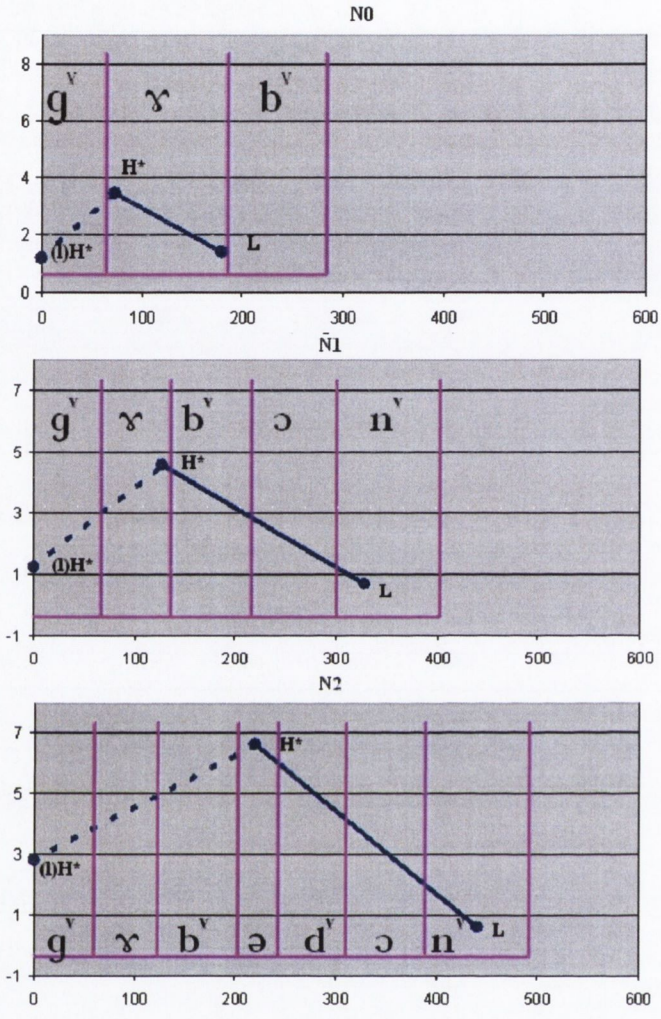

Figure 2.20 Extrinsic peak alignment features shown for the nuclear peak in Inis Oírr Irish. The Figures represent the pitch-accented syllable /gˠobˠ/ followed by zero (N0), one (N1), and two (N2) unstressed syllables respectively. The x-axis is time (ms) and the y-axis is f0 (in semitones, reference value 150Hz), reproduced from Dalton (2008).

The complexity and profusion of alignment studies may be easier to handle if we think of them in terms of the type of alignment being investigated. More importantly, differences between dialects and languages may be better expressed in terms of intrinsic and extrinsic alignment features. For example, the difference in alignment between Southern and Northern German can be classified as being intrinsic, and the difference between the two varieties of Connemara Irish are essentially extrinsic ones (even though intrinsic differences also exist).

Alignment studies suggest that it may be useful to differentiate between **intrinsic** features and **extrinsic** features of alignment. Most alignment studies can be grouped into an investigation of factors which control intrinsic alignment, factors that cause extrinsic alignment features, or both. In what follows, examples of such studies are given so that the difference between these two aspects of alignment becomes clear. Many studies were motivated by the question of which factors were merely extrinsic and which factors were actually controlling intrinsic alignment e.g. (Arvaniti et al., 1998). I give six examples of studies that deal with extrinsic alignment factors. Then four examples of studies that investigate intrinsic alignment are given.

2.4.2 Extrinsic Alignment Studies

Silverman and Pierrehumbert (1990)

One of the earliest studies to deal specifically with extrinsic alignment was Silverman and Pierrehumbert (1990). The investigators examined the alignment of pre-nuclear peaks by manipulating the prosodic context in made up names such as *'Ma 'Lemm, 'Mom Le 'Mann, 'Mamalie 'Lemonick,* and *'Mamalie Le 'Mann*. They manipulated two factors: the proximity of the pitch accents to a word boundary (by varying the number of syllables separating the pre-nuclear and the nuclear accents) and speech rate. They found that **speech rate**[3] and the following prosodic context (**proximity to the word boundary** and the number of unstressed syllables) influence peak alignment in different ways. Specifically, when a syllable is lengthened from being spoken slowly, the peak will be later. In changing speech rate "the peak delay will shift in such a way that its relationship to the overall syllable duration will be maintained" (Ibid.: 96). In contrast, when lengthening is induced by the following prosodic context (i.e. following pitch accent or boundary tone) the rhyme of the syllable undergoes more lengthening and at the same time the peak will occur earlier in the syllable rhyme. They found that this tonal repulsion was gradient as it extends with decreasing magnitude over the number of intervening unstressed syllables. Furthermore, they found that nuclear peaks were aligned earlier than pre-nuclear peaks. They suggest an explanation that this phenomenon is a result of the fact that nuclear syllables usually undergo greater lengthening. They also suggest that the nuclear peak could be repelled backwards due to its proximity to the immediately following L tone. Silverman and

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[3] All reported extrinsic alignment factors in the literature are in bold for ease of reference.

Pierrehumbert also found that the variability in peak alignment was best expressed as a proportion of the stressed syllable rhyme length rather than as an absolute measure of peak shift (Ibid.: 87).

Arvaniti et al. (1998)

Arvaniti et al. (1998) provides a good example of a study where the investigators manipulated contextual factors in order to investigate the alignment of the pre-nuclear rise (L*+H) in Modern Greek. The number of unstressed syllables between the initial pre-nuclear accent and following pre-nuclear pitch accent was always three unstressed syllables but the **duration between the two accents** was manipulated by using inherently longer and shorter intervening syllables[4], e.g. /ɾoˈðitiko toˈpio/ and /aˈpomakɾa vɾaˈxaca/ respectively. They found that the L and the H of the rise were independently aligned to specific locations in the segmental string. The L was located just before the accented syllable and the H was located at the onset of the post-accentual vowel. This then would be the intrinsic alignment of pre-nuclear L*+H in Modern Greek. They found that the slope and the duration of the rise were variant and completely dependent on the segmental composition of the accented word.

In a second experiment, the **duration of the accented syllable** was manipulated, e.g. [ðja], [lev], and [ɾi] (longer to shorter respectively) and the number of the following unstressed syllables ranged from two to five. In a third experiment, the influence of the word boundary was investigated by using paroxytones (words with penultimate stress) and oxytones (words with final stress) and the number of following unstressed syllables ranged from none to two. Overall, results showed that L and H of the rise were consistently aligned to the same segmental anchors regardless of the phonetic duration of the accented syllables or the proximity to the word boundary. Interestingly, Arvaniti et al conclude that:

> [T]he canonical conditions which allow us to observe the *full form* of the pre-nuclear accents involve at least two unaccented syllables following the accented one, preferably within the same word as the accent. If these conditions are not met, then it appears that there are two main factors that *may*

[4] The accented syllable was always antepenultimate followed by an accented word that starts with an unstressed syllable. The length of syllable duration was varied by changing the vowels and consonant clusters.

> influence the H tone: the position of the accent relative to the word's right boundary and the number of the post-accentual syllables.
>
> (Ibid.: 22, emphasis provided)

Ladd et al. (1999)

The study by Ladd et al. (1999) builds on the findings of (Arvaniti et al., 1998) and investigates the detailed effects of **speech rate** (an extrinsic factor) on the realisation of individual pitch accents. Using Southern British English data they find that there was a strong correlation between the duration of what they call a 'rising' pre-nuclear accent (which they typically label as L+H* and which in this study would be labelled as H*) and the time interval between the anchors of L and H. In other words, they find little or inconsistent effect of speech rate on the alignment of L and H and on the f0 size of the rise. The extrinsic effect of speech rate thus proved to be insignificant to the intrinsic alignment of pre-nuclear rises in Southern British English. The low is aligned at the beginning of the onset consonant of the accented syllable and the peak is aligned late, in the consonant following the accented vowel. This study strengthens the finding of (Arvaniti et al., 1998) and supports a model which considers the 'tonal targets' as the primitives of contours (where the alignment and the f0 level of the tonal targets determine a pitch accent's shape). Therefore, Ladd et al. building on previous studies and their own findings coined the term 'segmental anchoring' and demonstrated it as an 'empirical finding of a phonetic regularity'. Segmental anchoring means that "the alignment of f0 turning points is extremely consistent and predictable" (Ladd, 2008: 172).

Nolan and Farrar (1999)

Nolan and Farrar (1999) investigated two factors that influence the presence or absence of a peak lag in initial pre-nuclear pitch accents in English: the size of the anacrusis (the number of unstressed syllables preceding the initial pre-nuclear accent) and the variety of English investigated. Peak-lag in initial pre-nuclear accents was found to be more frequent when there was no anacrusis. Peaks in initial pre-nuclear position were more frequently subject to lag in data from Belfast, Newcastle, and Leeds, than in data from Cambridge. This study emphasises the importance of the **size of anacrusis** as an extrinsic conditioning factor. It also suggests that alignment characteristics may vary across dialects of a language. It is important to note that the pitch accent investigated was H*+L (in IViE). The

different alignment across the dialects does not entail a different phonological category since H*+L "functions as this accent usually does in the dialect in question" (Ibid.: 961).

Dalton and Ní Chasaide (2007)

When comparing peak alignment features across dialects and languages it is important to know whether the timing differences found/investigated are intrinsic or extrinsic, just as we differentiate between the concept of canonical form (intrinsic) and coarticulation (extrinsic) in segmental phonology. As part of the study on Irish by Dalton and Ní Chasaide (2007), two dialects of Connemara Irish, Inis Oírr Irish and Cois Fharraige Irish were investigated for their peak alignment of H*+L (in IViE) in nuclear positions. The extrinsic factor manipulated was the **number of unstressed syllables following the nuclear accent**. It was found that the peaks in Inis Oírr Irish show largely systematic shifts as the number of the manipulated unstressed syllables increases. This shifting is reported to be absent in Cois Fharraige Irish as shown in Figure 2.21.

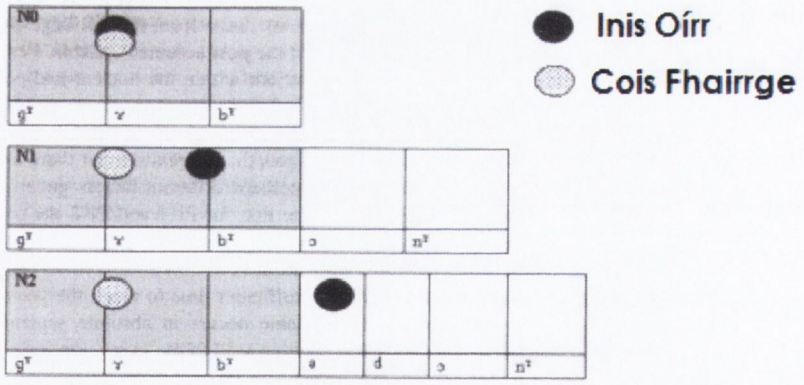

Figure 2.21 Schematic representation of intrinsic and extrinsic peak alignment features of nuclear H*+L in Inis Oírr Irish and Cois Fharraige Irish. Peak location is represented by circles. The grey section represens the accented syllable whereas the white section section represents the unstressed syllables following the accented syllable. The numbers 0, 1, and 2 represent the number of unstressed syllables following the nuclear syllable (N), reproduced from Dalton and Ní Chasaide (2007).

Note that the two dialects differ in both intrinsic and extrinsic alignment characteristics. As suggested earlier, intrinsic peak alignment features can be ascertained in the '$2^{+}A2^{+}$' condition, which is exemplified here in the N2 example in the sentence *Ní maith le Deaidí an **gob**adán* 'Daddy doesn't like the sandpiper'. The peak is located within the post-nuclear

vowel in Inis Oírr Irish but at the start of the nuclear vowel in Cois Fharraige Irish, an intrinsic alignment difference.

The two dialects also differ in their sensitivity to the extrinsic alignment factors. Inis Oírr Irish shows peak shifts as a function of the number of unstressed syllables following the nuclear accent, whereas Cois Fharraige Irish seems to be insensitive to such factors and does not show alignment shifts under such conditions.

Knight and Nolan (2006)

The study by Knight and Nolan (2006) investigated the effect of **pitch span** on nuclear high plateaus on the word *milliner*. Two phoneticians, a male and a female, recorded each of the two sentences below in three different pitch spans: neutral, compressed (narrower than the neutral span), and expanded (wider than the neutral span).

A. We were relying on a milliner (H*+L L-L%)[5]

B. A milliner (H* L-H%)

The tokens were combined to form conversational dyads. The tokens were randomized to provide different combinations of which A token preceded which B token in a dyad, and so that the speaker and the pitch span were different for each sentence. The randomized tokens were presented to 12 native speakers of British English who were asked to imitate the randomized exchanges they have heard. The investigators ran statistical tests to make sure that the speakers produced different pitch spans. The findings are based on the speech of the imitating speakers. The points investigated for the plateau of the peaks were the beginning of the plateau, peak, and end of plateau as shown in Figure 2.22.

[5] The labels are as given in Knight and Nolan (2006).

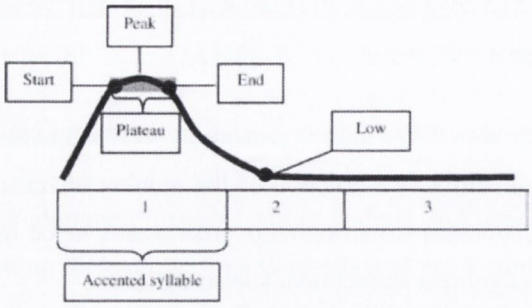

Figure 2.22 Schematic representation of plateau measurements, reproduced from Knight and Nolan (2006:26)

It was found that the plateau was shorter in the expanded pitch range. This finding was expected by the investigators who argued that the speaker must reach more extreme pitch values which will take longer to reach, leaving less time for the target to remain high as a plateau. They posited two hypotheses as to how the plateau shortens in expanded pitch span. The first hypothesis is that the plateau would contract around the peak due to time limitations. The second hypothesis is that the whole plateau would be aligned later in the syllable. The second hypothesis was borne out, but only partially. It was found that in expanded pitch span the beginning of the plateau and the peak were delayed, whereas the end of the plateau was firmly anchored within the accented syllable. The low target after the plateau was also not significantly affected by pitch span. This suggests that pitch span is another possible extrinsic factor which influences peak alignment.

2.4.3 Intrinsic Alignment Studies

Atterer and Ladd (2004)

This section gives examples of studies that are specifically designed to investigate what I term intrinsic alignment features. Atterer and Ladd (2004) investigated Northern and Southern German pre-nuclear rising accents. They find that German speakers align the rises later than published data for Greek, English, and Dutch. In addition, Southern speakers show later alignment than Northern speakers. Interestingly, they find that native alignment patterns were carried over into the German speakers' pronunciation of English. These findings have important implications for the phonological representation of pitch accents. The intrinsic alignment features are dialect specific and do not represent different phonological categories in the two German dialects as shown in Figure 2.23.

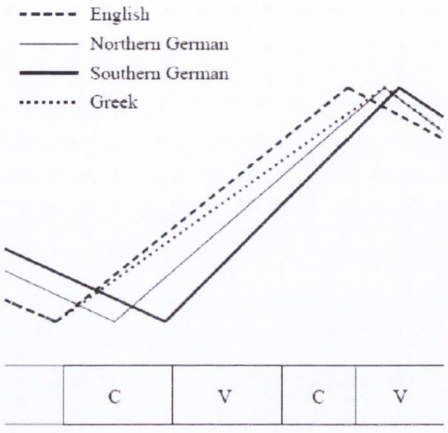

Figure 2.23 Schematic representation of the alignment in 'rising pre-nuclear accents' relative to a stressed syllable in English, Northern and Southern German, and Greek, reproduced from Atterer and Ladd (2004)

The study by Atterer and Ladd is relevant to a current problem in the literature: the use of the star to indicate association of the tonal targets with particular point in the segmental string. Atterer and Ladd argue that it is misleading to label a particular bi-tonal accent such as L*+H, for example, which will indicate that it is distinct from L+H* whereas the real difference would be a matter of a phonetic difference in alignment only. Specifically they state that:

> Our findings offer no support for the general assumption in the literature that the German rising prenuclear accent 'is' L*+H, distinct from the H* and the L+H* accents normally used in transcribing English. Phonetically, the alignment pattern we find for Northern German is midway between those of Dutch/English and of Southern German; it is difficult to escape the conclusion that we are dealing with a phonetic continuum of alignment.
>
> (Ibid.: 192)

Atterer and Ladd suggest then that the languages they are comparing in Figure 2.23 have a single category what they call the ordinary 'rising pre-nuclear accent' but with a continuum of phonetic alignment in its realisation. They draw the analogy to voice onset

time in segmental phonology where a language can have a few categories of voice onset time, but that cross-linguistic phonetic detail shows a continuum of values.

Atterer and Ladd mention that one objection raised to their study was that they make the premature assumption of comparing what they think is the same category across the different languages. They defend their argument by suggesting that their data give evidence that the ordinary accentual rise used spontaneously by speakers of English, Dutch, German, and Greek on the first accented word of a read sentence is in some way 'the same thing' cross linguistically.

What seems clear is that the investigated pitch accent between the two varieties of German is the same category in German, be it L*+H, L+H*, or H*. Whether this is the 'same' category in English, Greek, and Dutch is another issue. The issue of what constitutes the same pattern across different languages and the unification of labelling is a major problem in the current theoretical debates in intonational phonology (Ladd, 2008: 113).

Ladd and Schepman (2003)

Ladd and Schepman (2003) investigated the phonological status of the dip in f0 between two consecutive peaks, H* H* (in ToBI). They use minimal pairs of names such as *'Norman* *'Elson/* *'Norma* *'Nelson*. The minimal pairs result from the position of an ambiguous consonant, the 'n' in this example. They show that the f0 minimum between two H*'s is reliably aligned with the beginning of the second accented syllable, whether it is /ɛl/ or /nɛl/. Hence, they argue that both H* and L+H* have distinct L and H targets and should be regarded as one phonological category. This phonological significance of the preceding low (L) in H* is strengthened by a perceptual test. They show that modifying the alignment of L in such ambiguous pairs of names affects listeners' judgment of which name they hear.

In a third experiment, they varied the number of intervening unstressed syllables between the two peaks, H(1) and H(2), from zero to three and measured the f0 level of L and the following (second) peak. They find that the fall from the H(1) to L increases in size as the number of inter-peak syllables increases. They also find a close relation between the scaling of L and H(2). The rise from L to H(2) is constant across the range of inter-peak syllables. There was no effect of intervening unstressed syllables on the duration of the rise

from L to H(2). This suggests that L is located at a relatively constant distance from the second peak.

The findings of Ladd and Schepman (2003) cast doubts on Pierrehumbert's notion of 'sagging transitions'. Pierrehumbert considers the low between two consecutive H* to be a mere phonetic consequence of a 'sagging transitions'. The findings of this study show that the low between two consecutive H* has a systematic relation with H(2). Hence, they argue that H* should be labelled as L+H* and in this and subsequent studies they refer to this tone as a 'rising' accent. By analyzing the anatomy of the second peak and consequently labelling it as L+H*, Ladd and Schepman have described the intrinsic alignment of this particular pitch accent.

Dilley et al. (2005)

Dilley et al. (2005) used the data from Ladd and Schepman (2003) and measured the alignment of the second H* (in what they now label as L+H*) as a function of the syllable boundary e.g. *Norman Elson/ Norma Nelson*. The accented syllable would be VC in one case and CVC in the other. They find that L and H are aligned with the segmental string rather than with each other. The duration between L and H is not consistent. This finding seems superficially at odds with that of (Ladd and Schepman, 2003) who find the duration between L and H* to be consistent as a function of the intervening syllables between the two H*'s. But it should be noted that in their third experiment, Ladd and Schepman (2003) manipulated the number of the intervening syllables between the two H*'s to see whether the dip in f0 increases as the distance between the peaks increases. In almost all their test sentences the second accented syllable was a CVC syllable. Hence, when they say that duration between the low and the second peak was relatively constant, this meant that the low was constantly aligned at the beginning of the accented CVC syllable. On the other hand, Dilley et al. had two different syllable structures, VC and CVC, which resulted in their finding that the low (L) is aligned differently according to syllable structure. This would suggest that intrinsic alignment is specific for a given syllable structure.

Ladd et al. (2009)

Finally, Ladd et al. (2009) is a recent study which investigated the intrinsic differences in alignment between, what they refer to as, Southern British English and SSE (Scottish Standard English) in what they term 'rising' pre-nuclear accents (roughly equivalent to H*

in the present study) and in nuclear accents. The study also investigated peak alignment conditioned by the 'phonological' vowel length of the accented syllable. The long vowels of FLEECE and FACE and the short vowels of KIT and DRESS were used. The accented syllables were preceded by mostly three unstressed syllables and were followed by at least one, but mostly two to three unstressed syllables in the same word, e.g. *It was a seemingly endless meeting.*

It was found that f0 peaks were consistently later in SSE than those in RP in both pre-nuclear and nuclear positions. It was also found that the pre-nuclear peaks were aligned within the accented vowel if the vowel was long (FLEECE/FACE) but within the following consonant if the vowel was short (KIT/DRESS) as shown in Figure 2.24. This effect of vowel length was not significant in nuclear peaks. They explain that the effect of the vowel length is overridden by the need to execute a nuclear peak early enough before the final fall.

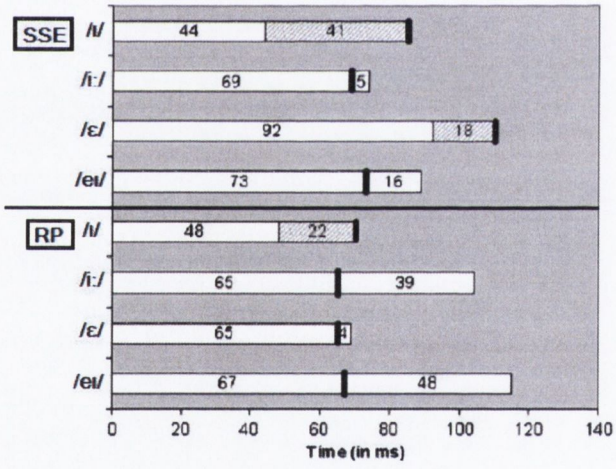

Figure 2.24 Peak alignment in initial pre-nuclear peaks for SSE and RP, adjusted from Ladd et al. (2009). The white bars represent the duration of the vowel of the accented syllable and the grey bars represent the consonantal duration from the end of the accented vowel to the peak location. The bars show durations in (ms). The vertical black lines represent the peak location. The vowels in the study are long high /i:/ (FLEECE), short high /ɪ/ (KIT), long mid /eɪ/ (FACE), and short mid /ɛ/ (DRESS).

The findings by Ladd et al. (2009) suggest three aspects specific to intrinsic alignment. First, the systematic differences in the alignment of the same pitch accent in RP and SSE show that intrinsic alignment features are dialect specific. Second, the fact that N peaks are consistently aligned earlier than PN peaks suggests that for each dialect there are two

distinct intrinsic alignments: PN and N. Third, the influence of vowel length suggests that the basic intrinsic alignment is specific to a given syllable structure and segmental composition.

2.4.4 Summary of Alignment

Two different aspects of alignment were proposed: intrinsic and extrinsic. For a given syllable structure with specific component segments there is an **intrinsic alignment** which is the default location of the f0 turning points of a particular pitch accent relative to the segmental string in the context of there being no major rhythmic or temporal constraints. In addition the intrinsic alignment is likely to differ in nuclear and pre-nuclear conditions.

Extrinsic alignment relates to the potential shifting of the default (intrinsic) location of the f0 turning points of a particular pitch accent, conditioned by contextual constraints on the realisation of the default pattern.

The basic point being made is that languages and dialects are likely to differ in terms of (i) intonational patterning but also (ii) in terms of the intrinsic alignment properties and (iii) in the extent and type of extrinsic alignment variation. A case in point is the study on Irish by Dalton and Ní Chasaide (2007). The two dialects of Irish not only differ in their default intrinsic alignment of the peak, but also, in the extent to which this alignment shifts as a function of extrinsic factors such as the number of unstressed syllables preceding initial pre-nuclear accents and following nuclear accents. In Inis Oírr Irish the initial pre-nuclear peak is within the accented vowel. In Cois Fharraige Irish the initial pre-nuclear peak is located at the end of the accented syllable. Inis Oírr Irish shows peak shifts as a function of the number of unstressed syllables in the anacrusis and following the nuclear syllable, whereas Cois Fharraige Irish does not show alignment shifts in the same rhythmic contexts.

In this study some alignment aspects in DroghE are investigated, both intrinsic and extrinsic. To begin with, the the '$2^{+}A2^{+}$' hypothesis is used to formulate whether this indeed allows us to capture the intrinsic default alignment. The differences in intrinsic alignment for pre-nuclear and nuclear accents are also compared, as well as across differences in the somewhat different syllable structures. Further to this, the extent to which there is extrinsic alignment variation when the '$2^{+}A2^{+}$' context is not available is investigated.

2.5 Summary

This chapter provided a general background to the literature on intonation which is relevant to the three topics addressed in Chapters 5, 6, and 7. The current systems used in describing the intonation of languages were reviewed, particularly the ToBI and the IViE. Both systems are relevant to the modified ToBI that will be used in the transcription in this study. The available literature on the intonation of both Northern IrE and Southern IrE was also outlined as background to Chapter 5 which presents an analysis of the tonal patterns in DroghE. The literature on question intonation is reviewed as background to Chapter 6 where the f0 scaling of crucial points in the contours of different questions types and of statements is compared. Finally, while reviewing the literature on alignment studies I have proposed two types of alignment that can be useful to consider. This introduction sets the scene for the analysis presented in Chapter 7. In Chapter 7, pre-nuclear and nuclear peaks are analysed in different rhythmic contexts by employing the distinction between intrinsic and extrinsic alignment which was introduced in this chapter.

Chapter 3 Materials and Methods

3.1 Introduction

This chapter presents the materials and methods of the four main analysis chapters. These chapters cover: vowels and consonants of DroghE (Chapter 4), the tonal patterns of DroghE (Chapter 5), phonetic marking of interrogative intonation in DroghE (Chapter 6), and peak alignment in DroghE (Chapter 7). In this chapter we first give an overview of the informants who were recorded for this study. Next, we briefly introduce the main corpora used. We then present the different materials and methods used in each of the four analysis chapters. Two perception experiments were included in this work for which the materials and methods are also explained; the first perception experiment was undertaken as part of the vowels study; the second perception experiment was undertaken as part of the interrogative intonation study.

3.2 Informants

The informants, 20 in total, who took part in the experiments reported in this study, are male adolescent locals of Drogheda most of whom were Leaving Certificate students[6] at the time of the recording. 18 of the participants fell into the (16-18) age range with one participant aged 15 and another aged 20. The profession and education of the informants' parents indicates that they are middle-class to lower-middle class. There were no reports of a history of hearing or speech disorder. An informants' profile is given in Appendix 8.

Several factors were important in choice of informants. First of all, the cohort was specifically chosen not to be a socio-diverse group. Given the very detailed nature of the study and analysis made, we aimed for a maximally homogenous group, who would be likely to use the local variety of DroghE. Secondly, young middle-class or lower-middle class informants were chosen as their speech is less likely to be influenced by travel or by moving elsewhere for education. Thirdly, males are more likely than females to use local varieties (Milroy and Milroy, 1978). Finally, the speech of males is more suitable for

[6] The Leaving Certificate is the Irish school exam of the end of the secondary education cycle when students are up to 18 years old.

spectrographic analysis and this was helpful for the acoustic analysis of the vowel system. It should also be noted that informants came from male only Grammar Schools.

Therefore, this study does not attempt to capture the social richness of variation that is likely to be found if one takes a fuller sampling, including male-female, different ages, and different socio-economic groups. Rather, this study should provide baseline material, which could be used as a starting point for any future sociolinguistic study[7].

The study evolved over a period of three recordings (in 2007, 2008, and 2009), resulting in two main groups of informants. The first group, of 11 informants, was involved in the earliest recordings, which were used for the study of vowels and consonants. The second group, of 7 informants (and 2 other disscused below in Corpus G), was recorded at a later stage, for the intonation study (corpora E, F, G in Table 3.1). The speakers of the two groups are not the same. However, they come from the same pool as described above.

The recordings took place in a cultural institution familiar to the informants (Droichead Arts Centre) where various youth activities are usually held. This venue was chosen as it had a quiet setting and is a place known to most locals in Drogheda. Furthermore, the informants were chosen with the assistance of local adolescents, who knew the informants and were present during the recordings. There were usually three to four people in the recording room which was bright and comfortable. The informants were recorded in pairs who were usually friends. All this was intended to maximize the comfort and naturalness of the context in which the recordings were conducted in order to elicit as much a representative sample of the dialect as possible.

3.3 Corpora

Table 3.1 shows the main corpora for the four analysis chapters and the informants on whose speech data the analyses are based. The informants are given numbers corresponding to their initials in Appendix 8. For example informant 1 = CD.

---

[7] The term Drogheda English is used throughout this study to represent the speech of the informants described here, whose speech is a sample of the Drogheda population speech.

Table 3.1 Corpora used in the four analysis chapters

Corpora	Type	Appendix	Informants
Vowel Corpus A	Main corpus	Appendix 2:A	1-11
Vowel Corpus B	Additional materials	Appendix 2:B	6-11
Consonant Corpus C	Main corpus	Appendix 3	1,2,4,5
Consonant Corpus D	Story: read & retold	Appendix 4	1-11
Intonation Corpus E	For tonal patterns	Appendix 5	12-18
Intonation Corpus F	Subset of E for interrogative intonation	Appendix 5	12-18
Intonation Corpus G	For tonal alignment	Appendix 6	12-18, (19, 20)

There are two corpora for the vowels (A and B). The main vowel corpus, Corpus A was designed around Wells' lexical sets, but to ensure that coarticulatory influences would not overly skew our spectrographic measurements, the vowels were elicited, where possible, in words with a /h-d/ context (*hid, heed,* etc.). When analysis of Corpus A was underway, it became clear that additional material would be required. Firstly, further items were needed to establish more clearly whether certain oppositions/neutralizations were found in the DroghE variety. Furthermore, it was clear that more material would be needed to illustrate the range of contrasts in the /Vɹ/ context. In RP and GenAm, the vowel system is greatly reduced in this context, something which is not true of IrE. Therefore, additional material was added in Corpus B. The additional material in Corpus B was recorded by six of the same informants as shown in Table 3.1. The main and additional corpora will be explained in detail in Section 3.4.

The consonant corpora are also two parts (C and D). Corpus C includes the main corpus which consists of a read list of test words embedded in sentences. The analysis of the main consonant corpus is based on data from four speakers as shown in Table 3.1. Corpus D consists of a read passage (Cinderella story) and a retold version of the story. The analysis of Corpus D is based on data from eleven speakers as shown in Table 3.1. Corpora C and D will be explained in detail in Section 3.5.

The intonation corpora comprise three parts (E, F, and G). Corpus E is used for describing the tonal patterns in DroghE. Corpus F is a subset of Corpus E, which includes different

types of questions, and is used for the analysis of interrogative intonation. Corpus G is used for analysis of tonal alignment. The same seven informants were used for all intonation corpora as shown in Table 3.1. Some additional recordings from two extra speakers (speakers 19 and 20) were used for a small subset of corpus G, as will be explained in Section 3.6.5.

3.4 Vowels

The two corpora of vowels (A and B) are presented in this section. Corpus A is presented first, followed by the additional material of corpus B.

3.4.1 Corpus A

The speech material has been chosen to provide an overview of the vowel system of DroghE. The investigated vowels were recorded in monosyllabic words that were placed in the carrier sentence *Say ___ again*. The investigated vowels are in four groups: monophthongs, diphthongs, weak vowels as shown in Table 3.2 and a set of vowels in /Vɹ/ contexts as shown in Table 3.3. The vowel symbols used in the tables represent those for Southern IrE, based on Wells (1982). The monophthongs, diphthongs, and weak vowels recorded in Corpus A are those listed under the 'Main Words' column in Table 3.2. These involved a /h-d/ context (except for the BATH vowel in the word *half*), and the weak vowels /ɪ/ and /ə/ which are elicited in the words *happy/early*, and *sofa*, respectively.

Table 3.2 Test words for monophthongs, diphthongs, and weak vowels

Vowel	Main words (Corpus A)	Extra Words (Corpus B)	Lexical Set
Monophthongs			
ɐ, ɜ, ɤ	*Hudd*	*could-cud, took-tuck, bus, mud, hug, done, come, double, dull*	STRUT
ʊ	*hood*	*cook, rook*	FOOT
u:	*who'd*	*school, two*	GOOSE
a	*had*	*ant, Mater* (well known hospital in Dublin), *Pam*	TRAP
a(:ʔ)	*half*	*aunt, matter, palm, path, dance, father, spa*	BATH
ɑ	*Hod*	*pot, bother, soft, boss*	LOT
ɑ:, ɔ:	*hawed*	*bought, halt*	THOUGHT
i:	*heed*	*piece-peace*	FLEECE
ɪ	*hid*	*peculiar, secure* (in unstressed syllables)	KIT
ɛ	*head*	*any, many*	DRESS
Diphthongs			
ɑɪ, ʌɪ	*hide*	*pint, vice, aisle, buy, height, rice-rise*	PRICE
ɔɪ, ɒɪ	*Hoyed*	*point, voice, oil, boy*	CHOICE
æʊ, ɛʊ	*how'd*	*cow*	MOUTH
ɔ:	*hoed*	*coat, toe, bold*	GOAT
e:	*hayed*	*pace, eight, day, break, steak*	FACE
Weak Vowels			
i:	*happy, early*		*happ*Y
ə	*sofa*	*vowel-owl, lion-line*	*comm*A
ŋ, ən	*-ing*	*rotting- rotten*	*-ing*

Table 3.3 Test words for monophthongs in /Vɹ/ contexts

Vowel	/Vr/ vowels (Corpus A)	Wells' Lexical Sets	Further Potential /Vr/ Oppositions (Corpus B)	
ɛɪ / ʌɪ	*turn, dirt, bird*	NURSE	/ɛɹ/ - /ʌɹ/	*per-purr, earn-urn, ferry-furry*
e:ɹ	*hair*	SQUARE	/e:ɹ /- /ɛɹ/	*pair-per, paired-herd*
i:ɹ	*hear*	NEAR	/i:ɹ/ - /ɪɹ/	*nearer-mirror, Lear-Lir, mere-myrrh*
ɔ:ɹ	*Corr, born*	NORTH	/ɔ:ɹ/-/o:ɹ/	*horse-hoarse*
o:ɹ	*four*	FORCE		
u:ɹ	*poor*	CURE	/u:ɹ/ - /o:ɹ/	*poor -pore, tour-tore*
a:ɹ	*far, hard*	START	a:ɹ	

As mentioned, the vowels investigated in /Vɹ/ contexts (Corpus A) are the monophthongs followed by /ɹ/ and are represented by the following lexical sets: NURSE, SQUARE, NEAR,

NORTH, FORCE, CURE, and START. The lexical sets for vowels in /Vɹ/ contexts are less in number than those for monophthongs because many potential vowel contrasts in /Vɹ/ contexts are lost in RP and GenAm. In general, this loss emerged as follows:

KIT, DRESS, and STRUT + /ɹ/ → NURSE
TRAP and BATH + /ɹ/ → START
LOT, THOUGHT, and GOAT + /ɹ/ → NORTH/FORCE
FACE + /ɹ/ → SQUARE
FLEECE + /ɹ/ → NEAR
GOOSE + /ɹ/ → CURE
There are almost no words in English with FOOT + /ɹ/ (Wells, 1982: 420).

It should be noted that the exception to the loss of vowel oppositions in /Vɹ/ context in reference varieties (RP and GenAm) is prevocalic /ɹ/. For example, there is still an opposition between SQUARE and DRESS+/ɹ/: *Mary-merry* (outside North America), between SQUARE and TRAP+/ɹ/: *Mary-marry*, between NORTH/FORCE and LOT+/ɹ/ *aura/Laura/story-orange/Laurence/sorry*, and between NEAR and KIT + /ɹ/ *nearer-mirror, Liberia- Syria,* and *period-myriad.* Similarly, KIT, DRESS, and FOOT vowels were not affected by the NURSE Merger pre-vocalically. Thus, RP still has a short vowel plus /ɹ/ in *mirror* /mɪɹə/, *very* /veɹɪ/, and *furrow* /fʌɹəʊ/. In American speech *squirrel, stirrup* and *syrup* all have /ɪ/ and *furrow, worry* have /ʌɹ/ (Ibid. 156, 199-201).

3.4.2 Corpus B

Corpus B is the material shown in the column headed 'Extra Words' in Table 3.2 and the 'Further Potential /Vɹ/ oppositions' in Table 3.3. As mentioned, the materials of Corpus B were included at a later stage and were recorded by speakers (6-11) as shown in Table 3.1 in addition to the main vowel Corpus A.

The 'Extra Words' in Table 3.2 relate to certain vocalic aspects regarding specific minimal pairs and mergers as explained in points (1-11) below and summarised in the last column of Table 3.4.

Table 3.4 Vowels in RP, GenAm, SIrE, and NIrE, based on Wells (1982) and issues investigated in DroghE.

Lexica Set	RP	GenAm	SIrE	NIrE	Question in DroghE
STRUT	ʌ	ʌ	ɵ̞, ɔ̈, ɤ	ʌ	**contrast?**
FOOT	ʊ	ʊ	ʊ	ɨ, ʉ	
GOOSE	u:	ʊ	u:	ʉ:	**GOOSE vs. FOOT**
TRAP	æ	æ	a	a̟	**contrast?**
BATH	ɑ:	æ	a, a:	a(:)	
LOT	ɒ	ɑ	ɑ	ɒ, ɔ	**contrast?**
THOUGHT	ɔ:	ɔ	ɑ:, ɔ:	o:	
KIT	ɪ	ɪ	ɪ	ɨ	
FLEECE	i:	i:	i:	i:, e:	
DRESS	ɛ	ɛ	ɛ	æ, ɛ:, eə	
***happ*Y**	ɪ	ɪ	i:	e, ë	
***lett*ER**	ə	ɚ	əɪ	əɪ	
***comm*A**	ə	ə	ə	ə	
PRICE	aɪ	aɪ	ɑɪ, ʌɪ	æɪ, eɪ	**contrast?**
CHOICE	ɔɪ	ɔɪ	ɔɪ, ɒɪ	ɔɪ	
MOUTH	aʊ	aʊ	æʊ, ɛʊ	əʉ	
FACE	eɪ	eɪ	e:	ɛ:, eə, ɪə	**monophthongs?**
GOAT	əʊ	o	ɔ:	o:, oʊ	

A particular feature in IrE is that it has almost complete vowels oppositions in /Vɹ/ contexts. Therefore, the materials in the column headed 'Further Potential /Vɹ/ Oppositions' in Table 3.3 were included to allow a fuller coverage of the range of vowel oppositions in the /Vɹ/ contexts in DroghE as explained in points (12-16) below. In this study vowel oppositions in /Vɹ/ contexts are not investigated in prevocalic /ɹ/ contexts which are known to be contrastive in reference varieties as mentioned above. Vowels preceding the /ɹ/ in coda position have a higher chance of manifesting neutralization, hence, they are the contexts considered in this study.

The vocalic aspects investgated in Corpus B are:

1. **STRUT- FOOT opposition:** Nally reports that /ʊ/ in the Westmeath dialect precedes nasals: *month, money, bungle* and velars: *buck* and *lug* and that /ʌ/ with 'scarcely

any lip rounding' occurs before /l/ or a bilabial plus /l/: *color, Dublin, double, couple* (1971: 34). The realisation of the SRTUT vowel is investigated in different contexts: after labials: *mud, bus*, before velars: *hug, tuck*; before nasals: *done, come* and before labials or a labial+/l/: *dull, double*. The FOOT-STRUT opposition is investigated in the following pairs: *could-cud,* and *took-tuck*. Certain words that belong to FOOT in standard accents retain in general the historical /u:/: *book, cook, crook,* and *rook* (Wells 1982: 423). This is also observed in North Roscommon by Henry who notes [u:] before labials and velars as in *book* [bu:k] *cookers* [ku:kər˚ʒ][8] *rook* [ru:k], *move* [mu:β]. He also mentions that typical slow dialect speakers tend to substitute a lowered, advanced and unrounded /u:/ (1957: 28-29).The realisation of FOOT in words with 'oo' spelling in DroghE is investigated in the words *cook* and *rook*.

2. **GOOSE:** Wells reports some diphthongal variants of /u:/ in 'popular Dublin' speech: *school* [skɛʊl] and *book* [bĕu:k] (1982: 423). Similarly, Hickey observes a diphthongal realisation in local Dublin English: *school* [skuʷəl] (2007: 328-29). Henry refers to this 'breaking' as a glide that diphthongizes long vowels particularly before a pause: *goose* [gu·ᵊs] (Laois), *school* [šku:·ᵊl] (Kilkenny), *moon* [mu·ən], (Tipperary), *school* [skụᵊl] (Limerick), *goose* [gu:əs], *cool* [ku:ᵘL] (Cork) (1958: 119-21). The words *school* and *two* are added to investigate the reported diphthongization of this vowel in closed and open syllables respectively.

3. **TRAP and BATH opposition:** The opposition between /a/ and /a:/ in *ant- aunt, Mater- matter*, and *Pam-palm* is investigated. The words *path, dance, father*, and *spa* are included to investigate the lexical incidence of /a ~ a:/ in DroghE. In RP these words have [ɑ:]. In GenAm, the first two belong to the TRAP vowel, whereas the last two belong to the PALM vowel /ɑ/.

4. **LOT and THOUGHT variation:** The words *pot* and *bother* are added to verify the quality and length of the LOT vowel. The words *bought* and *halt* are added to investigate the quality of THOUGHT particularly in words with the spelling

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[8] Henry's examples are reported, throughout this study, as they appear in his work. Explanation of the symbols used by Henry is provided in Appendix 1.

'ought/aught' such as *brought/taught,* and before /l/ in words such as *salt, fault, halt,* respectively. The words *soft* and *boss* which belong to LOT in RP and to THOUGHT in GenAm (the CLOTH set) are included to verify which set they belong to in DroghE.

5. **FLEECE:** The FLEECE Merger (Wells, 1982: 140, 195) is investigated in the pair *piece-peace.*

6. **KIT:** Wells reports that in SIrE the first unstressed syllables of words such as *prefer, peculiar, secure* have [ə] instead of [ɪ] in RP (1982: 427). This possibility is investigated in the words *peculiar* and *secure.*

7. **DRESS:** The words *any* and *many* are reported to have an open realisation of this vowel close to [æ] (Wells, 1982: 423).

8. **PRICE and CHOICE:** The opposition between PRICE and CHOICE is investigated in three contexts: after labials or labio-dentals: *pint-point, vice-voice,* word-initially: *aisle-oil,* and word-finally: *buy-boy.* Hickey observes that for Dublin English the retraction to [ɑɪ] only occurs before voiced segments: *rice-rise* [rɑɪs-rɑɪz], *tight-tide* [tɑɪt-tɑɪd] (1999: 273). To test for this possibility the realisation of the first element of the PRICE vowel is investigated in the context of a following voiced obstruent in the minimal pairs: *rice-rise* and *height-hide.*

9. **MOUTH:** The word *cow* is added to investigate the MOUTH vowel in open syllables.

10. **GOAT:** Wells reports that Dublin city is distinguished by having diphthongal variants of the FACE and GOAT vowels except before /ɹ/: [e̝ɪ ~ ɛɪ] (1982: 425). Similarly, Hughes et al. report a diphthong in Dublin English such as in *boat* and *nose* (2005: 115). Diphthongal variants are also reported by Henry: *goat* [go·ət] (Leitrim, Waterford), *comb* [ko:ᵊm] (Galway), *cold* [ko:ᵊld] (Wicklow), *oats* [o̝·əts] (Kilkenny), *nose* [no̝·əz] (Tipperary), *ghosts* [go̝·əʃts] (Clare), *roads* [ro̝·ədz] (Kerry), *old* [o:ᵊld] (Cork) (1958: 119-21). The words *coat, toe,* and *bold* are added to verify the diphthongal realisation of this vowel in closed syllables, open syllables, and before /l/ contexts, respectively.

11. **FACE:** This vowel is investigated in words that have different ME origins: *pace* (from ME /a:/), *eight* and *day* (from ME ɛi ~ æi) and *break* and *steak* (from ME /ɛ:/)[9].

12. **NURSE:** The NURSE Merger is investigated in the following pairs: *per-purr, earn-urn,* and *ferry-furry*[10]. Hickey (2007) provides contextual conditions for the realisation of this vowel. It is realised as [ʊ:] following historic /u/ and following labials (irrespective of the vowel): *turn* [tʊ:(ɹ)n], *work* [wʊ:(ɹ)k], *first* [fʊ:(ɹ)st], *bird* [bʊ:(ɹ)d]. Historic /ir/ following alveolar stops is also retracted: *dirt* [dʊ:(ɹ)t], *third* [tʊ:(ɹ)d]. In all other cases, historic /ir/ is lowered as [ɛ:]: *circle* [sɛ:(ɹ)kl̩], *certain* [sɛ:(ɹ)tn̩], *germ* [ʤɛ:(ɹ)m]. To investigate the realisation of this vowel the following words were recorded: *herd, turn* (from historic /u/), *dirt* (from historic /ir/ after alveolar stops), and *bird* (after labials).

13. **SQUARE:** The opposition between SQUARE and DRESS + /ɹ/ is investigated in open and closed syllables: *pair-per, paired-herd* respectively.

14. **NEAR:** The opposition between NEAR and KIT +/ɹ/ is investigated in the pair: *nearer-mirror* which is a prevocalic /ɹ/ context. It is difficult, to find a NEAR and KIT +/ɹ/ opposition pair in non prevocalic contexts. Wells mentions that there are no minimal pairs with identical morphological composition to test this opposition (1982: 154). However, in IrE a possible minimal pair is *Lear* (*King Lear*) vs. *Lir* (*The Children of Lir* is an Irish Legend). It should be noted that the pairs *Lear-Lir* and *mere-myrrh* come from the seven informants (12-18).

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[9] The FACE words such as *break* and *steak* which originate from ME /ɛ:/ should have ended in the FLEECE set but for an unclear reason they have not (Wells: 1982: 196).

[10] Although prevocalic /ɹ/ contexts were not included in this study, one of the contexts in investigating for the NURSE Merger is a prevocalic /ɹ/ context: *ferry-furry*. The NURSE merger did not affect vowels before prevocalic /ɹ/, but this has not been the case in most GenAm accents. Wells describes a development he calls the Second NURSE Merger which gives the merged vowel /ɜɹ/ in prevocalic /ɹ/ contexts. This occurs in most GenAm accents and gives rhyming words such as *furry-hurry* (Wells, 1982: 201). This possibility is investigated in DroghE.

15. **NORTH and FORCE:** The NORTH-FORCE opposition is investigated in the pair *horse-hoarse* respectively.

16. **CURE:** The opposition between NORTH/FORCE and CURE is investigated in the pairs: *pore-poor* and *tore-tour* respectively.

3.4.3 Procedure & Analysis for Corpus A & B

The recordings were carried out in two separate phases. In the first phase informants (1-5) were recorded in a quiet room using a portable TASCAM DA-P1 Digital Audio Tape (DAT) recorder, using Maxell Professional R-90DA (90 minutes) DAT cassettes, and an Audio-technica condenser Lo-Z microphone situated approximately 10 cm from the speaker's mouth. The speech analysis software Kay Elemetrics Multispeech (version 2) was used to transfer the data from the tapes onto a computer in the Phonetics Laboratory at Trinity College. In the second phase informants (6-11) were recorded in a quiet room using a digital recorder, ZOOM Handy Recorder H4, and the data were then transferred using a USB cable to the computer.

Each target word was read in the carrier frame *Say ___ again* in five randomizations. There were two lists. List 1 was for the vowels in non-rhotic contexts and List 2 was for vowels in /Vɹ/ contexts. Three filler sentences were added at the beginning and end of each list in order to avoid begin and end effects. At a later stage the pairs *Lear-Lir* and *mere-myrrh* were recorded by the seven informants (12-18). In total, 112 test words were recorded[11].

The vowels were analysed using the Praat software (Boersma and Weenink, 2009). Three measurements were extracted for each vowel (including each of the two elements of a diphthong): F1, F2, and the vowel duration. Similar to the approach by Cox (2006) for Australian English diphthongs, the measurements for diphthongs include the durations of both elements of the diphthong and the duration of the transition between the two

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[11]The words whose vowel measurements are based on data from eleven speakers are: *hid, heed, head, had, half, (ant, aunt, Mater, matter, Pam, palm, father), Hod, hawed, Hudd, hood, who'd, hayed, hoed, hide (pint, point, vice, voice, aisle, oil, buy, boy), Hoyed, how'd, herd (earn,urn,purr) hair, hear, hard(far), Corr, four, and poor.*

elements. The onset of the transition was marked at the end of the steady state of the first element and its end was marked by the beginning of the steady state of the second element.

The formant measurements were determined by the standard analysis parameters in Praat. Formant values were measured in the middle of the steady state part of the vowel using a specific Praat script (in the case of diphthongs, in the middle of each element of the vowel). The durational measurements follow standard segmentation procedures outlined in Peterson and Lehiste (1960). The beginning and end times of the vowels were determined by hand on the basis of visual information from wide band spectrograms and aligned waveforms. The onset of the vowel was marked by the onset of voicing or the sudden change in intensity or formant frequency. The offset of the vowel was marked by the offset of voicing or a sudden drop in intensity. In cases where the onset or the offset of the vowel was not clear, measurement points were determined by visual inspection of the waveform and spectrogram as well as by ear. Tokens that were not suitable for analysis due to factors such as disfluencies or recording errors were excluded. Labelling and extraction of formant measurements were carried out using Praat scripts available online (http://www.ling.ohio-state.edu/~welby/praat.html). All measurements were hand-checked and corrected prior to analysis.

Normalization of the measurements was not deemed necessary in this study. The factors that necessitate normalization of measurements such as anatomical/physiological and sociolinguistic differences between speakers were not present in our data (Adank et al., 2004). All informants were males, of the same age-group, from the same town, and had a similar socioeconomic status.

Based on the assumption that the first two vowel formants are the acoustic correlates of vowel quality, many acoustic studies on vowels carry out statistical tests on F1 and F2 values to compare vowels or to investigate vowel mergers (Clopper et al., 2005, Most et al., 2000). Statistical tests were coducted using the software Minitab (version 13.32) and Data Desk (version 6.1).

3.4.4 Vowel Perception Experiment

Following the analytic study, a perception experiment was conducted to clarify the status of certain possible contrasts, and to verify that particular possible minimal pairs were or were not being discriminated by apparently homophonous words which have been

produced by the informants in the production study. Ten subjects (four females and six males) listened to the test minimal pairs. These subjects were adolescent locals of Drogheda, drawn from the same pool as our informants, and some of them were in fact recorded later for the intonation study.

17 minimal pairs were presented to the listeners. The sound files chosen for the experiment were all produced by the same speaker (MO) who was unknown to the listeners. Three repetitions of the 34 words (102 in total) shown in Table 3.5 were randomized in a list and saved on a computer folder. Each informant was instructed to click on each sound file, listen to the word (preferably once) and write down what they have heard. Listeners were not given multiple choice options. The informants carried out the perception test in a quiet room and used a Sennheiser HD 270 headset to listen to the sound files from the computer.

Table 3.5 The 17 minimal pairs of words included in the perception experiment

Vowel Oppositions	Minimal Pairs
TRAP vs. BATH	*ant-aunt, Mater-matter, Pam-palm*
FOOT vs. STRUT	*hood-Hudd, could-cud, took-tuck*
PRICE vs. CHOICE	*hide-Hoyed, pint-point, vice-voice, aisle-oil, buy-boy*
NURSE /ɛr/ vs. /ʌr/	*per-purr, earn-urn, ferry-furry*
NORTH vs. FORCE	*horse-hoarse*
NORTH/FORCE vs. CURE	*pore-poor, tore-tour*

3.5 Consonants

The two corpora of consonants (C and D) are presented in this section. The reading list of Corpus C is presented first followed by the supplemental material of corpus D. The recording procedures were similar to the vowels study. Speakers were instructed to read five randomized lists of the sentences in Corpus C as naturally as possible.

3.5.1 Corpus C

Corpus C consists of the main test words on which the analysis of the consonantal system is based (Appendix 3). All investigated consonants were recorded in monosyllabic words in addition to few cases where a consonant was elicited at a word boundary. In total, there were 66 items. These test items were embedded in sentences and read by four speakers as

shown in Table 3.1. Some words were elicited in the carrier sentence *Say ___ again* as they were recorded initially with the vowel lists. The consonantal reading list was designed to investigate eight consonantal aspects which are outlined in Table 3.6 and explained below (test words are in brackets). The contexts in which the consonants are examined were chosen based on reports in the literature.

1. **The realisation of the dental fricatives /θ/ and /ð/**

   There are two questions of interest here. First is the question of how these are realised: are they dental fricatives, dental stops, or alveaolar stops? The contexts investigated are: word-initially (*thin, thought, then*), inter-vocalically (*ether, breather, father, bother*), word-finally (*path, breathe*), and for /θ/ preceding /r/, /l/, and /s/ (*three, athlete, and faiths*). Wells reports that alveolar stops realisations of /θ/ and /ð/ may be present before /l/; *athlete* ['atli:t] or before an /s/ resulting in homophones such as *faiths/fates* [fe:ts] (Wells, 1982: 430-31). The second and related question is whether the contrast with the alveolar stops /t, d/ is maintained. Thus the word in the pairs: (*thin-tin, ether-eater, three-tree, faiths-fates, then-den, breather-breeder,* and *breathe-breed*) are compared.

2. **The lenition of the alveolar stops /t/ and /d/**

   Kallen (2005:65-66) shows that lenition in the form of slit /t/ occurs inter-vocalically and particularly in syllable codas. In line with Kallen's (2005) argument, Hickey reports lenition in positions of high sonority: in final position, before a pause, or inter-vocalically (2007: 322-24). Lenition of /t/ and /d/ is investigated in the coda of a stressed syllable. The investigated contexts are: word-finally (*site, heat, breed*), word-finally preceded by a consonant (*belt, ant, aunt, halt, end, bird*), inter-vocalically (*eater, better, Mater, matter, breeder, spider*), and for /t/ inter-vocalically across words (*right industry, art of, goat again*) and followed by /h/ across a word boundary (*right heat*).

3. **The realisation of /l/**

   The contexts investigated are: word-initially (*Laura*), inter-vocalically (*follow*), word-finally (*peel*), and word-finally followed by a consonant (*milk*).

4. **The realisation of /ɹ/**

The contexts investigated are: word-initially (*rice*), word-initially preceded by a consonant (*bring*), word-initially preceded by /t/ or /d/ (*try, tree, dry*), inter-vocalically (*sorry*), inter-vocalically preceded by an unstressed syllable (*aɻrrive*), word-finally (*far*), in coda position followed by a consonant (*farm*), and in an unstressed syllable (*surɻprise*).

5. The possible contrast of /w/ and /ʍ/

The contexts investigated are: words spelt with 'w' (*Wales*) and words spelt with 'wh' (*whales*).

6. The realisation of the velar stops /k/ and /g/

Wells reports that some palatalised consonants in IrE follow front vowels as in *bark* [bɑ:rc] and *kick* [kɪç] (1982: 433). He also reports that a common feature in Ulster is the palatalized variants of /k/ and /g/ before front or open vowels: *cab, can, car* all with [c], but untypical in firmly Scots areas (Ibid.: 446). The contexts investigated for /k/ and /g/ are: preceding front vowels (*cabs, kick, geese, gig*) compared to contexts preceding back vowels (*cobs, cock, goose, Gog*).

7. The realisation of alveolar consonants preceding /j/

In some parts of the south of Ireland the combination /Cj/ can result in the loss of /j/ and its substitution with /u:/, a process referred to by Wells as Yod-Dropping: *thank you* ['taŋku:] (1982). The consonants investigated are: /t/ (*tune*), /d/ (*due*), and /n/ (*nuclear*).

8. The realisation of /h, k, g/ preceding /j/

The cluster /hj/ is regular in words such as *human* or is realised as single segment voiceless fricatives [ç] (Wells 1982: 432). To test for voiceless fricative realisations the test words are: /h/ (*human, humorous*), /k/ (*Keogh*), and /g/ (*McGeogh*).

Table 3.6 Test words of the eight consonantal aspects which are investigated

	Investigated aspect	Context	Item	Compared item
1	**Dental fricative /θ/**	# -	*thin, thought*	*tin, sin*
		V-V	*ether*	*eater, better*
		- #	*path*	
		- ɹ	*three*	*tree*
		- l	*athlete*	
		- s	*faiths*	*fates*
	Dental fricative /ð/	# -	*then*	*den*
		V-V	*breather, bother, father*	*breeder, spider*
		- #	*breathe,*	*breed*
2	**Lenition of /t/**	V- #	*site, heat*	
		C - #	*belt, ant, aunt, halt*	
		V-V	*eater, better, Mater, matter*	
		- # #V	*right (industry), art (of), goat (again)*	
		- # #h	*right heat*	
	Lenition of /d/	- #	*breed*	
		n - #	*end*	
		ɹ - #	*bird*	
		V-V	*breeder, spider*	
3	**/l/**	# -	*Laura*	
		V-V	*follow*	
		- #	*peel*	
		- C	*milk*	
4	**/ɹ/**	# -	*rice*	
		#C -	*bring*	
		t -	*try, tree*	
		d -	*dry*	
		V-V	*sorry*	
		V ˈ-V	*arrive*	
		- #	*far*	
		- C#	*farm*	
		unstressed σ	*surprise*	
5	**/w/ vs. /ʍ/**	spelt with 'w'	*Wales*	
		spelt with 'wh'	*whales*	
6	**/k/+ front vowels**	- front V	*cabs, kick*	*cobs, cock*
	/g/+ front vowels	- front V	*geese, gig*	*goose, Gog*
7	**Yod Coalescence**	tj	*tune*	
		dj	*due*	
		nj	*nuclear*	
8	**/h, k, g/ preceding /j/**	hj	*humane, humorous*	
		kj	*Keogh*	
		gj	*McGeogh*	

3.5.2 Corpus D

Corpus D consists of a read story (the Cinderella passage, Appendix 4), adopted from the IViE project (Grabe et al., 2001), a retelling of the story, and a conversation. Eleven speakers were recorded for Corpus D as shown in Table 3.1. The recording procedures were similar to the vowels study. Speakers were instructed to read the passage as naturally as possible. Later they were asked to retell the story they have read. Finally, pairs were recorded for a conversational free speech session (5 ~ 10 minutes) where they talked about general interests such as football, summer plans, final year in school, etc. Usually, the local assistant would initiate these topics. There were breaks between different tasks. The analysis of the consonants is based on auditory analysis and visual inspection of spectrograms. The sound files were inspected using Praat (Boersma and Weenink, 2009).

3.6 Intonation

The intonation material is made up of three corpora Corpus E, F, and G as will be explained below. Seven informants have been recorded for all the three intonation corpora as shown in Table 3.1.

3.6.1 Corpus E

Corpus E is the speech material for investigating the tonal patterns in DroghE. It consists of a list of short exchanges and utterances designed to elicit the 23 target utterances in Table 3.7. These are included in Appendix 5. The utterances fall into four types: statements (ST), wh-questions (WQ), yes-no questions (YQ), and declarative questions (DQ). The findings of Chapter 5 are based on these 23 target utterances (8 ST, 5WQ, 5YQ, and 5 DQ). These were produced with 5 repetitions by 7 informants to yield a total of 626 utterances for analysis (after exclusion of unsuitable tokens).

Table 3.7 Corpus E and F, the 23 utterances for the analysis of tonal patterns and interrogative intonation in Chapters 5 and 6 (total of 626 tokens by seven speakers)

tokens	ST	tokens	WQ
34	*Here's the manual.*		
28	*Manny lives in Mallow*	35	*Where's the manual?*
29	*Amanda is selling the mandolin.*	20	*When did Manny live in Mallow?*
30	*Manny has a meeting with the*	25	*When is Amanda selling the mandolin?*
35	*manager.*	25	*When does Manny have a meeting with the*
33	*Ray married Mandy.*	33	*manager?*
31	*Liam is annoyed with Mandy.*		*Where are you from?*
29	*Laura was mowing the lawn.*		
	We live down the Boyne Valley.		
249		**138**	
tokens	**YQ**	**tokens**	**DQ**
30	*Is this the manual?*	35	*You mean the manual?*
22	*Does Manny live in Mallow?*	18	*Manny lives in Mallow?*
25	*Is Amanda selling the mandolin?*	22	*Amanda is selling the mandolin?*
23	*Does Manny have a meeting with*	(24)	*Manny has a meeting with the manager?*
31	*the manager?*	33	*You live in Mallow?*
	May I leave the meal early?		
131		**132**	

3.6.2 Corpus F

Corpus F is a subset of Corpus E and comprises all the underlined utterances in Table 3.7. It is used for investigating in detail the phonetic marking of interrogative intonation in DroghE in Chapter 6. Corpus F has been designed in three sets. The three sets, shown below, differ in the number of unstressed syllables (indicated in brackets) between the potentially pitch-accented syllables (in bold).

Set 1: '**Ma**nny '**lives** in '**Ma**llow. (1)

Set 2: A'**man**da is '**se**lling the '**man**dolin. (2)

Set 3: '**Ma**nny has a '**mee**ting with the '**ma**nager. (3)

Each set is recorded in the four utterance types, e.g.:

ST: A'**man**da is '**se**lling the '**man**dolin.

WQ: '**When** is A'**man**da '**se**lling the '**man**dolin?

YQ: Is A'**man**da '**se**lling the '**man**dolin?

DQ: A'**man**da is '**se**lling the '**man**dolin?

The utterances have been designed to have three potential pitch accents. In each utterance, there are two 'identical' pitch-accented syllables in initial pre-nuclear and nuclear positions (with the exception of the initial pre-nuclear accent in WQ, *when*). This was intended to preclude interference by intrinsic pitch of different segments when comparing the same syllable in initial pre-nuclear and nuclear positions or across different utterance types. The findings of Chapter 6 are based on 12 target utterances (3sets x 4utterance types), which were produced with 5 repetitions by 7 speakers to yield a total of 291 utterances for analysis (after exclusion of unsuitable tokens).

3.6.3 Procedure & Analysis for Corpora E & F

The recording procedures were similar to those for vowels and consonantal studies. However, each test utterance was prompted separately on a computer screen. The utterances were randomized in five lists. The total number of renditions for corpora E was 805 utterances: 7speakers x 5repetitions x 23utterances. However, utterances that were not suitable for analysis due to factors such as disfluencies, creakiness, or presence of narrow focus were excluded, giving a total of **626**. It should be noted that for the tonal patterns analysis, the renditions of DQ in Set 3 (*Manny has a meeting with the manager?*) were not included (indicated between brackets in Table 3.7) as will be explained in Chapter 5.

For Corpus F, only the underlined utterances were used, giving a total of **291** utterances. The measurements of crucial f0 points in the contour of each utterance were taken. These points are shown in Figure 3.1. Three f0 points were taken for each pitch accent: the preceding f0 low, the peak value, and the following f0 low. The initial f0 (B) and the final f0 (E) of the pitch contour were also taken. Labelling the f0 points and extraction of their values were carried out using specific Praat scripts available online (http://www.ling.ohio-state.edu/~welby/praat.html).

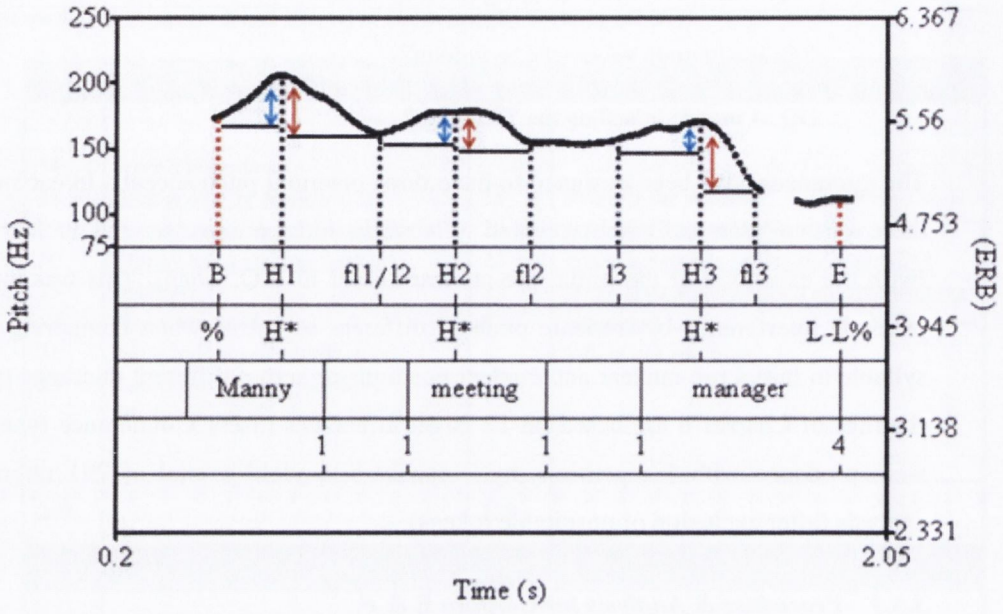


Figure 3.1 f0 points used to calculate the f0 metrics across utterances in the example *Manny has a meeting with the manager*, H: peak of pitch accent, fl: following f0 low, l: preceding f0 low, blue arrows: rise size of peak, red arrows: fall size of peak, B: initial f0, E: final f0, sound file (ST4_Manny_has_a_meeting_with_the_manager_5_GM)

The section on the f0 global trends of different utterance types in Chapter 6 is based on calculation of regression lines for the contour of each utterance. A group of Praat scripts were kindly written specifically for this study by Jos Pacilly and assistance of Vincent van Heuven, of the Leiden Univesity Centre for Linguistics. Regression lines calculations are discussed in the relevant chapter. All measurements were hand-checked and corrected prior to analysis. The f0 values are expressed in ERB (Equivalent Rectangular Bandwidths) which is considered to be a suitable scale for intonation research (Nolan, 2003, Hermes and van Gestel, 1991).

3.6.4 Intonation Perception Experiment

The findings of Chapter 5 suggest that in DroghE, declarative questions (DQ) do not have final rises and are potentially similar to statements (ST). Before carrying out analysis, it was important to make sure that the recorded DQ were 'perceived' as such by native speakers of DroghE. Therefore, a perception experiment was designed.

12 sample sound files in total (6 DQ and 6 ST) were chosen from different speakers of the production study. Each DQ and its corresponding ST were produced by the same speaker. The sound files were randomized and presented in an online task. The participants were instructed to click on a sound file and were given two contexts. One context was appropriate to a DQ, the other to a ST. The listeners had to decide which context was more appropriate to the utterance they have heard i.e. whether what they heard was a DQ or a ST.

The contexts of the perception experiment are shown in Table 3.8. The sets of the contexts correspond to the three sets in the production study: Set 1: *Manny lives in Mallow,* Set 2: *Amanda is selling the mandolin,* and Set 3: *Manny has a meeting with the manager.*

Table 3.8 The three sets of contexts used in the perception test

Sets	Contexts
Set 1	Context A: • *Where does your man live?* • *Manny lives in Mallow.* Context B: • *Manny told us to drop in on him on our way through Mallow.* • *Oh that's interesting ... Manny lives in Mallow?*
Set 2	Context A: • *Hi, David. Any news?* • *Amanda is selling the mandolin.* Context B: • *Amanda is down at the flee market getting rid of a few things.* • *Oh?... Amanda is selling the mandolin?*
Set 3	Context A: • *Hi Liam, any news?* • *The usual, Manny has a meeting with the manager.* Context B: • *Hi Anne, I'm just checking everyone's schedule for 9 o'clock . . . Manny has a meeting with the manager?* • *He does, indeed.*

The perception experiment was taken by 20 native speakers of DroghE (12 males and 6 females). The average age of participants was 28 years (ranging from 19 to 38 years). The majority of participants have lived all their lives or at least for most of their lives in Drogheda and were reported to have both or one parent(s) from Drogheda. Five

participants do not have parents from Drogheda but were included as they spent all or most of their lives in Drogheda. All participants are native speakers of Irish English.

3.6.5 Corpus G

The material of Corpus G is used for the analysis of tonal alignment in DroghE, the results of which are reported in Chapter 7. Data of two different additional speakers (speaker 19 and 20) was also used in a small subsection of the alignment study as shown in Table 3.1.

The alignment study investigates peak alignment of the H* accent in DroghE in both the initial pre-nuclear (PN) and the nuclear (N) accented syllables. The influences on peak alignment are investigated when the 'preceding' and 'following' rhythmic contexts of the accented syllable are varied. In addition, peak alignment is investigated when the syllable structure of the accented syllable is changed from CVC to CV(C).

In total, there are eight sets of test sentences: 2types of accented syllables (PN, N) x 2types of rhythmic contexts (preceding, following) x 2types of syllable structures (CVC, CV(C)). The speech material for the alignment study is shown in Table 3.9. For ease of reference, each of the eight investigated sets is represented by a letter. For example, in set A the investigated accented syllable is PN, the investigated rhythmic context is 'preceding' the PN accented syllable, and the investigated syllable structure is CVC.

Table 3.9 The eight sets of sentences for PN and N accented syllables, the unstressed context is underlined

Syllable Structure	Initial Pre-nuclear (PN)	
	Preceding syllables (-PN)	Following syllables (PN-)
CVC	(A) *(0)* ***Man*** *is an omnivore.* *(1) The* ***man*** *in the lobby is waiting for you.* *(2) There's a* ***man*** *in the lobby for you.* *(3) There was a* ***man*** *in the lobby for you.*	(B) *There's a* ***man*** *waiting for you. (0)* *There's a* ***man*** *in Navan. (1)* *There's a* ***man*** *in the lobby for you. (2)* *There's a* ***man*** *on the veranda for you. (3)*
CV(C)	(C) *(0)* ***Man****ny is in love with Mary.* *(1) The* ***ma****nor was renovated.* *(2) There's a* ***ma****nor on Wellington Street.* *(3) There was a* ***ma****nor on Wellington Street.*	(D) --- *The* ***ma****nor opens on a Sunday. (1)* *The* ***ma****nor was renovated again. (2)* *The* ***ma****nor was unusually glamorous. (3)*
Syllable Structure	**Nuclear (N)**	
	Preceding syllables (-N)	**Following syllables (N-)**
CVC	(Ȧ) *(0) Mel has a new* ***man****dolin.* *(1) Mel plays the* ***man****dolin.* *(2) Mel is playing the* ***man****dolin.* *(3) Mel is playing on the* ***man****dolin.*	(Ḃ) *I'm meeting the* ***man****. (0)* *He's handsome and* ***man****ly. (1)* *It's an example of* ***man****liness. (2)* *We need some more* ***man****liness here.(3)*
CV(C)	(Ċ) *(0) Mel is a good* ***ma****nager.* *(1) Melvin sued the* ***ma****nager.* *(2) Mel was dating the* ***ma****nager.* *(3) Mel was depending on the* ***ma****nager.*	(Ḋ) --- *We'll dine in the* ***ma****nor. (1)* *Mel is meeting the* ***ma****nager. (2)* *Mel is meeting the* ***ma****nager now. (3)*

The rhythmic context for each PN and N accent is varied by changing the number of unstressed syllables 'preceding' the accented syllable from zero to three (0-3) and the number of unstressed syllables 'following' the accented syllable from zero to three (0-3). This gives four sentences for each of the eight sets and 30 sentences in total as shown in Table 3.9. If we were investigating the influence of the preceding rhythmic context, we fixed the following rhythmic context to two unstressed syllables and vice versa. The exception to this condition is set D where the fixed number of preceding unstressed syllables was one. We comment on this exception in Chapter 7.

The words used to investigate peak alignment in the CVC syllable structure are: *man, manly, manliness* and *mandolin*. The words used to investigate peak alignment in the CV(C) syllable structure are: *manor, manager,* and *Manny*. In all cases the accented vowel was the short monophthong /a/ and was flanked by the same nasal consonants /m/ and /n/.

This was intended to preclude potential differences in intrinsic pitch of different segments and to render the data in different conditions as comparable as possible.

3.6.6 Procedure & Analysis for Corpus G

The recording procedures were similar to those for the tonal patterns and interrogative intonation studies. The utterances were randomized in five lists. The total number of renditions was 1050 utterances: 7speakers x 5repetitions x 30sentences.

Peak alignment (H) is expressed as a proportion and measured as the duration of the interval from the onset of the accented vowel /a/ to the peak location, relative to the duration of the vowel. For the PN accented syllables the alignment of the preceding low (l) was also investigated. The alignment of the preceding low (l) was measured as the duration of the interval from the onset of the accented syllable to the low location, relative to the duration of the onset-consonant, /m/.

The points of measurement are shown in Figure 3.2 where (H) is the location of f0 peak and (l) is the location of f0 low preceding the peak. The durations of the manipulated unstressed syllables and the segments of the accented syllable were measured and averaged across the seven speakers in (ms). It should be noted that alignment of the preceding low was measured only in PN accents as its location was not as clear in N accents. This was due to the declination effect that was apparent towards the end of the utterance.

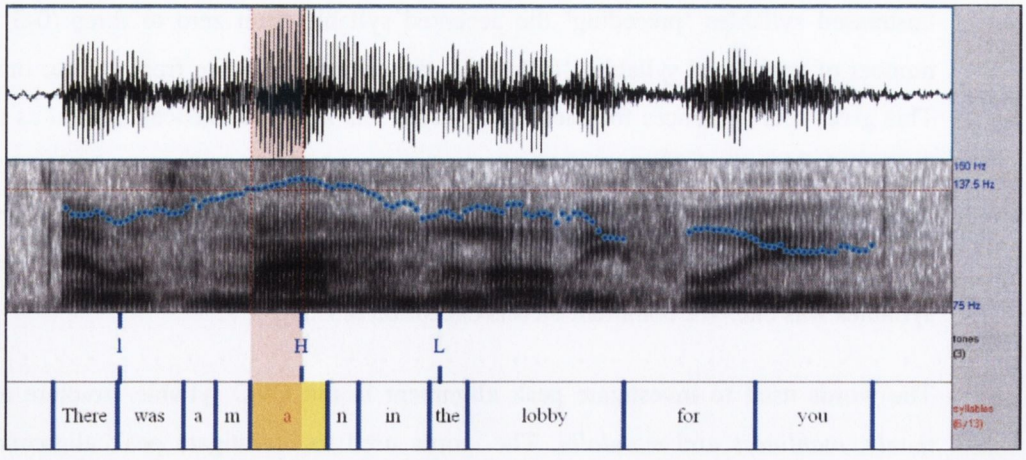


Figure 3.2 Peak alignment measurements taken for the peak on man in *There was a man in the lobby for you*, sound file (3PN_There_was_a_man_in_the_lobby_for_you_1_JG). The yellow bar is the accented vowel /a/. The pink bar is the interval from the onset of the accented vowel to the peak location (H). The point (l) is the low preceding the peak.

Labelling and extraction of f0 time points were carried out using Praat scripts available online (http://www.ling.ohio-state.edu/~welby/praat.html). All measurements were hand-checked and corrected prior to analysis. The software used for conducting the statistical tests was Data Desk (version 6.1). The values that were used in the statistical tests were the values of the proportional peak alignment (H) and values of the proportional alignment of the preceding low (l) for PN accents.

3.6.7 The Labelling System in This Study

In Chapter 2, the ToBI and IViE labelling systems were reviewed. In this section we introduce the labelling system which we use to describe the intonation of DroghE. This system is a modified version of the ToBI and will be referred to in this study as 'the modified ToBI'. Two of the main differences between the ToBI and the IViE labelling systems are that the former employs the 'phrase accent' and that the latter has a (0%) boundary tone. We see that both the phrase accent and the 0% are useful for describing different nuclear contours. Accordingly, in our modified version of ToBI for IrE, particularly the variety of DroghE, we employ both the notion of the phrase accent and the 0% boundary tone.

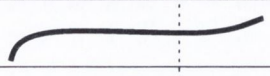
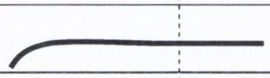
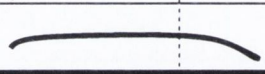
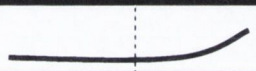
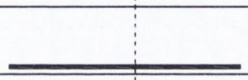
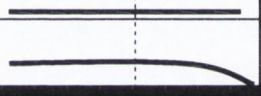
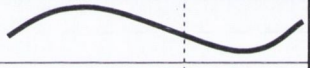
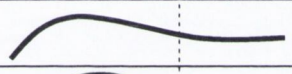
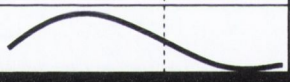
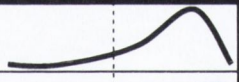
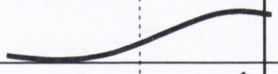
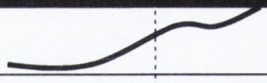
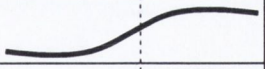
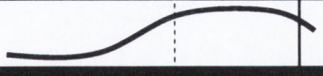
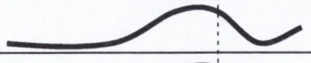
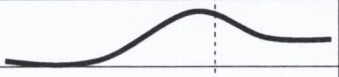
Therefore, our main modification to ToBI is the addition of the 0% boundary tone, which we represent as %. This gives six combinations of edge-tones (2 phrase accents x 3boundary tones): H-H%, H-%, H-L%, L-H%, L-%, and L-L%. The possible nuclear contours that result from this modification are introduced in Table 3.10.

The pitch accents that we employ are H*, L*, L+H*, and L*+H. In total, there are 24 nuclear contours (4pitch accents x 6edge-tones). It should be noted that we do not suggest that all the nuclear contour combinations in Table 3.10 are possible in IrE. We simply provide labels and taxonomy for the potential nuclear contours.

The different nuclear contours are distinguished based on the notion of 'association' as explained by Ladd (2008: 179, 2000: 45). Ladd explains that association is the abstract phonological property whereby tonal targets are associated with a particular phonological domain. For example, pitch accents are associated with the pitch-accented syllable of a particular word in an utterance. This means that the tonal targets of any pitch accent (whether mono-tonal or bi-tonal) are realised somewhere in the 'vicinity' of the accented syllable. We can extend the concept of 'association' to include the edge-tone (phrase

accent and boundary tone) so that the 'phrase accent' is associated with syllables following the accented syllable and the boundary tone is associated with the last unstressed syllable of the accent-group. Therefore, the nuclear pitch accents in Table 3.10 are associated with the accented syllable (before the dashed line) while the phrase accent and the boundary tone are associated with the material following the accented syllable (after the dashed line).

Table 3.10 Labels, schematic representation, and taxonomy of the nuclear contours in the modified ToBI

Label	Schematic Representation	Taxonomy
H* H-H%		high, rise
H* H-%		high, plateau
H* H-L%		high, slump
L* L-H%		low, rise
L* L-%		low, plateau
L* L-L%		low, slump
H* L-H%		fall, rise
H* L-%		fall, plateau
H* L-L%		fall
L* H-L%		rise, fall
L* H-%		rise, plateau
L* H-H%		rise
L*+H H-H%		rise, rise
L*+H H-%		rise-plateau
L*+H H-L%		rise-plateau, slump
L*+H L-H%		rise-fall, rise
L*+H L-%		rise-fall, plateau
L*+H L-L%		rise-fall

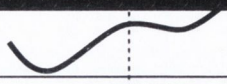
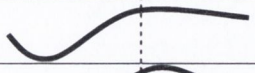
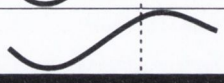
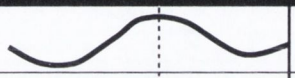
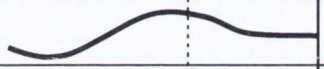
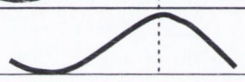
In the modified ToBI, the use of the comma and the hyphen in the taxonomy is important. The words after the comma indicate that they are associated with the edge-tone. A pitch accent is termed by its final tonal event, whereas it is the accentual tonal target that characterises it. For example, a rise is termed a 'rise' because it ends with H, but it is the accentual L that makes it a rise. A fall is termed a fall because it ends with L, but it is the accentual H that makes it a fall. Similarly, the boundary tone determines the terminology of the edge-tone. If the boundary tone is H%, -%, or L%, then the edge-tone is a termed a rise, a plateau or a slump/fall, respectively. The difference between a fall and a slump is essentially a size difference in pitch range. A slump is not a full fall and has smaller excursion (from the f0 point where the pitch starts to fall to the final f0 point). The hyphen indicates a bi-tonal pitch accent. For example, the 'rise, fall' (L* H-L%) is different from the 'rise-fall' (L+H* L-L%). The only bi-tonal pitch accent that does not have a hyphen is the 'rise, rise'. There is no 'fall-rise' bi-tonal pitch accent in our system since a sequence of a fall and a rise cannot be associated with an accented syllable even when followed by unstressed material, at least not in English.

The nuclear contours H* L-L% and L* H-H% are termed 'fall' and 'rise', respectively, indicating a full fall and a full rise. The simple 'fall' and 'rise' are the two canonical nuclear contours from which other contours can be derived. The other nuclear contours are derived by manipulating the edge-tones, the pitch accents, or both.

Table 3.11 shows the nuclear contours for L+H* which are the same as for H* with the exception that 'high' or 'fall' is preceded by the term 'scooped': 'scooped-high' or 'scooped-fall', respectively. We include the 'scooped-highs' in order to complete the paradigms which our modification generates. However, we do not claim that the 'scooped-highs' or all the other nuclear contours in the modified system exist in IrE.

The peak in L+H* is preceded by a low target and is realised later in the pitch accented syllable, what others view as a delayed peak (Gussenhoven, 1984). The term 'scooped-fall' is different from that in the British tradition and from that used by Ladd where 'scooped' refers to the rise in L*+H (Ladd, 2008: 91). The findings in Chapter 5 will show that the 'scooped-fall' nuclear contour (L+H* L-L%) is employed to convey interrogative intonation in DroghE.

Table 3.11 The potential nuclear contours for the L+H* pitch accent in our modified ToBI

Label	Schematic Representation	Taxonomy
L+H* H-H%		scooped-high, rise
L+H* H-%		scooped-high, plateau
L+H* H-L%		scooped-high, slump
L+H* L-H%		scooped-fall, rise
L+H* L-%		scooped-fall, plateau
L+H* L-L%		scooped-fall

This modification on the ToBI is useful in two ways. First of all, it provides a transparent labelling of the 'high, plateau' nuclear contour which is labelled as H* H-L% (ToBI) or H* 0% (IViE), but as H* H-% in our modified ToBI system. Consequently, this provides a transparent labelling of the 'calling contour' which we label as H* !H-%. Furthermore, Sullivan (2006: 41) notes a number of flat contours in her IrE data, particularly in Dublin English (from Malahide). It will be shown in this study that flat contours are not uncommon in declarative sentences in the IrE dialect under study.

Secondly, this modification presents an adequate description of some common types of falling nuclear contours in varieties of Southern IrE, where the fall is rather gradual and not steep compared to that in GenAm and British English varieties. We find these types of contours in our DroghE data and they have also been reported for Dublin English (from Malahide) and Wexford English by Sullivan (2006). Therefore, in addition to H* L-L%, we have H* L-%, the 'fall, plateau', which indicates that the fall is not steep; the L% boundary tone does not seem to be evident.

Chapter 4 Vowels and Consonants of Drogheda English

In this chapter we present the results of the auditory and acoustic analysis of the vocalic system and the consonantal systems of DroghE. First, we present the analysis of the vowels in non /Vɹ/contexts i.e. monophthongs, weak vowels, and diphthongs. Next, we present the analysis of vowels in /Vɹ/ contexts. The vowels are first placed in the traditional vowel auditory quadrilateral for comparison with Dublin English, RP, and Belfast English. The vowels are also referred to using Wells' lexical sets. The acoustic analysis is presented by reporting on the formant values of each vowel. Next, the consonantal system is presented. Consonants were analysed by auditory and by the visual inspection of an accompanying spectrogram. The chapter concludes with a summary of the results and the conclusion that DroghE has a segmental system broadly typical of Southern IrE.

4.1 Vowels

In Chapter 3, we have explained that there are two vowel corpora. Corpus A includes the main vowels and is based on the speech of 11 informants (1-11). Corpus B includes later additions to Corpus A and is based on the speech of six speakers (6-11). The analysis of the vowels is also supported by a small perception experiment in which ten native speakers of DroghE, of the same age group and socioeconomic status to informants of the production study, listened to minimal pairs produced by one of the speakers (MO) of the production study.

Table 4.1 shows the words of the investigated vowels for the non /Vɹ/ contexts (from corpora A &B). Table 4.2 shows the test minimal pairs used in the perception experiment for the non /Vɹ/ contexts. The symbols used in the tables were chosen as the most suitable to the vowels of DroghE.

Table 4.1 Test words for monophthongs in non /Vɹ/ contexts, diphthongs, and weak vowels

Vowel	Main words (Corpus A)	Extra Words (Corpus B)	Lexical Set
Monophthongs			
ʊ	*Hudd*	*could-cud, took-tuck, bus, mud, hug, done, come, double, dull*	STRUT
ʊ	*hood*	*cook, rook*	FOOT
ʉː	*who'd*	*school, two*	GOOSE
a	*had*	*ant, Mater (well known hospital in Dublin), Pam*	TRAP
aː	*half*	*aunt, matter, palm, path, dance, father, spa*	BATH
ɑ	*Hod*	*pot, bother, soft, boss*	LOT
ɑː	*hawed*	*bought, halt*	THOUGHT
iː	*heed*	*piece-peace*	FLLECE
ɪ	*hid*	*peculiar, secure* (in unstressed syllables)	KIT
ɛ	*head*	*any, many*	DRESS
Diphthongs			
ɒɪ, ɑɪ	*hide*	*pint, vice, aisle, buy, height, rice-rise*	PRICE
ɔɪ	*Hoyed*	*point, voice, oil, boy*	CHOICE
ɛʉ	*how'd*	*cow*	MOUTH
oʊ	*hoed*	*coat, toe, bold*	GOAT
eɪ	*hayed*	*pace, eight, day, break, steak*	FACE
Weak Vowels			
i	*happy, early*		*happ*Y
ə	*sofa*	*vowel-owl, lion-line*	*comm*A
ŋ, ən	*-ing*	*rotting- rotten*	*-ing*

Table 4.2 The minimal pairs of words included in the perception experiment of non /Vɹ/ vowels

Vowel Oppositions	Minimal Pairs
FOOT vs. STRUT	*hood-Hudd, could-cud, took-tuck*
TRAP vs. BATH	*ant-aunt, Mater-matter, Pam-palm*
PRICE vs. CHOICE	*hide-Hoyed, pint-point, vice-voice, aisle-oil, buy-boy*

The vowels of the DroghE system are initially shown on an auditory chart alongside the corresponding vowels in Dublin English, RP, and Belfast English. Some vowel distinctions are established on the basis of minimal pairs which were differentiated by listeners in the perception experiment. In some cases, vowel length is investigated as a possible feature

corresponding to a potential vowel distinction (e.g. TRAP-BATH and LOT-THOUGHT). Vowels are also presented acoustically by plotting their averaged F1 and F2 values.

4.1.1 Monophthongs

Impressionistic examination of the vowels in DroghE suggests that they are fairly similar to those in general Southern IrE varieties, with few exceptions. In what follows, we first present the general vowel system in an auditory chart and in an acoustic chart. Next, we present the vowels in order of the main differences from corresponding realisations in RP. Thus, we start with the vowels of STRUT, FOOT and GOOSE, then TRAP and BATH, followed by LOT and THOUGHT, and end with the vowels in FLEECE, KIT, and DRESS.

Figure 4.1 shows the auditory charts of the monophthongs of DroghE along with the charts of SIrE represented by Dublin 'mainstream' speech, RP, and of NIrE represented by Belfast 'general' speech. The auditory chart of DroghE is based on the speech of one informant (MO), whose speech is considered representative of this variety. The charts for SIrE and NIrE are based on the speech of a female (age around 50) labelled as 'Dublin (mainstream)' and the speech of a male speaker aged 'around 20' labelled as 'Belfast (general)', respectively, in the recordings of *A Sound Atlas of Irish English* (Hickey, 2004). The RP chart is based on the quadrilaterals provided in Wells' *Pronunciation Dictionary* (1991). The auditory charts are based on the vowels in the accompanying words. I have listened to the speech and related words produced by the the DroghE, Dublin English, and Belfast English speakers and placed the vowels in their most likely position in the quadrilateral. Dark circles represent long monophthongs. It should be noted that since the charts of the two speakers of SIrE and NIrE are based on a single speaker each, the charts are only suggestive and may not represent all mainstream vowel realisations in the particular variety of IrE, as will be indicated where appropriate.

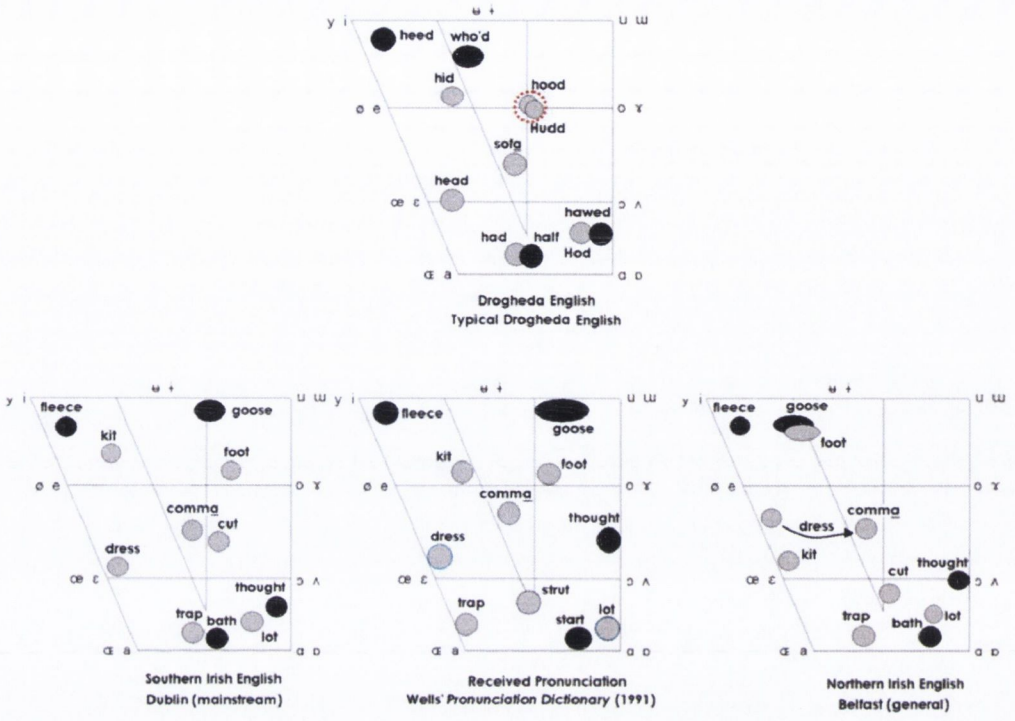


Figure 4.1 Auditory charts of monophthongs in DroghE, SIrE, RP, and NIrE, respectively. The chart of DroghE is based on the speech of speaker (MO). The SIrE and NIrE charts are based on two representative speakers from *A Sound Atlas of Irish English* (Hickey 2004). The RP chart is based on the quadrilaterals in Wells' *Pronunciation Dictionary* (1991). Dark circles are long monophthongs.

In general, the findings suggest that the analysed vowel system comprises of six short vowels and four long vowels [ɪ, ɛ, ə, a, ɑ, ʊ, iː, aː, ɑː, ʉː]. It is clear in Figure 4.1 that DroghE differs from RP in certain vowel realisations. The vowels in FOOT and STRUT (*hood-Hudd*) are realised as a single phoneme /ʊ/ in this variety. The TRAP-BATH vowels (*had-half*) have very similar qualities but are differntiated in length. Similarly, the vowel qualities of LOT-THOUGHT (*Hod-hawed*) differ mainly in duration. Furthermore, the position of the GOOSE vowel (*who'd*) is quite advanced compared to that in RP and SIrE charts[12] and is the one clear 'Northern' feature in this variety. The vowels of FLEECE (*heed*), KIT (*hid*), and DRESS (*head*) are not very different from the corresponding vowels in RP.

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[12] It should be noted however, that the realization of the GOOSE vowel in present day Southern British English is quite advanced and similar to the NIrE realisation (personal communication with John Harris, UCL)

Figure 4.2 shows the acoustic chart of the monophthongs in the accompanying words across 11 speakers. The circles for each vowel are centered on the mean F1-F2 values obtained across speakers and tokens. Figure 4.3 plots the individual tokens of the monophthongs (excluding the schwa) in Figure 4.2 for the 11 speakers. The values in Figures 4.2 and 4.3 are for the main list (Corpus A) elicited in identical /h-d/ contexts (with the exception of the vowels of *half* and *sofa*). The additional word list (Corpus B) is used in individual sections below, to look more closely at particular contrasts/mergers.

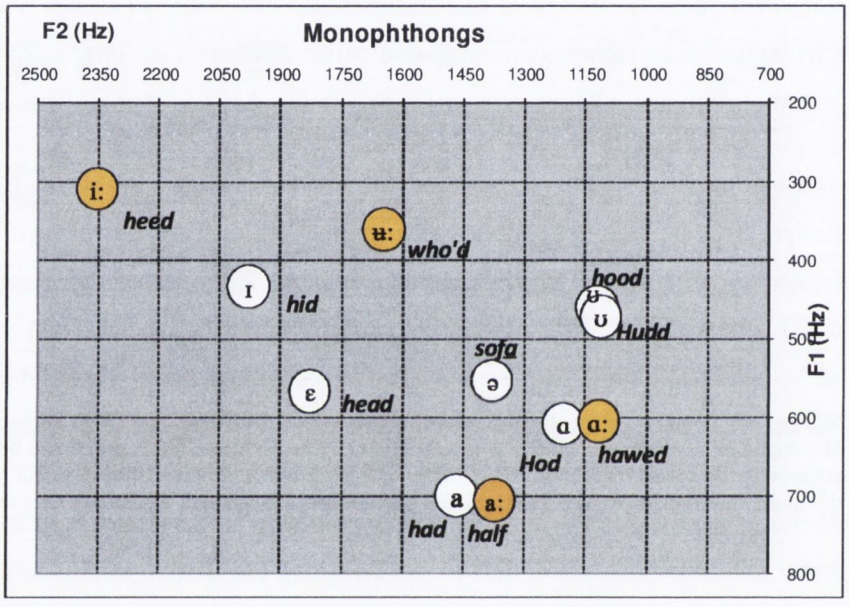

Figure 4.2 Acoustic chart of the averaged F1 and F2 values of the monophthongs in the accompanying words by 11 speakers. Yellow circles indicate long monophthongs.

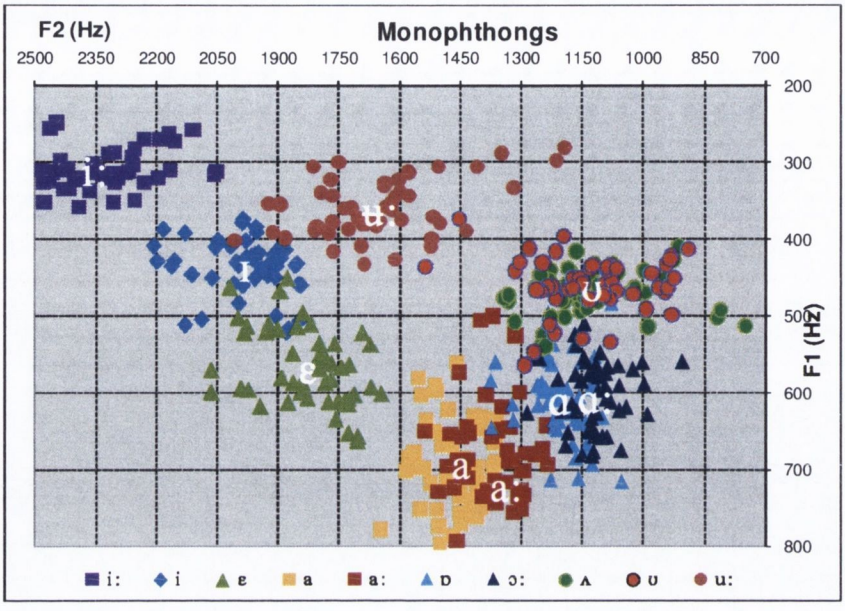

Figure 4.3 Scatter plot of the individual F1 and F2 values of the monophthong in words in Figure 4.2 by the 11 speakers

It is clear that the qualities of the STRUT-FOOT are acoustically very similar and suggest that they are realised as a single vowel. The LOT-THOUGHT and TRAP-BATH sets also show considerable, though less, overlap in F1-F2 values, but do not appear to have merged (see discussion). On the other hand, the FLEECE, KIT, DRESS, and GOOSE vowels have clearly distinct qualities. We will proceed first with the vowel areas that seem to overlap and investigate the presence of possible mergers.

To test for statistical significance of differences between vowels in their F1 and F2 values and in durations, we use a 2-way ANOVA analysis, where the two factors 'vowel' and 'speaker' are fixed factors. Often, not all speakers would have the same number of repetitions which makes an unbalanced design for the 2-way ANOVA analysis. Therefore, the averaged values of the repetitions per speaker are used in the statistical tests.

Table 4.3 provides the averaged F1, F2, and F3 values for all the analysed monphthongs in non /Vɹ/ contexts and those in /Vɹ/ contexts for reference while presenting the findings.

Table 4.3 Averaged F1, F2, and F3 (Hz) of the comparable vowels in /h-d/ and /Vɹ/ contexts

Word	/h-d/ Contexts	F1	F2	F3	Lexical Sets for IrE
Hudd	ʊ	471	1114	2461	STRUT
hood	ʊ	460	1123	2483	FOOT
who'd	ʉː	361	1648	2261	GOOSE
had	a	699	1467	2410	TRAP
half	aː	706	1374	2377	BATH
Hod	ɑ	607	1205	2456	LOT
hawed	ɑː	605	1117	2474	THOUGHT
heed	iː	309	2354	2975	FLEECE
hid	ɪ	434	1981	2580	KIT
head	ɛ	566	1829	2584	DRESS
sofa	ə	553	1381	2296	*comm*A
Word	/Vɹ/ Contexts	F1	F2	F3	Lexical Sets for IrE
turn	ɯɹ	500	1063	2173	URN
dirt		500	1237	2165	
bird		471	957	2235	
purr		491	1064	2070	
urn		499	1248	2078	
furry		493	1089	2156	
Lir	ɯɹ	528	1297	2463	LIR=URN
hard	aɹ	626	1541	2064	START
far		627	1461	2072	
horse		507	974	2287	NORTH
Corr	oːɹ	479	935	2334	
born		506	945	2294	
hoarse		459	870	2400	FORCE
four	oːɹ	458	849	2473	
pore		466	860	2369	
tore		472	907	2377	
poor	oːɹ	460	863	2397	CURE=NORTH=FORCE
tour		468	930	2338	
hear	iːɹ	393	2095	2614	LEAR
nearer		427	2052	2588	
Lear		433	2027	2676	
mere		396	2012	2608	
mirror	ɪɹ	492	1544	2116	(postvocalic KIT+ɹ)
herd	ɛɹ	512	1657	2074	EARN=ERR=AIR
per		538	1742	2239	
earn		529	1708	2155	
ferry		570	1578	2114	
myrrh		488	1784	2346	
hair	ɛɹ	513	1871	2401	
pair		529	1816	2304	
paired		526	1758	2180	

STRUT, FOOT, and GOOSE (*Hudd, hood,* and *who'd*)

These vowels are grouped together for two reasons. First, we want to find out whether DroghE has a STRUT-FOOT opposition, the /ʌ-ʊ/ contrast. Second, the relationship of the FOOT lexical set (*hood, took, cook, could, rook* in our data) and the GOOSE set (*who'd, school, too* in our data) is looked at more closely. That the vowels of GOOSE and FOOT have similar qualities is a feature of NIrE and any such tendency would be indicative here.

STRUT and FOOT

First of all, the vowels of STRUT and FOOT do not seem to have gone through the FOOT-STRUT Split (Wells, 1982: 132) in DroghE as suggested by the massive overlap of F1-F2 values. In the perception experiment, none of the listeners could distinguish the words in the pairs: *hood-Hudd, could-cud,* and *took-tuck.* In all cases, informants heard *Hudd, cud,* and *tuck* as *hood, could,* and *took,* respectively. Undoubtedly, frequency of word usage may have an important effect on the particular choice. The words *Hood, could* and *took* are more common than their counterparts in the experiment. The fact remains that the pairs in question were not differentiated.

Figure 4.4 shows the F1 and F2 values of the vowels in the pairs: *hood-Hudd, could-cud,* and *took-tuck.* 2-way ANOVA tests were carried on the F1 and F2 of each of the vowels in these pairs. The vowels within *cud-could* and *tuck-took* were not significantly different in F1 and F2 values: F1: $F(1,5) = 0.44$, $p = 0.535$, F2: $F(1,5) = 3.15$, $p = 0.136$ and F1: $F(1,5) = 1.41$, $p = 0.288$, F2: $F(1,5) = 3.49$, $p = 0.121$, respectively.

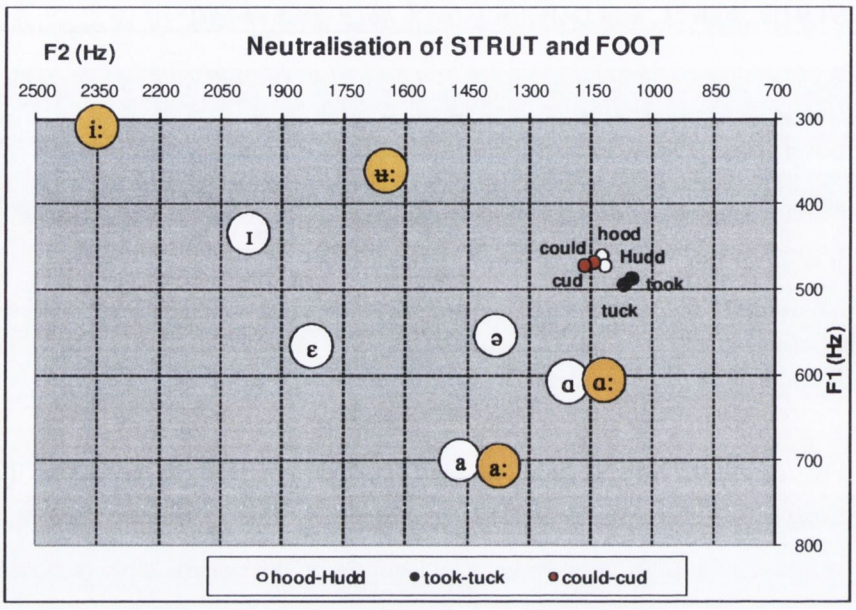

Figure 4.4 The averaged F1 and F2 values of vowels in the minimal pairs: *hood-Hudd, could-cud,* and *took-tuck*

Investigating the STRUT vowel in different contexts: after labials (*mud, bus*) and before velars (*hug, tuck*), preceding nasals (*done, come*) and labials or a labial+/l/ (*dull, double)* suggests that all these words belong to the FOOT vowel. The vowel is as a close-mid slightly rounded back vowel /ʊ/. The averaged F1-F2 values of the vowels in these words are plotted in Figure 4.5 across 6 speakers.

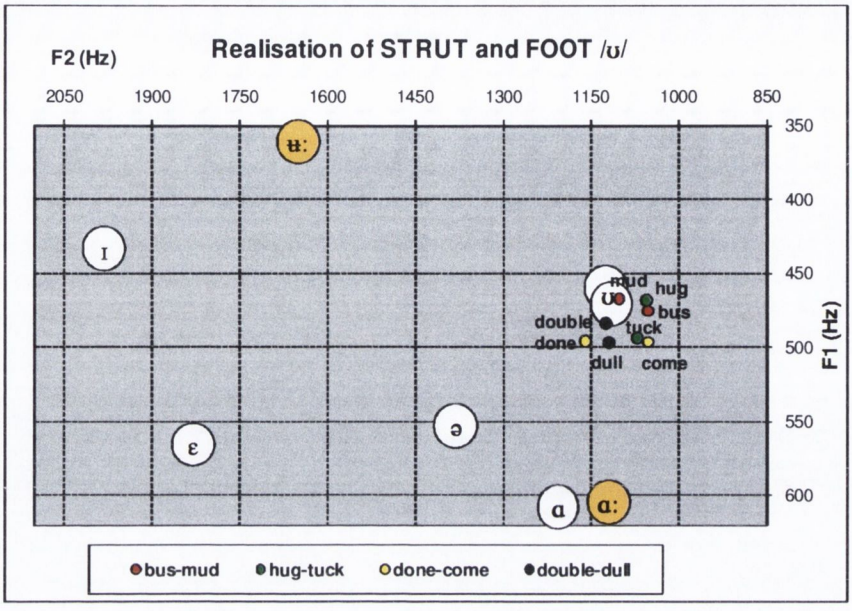

Figure 4.5 The averaged F1 and F2 values of the vowel of STRUT after labials (*mud, bus*), before velars (*hug, tuck*), before nasals (*done, come*) and before labials or labial+/l/ (*dull, double*) for 6 speakers

GOOSE

In Figure 4.3, it is clear from the spread of individual values for the GOOSE vowel in *who'd* that there is a considerable range of variability in the front-back acoustic space (F2 for isolated cases can vary as between 2000Hz and 1200Hz). However, with an average F1-F2 of 360Hz and 1640Hz, this is clearly best viewed as a high central (or even advanced central vowel). As such, it is clear that the vowel is more advanced than in the typical SIrE varieties. Rather in DroghE, the GOOSE vowel realisation is similar to that in NIrE. The analysed vowel can best be transcribed as [ʉː] a long high front-central rounded vowel.

In some words of the FOOT set where the vowel is represented with an 'oo' spelling, the vowel can have a higher and more fronted realisation so that it patterns with the GOOSE set. Figure 4.6 shows the individual F1-F2 values of the vowels in *cook* and *rook* for 6 speakers. It is clear that the vowels in these words are closer to the GOOSE set than to the FOOT set. The vowel of *cook* clearly belongs to the GOOSE set, that in *rook* seems to be more retracted, though still almost certainly part of the GOOSE set. However, not all words with 'oo' spelling behave like this. See for example the pair *took/tuck* in Figure 4.4.

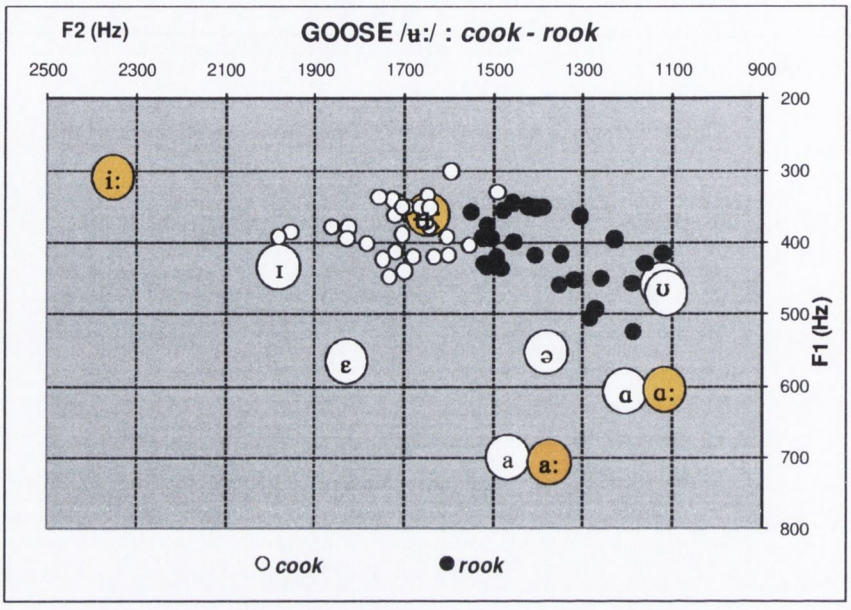

Figure 4.6 Scatter plot of individual F1 and F2 values of the vowels in *cook* and *rook* by 6 speakers

Figure 4.7 shows the individual F1-F2 values for the vowels in *two* and *school* by 6 speakers. Diphthongization of the GOOSE vowel towards a schwa is often found in some IrE varieties. Two speakers (MO and DW) had a diphthongal realisation of this vowel in *school*: [ʉə]. There were no diphthongal realisations in the open syllable in *two*.

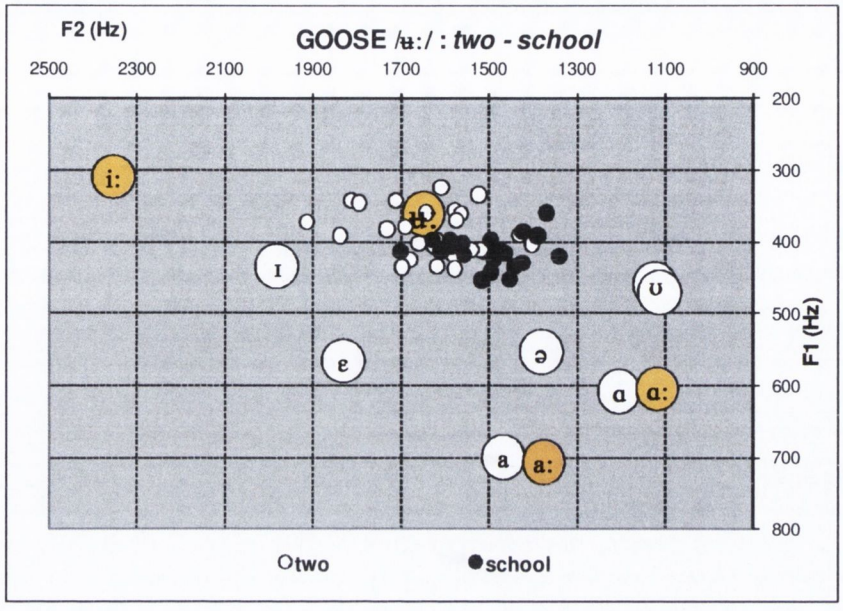

Figure 4.7 Scatter plot of individual F1 and F2 values of the vowels in *two* and *school* by 6 speakers

Figure 4.8 shows boxplots of the durations of the test words *cook, rook, school, two* and *who'd* respectively across 6 speakers. It is clear that the vowels in *cook* and *rook* are shorter than those in the other words. We would tentatively conclude as regards the STRUT, FOOT, and GOOSE vowels that (i) there is no STRUT-FOOT opposition and that the STRUT vowel is realised with the quality of the FOOT vowel [ʊ], (ii) that GOOSE is a high central or front-central vowel, suggesting a Northern influence, and that (iii) some of the words with 'oo' spelling in FOOT have a GOOSE vowel quality but retain their short durations.

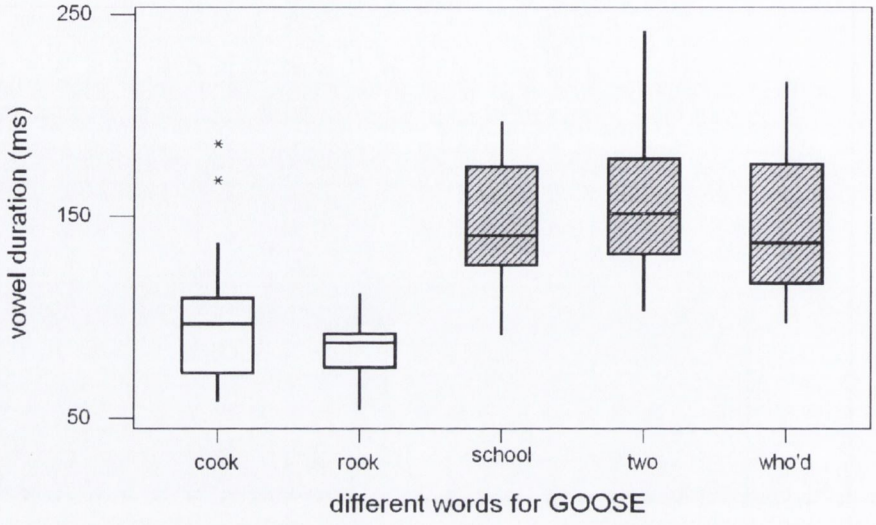

Figure 4.8 Boxplot of vowel durations in *cook, rook, school, two* and *who'd* respectively across 6 speakers. Long vowels are shaded. The horizontal lines represent the median value for each boxplot

TRAP and BATH (*had* and *half*)

The TRAP-BATH opposition has a weak functional load in IrE and is often described as not clear (Wells, 1982). Therefore, we first want to look at possible quality and length distinctions between the two vowels in DroghE using the minimal pairs: *ant-aunt, Mater-matter*, and *Pam-palm*. Second, it is of interest to look at lexical incidence of the TRAP/BATH set (*had, half, dance, path, father, spa* in our data).

The realisation of the TRAP vowel is more retracted and lowered than its counterpart in RP. The vowels in TRAP and BATH seem to have a very similar quality as shown in Figure 4.1. The two words representing the TRAP-BATH opposition are *had* and *half* respectively. Both vowels are fairly low and central to central back. Figure 4.9 shows the individual F1-F2 values for the vowels in the pairs *ant-aunt, Mater-matter*, and *Pam-palm* for 11 speakers. It is clear from the acoustic charts that the vowels in each pair occupy the same acoustic space. This indicates that the two vowels in each pair have similar vowel quality. The perception experiment showed that the words in the pairs: *ant-aunt, Mater-matter*, and *Pam-palm* were not heard as distinct by the informants.

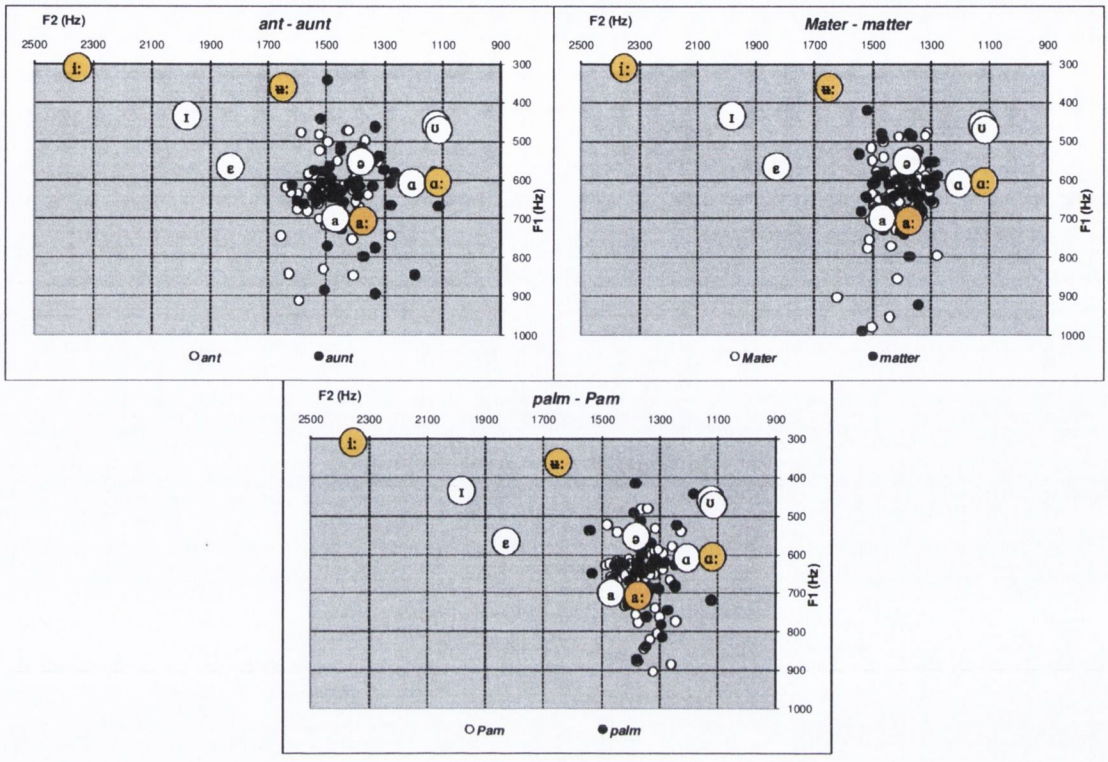

Figure 4.9 Scatter plot of individual F1-F2values for the vowels in the pairs: *ant-aunt, Mater-matter,* and *Pam-palm*, respectively, for 11 speakers

Figure 4.10 shows boxplots of the durations of all the test words for TRAP and BATH across 11 speakers for the potential minimal pairs included. The only clear durational difference is that between *Pam* and *palm.* Despite the fact that the durational difference is there and is in the direction one might expect in an /a-a:/distinction, it is noteworthy that this pair of words was not differentiated in the perception experiment. The vowels in the pairs *ant-aunt* and *Mater-matter* do not seem to be durationally different. The long duration of the vowel in *spa* is likely to be conditioned by context. Therefore, based on these observations we conclude that in DroghE the vowels of TRAP and BATH have a similar vowel quality which is mostly realised as a centralized open vowel [a]. However, the vowel can be short as in *ant, aunt, Mater, matter* and hence belong to the TRAP set, or can be long as in *half* and *father* and hence belong to the BATH set. The general conclusion is that the two lexical sets are still distinct but differ in their lexical contents in this variety of IrE than those in RP.

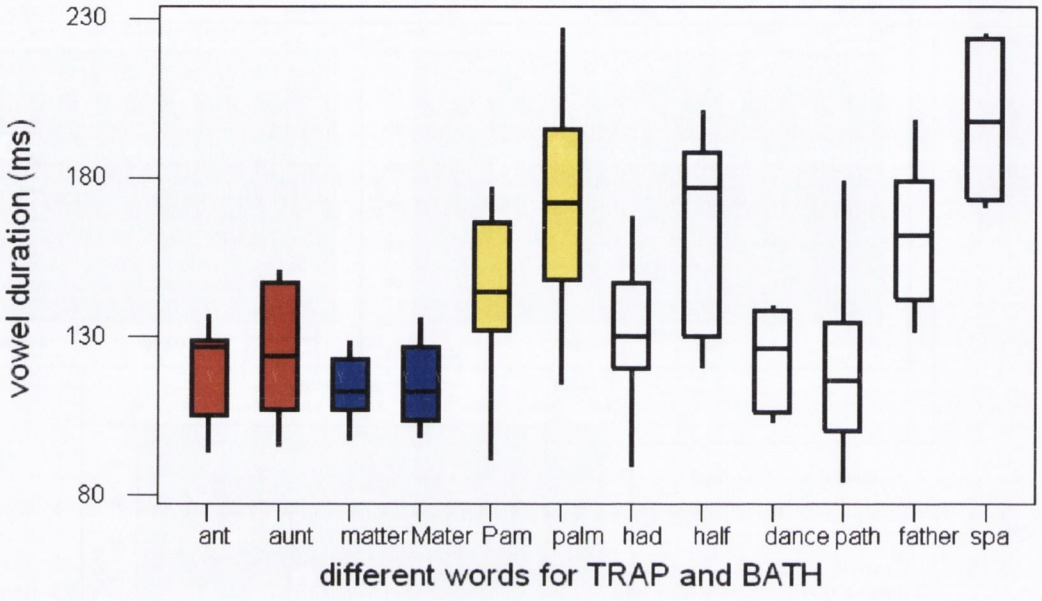

Figure 4.10 Boxplot of vowel durations in the words *ant, aunt, matter, Mater, Pam, palm, had, half, dance, path, father, and spa* across 11 speakers. The minimal pairs are shown in matching colors. The horizontal lines represent the median value for each boxplot.

LOT and THOUGHT (*Hod-hawed*)

The LOT-THOUGHT opposition is generally maintained in varieties of IrE. We wanted to confirm this distinction for DroghE and describe the quality of these two vowels in (*Hod, pot, bother, boss,* and *soft*) for LOT and in (*hawed, bought,* and *halt*) for THOUGHT.

The test words that represent the LOT-THOUGHT opposition are *Hod-hawed,* respectively. It can be noted from Figure 4.3 that vowels of LOT and THOUGHT are similar in quality, although THOUGHT is slightly more retracted. However, the vowel of THOUGHT is longer than that in LOT. Both vowels are fairly back and open-mid and usually unrounded [ɑ] and [ɑ:], respectively. The vowels in *Hod* and *hawed* were found to be significantly different in F2 and duration values: F1: $F(1,5) = 0.18$, $p = 0.69$, F2: $F(1,5) = 15.05$, $p = 0.012$, and duration: $F(1,5) = 49.07$, $p = 0.001$.

Figure 4.11 shows the individual F1-F2 values of the vowels in the minimal pair *Hod-hawed* (11 speakers) and the near minimal pair *pot-bought* (6 speakers). The scatter plots

suggest that the vowels in each pair are not very different in quality, and that the contrast depends to a great extent on the clear durational difference.

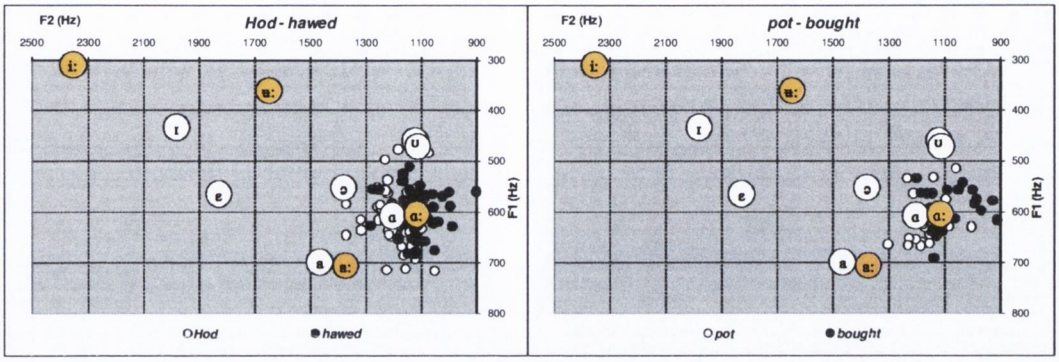

Figure 4.11 Scatter plot of individual F1-F2 values of the vowels in the minimal pair *Hod-hawed* (11 speakers) and the near minimal pair *pot-bought* (6 speakers)

Figure 4.12 shows the individual F1-F2 values of the vowels in *boss, soft,* and *halt* plotted against the vowel in *bother* for 6 speakers. Similarly, the scatter plots suggest that the vowels in each pair are not very different in quality.

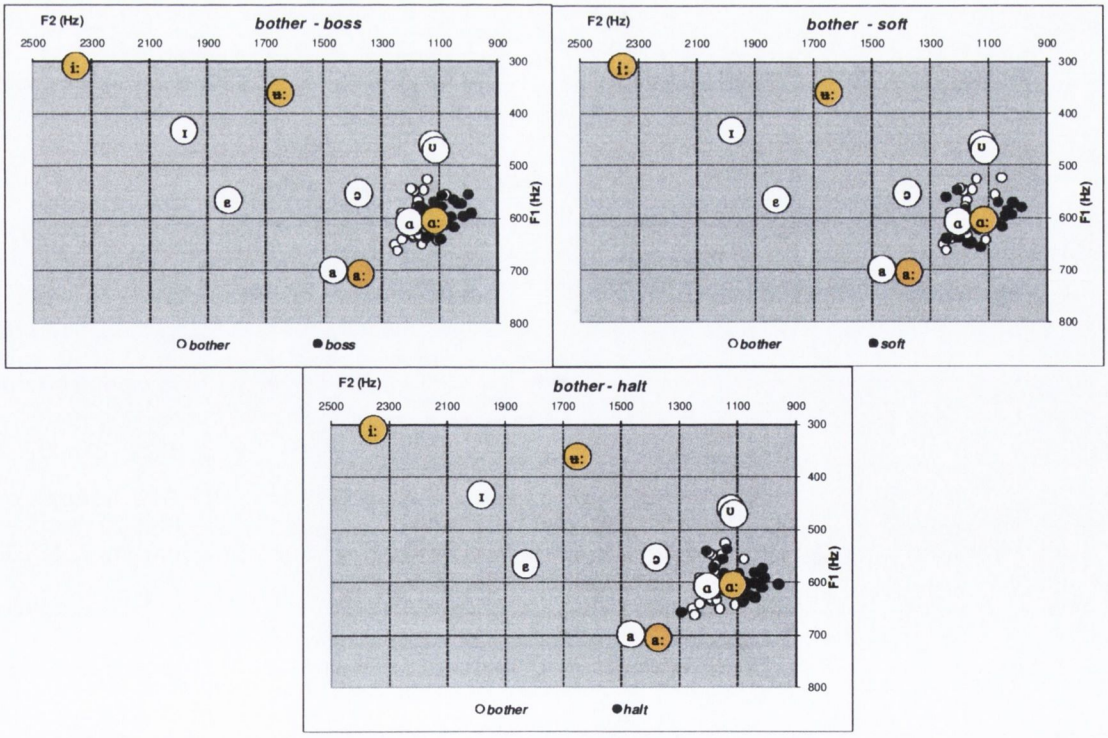

Figure 4.12 Scatter plot of individual F1-F2 values of the vowels in *bother, boss, soft,* and *halt* (6 speakers)

Figure 4.13 shows boxplots of the durations of the LOT and THOUGHT in the test words. There is a clear durational difference for the minimal pair *Hod-hawed* and also for the near minimal pair *pot-bought*. The vowels in *boss* and *soft* are longer than those in *bother* and *halt*.

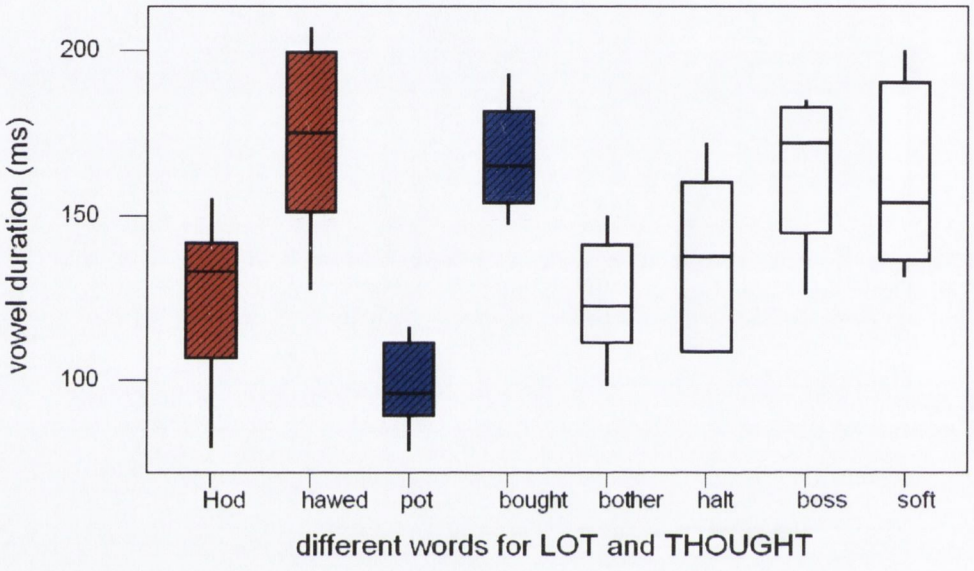

Figure 4.13 : Boxplot of vowel durations in the words *Hod,hawed, pot, bought,bother, halt, boss*, and *soft* respectively, the minimal pair *Hod-hawed* and the near minimal pair *pot-bought* are shown in matching colors. The horizontal lines represent the median value for

Durational differences suggest that test words for LOT and THOUGHT fall into two groups. The first group belongs to the LOT vowel and includes the words *Hod, pot*, and *bother*. The vowel in these words is a short back open unrounded vowel [ɑ]. The second group belongs to the THOUGHT vowel and includes the vowels in *hawed, bought, soft*, *boss*, and *halt*. The vowel in these words is a long back open unrounded vowel [ɑ:]. The vowels in *soft* and *boss* belong to the LOT set in RP but to the THOUGHT vowel in DroghE (similar to GenAm), and to that extent one suspects the lexical sets may differ in terms of their contents as is the case for the TRAP and BATH sets.

FLEECE, KIT, and DRESS (*heed, hid,* and *head*)

As noted in Chapter 2, the FLEECE, KIT, and DRESS vowels are not reported to be different from the corresponding vowels in RP. However, we look at their realisations in DroghE in

the words (*heed* and the pair *piece-peace* to check for the FLEECE merger), (*hid, peculiar,* and *secure*) for KIT, and (*head, any* and *many*) for DRESS.

The monophthongs of FLEECE (*heed*), KIT (*hid*), and DRESS (*head*) have similar realisations to those in RP as shown in Figure 4.1. However, the DRESS vowel is slightly lower than that in RP. Figure 4.14 shows the acoustic chart for these vowels. The variety of DroghE has undergone the FLEECE merger. The vowels in *piece* and *peace* were not heard as different in the perception experiment and occupy the same region in the acoustic chart in Figure 4.14, for 6 speakers. The vowels in *piece* and *peace* were not significantly different in their F1 an F2 values: F1: $F(1,5) = 0.01$, $p = 0.91$, F2: $F(1,5) = 1.83$, $p = 0.234$.

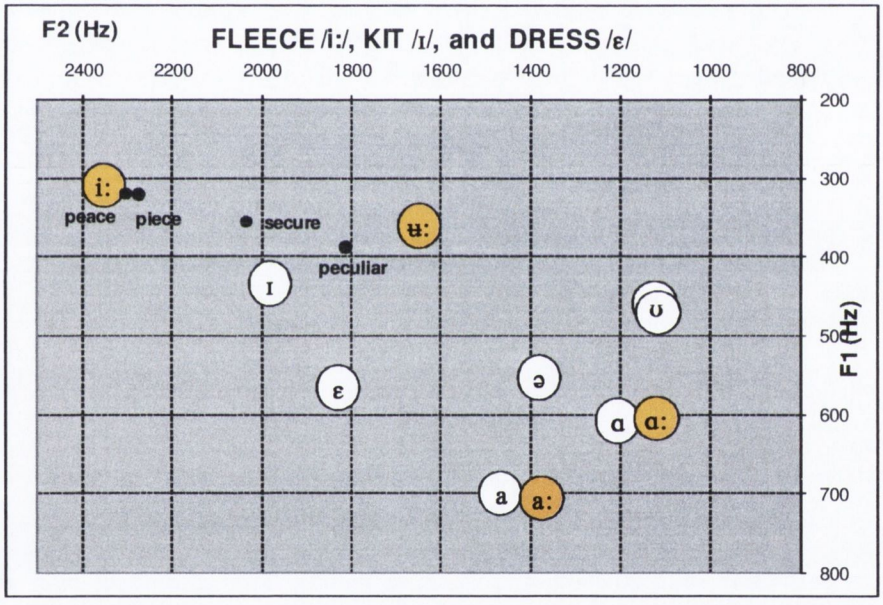

Figure 4.14 Averaged F1 and F2 of the vowels of FLEECE, KIT, and DRESS in *heed, hid,* and *head,* respectively for 11 speakers, also showing the veraged F1-F2 values of the vowels in peace-piece and of the vowels in the first unstressed syllables in *secure* and *peculiar* for 6 speakers

Wells mentions that in Southern IrE the KIT vowel is realised as [ə] in the first unstressed syllable of words such as *peculiar* and *secure* (1982: 427). This is not the case in DroghE as the vowels sound front and close. The averaged F1- F2 values of the vowels in the first syllables of *peculiar* and *secure* are plotted in Figure 5.14 for 6 speakers. The vowels are not close to the [ə] area and have in fact lower F1 values than the vowel of KIT.

Figure 4.15 shows the individual F1-F2 values of the vowels in *many* and *any* for 6 speakers. The scatter plots suggest that the vowel in *any* is realised with a lower and more

central vowel quality than that in the DRESS vowel which is a common feature in Southern IrE speech. If we compare these values to those for /a/ in Figure 4.9 and 4.3, we see that this word is pronounced with /a/.The first vowel in *many*, however, is realised as a DRESS vowel.

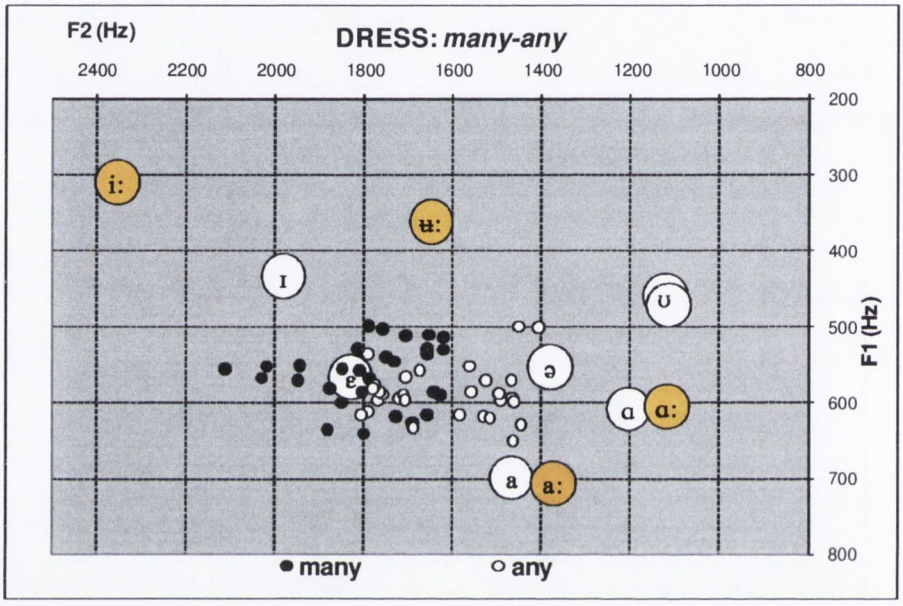

Figure 4.15 Scatter plot of individual F1-F2 values of the vowels in *many* and *any* for 6 speakers

4.1.2 Weak Vowels

The weak vowel in the lexical set *happ*Y is investigated in the words *happy* and *early*. Figure 4.16 shows the individual F1-F2 values of the vowels in *happy* and *early* for 6 speakers. The scatter plots suggest that the vowel in these words is a high front vowel. The unstressed vowels in *happy* and *early* are closer and shorter than the vowel in *hid*. The *happ*Y vowel in DroghE is best transcribed as [i]. 2-way ANOVA tests show that the unstressed vowels in *happy* and *early* are significantly shorter than the vowel in *hid*: $F(2,10) = 17.07$, $p = 0.001$. The average durations of the vowels in *happy*, *early*, and *hid* are 72ms, 73ms, and 98ms respectively.

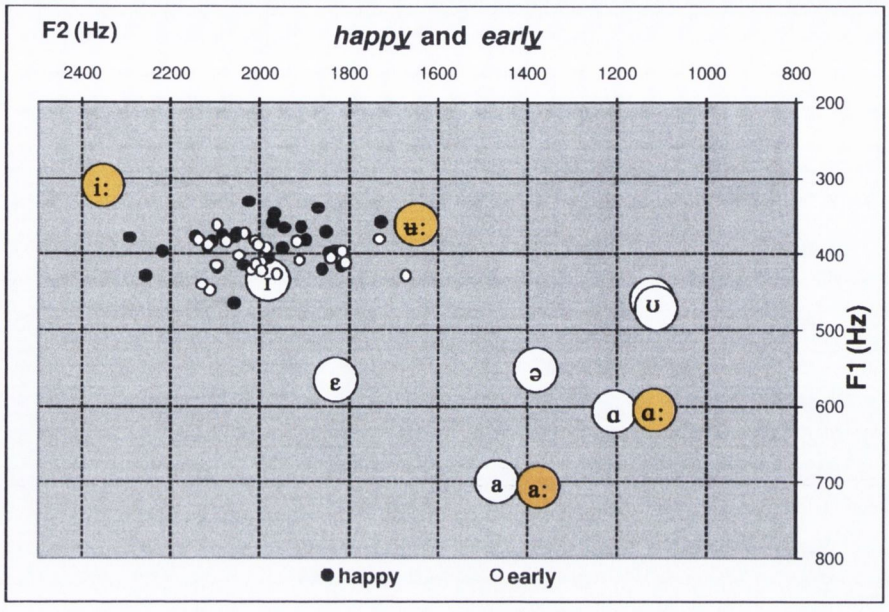

Figure 4.16 Scatter plot of individual F1-F2 values of the unstressed vowels in *happy* and *early* for 6 speakers

In relation to realisations of weak vowels in DroghE, the process of Schwa-Dropping was investigated in the pairs: *vowel-owl* and *lion- line*. The schwa vowel in *vowel* was often dropped resulting in the rhyming words *vowel* and *owl* [vaʊl] and [aʊl]. However, the words *lion* and *line* were not always homophonous: [lɑɪən] and [lɑɪn], respectively. Furthermore, the realisation of *-ing* was investigated in the pair *rotten-rotting*. The realisation of *-ing* ranged from [ɪŋ] to [n̩]. Hence, *rotten* and *rotting* were not homophones in all cases. The opposition would often result from the different realisations of /t/ in the two words: *rotten* [rɔʔn̩] or [rɔtn̩], *rotting* [rɔtɪŋ], [rɔt̬ɪŋ], [rɔtɪn], [rɔt̬ɪn], [rɔhɪŋ], [rɔtn̩], where [t̬] refers to a fricated form of /t/, discussed in Section 4.2.2 below.

We end this section by showing the durations of the vowels in the /h-d/contexts across 11 speakers. Figure 4.17 shows the average durations of the monophthongs in *hid, heed, head,* hayed (FACE vowel to be discussed later), *had, Hod, hawed, Hudd, hood,* and *who'd* for the lexical sets KIT, FLEECE, DRESS, FACE, TRAP, BATH, LOT, THOUGHT, STRUT/FOOT, and GOOSE, respectively, as well as the duration of the schwa in *sofa*.

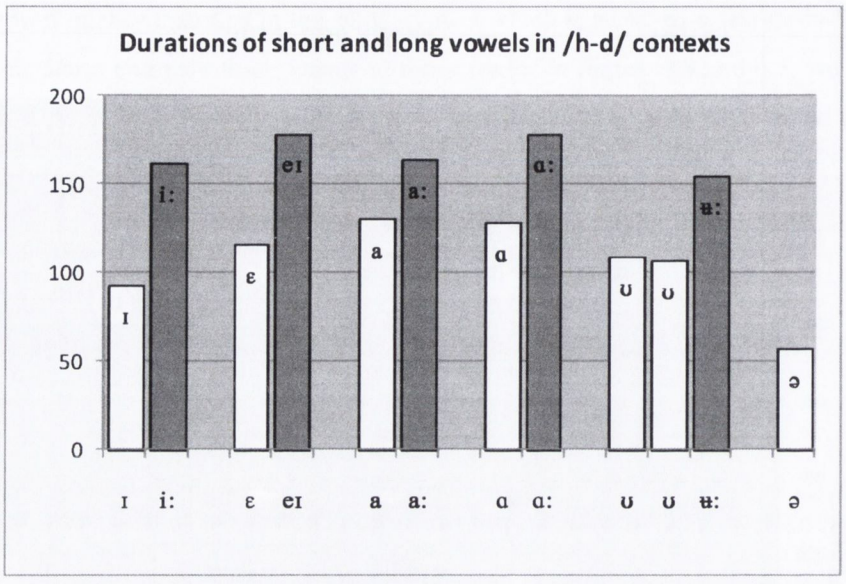

Figure 4.17 Averaged durations (ms) of the vowels in *hid, heed, head, hayed, had, half, Hod, hawed, Hudd, hood, who'd,* and *sofa*, respectively, long vowels are in grey

The average vowel durations show that there is a robust length distinction between the following pairs: KIT-FLEECE, DRESS-FACE, TRAP, BATH, LOT-THOUGHT, and FOOT-GOOSE. This suggests that there is no evidence for the loss of vowel length oppositions which characterises many Northern varieties of IrE. Moreover, for some vowels, particularly /ɑ/ vs. /ɑː/, length is the crucial feature for distinction since the quality of these two vowels appears to be very similar.

4.1.3 Diphthongs

Similar to the monophthongs, the realisations of diphthongs in DroghE broadly reflect those in Southern IrE varieties. In what follows, we first present the general diphthongs in an auditory chart and in an acoustic chart. Next, we present the diphthongs in order of the main differences from RP. Thus, we start with the vowels of PRICE and CHOICE, and look at issue of potential loss of opposition between these two diphthongs. Then we present the realisation of the MOUTH vowel followed by that of the GOAT and the FACE vowels.

Figure 4.18 shows the auditory charts of the diphthongs of DroghE, of SIrE represented by Dublin 'mainstream' speech, of RP, and of NIrE represented by Belfast 'general' speech. The charts are based on the same sources for monophthongs in Figure 4.1. The diphthongs of DroghE are based on speaker (MO). The charts for SIrE and NIrE are based on the

speech of a female (age around 50) whose speech is labelled as 'Dublin (mainstream)' and the speech of a male speaker aged 'around 20' labelled as 'Belfast (general)', respectively, in the recordings of *A Sound Atlas of Irish English* (Hickey, 2004). The RP chart is based on the quadrilaterals provided in Wells' *Pronunciation Dictionary* (1991). The auditory charts are based on the vowels in the accompanying words. I have listened to the speech and related words produced by the DroghE, Dublin English, and Belfast English speaker sand and placed the vowels in their most likely position in the quadrilateral. The analysed data suggest that DroghE has five diphthongs [ɒɪ/ɑɪ, ɔɪ, ɛʉ, oʊ, eɪ].

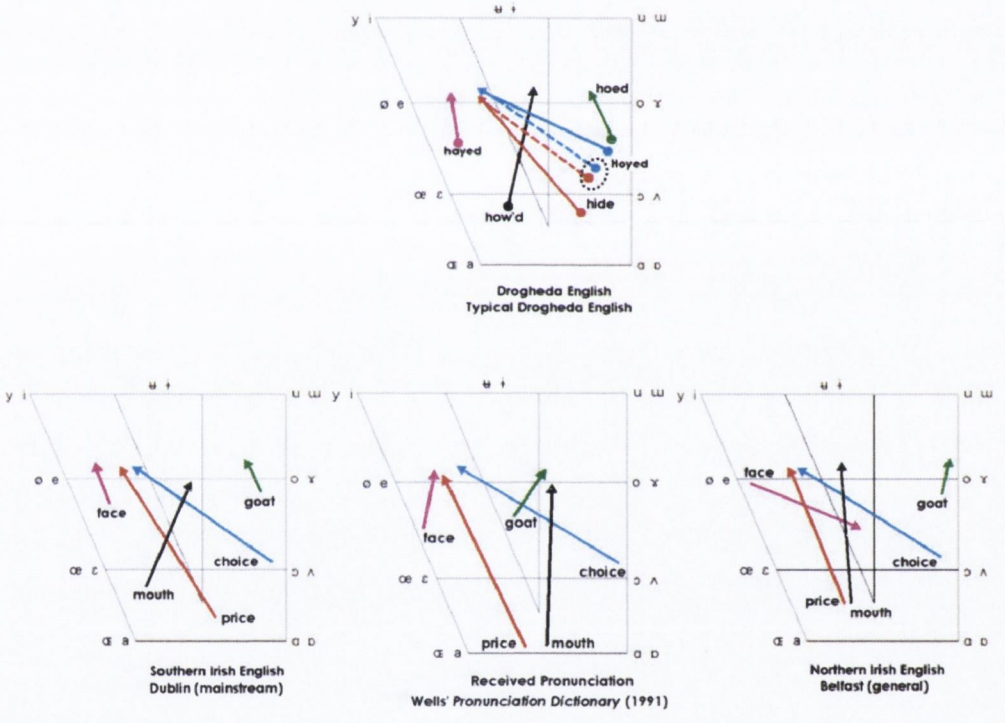

Figure 4.18 : Auditory charts of diphthongs in DroghE, SIrE, RP, and NIrE respectively. The chart of DroghE is based on the speech of speaker (MO). The SIrE and NIrE charts are based on two representative speakers from *A Sound Atlas of Irish English* (Hickey 2004). The RP chart is based on the quadrilaterals in Wells' *Pronunciation Dictionary* (1991).

It should be noted that for the PRICE (red) and CHOICE (blue) vowels in Figure 4.18, in addition to their realisations in the speech of speaker (MO), we include the realisations of other speakers. These speakers (6 out of 11) seem to have lost the opposition between PRICE and CHOICE indicated by the dashed lines, as will be discussed below.

The auditory charts suggest that most diphthongs in DroghE are different from their corresponding realisations in RP. Specifically, the realisations of the PRICE (*hide*), GOAT (*hoed*) and MOUTH (*how'd*) vowels are different. The PRICE-CHOICE opposition seems to be neutralised for some speakers but not for others. The merged realisations of PRICE and CHOICE (red and blue dashed arrows) have their first elements in the back open-mid region of the vowel space giving homophonous pairs such as *pint-point* and *vice-voice*. The GOAT diphthong (green arrow) has a back close rounded first element [oʊ] unlike the RP [əʊ]. The MOUTH diphthong (black arrow) begins with a front and close [ɛ] then glides towards a centralized [ʉ]. Figure 4.18 shows the realisations of GOAT and FACE in 'mainstream' Dublin English which is distinguished by having diphthongal realisations [oʊ] and [eɪ], respectively. However, the realisations of the GOAT and FACE vowels in Dublin 'mainstream' English are not representative of the typically monophthongal [o:] and [e:], respectively, in many Southern IrE varieties.

Figure 4.19 shows the acoustic charts of the diphthongs in /h-d/contexts in the accompanying words across 11 speakers. The starting points of diphthongs are shown in red circles and the end points in blue circles. Monophthongs are shown in white circles. Two graphs are shown to represent two groups of speakers who realised the vowels of PRICE and CHOICE differently. The left panel shows the averaged F1-F2 values of 6 speakers who do not have a PRICE-CHOICE distinction. The right panel shows the averaged F1-F2 values of 5 speakers who have a PRICE-CHOICE distinction. All the other vowels in both panels are represented across 11 speakers.

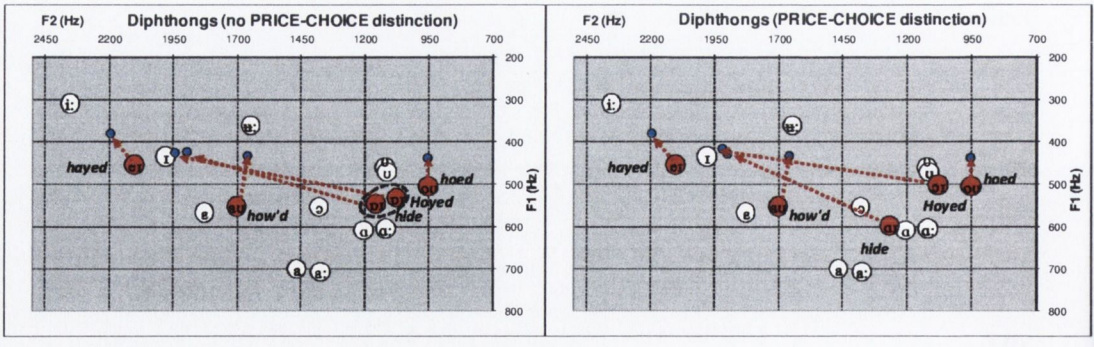

Figure 4.19 Acoustic charts of diphthongs in the accompanying words. Left panel shows the averaged F1-F2 values of 6 speakers who do not seem to have a PRICE-CHOICE distinction. Right panel shows the averaged F1-F2 values of 5 speakers who maintain a PRICE-CHOICE distinction. All other vowels in both panels are averaged across 11 speakers. Red and blue circles represent the first and the second elements of the diphthongs respectively. White circles are monophthongs.

PRICE and CHOICE (*hide* and *Hoyed*)

Many accents of Southern IrE tend not to exhibit a robust PRICE-CHOICE distinction. One of the issues we would like to clarify for DroghE concerns the extent to which these two vowels are distinct in this variety.

The opposition between PRICE-CHOICE was tested in the following minimal pairs: *hide-Hoyed, pint-point, vice-voice, aisle-oil,* and *buy-boy*. The perception experiment showed that the ten informants could not distinguish the words in each of these pairs. The words *pint, vice, aisle,* and *buy* were heard as *point, voice, oil*, and *boy*, respectively. Only one informant distinguished *pint* and *point* and three out of ten informants could distinguish *buy* and *boy*. The word *Hoyed* was often heard as *hide*. It should be noted, however, that speaker (MO) whose sounds files were used in the perception experiment belongs to the group of speakers who generally maintain a PRICE-CHOICE distinction. Two factors can have potential effects on the findings of the perception experiment. First, word frequency is a possible influence. Second, it could be the case that the majority of the listeners do not have a PRICE-CHOICE distinction. However, it is more likely that for many DroghE speakers these words are homophonous.

When plotting the individual F1-F2 values of the vowel in the minimal pairs: *hide-Hoyed, pint-point, vice-voice, aisle-oil,* and *buy-boy* for each speaker, it appeared that there were two groups of speakers. The first group consists of six speakers who have very similar F1-F2 values for PRICE and CHOICE (henceforth, Group 1). The second group consists of 5 speakers who have distinct F1-F2 values for PRICE and CHOICE (henceforth, Group 2). Figure 4.20 shows the acoustic charts for the individual tokens of the first elements of the diphthongs in *hide-Hoyed* for the six speakers in Group 1 and for the five speakers in Group 2.

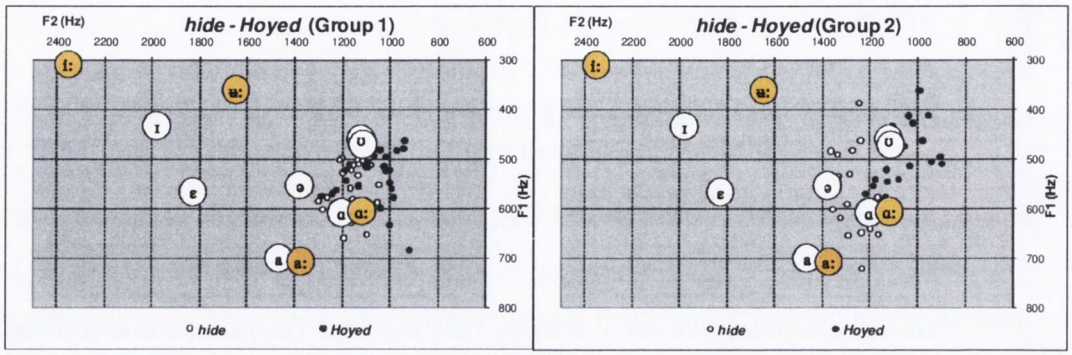

Figure 4.20 Scatter plot of individual F1-F2 values of the first element of the vowels in *hide* and *Hoyed* for the 6 speakers in Group 1 and the 5 speakers in Group 2

I have listened to the realisations of the minimal pairs: *hide-Hoyed*, *pint-point, vice-voice, aisle-oil,* and *buy-boy* for each speaker. It appears that indeed there are two groups of speakers. Speakers in Group 1 do not seem to have a PRICE-CHOICE distinction and realize both vowels as [ɒɪ], with slight lip rounding. Speakers in Group 2 show a PRICE-CHOICE distinction, realised as [ɑɪ] and [ɔɪ], respectively.

Figure 4.21 shows the individual F1-F2 values of the first element in each diphthong in the minimal pairs: *pint-point, vice-voice*, *aisle-oil,* and *buy-boy* for the six speakers of Group 1 and the 5 speakers of Group 2. It should be noted that data for the pair *buy-boy* was available for 7 speakers only, 4 belonging to Group 1 and 3 belonging to Group 2.

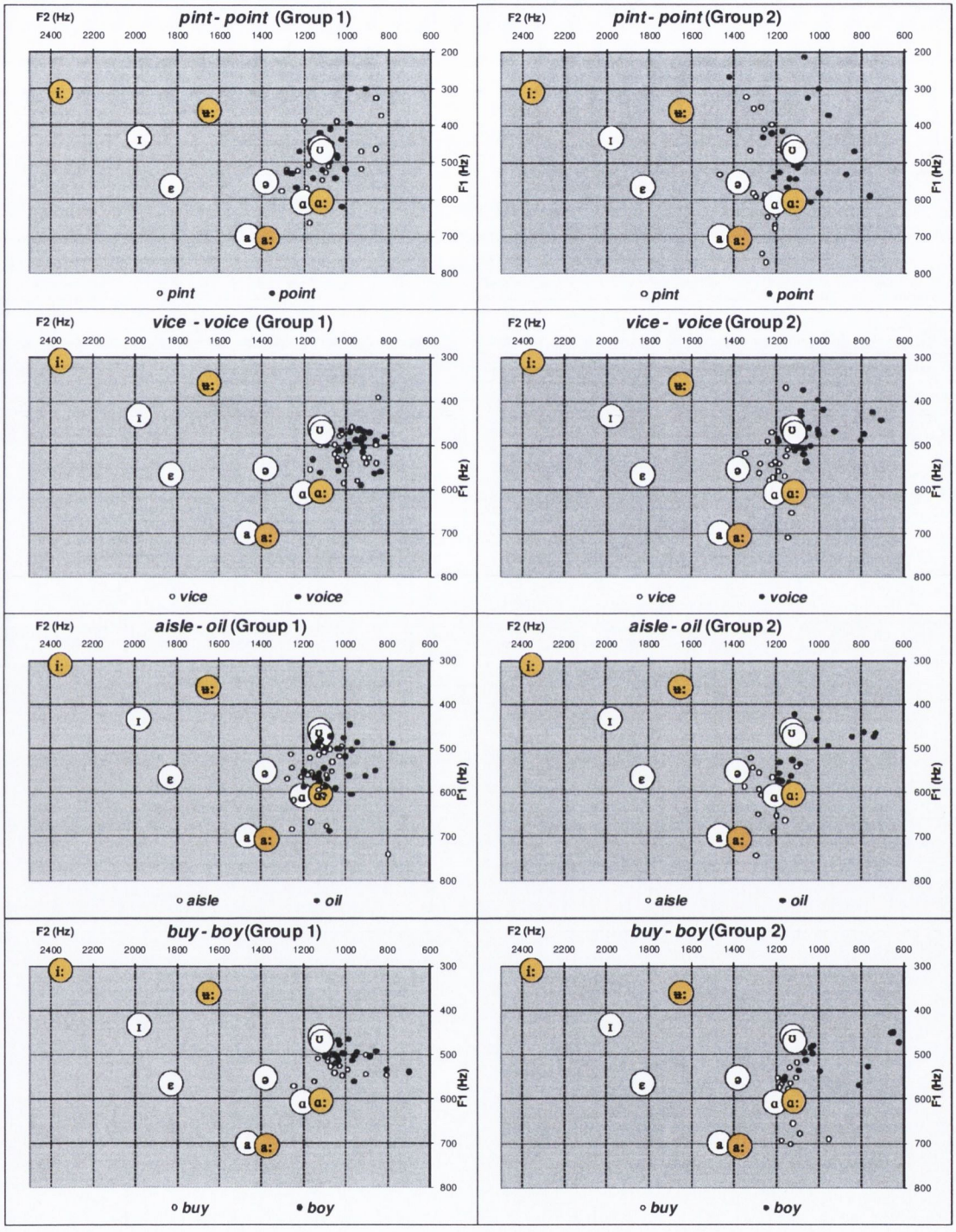

Figure 4.21 Scatter plot of individual F1-F2 values of the first element of each diphthong in the minimal pairs: *pint-point, vice-voice, aisle-oil*, and *buy-boy* for speakers in Group 1 and Group 2

To test for the influence of voicing of the following consonant on the realisation of the PRICE vowel, we plot the individual F1-F2 values of the first elements of the diphthongs in the minimal pairs: *rise-rice* and *hide-height* for 6 speakers, four who belong to Group 1 and two to Group 2, as shown in Figure 4.22.

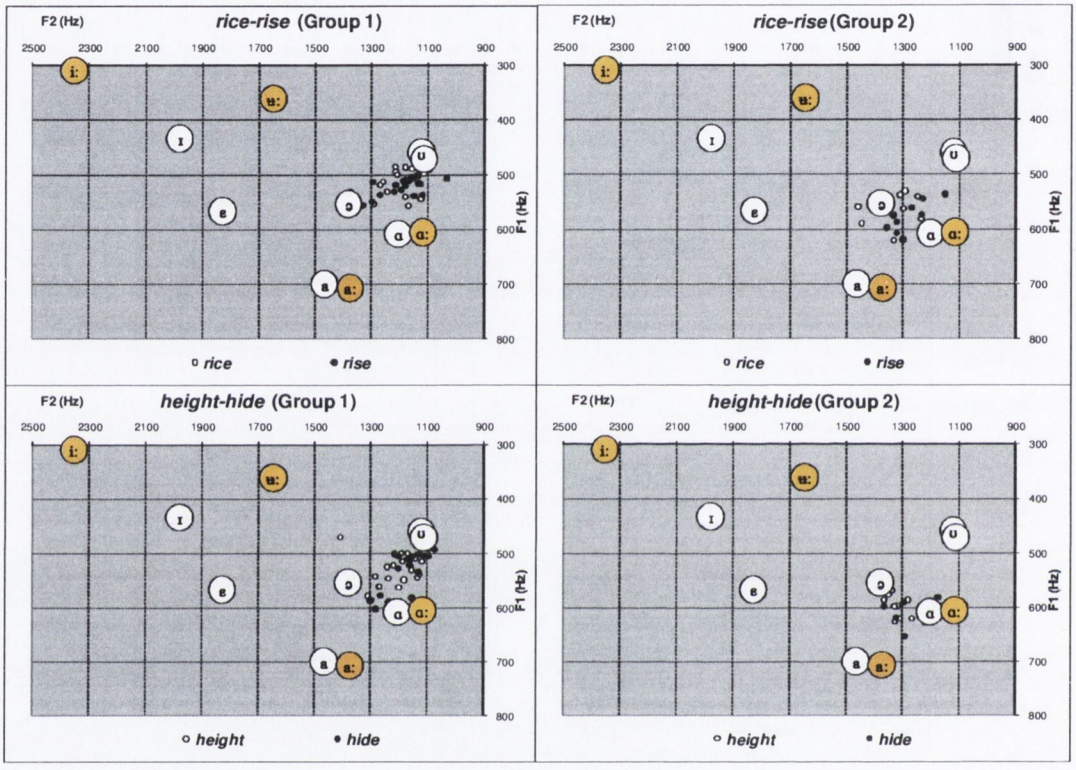

Figure 4.22 Scatter plot of individual F1-F2 values of the first element of each diphthong in the minimal pairs: *rise-rice* and *hide-height* for speakers in Group 1 and Group 2

The scatter plots do not seem to suggest that the realisations of the first elements of the diphthongs in each pair are influenced by voicing of a following consonant. Moreover, the vowels in the words of each pair do not sound different. Unlike what is reported by Hickey for Dublin English (see Chapter 3), the voiced consonants following the PRICE vowel do not seem to cause the first element to be retracted in DroghE. This is supported by statistical analysis. 2-way ANOVA tests show that the first elements of the diphthongs in *rise-rice* and *hide-height* are not significantly different in F1 and F2 values: *rise-rice* F1: $F(1,5) = 4.6$, $p = 0.085$, F2: $F(1,5) = 3.77$, $p = 0.110$, *hide-height*: F1: $F(1,5) = 0.86$, $p = 0.395$, F2: $F(1,5) = 5.06$, $p = 0.074$.

To sum up, it seems that the diphthongs of PRICE and CHOICE are only partially neutralised in this variety. When the vowels are neutralised, the quality of the resulting vowel is similar to the CHOICE diphthong and is realised as [ɒɪ ~ ɔɪ] with slight lip rounding. In cases where there is no neutralization, the diphthong in PRICE is realised as [ɑɪ] and that in CHOICE as [ɔɪ].

MOUTH (*how'd*)

The vowel of MOUTH is reported to have a raised and fronted starting point compared to RP. The realisation of this vowel in DroghE is tested in the words *how'd* and *cow*.

Figure 4.23 shows the individual F1-F2 values of the first and second elements of the MOUTH vowel in *how'd* (for 11 speakers) and in the open syllable *cow* (for 6 speakers). The arrow shows the direction of the averaged F1-F2 values of the diphthongs across the speakers (the two red circles). The MOUTH vowel is realised with a front open-mid, unrounded first element which glides towards a central rounded vowel [æʉ] or [ɛʉ].

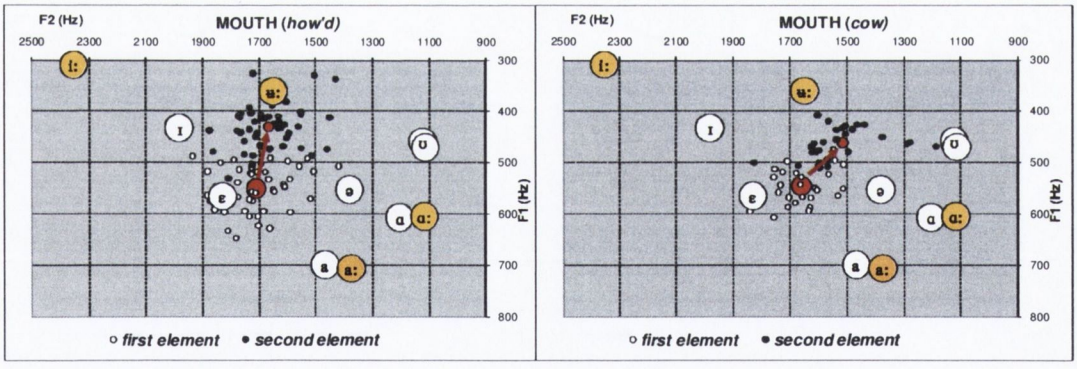

Figure 4.23 Scatter plot of individual F1-F2 values of the first and second elements of the diphthong in *how'd* (11 speakers) and in the open syllable *cow* (6 speakers), red arrows show the direction of the averaged F1-F2 values across speakers (red circles)

The scatter plots for the MOUTH vowel in *how'd* and *cow* support the auditory chart in Figure 4.18. The first element of the MOUTH vowel is a front open-mid, unrounded vowel and the second element is central rounded vowel. The second element in *cow* is more retracted, however.

GOAT (*hoed*)

The vowel of GOAT is reported to be typically realised as a long monophthong /o:/ in IrE. However, Dublin English is distinguished by having diphthongal variants that range from [oʊ] to [ɔʊ]. The realisation of this vowel in DroghE is tested in the words *hoed*, *coat*, *toe*, and *bold*.

Figure 4.24 shows the individual F1-F2 values of the first and second elements of the GOAT vowel in *hoed* for 10 speakers. The arrow shows the direction of the averaged F1-F2 values of the diphthongs across the speakers (the two red circles). The vowel sounds diphthongal and increases in lip rounding as it reaches its second element. The first element of the diphthong is a back close-mid rounded vowel which glides to a closer /ʊ/ quality. The diphthong is best transcribed as [oʊ] or [oᵘ]. However, one speaker (DW) had a monophthongal realisation [o:].

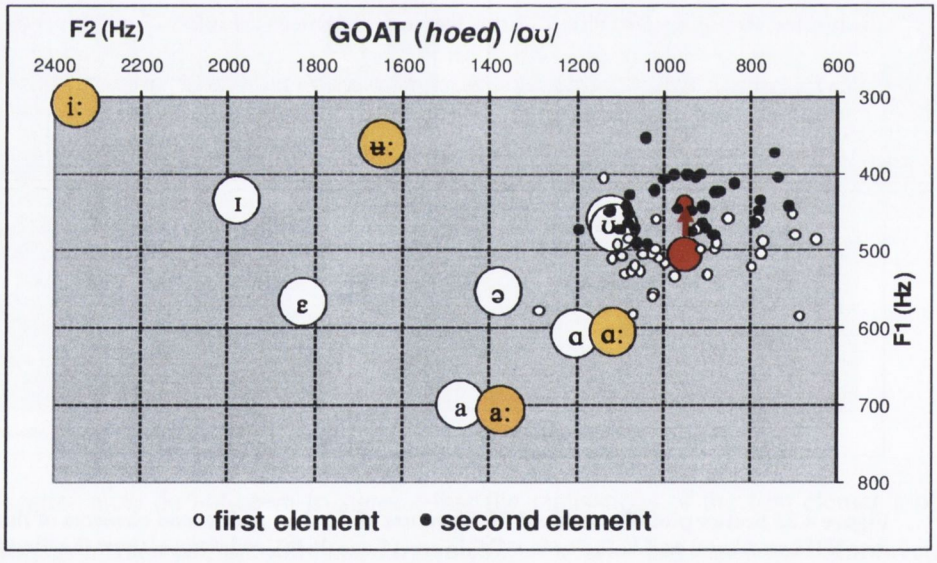

Figure 4.24 Scatter plot of individual F1-F2 values of the first and second elements of the diphthong in *hoed* for 10 speakers, the red arrow shows the direction of the averaged F1-F2 values across speakers (red circles)

Figure 4.25 shows the acoustic charts of the individual tokens of the first and second elements of diphthongs in *coat*, *toe*, and *bold* (for 5, 4, and 3 speakers respectively). These words represent the GOAT vowel in a closed syllable, an open syllable, and in contexts

preceding /l/, respectively. Sometimes certain speakers (DW, CC, and SK) had monophthongal realisations in *bold*, [o:].

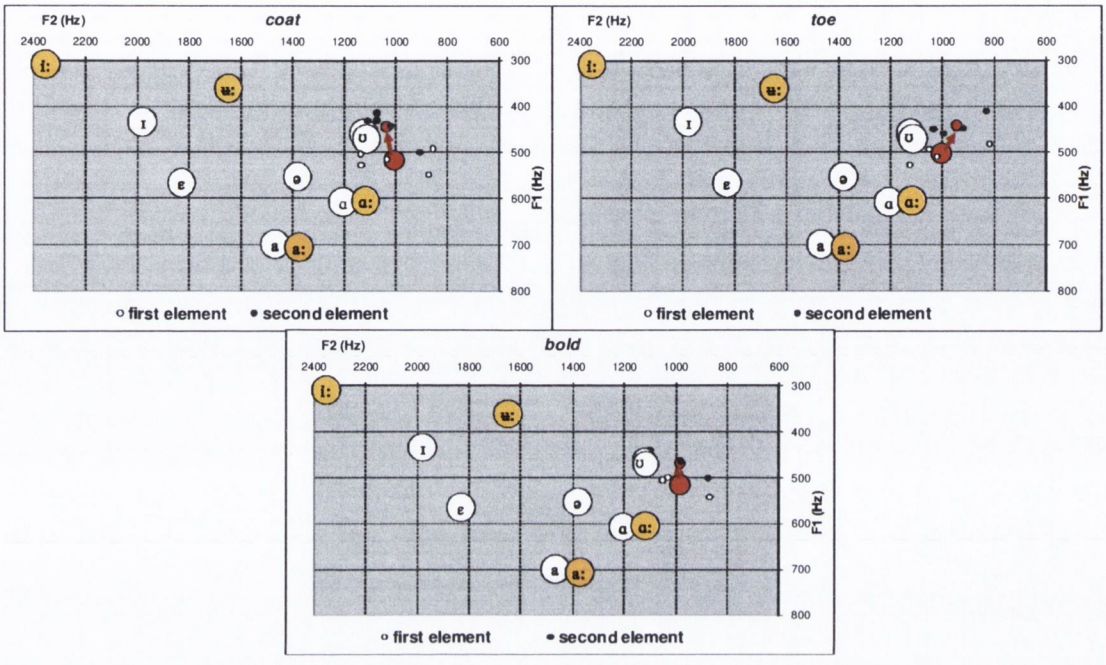

Figure 4.25 Scatter plots of individual F1-F2 values of the first and second elements of the diphthong in *coat*, *toe*, and *bold* (for 5, 4, and 3 speakers respectively), red arrows show the direction of the averaged F1-F2 values across speakers (red circles)

Similar to the realisation of the GOAT vowel in Dublin English, DroghE seems to have a diphthong in this vowel. However, one speaker has a monophthongal realisation of this vowel and few speakers had some monophthongal realisations particularly in *bold*. The vowel of GOAT is a close diphthong starting with a back close-mid rounded vowel which glides to a closer and more rounded /ʊ/ quality, best transcribed as [oʊ].

FACE (*hayed*)

The vowel of FACE is reported to be typically realised as a long monophthong /e:/ in IrE. However, Dublin English is distinguished by having diphthongal variants [eɪ] or [ɛɪ]. The realisation of this vowel in DroghE is tested in *hayed*, *pace*, *eight*, *day*, *break* and *steak*.

Figure 4.26 shows the individual F1-F2 values of the first and second elements of the FACE vowel in *hayed* for 10 speakers. One speaker (DW) had mostly monophthongal realisations of this vowel [e:]. The arrow shows the direction of the averaged F1-F2 values of the

diphthongs across the 10 speakers (the two red circles). The vowel sounds diphthongal which glides from a front close-mid vowel in the region of /e/ towards a close /ɪ/ vowel quality.

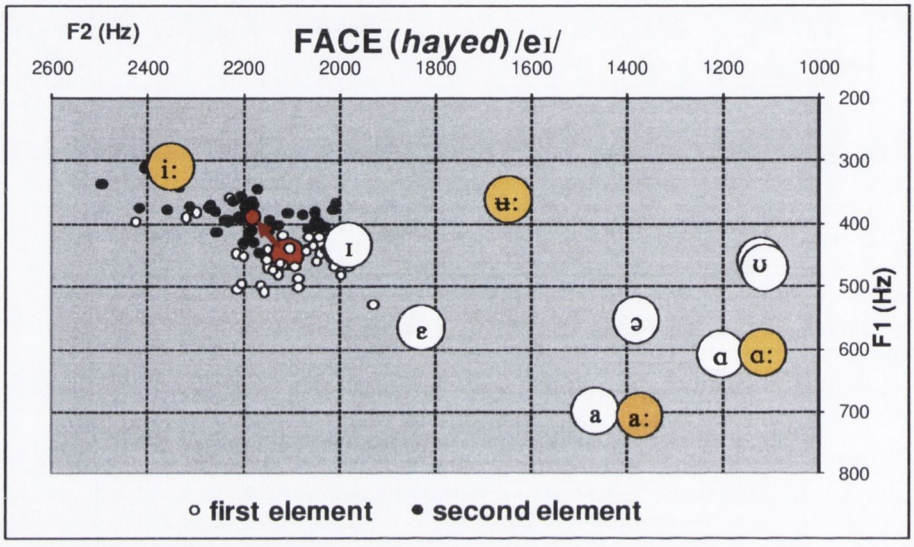

Figure 4.26 Scatter plot of individual F1-F2 values of the first and second elements of the diphthong in *hayed* for 10 speakers, the red arrow shows the direction of the averaged F1-F2 values across speakers (red circles)

The FACE diphthong is also plotted for words with different historical origins, *pace* (from ME /a:/), *eight, day* (from ME ɛi ~ æi), *break, steak* (from ME /ɛ:/). Figure 4.27 shows the individual F1-F2 values of the first and second elements of diphthongs in these words for 6 speakers. It is noticed that the FACE diphthong starts in the region of the close-mid front vowel [e] and glides towards a closer and fronter vowel quality [i ~ ɪ].

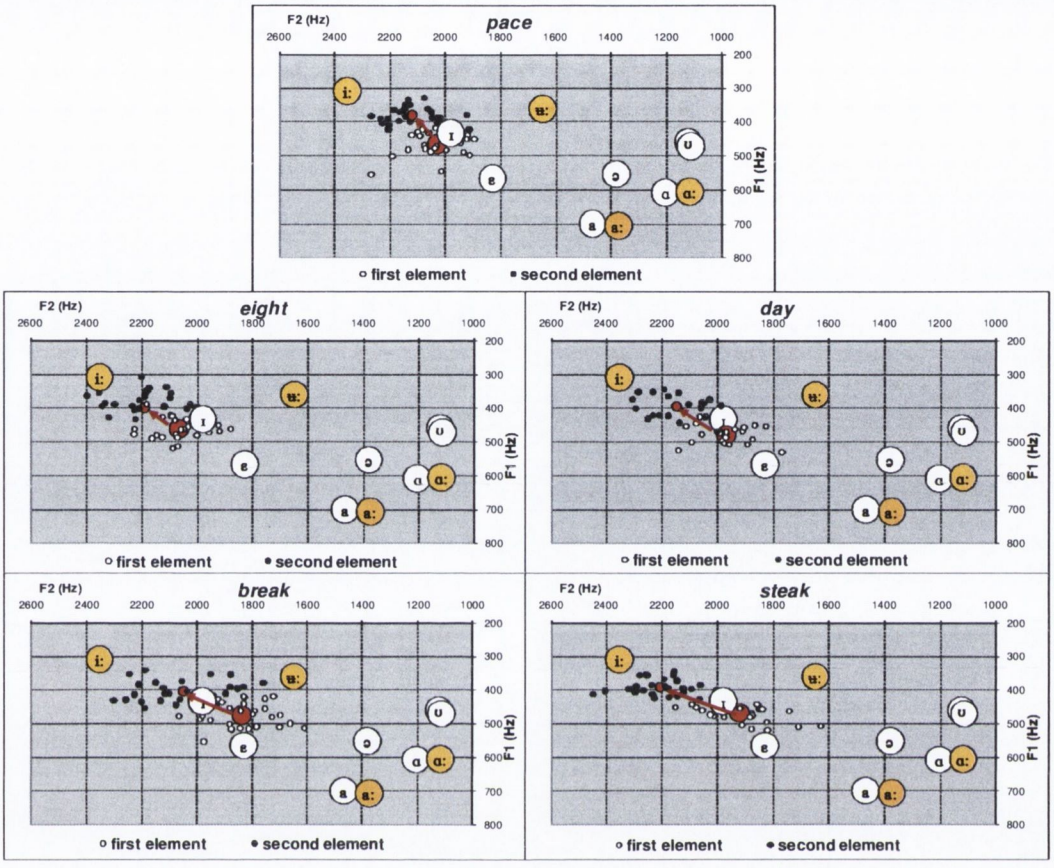

Figure 4.27 Scatter plots of individual F1-F2 values of the first and second elements of the diphthong in *pace, eight, day, break* and *steak* for 6 speakers, red arrows show the direction of the averaged F1-F2 values across speakers (red circles)

Similar to the realisation of the FACE vowel in Dublin English, DroghE seems to have a diphthong in this vowel. However, one speaker had some monophthongal realisations. The vowel of FACE is a close diphthong starting with front close-mid vowel which glides to a closer and fronter /ɪ/ quality, best transcribed as [eɪ].

We end this section by showing the durations of the four diphthongs in the /h-d/ contexts across 11 speakers. Figure 4.28 shows the average durations of the components of each diphthong: the first element, the transition, and the second element in *hide, Hoyed, how'd, hoed* and *hayed* for the lexical sets PRICE, CHOICE, MOUTH, GOAT and FACE, respectively.

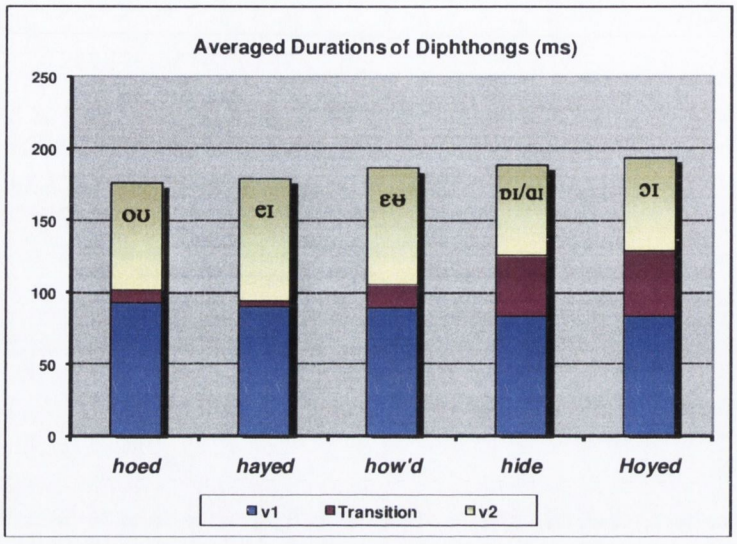

Figure 4.28 Averaged durations of the diphthongs in *hoed, hayed, how'd, hide* and *Hoyed* respectively, showing the three durational components of each diphthong: the first element (v1), the second element (v2), and the transition between both elements

It is noticed that the diphthongs are not very different in their durations. The FACE and the GOAT vowels have relatively smaller transition durations compared to those of the other diphthongs. Figure 4.29 shows the averaged durations of all monophthongs and diphthongs in the /h-d/ context for 11 speakers.

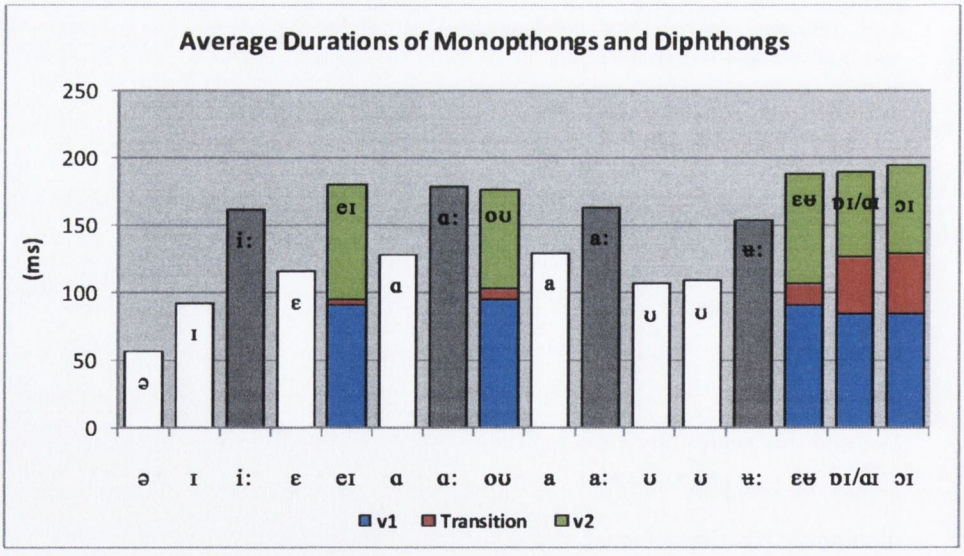

Figure 4.29 Averaged durations of the monophthongs and diphthongs in *sofa, hid, heed, head, hayed, Hod, hawed, hoed, had, half, Hudd, hood, who'd, how'd, hide* and *Hoyed* respectively, long monophthongs are in grey

Table 4.4 provides the averaged F1 and F2 values of both elements (V1, V2) for the diphthongs in *hide, Hoyed, how'd, hoed* and *hayed,* which represent the lexical sets PRICE, CHOICE, MOUTH, GOAT and FACE, respectively.

Table 4.4 Averaged F1 and F2 values (in Hz) for diphthongs in the /h-d/ context across11 speakers

Diphthongs						
		V1		V2		
Word	Vowel	F1	F2	F1	F2	Lexical Set
hide	ɒɪ/ɑɪ	569	1207	425	1898	PRICE
Hoyed	ɔɪ	518	1079	420	1932	CHOICE
how'd	ɐʊ	551	1704	433	1662	MOUTH
hoed	oʊ	505	952	437	954	GOAT
hayed	eɪ	454	2102	379	2195	FACE

4.1.4 Vowels in /Vɹ/ Contexts

The lexical sets provided by Wells for vowels in /Vɹ/ contexts are fewer in number than those for monophthongs because vowel contrasts in /Vɹ/ contexts are lost in RP and GenAm. These lexical sets are: NURSE, NEAR, SQUARE, START, NORTH, FORCE, and CURE. Unlike other varieties of English, IrE has a nearly complete range of vowel oppositions in /Vɹ/ contexts. Neutralizations occur particularly in Dublin English varieties. However, in general almost all vowels remain in mutual opposition preceding /ɹ/ (Welss 1982).The materials for the vowels in the /Vɹ/ contexts are drawn from the two vowel corpora (A &B) as shown in Table 4.5, reproduced from Chapter 3. The analysis of the vowels is supported by a small perception experiment in which ten native speakers of DroghE, of the same age group and socioeconomic status to informants of the production study, listened to minimal pairs produced by speakers (MO) of the production study. Table 4.6 shows the test minimal pairs used in the perception experiment for the vowels in /Vɹ/ contexts.

Table 4.5 Test words for vowels in /Vɹ/ contexts

Vowel	/Vr/ vowels (Corpus A)	Wells' Lexical Sets	Further Potential /Vr/ Oppositions (Corpus B)	
ɛɹ or ʌɹ	*turn, dirt, bird*	NURSE	/ɛɹ/ - /ʌɹ/	*per-purr, earn-urn, ferry-furry*
e:ɹ	*hair*	SQUARE	/e:ɹ /- /ɛɹ/	*pair-per, paired-herd*
i:ɹ	*hear*	NEAR	/i:ɹ/ - /ɪɹ/	*nearer-mirror, Lear-Lir, mere- myrrh*
ɔ:ɹ	*Corr, born*	NORTH	/ɔ:ɹ/-/o:ɹ/	*horse-hoarse*
o:ɹ	*four*	FORCE		
u:ɹ	*poor*	CURE	/u:ɹ/ - /o:ɹ/	*poor -pore, tour-tore*
a:ɹ	*far, hard*	START	a:ɹ	

Table 4.6 The minimal pairs included in the perception experiment for vowels in /Vɹ/ contexts

Vowel Oppositions	Minimal Pairs
NURSE Split	*per-purr, earn-urn, ferry-furry*
NORTH vs. FORCE	*horse-hoarse*
NORTH/FORCE vs. CURE	*pore-poor, tore-tour*

Table 4.7 shows the proposed lexical sets in /Vɹ/ contexts for potential oppositions which are absent in RP and GenAm but still maintained in IrE. There are three common ME sources for the NURSE vowel: short /i/, /ɛ/, or /u/ when followed by final or pre-consonantal /ɹ/. The NURSE Merger is the process that resulted when these vowels were centred and merged as [ə] preceding a final or pre-consonantal /ɹ/. The merging of these vowels started in the northern and eastern dialects of English in the 15th century. By the 16th century it spread to popular London speech so that homophones such as *serf-surf, tern-turn,* and *birth-berth* occur in reference varieties of English today. The NURSE Merger has not occurred in most Scottish accents and in Ireland, so that the above mentioned words would be contrastive in these varieties (Wells, 1982: 199-200). Therefore, to represent the vowel realisations prior to the NURSE Merger process, the following three sets are proposed: LIR /ɪɹ/, EARN /ɛɹ/, and URN /ʊɹ/ or /ʌɹ/. The LIR vowel also contrasts with the NEAR vowel /i:ɹ/ or the set LEAR (to maintain minimal pair representation in LEAR vs. LIR). Furthermore, the FACE+/ɹ/-DRESS+/ɹ/ distinction is lost in RP resulting in the SQUARE vowel. Many varieties

of IrE maintain this distinction between /eːɹ/-/ɛɹ/ in miminal pairs such as *air-err,* hence the sets AIR vs. ERR, respectively. Note that the vowel represented by ERR is the same as EARN (both represent DRESS+/ɹ/).

Table 4.7 Wells' Lexical Sets for vowels in /Vɹ/ contexts for RP and GenAm and our proposed Lexical Sets for IrE

Wells' Lexical Sets	RP	GenAm	IrE	IrE Lexical Sets
SQUARE	ɛə	ɛɹ	eːɹ	**AIR**
NURSE	ɜː	ɜɹ	ɛɹ	**EARN (ERR)**
			ʌɹ	**URN**
NEAR	ɪə	ɪɹ	iːɹ	**LEAR**
			ɪɹ	**LIR**
NORTH	ɔː	ɔɹ	ɔːɹ	**NORTH**
FORCE	ɔː	oɹ	oːɹ	**FORCE**
CURE	ʊə/ ɔː	ʊɹ	uːɹ	**CURE**

In what follows, we present the potential vowel oppositions in DroghE starting with the NURSE vowel (*ear-urn*) to test for the /ɛɹ/ vs. /ʊɹ/ opposition. Next we look at the realisation of the SQUARE vowel (*herd-paired*) and test for the opposition /eːɹ/ vs. /ɛɹ/. Then, we look at the NEAR vowel (*Lear-Lir*) to test for the /iːɹ/ vs. /ɪɹ/ opposition. Finally, we test for the opposition between the vowels of NORTH (*horse*) and FORCE (*hoarse*) and investigate the realisation of the CURE vowel (*poor*).

In general, this variety does not seem to have undergone the NURSE Merger which results in the /ɛɹ/ - /ʊɹ/ opposition as in *earn* vs. *urn* and *herd* vs. *dirt*, respectively. The vowels of FACE and DRESS are indistinguishable in contexts preceding /ɹ/ so that *herd* and *paired* have the same vowel. Moreover, the /iːɹ/ - /ɪɹ/ opposition is evident in the pair *Lear-Lir.* However, the vowel in /ɪɹ/ seems to be realised as a retacted and slightly rounded vowel similar to the vowel of URN. Similarly, there is no distinction between the vowels in *horse* and *hoarse* which makes them homophones. Finally, the CURE vowel has the same vowel quality as that of NORTH and FORCE so that the words in pairs such as *poor-pore* and *tour-tore* are homophones, all with /oːɹ/.

Figure 4.30 shows the acoustic charts of the vowel space for vowels in non /Vɹ/ (left) and in /Vɹ/ (right) contexts in the accompanying words. The vowels in non /Vɹ/ and in /Vɹ/ contexts have matching colors for ease of comparison. It should be noted that the words *Lear* and *Lir* come from 7 speakers different from the 11 speakers for the other words.

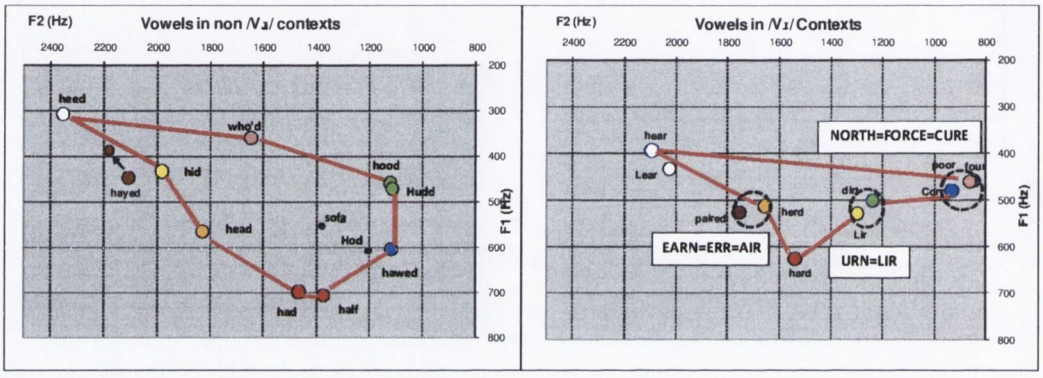

Figure 4.30 Acoustic charts for vowels in non /Vɹ/ (left) and in /Vɹ/ (right) contexts in the accompanying words, the vowels in the two different contexts have matching colors for comparison, the words *Lear* and *Lir* come from 7 speakers different from the 11 speakers for the other words

It can be noticed that the vowel space has shrunk towards the center in the /Vɹ/ contexts. Specifically, the vowels of FLEECE, FACE, DRESS, TRAP, BATH, and STRUT in *heed, head, had, half,* and *Hudd*, respectively, become more centralized in *hear, herd, hard* and *dirt.* Moreover, the vowel space has moved backward as a result of the retraction of back close vowels in /Vɹ/ contexts. The vowels of GOOSE, THOUGHT, and GOAT in *who'd, hawed* and *hoed*, respectively, become more retracted (lower F2) in *poor, Corr*, and *four.*

There appears to be three groups of similar vowel realisations in /Vɹ/ contexts, shown as dashed circles in Figure 4.30. First, the vowels of NORTH, FORCE, and CURE in *Corr, four* and *poor*, respectively, all have /oːɹ/. Second, the vowel of KIT preceding /ɹ/ is realised similar to the vowel of URN, /ʊɹ/. Third, the vowel of FACE preceding /ɹ/, Wells' SQUARE set, has a similar realisation to the ERR and EARN vowels, /ɛɹ/.

NURSE and (EARN vs. URN)

In RP and GenAm the DRESS and STRUT vowels neutralise in /Vɹ/ contexts via the NURSE Merger, resulting in the NURSE vowel. However, in many varieties of IrE there is a potential distinction between DRESS and STRUT vowels in /Vɹ/ contexts evident in minimal pairs such as *earn-urn*.

The presence of the NURSE Merger was investigated in the perception experiment using the pairs: *per-purr, earn-urn,* and *ferry-furry*. Results show that all informants heard the pairs *per-purr* and *ferry-furry* as distinct words. Only two female listeners out of the ten could distinguish the words e*arn-urn*. The other eight informants wrote down the word *earn* when the word *urn* was played.

Figure 4.31 shows the individual F1-F2 values of the vowels in the pairs: *per-purr, earn-urn,* and *ferry-furry* for 6 speakers. It can be seen that the vowels fall into two distinct areas in the chart. This shows that the NURSE Merger is not evident in DroghE. The words with /ɛɹ/ realisation occupy a more front region (higher F2) of the chart, whereas those with /ʊɹ/ realisation occupy a more retracted region (lower F2) with a slightly rounded vowel quality. Based on the perception experiment and the acoustic charts we establish that there is a /ɛ/ - /ʊ/ contrast before /ɹ/, corresponding to the IrE lexical sets EARN and URN, respectively.

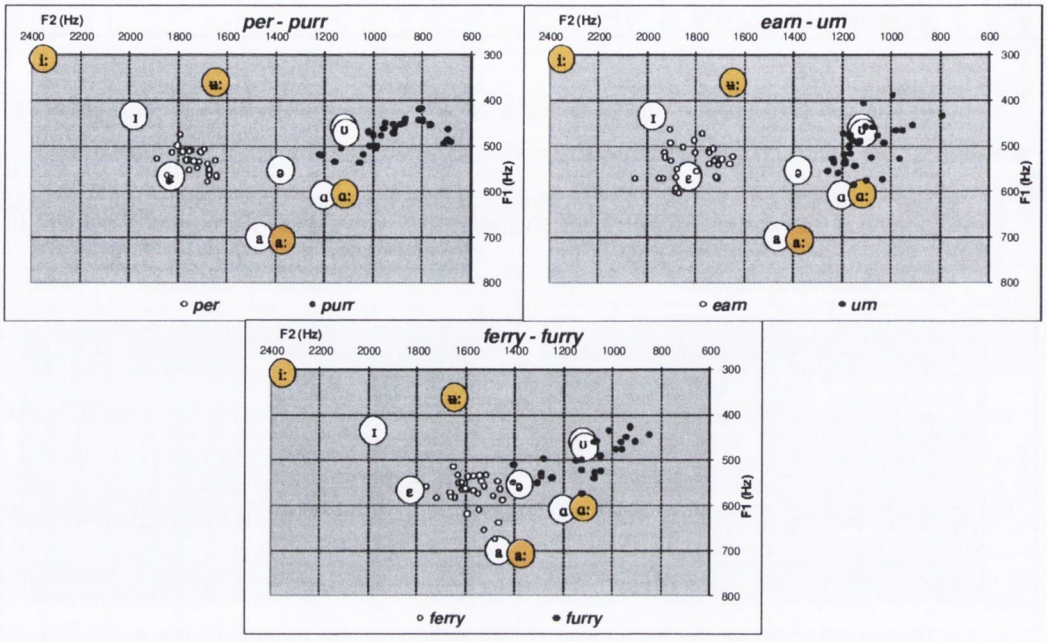

Figure 4.31 Scatter plots of individual F1-F2 values of the vowels in the pairs: *per-purr, earn-urn*, and for 6 speakers

Indeed, 2-way ANOVA tests show that vowels in the pairs *per-purr* and *ferry-furry* differ significantly in F1 and F2 values: *per-purr*: F1: $F(1,5) = 17.62$, $p = 0.009$, F2: $F(1,5) = 122.59$, $p = 0.000$, *ferry-furry*: F1: $F(1,5) = 29.20$, $p = 0.003$, F2: $F(1,5) = 91.24$, $p \leq 0.000$. The vowels in *earn* and *urn* also significantly differ in F2 values only: F1: $F(1,5) = 2.48$, $p = 0.146$, F2: $F(1,5) = 21.53$, $p = 0.001$.

When plotting the individual F1-F2 values of the vowels in *earn* and *urn*, it was found that three speakers (CD, CM, and ND) have a mixed scatter of F1-F2 values for these vowels as shown in Figure 4.32. When listening to these words for the three speakers it was clear that the NURSE Merger is evident in their speech.

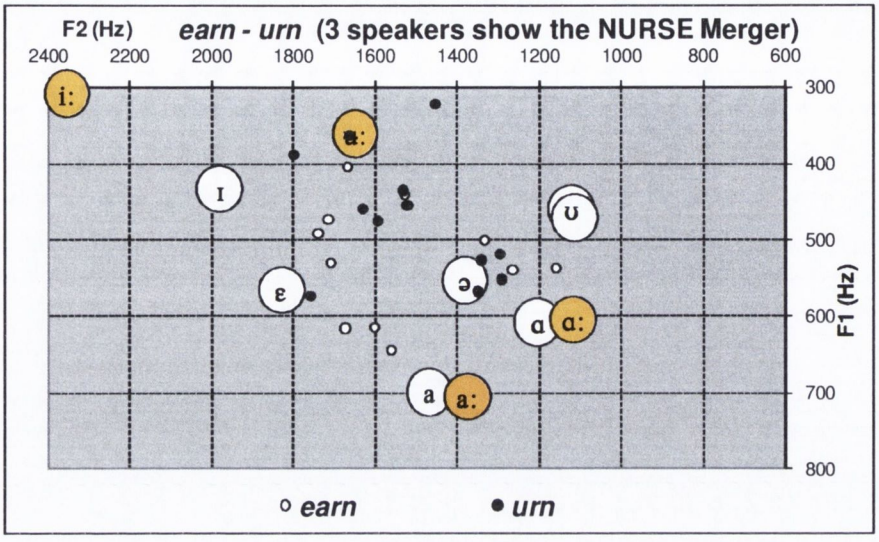

Figure 4.32 Scatter plots of individual F1-F2 values of the vowels in *earn* and *urn* for the speakers (CD, CM, and ND) who seem to have a single NURSE vowel

Vowels in words with historical /ɪɹ/ and /ɯɹ/ such as *turn, dirt* and *bird* seem to belong to URN /ʊr/ in DroghE. The vowels in these words sound retracted and slightly rounded in some cases. Figure 4.33 shows the individual F1-F2 of the vowels in *turn, dirt* and *bird* for 6 speakers. It is noticed that these vowels are realised in the open-mid back region of the vowel space.

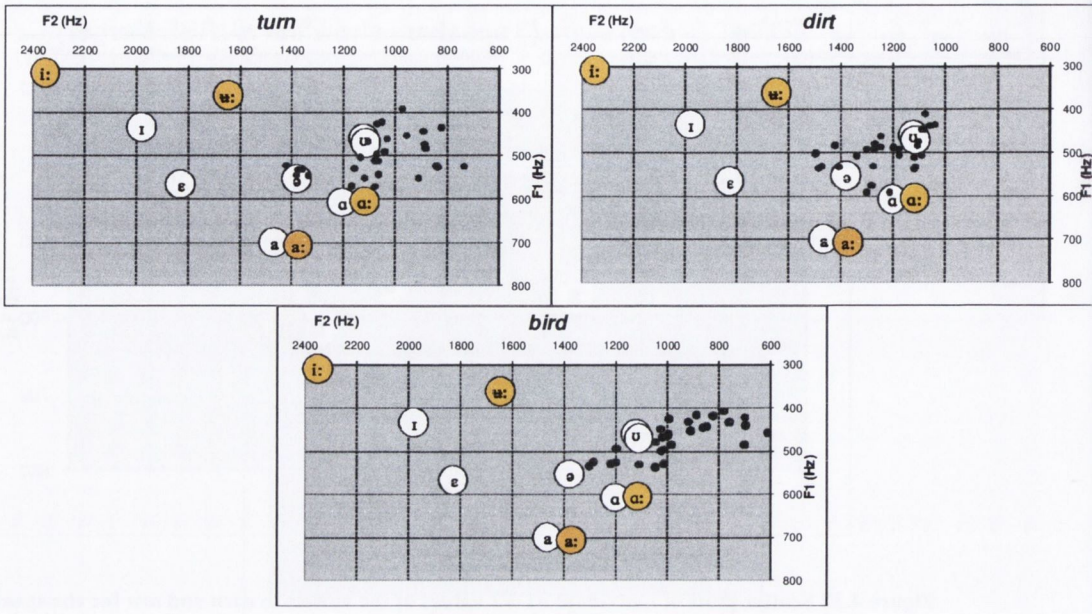

Figure 4.33 Scatter plots of individual F1-F2 values of the vowels in *turn*, *dirt* and *bird* for 6 speakers

To sum up, the varity of DroghE maintains a distinction between the vowels of EARN-URN which are realised as /ɛɹ/ and /ʊɹ/, respectively, which suggests that the DroghE variety did not undergo the NURSE Merger. However, there were few speakers who realised words such as *earn* and *urn* as homophones.

SQUARE and (AIR vs. ERR)

In many varieties of IrE there is a potential preservation of the distinction between the DRESS and FACE vowels in /Vɹ/ contexts, evident in minimal pairs such as *err-air*. However, in Dublin English the opposition /e:ɹ/ vs. /ɛɹ/: *care-Kerr* is neutralised as /ʌɹ/ [ɜ:]. This potential opposition is tested in the pairs: *paired-herd* and *pair-per*.

Figure 4.34 shows the individual F1-F2 values of the vowels in *paired-herd* and *pair-per* for 6 speakers, respectively. The vowels in these pairs sound similar. It is clear that the F1-F2 values of the vowels in each pair are clustered in the same region. It seems that there is no clear opposition between SQUARE and DRESS + /r/. 2-way ANOVA tests showed that the vowels in the pairs: *paired-herd* and *pair-per* are not significantly different in their F1

and F2 values: *paired-herd*: F1: F(1,5) = 1.79, p = 0.239, F2: F(1,5) = 0.07, p = 0.802, *pair-per:* F1: F(1,5) = 2.73, p = 0.159, F2: F(1,5) = 5.75, p = 0.062.

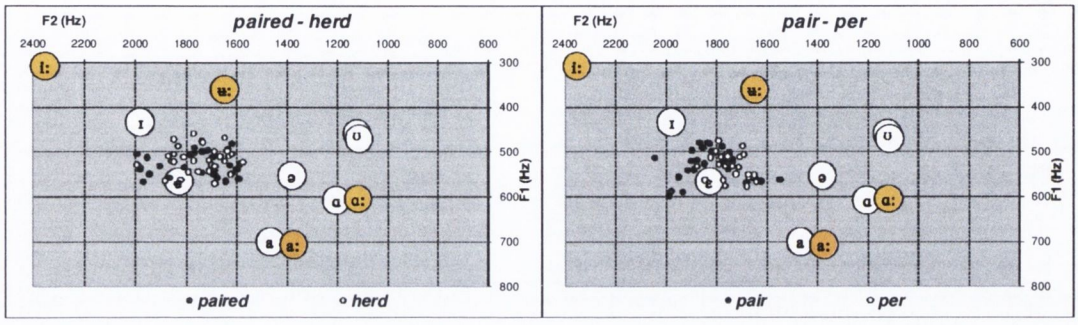

Figure 4.34 Scatter plots of individual F1-F2 values of the vowels in the pairs: *paired-herd* and *pair-per* for 6 speakers

Although, the pairs used in testing this opposition are not optimal minimal pairs, the vowels are perceptually very similar. It is worth noting also that in the perception experiment for the pair *per* vs. *purr*, in most cases listeners wrote down *pair* for *per*. In general, it seems that the AIR-ERR opposition is not evident in this variety and that these two sets are the same as that of the EARN vowel, all realised as /ɛɹ/.

NEAR and (LEAR vs. LIR)

Minimal pairs of /i:ɹ/ vs. /ɪɹ/ are very rare in English except in prevocalic contexts. To investigate the /i:ɹ/ vs. /ɪɹ/ opposition, the following pairs were recorded: *nearer-mirror*, *Lear-Lir* (*The Children of Lir* is an Irish Legend), and *mere-myrrh*. It should be noted that the pairs *Lear-Lir* and *mere-myrrh* were recorded at a later stage by seven speakers different from those recorded for *nearer-mirror* (as explained in Chapter 3). The following investigation of the /i:ɹ/ vs. /ɪɹ/ opposition is based on auditory judgment and acoustic analysis. Unfortunately, at the time of the perception experiment, the words *Lear-Lir* and *mere-myrrh* were not available in recordings.

Figure 4.35 shows the individual F1-F2values of the vowels in the pair *nearer-mirror* for 6 speakers. The stressed vowels in these two words sound different. It is noted that the data fall into two distinct regions in the vowel space. However, it should be noted that in postvocalic /Vɹ/ contexts the contrast is expected.

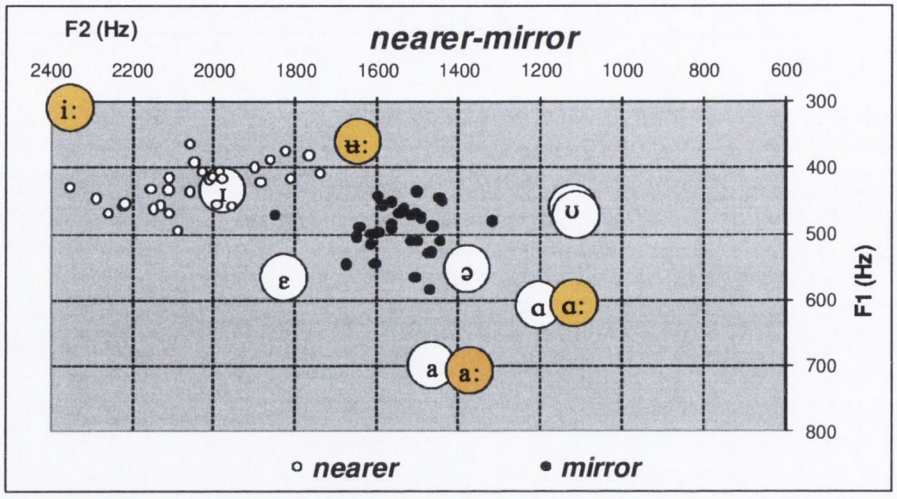

Figure 4.35 Scatter plots of individual F1-F2 values of the vowels in *nearer-mirror* for 6 speakers

Figure 4.36 shows the individual F1-F2 values of the vowels in the pair *Lear-Lir* and for five speakers (left panel) and two speakers (right panel). The two words sound distinct for the five speakers but similar for two speakers (RK and TO). In the left panel, the data fall into two distinct regions in the vowel space. The LEAR vowel is in the region of the vowel quality /ɪ~i:/. The LIR vowel is in the region of the vowel quality /ʌɹ~ʊɹ/. 2-way ANOVA tests showed that the vowels in *Lear-Lir* were significantly different in F2 values for the 5 speaker (left panel): F1: $F(1,4) = 5.88$, $p = 0.072$, F2: $F(1,4) = 26.97$, $p = 0.007$. In the right panel, the vowels seem to be similar.

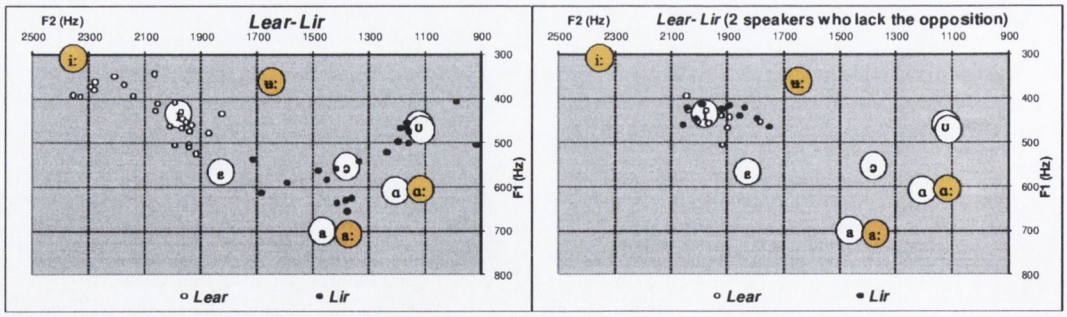

Figure 4.36 Scatter plots of individual F1-F2 values of the vowels in the minimal pair *Lear-Lir* for 5 speakers (left) and 2 speakers (right)

The case of *mere-myrrh* is more complex. All 7 speakers have a distinction between the vowels in the two words. Figure 4.37 shows the individual F1-F2 values of the vowels in the pair *mere-myrrh* for all 7 speakers. The vowels in these words sound clearly distinct and are significantly different in F1 and F2 values: $F1(1,6) = 17.29$, $p = 0.006$, $F2(1,6) = 12.7$, $p = 0.012$. However, the realisations of the vowel in *myrrh* were not all the same. Some speakers had a vowel quality that belongs to the EARN set, whereas others had a vowel quality that belongs to the URN set.

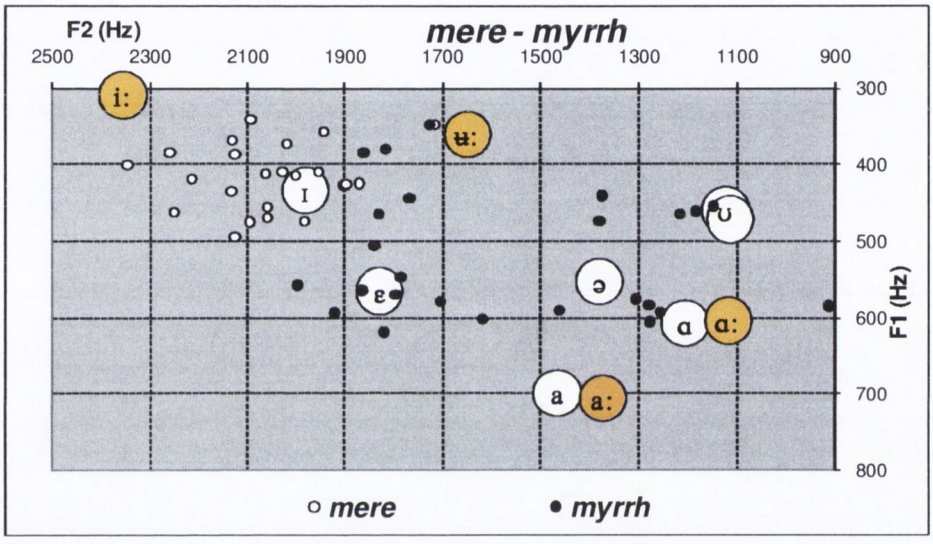

Figure 4.37 Scatter plots of individual F1-F2 values of the vowels in *mere* and *myrrh* for 7 speakers

To sum up, the vowel of LIR is the same as the URN vowel in DroghE. The word *Lir* is realised with an open-mid central and retracted /ʊ/ vowel and sounds similar to that in words such as *dirt, turn,* and *urn.* Only two speakers produced *Lear-Lir* with the same vowel, /i:ɹ/. The word *myrrh,* on the other hand, belongs to the EARN set, although there were some speakers who had realisations with /ʊɹ/ in *myrrh* (GM and IF). The /i:ɹ/ vs. /ɹ/ opposition, which is evident in the near-minimal pair *nearer-mirror,* does not seem to be evident in non-postvocalic contexts in DroghE.

NORTH, FORCE, and CURE

In many varieties of IrE and conservative Dublin speech the NORTH-FORCE opposition is retained so that *horse-hoarse, war-wore, for-four,* respectively, are minimal pairs.

The vowel of NORTH is tested in *Corr* and *born* and that of FORCE in *four*. The NORTH-FORCE opposition is investigated in the minimal pair *horse-hoarse*. Perceptually, the vowels of NORTH and FORCE in the investigated words do not sound different. Indeed, the perception experiment shows that all informants heard both *horse* and *hoarse* as *horse*. This indicates that the opposition between NORTH and FORCE is lost in this variety. We transcribe the neutralised vowel as /oʊr/ which is phonetically realised as [oːɹ].

Similarly, the acoustic analysis suggests that the opposition between the NORTH and the FORCE vowels is neutralised. Figure 4.38 shows the individual F1-F2 values of the vowels in the pair *horse-hoarse,* and for each of the vowels in *Corr* and *born* plotted against the vowel in *four* for 6 speakers.

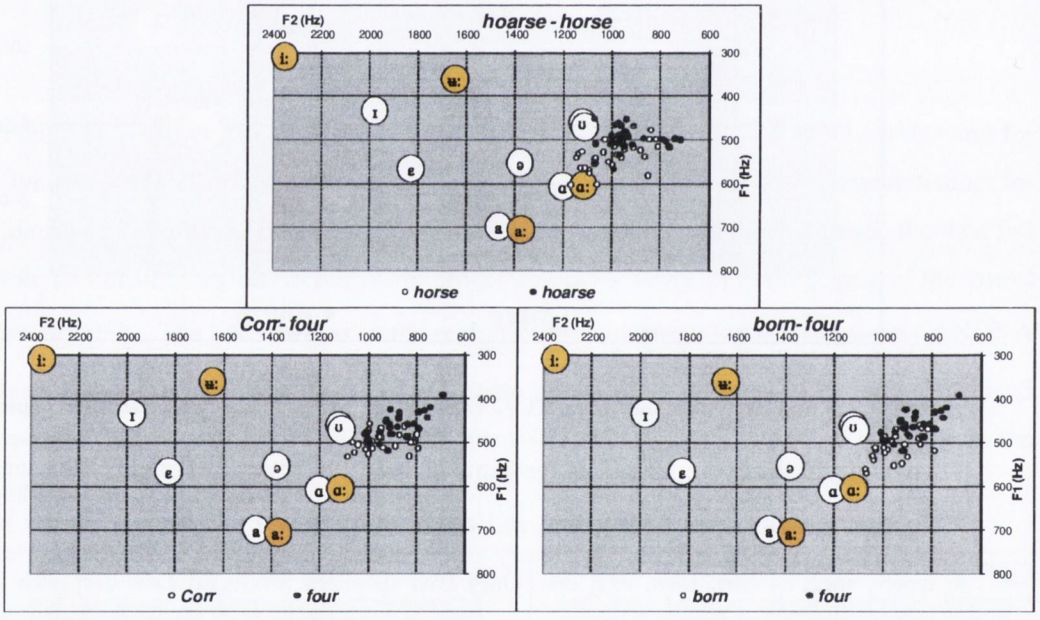

Figure 4.38 Scatter plots of individual F1-F2 values of the vowels in the pair: *horse-hoarse*, and in each of the vowels in *Corr* and *born* plotted against the vowel in *for* for 6 speakers

The scatter plots show that the realisations of the vowels of NORTH and FORCE occupy the same region in the vowel space. This indicates that the vowels are essentially of the same quality. Statistically, 2-way ANOVA tests showed that the vowels in *horse-hoarse* do not differ significantly in their F1 and F2 values: F1: $F(1,5) = 0.99$, $p = 0.365$, F2: $F(1,5) = 0.06$, $p = 0.813$. Nonetheless, it seems worth noting that despite the considerable overlap of

values, the F1-F2 values do suggests that for some speakers, the vowel of *hoarse* and *four* may be higher and more retracted.

The CURE vowel and its potential opposition with the vowels NORTH/FORCE is tested in the pairs: *poor-pore* and *tour-tore*. Perceptually, the vowels in each of the pairs *poor-pore* and *tour-tore* do not sound different. None of the informants in the perception test could distinguish the words in the pairs *poor-pore* and *tour-tore*. *Pore* and *tore* were unanimously written down as *poor* and *tour*, respectively. One female informant provided *purr* for all repetitions of *poor* and *pore*. This indicates that the opposition between CURE and NORTH/FORCE is lost in this variety.

Figure 4.39 shows the individual F1-F2 values of the vowels in the pairs *poor-pore* and *tour-tore* for 6 speakers. The F1-F2 values are fairly overlapping which suggests that the vowels in each pair have similar qualities. Statistically 2-way ANOVA tests showed that the vowels in the pairs *poor-pore* and *tour-tore* were not significantly different in their F1 and F2 values: *poor-pore*: F1: $F(1,5) = 0.18$, $p = 0.687$, F2: $F(1,5) = 0.05$, $p = 0.828$, *tour-tore* F1: $F(1,5) = 1.11$, $p = 0.340$, F2: $F(1,5) = 0.49$, $p = 0.517$).

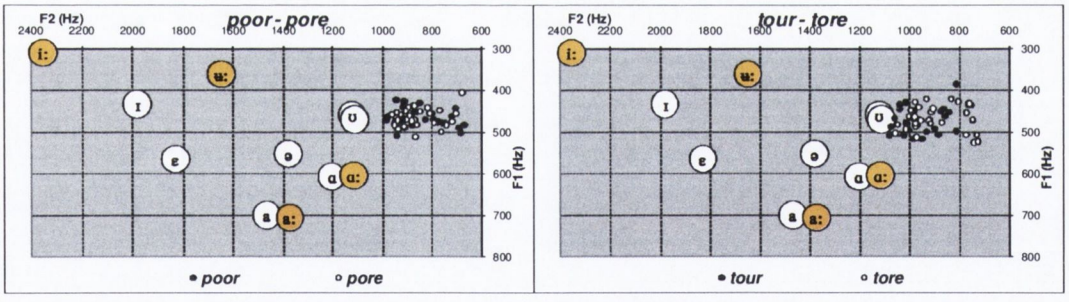

Figure 4.39 Scatter plots of individual F1-F2 values of the vowels in the pairs: *poor-pore* and *tour-tore* for 6 speakers

In general, it seems that the vowels of NORTH/FORCE and CURE are neutralised all realised as [oːɹ] in this variety.

START /aːɹ/

The vowel of START represents TRAP and BATH +/ɹ/, /aːɹ/. For DroghE, the realisation of the START vowel is investigated in *hard* and *far*. Figure 4.40 shows the individual F1-F2 values of the vowels in *hard* and *far* for 11 speakers. One speaker (OC) had a close

realisation in *hard* [ɛ:]. It is noted that some realisations are raised in comparison to the TRAP vowel, however this vowel is best transcribed as /a:ɹ/.

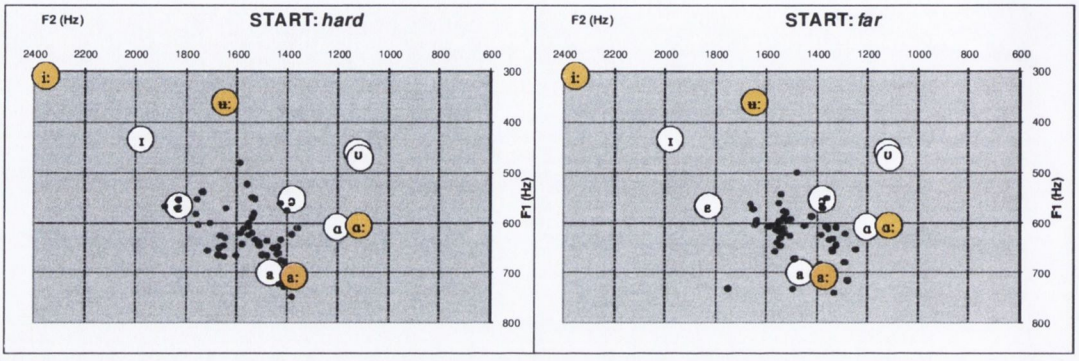

Figure 4.40 Scatter plots of individual F1-F2 values of the vowels in *hard* and *far* for 11 speakers

4.1.5 Summary of Vowels

The results of the vocalic system of DroghE were based on the perception experiment of minimal pairs, auditory judgment, and on acoustical analysis. The vocalic system that emerges consists of six short vowels [ɪ, ɛ, ə, a, ɑ, ʊ], four long vowels [i:, a:, ɑ:, ʉ:], and five diphthongs [ɒɪ/ɑɪ, ɔɪ, ɛʉ, oʊ, eɪ]. In /Vɹ/ contexts, there are two main vowel oppositions. The variety does not appear to have undergone the NURSE Merger which results in the EARN-URN opposition, /ɛɹ/ vs. /ɷɹ/, giving minimal pairs such as *earn-urn* and *ferry-furry*. The vowel of LIR is similar to the URN vowel, both realised as /ɷɹ/.

The FOOT-STRUT Split does not seem to have occurred in variety under study, resulting in homophonous pairs such as *could-cud* and *took-tuck*. The vowel is realised as /ʊ/ which is a short rounded close-mid back vowel. Moreover, some words of the FOOT set which are spelt with 'oo' can have a longer and higher vowel realisation, making words such as *cook* and *rook* belong to the GOOSE set. In DroghE, the GOOSE vowel is realised as a long high central rounded vowel [ʉ:] which is similar to its realisation in Northern IrE. The realisation of the TRAP vowel is retracted compared to that in RP. The TRAP and BATH sets have a similar vowel quality but distinct in duration, /a/ and /a:/ respectively. However, some lexical items of the BATH set seem to belong to the TRAP set, collapsing pairs such as

Mater-matter and *Pam-palm*. Similarly, the vowels of LOT and THOUGHT are realised as open back unrounded vowels. However, they are distinct in duration: /ɑ/ and /ɑ:/, respectively. In RP, the vowels in *soft* and *boss* belong to the LOT set, while in DroghE they are realised as /ɑ:/ and belong to the THOUGHT set. The monophthongs of FLEECE, KIT, and DRESS have similar realisations to those in RP.

The common realisations of the PRICE and CHOICE vowels are [ɒɪ/ɑɪ, ɔɪ], respectively. Perceptual and acousitic analysis suggests that the PRICE-CHOICE opposition is partially neutralised, resulting in homophonous pairs such as *vice-voice, aisle-oil,* and *buy-boy*. The MOUTH vowel is realised with a front open-mid and unrounded first element which glides towards a central rounded close vowel [æʉ] or [ɛʉ]. Unlike rural Southern IrE varieties and similar to Dublin English, the vowels of FACE and GOAT have diphthongal realisations: [eɪ] and [oʊ/oᵘ], respectively.

Perceptual and acoustic analysis suggests that DroghE has not undergone the NURSE Merger. The lexical sets EARN and URN are proposed to represent the unmerged vowels giving minimal pairs such as *earn-urn* and *ferry-furry* with /ɛɹ/ and /ʊɹ/ realisations, respectively. A few speakers, however, show the NURSE Merger in such pairs. Moreover, there appears to be an opposition between FLEECE+ /ɹ/- KIT+ /ɹ/ for which the lexical sets LEAR-LIR are proposed. However, the realisation of the LIR vowel is similar to the URN vowel, both realised as /ʊɹ/: *Lear* [li:ɹ] – *Lir* [lʊɹ]. The lexical sets AIR and ERR are proposed to represent SQUARE and DRESS + /r/, /e:r/ vs. /ɛr/, respectively. However, it seems that this opposition is not evident in DroghE as the vowels in *herd* and *paired* have a similar vowel quality. This suggests that AIR, ERR, and EARN, /ɛɹ/, are the same in DroghE. Finally, there seem to be no opposition between the three sets NORTH-FORCE-CURE. The pairs *horse-hoarse* and *pore-poor* are homophonous.

Table 4.8 shows the vowel realisations in RP (red), SIrE (green), DroghE, and NIrE (orange). DroghE vowel realisations are red, green, or orange, if they are similar to RP, SIrE, or NIrE, respectively. The dominant green in the DroghE column suggests that it is a fairly Southern IrE variety with few exceptions, GOOSE and MOUTH which have typical Northern IrE realisations.

Table 4.8 Vowel realisations in RP, SIrE, and NIrE, based on Wells (1982), and those in DroghE

Lexica Set	RP	SIrE	DroghE	NIrE
STRUT	ʌ	ɐ̟, ɔ̈, ɤ	ʊ	ʌ
FOOT	ʊ	ʊ		ɨ, ʉ
GOOSE	uː	uː	ʉː	ʉː
TRAP	æ	a	a	a̟
BATH	ɑː	a, aː	aː	a(ː)
LOT	ɒ	ɑ	ɑ	ɒ, ɔ
THOUGHT	ɔː	ɑː, ɔː	ɑː	oː
KIT	ɪ	ɪ	ɪ	ɨ
FLEECE	iː	iː	iː	iː, eː
DRESS	ɛ	ɛ	ɛ	æ, ɛː, eə
happy	ɪ	iː	i	e, ë
***lett*ER**	ə	əɪ	əɪ	əɪ
***comm*A**	ə	ə	ə	ə
PRICE	aɪ	ɑɪ, ʌɪ	ɒɪ/ɑɪ	æɪ, eɪ
CHOICE	ɔɪ	ɔɪ, ɒɪ	ɔɪ	ɔɪ
MOUTH	aʊ	æʊ, ɛʊ	ɛʉ	əʉ
FACE	eɪ	eː	eɪ	ɛː, eə, ɪə
GOAT	əʊ	oː	oʊ	oː, oʊ

Table 4.9 shows the vowel realisations in /Vɹ/ contexts in RP, GenAm, and in DroghE. The vowels that show no contrast are shown in the same color. It is noticed that DroghE, as a rhotic variety of English, differs from RP in all vowel realisations in /Vɹ/ contexts. The NURSE is realised as either EARN or URN, /ɛɹ/-/ʊɹ/. Furthermore, the opposition between LEAR (NEAR) and LIR is evident as /iːɹ/-/ʊɹ/, respectively.

Table 4.9 Realisations of the vowels in /Vɹ/ contexts in RP, GenAm, and DroghE

Well's Lexical Sets	RP	GenAm	DroghE	IrE Lexical Sets for DroghE
SQUARE	ɛə	ɛɹ	ɛɹ	**AIR=EARN=ERR**
NURSE	ɜː	ɜɹ	ɛɹ	**EARN (ERR)**
			ʊɹ	**URN**
NEAR	ɪə	ɪɹ	iːɹ	**LEAR**
			ʊɹ	**LIR (URN)**
NORTH	ɔː	ɔɹ	oːɹ	**NORTH**
FORCE	ɔː	oɹ	oːɹ	**FORCE**
CURE	ʊə/ ɔː	ʊɹ	oːɹ	**CURE**
START	ɑː	aɹ	aːɹ	**START**

4.2 Consonants

The consonantal system of DroghE represents a typical southern variety of IrE. Most of the consonantal aspects of DroghE are characteristics of Southern IrE. As mentioned in Chapter 3, the analysis of the consonants is based on auditory analysis and visual inspection of spectrograms. The consonants are examined in read speech (a reading list of sentences and a read story) and in spontaneous speech (retold story and conversational speech). Investigating consonantal realisations across different speaking styles is not the focus of this study. However, since we had available recordings of spontaneous speech (retold story) we report on the realisations of certain consonants in read as well as in spontaneous speech. The consonantal study investigates eight consonantal aspects outlined in Table 4.10 and explained in Chapter 3 (Section 3.5.1).

Table 4.10 Test words for consonantal analysis of the eight investigated consonantal aspects

	Investigated aspects	Context	Item	Compared item
1	**Dental fricative /θ/**	# -	*thin, thought*	*tin, sin*
		V-V	*ether*	*eater, better*
		- #	*path*	
		- ɹ	*three*	*tree*
		- l	*athlete*	
		- s	*faiths*	*fates*
	Dental fricative /ð/	# -	*then*	*den*
		V-V	*breather, bother, father*	*breeder, spider*
		- #	*breathe,*	*breed*
2	**Lenition of /t/**	V- #	*site, heat*	
		C - #	*belt, ant, aunt, halt*	
		V-V	*eater, better, Mater, matter*	
		- # #V	*right (industry), art (of), goat (again)*	
		- # #h	*right heat*	
	Lenition of /d/	- #	*breed*	
		n - #	*end*	
		ɹ - #	*bird*	
		V-V	*breeder, spider*	
3	**/l/**	# -	*Laura*	
		V-V	*follow*	
		- #	*peel*	
		- C	*milk*	
4	**/ɹ/**	# -	*rice*	
		#C -	*bring*	
		t -	*try, tree*	
		d -	*dry*	
		V-V	*sorry*	
		V ˈ-V	*arrive*	
		- #	*far*	
		- C#	*farm*	
		unstressed σ	*surprise*	
5	**/w/ vs. /ʍ/**	spelt with 'w'	*Wales*	
		spelt with 'wh'	*whales*	
6	**/k/+ front vowels**	- front V	*cabs, kick*	*cobs, cock*
	/g/+ front vowels	- front V	*geese, gig*	*goose, Gog*
7	**Yod Coalescence**	tj	*tune*	
		dj	*due*	
		nj	*nuclear*	
8	**/h, k, g/ preceding /j/**	hj	*humane, humorous*	
		kj	*Keogh*	
		gj	*McGeogh*	

Presentation of the findings follows the order of the eight aspects. In general, the analysis suggests that DroghE is a variety of Southern IrE. A salient aspect of DroghE is the realisation of the dental fricatives /θ/ and /ð/ as the alveolar stops [t] and [d], respectively, what Ó hÚrdail (1997) calls 'under-differentiation'. Therefore, in DroghE the words in pairs such as *thin-tin* and *then-den* are homophones. Another aspect is that /t/ and to a lesser extent /d/ undergo lenition word finally and inter-vocalically. For example, /t/ is either produced as a slit [t̪]: *heat* [hi:t̪] or as a glottal stop: *get it* [gɛʔ ɪʔ]. The realisation of /l/ is almost always a clear /l/ even word finally. The realisation of /ɹ/ is weakened word-finally or often dropped. Finally, the distinction between /w/ and /ʍ/ is not retained so that *Wales-whales* are homophones.

4.2.1 Dental Fricatives /θ/ and /ð/

Aspect (1) relates to the realisation of the dental fricatives /θ/ and /ð/ in different contexts. Tables 4.11, 4.12, and 4.13 present the results of the realisations in the reading list, the read story, and in the retold story, respectively. The highest percentages of occurrence are given in red.

Table 4.11 Realisation of /θ/ and /ð/ in the tests words (reading list) in different contexts (4 speakers), the highest percentages are given in red

/θ/ and / ð/ in the reading list													
context	**words**	**speakers**	**tokens**	θ	t̪θ	t^h/t	t̪	t̪	t̪ɹ̥	t̪θɹ̥	ts	θs	tθs
#θ	***thin***	4	**20**	20		80							
	thought	4	**13**	23	8	69							
VθV	***ether***	4	**20**	20		40	30						
θ#	***path***	6	**28**	21		64	14						
θɹ	***three***	4	**20**	5				5	85	5			
θl	***athlete***	4	**20**	65	25	10							
θs	***faiths***	5	**23**								87	48	9
context	**words**	**speakers**	**tokens**	ð	d	ɾ							
#ð	***then***	4	**20**	30	65								
VðV	***breather***	4	**19**	26	37	37							
	bother	6	**30**		47	53							
	father	11	**53**	6	32	62							
ð#	***breathe***	4	**20**	20	80								

Table 4.12 Realisation of /θ/ and /ð/ in the read-story in different contexts (11 speakers), the highest percentages are given in red

/θ/ and / ð/ in the read-story			(Percentage from total tokens %)							
context	**example words**	**tokens**	θ	t̪θ	tʰ/t	t̪	t̪̊	ʔ		
#θ	***thought, third***	**44**	25	2	68	5				
C'θ	***something***	**23**	17	17	57			9		
θɪ	***three***	**11**	9		9		82			
context	**example words**	**tokens**	ð	d̪	d̪̊	ɖ	ɾ	Ø	t	ʔ
#ð	***this, though***	**243**	40	58						
VðV	***mother, other***	**125**	22	26	1		54	4		1
ð#	***with***	**8**	13	38		25			25	13
ðz	***clothes***	**11**						100		

Table 4.13 Realisation of /θ/ and /ð/ in the retold-story in different contexts, represented by count out of total tokens (11 speakers), the highest counts are underlined

/θ/ and / ð/ in the retold-story			(counts from total tokens)						
context	**example words**	**tokens**	θ	tʰ	t̪	s	t̪̊		
#θ	***think, thought***	**13**	2	**11**					
C'θ	***something, everything***	**4**		2		2			
VθV	***nothing***	**1**			1				
θ#	***both***	**1**		1					
θɪ	***three***	**2**	1				1		
context	**example words**	**tokens**	ð	d	ɾ	z	t	ʔ	Ø
#ð	***this, though***	**43**	3	**40**					
VðV	***mother, another***	**114**	13	**89**	10	2			
ð#	***with***	**5**		**3**			1	1	
ðz	***clothes***	**1**							1

Overall, the most frequent realisation of the voiceless dental fricative /θ/ is an alveolar stop /t/ particularly word initially and word finally, although realisations with slit [t̪] also occur. Inter-vocalically, the test word *ether* was mostly realised with [tʰ] but there were some realisations with slit [t̪]. Similarly, in spontaneous speech there were realisations with a slit [t̪] inter-vocalically: *nothing* [nɑt̪ɪŋ]. We did not find strong evidence that /θ/ is realised as [t] preceding /l/ as reported in the literature for Southern IrE: *athlete* [aθli:t]. The words in

the minimal pair *faiths-fates* were mostly produced as homophones, realised with a final [ts].

The majority of the realisations of the voiced dental fricative /ð/ were [d] in all contexts, although inter-vocalically a tap was also very common [ɾ]: *breather-breeder* [ˈbɹiːɾəɹ], *another* [əˈnʊɾəɹ], *mother* [ˈmʊɾəɹ], *otherwise* [ˈɒɾəɹwɔɪz]. In the speech of the four speakers who read the list of sentences, the following pairs were homophones in most cases: *thin-tin* [ˈtʰɪn], *ether-eater* [ˈiːt̬əɹ], *three-tree* [t̪i̪ː], *then-den* [ˈdɛn], *breathe-breed* [ˈbɹiːd], *breather-breeder* [ˈbɹiːdəɹ].

The realisations of dental fricatives as [θ] and [ð] are more likely to occur in careful read speech than in spontaneous speech. There were virtually no dental fricative realisations in the free speech section by any informant. In the read sentences, one speaker (CD) consistently read *ether* with [θ] and *breather* with [ð] but in the free speech section, he consistently produced [t] and [d] in place of dental fricatives e.g. in *think, thirty, that*. The same speaker repeatedly produced *Maynooth* with a final [s] whereas it had [t] by others (e.g. DW in free speech). In the spontaneous speech /t/ and /d/ replace the dental fricatives /θ/ and /ð/ in the speech of all speakers in all contexts: syllable onset e.g. *thing* [ˈtʰɪŋ], *thought* [ˈtʰoʊt], *something* [ˈsʊmtɪŋ], *thousand* [ˈtʰaʊzənd], *their* [dɛɹ], *that* [dat], *then* [dən], *them* [dəm], *this* [dɪs], *though* [doʊ], inter-vocallically e.g. *another* [əˈnʊdəɹ], *mother* [ˈmʊdəɹ], *other* [ˈʊdəɹ], and across words e.g. *with*[wɪd] *her, with the* [wɪdə], *with prince* [wɪt]. Sometimes mixed realisations occurred with a dental stop followed by a dental fricative e.g. in *faith* [ˈfeɪt̪θ], *eater* [ˈiːt̪θəɹ]. Often in fast speech, the consonants were deleted e.g. *and then* [ə nən].

Overall, the dental fricatives /θ/ and /ð/ have collapsed with the alveolar stops /t/ and /d/ in all contexts in the speech of our informants. However, in careful speech the contrast is sometimes retained. These findings support those of Ó hÚrdail (1997), who found a high incidence of this loss of opposition between /θ/ and /t/ and between /ð/ and /d/ in Dublin, Kildare, Meath, and particularly in the town of Drogheda.

4.2.2 Lenition of /t/ and /d/

Aspect (2) relates to the process referred to as lenition of alveolar stops. Lenition of /t/ or /d/ usually occurs in word final position and affects /t/ and to a lesser extent /d/. The phoneme /t/ or /d/ are said to be 'weakened' since the resulting sound would have a less degree of superglottal stricture[13]. This in turn adds to the stop an element of frication. The most common result of this process is the slit [t̪] and [d̪], respectively. Tables 4.14, 4.15, and 4.16 present the results of the realisations of /t/ and /d/ in the reading list, the read-story, and in the retold-story, respectively. The highest percentages of occurrence are given in red.

Table 4.14: Realisation of /t/ and /d/ in the tests words (reading list) in different contexts (4 speakers), the highest percentages are given in red

/t/ and /d/ in the reading list				(Percentage from total tokens %)							
context	**words**	**speakers**	**tokens**	**t**	**t̪**	**ʔ**	**ɾ**	**θ**	**t̪θ**	**h**	**Ø**
Vt#	*site*	3	**15**	13	**47**	13				7	20
	heat	4	**39**	26	**28**	15		18	5	8	
Ct#	*belt*	2	**10**	**100**							
	ant	11	**48**	**100**							
	aunt	11	**51**	**98**	2						
	halt	6	**30**	**100**							
VtV	*eater*	4	**20**	**55**	45						
	better	4	**18**	11	**61**	22	6				
	Mater	11	**51**	**53**	31	4	6			6	
	matter	11	**54**	41	**48**	11					
Vt #V	*art (of)*	4	**18**	21	**53**	26					
	right (industry)	4	**17**	24	**53**	12					12
	goat (again)	5	**23**	43	**52**	4					
Vt #h	*right (heat)*	4	**19**	37	**42**						21
context	**words**	**speakers**	**tokens**	**d**	**d̪**	**dˤ**	**ɾ**	**t**	**Ø**		
Vd#	*breed*	5	**20**	**80**	15	5					
Cd#	*end*	4	**18**	**39**	22			17	22		
	bird	4	**19**	**53**	47						
VdV	*breeder*	4	**20**	**65**	5		30				
	spider	4	**20**	40			**60**				

[13] For a discussion on the definition of lenition see Kallen (2005)

Table 4.15: Realisation of /t/ and /d/ in the read speech (read story) in different contexts (11 speakers), the highest percentages are given in red

/t/ and /d/ in the read-story			(Percentage from total tokens %)						
Context	**example words**	**tokens**	**t**	**t̪**	**ʔ**	**tˀ**	**ɾ**	**h**	**Ø**
Vt#	*hat, midnight*	57	30	42	11	4		5	9
Vt# C	*about (your), white (mice)*	67	25	28	28	16	1		
Vt# V	*have (it all), fit (in)*	50	46	8	12	2	32		
VtV	*daughter, beautiful*	65	32	28	14		26		
Ct#	*heart, embarrassed*	50	50	14		8			28
Ct# C	*felt (very), most (beautiful)*	54	43	6	2	13			37
Ct# V	*spent (all), lost (one)*	39	62	8					31
ɹtV	*parties, dirty*	33	45	24	15				15
Context	**example words**	**tokens**	**d**	**d̪**	**dˀ**	**ɾ**	**Ø**		
Vd#	*need, bride*	109	78	6	7		8		
VdV	*wedding, ready*	17	65		6	29			
Cd#	*yelled ,wand*	86	40	14	2		23		
Cd# C	*amazed (by), land (was)*	107	35	3	8		54		
Cd# V	*dreamed (of), held (on)*	39	59	8	5		28		

Table 4.16 Realisation of /t/ and /d/ in spontaneous speech (retold story) in different contexts (11 speakers), represented by count out of total tokens, the highest counts are underlined

Retold Story (lenition of /t/ and /d/)			(counts from total tokens)				
context	**example words**	**tokens**	**t**	**t̪**	**ɾ**	**ʔ**	**Ø**
Vt#	*might, midnight*	43	4	21		17	1
Vt# C	*get (ready), put (her)*	10				10	
Vt# V	*fit (anyone), hit (it off)*	13	1	4	1	7	
VtV	*mater, beautiful*	18	2	6	1	8	1
Ct#	*heart, went*	10	6	2			2
ɹtV	*dirty, certain*	10	2	2		5	1
context	**example words**	**tokens**	**d**	**d̪**	**ɖ̪**	**ts**	**Ø**
Cd#	*wand, old, and*	10	3	4	1	1	1

The general observation is that /t/ is mostly realised as [t̪]. However, in read speech the lenited [t̪] competes with [t] word-finally and with both [t], [ʔ], and [ɾ] inter-vocalically. In inter-vocalic contexts, the competition is between the variants [t̪], [t], and [ʔ] in the reading list and between [t̪], [t], and [ɾ] in the read-story. Examples from read speech are: *right*

industry ['ɹɑɪt̪ 'ɪndəstɹɪ], *matter* ['maṭəɹ], *writing* ['ɹɑɪṭɪŋ], *beauty* ['bju:ʔɪ]/['bju:tɪ], *art* of ['aɹṭɔv]/['aɹʔɔv]. There were other realisations including [h] and deletion. Instances of deletion in word-final position occurred only in the word *site* (3 tokens) *site* ['sɑɪ] and the word *midnight* ['mɪdnɑɪ] (5 tokens).

In codas consisting of more than one consonant, the most common realisation is [t] or deletion, e.g. *aunt, went, belt, looked* are all pronounced with a final [t] and *most, lost* have lost the final /t/. Deletion or non-lenited /t/ in complex codas has also been reported in working-class Dublin English (Kallen, 2005).

In the retold-story, the most common realisation is [ʔ] in all contexts except word-finally where [t̪] is common. Examples from spontaneous speech in contexts other than word-finally and complex codas are: *fit anyone* ['fɪʔanɪwʊn], *daughter* ['daʔɔɹ]/['datəɹ], *get a* ['gɛʔa], *forget about* [fə'gɛʔə'bɛʁʔ], *delighted* [dɪ'lɔɪʔɪd], *beautiful* ['bju:ʔɪfʊl], *excited* [ɛk'sɒɪʔɪd], *devastated* [dɛvəs'teɪʔɪd], *out of* [aʁʔɑv], *put it on* ['pʊʔɪʔɔn], *dirty* [dʊɹʔɪ], *started* ['sta:ɹʔɪd], *certain* ['sɛɹʔɪn], *parties* ['paɹʔi:z]. Examples from the spontaneous speech word-finally are: *night* ['nɑɪt̪], *great* ['gɹɛɪṭ], *for it* [ɪṭ], *get* [gɛṭ], *over it* [ɪṭ], *out* [aʁt]/[aʁṭ], *not* [nɔṭ], *about* [ə'baʁṭ], *fit* [fɪṭ], *feet* [fi:ʔ], *fat* [faʔ]/[fat], *get me* ['gɛʔ], *that* [daʔ], *but* [bʊt]/[bʊʔ], *upset* [əp'sɛt̪]/[əp'sɛʔ], *put* ['pʊʔ], *it was* [ɪʔ], *midnight* ['mɪdnɑɪ], *didn't* [dɪdnʔ], *straight* ['stɹeɪʔ], *forget* [fə'gɛʔ].

Lenition is less common in the realisations of /d/. The most common realisation of /d/ word finally and inter-vocalically is [d] e.g. *said* [sɛd]. The data from the retold-story for /d/ were very limited. The lenited realisations of [ḍ] were mostly of the word *and* (3 tokens). However, in intervocalic contexts /d/ was often realised as a tap [ɾ], e.g. *breeder, spider, ready*. Deletion of /d/ occurred in complex codas, e.g. *old* [oʊl], *end* [ɛn].

We did not observe cases of lenition in word initial positions even when preceded by a vowel of a preceding word. For example, none of the eleven speakers had a lenited form of /t/ in the contexts of *'once a upon a time'* and *'go to the ball'*. The different forms of /t/ or

/d/ are context-specific e.g. deletion of the alveolar stop in complex codas, [ɾ] inter-vocalically, and [t̪] mostly word finally.

4.2.3 Liquids /l/ and /ɹ/

Aspect (3) concerns the realisation of /l/ which is reported to have a clear realisation in all positions in IrE, with the exception of Dublin English. In our data, this seems to be the case with the exception of one speaker (CD) who manifests [ɬ] in all contexts except word initially. The other speakers have a clear /l/ in all positions, word initially: *Laura*, pre-consonantally: *milk*, inter-vocalically: *follow*, and word finally: *peel*.

Aspect (4) relates to the realisation of /ɹ/. Before proceeding to own data, we listened to recordings of DroghE available from *A Sound Atlas of Irish English* (Hickey, 2004). Recordings representing DroghE came from 18 speakers. Only five speakers (including a 55 year old woman) had what is often referred to as uvular [ʁ]. The majority had a sort of a weak alveolar [ɹ]. Examples are also found in Cavan. Hickey (2004) reports that the uvular [ʁ] realisation is found mainly on the north-east coast of the Republic particulalry in an area from Drogheda up to Dundalk and along the south side of Ulster. He further suggests that this realisation is a relic of the first form of English in the east coast of Ireland and that it was replaced by alveolar [ɹ] typical in the south and a retroflex [ɻ] typical of the north varieties (2004, 78-79). He observes that [ʁ] is now recessive and only found in syllable-final position: *beer* [biəʁ], *square* [skwɛəʁ] (2007: 320-21). However, we believe that this variant is not fully uvular as often reported but is a form of weakly articulated /ɹ/ and possibly pharyngealized. A similar pharyngealized variant of /ɹ/ is also said to occur in Glasgow English (Paul Foulkes, personal communication). The weakly articulated /ɹ/ is often heard as a slightly retracted open-mid central short vowel [ɐ̯]. This realisation is similar to that realised by German speakers when they produce a uvular variant of /ɹ/ post-vocalically.

In our recordings, one speaker of the four who read the test words in Table 4.10 had [ɐ̯] for /ɹ/ in coda position. The other speakers had an alveolar approximant [ɹ] in most contexts: syllable onset: *rice, bring*, inter-vocalically: *arrive, sorry*, and in coda position: *far, farm.* The realisation of [ɹ] was weak and often lost word finally: *slipper, after*, and *messenger.* However, speakers who drop the /ɹ/ word finally are not consistent in this: *ever after* [ˈa:ftə]/[ˈa:ftəɹ], *near* [ˈni:ɹ] *twelve* (OC, retold-story), *messenger* [mɛsəngə], *all their* [dɛɹ] *time*, *four*[ɹ] *mice* (DW, retold-story), *slipper* [slɪpə], *for*[ɹ] *this girl* [gɛɹl], *got her* [həɹ] *some jewelry* (SK, retold-story). All speakers dropped /ɹ/ in *surprise* [səprɒɪz]. In contexts following /t/ and /d/, the realisation of /ɹ/ was devoiced which gave affricated variants of the preceding alveolar stop: *tree* [ˈt̪i̥i:], *try* [ˈt̪i̥ɔɪ], *dry* [ˈd̪i̥ɔɪ].

In the read-story there were more instances of [ɐ̯]. The context for [ɐ̯] is almost exclusively the syllable coda. Speakers often oscillate between [ɐ̯] and dropping the /ɹ/ word finally. Table 4.17 shows the results of /ɹ/ realisations in the read-story and the re-told story for eleven speakers. The highest percentages of occurrence are given in red in the read-story.

Table 4.17 Realisations of /ɹ/ in the read speech (read story) and spontaneous speech (retold story) (11 speakers), the highest percentages are given in red

/ɹ/ in the read-story			(Percentage from total tokens %)		
context	**example words**	**tokens**	**ɹ**	**ɐ̯**	**∅**
ɹ#	*dear, slipper*	111	50	20	31
ɹC#	*girl, slippers*	78	78		22
/ɹ/ in the re-told story			**(counts from total tokens)**		
context	**example words**	**tokens**	**ɹ**	**ɐ̯**	**∅**
ɹ#	*ever, slipper*	47	25		22
ɹC#	*work, sisters*	10	5		5

Although the data from spontaneous speech might suggest that the [ɐ̯] realisation of /ɹ/ is recessive, it should be noted that the spontaneous speech data was very limited to produce a proper comparison with the read speech.

4.2.4 Other Consonants

Aspect (5) relates to the possible opposition between the voiced labial-velar approximant /w/ and the voiceless labial-velar fricative /ʍ/. For all speakers, the test words *Wales* and *whales* were homophones. In the read-story, almost all renditions of *what, where, when,* and *why* were [w]. One speaker (LD) had [ʍ] in words such as *white, why* but [w] in *where*. Unlike what is regarded as typical in Southern IrE, /ʍ/ was rarely observed in the read or in the spontaneous speech: *why* [ˈʍɑɪ], *when* [ˈwɛn], *what* [ˈwaṭ], *white* [ˈwɒɪṭ]. Therefore, we conclude that the opposition between /w/ and /ʍ/ is only residually present in DroghE. In that regard, DroghE appears to be more similar to Northern IrE and RP than to Southern IrE.

Aspect (6) concerns the realisation of the velar stops preceding front vowels. The realisation of /k/ was an aspirated palatal stop in *cabs* and *kick* [cʰ] whereas it was [kʰ] in *cobs* and *cock*. Similarly, the realisation of /g/ in *gig* and *geese* was a voiced palatal stop [ɟ] whereas in *Gog* and *goose* it was [g]. The fricative palatal variants [ç] and [j̬], which are reported for some varieties of Southern IrE in contexts preceding front vowels, were not observed here.

Aspects (7) relates to the process of Yod-Coalescence, the assimilation of /j/ with the preceding alveolar consonant to give a post-alveolar consonant. Yod-Coalescence occurred where /j/ followed alveolar stops /t, d/: *tune* [ʧu:n] and *due* [ʤu:]. Similar to what has been reported for Dublin English (Wells, 1982: 435), we find that Yod-Coalescence is common in stressed syllables in DroghE.

Aspect (8) relates to the realisation of the consonants /h/, /k/ and /g/ when followed by /j/. The realisation of /k, g/ was an aspirated palatal stop: *Keogh* [ˈcʰoʊ] and a voiced palatal stop: *McGeogh* [məˈɟoʊ] respectively. Instances of fricative realisations such as [ˈçoʊ] and [məˈj̬oʊ] rarely occurred. Following /h/, co-articulation of /j/ with /h/ yielded a palatal fricative [ç] in the speech of two speakers (CD, CM) but was absent in the speech of the

other two speakers (ND, OC): *human* and *humorous* were either [ˈç:mən], [ˈçu:mərəs] or [ˈhju:mən], [ˈhju:mərəs].

In general, Yod-Dropping is not a feature of DroghE. For the four speakers who read the test word *nuclear*, two dropped /j/ after /n/: *nuclear* [nu:kləɹ] (CM, OC), whereas the other two did not: [ˈnju:klɪəɹ] (CD, ND). In the read-story, the majority of the eleven speakers produced instances of the word *new* as [nju:] even those who dropped /j/ after /n/ in the test word *nuclear*. This suggests that the conditions set by Hickey for Yod-Dropping (for the preceding sound to be sonorant, an alveolar, and that the syllable should be stressed (2007: 325) do not necessarily have predictive accuracy here.

4.3 Summary

This chapter has presented a description of the vocalic and consonantal systems of the variety of DroghE. The analysis suggests that DroghE is a typical southern variety of IrE. In terms of the vocalic system, the most important aspect is the neutralisation of the STRUT and FOOT vowels giving homophonous pairs such as *tuck-took* and *cud-could*. This vowel is realised as [ʊ]. Similar to Southern IrE varieties, the vowel of TRAP is a fairly retracted vowel [a] and the vowel of LOT is unrounded [ɑ]. The DRESS vowel, [ɛ], is slightly lower than that in RP. The PRICE and CHOICE vowels have similar qualities: the first element in both vowels occurs in the back area of the vowel space [ɒɪ/ɑɪ] and [ɔɪ] respectively. For many speakers the [ɒɪ] realisation of the PRICE vowel often results in homophonous pairs such as *pint-point, aisle-oil,* and *buy-boy*. However, other speakers retain a distinction between PRICE and CHOICE. This suggests that the neutralization of PRICE and CHOICE is partial. DroghE does not seem to have undergone the NURSE Merger which results in minimal pairs such as *earn-urn.* The LIR vowel is of a /ʊɹ/ vowel quality and is the same as the URN vowel.The potential opposition between NORTH, FORCE, and CURE has also neutralised so that *horse-hoarse* and *pore-poor* are homophones.

There are a number of consonantal findings which clearly align DroghE with Southern IrE varieties. First of all, there is the lack of dental fricatives as they are most frequently realised as alveolar stops, the contrast with 'original' /t, d/ tends to be lost. Therefore, a salient feature in DroghE is the very frequent use of the alveolar stops /t/ and /d/ in place of

the dental fricatives /θ/ and /ð/, respectively, in all environments. The lenition of /t/ as a slit [t̪] word-finally and inter-vocalically is a common characteristic in the analysed data. Furthermore, glottalisation of /t/ is as frequent as the use of slit [t̪] word-finally and inter-vocalically. The realisation of /l/ is clear in all environments. Finally, DroghE exhibits instances of a weak articulation of /ɹ/ word finally, which can be transcribed as [ɻ̞].

Certain features of DroghE are similar to Northern IrE. The realisation of GOOSE is similar to that of NIrE: a close, central rounded vowel [ʉː]. Also, the first element of MOUTH is a front open-mid vowel and glides towards a central rounded vowel [ɛʉ] similar to the Northern IrE realisation. Contrary to what is usually reported for Southern IrE varieties, with the exception of Dublin English, (Wells, 1982), DroghE has diphthongal realisations of the FACE and GOAT vowels. The opposition between /w/ and /ʍ/ is only residually present in DroghE where words such as *what* and *whales* have [w], and in this respect, DroghE may be closer to Northern IrE and to RP than to Southern IrE.

Now that we have presented a description of the segmental system of DroghE, which is typically southern with few northern influences, as shown in Table 4.8 for the vocalic system, we move on to describe the intonational system. Chapter 5 investigates the tonal patterns that are prevalent in this variety in different types of utterances.

Chapter 5 The Tonal Patterns of Drogheda English

In this chapter, we present the analysis of the tonal patterns in DroghE as elicited in four utterance types: statements (ST) wh-questions (WQ), yes-no questions (YQ), and declarative questions (DQ). The analysis is based on Corpus E, available in Appendix 5 as explained in Chapter 3. First, results for statements are presented, then the three kinds of questions WQ, YQ, and DQ, respectively. For each utterance type we present the most common nuclear contour and discuss separately the pre-nuclear accent, nuclear accent, and edge-tone realisations. Finally, we relate our findings to other IrE varieties and conclude that in regards to the tonal patterns in DroghE the prevalent patterns are generally similar to what has been reported for Dublin English.

5.1 Tonal Patterns of Drogheda English

In the following sections each utterance type is presented separately. Table 5.1 shows the materials of Corpus E, recorded for seven informants, on which the analysis is based. There are 23 utterances (8ST[14], 5 WQ, 5 YQ, and 5 DQ). The DQ *Manny has a meeting with the manager?* was included initially to be compared with its corresponding forms in ST, WQ, and YQ. However, the renditions of this DQ were excluded since they were not suitable for analysis for reasons that will be explained when discussing DQ.

In all graphs, the pitch scale is shown in ERB, on the right, which is considered a suitable scale for intonation research (Hermes and van Gestel, 1991, Nolan, 2003). The pitch in (Hz) is shown on the left margin of the graphs for ease of comparison. For speakers GM and JG, who have a higher pitch range than other speaker, the pitch range is shown from 2.331 to 6.367 ERB (75-250Hz) whereas for the rest of the speakers it is shown from 2.331to 4.253 ERB (75-150Hz).

[14] The initialisms ST, WQ, YQ, and DQ, are used interchangeably to present plural or singular nouns (e.g. 'ST are . . . ' or 'a ST is . . .')

Table 5.1 The 23 utterances on which the present study is based, a total of 626 tokens by seven speakers

tokens	ST	tokens	WQ
34	*Here's the manual.*	35	*Where's the manual?*
28	*Manny lives in Mallow*	20	*When did Manny live in Mallow?*
29	*Amanda is selling the mandolin.*	25	*When is Amanda selling the mandolin?*
30	*Manny has a meeting with the manager.*	25	*When does Manny have a meeting with the manager?*
35	*Ray married Mandy.*	33	*Where are you from?*
33	*Liam is annoyed with Mandy.*		
31	*Laura was mowing the lawn.*		
29	*We live down the Boyne Valley.*		
249		**138**	
tokens	**YQ**	**tokens**	**DQ**
30	*Is this the manual?*	35	*You mean the manual?*
22	*Does Manny live in Mallow?*	18	*Manny lives in Mallow?*
25	*Is Amanda selling the mandolin?*	22	*Amanda is selling the mandolin?*
23	*WQ4: Does many have a meeting with the manager?*	(24)	*Manny has a meeting with the manager?*
31	*May I leave the meal early?*	33	*You live in Mallow?*
131		**132**	

We have already established in Chapter 4 that the segmental system of DroghE is typical of a southern variety of IrE. Consequently, we expect that the tonal patterns would similarly be southern in character. As part of the IViE project, Dublin English was found to exhibit a falling nuclear contour in statements, whereas in Belfast English it was a rising nuclear contour (Grabe et al., 2003, 2004). As presented in Chapter 2, the few studies on the intonation of Southern IrE suggest that the default nuclear contour in statements is a falling contour. The reader is reminded that in our modified version of the ToBI labelling system, we label the falling nuclear contour as either H* L-L%, a normal 'fall', or H* L-%, 'fall, plateau' (see Chapter 3). The main distinction between the two nuclear contours is that the latter is a type of a fall that is not as steep as the former, and often ends with a plateau in the mid of the speaker's pitch range. In the system devised in this study, the common nuclear contour in Belfast English would be labelled as L*+H H-% and termed a 'rise-plateau'.

The present findings suggest that the default tonal pattern in statements of DroghE is a series of H* that ends with a falling nuclear contour: H* H* H* L-L%. This is found to be the same for wh-questions and yes-no questions. Declarative questions, however, are characterised by a sequence of H* ending in what we call a 'scooped-fall' nuclear contour: H* H* L+H* L-L%. The most common edge-tone (phrase accents and boundary tone) was L-L% in all utterance types. Other edge-tones were L-% and H-%. Figure 5.1 shows the distribution of initial pre-nuclear (PN) accents, nuclear (N) accents, edge-tones, and the whole nuclear contour across the four utterance types, respectively.

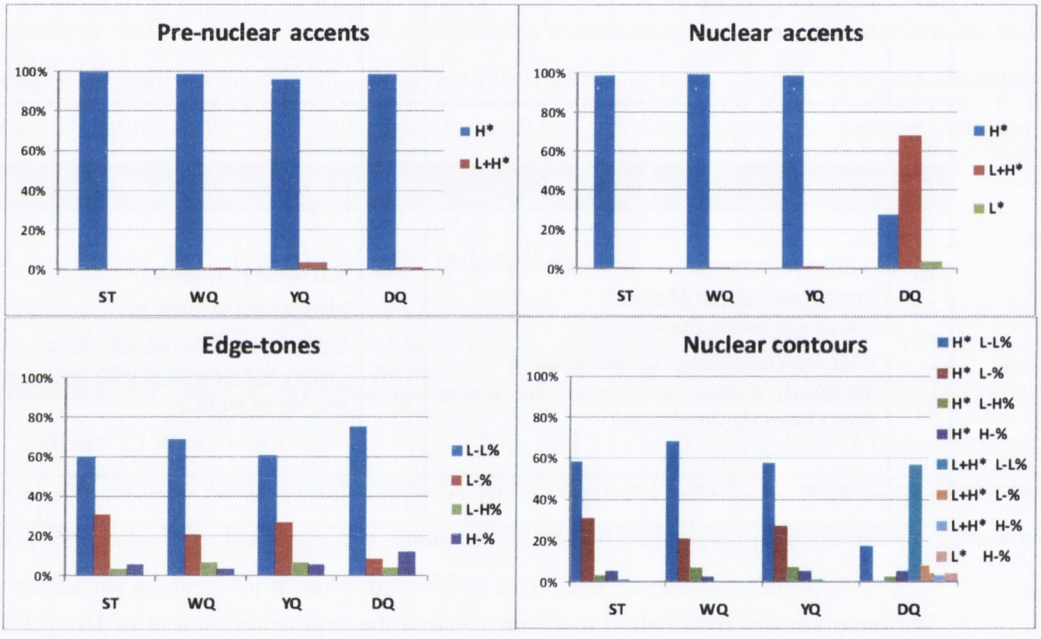

Figure 5.1 Distribution of initial PN accents, N accents, edge-tones, and the nuclear contours across the four utterance types, respectively

5.2 Statements (ST)

Figure 5.2 shows the distribution of the nuclear contours for 249 statements across the speakers. It is noticed that a falling nuclear contour is the most common, particularly the normal 'fall' (H* L-L%). In over 30% of statements the nuclear contour is a 'fall, plateau', where the fall is not as steep as that of the 'fall' and usually ends in a plateau.

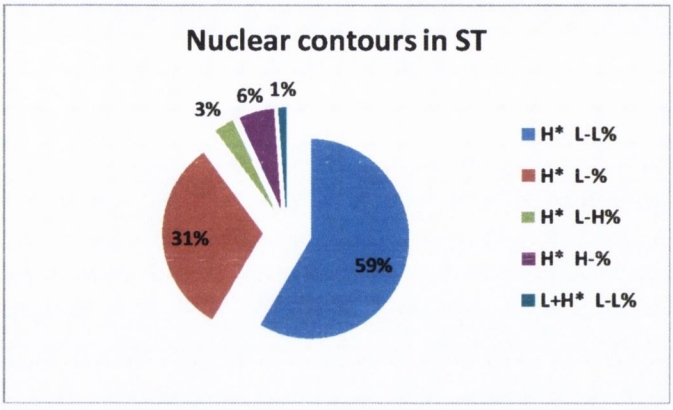

Figure 5.2 Distribution of nuclear contours in ST (249 tokens)

Figures 5.3 and 5.4 show a 'fall' nuclear contour in *Manny has a meeting with the manager*, and a 'fall, plateau' in *Amanda is selling the mandolin*, respectively, produced by two different speakers (the potentially pitch-accented syllables are underlined).

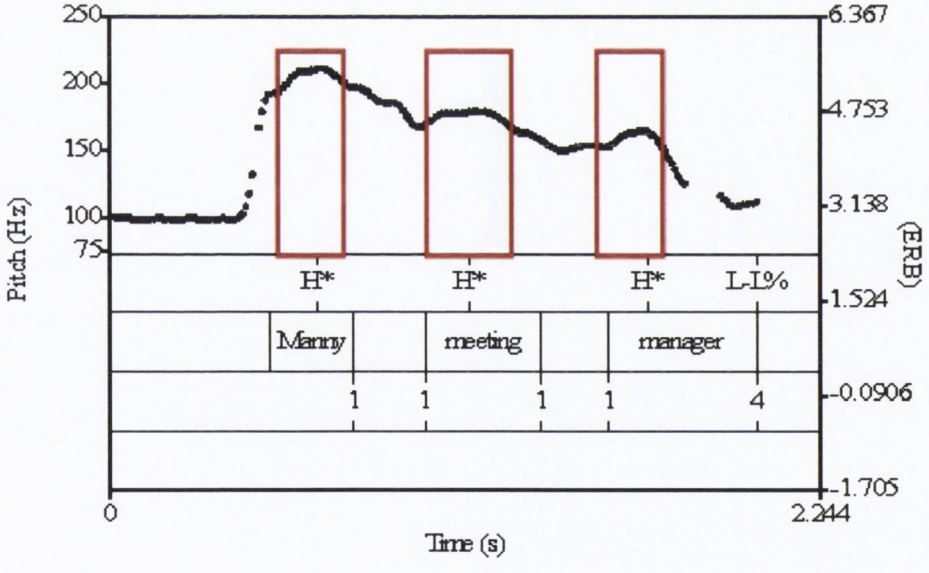

Figure 5.3 A 'fall' nuclear contour shown in *Manny has a meeting with the manager*; the red rectangles encompass the pitch-accented syllables, sound file (ST4_Manny_has_a_meeting_with_the_manager_3_GM)

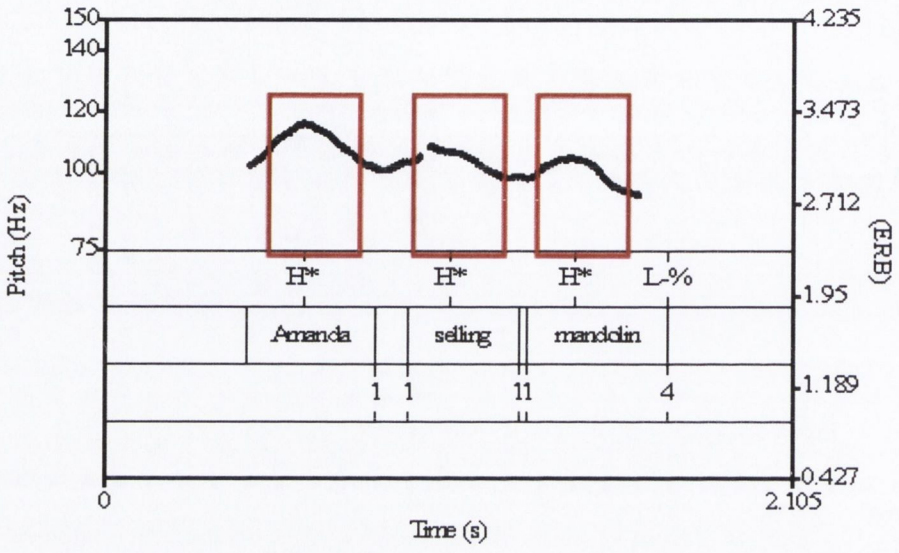

Figure 5.4 A 'fall, plateau' nuclear contour shown in *Amanda is selling the mandolin*, the red rectangles encompass the pitch-accented syllables, sound file (ST3_Amanda_is_selling_the_mandolin_3_GO)

5.2.1 Initial Pre-nuclear Pitch Accents in ST

The initial f0 onset in the contours of the statements averages 3.92 ERB (120Hz) across all speakers. Initial pre-nuclear accents are almost always H* as shown in Figure 5.5. It should be noted, that similar to ToBI, what is transcribed as H* here mainly suggests a peaked target. It should be noted that flat variants of H*, what is usually termed a 'high' are also labelled as H* in ToBI. However, in our data the initial PN accents were always peaked H* targets in statements as well as in other question types.

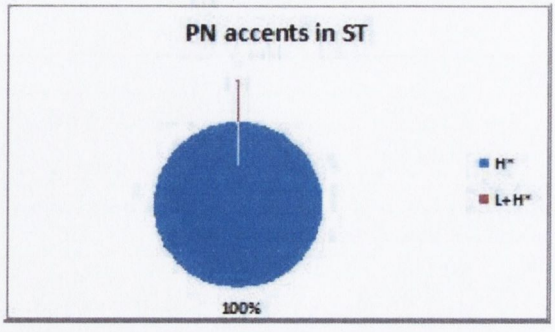

Figure 5.5 Distribution of initial PN accents in ST (249 tokens)

The peak of the initial pitch accent was usually located within the vowel of the pitch-accented CVC syllable (e.g. /man/ in *Amanda*) and CV(C) syllable (e.g. /ma(n)/ followed by ambi-syllabic /n/ in *Manny*). Figures 5.6 and 5.7 illustrate the typical peak positions in both syllable structures, respectively. In Figure 5.6, the peak is located within the vowel of /man/ in *Amanda*. Similarly, the nuclear peak is located within the vowel of /man/ in *mandolin*. However, in Figure 5.7 the initial PN peak is located later (in the second syllable) in *Manny*. Delayed peaks on initial PN pitch accents will be discussed in Chapter 8, and it will be shown that the lack of unstressed material before the initial PN accent can result in the peak being delayed. It is can also be noted that the peak in the PN accents is somewhat later in the vowel than that in N accents, a phenomenon also discussed in Chapter 8.

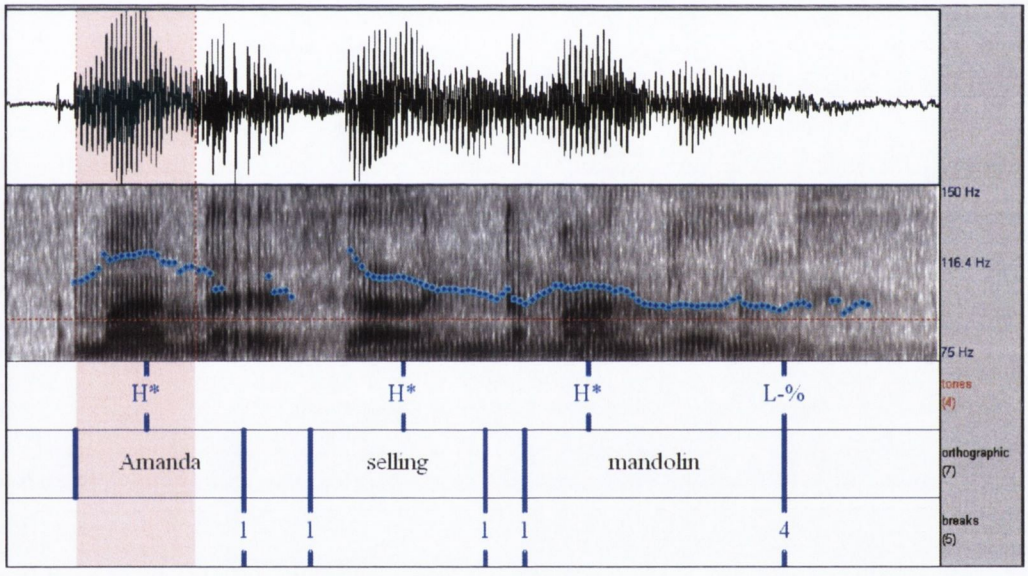

Figure 5.6 Peak timing of the initial PN accent in *Amanda is selling the mandolin*, the pink bar encompasses the pitch-accented syllable /man/ in *Amanda*, the pitch accent labels are placed at the peak locations, sound file (ST3_Amanda_is_selling_the_mandolin_4_GO).

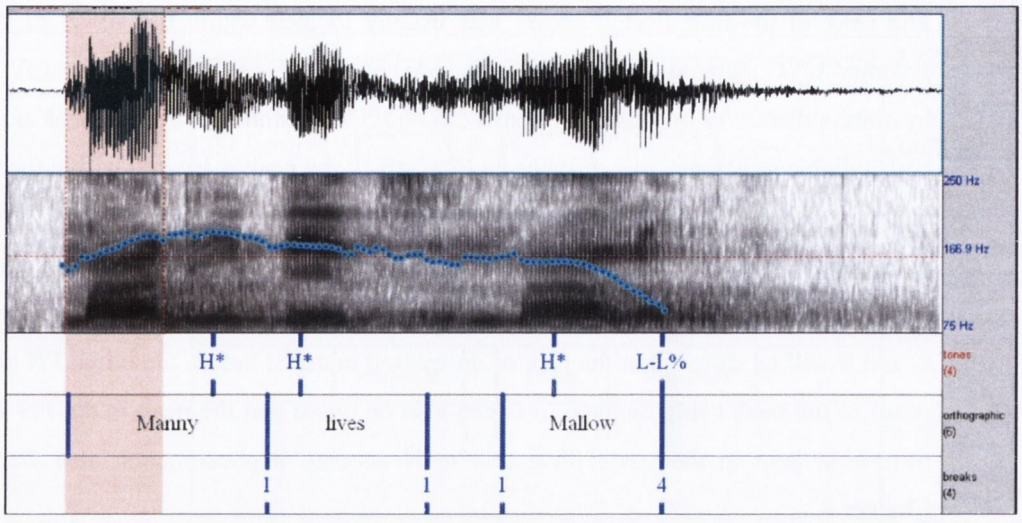

Figure 5.7 : Peak timing of the initial PN accent in *Manny lives in Mallow*, the pink bar encompasses the pitch-accented syllable /ma(n)/ in *Manny*, the pitch accent labels are placed at the peak locations, sound file (ST2_Manny_lives_in_Mallow_4_GM).

5.2.2 Nuclear Pitch Accents & Edge-tones in ST

The nuclear accents are commonly realised as H* which are followed by a low phrase accent and boundary tone (L-L%). The second most common edge-tone (31%) is L-% where the fall is gradual and not as low in pitch as in L-L%. It should be noted that (L-%) was employed by the majority of speakers with varying degrees, as some speakers used this edge-tone more than others (particularly GO, RK, and SS). There were also few cases of what is termed in the modified ToBI 'high, plateau' (6%) nuclear contours (H* H-%) as shown in Figure 5.8. These contours usually end with relatively the same pitch level as that of the nuclear accent; the pitch level is sustained.

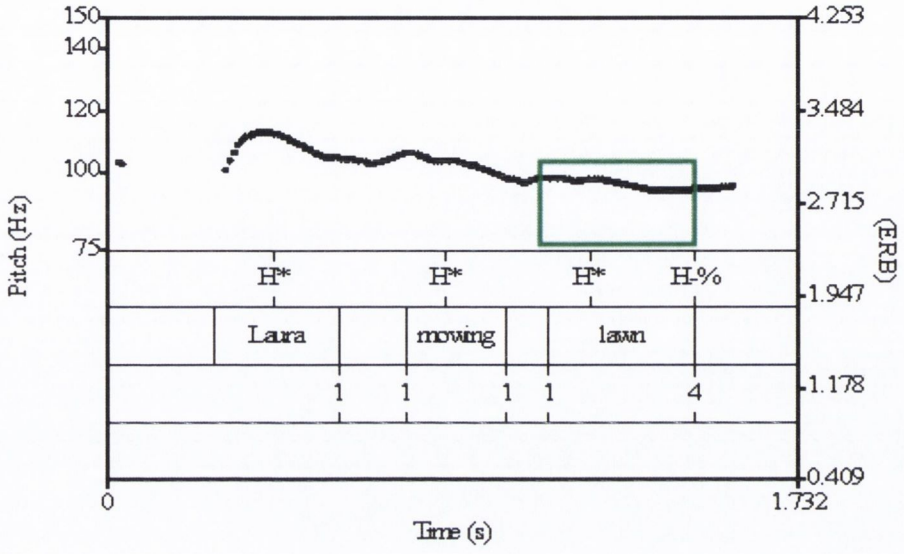

Figure 5.8 A 'high, plateau' nuclear contour shown in *Laura was mowing the lawn*, the green rectangle encompasses the material in the nuclear contour, sound file (ST_Laura_was_mowing_the_lawn_3_GO)

'High, plateaus' were not reported for Dublin English in any of the four utterance types: ST, WQ, YQ, or DQ (Grabe, 2004). However, Sullivan (2006: 41) suggests that this pattern is not uncommon in the Dublin data (from Malahide). Another less common edge-tone is a small rise after the N accent H* L-H%. This edge-tone was only present in the speech of one speaker (GM) as shown in Figure 5.9. The green rectangle includes all material in the nuclear contour on *manual*. The pitch goes down after being high on /man/ (demarcated by the red dashed rectangle) then goes up on the last syllable in *manual*. This nuclear contour is labelled as H* L-H% and termed 'fall, rise' in the modified ToBI. The use of the comma in the terminology indicates that the rise occurs as a realisation of the edge-tone (see Chapter 3).

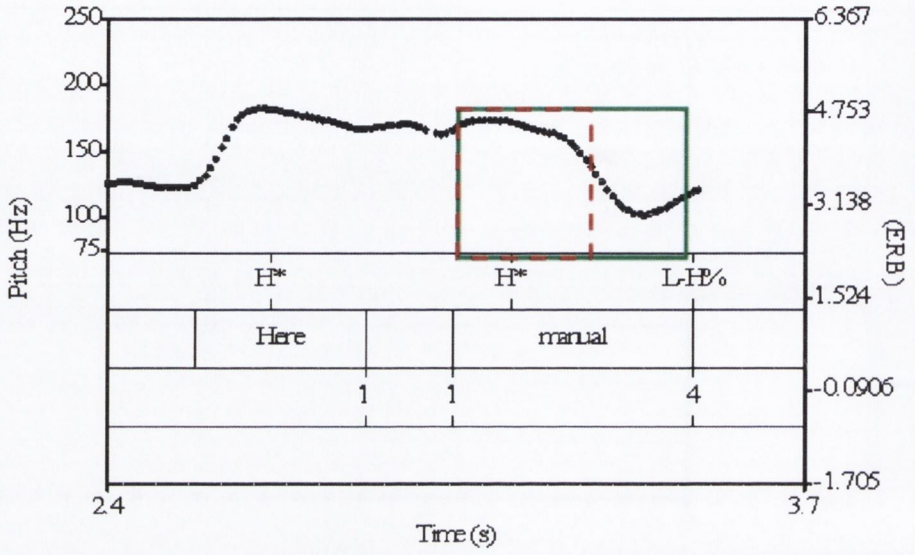

Figure 5.9 A 'fall, rise' nuclear contour shown in *Here is the manual*, the accented syllable /man/ is demarcated by the red dashed rectangle, the green rectangle encompasses the material in the nuclear contour, sound file (ST1_Here_is_the_manual_5_GM)

The distribution of N accents and edge-tones in ST is given in Figure 5.10. The different combinations of N accents and edge-tones result in different nuclear contours as presented earlier in Figure 5.2.

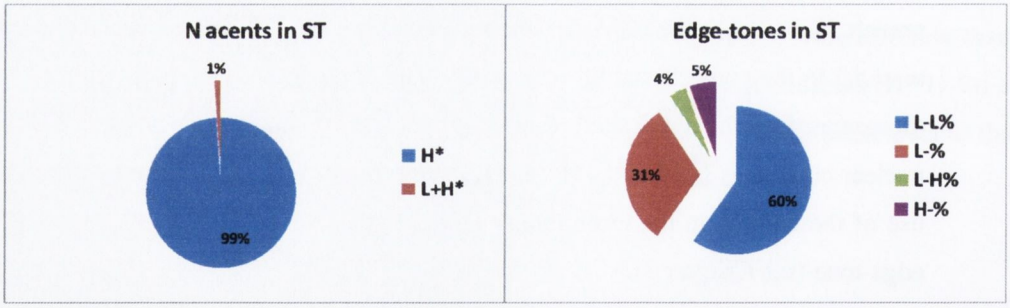

Figure 5.10 Distribution of N accents and edge-tones in ST (249 tokens)

It appears that the default tonal patterns of statement in DroghE, H* H* H* L-L%, is similar to that found in Dublin English (Grabe, 2004, Grabe et al., 2003, Grabe and Post, 2002). However, since the few descriptions of IrE intonation do not differentiate between

different types of falls based on edge-tone types, it is not clear to what extent 'fall, plateaus' are common in southern varieties of IrE. Nonetheless, it has been suggested by Sullivan (2006) that such non-steep nuclear contours are common in Dublin English (from Malahide) and Wexford English.

5.3 Wh-Questions (WQ)

Figure 5.11 shows the distribution of nuclear contours in WQ (138 tokens) across the speakers. Similar to ST, the most common nuclear contour in WQ is a fall, H* L-L%. However, it is noticed that the percentage of this nuclear contour is higher in WQ than in ST. Concomitantly, there are fewer 'fall' plateaus' (21%) than in ST. This indicates that the slope of the f0 contour is steeper than that in ST as will be discussed in detail in Chapter 6. A less common nuclear contour is the 'fall, rise' (7%), again mostly produced by the same speaker (GM).

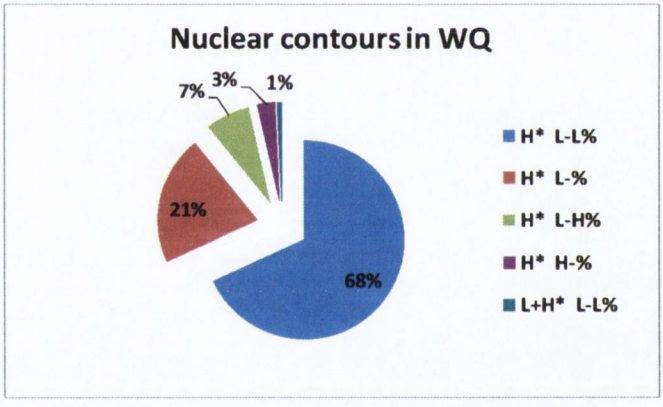

Figure 5.11 Distribution of nuclear contours in WQ (138 tokens)

Figures 5.12 and 5.13 show the prototypical 'fall' and 'fall, plateau' nuclear contours in *When did Manny live in Mallow?* produced by two different speakers, respectively (the potentially pitch-accented syllables are underlined).

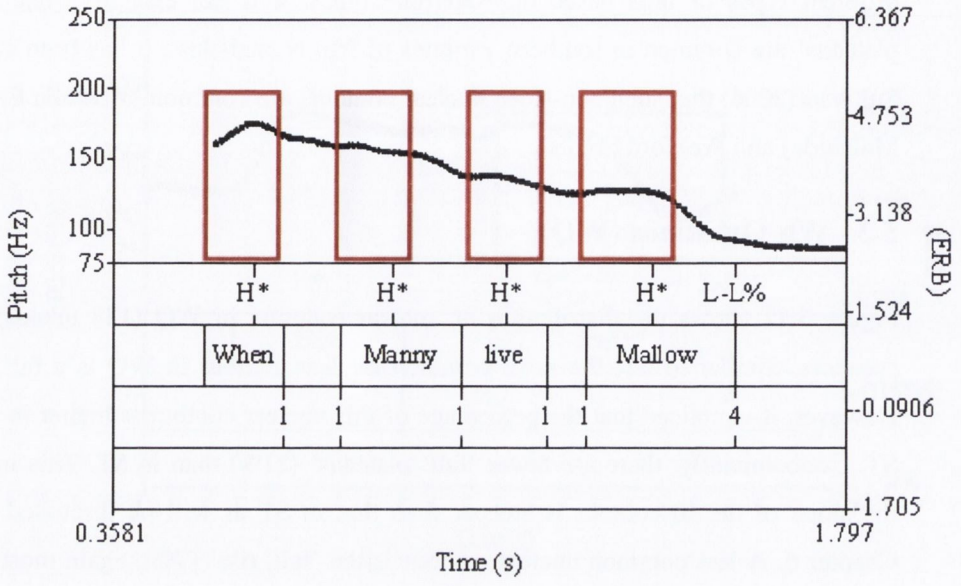

Figure 5.12 A 'fall' in *When did Manny live in Mallow?*, the red rectangles encompass the pitch-accented syllables, sound file (WQ2_When_did_Manny_live_in_Mallow_1_JG)

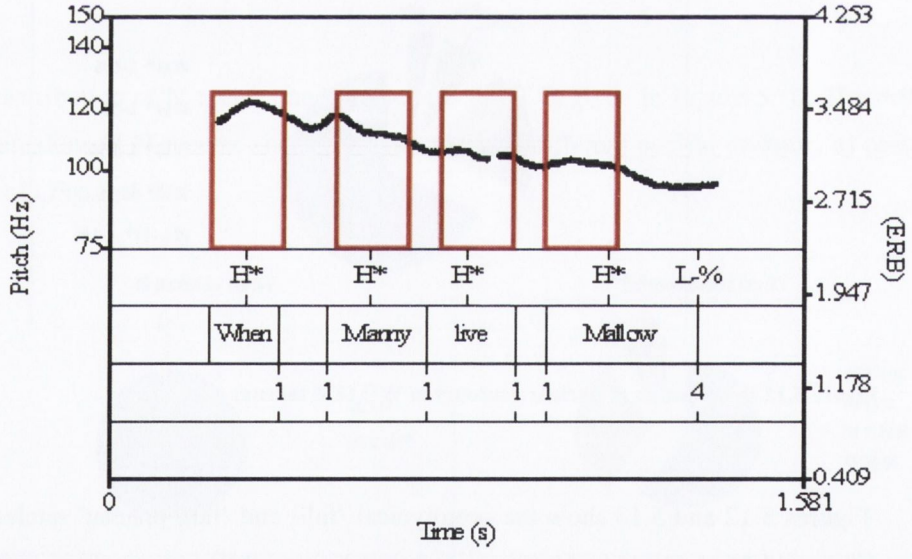

Figure 5.13 A 'fall, plateau' in *When did Manny live in Mallow?*, the red rectangles encompass the pitch-accented syllables, sound file (WQ2_When_did_Manny_live_in_Mallow_2_GO)

Comparing these pitch contours, particularly the upper parts of the red boxes, with the examples for ST, shows that WQ have a steeper global f0 trend compared to ST. The potential effect of the high peak on the wh-word, *when* is discussed in Chapter 6. In the

WQ of Dublin English, reported by Grabe[15] (2004), the dominant nuclear contour is H*L 0% , while other patterns that occur in WQ include H*L H% (5.6%) and L*H 0% (16.7%). However, rising nuclei are absent in our data and the tonal pattern is not significantly different from that of ST.

5.3.1 Initial Pre-nuclear Pitch Accents in WQ

The initial f0 contour in the WQ averages 4.08 ERB (126Hz) across speakers. The most common PN accent is H* as shown in Figure 5.14, usually realised on the wh-word, *when*. The f0 maximum in the pitch contour is typically realised on the wh-word (94%).

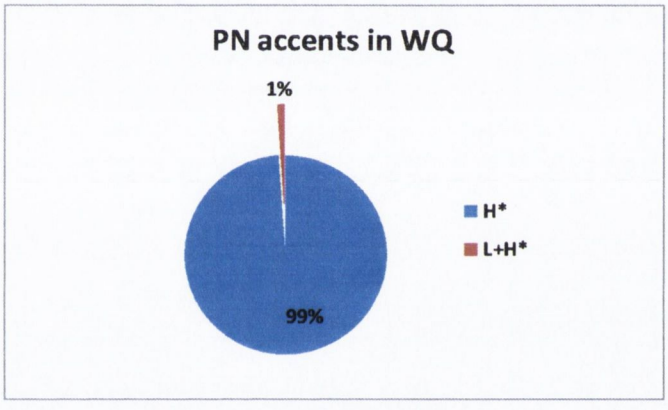

Figure 5.14 Distribution of PN accents in WQ (138 tokens)

The initial PN peak on *when* was usually realised at the beginning of the coda /n/ in /wɛn/. However, it was not uncommon in many cases for the peak to be realised later within the /n/ as shown in Figure 5.15 in *When did Manny live in Mallow?* This delay in the realisation of the peak will be shown to be due to the lack of unstressed material before the initial accented syllable (the anacrusis) as will be discussed in Chapter 7. It can also be noticed thathe nuclear peak in *Mallow* is aligned within the accentual vowel in /ma(l)/.

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[15] Grabe's (2004) findings, using IViE, for Dublin English (among other varieties of English) are based on the speech of six 16-year olds (three females, three males) from the town of Malahide, north of County Dublin.

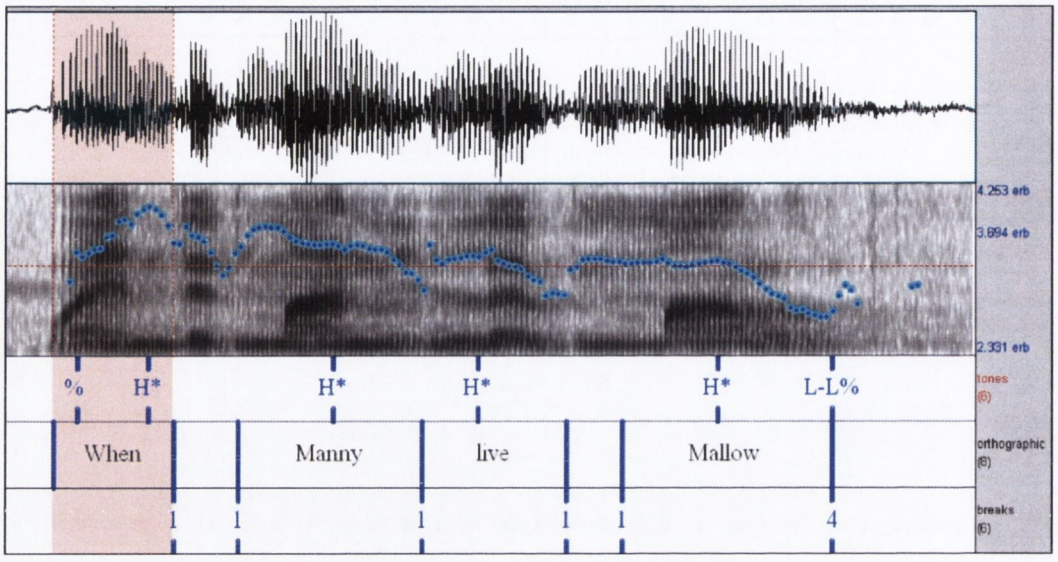

Figure 5.15 Peak timing of the initial PN accent in *When did Manny live in Mallow*?, the pink bar encompasses the pitch-accented syllable /wɛn/, the pitch accent labels are placed at the peak locations, sound file (WQ2_When_did_Manny_live_in_Mallow_5_RK)

5.3.2 Nuclear Pitch Accents & Edge-tones in WQ

Nuclear pitch accents were almost always realised as H* followed by L-L%. The second most common edge-tone was L-% (in 21% of cases) as illustrated in Figure 5.16. The different combinations of N accents and edge-tones result in the nuclear contours presented earlier in Figure 5.11.

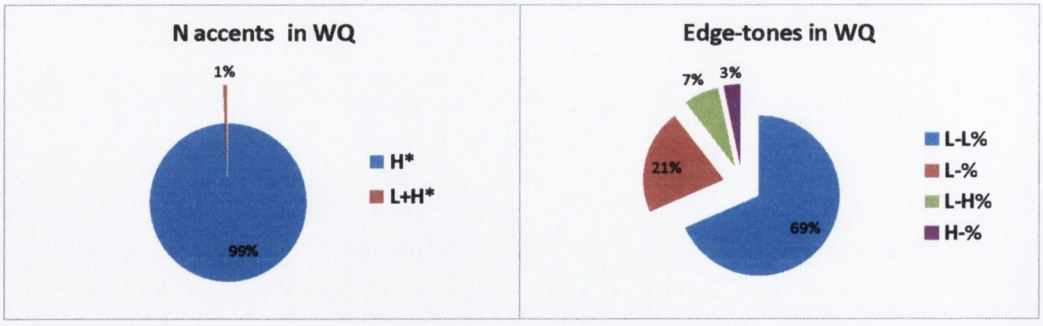

Figure 5.16 Distribution of N accents and edge-tones in WQ (138 tokens)

The rising edge-tone L-H% is a feature in the speech of speaker (GM) as shown in Figure 5.17. The observed L-H% is a low rise which begins immediately after the low phrase accent (L-) but does not go very high in the speaker's pitch range. The perceived rise gives a sense of chatty turn-taking as if expecting an elaborate answer from the listener.

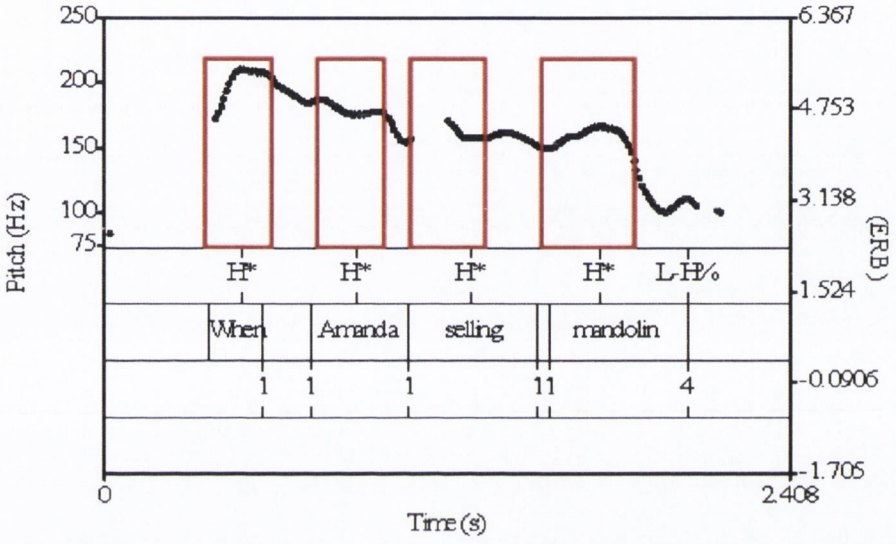

Figure 5.17 A small 'fall, rise' in *When is Amanda selling the mandolin?*, the red rectangles encompass the pitch-accented syllables, sound file (WQ3_When_is_Amanda_selling_the_mandolin_4_GM)

Sometimes certain apparent movements in the f0 contour do not reflect real tonal events. Two of these movements are apparent in Figure 5.18. The first observation relates to the apparent phrase-final rise after the edge-tone (L-L%). This is a common feature of final pitch tracking; the extra movement after the end of the utterance is often attributed to what is called tracking 'errors'. A real phrase-final rise in pitch should be audible and occurs at the final syllable of the utterance as shown in Figure 5.17, whereas the visual rise in Figure 5.18 is not audible and occurs after the end of the utterance. The second observation is the high f0 around /s/ in *selling* which is a segmental effect on the f0 contour, often referred to as 'micro-prosody', and is not treated as a tonal event.

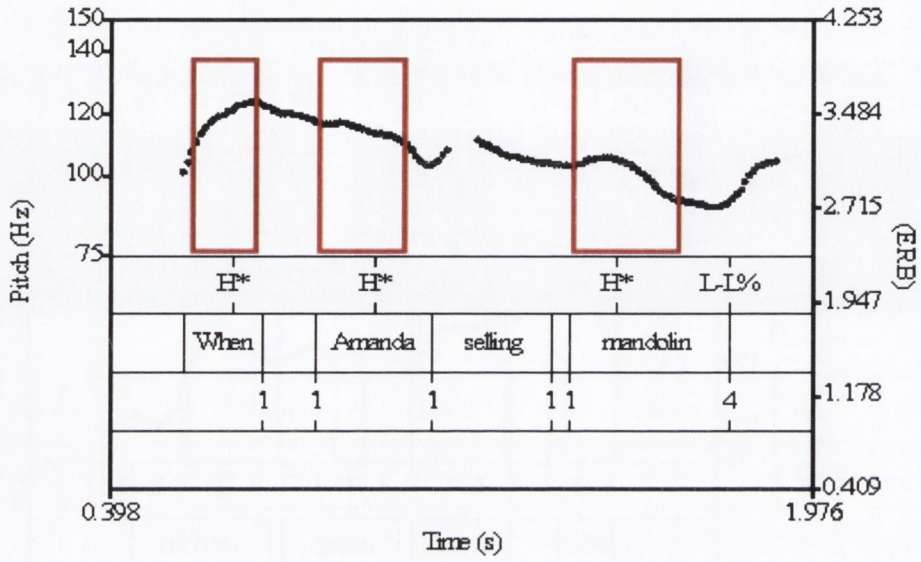

Figure 5.18 Pitch trace of *When is Amanda selling the mandolin?*, the red rectangles encompass the pitch-accented syllables, sound file (WQ3_When_is_Amanda_selling_the_mandolin_5_TO)

Middle content words such as *selling* in Figure 5.18 can sometimes be unaccented. It is worth noting that WQ had the highest percentage of unaccented middle content words (21%) compared to ST (6%), YQ (12%), and DQ (16%).

The findings of tonal patterns in WQ suggest that the nuclear contours typically have a falling pattern (H*L-L%) and do not appear to be different from the those observed for ST. The only observable difference is that WQ have in general a steeper global f0 trend compared to ST.

5.4 Yes-no Questions (YQ)

Figure 5.19 shows the distribution of nuclear contours in YQ (131 tokens) across the speakers. Similar to ST and WQ the most common nuclear contour in YQ is a normal 'fall' H* L-L% and the second most common is a 'fall, plateau' H* L-% (27%).

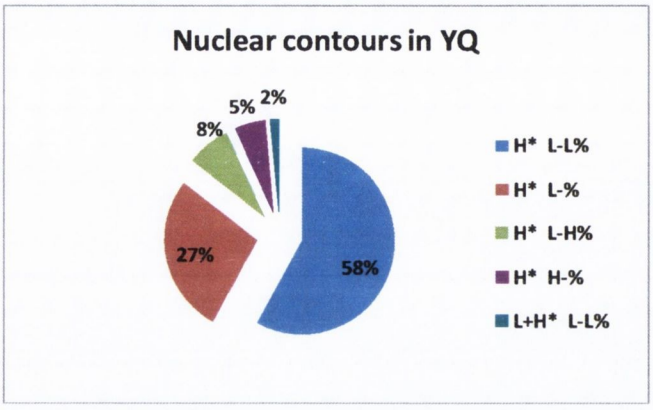

Figure 5.19 Distribution of nuclear contours in YQ (131 tokens)

Figures 5.20 and 5.21 show the prototypical fall nuclear contour in *Is Amanda selling the mandolin?* and *Does Manny have a meeting with the manager?* (the potentially pitch-accented syllables are underlined), respectively.

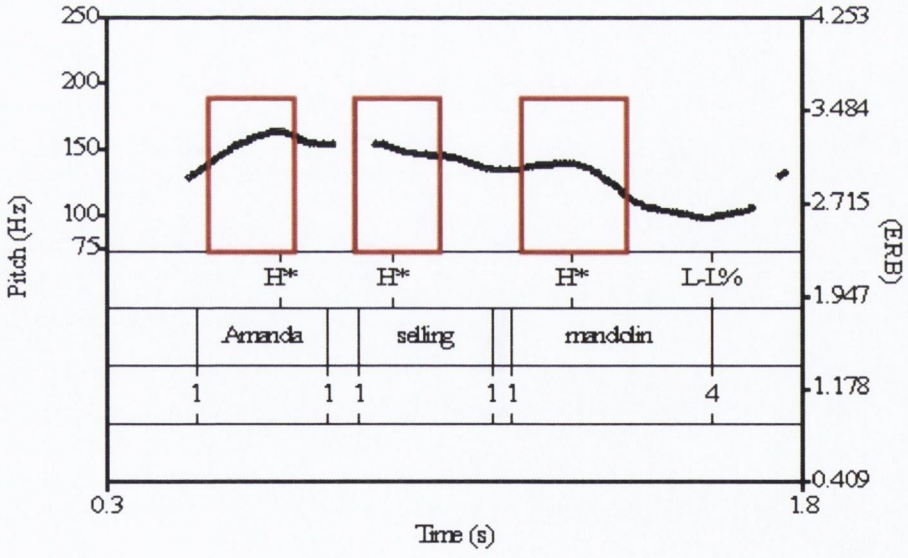

Figure 5.20 A fall nuclear contour in *Is Amanda selling the mandolin?*, the red rectangles encompass the pitch-accented syllables, sound file (YQ3_Is_Amanda_selling_the_mandolin_3_JG)

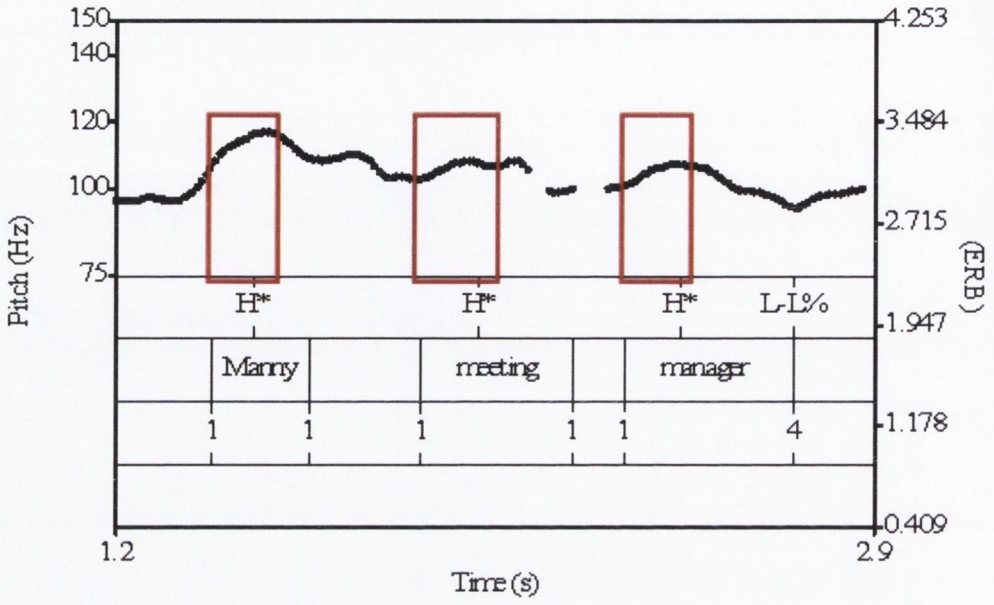

Figure 5.21 A fall nuclear contour in *Does Manny have a meeting with the manager?*, the red rectangles encompass the pitch-accented syllables, sound file (YQ4_Does_Manny_have_a_meeting_with_the_manager_5_IF)

When comparing the contours of YQ with those in ST and WQ, particularly the upper parts of the red boxes, it can be noted that the global f0 trend in YQ is less steep than that in both ST and WQ. This observation will be further investigated and discussed in Chapter 6. Grabe (2004) reports that the dominant nuclear contour in YQ in Dublin English is H*L 0%, while other patterns that occur include H*L H% (15.8%) and L*H 0% (15.8%). However, rising nuclei are absent in our data. Similar to the case in WQ, the tonal patterns of YQ are not significantly different from those of ST.

5.4.1 Initial Pre-nuclear Pitch Accents in YQ

The initial f0 of the pitch contour in YQ averages 3.97 ERB (122Hz) across speakers. The PN accents in YQ are usually H* as shown in Figure 5.22. In 81% of all analysed YQ (total of 131 tokens), f0 maximum occurred on the PN accent. In 17% of cases f0 maximum was realised on the N accent.

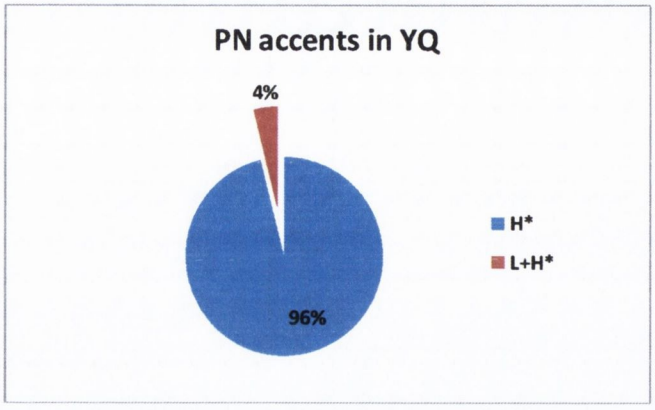

Figure 5.22 Distribution of initial PN accents in YQ (131 tokens)

The peak of the initial PN accent is usually realised within the final part of the vowel of the accented syllable as shown in Figure 5.23 in *Is Amanda selling the mandolin?*. The peak here is realised within the vowel /a/ in /man/. In Chapter 7, it will be shown that the default peak alignment of PN in DroghE is precisely the final part of the accentual vowel. Similarly, the nuclear peak is located within the vowel of /man/ in *mandolin*.

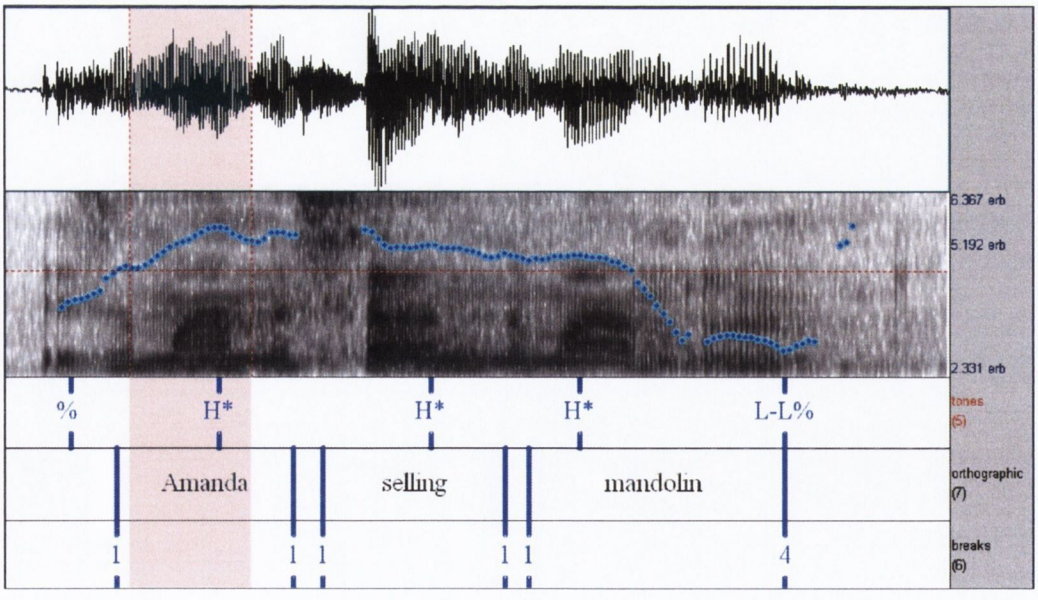

Figure 5.23 Peak timing of the initial PN accent in *Is Amanda selling the mandolin?*, the pink bar encompasses the pitch-accented syllable /man/ in *Amanda*, the pitch accent labels are placed at the peak locations, sound file (YQ3_Is_Amanda_selling_the_mandolin_1_JG)

5.4.2 Nuclear Pitch Accents & Edge-tones in YQ

Figure 5.24 shows the distribution of N accents and edge-tones in YQ. The different combinations of N accents and edge-tones result in different nuclear contours presented earlier in Figure 5.19. The typical nuclear pitch accent in YQ is H* followed by L-L%. The second most common edge-tone is L-% as shown in Figure 5.25. There were also few cases of 'high, plateau' nuclear contours, H* H-%, as shown in Figure 5.26. The rising edge-tone L-H% was a feature in the speech of speaker (GM).

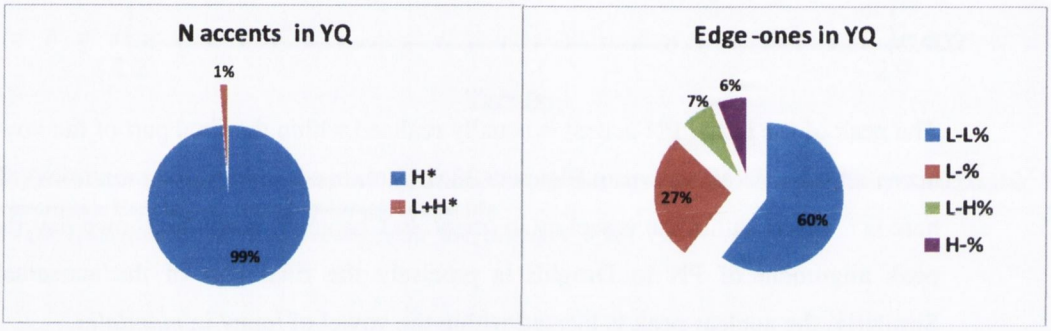

Figure 5.24 Distribution of N accents and edge-tones in YQ (131 tokens)

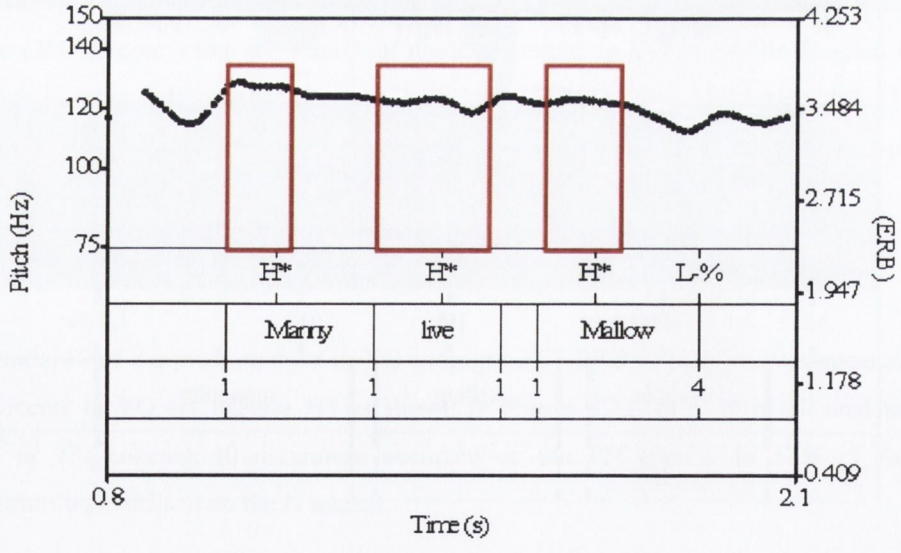

Figure 5.25 A 'fall, plateau' nuclear contour in *Does Manny live in Mallow?*, the red rectangles encompass the pitch-accented syllables, sound file (YQ2_Does_Manny_live_in_Mallow_5_SS)

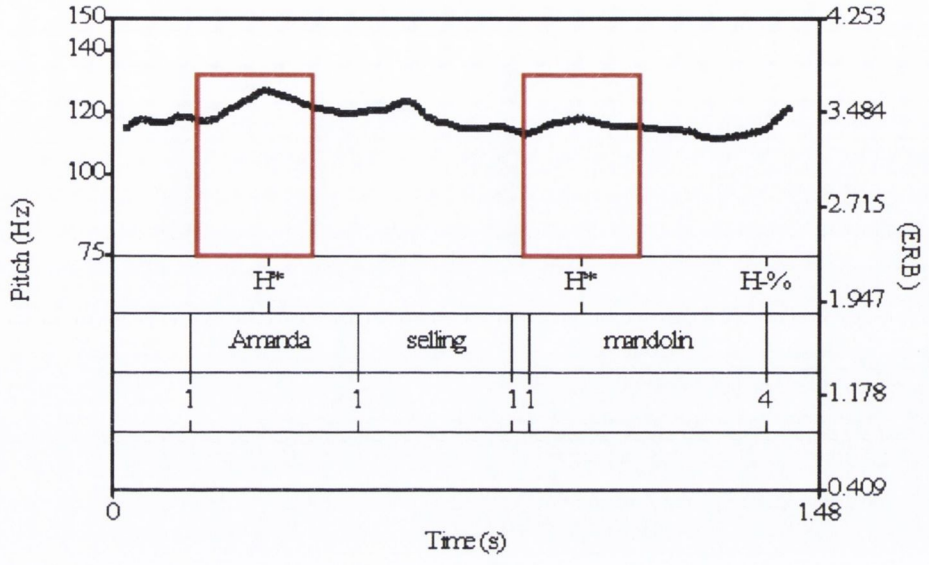

Figure 5.26 A 'high, plateau' nuclear contour in *Is Amanda selling the mandolin?*, the red rectangles encompass the pitch-accented syllables, sound file (YQ3_Is_Amanda_selling_the_mandolin_5_SS)

The findings of tonal patterns in YQ suggest that the nuclear contours typically have a falling pattern (H*L-L%) and do not appear to be very different from those found in ST or WQ. However, it was also observed that the global f0 trend of YQ is less steep that that in both ST and WQ, an issue that will be looked at in more detail in Chapter 6. We now move to the last type of investigated questions.

5.5 Declarative Questions (DQ)

Declarative questions are not the most common types of questions in this variety of English. The DQ were elicited by providing appropriate contexts, available in Appendix 5. Most speakers did not produce the DQ *Manny has a meeting with the manager?* in a tonal pattern that is similar to the same speaker's production of other declarative questions. The pitch contours of the majority of realisations of this utterance were similar to those of a ST. Hence, we decided to exclude the renditions of this particular DQ.

The most typical tonal pattern in DQ is H* H* L+H* L-L% which ends in a nuclear contour termed in the modified ToBI as the 'scooped-fall'. Figure 5.27 shows the distribution of nuclear contours in DQ (132-24 = 108 tokens) across speakers. DQ are the only question types where the f0 maximum is typically reached on the phrase-final accent.

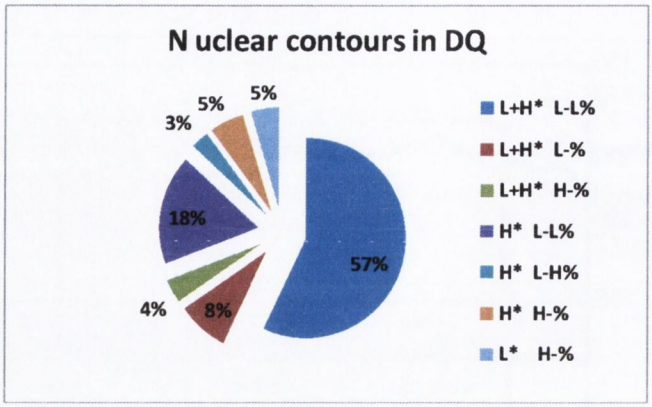

Figure 5.27 Distribution of nuclear contours in DQ (108 tokens)

Figures 5.28 and 5.29 show examples of the prototypical 'scooped-fall' of DQ in *Manny lives in Mallow?* and *Amanda is selling the mandolin?* (the potentially pitch-accented syllables are underlined).

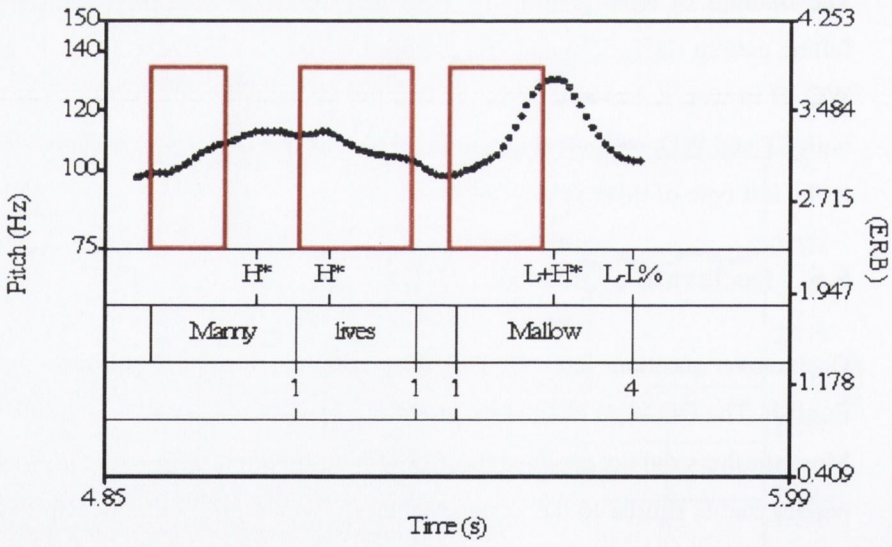

Figure 5.28 A 'scooped-fall' nuclear contour in *Manny lives in Mallow?*, the red rectangles encompass the pitch-accented syllables, sound file (DQ2_Manny_lives_in_Mallow_1_IF)

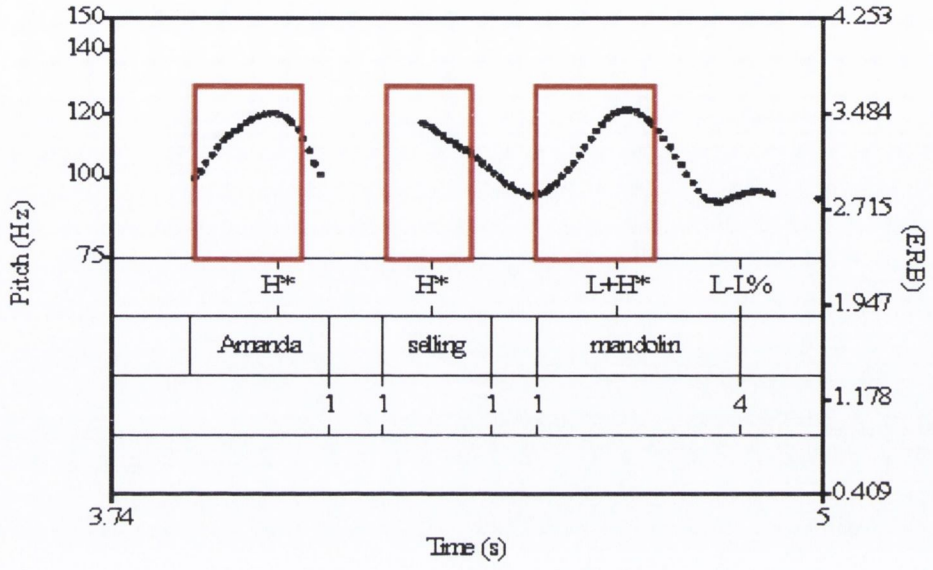

Figure 5.29 A 'scooped-fall' nuclear contour in *Amanda is selling the mandolin?*, the red rectangles encompass the pitch-accented syllables, sound file (DQ3_Amanda_is_selling_the_mandolin_2_TO)

The realisation of the 'scooped-fall' (L+H*) on the N accent is characterised by a fall which is realised at the end of or immediately after the accented syllable. This fall is also preceded by a low target usually realised within the accented vowel. It should be noted that a delayed 'fall' (of H*) and a 'scooped-fall' are different in the modified ToBI. In Figure 5.29 the fall on the PN accent in *Amanda* is delayed because of rhythmic factors, whereas the scooped-fall is realised as such regardless of constraints of rhythmic factors. The latter is a distinct pitch accent category, whereas the former is a variant of the pitch accent (H*).

5.5.1 Initial Pre-nuclear Pitch Accents in DQ

The initial f0 onset in the pitch contours of DQ (108 tokens) averages 3.58 ERB (108Hz) across speakers. The distribution of initial PN accents in the DQ is shown in Figure 5.30 where the most common accent is H*.

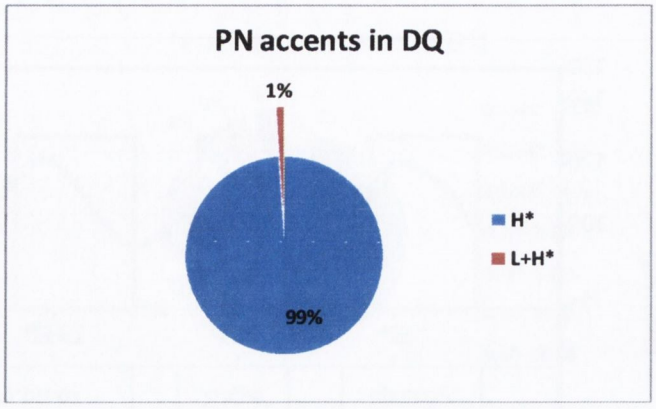

Figure 5.30 Distribution of initial PN accents in DQ (108 tokens)

As noted for the initial PN peak timing in other utterance types, the peak is usually located within the vowel of the pitch-accented syllable in a CVC syllable (e.g. /man/ in *Amanda*) and in a CV(C) syllable (e.g. /ma(n)/ followed by ambi-syllabic /n/ in *Manny*). Figures 5.31 and 5.32 illustrate the typical peak positions in both syllable structures, respectively. In Figure 5.31, the peak is located within the vowel of /man/ in *Amanda.* Similarly, the nuclear peak is located within the vowel of /man/ in *mandolin.* In Figure 5.32, the peak is located later (in the second syllable) in *Manny.*

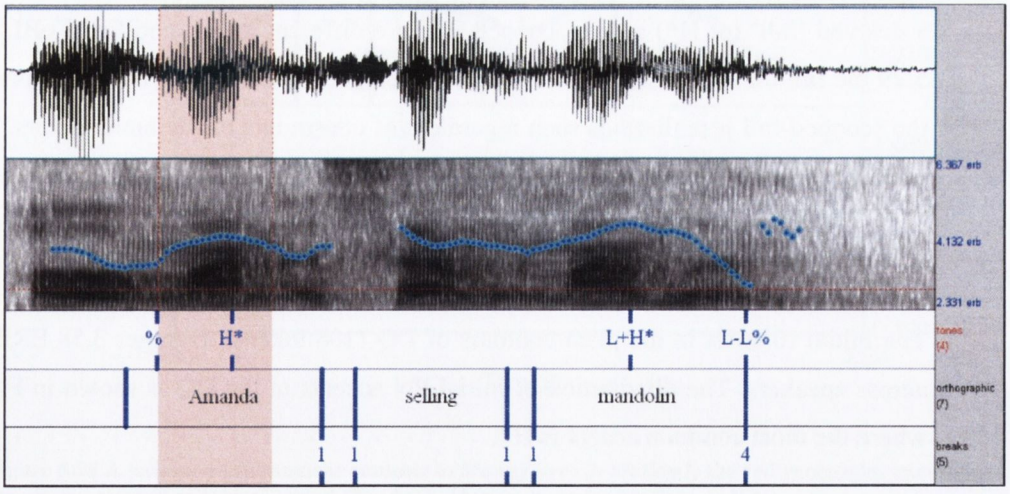

Figure 5.31 Peak timing of the initial PN accent in *Amanda is selling the mandolin?*, the pink bar encompasses the pitch-accented syllable /man/ in *Amanda*, the pitch accent labels are placed at the peak locations, sound file (DQ3_Amanda_is_selling_the_mandolin_3_JG)

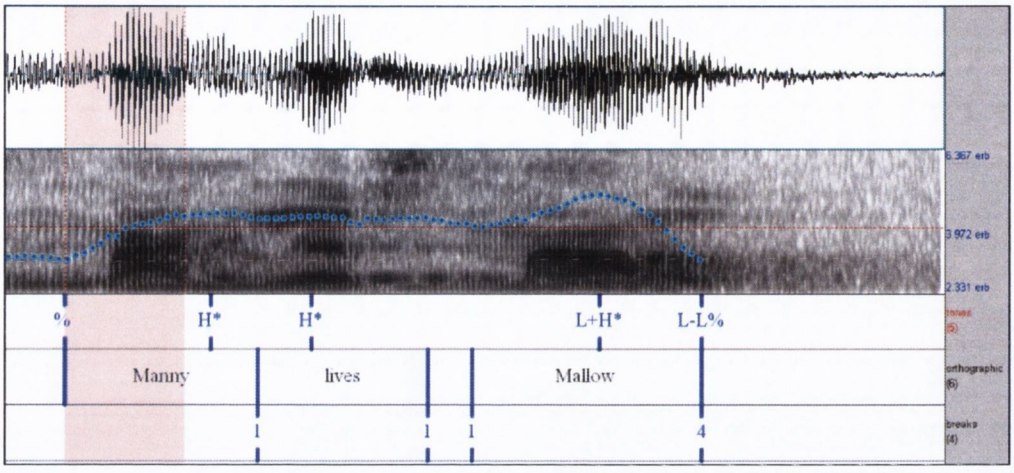

Figure 5.32 Peak timing of the initial PN accent in *Manny lives in Mallow?*, the pink bar encompasses the pitch-accented syllable /ma(n)/ in *Manny*, the pitch accent labels are placed at the peak locations, sound file (DQ2_Manny_lives_in_Mallow_1_JG)

5.5.2 Nuclear Pitch Accents & Edge-tones in DQ

Nuclear accents in DQ exhibit more variation than in the other utterance types. Figure 5.33 shows the distribution of N accents and edge-tones in DQ. The distribution of edge-tones is not different from the other utterance types with L-L% as the most common tone. The nuclear tone was often realised as L+H* followed by L-L%. A less common N accent is H* (28%) as illustrated in Figure 5.34. The N accent L* which gives a 'rise, plateau' was realised mostly by speaker (GM), particularly in the utterance *You live in Mallow?* as shown in Figure 5.35.

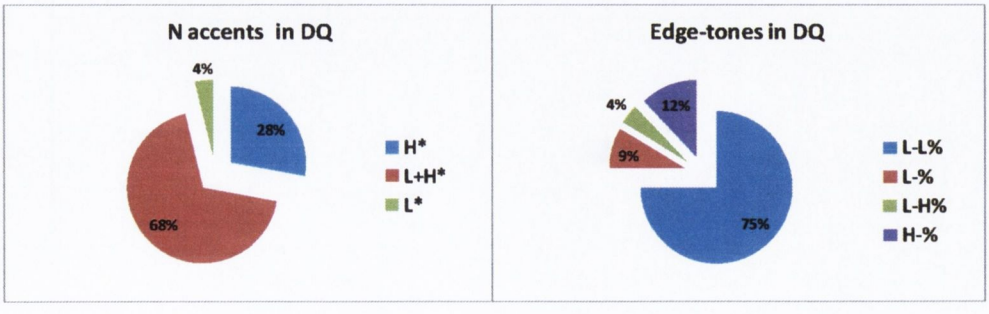

Figure 5.33 Distribution of N accents and edge-tones in DQ (108 tokens)

The different combinations of N accents and edge-tones result in different nuclear contours as presented earlier in Figure 5.27.

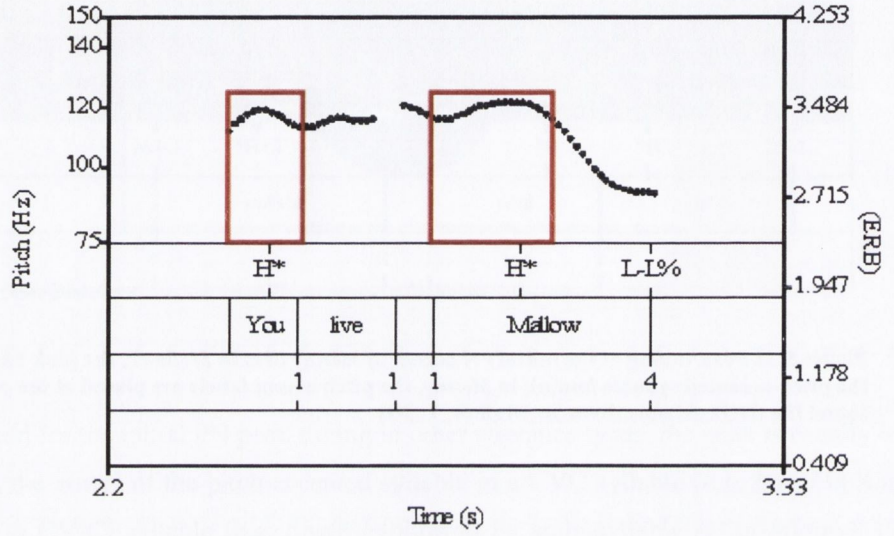

Figure 5.34 : A 'fall' nuclear contour in *You live in Mallow?*, the red rectangles encompass the pitch-accented syllables, sound file (DQ_You_live_in_Mallow_5_RK)

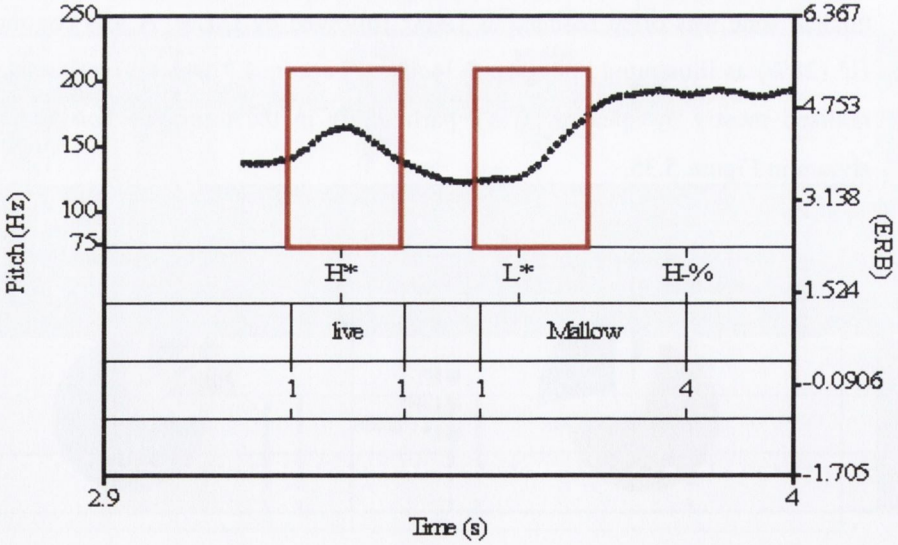

Figure 5.35 A 'rise, plateau' nuclear contour in *You live in Mallow?*, the red rectangles encompass the pitch-accented syllables, sound file (DQ_You_live_in_Mallow_3_GM)

Comparing the pitch contours of DQ with those of the other utterance types shows that the f0 maximum of the pitch contours occurs phrase-finally rather than phrase-initially. This makes the global f0 contour go up instead of having a downtrend typical in the other two types of questions and in statements. Figure 5.36 shows the location of f0 maximum in the four utterance types investigated (total of 626 tokens). This pattern seems to be related to the different N accents in DQ. However, this does not mean that the f0 global trends in ST, WQ, and YQ are the same and that the slope of the f0 contour in these utterance types is identical.

Grabe (2004) reports that the dominant nuclear contours in DQ of Dublin English are rising L*H 0% (50%) and falling H*L 0% (26.7%), while other patterns include L*H L% (22%) and L*H H% (5.6%). This contrasts with our data in which rising nuclei are almost absent.

Unlike WQ and YQ, DQ are not marked lexically nor syntactically. In order to convey a DQ, which is similar in structure to a ST, an intonational device is necessary. The tonal pattern reveals that ST, WQ, and YQ are different from DQ: the former group has a normal 'fall' nuclear contour, the latter a 'scooped-fall' one.

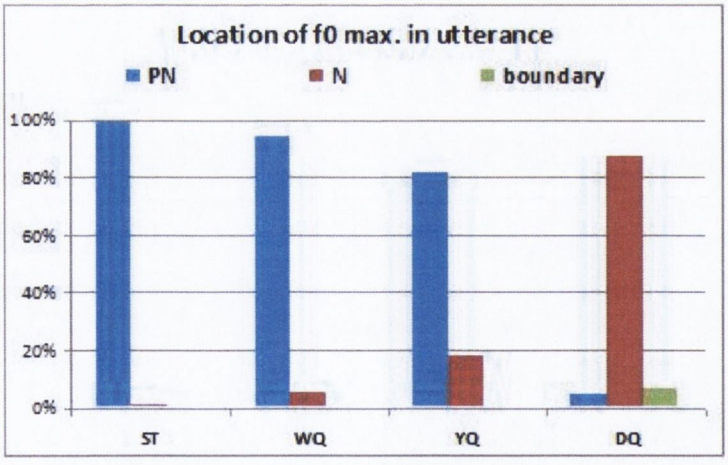

Figure 5.36 Location of f0 maximum in the four utterance types (total of 632 tokens)

In Figure 5.37 we compare the type of nuclear contour (rising vs. non-rising) for DroghE with those for Belfast, Donegal, Dublin, and West Cork, in the four utterance types. The graphs are reproduced from Chapter 2 and show the percentage of rising (red) and falling

(blue) nuclear contours in each variety for each utterance type. Recall that the data for Belfast and Dublin are adopted from Grabe (2004: 25-6) which is based on six speakers per dialect (three males and three females). The Donegal and the West Cork data (which are based on the limited pilot studies of a single female speaker each) are shown alongside the more extensive data from IViE on Dublin and Belfast. The Donegal and West Cork studies used similar data to IViE, though not identical, and employed the same labelling system. We should note however in the case of the single speaker in the West Cork study that this informant is not necessarily typical. She was chosen for analysis precisely because she exhibited tonal patterns often associated with a Cork accent, even though it may no longer be the dominant type of tonal patterning in the region. In view of this, the West Cork data here is illustrative only, and this is why it is marked with an asterisk in Figure 5.37.

In Figure 5.37, we count a nuclear contour with respect to the f0 movement and the phrase boundary as rising if it ends in (H%) or if it is a rise plateau (L*H 0%) and as non-rising if it ends in (L%) or is (H*L 0%). For DroghE, as labbelled in our modified system, we count a nuclear contour with respect to the f0 movement and the phrase boundary as rising if it ends in (L-H%, H-H%) or if it is (L* H-%) and as non-rising if it ends in (L-L%, L-%, H-L%) or is (H* H-%).

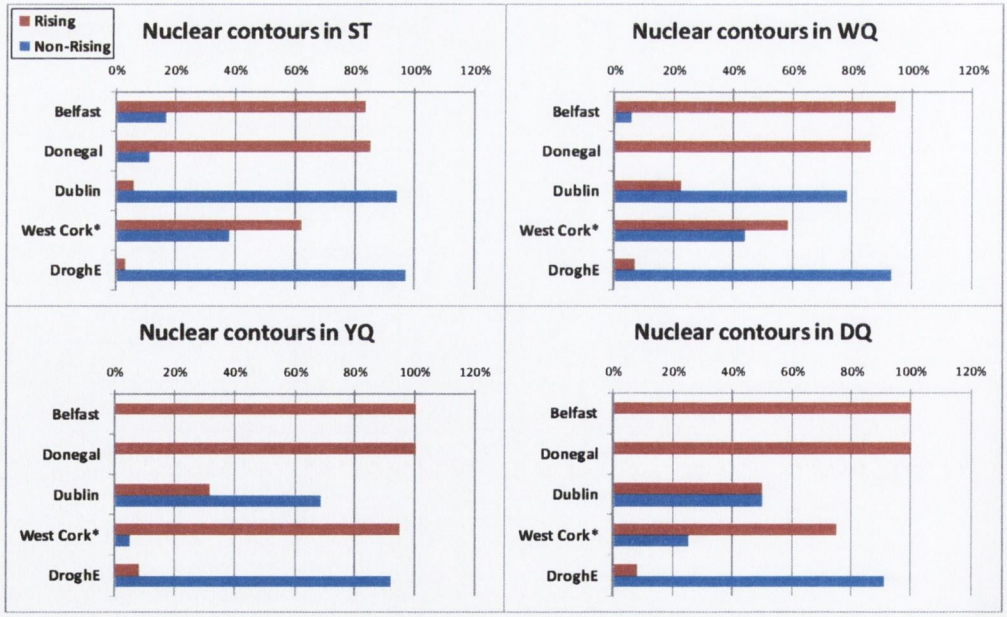

Figure 5.37 Rising and non-rising nuclear contours shown for the available data for Belfast and Dublin by Grabe (2004), Donegal by Dorn (2006), West Cork by O'Connor (2005), and DroghE

Note that although the speech data for DroghE is not the same as that in the other varieties, comparison should be valid and since the same types of utterances were employed. It is noticed that DroghE has the highest percentages of falling nuclear contours in all utterance types. Furthermore, the only variety relatively similar to DroghE is Dublin English.

It is clear that categorizing nuclear contours in the different dialects as rising vs. non-rising does not tell us the full story about the strategies of interrogative intonation employed by these dialects. Describing the tonal pattern across utterance types is one way of investigating interrogative intonation. However, investigating the f0 scaling at crucial points in the f0 contours can provide important information of the way interrogativity is conveyed via intonation, and we look at this in Chapter 6.

Figure 5.38 shows the typical contours of the four utterance types investigated in this study for the short utterances: *Here's the manual. Where is the manual?, Is this the manual?* and *You mean the manual?* as produced by speaker (JG). Each of these short utterances has two pitch accents.

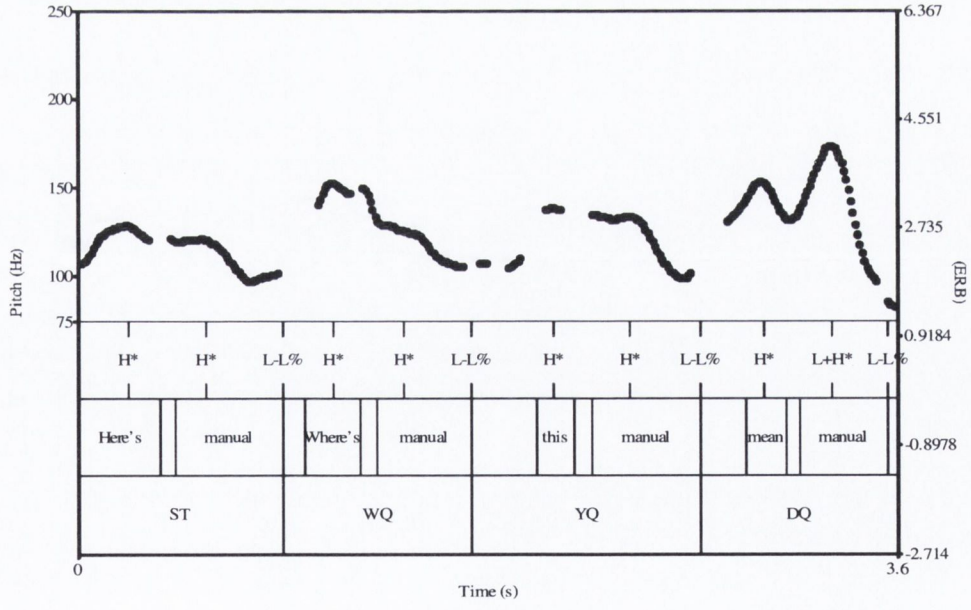

Figure 5.38 The prototypical pitch contours of the four utterance types in *Here's the manual, Where is the manual?, Is this the manual?* and *You mean the manual?* respectively, produced by speaker (JG)

Capturing declination or its opposite, an upward trend, is important in distinguishing between different utterance types in a language variety whose tonal patterns do not show a lot of variation in pitch accent and edge-tones. There is a need to describe the 'relations' between sequences of pitch accents in terms of their f0 values (scaling): are they declining, staying level, or increasing in value. The differences in terms of f0 scaling across the four utterance types are discussed in Chapter 6.

5.6 Summary

In this chapter the tonal patterns of DroghE were outlined based on the speech of seven speakers. Similar to the results of the segmental analysis, the tonal pattern analysis suggests that DroghE has a typical Southern IrE intonation similar to that of Dublin (Grabe, 2004, Grabe et al., 2003, Grabe and Post, 2002) and is quite different from the typical Ulster varieties of English which commonly share a rising nuclear contour. It was observed that although the majority of falling nuclear contours had (L-L%) edge-tones, it was not uncommon to have gradual and non-steep falls (H* L-%) in different utterance types. In the modified ToBI, these falls are termed 'fall, plateaus' which have been observed earlier by Sullivan (2006) for Malahide English and Wexford English.

The observation that emerges out of the analysis is twofold. First, in terms of the tonal events, there are two groups of tonal patterns. One is a sequence of falling accents (H* H* H* L-L%). This tonal pattern is the default in ST, WQ, and YQ. The other tonal pattern has a sequence of H* followed by a scooped-fall (H* H* L+H* L-L%) which is the default in DQ.

Second, in terms of f0 scaling, the location of f0 maximum seems to be a good indicator of the utterance type. The f0 maximum occurs on the first part of the intonational phrase in ST, WQ, and YQ, particularly on the PN accent. In DQ, the f0 maximum occurs predominantly towards the end of the utterance, particularly on the N accent.

The rare occurrence of final rises in questions is a characteristic of the intonation of this variety of English. This necessitates that speakers employ different intonational strategies to convey interrogativity, particularly in DQ where there is no grammatical, syntactic, or lexical marking. Exactly what these strategies are and the role of f0 scaling in characterizing different utterance types is the topic of the following chapter.

Chapter 6 Markers of Interrogative Intonation in Drogheda English

Chapter 6 investigates the phonetic markings of interrogative intonation in DroghE. The main aim of this investigation is to look at prosodic features, other than tonal labelling, which are associated with the different pitch contours for four different utterance types: ST, WQ, YQ, and DQ. The chapter presents evidence that factors such as the global trend of the pitch contour and the relation between pitch accents within the utterance are important cues for signalling the intonation of different utterance types.

6.1 Introduction

In Chapter 2, the literature on interrogative intonation was reviewed as a background to the present chapter. Gussenhoven's (2002) three biological codes: Ohala's Frequency Code, the Effort Code, and the Production Code were reviewed. These codes are said to be employed by speakers of different dialects and languages to express universal intonational meanings. The Frequency Code, as explained by Ohala (1994) is the exploitation of the size of the larynx and the rate of the vocal cord vibration to express power relations. This explains why a rising tone is needed in a question; the speaker is dependent on the listener's knowledge and cooperation. The Frequency Code is relevant to interrogative intonation, since there is a correlation between sentence type and pitch type; high/rising pitch in questions and low/falling pitch in statements. The Effort Code relates to the amount of energy in speech production which is exploited for more precise articulatory and pitch movements and is relevant when expressing focus. The Production Code relates to the energy used in the exhalation phase of the breathing process which is exploited to associate high pitch with beginnings of utterances and low pitch with ends. We have also reviewed some of the common devices used to convey interrogative intonation in different languages, particularly final rise, higher register span, and use of different types of pitch accents.

In Chapter 5, we have seen that the default tonal pattern in ST, WQ, and YQ is a sequence of H* followed by a low boundary (H* H* H* L-L%). The common tonal pattern in DQ was similar to the other utterance types except that the nuclear contour was L+H* L-L%,

what we term a 'scooped fall' as opposed to a 'fall' (H* L-L%) (see Chapter 3 for the labelling system used in this study). It was also mentioned that what makes the nuclear pitch accent in DQ different from that in ST, WQ, and YQ is that the peak in L+H* is realised later in the accented syllable and is preceded by a low target. Furthermore, it was observed that the nuclear peak in L+H* L-L% had a relatively higher peak value and excursion size than the canonical H* L-L% fall. In this chapter, we pick up on the observed differences in f0 scaling of the contours across different utterance types to have more insight into the anatomy of interrogative intonation in DroghE.

6.2 Interrogative intonation in Drogheda English

In this chapter we set out to compare the scaling of the f0 at crucial points in the contours of different types of questions and in the contours of statements. The four utterance types investigated are statements (ST), wh-questions (WQ), yes-no questions (YQ), and declarative questions (DQ).

WQ and YQ are types of questions which seek information rather than confirmation, are supported by syntactic or lexical features, and are primary rather than secondary questions in that they can be asked independently of a previous context (unlike an echo question e.g. *He said what?*). We also look at DQ which lack syntactic and lexical markings and often seek confirmation rather than information. DQ are interesting in that they form an intonational minimal pair with a corresponding declarative statement. It should be noted that even though DQ are more common in spontaneous speech, they were still included for comparison with syntactically and lexically marked questions and with statements. Therefore, in order to elicit DQ as naturally as possible, a context was provided for each DQ (Appendix 5). For the purposes of this chapter, we define the three question types as:

- WQ: marked lexically by a question word and syntactically by inversion
- YQ: marked syntactically by inversion
- DQ: not marked by any lexical or syntactic markers

It is expected that there will be a trade-off in the employment of intonational aspects with the presence of lexical and syntactic markers, similar to reports for other languages Dutch (Haan, 2002) and Estonian (Asu, 2004). The less lexical-syntactic information is available, the more the employment of intonational aspects. This trade-off is expected to manifest in

the following ascending order WQ < YQ < DQ. Furthermore, we investigate what intonational aspects are crucial in signalling interrogative intonation in DroghE. In the section below, we define the intonational aspects that can be associated with producing questions.

6.2.1 f0 metrics for analysis of Interrogative intonation

In this section we define certain f0 metrics to verify whether they are employed by the speakers of DroghE in conveying interrogative intonation in different question types compared to statements. Interrogative intonation in different languages, reported in the detailed sections, tends to manifest itself in some or all of the following respects:

- Presence of a **final rise**
- Higher f0 of the **PN** (initial pre-nuclear) accent, therefore, we measure:
  - **f0 height** (value) of the PN accent
  - **f0 size** (excursion) of the PN accent
- Higher f0 of the **N** (nuclear) accent, therefore, we measure:
  - **f0 height** (value) of the N accent
  - **f0 size** (excursion) of the N accent
- Particular relation between the **N and PN accents,** therefore, we measure:
  - **f0 height difference** between the N and PN accent
  - **f0 size difference** between the N and PN accent
- Globally raised **f0 register**
  - f0 of the **register span** (maximum f0 – minimum f0)
  - f0 of the **register level** (minimum f0)
- Absence of declination in the **f0 global trend**

The most commonly expected pattern in the intonation of a question, the final rise, was not attested in our data but we include it as an aspect to show lack of final rising in

interrogative intonation in DroghE. We elaborate below on the f0 metrics (a-f) which have been shown to be potential in other studies.

6.2.1.1 Final rise

A final rise is considered to be the perceptually and acoustically upward movement which usually falls on the last unstressed syllable of the utterance (represented as H%). A final rise can also be realised as a nuclear accent (L*+H). The size of the final rise is the f0 difference between the onset and the offset of the rise. The onset would be usually the lowest point before the pitch goes up to reach the high of the rise. In Chapter 5, it was shown that final rises are almost non-existent in the analysed question types in the dialect under study. However, we use a measure that shows the extent to which a contour has increased in f0 from beginning to start. This measure is termed 'upsweep' after Haan (2002: 87). Upsweep is the difference between the initial f0 and final f0 of the pitch contour of an utterance. To measure upsweep the initial f0 of the pitch contour (B) is subtracted from the final f0 of the pitch contour (E). Points (B) and (E) are shown in Figure 6.1. If the initial f0 is larger than the final f0, the upsweep will be negative. A large negative upsweep indicates a large declination effect in the pitch contour.

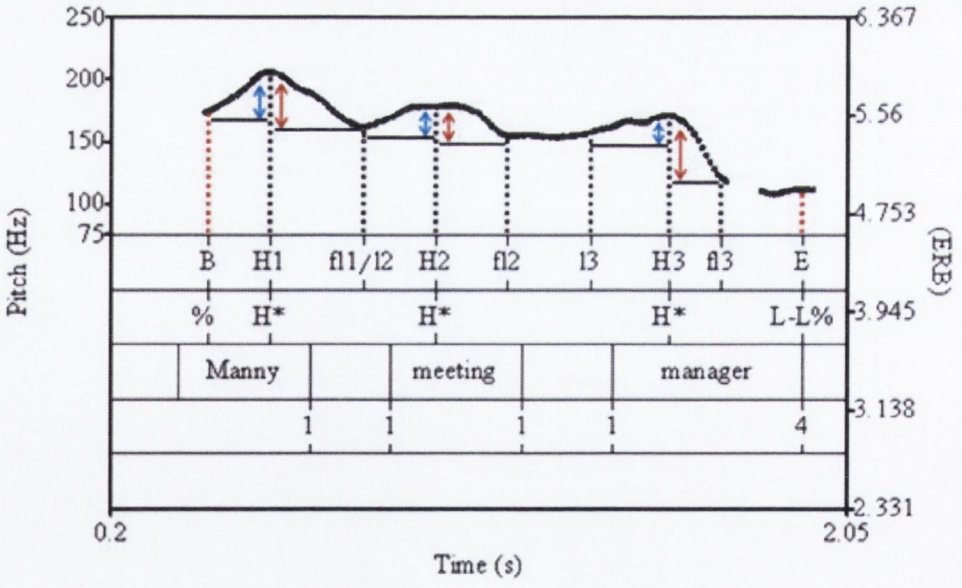

Figure 6.1 f0 points used to calculate the f0 metrics across utterances in the example *Manny has a meeting with the manager*, H: peak of pitch accent, fl: following f0 low, l: preceding f0 low, blue arrows: rise size of peak, red arrows: fall size of peak, B: initial f0, E: final f0, sound file (ST4_Manny_has_a_meeting_with_mamager_5_GM)

6.2.1.2 f0 of the initial pre-nuclear pitch accent

As mentioned in Chapter 2, a final rise is not the only realisation available to signal interrogative intonation in different languages. In Finnish, both questions and statements lack a final rise, but questions are characterised by a high initial pitch (Iivonen, 1998:318). In Moroccan Arabic, statements and declarative questions[16] are characterised by a rising-falling nuclear contour; however, declarative questions have an overall higher pitch register (Benkirane, 1998). The initial pitch of the utterance in declarative questions of Moroccan Arabic is higher than that in statements by an average of 3.5 semitones (Ibid.: 354). We do not compare the initial f0 of the pitch contour across different utterance types, as in (Haan, 2002), since the different utterance types do not all start with a similar rhythmic structure. YQ start with unaccented syllables (*Is* and *Does*). ST, WQ and DQ start with pitch-accented syllables (*Mann*y and *When*). Instead, we compare the initial pre-nuclear pitch accent (PN) across the different utterance types. Two measurements are taken for each PN accent: its height (f0 value) and its size (excursion). In measuring the size of the peak, we take two different measurements: the rise size and the fall size. The rise size is the difference between the preceding f0 low and the PN peak value (H1-l1). The fall size is the difference between the PN peak value and the following f0 low (H1-fl1). Often, the f0 low following a PN accent would be the same f0 low preceding the next PN accent as exemplified by point (fl1/l2) in Figure 6.1.

6.2.1.3 f0 of the nuclear pitch accent

In Swedish, Dutch, Moroccan Arabic, and Estonian the peaks of nuclear accents in questions are higher than in statements (Gårding, 1983: 21, Hadding-Koch and Studdert-Kennedy, 1964, Haan, 2002, Benkirane, 1998, Asu, 2004). In Hausa, a tone language, if the final syllable has a high lexical tone it is raised to a super high level in a question (Inkelas and Leben, 1990: 18). Similar to the f0 metrics of PN, we look at the f0 height and size of the N accent. In measuring the size of the peak, we take two different measurements: the rise size and the fall size. The rise size is the difference between the preceding f0 low and the N peak value (H3-l3). The fall size is the difference between the N peak value and the following f0 low (H3-fl3).

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[16] We refer to Benkirane's 'yes/no questions' as declarative questions. As a native speaker of Arabic, I realized that the 'yes/no questions' in (Benkirane: 1998) do not have subject-verb inversion as typical yes-no questions do and they are structurally similar to declarative statements.

6.2.1.4 Relation between the PN peaks and N peaks

A raised nuclear pitch accent can be described in relation to the height of an adjacent peak. The relaion between pre-nuclear and nuclear accents have been previously investigated in other studies (Asu, 2004, Haan, 2002). The present data have been desiged to contain three potential pitch accents per utterance to match the structure across the different utterance types. Only WQ had 4 accents (the wh-word, *when,* was always pitch accented). The peak of the nuclear pitch accent, in the following sections, is compared to that of the initial pre-nuclear pitch accent. The two prominent pitch accents in the utterances were usually the initial pre-nuclear and the nuclear pitch accents. Sometimes, the middle content word did not receive an accent. Even when there was a middle pre-nuclear pitch accent, the initial pre-nuclear was typically more prominent. In Dutch, N peaks were higher than PN peaks in DQ, YQ, and to a lesser extent in WQ but in ST the PN peaks were higher than the N ones (Haan, 2002). In Estonian the step from the last PN peak to the N peak was higher in unmarked questions and tag questions but not in YQ (Asu, 2004).

Two measurements are used to compare PN and N accents in different utterance types. First, there is the difference in f0 values between the PN and N peaks. Second, there is the difference in the sizes of the PN and N peaks. A peak usually has a preceding low and a following low. The size of a peak is usually calculated as the largest difference between the preceding or following low and the peak value. In our study, we take whichever low that gives the largest size. Therefore, we compare the largest size of the PN peak (usually the rise size) with the largest size of the N peak (usually fall size).

6.2.1.5 Register span and register level

The f0 contours in terms of the global level can be realised in a narrow or wide register span or on a high, low, or mid register level. The register span is the span between the minimum and the maximum f0 within an utterance. The register level is the location in the speaker's overall range at which the f0 of the utterance is realised; whether up, high or mid in the pitch range. Questions are usually realised with a wider register span, since final rise or high nuclear pitch accents widen the span. An upward shift in register level has been reported for questions in several languages such as Swedish, Hausa, Finnish, American English, Hungarian, Vietnamese and Thai (see Chapter 3). We take the f0 minimum as one possible correlate of register level.

6.2.1.6 Declination in the global trend

It is reported that declination is 'suspended' or 'turned off' when producing questions (Thorsen, 1983, Asu, 2004). The general direction of the whole pitch contour can be represented by fitting visually, by eye, the declination toplines across the peaks and baselines across the valleys of the f0 contour as usesd in t'Hart et al. (1990). An alternative and more recently used method calculates regression lines of the f0 contour, as in Haan (2002). In this method a regression line is fitted through all the points of the f0 contour as a function of time as shown in Figure 6.2 for the same utterance in Figure 6.1, *Manny has a meeting with the manager*. This generates a central regression line that divides the f0 contour into points above the central line (red shaded area) and points below it (green shaded area).

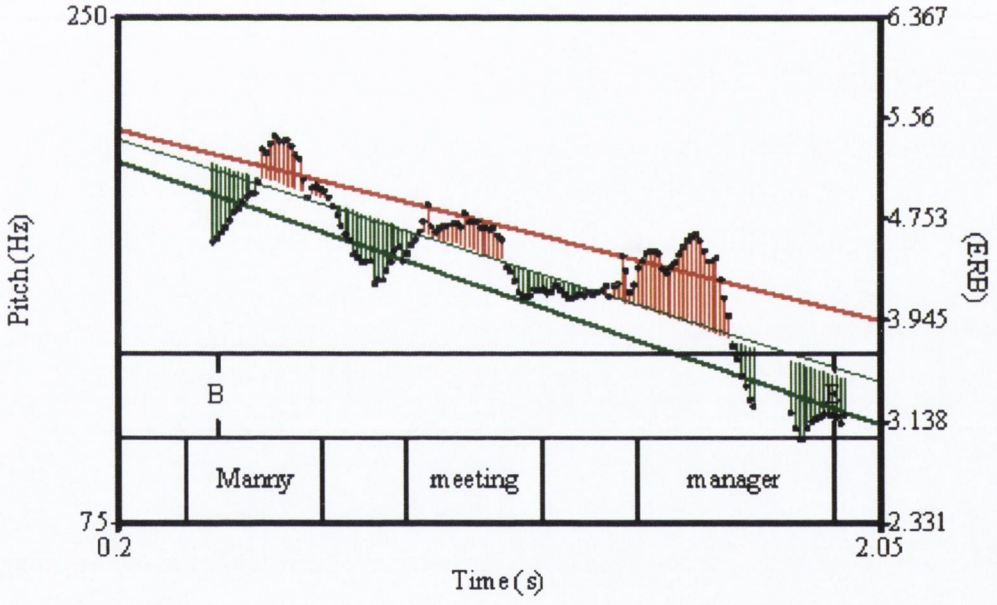

Figure 6.2 An illustration of the regression lines in *Manny has a meeting with the manager*, the two regression lines (red and green) are by-products of the central regression line. Regression lines are calculated for the whole f0 contour (from point B; beginning, to point E; end). The red shaded area includes all points above the central regression line and the green shaded area includes all points below this line, sound file (ST4_Manny_has_a_meeting_with_the _mamager_5_GM)

From the central regression line two further regression lines are calculated; an upper line (fitted through points above the central line, the red line) and a lower line (fitted through points below the central line, the green line). Following Haan (2002), we decided to use

regression lines which are reported to be an objective method to describe the global direction of an intonation contour.

It should be noted that the area demarcated by the upper and lower regression lines is narrower than that of the declination lines method by roughly 50%, since regression lines by definition move away from extreme values as shown in Figure 6.2[17]. To allow for a meaningful comparison between the global trends of statements and questions, regression lines are calculated from the initial f0 of the pitch contour to the end of the contour excluding the phrase-final low. Including the phrase-final low in calculating regression lines would result in steeper lines than what the global trend, fitted through the f0 peaks and valleys, actually is. However, it should be noted that in the majority of our data the pitch does not drop any further after the low of the nuclear accent as shown in Figure 6.1 Therefore, in such cases we include the final f0 point marked (E) in Figure 6.1 when calculating the regression lines.

6.2.2 Perception Experiment

In Chapter 5, it was shown that the analysed DQ of DroghE do not have final rises and differ from the tonal pattern in ST in that they are mostly realised with L+H* nuclear pitch accent. I wanted to make sure that the recorded DQ were 'perceived' as such by native speakers of DroghE and if so, to what degree they perceive the difference between DQ and ST. Therefore, a perception experiment was carried out, as outlined in Chapter 3, Section 3.6.4.

To recap on the experiment procedure, samples of the recorded DQ in *Manny lives in Mallow?, Amanda is selling the mandolin?, Manny has a meeting with the manager?* and their respective ST were randomly presented to listeners in an online listening task. The participants clicked on a sound file and were given two contexts. One context was appropriate to a DQ, the other to a ST. The listeners had to decide which context was more appropriate to the utterance they have heard i.e. whether what they heard was a DQ or a ST. The listening task was taken by 20 native speakers of DroghE who listened to 12 sound files (6 DQ and their corresponding ST). The results are shown in Figure 6.3.

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[17] The script used to generate regression lines was specifically written for this study on Irish English by Jos Pacilly. The assistance of Vincent Van Heuven and Jos Pacily is gratefully acknowledged.

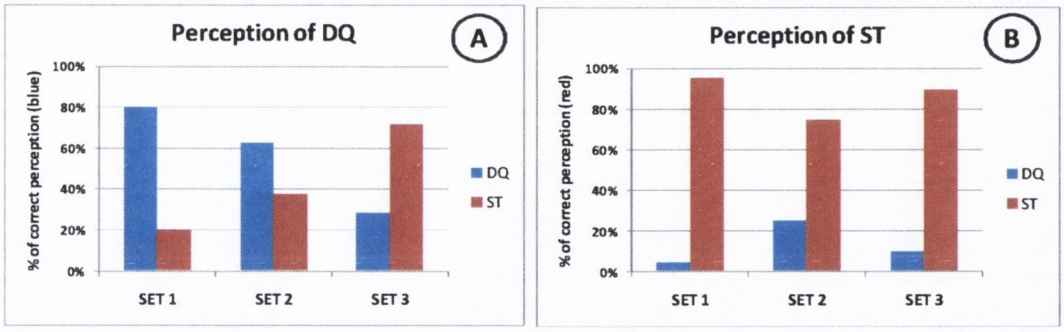

Figure 6.3 Results of the perception of DQ and ST. Panel (A) shows the results for the perception of DQ (blue). Panel (B) shows the results for the perception of ST (red). Set 1: *Manny lives in Mallow*, Set 2: *Amanda is selling the mandolin*, and Set 3: *Manny has a meeting with the manager*.

The results in panel (A) indicate that the samples from recordings of *Manny lives in Mallow?* and *Amanda is selling the mandolin?* were perceived by native speakers of DroghE as DQ in the majority of cases (blue columns). The samples from recordings of *Manny has a meeting with the manager*? were perceived by native speakers of DroghE as ST (red column) in the majority of cases. In the perception of ST in panel (B), it is clear that ST were perceived as such in the majority of cases (red columns).

The results indicate that, apart from the DQ in *Manny has a meeting with the manager*?, the recorded DQ produced by the informants were perceived as such by native speakers of DroghE. This was not surprising as DQ are usually more common in spontaneous informal speech and are usually produced with short intonational phrases. The utterance *Manny has a meeting with the manager*? is relatively long averaging 1314ms.

Following the results of the perception experiment which showed that there is a good degree of recognition of DQ, Analyzing the f0 metrics is likely to provide a broader picture of the intonational aspects of questions in DroghE. Moreover, such an analysis can reveal the aspects in the f0 which resulted in the utterance *Manny has a meeting with the manager*? being perceived as a statement rather than a question.

6.3 Results for DroghE

In this section we present the findings of the above mentioned metrics. The results are those of the three main sets which vary in length and rhythmic structure:

- Set 1:Manny lives in Mallow
- Set 2: Amanda is selling the mandolin
- Set 3: Manny has a meeting with the manager

The potentially pitch-accented syllables are underlined. Each set is designed to match the statement (ST) and the matched questions (WQ, YQ, and DQ). The materials and methods are outlined in Chapter 3, Section 3.6.1.

Before we present the f0 metrics analysis, it would be useful to have an overview of the general pitch contours in the tested utterances. Figure 6.4 shows the stylized f0 contours for Set 1 and Set 2, respectively. The horizontal axis represents the words where the pitch accents were realised and is not to be mistaken for a representation of time. The x-axis represents the following f0 points in the contours of the utterances: initial f0 (B), peak value of H1, preceding f0 low of H2, peak value of H2, preceding f0 low of H3, peak value of H3, f0 low following H3, and the final f0 (E), respectively. Each pitch accent is presented by its preceding f0 low and its peak value. The vertical axis represents f0 (in ERB). The peaks of the initial pre-nuclear and the nuclear pitch accents are shown in yellow and red points, respectively. The f0 values in Set 1 and Set 2 are averaged across five speakers (GO, IF, JG, RK, and TO).

Figure 6.4 Stylized contours in ST, WQ, YQ, and DQ for Set 1 and Set 2. Each pitch accent is represented by its preceding low f0 and its peak value. Pre-nuclear peaks are yellow points and nuclear peaks are red points. The y-axis is f0 in ERB. The x-axis represents the initial f0 (B), the pitch accented words, the f0 low following the N peak, and the final f0 (E) of the pitch contours, respectively.

Similarly Figure 6.5 shows the stylized f0 contours for Set 3. The f0 values are averaged across four speakers (GO, JG, RK, and TO).

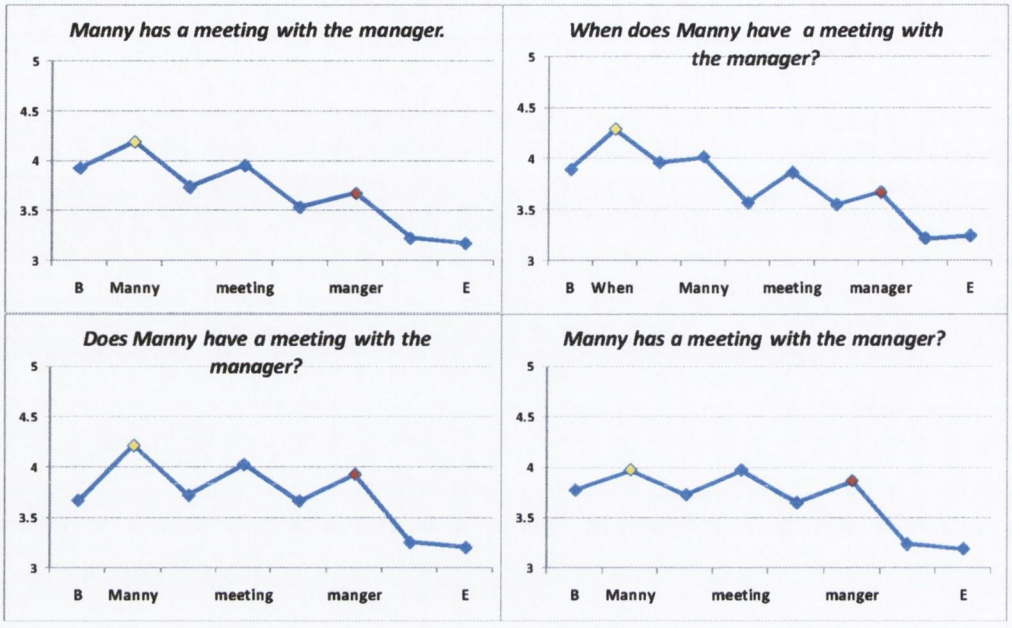

Figure 6.5 Stylized contours in ST, WQ, YQ, and DQ for Set 3

As explained in Chapter 3, this analysis is based on data from seven male informants. However, there were missing values for some of the utterances for speakers GM, SS, and IF due to disfluencies, de-accentuation and focus placement. Therefore, the following figures and statistical tests are based on five speakers for Set 1 and Set 2 (GO, IF, JG, RK, and TO) and four speakers for Set 3 (GO, JG, RK, and TO). Moreover, when comparing data within the same utterance type across the three sets, data of the four speakers (GO, JG, RK, and TO) who have all utterance types is used. The statistical tests used are the Linear Model ANOVA (LMAA) and Bonferroni post hoc tests.

6.3.1 Final rise

In Chapter 5, it was shown that the occurrence of final rises in questions is almost non-existent in DroghE. Therefore, instead of looking for a final rise, we look at the f0 difference between the initial and the final f0 of the contour. This gives a measure of the extent of declination in each utterance type. 'Upsweep' is the difference between the final f0 value and the initial f0 value of the f0 contour. Figure 6.6 shows the measured upsweep for all utterance types in all three sets.

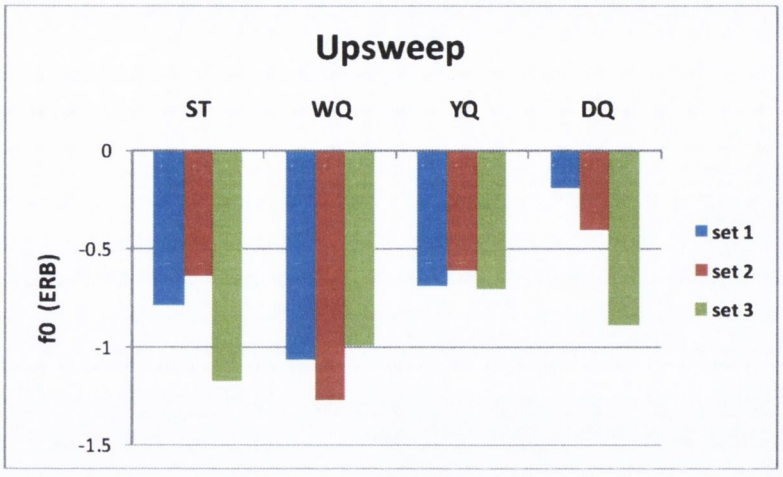

Figure 6.6 Upsweep across the different utterance types in the three sets

It is clear from Figure 6.6 that all upsweep values are negative. This indicates that in all utterance types, the initial f0 value was always higher than the final f0 of the pitch contour. However, the size of upsweep is different across the utterance types.

Three observations can be made from Figure 6.6. First, it is clear that upsweep in DQ has the smallest size in Set 1 and Set 2. In Set 1 (blue), LMAA show that the difference in upsweep is significant across the utterance types: $F(3, 43) = 27.11$, $p \leq 0.0001$. Bonferroni post hoc tests show that DQ are significantly different from all other utterance types and that WQ and YQ are significantly different. In Set 2 (red), WQ were found to be significantly different from all other utterance types $F(3,43) = 22.01$, $p \leq 0.0001$. Second, upsweep in Set 3 (green) does not seem to be hugely different across the utterance types in contrast to the case in the other two sets. This could be related to the durational differences between the three sets. This observation is supported statistically: in Set 3: $F(3, 51) = 2.79$, $p = 0.0519$. The statistical results for upsweep across utterance types are summarised in Table 6.1.

Table 6.1 Statistical results for UPSWEEP, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	27.11	≤0.0001	≤0.0001	≤0.0001	≤0.0001		0.035	
Set 2	(3,53)	22.01	≤0.0001		<0.000			<0.000	<0.000
Set 3	(3,41)	2.79	0.052						

Third, the upsweeps in Set 3 are clearly larger in ST and DQ than their counterparts in Set 1 and Set 2. LMA and Bonferroni tests show that the DQ in Set 3 have a significantly larger upsweep than those in Set 1 and Set 2: $F(2, 25) = 11.56$, $p = 0.0003$, and that only the upsweeps of ST in Set 2 and Set 3 are statistically different: $F(2, 25) = 6.68$, $p = 0.0037$. The statistical results for upsweep in ST and DQ across the three sets are summarised in Table 6.2.

Table 6.2 Statistical results for UPSWEEP in ST and DQ, red = significant difference

Type	df	F-ratio	overall p-value	Bonferroni post hoc tests		
				Set 1 Set 2	Set 1 Set 3	Set 2 Set 3
ST	(2,25)	11.56	0.0003		≤0.0001	0.0032
DQ	(2,25)	6.679	0.0037			0.0039

The fact that ST and DQ have a large negative upsweep in Set 3 could be due to a high initial f0, a low final f0, or both. Moreover, the similarity between the upsweep measure between ST and DQ in Set 3 is in line with the results of the perception test where the majority of DQ in Set 3 were perceived as ST.

To look at the source of this similarity in upsweep size for ST and DQ in Set 3, we plot the initial f0 and final f0 values in the contours of the different utterance types in the three sets as shown in Figure 6.7.

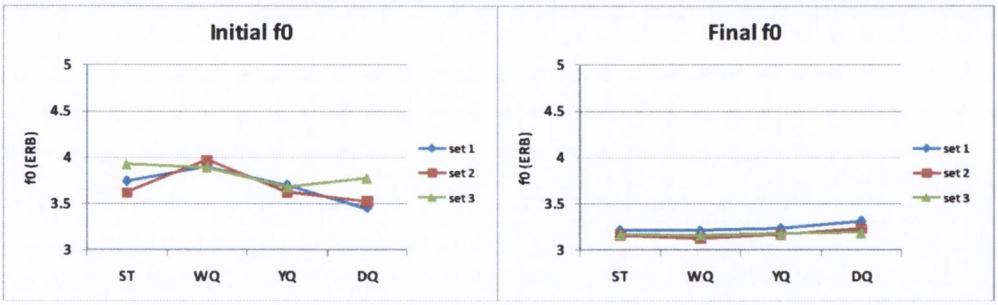

Figure 6.7 Initial f0 and final f0 values in the contours of the utterance types in the three sets

It can be observed that the initial f0 in the contours of ST and DQ of Set 3 are higher than those in Set 1 and Set 2. This is borne out by statistical results: ST: $F(2,33) = 8.68$, $p = 0.0009$, Bonferronin tests show that the initial f0 in ST of Set 3 are significantly higher than those in Set 2, DQ: $F(2,25) = 8.26$, $p = 0.0018$, Bonferroni tests show that the initial f0 in DQ of Set 3 are significantly higher than those in Set 21 and Set 2. The initial f0 values in WQ and those in YQ were not found to be significantly different across the three sets: WQ: $F(2,32) = 0.262$, $p = 0.771$, YQ: $(2, 24) = 0.371$, $p = 0.694$. The statistical results for initial f0 values across the three sets are summarised in Table 6.3.

Table 6.3 Statistical results for INITIAL f0 across the three sets, red = significant difference

Type	df	F-ratio	overall p-value	Bonferroni post hoc tests		
				Set 1 Set 2	Set 1 Set 3	Set 2 Set 3
ST	(2,33)	8.68	0.0009			0.0029
WQ	(2,32)	0.262	0.771			
YQ	(2,24)	0.371	0.694			
DQ	(2,25)	8.26	0.0018		0.0042	0.0172

Figure 6.7 also shows that the final f0 values of the contours in all utterance types are nearly identical. This is supported by statistical tests which are summarised in Table 6.4.

Table 6.4 Statistical results for FINAL f0 across the three sets, red = significant difference

Type	df	F-ratio	overall p-value	Bonferroni post hoc tests		
				Set 1 Set 2	Set 1 Set 3	Set 2 Set 3
ST	(2,33)	0.043	0.958			
WQ	(2,32)	1.155	0.328			
YQ	(2,24)	1.522	0.238			
DQ	(2,25)	2.61	0.094			

The findings suggest that what makes the upsweeps in ST and DQ in Set 3 larger than those in Set 1 and Set 2 is the higher initial f0 of the contours in ST and DQ. The question arises as to why this is the case. One possible reason is utterance duration. Figure 6.8 shows the durations in (ms) of all the utterances in the three sets.

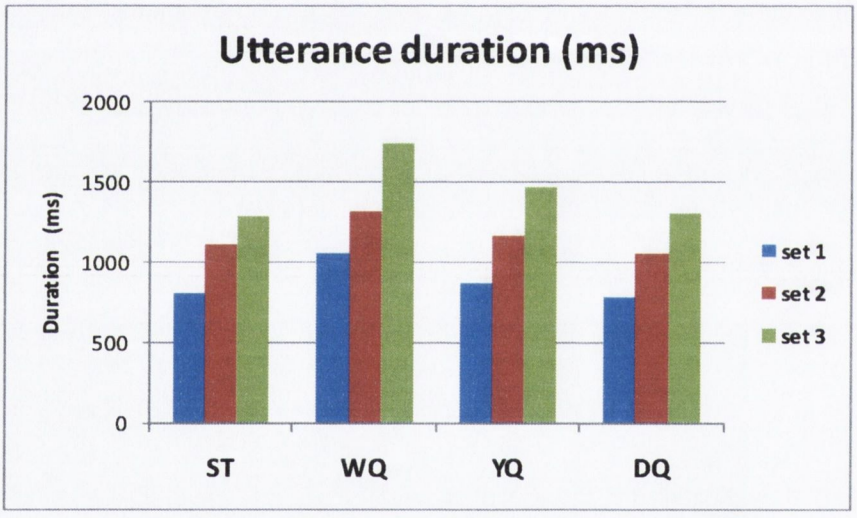

Figure 6.8 Durations of the utterances in (ms) in the three sets

Figure 6.8 shows that the utterances in Set 3 are longer than their counterparts in Set 1 and Set 2. This is supported statistically, the three sets were significantly different in duration in the following order Set 1 < Set 2 < Set 3: ST: $F(2,33) = 240.46$, $p \leq 0.0001$, WQ: $F(2, 32) = 23.67$, $p \leq 0.0001$, YQ: $F(2,24) = 220.92$, $p \leq 0.0001$, and DQ: $F(2,25) = 198.27$, $p \leq 0.0001$.

The previous findings suggest that longer utterances in Set 3 are characterised by a higher initial f0 in the contours of ST. Other studies have also suggested that shorter utterances have lower initial f0 (Liberman and Pierrehumbert, 1984). This higher initial f0 is the reason why ST had the largest negative upsweep in comparison to Set 1 and Set 2. DQ in Set 3, unlike those in Set 1and Set 2, were similar to ST in having a higher initial f0 and larger upsweep than in the other two sets. The higher initial f0 value could be one possible reason why the DQ in Set 3 were perceived as ST rather than questions. The other f0 metrics can provide more insight to the defining intonational characteristics of statements and questions in DroghE.

6.3.2 f0 of the initial pre-nuclear pitch accent

The initial pre-nuclear (PN) peaks were compared across the different utterance types. Figure 6.9 shows the initial PN peak f0 values across utterance types for Set 1: *Manny lives in Mallow,* Set 2: *Amanda is selling the mandolin,* and Set 3: *Manny has a meeting with the manager.*

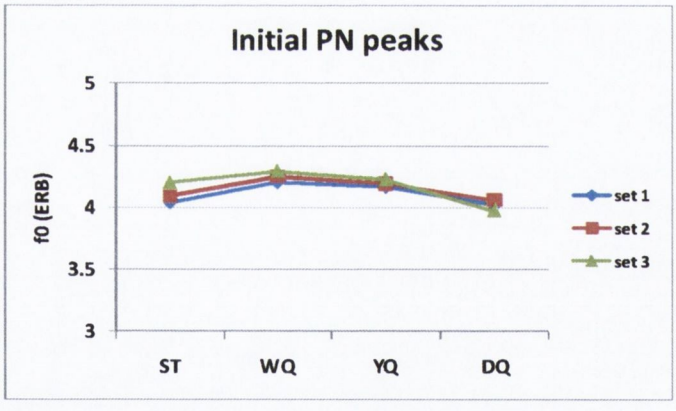

Figure 6.9 Initial PN peaks across different utterance types for the three sets

It is clear that the differences in PN peaks across utterance types are not significant in all three sets. This is supported statistically for Set 1: $F(3,43) = 2.57$, $p = 0.067$ and Set 2: $F(3, 53) = 1.78$, $p = 0.161$. In Set 3 there was a significant difference: $F(3,41) = 3.21$, $p = 0.033$. Bonferroni tests for Set 3, however, showed that initial PN peaks of DQ were lower than in other utterances, but not significantly. This suggests that the initial PN peak is not employed by speakers to differentiate utterance types in DroghE.

We proceed to look at the size of the f0 rising and falling movement occurring in the initial PN accent. Figure 6.10 shows the rise size and the fall size of the PN peak in all three sets. Each peak is plotted against the preceding f0 low and a following f0 low from which the rise size and the fall size were calculated, respectively.

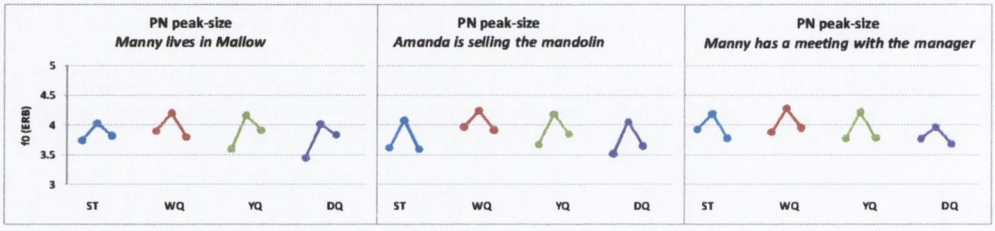

Figure 6.10 Rise size and fall size of initial PN peaks across the utterance types for the three sets.

It is observed in general, that the rise size for initial PN peaks is larger than the fall size. The rise size is larger in YQ and DQ for Set 1 and Set 2. LMA show that the rise size is significantly different across utterances for Set 1: $F(3, 43) = 14.97$, $p \leq 0.0001$, Bonferroni test show that DQ and YQ are significantly different from WQ and ST. For Set 2, the rise size is significantly different across utterances: $F(3, 53) = 8.75$, $p \leq 0.0001$, Bonferroni tests show that only WQ and DQ are significantly different. For Set 3, the rise size is significantly different across utterances: $F(3, 41) = 5.45$, $p = 0.003$, however, Bonferrroni tests do not show a significant difference. Table 6.5 summarises the statistical results for the rise size of the initial PN peaks.

Table 6.5 Statistical results for PN RISE SIZE, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	14.97	≤0.0001	0.0047	0.0129		0.0052	0.0136	
Set 2	(3,53)	8.97	≤0.0001		<0.0214				
Set 3	(3,54)	5.45	0.0030						

These findings suggest that the rise sizes of the initial PN peak are not consistently different across the different utterance types. Dalton (2008) found that initial pre-nuclear accents in Kerry Irish are realised as L*+H in 47% of YQ and that they are often preceded

by a high boundary tone %H. In our data the realisation of the H* pre-nuclear accents in all questions types does seem to be different from that in statements.

6.3.3 f0 of the nuclear pitch accent

The averaged N peaks across different utterances are shown in Figure 6.11.

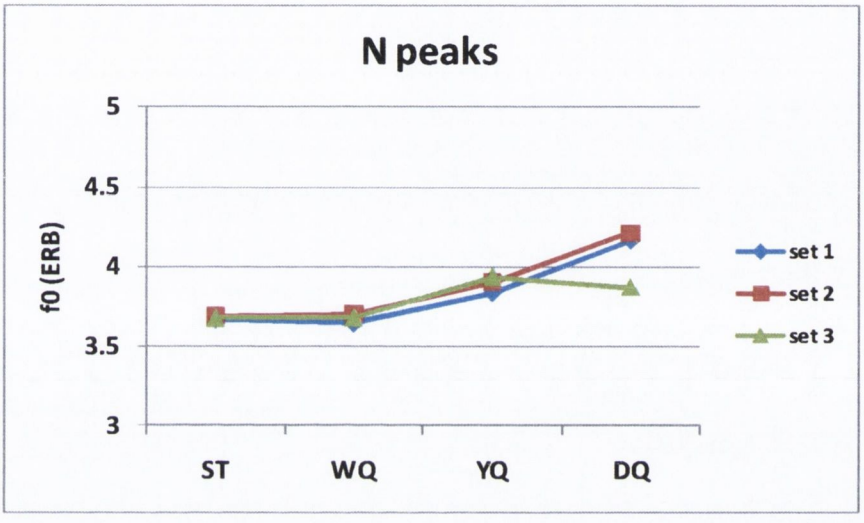

Figure 6.11 N peaks across different utterance types for the three sets: Set 1: *Manny lives in Mallow*, Set 2: *Amanda is selling the mandolin*, and Set 3: *Manny has a meeting with the manager.*

Two observations can be made. First, it is clear that N peaks in DQ stand out as higher than the N peaks in the other utterance types. This is supported statistically: Set 1: $F(3,43) = 22.45$, $p \leq 0.0001$, Bonferroni tests show that N peaks of DQ are significantly higher than in ST, WQ, and YQ, Set 2: $F(3, 53) = 21.51$, $p \leq 0.0001$, Bonferroni tests show that N peaks of DQ are significantly higher than in ST, WQ, and YQ, and that YQ are significantly different from ST, Set 3: $F(3,41) = 19.32$, $p \leq 0.0001$, Bonferroni tests show that the N peaks in DQ and YQ are significantly higher than those in ST and WQ. Table 6.6 summarises the statistical results for the N peaks across utterance types.

Table 6.6 Statistical results for N PEAK, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	22.45	≤0.0001	≤0.0001	≤0.0001	0.0063			
Set 2	(3,53)	21.51	≤0.0001	≤0.0001	≤0.0001	≤0.0001	0.0434		
Set 3	(3,41)	19.32	≤0.0001	0.0072	0.0035	≤0.0001	≤0.0001		

Second, it is clear that the N peaks in the DQ of Set 3 are lower than those in the DQ of Sets 1 and Set 2. This is supported statistically: $F(2, 25) = 16.57$, $p \leq 0.0001$. Table 6.7 summarises the statistical results for the N peaks in DQ across sets.

Table 6.7 Statistical results for N PEAK in DQ, red = significant difference

Type	df	F-ratio	overall p-value	Bonferroni post hoc tests		
				Set 1 Set 2	Set 1 Set 3	Set 2 Set 3
DQ	(2,25)	16.57	≤0.0001		≤0.0001	≤0.0001

The findings suggest that a high N peak is a potential device employed by speakers of DroghE to produce DQ. However, DQ in Set 3 were not perceived as such even though they had a significantly higher N peak than in ST and WQ. It seems that a high N peak is not the sole devise used to produce a DQ in DroghE. In this respect DroghE is not different from other languages that exhibit higher N peaks in questions such as Swedish, Dutch, Moroccan Arabic, Estonian, and Hausa in (Section 6.2.1.3 above). In recent work on Belfast English, Sullivan found that the peaks in L*+H were higher in WQ and YQ than peaks in ST and list utterances, but no peak height differences between WQ and YQ (personal communication).

We now look at the size of the N accents. Figure 6.12 shows the rise size and fall size of the N peaks in all three sets. Each peak has a preceding f0 low and a following f0 low as shown in Figure 6.1 from which the rise size and the fall size were calculated, respectively.

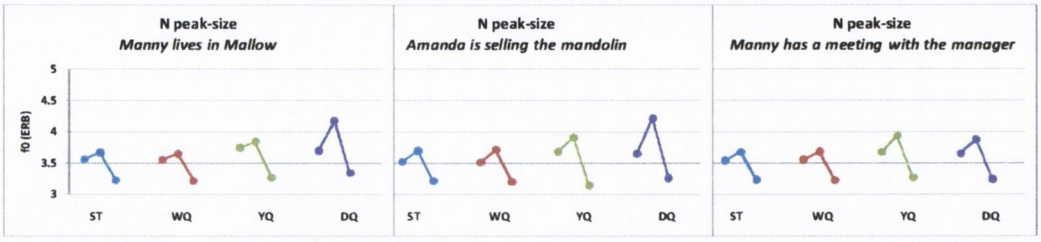

Figure 6.12 Rise size and fall size of N peaks across the utterance types for the three sets.

It is noted that the fall size is larger than the rise size in the N peaks of all utterances. This is expected as the f0 drop is usually considerable in this position. Moreover, it seems that the fall size in DQ is the largest in all sets. These observations are supported statistically: Set 1: $F(3,43) = 13.57$, $p \leq 0.0001$, Bonferroni tests show that the fall size of N peaks in DQ are significantly higher than those in ST, WQ, and YQ, Set 2: $F(3, 53) = 7.00$, $p \leq 0.0001$, Bonferroni tests show that the fall size of N peaks in DQ are significantly higher than in ST and WQ, Set 3: $F(3,41) = 12.07$, $p \leq 0.0001$, Bonferroni tests show the fall size of N peaks in DQ and YQ are significantly higher than those in ST and WQ. Table 6.8 summarises the statistical results for the fall size of N peaks.

Table 6.8 Results for FALL SIZE OF N PEAK, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	13.57	≤0.0001	≤0.0001	≤0.0001	0.0416			
Set 2	(3,53)	7.00	≤0.0001	0.0025	0.0049				
Set 3	(3,41)	12.07	≤0.0001	0.0377	0.0299		0.00859	0.0062	

These findings suggest that the fall sizes of N peak in DQ and YQ are consistently larger than those in ST and WQ. However, the DQ in Set 3 were not perceived as questions even though they have larger sizes of N peaks compared to ST and WQ. The lower N peak in the DQ of Set 3 that was clear in Figure 6.11 can also be observed in Figure 6.12. Note also that the f0 low preceding the N peaks is similar in all DQ. It can also be observed that the N peaks of YQ are higher than those in ST and WQ. The finding here suggests that N peak size alone is not a defining characteristic of DQ in DroghE.

6.3.4 Relation between the PN peaks and N peaks

So far, we have looked at the initial PN peaks (their height and size) and the N peaks (their height and size). The PN peaks did not show a clear difference across the different utterance types. The N peaks of DQ were significantly higher in peak and fall size than their counterparts in ST, WQ, and YQ (although N fall sizes in DQ were significantly different from YQ in Set 1 only). These findings highlight the importance of the N peaks in producing DQ in DroghE. However, the DQ in Set 3 had significantly high N peaks and high sizes compared to the other utterance types, but they were still not perceived as questions as was shown in the perception test.

We move on to look at the f0 contour of the utterance as a whole. One way of doing this is by investigating the relation between the initial PN peaks and the N peaks. Figure 6.13 shows the initial PN peaks (blue) and N peaks (red) connected by a dashed line in each utterance for the three sets.

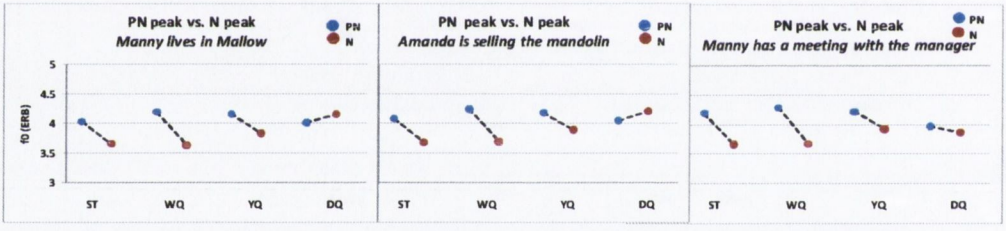

Figure 6.13 The difference between PN peaks (blue) and N peaks (red) across the different utterance types in the three sets

Figure 6.13 shows that in ST, WQ, and YQ in all the three sets, the PN peaks are higher than the N peaks. Conversely, in DQ the N peaks are higher than the PN peaks. The only exception is the DQ in Set 3; which is similar to other utterance types where the PN peaks are higher than the N peaks. Recall that in the perception test this was the DQ that was not perceived as a question. LMA show that the f0 difference between the PN peak and N peak is significantly smaller in DQ than that in the other utterance types: Set 1: $F(3,43) = 41.58$, $p \leq 0.0001$, Set 2: $F(3, 53) = 73.21$, $p \leq 0.0001$, Set 3: $F(3,41) = 13.63$, $p \leq 0.0001$. Bonferroni tests show that in all cases the difference between the PN peak and the N peak was significantly smaller in DQ than in ST, WQ, and YQ (except that DQ and YQ were

not significantly different in Set 3). The statistical results of the difference between PN and N peaks across utterance types are summarised in Table 6.9.

Table 6.9 Statistical results for N PEAK - PN PEAK, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	13.57	≤0.0001	≤0.0001	≤0.0001	≤0.0001			
Set 2	(3,53)	73.21	≤0.0001	≤0.0001	≤0.0001	≤0.0001		≤0.0001	0.0182
Set 3	(3,51)	13.63	≤0.0001	0.0017	≤0.0001			0.0196	

We present the relation between PN and N peaks in DQ in more detail by comparing the f0 difference between PN peaks and N peaks across the three DQ: *Many lives in Mallow? Amanda is selling the mandolin?* and *Manny has a meeting with the manager?* LMA and Bonferroni tests show that the difference between the initial PN peak and the N peak in (DQ3) *Manny has a meeting with the manager?* is significantly different from that in (DQ1) *Many lives in Mallow?* and (DQ2) *Amanda is selling the mandolin?*: $F(2,25) = 9.01$, $p = 0.0011$ as summarised in Table 6.10.

Table 6.10 Statistical results for N PEAK - PN PEAK in DQ, red = significant difference

Type	df	F-ratio	overall p-value	Bonferroni post hoc tests		
				Set 1 Set 2	Set 1 Set 3	Set 2 Set 3
DQ	(2,25)	9.01	0.0011		0.0029	0.0021

In DQ1 and DQ2 the difference is positive (N-PN), in DQ3 it is negative. This means that in DQ1 and DQ2 the PN peaks are lower than the N peaks; in DQ3 the PN peaks are higher than the N peaks. In other words, for a DQ in DroghE to be heard as a question, the N peak has to be higher than the PN peak. This explains why DQ3 was not perceived as a question since in the majority of cases the two peaks were either of equal height or the PN peak was higher than the N peak.

It is clear in Figure 6.4 above that the red peaks (N) are higher than the yellow ones (PN) only in the DQ of Set 1 and Set 2. Conversely, yellow peaks are higher than the red peaks in all utterances of Set 3, including DQ as shown in Figure 6.5.

Similar findings are reported for Moroccan Arabic where the nuclear peaks in declarative questions are more than 6 semitones higher than those in statements (Benkirane, 1998: 354) and Dutch where DQ, YQ, and WQ (to a lesser extent) have higher PN peaks than N peaks in contrast to ST (Haan, 2002). Interestingly, experiments with two pitch accents in a statement have shown that for the two peaks to sound equally high, the first in general will have a higher f0, whereas when both have the same f0, the second is perceived as higher (Pierrehumbert, 1981: 987). In the well-known experiment by Liberman and Pierrehumbert (1984) the utterance *Anna came with Manny* (containing two separate intonational phrases with one nuclear accent in each) is uttered in two different focus structures corresponding to two different questions: *What about Manny? Who came with him?* and *What about Anna? Who did she come with?* In one answer *Anna* is focused, while in the other it is *Manny*. Each answer was elicited in ten-step different pitch ranges (from a 'phlegmatic mumble' to 'a forceful shout'). It was found that regardless of the level of pitch range employed, the second peaks were lower than the first peaks in both cases of the two different answers (although less lower when the second peak is focused, *Manny*) (Ibid.: 182). This is said to be the effect of declination which is implicitly involved in the scaling of pitch accents that corresponds to a certain degree of prominence.

The findings suggest that in questions of certain dialects/languages not only is declination 'suspended' but an upward effect is triggered by the nuclear accents, making them both acoustically and perceptually more prominent.

We now look more into the relation between the PN peaks and the N peaks by comparing the differences in the sizes of the peaks across the different utterance types. Figure 6.14 shows the difference between the largest sizes of the PN peak (mostly rise sizes) in blue and the largest sizes of the N peaks (fall sizes) in red.

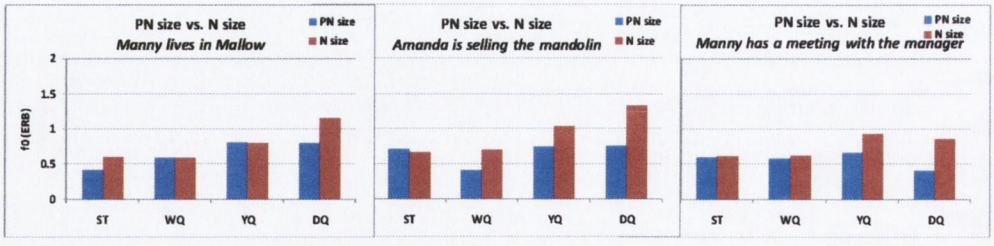

Figure 6.14 The difference between PN peak sizes (blue) and N peak sizes (red) across the different utterance types in the three sets

It appears that the difference between the peaks is largest in DQ. However, statistical tests do not show that this difference is systematic. Although the difference between the PN peaks and the N peaks is significant across the different utterance types: Set 1: $F(3,43) = 9.33$, $p \leq 0.0001$, Set 2: $F(3, 53) = 4.26$, $p = 0.009$, Set 3: $F(3,41) = 5.66$, $p = 0.0024$, DQ are not always significantly different from all other utterance types. Bonferroni tests show that in Set 1, DQ are significantly different from WQ and YQ, in Set 2 only DQ and ST are significantly different, and in Set 3 DQ are significantly different from ST and WQ. Table 6.11 summarises the statistical results for the differences between peaks sizes across the different utterance types.

Table 6.11 Statistical results for N PEAKS SIZES-PN PEAKS, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	9.33	≤0.0001		0.0044	0.0031			
Set 2	(3,53)	4.26	0.0090	0.0055					
Set 3	(3,41)	5.66	0.0024	0.0182	0.0176				

To sum up, analyzing the relation between the initial PN peak and the N peak within an utterance revealed a crucial aspect of DQ intonation in DroghE. The results suggest that in order for a DQ in DroghE to be perceived as such, it is not enough to have higher N peaks and higher N peak sizes compared to ST. For a DQ to be perceived as such in DroghE, the N peak has to be higher than the initial PN peak within the same utterance. The PN-N peak relation in WQ and YQ was similar to that in ST; PN peaks were higher than N peaks.

6.3.5 Register span and register level

Figure 6.15 shows the overall register span (dashed vertical lines) of the three sets across utterance types. The register span is the difference between the absolute maximum f0 (blue points) and the minimum f0 (red points), which are taken anywhere in the contour. As mentioned earlier, we take the f0 minimum as one possible correlate of register level.

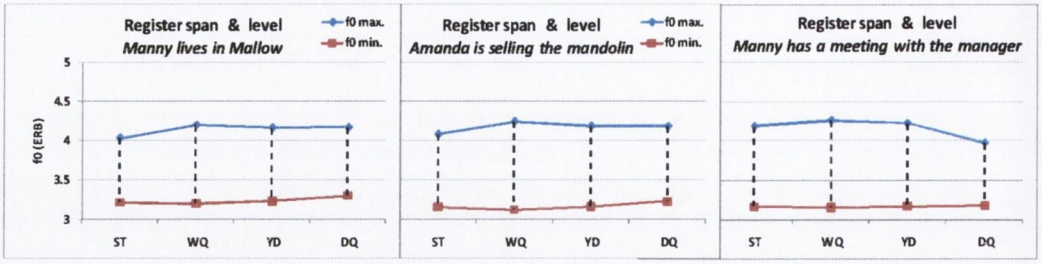

Figure 6.15 Register span (dashed vertical lines) and register level (red points) of the f0 contour across the different utterance types in the three sets

As mentioned earlier in section 7.2.1.5, a globally raised register level is an aspect of interrogative intonation in several languages. The lower red lines in Figure 6.15 do not seem to suggest that in DroghE questions have a globally raised register level. Statistically the differences between f0 minimum across different utterance types are significant in Set 1: $F(3,43) = 3.40$, $p = 0.026$ and in Set 2: $F(3, 53) = 5.59$, $p = 0.0021$, but not in Set 3: $F(3,41) = 0.239$, $p = 0.869$. However, Bonferroni tests in Set 1 and Set 2 do not show consistent differences between questions and statements as summarised in Table 6.12.

Table 6.12 Statistical results for REGISTER LEVEL, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	3.40	0.0260						
Set 2	(3,53)	5.59	0.0021		0.00281				
Set 3	(3,41)	0.239	0.869						

Figure 6.15 also shows that the register span is not different across the utterance types in the three sets. This observation is borne out by LMA for Set 1: $F(3,43) = 1.86$, $p = 0.15$ and Set 2: $F(3, 53) = 1.87$, $p = 0.15$. Set 3 shows significance: $F(3, 41) = 3.47$, $p = 0.025$ (however, Bonferroni tests do not show significant differences across utterance types). In contrast to other languages that have a raised register level in questions such as Swedish, Hausa, Finnish, American English, Hungarian, Vietnamese, Thai, and Moroccan Arabic (see Chapter 3), DroghE does not employ a globally raised register span or a raised register level to convey interrogative intonation. Since a device to convey interrogative intonation already exist in DroghE, the PN-N peak relation, a second device would seem to be redundant.

6.3.6 Declination in the global trend

The previously discussed f0 metrics involved f0 measurements at certain points in the f0 contour. The present metric characterises the direction of the whole f0 contour, the global trend. Figure 6.16 shows the averaged upper (blue) and lower (red) regression lines for the four utterance types for five speakers (GO, IF, JG, RK, and TO) for Set 1 and Set 2. The value next to each line is the regression line slope coefficient. A negative coefficient indicates a downtrend effect; whereas a positive one indicates an uptrend effect. The regression lines for Set 3 are presented separately in Figure 6.17. The DQ in Set 3 differed in most of the f0 metrics from those in Set 1 and Set 2. Moreover, the values for Set 3 are based on four speakers (GO, JG, RK, and TO).

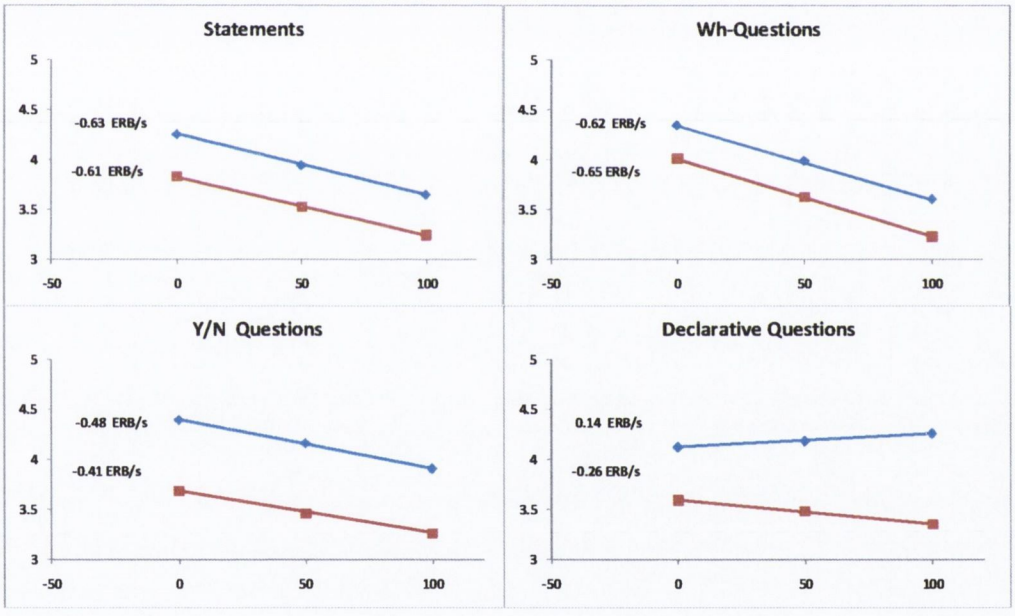

Figure 6.16 The global trend represented by upper (blue) and lower (red) regression lines for each utterance type averaged for five speakers for Set 1 and Set 2. The x-axis represents the time as a percent of the utterance duration. The x-axis represents the time as a percent of the utterance duration. The y-axis represents the pitch in (ERB). Values next to lines are the slope coefficient for each line in (ERB/s). Each regression line has an initial, central, and final f0. A negative coefficient indicates a downtrend effect, a positive one indicates an uptrend effect.

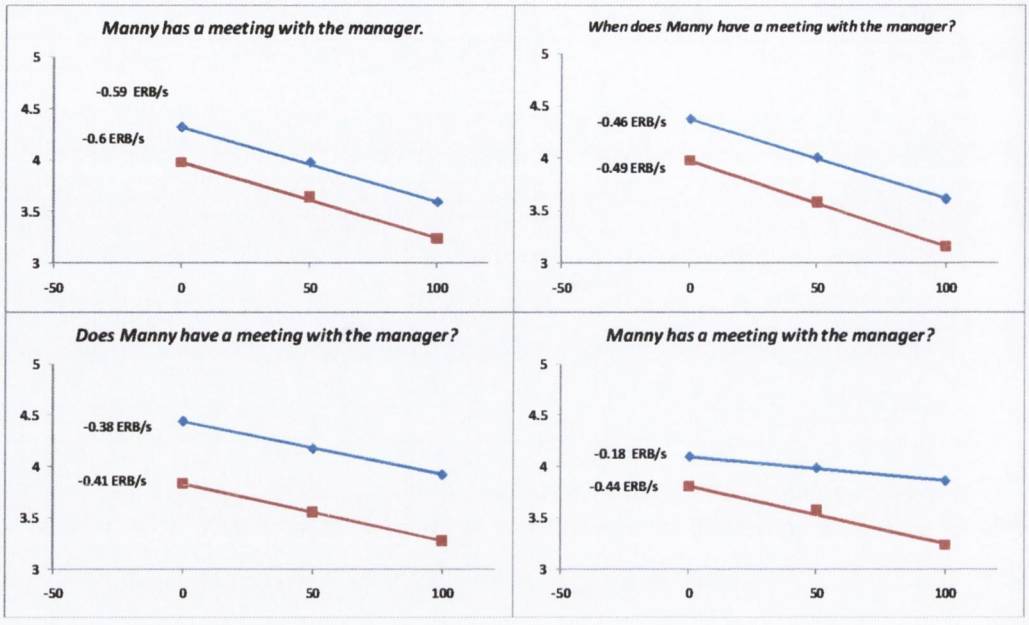

Figure 6.17 The global trend represented by upper (blue) and lower (red) regression lines for each utterance type averaged for four speakers for Set 3.

It is noticeable in Figure 6.16 that only DQ have a positive slope coefficient for the upper regression lines. This indicates that DQ are characterised by a global uptrend in the analysed data. All other utterance types have a clear downtrend; however, YQ are less steep than ST and WQ. Statistical tests support this observation and show that coefficients of the upper regression lines are significantly different across utterance types in all sets: Set 1: $F(3,43) = 35.63$, $p \leq 0.0001$, Set 2: $F(3, 53) = 72.31$, $p \leq 0.0001$, Set 3:$F(3,41) = 14.34$, $p \leq 0.0001$. However, the coefficient value of the upper regression line in DQ of Set 3 is negative indicating a downtrend slope. Statistical results for coefficients of upper regression lines in the three sets are summarised in Table 6.13.

Table 6.13 Statistical results for UPPER REGRESSION LINES, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	35.63	≤0.0001	≤0.0001	≤0.0001	≤0.0001			
Set 2	(3,53)	72.31	≤0.0001	≤0.0001	≤0.0001	≤0.0001	0.0179	≤0.0001	
Set 3	(3,41)	14.34	≤0.0001	≤0.0001	0.0043				

Figure 6.16 also shows that the lower regression lines are all negative for all utterance types; however, lower regression lines in WQ seem to be steeper than those in YQ and DQ. Statistical tests support this observation for Set 2 and partially for Set 1: Set 1: $F(3,43) = 6.62$, $p = 0.0003$, Bonferroni tests show that DQ are significantly different from ST and WQ, Set 2: $F(3, 53) = 13.59$, $p \leq 0.0001$. Similarly, coefficient values of lower regression lines in Set 3 are significantly different: $F(3,41) = 3.45$, $p = 0.025$ (however, Bonferroni tests do not show significant differences across utterance types). Statistical results for the coefficients of lower regression lines are summarised in Table 6.14.

Table 6.14 Statistical results for LOWER REGRESSION LINES, red = significant difference

Set	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				ST DQ	WQ DQ	YQ DQ	ST YQ	WQ YQ	WQ ST
Set 1	(3,43)	6.62	0.0003	≤0.0001	0.0028				
Set 2	(3,53)	13.59	≤0.0001		≤0.0001			≤0.0001	0.0089
Set 3	(3,41)	3.45	0.025						

Figure 6.18 reproduces the global trend results for Dutch (Haan, 2002: 85). It can be seen that in YQ and DQ there is a global uptrend. This stands in sharp contrast to our IrE data. This difference is due to the high occurrence of final rises in all question types in Dutch in the following ascending order of occurrence WQ < YQ < DQ. Haan's findings are in line with the Frequency Code where higher pitch represented by the occurrence of final rises conveys interrogativity. Her findings also show that in Dutch there is a trade-off between intonational aspects of higher pitch and morpho-syntactic markers of interrogativity i.e. the less the use of morpho-syntactic markers the more the use of intonational aspects.

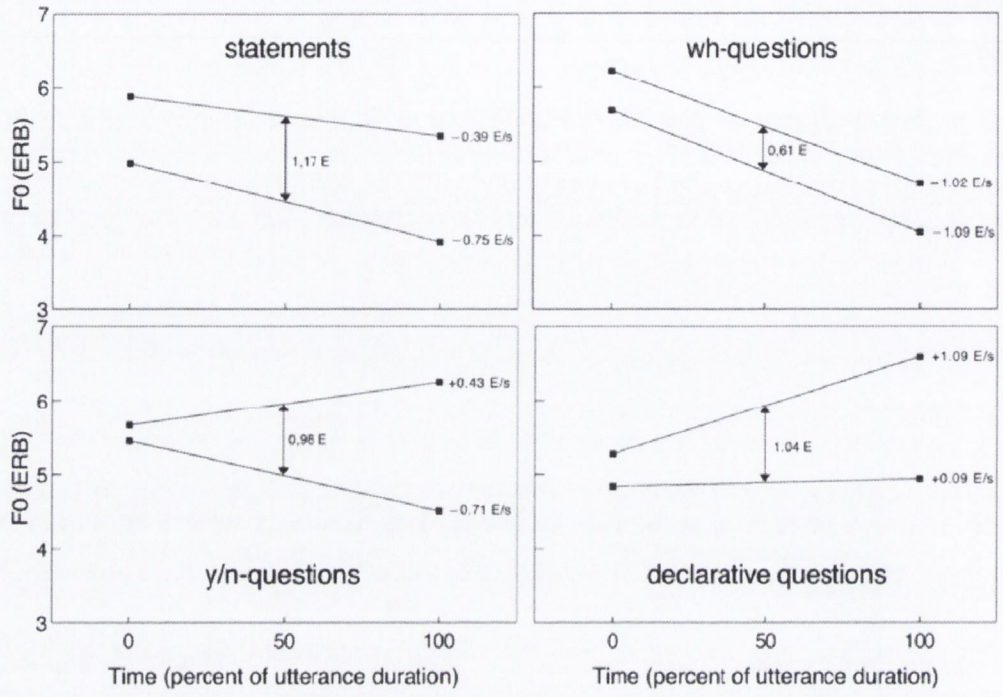

Figure 6.18 The global trend represented by upper and lower regression lines for each utterance type collapsed over (10 Dutch speakers, 5 males and 5 females). Values next to lines are the slope coefficient for each line in (ERB/s). A negative coefficient indicates a downtrend effect, a positive one indicates an uptrend effect. Vertical arrows indicate mean register span at the temporal midpoint.

To sum up, the global trend, represented by the regression lines, indicates that the uptrend of the upper regression line is crucial in the production of DQ in DroghE. This in turn reflects the peak height interplay between the initial PN peak and the N peak. The N peak must be higher than the initial PN peak to convey an interrogative intonation. The uptrend of the upper regression lines in interrogative intonation seems to be the grammaticalisation of the Frequency Code in DroghE. Moreover, it seems that in this variety of IrE, question types that are marked by morpho-syntactic markers do not employ aspects of interrogative intonation in contrast to the case in DQ. This suggests that the variety of DroghE is economical in the use of linguistics devices to convey interrogativity.

6.4 Summary

In this chapter we looked at the markers that convey interrogative intonation in different question types and statements. This was done by comparing f0 metrics in different parts of the f0 contour as well as characterizing the global trend of the f0 contour. In terms of pitch

accents, ST, WQ and YQ are characterised by PN peaks which are higher in f0 than N peaks. In contrast, DQ are characterised by N peaks which are higher in f0 than PN peaks. In terms of global trends, ST and WQ were similar in having quite steep upper and lower regression lines. YQ were characterised by having similar downtrends; however, they were less steep than ST and WQ. In contrast, DQ typically had uptrends in the upper regression lines, reflecting the high scaling of the N peak. Other f0 metrics that pertain in other languages such as register span and an overall raised resister level do not seem to play a role in question characterisation in DroghE.

Moreover, utterance duration seems to be a factor that influences the use of DQ. The recorded DQ in Set 3 *Manny has a meeting with the manager?* which was not perceived as a question in the perception test served as control data to test potential factors of interrogative intonation in this dialect. DQ of Set 1 and Set 2 had a smaller negative upsweep than that in ST, WQ, and YQ. This indicates a lesser declination effect in DQ and that longer utterances in general start off with a relatively higher initial f0 than shorter utterances. This also gives a larger upsweep size for ST. To produce a long DQ, the speaker would not only have to start with a higher initial f0 but would also need to produce a higher nuclear peak than the initial PN peak. Therefore, producing a relatively long DQ was not as economical as that in shorter utterances in DroghE.

Finally, the exploitation of the Frequency Code in DroghE to produce interrogative intonation seems to be grammaticalised by the higher N peak compared to the PN one, resulting in a global uptrend. The uptrend in f0 contours of DQ gives evidence to a theory which considers declination to be purposefully imposed by speakers to produce questions. Moreover, our findings similar to Asu's (2004), on Estonian, show that interrogative intonation is manifested over the whole utterance.

In Chapter 5, we found that the default nuclear contour in ST, WQ, and YQ to be a 'fall' (H* L-L%) and a 'scooped fall' (L+H* L-L%) in DQ. In Chapter 6, we learned that not only are DQ different in their nuclear contours, but also in the f0 scaling of the accentual peaks and their scaling relations over the f0 contour. In Chapter 7, we will look at another aspect where pitch accents within contours differ: their timing relations with the segmental string, tonal alignment. The next chapter investigates the tonal alignment of H* pre-nuclear and nuclear accents in non-emphatic statements and the factors that might influence its default realisation.

Chapter 7 Peak Alignment in Drogheda English

7.1 Introduction

In Chapter 5 we have described the default tonal patterns of DroghE as a sequence of falling tones H* H* H* L-L%. This suggests that DroghE is a southern variety of IrE which has a tonal pattern more akin to Dublin English than to Belfast or Donegal English. As mentioned in Chapter 2, two dimensions are important in characterizing a tonal target: its scaling (f0 level) and its particular phonetic alignment with the segmental string (Ladd, 2008: 169). In the previous chapter, we looked at the scaling of initial pre-nuclear and nuclear pitch accents as well as their respective sizes in different utterance types. The findings suggest that the difference between statement intonation and declarative-question intonation were mainly controlled by the 'relation' between the scaling of the initial-pre-nuclear and the nuclear pitch accents. The peak of the nuclear pitch accent had to be over 100% of the value of the initial pre-nuclear pitch accent in order for the utterance to be heard as a declarative-question in DroghE. In this chapter we set out to specify the characteristics of timing of the initial pre-nuclear and nuclear peaks with the segmental string; their alignment features.

While a tonal label like H*, L+H*, or L*+H is seen as associated with an accented syllable, the alignment specifically allows us to see how precisely the L and H alignment maps to the syllabic and segmental tiers. As outlined in the literature review (Chapter 2) the alignment characteristics can vary with a large number of factors including proximity to word/phrase boundary, rhythmical organization (e.g. stress clash), focus, tonal environment (e.g. tonal crowding), pitch range (e.g. differences in degree of emphasis), global intonation (e.g. absence/presence of downdrift due to interrogative/declarative structure), and speaking rate (e.g. fast, normal, slow tempo).

It was proposed in Chapter 2 that one might usefully differentiate between intrinsic and extrinsic alignment characteristics. For a given syllable structure with specific component segments there is an **intrinsic alignment** which is the default location of the f0 turning points of a particular pitch accent relative to the segmental string in the context of no major rhythmic or temporal constraints. It was also suggested that there are potentially two

separate pre-nuclear (PN) and nuclear (N) intrinsic alignments for any given accented syllable. We hypothesized that the optimal context for intrinsic alignment to occur is the '$2^{+}A2^{+}$' context. The '$2^{+}A2^{+}$' hypothesis means that when the accented syllable (A) is preceded and followed by 'at least two' unstressed syllables, the intrinsic alignment for a given syllable will be manifest in so far as it allows for a 'full' realisation of the timing characteristics of the pitch accent.

Extrinsic alignment is the potential shifts to the default (intrinsic) location of the f0 turning points of a particular pitch accent for a given syllable conditioned by 'contextual variation' constraints.

In this chapter, not all the intrinsic and possible extrinsic alignment characteristics are investigated; however the following questions will be addressed:

1. Is the '$2^{+}A2^{+}$' context optimal for specifying the default, intrinsic alignment characteristic of H* accent for a given syllable structure in the dialect under study?
2. How much potential extrinsic variation is there when the '$2^{+}A2^{+}$' context is not available (when there are less than two syllables either preceding or following) for both PN and N accents?
3. Does a change in syllable structure occasion changes to the intrinsic timing? and
4. Are PN and N peak alignments differerent in terms of their intrinsic timing?

It has already been established that DroghE is a typical southern variety of IrE, in both its segmental structure and intonational patterns. There is virtually very little information on alignment in IrE although there is current work being carried out on Ulster English. There is some suggestion in Nolan and Farrar (1999) that under different conditions in the anacrusis there could be more peak shifting (delay) in Belfast, Newcastle, and Leeds than in Cambridge.

One of the few studies on alignment in IrE is Sullivan (2006) who looked at the alignment of nuclear falls in Wexford and Dublin English, and nuclear rises in Belfast English.The Belfast and the Dublin data were based on recordings available from the IViE project (Grabe et al., 2001), and the Wexford English data was based on data of four female speakers. It should be noted that the Dublin data from the IViE project is based on speakers from the town of Malahide, north of Dublin. Sullivan's study is concerned with, what is termed here, intrinsic alignment, and the implications alignment features can have on

labelling, and she does not investigate factors that trigger shifts in alignment. She finds that peaks of nuclear falls in Malahide English are consistently aligned near the beginning of the accented vowel, whereas in Wexford English the peak occurred before the beginning of the accented vowel. In Belfast English, there was a tendency for the L in nuclear L*+H to align close to the end of the accented syllable and 'possibly beyond it in some cases' (Ibid.: 121).

In later work, Sullivan (2007) focuses more on the alignment of the L target in nuclear L*+H pitch accent in Belfast English using the same source for data (IViE project). Some of the factors she looks at include the anacrusis size, the segmental structure, sentence type, and gender. In general, she finds that the L is aligned earlier in the accented syllable as the size of the anacrusis increased. There is a tendency for L to be aligned earlier when the accented syllable is onsetless than when it contains an onset. When the vowel of the accented syllable is phonetically short, L is aligned earlier. She also finds an effect, although very limited, of a different grouping of the alignment of L in declarative questions from that of coordination questions and yes/no questions. Gender differences suggest that male speakers have earlier alignment than females in both the Belfast and Dublin IViE data, but Sullivan points out that the effect of gender on alignment is an area which is still at its infancy and that her findings might not only be due to gender differences.

In Irish, the situation is complex. Dalton and Ní Chasaide (2006) investigate alignment in two different dialects of Irish, Gaoth Dobhair in Ulster (GU-U) and Cois Fharraige in Connaught (CF-C). They find that although the two dialects differ in pitch accents, L*+H and H*+L[18] for (GU-U) and (CF-C) respectively, they have in common that the peak in H*+L and the L in L*+H do not shift when the number of unstressed syllables preceding PN and following N is varied. Specifically, in (CF-C), H* is aligned at the right edge of the accented syllable in PN and at the left edge of the syllable in N. Similarly, in (GD-U) in PN accents L* is aligned at the right edge of the accented syllable. The L* in N accents retains similar characteristic to PN alignment but shows truncation when there is not enough unstressed material following the nuclear syllable.

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[18] Dalton and Ní-Chasaide (2006) use the IViE labelling system in their study.

The southern Irish varieties of Connaught (Connemara and the Aran Islands of Inis Oírr) are much more similar prosodically to DroghE in that the tunes are a succession of H* tones. In the two southern Connaught Irish dialects a striking difference emerged in terms of the alignment pattern observed (Dalton 2007). Given that two very closely related dialects differ so strikingly in their alignment characterisitcs, it would be impossible to predict what any Irish influence may have had on IrE in this dimension.

7.2 Preamble: A Pilot Study in Drogheda English and Dublin English

Prior to the present study, a pilot investigation was carried out on two speakers of DroghE and two speakers of Dublin English reported in Kalaldeh, Dorn, & Chasaide (2009). Peak alignment was investigated for the pitch accent H* in both initial pre-nuclear and nuclear accents. The accented syllable /man/ was placed in different rhythmic structures. The number of unstressed syllables preceding the initial pre-nuclear syllable and following the nuclear syllable ranged from (0 to 3). Peak alignment was measured as a proportion of the duration of the interval from the onset of the accented syllable to the peak location, relative to the duration of the accented syllable.

In DroghE, we found that peak alignment in initial pre-nuclear peaks was located halfway through the accented syllable as shown in Figure 7.1. Visual observation suggested that the peak was aligned within the vowel of the accented syllable, specifically near the end of the vowel. In Dublin English the peaks were also consistently aligned within the accented syllable, particularly at VC boundary of the accented syllable. In both varieties there was an influence on peak alignment in the 0PN and N0 conditions, although this effect was larger and clearer in Dublin English. In both varieties nuclear peaks were also aligned within the accented syllable but were earlier than initial pre-nuclear peaks.

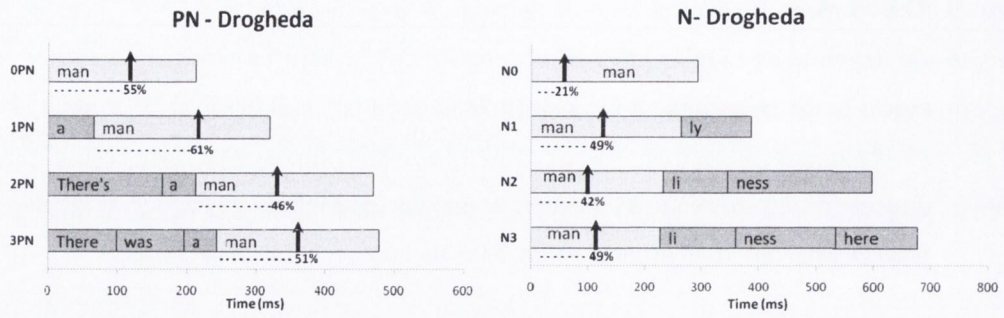

Figure 7.1 Averaged peak location (↑) shown in percentages across two speakers for initial pre-nuclear and nuclear H* pitch accents in DroghE. The accented syllable is /man/ in all cases, dark boxes represent unstressed syllables, reproduced from Kalaldeh et al. (2009).

The pilot study provided preliminary observations on intrinsic and extrinsic alignment features in DroghE. The peaks were aligned within the accented syllable in all conditions. Visual observation suggested that the peaks in DroghE are intrinsically aligned near the right edge of the vowel in the accented syllable.

The present study builds on the findings of the pilot study. Specifically, there will be closer examination of the exact location of the peak within the accented syllable. Therefore, alignment is measured as the proportion of the interval from the onset of the 'vowel' of the accented syllable to the peak location, relative to the duration of the 'vowel' of the accented syllable.

In addition, the influence of syllable structure on the realisation of intrinsic peak alignment is investigated. Previous studies have investigated the influence of syllable structure on tonal alignment. Some specifically controlled their test data using different syllable structures of the accented syllables (Prieto and Torreira, 2007). Others were primarily concerned with the influence of vowel length in the accented syllable on alignment (Ladd et al., 2009, Ladd et al., 2000). The manipulation of the vowel length resulted indirectly in different syllable structures since, in general, single intervocalic consonants are syllabified with a following syllable after long vowels but could be ambisyllabic after short vowels (Schiller et al., 1997).

Prieto and Torreira (2007) have shown that in Spanish, accentual initial pre-nuclear peaks are aligned differently depending on whether the accented syllable contains a coda consonant. They concluded that in "CV syllables the peak was located around the end of

the accented vowel, and in CVC syllables around the beginning-mid part of the sonorant coda, but still far from the syllable boundary." (Ibid.: 473). Ladd et al. (2000) showed that the alignment of pre-nuclear peaks in Dutch were aligned at the end of the accented vowel if it was a phonologically long vowel, but during the following consonant if the accented vowel was a phonologically short vowel. They suggested that the difference might be attributed to the syllable structure. The underlying principal in Ladd et al. (2000) was that the peak could be aligned in all cases to the end of the accented syllable.

However, a later study by Schepman et al (2006) on nuclear peaks in Dutch has shown that vowel length influences alignment regardless of syllable structure. They did not find a systematic effect of syllable structure on nuclear peaks in Dutch. They find an interesting trend in short vowels: in syllables with ambisyllabic consonants (e.g. *mannen* 'men' /ˈmɑnə/) the peak was later than that in CVC syllables (*man* 'man' /mɑn/). This trend, however, did not reach significance (Ibid.: 11).

The possible influence of syllable structure on peak alignment is still not clear. In the present study peak alignment in both initial pre-nuclear and nuclear peaks in DroghE is investigated for two syllable structures which are only different in the status of the coda. The CVC syllable /man/ is investigated in words such as *manliness* and *mandolin* and CV or CV(C) syllable /ma(n)/ is investigated in words such as *manor* and *manager*. According to the Maximal Onset Principal the stressed syllable in *manor* and *manager* is a CV syllable. If the intervocalic consonant /n/ is ambisyllabic, then the syllable in *manor* and *manager* is a CV-C- syllable, where /n/ is the coda of the stressed syllable and the onset of the following unstressed syllable simultaneously. It should be pointed, that ambisyllabicity in English is a very unresolved issue.

Intrinsic peak alignment features in both CVC and CV(C) syllable structures could have implications for syllabification. If the findings show that there are no peak alignment differences between the two syllable structures, there could be two explanations. One explanation is that both syllable structures do not have substantially different effects on peak alignment. The second explanation is that peak alignment is not controlled by syllable structure. However, if the findings show that peak alignment is different in CVC and CV(C) syllables, there is little doubt that syllable structure is crucial for peak alignment.

In case, where the findings show no significant alignment differences in either syllable structure, I prefer the second explanation and believe that even if the coda consonant /n/ in *manor* and *manager* is ambisyllabic, the syllable CV(C) is still different from a full CVC syllable in *manliness* and *mandolin*.

In light of the findings of the pilot study, the peak of H* in DroghE is expected to be aligned within the vowel of the accented syllable. In addition, these peaks are not expected to show significant shifts conditioned by differences in the rhythmic context. However, since a tighter measure of alignment is used (relative to the accented 'vowel' duration) potential fine-detailed shifts within the accented vowel, conditioned by the rhythmic contexts, can be detected. If these shifts prove to be systematic, they will be considered reliable measures to test the '$2^{+}A2^{+}$' hypothesis.

7.3 Peak Alignment in Drogheda English: Review of Methodology

The materials and methods of this study are presented in detail in Chapter 3. To recap, Corpus G is reproduced in Table 7.1. The study is based on data from seven speakers. For the initial pre-nuclear (PN) and the (N) nuclear H* accents in this study, the following questions are addressed:

1. **When** do the PN and N intrinsic alignments of the H* accent in DroghE occur?
2. **What** are the characteristics of the PN and N intrinsic alignments for such an accent?
3. **How much extrinsic variation** is there in DroghE if the rhythmic context is varied?
4. Is there a difference in intrinsic alignment if the accented **syllable structure** changes from CVC to CV(C)?

The first question investigates whether the '$2^{+}A2^{+}$' hypothesis is the optimal rhythmic context for intrinsic alignment of the H* pitch accent. The rhythmic context for each PN and N accent is varied by manipulating:

a) The number of unstressed syllables 'preceding' the accented syllable (0-3)

b) The number of unstressed syllables 'following' the accented syllable (0-3)

The number of unstressed syllables is manipulated from zero to three. If the size of unstressed material preceding the accented syllable was investigated, the size of unstressed material following the accented syllable is fixed to two unstressed syllables and vice versa as shown in Table 7.1[19].

Table 7.1 The four sets of sentences for PN and N peaks, letters refer to the corresponding Panels in the figures, the investigated unstressed syllables are undelined and the accented syllables are in bold.

Syllable Structure	Initial Pre-nuclear (PN)	
	Preceding syllables (-PN)	Following syllables (PN-)
CVC	(0) ***Man*** *is an omnivore.* (A) *(1) The* ***man*** *in the lobby is waiting for you.* *(2) There's a* ***man*** *in the lobby for you.* *(3) There was a* ***man*** *in the lobby for you.*	*There's a* ***man*** *waiting for you. (0)* (B) *There's a* ***man*** *in Navan. (1)* *There's a* ***man*** *in the lobby for you. (2)* *There's a* ***man*** *on the veranda for you. (3)*
CV(C)	(0) ***Man***ny *is in love with Mary.* (C) *(1) The* ***ma***nor *was renovated.* *(2) There's a* ***ma***nor *on Wellington Street.* *(3) There was a* ***ma***nor *on Wellington Street.*	---------- (D) *The* ***ma***nor *opens on a Sunday. (1)* *The* ***ma***nor *was renovated again. (2)* *The* ***ma***nor *was unusually glamorous. (3)*
Syllable Structure	**Nuclear (N)**	
	Preceding syllables (-N)	**Following syllables (N-)**
CVC	*(0) Mel has a new* ***man***dolin. (Ȧ) *(1) Mel plays the* ***man***dolin. *(2) Mel is playing the* ***man***dolin. *(3) Mel is playing on the* ***man***dolin.	*I'm meeting the* ***man****. (0)* (Ḃ) *He's handsome and* ***man***ly*. (1)* *It's an example of* ***man***liness*. (2)* *We need some more* ***man***liness here*.(3)*
CV(C)	*(0) Mel is a good* ***ma***nager*.* (Ċ) *(1) Melvin sued the* ***ma***nager*.* *(2) Mel was dating the* ***ma***nager*.* *(3) Mel was depending on the* ***ma***nager*.*	---------- (Ḋ) *We'll dine in the* ***ma***nor*. (1)* *Mel is meeting the* ***ma***nager*. (2)* *Mel is meeting the* ***ma***nager now*. (3)*

Answers to question (1) can provide answers for the rest of the questions. Once the optimal rhythmic context for intrinsic alignment is identified, question (2) can be answered. Once intrinsic alignment is characterised, question (3) can be answered. When the characteristics of intrinsic alignment and the extent of extrinsic alignment for H* accent in DroghE are identified, question (4) can be tackled. To investigate question (4) the words *man, manly,*

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[19] One exception is condition D (PN- for the CV(C)) where the number of fixed preceding unstressed syllables is only one. This condition is discussed in Section 7.4.2.

manliness and *mandolin* are used to represent the CVC syllable structure and the words *manor, manager,* and *Manny* to represent the CV(C) syllable structure.

In total, there are four different sets of sentences for each of the PN and N peaks: (2rhythmic contexts x 2syllable structures).

As mentioned earlier, peak alignment is measured as the duration of the interval from the onset of the accented 'vowel' /a/ to peak location, relative to the duration of the 'vowel'. The points of measurement are shown in Figure 7.2 where (H) is the location of f0 peak and (l) is the location of f0 low preceding the peak. The durations of the manipulated unstressed syllables and the segments of the accented syllable were measured and averaged across the seven speakers in (ms).

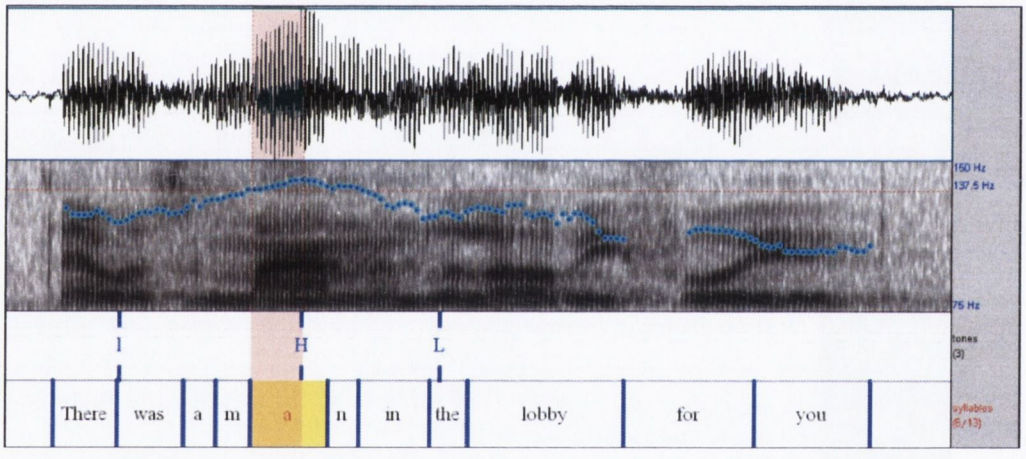

Figure 7.2 Peak alignment measurements taken for the peak on *man* in *There was a man in the lobby for you*, the yellow bar is the accented vowel /a/, the pink bar is the interval from the onset of the accented vowel to the peak location (H), the point (l) is the low preceding the peak.

7.4 Initial Pre-Nuclear Peak Alignment (PN)

This section presents the findings of peak alignment for the PN accents. The findings for the CVC syllable are presented first followed by those for the CV(C) syllable. The section ends with a comparison of alignment across the two syllable structures. The findings answer the following questions for each syllable structure:

1. Is the '$2^{+}A2^{+}$' hypothesis the right formulation?

2. If so, what is the intrinsic default in PN accents?

3. How much extrinsic variation is there?

7.4.1 Varying the rhythmic context for CVC

Figure 7.3 shows the results for the accented syllable /man/. Panels A and B show the influence of the number of unstressed syllables 'preceding' and 'following' /man/, respectively. The boxes in the figures represent that actual averaged syllable and segment durations in (ms). The percentages are the proportional peak alignment represented in upward arrows (↑). In the discussion the proportional peak alignment is referred to as (H). All unstressed syllables are shown in grey boxes. The manipulated unstressed syllables are provided in text. The fixed (not manipulated) unstressed syllables are marked as: s = following the accented syllable, sp = preceding the accented syllable. In all the figures in this chapter the beginning of the accented syllable is set to zero (ms) for ease of comparison across different conditions.

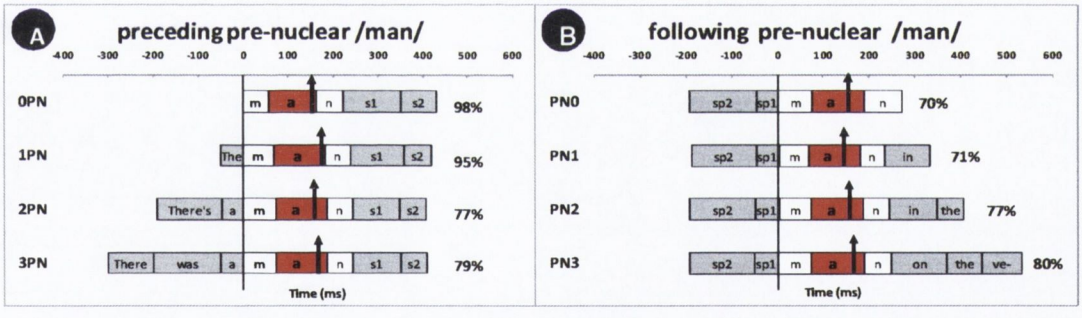

Figure 7.3 Averaged proportional peak alignment of (H = ↑) given in percentages for the accented syllable /man/ across the seven speakers. In A the number of unstressed syllables 'preceding' /man/ was varied. In B the number of unstressed syllables 'following' /man/ was varied. Unstressed syllables that are manipulated are provided in text. Fixed unstressed syllables are: s = following syllables, sp = preceding syllables.

- General Observation

In A, it is observed that the (H's) in both 0PN and 1PN are different from those in 2PN and 3PN. Peak alignment values seem to reflect this difference.

In B, peak alignment is constant across all conditions. This is observed when the accented PN syllable is preceded by a constant number of unstressed syllables in all conditions. The general trend of increasing (H) precentages is due to the PN intrinsic alignment of speaker

TO, whose intrinsic peak alignment is realised later within the /n/ than all other speakers. If we exclude his values we get PN0 (68%), PN1 (73%), PN2 (72%), and PN3 (76%).

- Statistical Analysis

The general observations are confirmed by statistical tests. In all the reported statistical analyses, the general linear model is used. The two fixed factors are 'the number of preceding/following unstressed syllables' and 'speaker'. The values used in the statistical analyses are the proportional values of (H). Statistical results for 'the number of preceding/following unstressed syllables' in A and B are summarised in Table 7.2.

In A, the differences of (H) values between different conditions are significant: $F(3,106) = 7.527$, $p = 0.0001$. Bonferroni tests show that both 0PN and 1PN are different from both 2PN and 3PN as shown in Table 7.2. This is reflected in the averaged (H) values as shown in A. In B, the difference in (H) values across the different conditions is not significant: $F(3,99) = 2.009$, $p = 0.118$.

Table 7.2 Statistical results of the factor 'number of preceding/following unstressed syllables' for (H) in Panels A and B, red = significant difference.

	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				0PN 1PN	0PN 2PN	0PN 3PN	1PN 2PN	1PN 3PN	2PN 3PN
A	(3,106)	7.527	0.0001		0.0096	0.0324	0.0062	0.0233	
B	(3,99)	2.009	0.1175						

- Discussion

The statistical findings largely support the trends shown. To sum up, the number of unstressed syllables preceding the accented syllable influences (H) to a limited extent. Only the 0PN and 1PN conditions are different from 2PN and 3PN. This suggests that when there is no anacrusis preceding the PN syllable, there is a 'phonetic' peak delay. Once there are more syllables in the anacrusis the alignment becomes similar to that in conditions 2PN and 3PN. The fact that (H) in 1PN is similar to 0PN but different from 2PN and 3PN indicates that it takes two or more unstressed syllables in the anacrusis for the peak to have a fixed/anchored location which is its intrinsic alignment.

It should be pointed out that in DroghE, the peak remains within the accented syllable in all conditions. Nonetheless, the fine-detailed differences across different conditions are systematic even if they were only manifesting within the accented vowel.

1. Is the '$2^{+}A2^{+}$' hypothesis the right formulation?

The findings in A show that it is the size of the anacrusis that is crucial for peak alignment of H* in PN accented syllables and not the following unstressed material. When the size of the anacrusis is manipulated and the unstressed material following the PN syllable is kept constant, peak alignment shifts occur. The findings in B reinforce this conclusion. In B, when the size of unstressed material following the PN accented syllable is manipulated and the anacrusis size is kept constant, no significant differences in alignment occur, even in the condition of a tonal crowding, PN0.

In A, peak alignment becomes stable when there is more than one unstressed syllable preceding the PN accented syllable. If another unstressed syllable is added, peak alignment remains at the same location within the segmental string. Therefore, in terms of the '$2^{+}A2^{+}$' hypothesis, the base formula for obtaining intrinsic alignment in H* for PN accents in CVC syllables in DroghE is 2^{+}PN.

2. What is the intrinsic default in PN accents?

In DroghE the peak in H* for PN accents in CVC syllables is intrinsically aligned at a timepoint typically 70% ~80% into the vowel of the accented syllable[20].

3. How much extrinsic variation is there?

After establishing the intrinsic alignment of H* and its optimal context for PN accents in CVC syllables, extrinsic alignment shifts can be evaluated. The observed peak shifts within the accented vowel in 0PN and 1PN mean that any peak shifts in PN accents do not cross the accented syllable boundaries in DroghE. This small, but important, amount of variation leads us to characterise DroghE as dialect that shows relatively little extrinsic variation as a result of varying the rhythmic context. In this respect DroghE is similar to Dublin English (Kalaldeh et al., 2009) and Coir Fharraige Irish (Dalton and Ní Chasaide, 2007). Dublin English does not show extrinsic alignment shifts outside the boundaries of the accented

[20] It should be noted that one speaker (TO) shows a later intrinsic peak alignment. In his speech, the peak is consistently aligned within the coda consonant of the accented syllable.

syllable when the rhythmic context is varied and Coir Fharraige Irish does not show extrinsic shifts in the same rhythmic contexts. Conversely, DroghE is different from Belfast English (Nolan and Farrar, 1999) and Inis Oírr (Dalton and Ní Chasaide, 2007), both of which show peak 'delay' outside the accented syllable boundaries when the rhythmic structure is varied.

7.4.2 Varying the rhythmic context for CV(C)

Figure 7.4 shows results for the accented syllable /ma(n)/. Panels C and D show the influence of the number of unstressed syllables 'preceding' and 'following' /ma(n)/, respectively. The dashed line is placed after the /n/ to indicate that it is an ambisyllabic consonant.

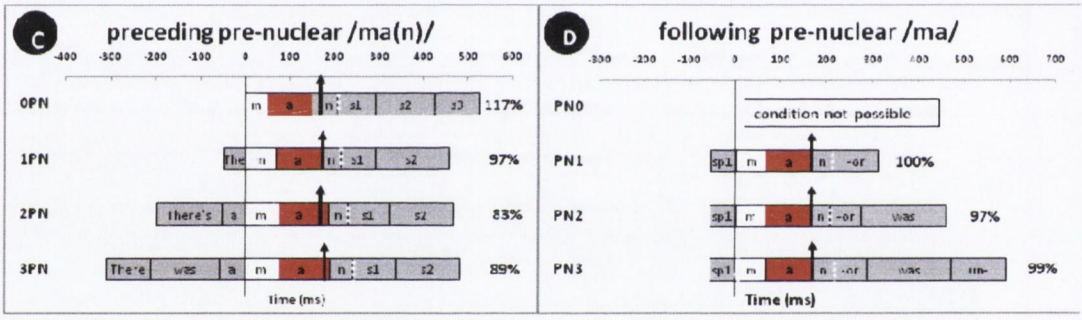

Figure 7.4 Averaged proportional peak alignment of (H = ↑) given in percentages for the accented syllable /ma(n)/ across the seven speakers. In C the number of unstressed syllables 'preceding' /ma(n)/ was varied. In D the number of unstressed syllables 'following' /ma(n)/ was varied.

- General Observation

The observations are similar to those in the /man/ syllable. In C, peak alignment is later in 0PN and 1PN than in 2PN and 3PN. In D, peak alignment is fairly similar across the three different conditions and conspiciously similar to the 1PN condition in C.

- Statistical Analysis

The general observations are confirmed by statistical tests. Statistical results for 'the number of preceding/following unstressed syllables' in C and D are summarised in Table 7.3. In C, peak alignment differences between different conditions are significant: $F(3,99) = 6.604$, $p = 0.0004$. Bonferroni tests show that 0PN is significantly different from the other conditions, but only weakly different from 1PN as shown in Table 7.3. In D, the

differences in (H) values across the different conditions are not significant: $F(2,69) = 0.1236$, $p = 0.884$.

Table 7.3 Statistical results of the factor 'number of preceding/following unstressed syllables' for (H) in Panels C and D, red = significant difference

	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				0PN 1PN	0PN 2PN	0PN 3PN	1PN 2PN	1PN 3PN	2PN 3PN
C	(3,99)	6.604	0.0004	0.0483	0.0002	0.0345			
D	(2,69)	0.1236	0.884						

There is an apparent difference in (H) between C and D. In D, (H) is at the VC boundary, /-aln-/. This is only similar to the 1PN condition in C. This similarity results from the presence of a single unstressed syllable before /ma(n)/. A comparison between the (H) values in the 1PN conditions in C and the PN1 condition in D show that they were not significantly different: $F(1,51) = 0.0229$, $p = 0.8801$.

In all test sentences the number of unstressed syllables that were not manipulated, whether preceding or following the accented syllable, were fixed to two unstressed syllables as shown in Table 7.1. Unfortunately due to an oversight, the only exception is the data in D.

Fortunately, there were earlier comparable data for two speakers (who are not amongst the seven speakers of this study). The data for the two speakers provide conditons similar to those in D but with two unstressed syllables preceding /ma(n)/ instead of only one. Panel Ď in Figure 7.5 shows peak alignment for the two speakers, reproduced with C for comparison. The three sentences in Ď are:

PN1: *She has **ma**naged Mell's affairs efficiently*

PN2: *They were **ma**naging well.*

PN3: *They were **ma**naging their finances well.*

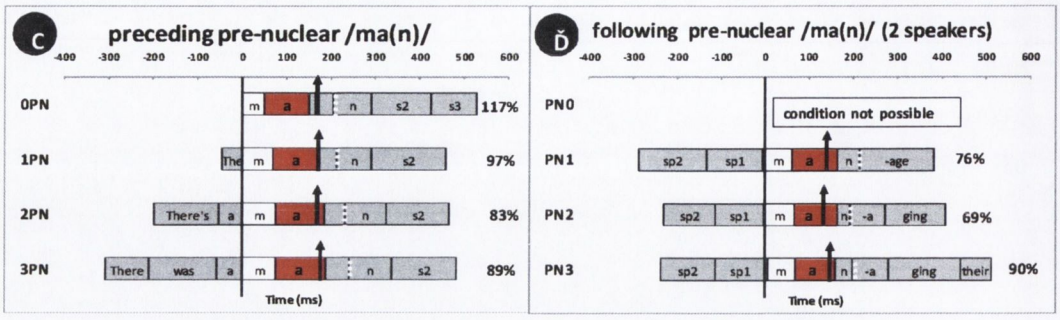

Figure 7.5 Averaged proportional peak alignment of (H = ↑) given in percentages for the accented syllable /ma(n)/. In C the number of unstressed syllables 'preceding' /ma(n)/ was varied (averaged across the seven speakers). In Ď the number of unstressed syllables 'following' /ma(n)/ was varied (averaged across two different speakers).

We do not carry statistical tests for the data in Ď as they are based on two speakers only. Nonetheless, it is clear that (H) in Ď is relatively similar across PN1, PN2 and PN3. In addition, the (H) of 1PN in C is clearly later than that in Ď and the peak of the PN1 conditon in Ď is similar to that in 2PN and 3PN in C. Peak alignment in the two conditions 2PN - PN2 and 3PN - PN3 across C and Ď, respectively, seems to be similar.

- Discussion

1. Is the '$2^{+}A2^{+}$' hypothesis the right formulation?

Similar to the findings for the CVC syllable, the number of unstressed syllables 'following' the PN accented syllable does not influence peak alignment in the CV(C) syllables as is clear in D and Ď. It is the anacrusis size that is crucial for peak alignment of H* in PN accented syllables and not the following unstressed material.

In C, although peak alignment in the 1PN condition is different (later) than in 2PN and 3PN this difference does not reach significance. The (H) in 1PN is weakly different from that in 0PN. The general trend again, is that peak is anchored near the end of the accented vowel when there are two or more unstressed syllables in the anacrusis. In terms of the '$2^{+}A2^{+}$' hypothesis, the base formula for obtaining intrinsic peak alignment for PN accents in CV(C) accented syllables in DroghE is 2^{+}PN.

2. What is the intrinsic default in PN accents?

The intrinsic peak alignment in PN accents in CV(C) accented syllables is similar to that found in the CVC accented syllable: the peak is aligned at a timepoint typically ~ 80% into the vowel of the accented syllable.

3. How much extrinsic variation is there?

The extrinsic shifts in peak alignment conditioned by the number of preceding unstressed syllables for H* in PN accents were only observed to vary within the accented vowel and do not move outside the boundaries of the accented vowel, the only exception being the 0PN condition in C.

7.4.3 Is CVC different from CV(C)?

Based on data of the PN accented syllables /man/ and /ma(n)/ in DroghE, four conclusions can be made. First, for PN peaks in H* accents, the size of the unstressed material preceding the accented syllable influences peak alignment whereas the size of the unstresed material following the accented syllable does not. Second, it takes two or more unstressed syllables in the anacrusis for the intrinsic alignment of H* in PN accents to occur i.e. the formula 2^{+}PN. Third, the instrinsic alignment of H* for PN accents is aligned at a timepoint 70% ~ 80% into the vowel of the accented syllable for both CVC and CV(C) syllables. Fourth, in DroghE the extent of extrinsic alignment shifts in PN accents as the size of the anacrusis increases is very small that the shifts do not occur outside the accented vowel boundaries. In this respect DroghE is similar to Dublin English and different from Belfast English, where PN peak delays were reported to fall beyond the boundaries of the accented syllable (Nolan and Farrar, 1999).

In this section we look at the intrinsic peak alignment of H* in PN accents across the two syllable structures: /man/ and /ma(n)/ in the same rhythmic contexts.

- General observation

Figure 7.6 reproduces A and C for ease of comaprison. Panels A and C show the influence of the number of unstressed syllables 'preceding' /man/ and /ma(n)/, respectively. General observations suggest that (H) is aligned near the end of the accented vowel in both syllable structures.

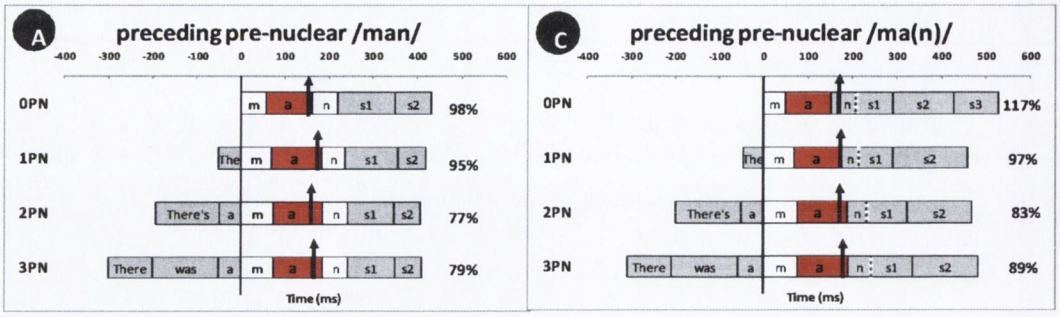

Figure 7.6 Averaged proportional peak alignment of (H = ↑) given in percentages, A shows the influence of the number of unstressed syllables 'preceding '/man/ and C shows the influence of the number of unstressed syllables 'preceding' /ma(n)/.

- Statistical Analysis

Statistical results for 'syllable structure' in A and C are summarised in Table 7.4. Alignment differences were compared across the two syllable structures in the four conditions: 0PN, 1PN, 2PN, and 3PN. For the 0PN conditions, the differences in (H) values were weakly significant: $F(1,52) = 8.6782$, $p = 0.048$. On closer inspection it was noticed that only one speaker (SS) had a significantly earlier (H) alignment in /man/ than in /ma(n)/. When the factor of speaker was re-set as 'random' to lessen speaker differences, the differences in (H) values turned insignificant for the 0PN conditions: $F(1,6) = 3.6085$, $p = 0.1062$. The differences in (H) values were not significant across the 1PN conditions and across the 2PN conditions by syllable structure as shown in Table 7.4. The differences in (H) values were significant for the 3PN conditions: $F(1,48) = 8.099$, $p = 0.0065$. Even when the factor of speaker was re-set as a 'random' the difference in (H) values remained significant for the 3PN conditions: $F(1,6) = 10.462$, $p = 0.0178$.

Table 7.4 Statistical results of the factor 'syllable structure' for (H) in Panels A and C, red = significant difference

A Syllable structure /man/ vs. /ma/	C Speaker	(H) alignment ↑ df	F-ratio	p-value
0PN	fixed	(1,52)	8.678	0.048
	random	(1,6)	3.6085	0.1062
1PN	Fixed	(1,53)	0.2063	0.6515
2PN	Fixed	(1,52)	2.7688	0.1021
3PN	fixed	(1,48)	8.0996	0.0065
	random	(1,6)	10.462	0.0178

- Discussion

The differences in (H) across the two syllable structures are inconclusive. The differences are insignificant for the 0PN, 1PN, and 2PN conditions across the two syllable structures. Only the 3PN conditions are different across the two syllable structures.

Figure 7.7 reproduces B and Ď for ease of comaprison. Panels B and Ď show the influence of the number of unstressed syllables 'following' /man/ and /ma(n)/. Recall that Ď is based on data from two speakers different from the seven speakers included in the other figures. Therefore, statistical comaprisons are not possisble for the individual conditions across B and Ď.

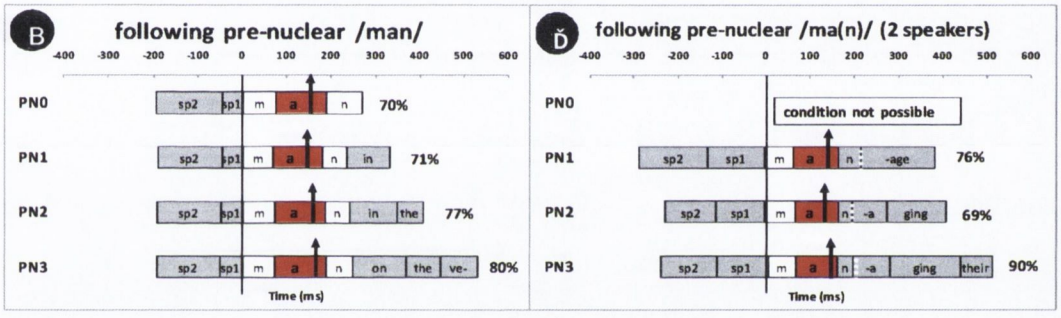

Figure 7.7 Averaged proportional peak alignment of (H = ↑) given in percentages, B shows the influence of the number of unstressed syllables 'following' /man/ (averaged across the seven speakers). Ď shows the influence of the number of unstressed syllables 'following' /ma(n)/ (averaged across two speakers).

- General Observation

In general, the alignment of (H) is similar for the PN1, PN2, and to a lesser extent in PN3 conditions across B and Ď. It should be kept in mind that the values of (H) in Ď are based on two speakers only.

- Discussion

The general observation is that there are no real differences in peak alignment across the two syllable structures. Data of nuclear peaks can provide further insight on peak alignment in the two syllable structures, discussed next.

7.5 Nuclear Peak Alignment (N)

This section presents the findings for peak alignment for N accented syllables in the nuclear contour H* L-L%. The findings for the CVC syllable are presented first followed by those for the CV(C) syllable. The section ends by comparing peak the alignment across both syllable structures. The findings answer the following questions for each syllable structure:

1. Is the '$2^{+}A2^{+}$' hypothesis the right formulation?
2. If so, what is the intrinsic default in N accents?
3. How much extrinsic variation is there?

7.5.1 Varying the rhythmic context for CVC

Figure 7.8 shows the results for the accented syllable /man/. Panels Ȧ and Ḃ show the influence of the number of unstressed syllables 'preceding' and 'following' /man/.

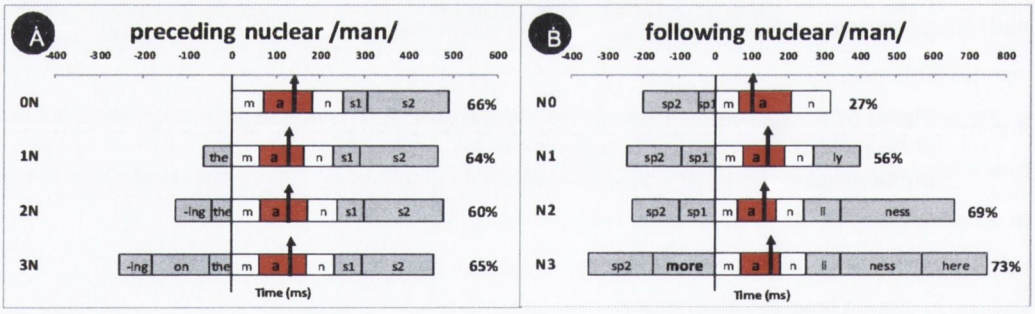

Figure 7.8 Averaged proportional peak alignment of (H = ↑) given in percentages, across the seven speakers. In Ȧ the number of unstressed syllables preceding /man/ was varied. In Ḃ the number of unstressed syllables following /man/ was varied.

- General Observation

In Ȧ, it is noticed that (H) is aligned within the accented vowel and is not different across the different conditions. In Ḃ, (H) is also aligned within the accented syllable but in the N0 and N1 conditions, (H) is earlier than in the N2 and N3 conditions. It should be noted that in the test sentence in N3 (*We **need** some **more** **man**liness here*) the word *more* was unexpectedly accented. This changes the rhythmic context into a preceding tonal crowding

instead of two preceding unstressed syllables as in all other conditions in Ḃ. This renders this sentence uncomparable with the other conditions in Ḃ. However, this sentence is not excluded as it appears that the preceding context in N accents does not significantly influence peak alignment in H* as will be shown statistically.

- Statistical Analysis

Statistical results for 'the number of preceding/following unstressed syllables' in Ȧ and Ḃ are summarised in Table 7.5. In Ȧ, the differences of (H) values between different conditions are not significant: $F(3,82) = 0.6337$, $p = 0.5954$. In Ḃ, the differences in (H) values across the different conditions are significant: $F(3,87) = 38.674$, $p \leq 0.0001$. Bonferroni tests in Ḃ showed that all conditions are significantly different from one another except for N2 and N3.

Table 7.5 Statistical results of the factor 'number of preceding/following unstressed syllables' for (H) in Panels Ȧ and Ḃ, red = significant difference

	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				N0 N1	N0 N2	N0 N3	N1 N2	N1 N3	N2 N3
Ȧ	(3,82)	0.6337	0.5954						
Ḃ	(3,87)	38.674	≤0.0001	<0.0001	<0.0001	<0.0001	0.0431	0.0087	

- Discussion

1. Is the '$2^{+}A2^{+}$' hypothesis the right formulation?

The findings in Ḃ suggest that the size of the 'following' unstressed material is crucial for N peak alignment of H*, while that of the 'preceding' unstressed material is not. When the size of the following unstressed material is manipulated and the unstressed material preceding the N syllable is kept constant, peak alignment shifts occur. The findings in Ȧ reinforce this conclusion. In Ȧ, the number of unstressed syllables 'preceding' the N accented syllable does not influence peak alignment even in the condition of a preceding tonal crowding, 0N. When the size of unstressed material preceding the N accented syllable is manipulated and the size of the following unstressed material is kept constant, peak alignment does not change.

Moreover, in Ḃ peak alignment in N0 is different from all other conditions suggesting that time pressure from the 'following' boundary tone necessitates that the nuclear peak be realised earlier. The (H) values in N3 are not significantly different form those in N2. However, the N1 condition is different from both N2 and N3. This shows that it takes more than two 'following' unstressed syllables for the nuclear peak of H* to be anchored at a specific location within the segmental string, in DroghE. Therefore, in terms of the '$2^{+}A2^{+}$' hypothesis, the base formula for obtaining intrinsic peak alignment of H* in nuclear CVC syllables in DroghE is $N2^{+}$. If more than one unstressed syllable is added after the accented syllable, peak alignment manifests. If a third unstressed syllable is added, the peak remains at its location. From observations of other material from DroghE, the location of the H* peak stays within the accentual vowel even if more than three unstressed syllables followed the nuclear syllable.

2. What is the intrinsic default in N accents?

In DroghE the peak in H* nuclear accents in CVC syllables is intrinsically aligned at a timepoint 60% ~75% into the vowel of the accented syllable.

3. How much extrinsic variation is there?

After establishing the intrinsic alignment of H* and its optimal context for N accents in CVC syllables, extrinsic alignment shifts can be evaluated. Similar to what has been found for H* accents in PN syllables, the extrinsic alignment shifts (in the in N0 and N1 conditions) vary within the accented vowel and do not move outside its boundaries. Therefore, DroghE shows relatively small extrinsic variation in nuclear H* as a result of varying the rhythmic context. In this respect DroghE is similar to Dublin English (Kalaldeh et al., 2009) and Coir Fharraige Irish (Dalton and Ní Chasaide, 2007).

7.5.2 Varying the rhythmic context for CV(C)

Figure 7.9 shows the results for the accented syllable /ma(n)/. Panel Ċ and Ḋ show the influence of the number of unstressed syllables 'preceding' and 'following' /ma(n)/.

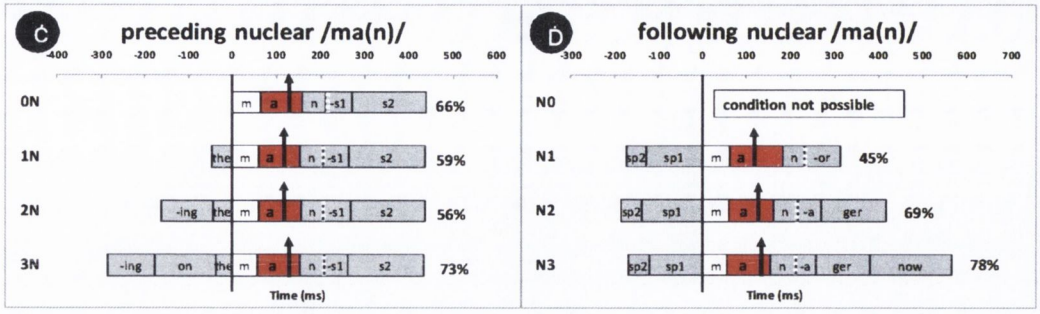

Figure 7.9 Averaged proportional peak alignment of (H = ↑) given in percentages, across the seven speakers. In Ċ the number of unstressed syllables 'preceding' /ma(n)/ was varied. In Ḋ the number of unstressed syllables 'following' /ma(n)/ was varied.

- General Observation

Similar to the what has been observed for the CVC data, in Ċ the (H) is aligned within the accented vowel and does not change across the different conditions. In Ḋ, (H) is also aligned within the accented syllable but in the N1 condition it is slightly earlier than that in both the N2 and N3 conditions.

- Statistical Analysis

Statistical results for 'the number of preceding/following unstressed syllables' in Ċ and Ḋ are summarised in Table 7.6. In Ċ, the differences of (H) values between different conditions are not significant: $F(3,77) = 2.436$, $p = 0.071$. In Ḋ, the differences of (H) values between different conditions are significant: $F(2,60) = 23.772$, $p \leq 0.001$. Bonferroni tests in Ḋ show that only N1 is different from both N2 and N3.

Table 7.6 Statistical results of the factor 'number of preceding/following unstressed syllables' for (H) in Panels Ċ and Ḋ, red = significant difference

	df	F-ratio	overall p-value	Bonferroni post hoc tests					
				N0 N1	N0 N2	N0 N3	N1 N2	N1 N3	N2 N3
Ċ	(3,77)	2.4362	0.071						
Ḋ	(2,60)	23.772	≤0.0001				<0.0001	<0.0001	

- Discussion

1. Is the '$2^{+}A2^{+}$' hypothesis the right formulation?

Similar to the findings of the CVC syllable, the findings for the CV(C) N syllable suggest that the number of unstressed syllables 'preceding' the N accented syllable does not influence peak alignment in H* even in the condition of a preceding tonal crowding as shown in Ċ. In Ḋ, peak alignment is influnced by the following unstressed material.

In addition, in all cases except the N1 condition peak alignment was at a timepoint 60% ~75% into the vowel. This suggests that it takes two or more 'following' unstressed syllables for the intrinsic peak alignment of the H* nuclear accent to manifest in DroghE. When more than two unstressed syllables are added, peak alignment remains stable in its location. In terms of the '$2^{+}A2^{+}$' hypothesis, the base formula for obtaining intrinsic alignment in H* nuclear accents in CV(C) syllables in DroghE is $N2^{+}$.

2. What is the intrinsic default in N accents?

In DroghE the peak in H* nuclear accents in CV(C) syllables is intrinsically aligned at a timepoint typically 60% ~75% into the vowel of the accented syllable.

3. How much extrinsic variation is there?

After establishing the intrinsic alignment of H* and its optimal context for N accents in CV(C) syllables, extrinsic alignment shifts can be evaluated. Similar to what has been observed for H* accents in nuclear CVC syllables, the extrinsic alignment shifts vary within the accented vowel and do not move outside its boundaries. Therefore, DroghE shows relatively little extrinsic variation in nuclear H* as a result of varying the rhythmic context.

7.5.3 Is CVC different from CV(C)?

Based on data of the N accented syllables /man/ and /ma(n)/ in DroghE, four conclusions can be made. First, the size of the unstressed material 'following' the accented syllable influences the realisation of peak alignment of nuclear H* accents whereas that 'preceding' the N accented syllable does not. Second, it takes two or more unstressed syllables following the accented syllable for the intrinsic alignment of nuclear H* accents to manifest i.e. the formula $N2^{+}$. Third, the peak of nuclear H* accents is intrinsically aligned

within the vowel of the accented syllable for both CVC and CV(C) syllables. Fourth, in DroghE the extent of extrinsic alignment shifts in N accents as the number of following unstressed syllables increases is very small in that the shifts do not occur outside the boundaries of the accented vowel.

This section investigates intrinsic alignment of the N peak across the two syllable structures: /man/ and /ma(n)/ in the same rhythmic contexts.

- General observation

Figure 7.10 reproduces Ȧ and Ċ for ease of comaprison. Panel Ȧ and Ċ show the influence of the number of unstressed syllables 'preceding' /man/ and /ma(n)/, respectively. General observations suggest that in both syllable structures (H) is aligned near the end of the accented vowel. There are no clear differences across individual conditons between the two syllable structures.

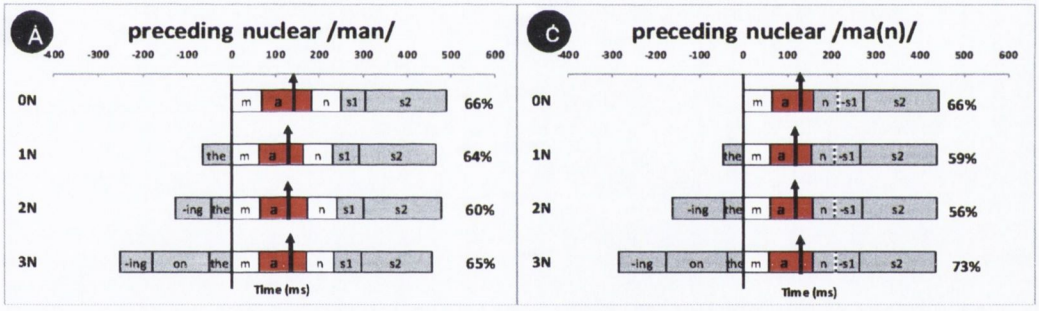

Figure 7.10 Averaged proportional peak alignment of (H = ↑) given in percentages, across the seven speakers. Ȧ shows the influence of the number of unstressed syllables 'preceding' /man/. Ċ shows the influence of the number of unstressed syllables 'preceding' /ma(n)/.

- Statistical Analysis

Statistical results for 'syllable structure' across Ȧ and Ċ show that peak alignment in all individual conditions across the two syllable structures is not significantly different as shown in Table 7.7.

Table 7.7 Statistical results of the factor 'syllable structure' for (H) in Panels Ȧ and Ċ, red = significant difference

Syllable structure /man/ vs. /ma/		(H) alignment ↑			
		speaker	df	F-ratio	p-value
Ȧ	0N	fixed	(1,43)	0.0184	0.8927
	1N	fixed	(1,42)	0.1772	0.6759
	2N	fixed	(1,38)	0.2903	0.5932
Ċ	3N	fixed	(1,36)	2.9649	0.0937

- Discussion

The findings provide evidence that intrinsic alignment in nuclear H* accents is the same for CVC and CV(C) syllables in DroghE. This reinforces the earlier findings for the relatively similar intrinsic alignment of H* in PN accents for both syllable structures.

Figure 7.11 reproduces Ḃ and Ḋ for ease of comaprison. Panel Ḃ and Ḋ show the influence of the number of unstressed syllables 'following' /man/ and /ma(n)/, respectively.

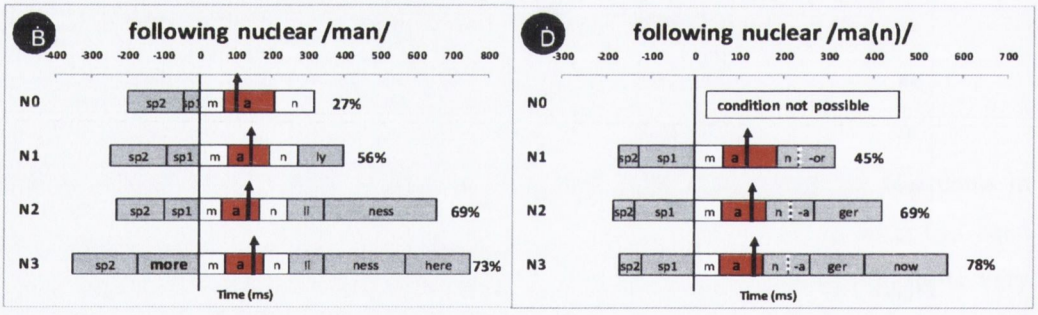

Figure 7.11 Averaged proportional peak alignment of (H = ↑) given in percentages, across the seven speakers. Ḃ shows the influence of the number of unstressed syllables 'following' /man/. Ḋ shows the influence of the number of unstressed syllables 'following' /ma(n)/.

- General observation

In general, the alignment of (H) seems to be similar for the N1, N2, and N3 conditions across Ḃ and Ḋ. The averaged percentages also suggest that there are no clear differences across individual conditons between the two syllable strucutres.

- Statistical Analysis

Statistical results for 'syllable structure' across Ḃ and Ḋ are summarised in Table 7.8. Peak alignment differences across the two syllable structures in the N1 conditions are significant: $F(1,53) = 6.303$, $p = 0.0151$, but when the speaker factor is re-set as a random factor, the difference was weakly significant: $F(1,6) = 6.0891$, $p = 0.0486$ as shown in Table 8.8. Peak alignment differences across the two syllable structures in the N2 conditions are not significantly different: $F(1,42) = 0.0635$, $p = 0.8022$, nor are they significantly different in the N3 conditions: $F(1,30) = 1.229$, $p = 0.3201$.

Table 7.8 Statistical results of the factor 'syllable structure' for (H) in Panels Ḃ and Ḋ, red = significant difference

Syllable structure /man/ vs. /ma/			(H) alignment ↑			
			speaker	Df	F-ratio	p-value
	N1		fixed	(1,53)	6.3031	0.0151
			random	(1,6)	6.0891	0.0486
Ḃ	N2	Ḋ	fixed	(1,42)	0.0635	0.8022
	N3		fixed	(1,30)	1.229	0.3201

- Discussion

Peak alignment in different rhythmic contexts, shows that intrinsic alignment in nuclear H* accents is the same for CVC and CV(C) syllables in DroghE. This is similar to the findings of Schepman et al. (2006) who investigated peak alignment of nuclear falls in Dutch. They find that the nuclear peak is influenced by phonological vowel length rather than by syllable structure.

In the PN accents, alignment across the two syllable structures was similar, with the exception of a difference in the 3PN conditions. The majority of the N and PN findings, suggest that peak alignment in the accented syllable /man/ and /ma(n)/ is the same in DroghE.

7.6 Syllable Structure and Alignment

The finding that intrinsic peak alignment in the two syllable structures, CVC and CV(C), is similar is compared to the findings in two alignment studies. Ladd et al. (2000)

investigated peak alignment in pre-nuclear accents in Dutch. Prieto and Torreira (2007) investigated PN peak alignment across two syllable structures in Spanish.

Ladd et al. (2000)[21] found that in pre-nuclear 'rising' accents in Dutch (labelled as H* in the present work) the peak was aligned at the end of the accented vowel if it was a phonologically long vowel, but during the following consonant if the accented vowel was a phonologically short vowel. They investigated whether this difference in alignment was due to the phonetic vowel duration or the phonological class (short/long) of the vowel. The two Dutch vowels /i:/ and /ɪ/ were suitable for the experiment since both are phonologically different (long/short) but have similar phonetic duration. It was found that in both cases the peak was aligned during the following consonant, but the peak in /i:/ was systematically earlier than that in /ɪ/. They concluded that alignment distinction between long and short vowels in Dutch is not really about 'time pressure' but about the different syllable structures for long and short vowels. However, they suggest that time pressure is only important in certain cases like the phonetically short 'long' /i:/ vowel in Dutch, where there is insufficient time to realize the 'rise' completely so that the peak is aligned after the end of the vowel. Therefore, neither the durational explanation nor the syllable structure (phonological) explanation was satisfactory on its own.

A similar effect on the alignment of pre-nuclear peaks by phonological vowel length has been reported for RP and SSE (Scottish Standard English) by Ladd et al. (2009). PN peaks were aligned within the accented vowel if the vowel was long (FLEECE/FACE) but within the following consonant if the vowel was short (KIT/DRESS). In Dutch and English stressed syllables with long vowels in polysyllabic words are usually open syllables whereas stressed syllables with short vowels are likely to have ambisyllabic consonants. If one accepts ambisyllabicity, the findings of Ladd et al. (2000) and Ladd et al. (2009) for Dutch, RP and SSE can be translated as follows: peak alignment in pre-nuclear accents is aligned within the vowel in open syllables but within the consonant following the accented syllable in closed syllables that have short vowels.

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[21] In Ladd et al. (2000) all test words had antepenultimate stress and were preceded by two to five unstressed syllables.

Although long vowels were not includedin this study[22], DroghE is different from RP, SSE, and Dutch in that for both CVC and CV(C) accented syllables with short vowels, the peak in PN accents is aligned within the vowel. The average duration of the vowel was 112.5ms in /man/ and 102.6ms in /ma(n)/.

In a recent study by Prieto and Torreira (2007), the investigators reach the conclusion that syllable structure influences alignment. Controlled speech materials from three female speakers of Peninsular Spanish were analysed in initial pre-nuclear CV[23] and CVC syllables. They found that in "CV syllables the peak was located around the end of the accented vowel, and in CVC syllables around the beginning-mid part of the sonorant coda, but still far from the syllable boundary." (Ibid. 473). A schematic representation of their findings is reproduced in Figure 7.12.

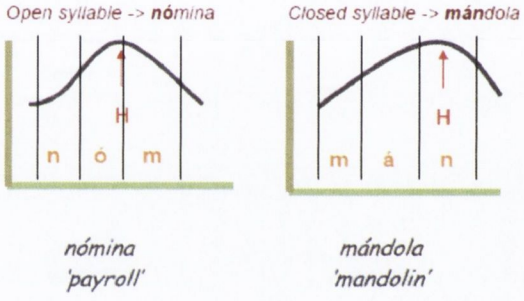

Figure 7.12: Schematic representation of peak alignment relative to the accented syllable in the Spanish test words, segment durations are idealized, reproduced from Prieto and Torreira (2007: 493).

Based on their findings, Prieto and Torreira call the phenomenon of segmental anchoring (see Chapter 2, Section 2.4.2) into question and conclude that "the accent gestures under [their] study are synchronized with the syllable unit. In general, the longer the syllable, the longer the rise time." Citing other evidence from alignment studies on different languages, Prieto and Torreira conclude that it is "clear that cross-linguistically the durations making up the target-accented syllable seem to determine peak delay" (Ibid.: 495). This statement seems contradictory since Prieto and Torreira did not find systematic influence of onset

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[22] Visual inspection of read and spontaneous speech data, not included in the present study on alignment, suggests that in DroghE the peak of H*in PN and N accented syllables with long vowels is aligned within the accented vowel.

[23] Prieto and Torreira (2007) refer to the accented syllable structure in the word *hómina* as CV

duration and vowel type of the accented syllable on peak alignment. Moreover, it should be noted that the vowels investigated in Prieto and Torreira's study seem to be all short vowels: what they term high vowels /i/ and /u/ and mid low vowels /a/ and /o/ with average durations 81.28ms and 92.06ms, respectively.

The syllable structures investigated in Prieto and Torreira's study are the same as in the present study and the accented vowels are also short. However, the findings are strikingly different. Different languages can have different syllabification. Significant PN peak alignment differences across the two syllable structures for the short vowel /a/ are not evident in the present study. This of course, suggests that DroghE is different from Peninsular Spanish in this respect. However, it should be noted that in Prieto and Torreira's study the initial pre-nuclear accented syllable was always preceded by only one unstressed syllable. The size of the anacrusis is crucial in revealing PN intrinsic alignment, even for a variety like DroghE, which shows very little extrinsic shifts as a result of variation in rhythmic contexts. The robust investigation of Prieto and Torreira's study is not questioned here. However, it is important to establish the intrinsic alignment of a particular PN accent for a given syllable before embarking on investigating alignment factors in a potentially non-optimal rhythmic context (one unstressed syllable in the anacrusis).

Moreover, if we compare PN peak alignment in Peninsular Spanish and DroghE in the same rhythmic context as that used in Prieto and Torreira, 1PN, we reach the conclusion that in DroghE the peak is always aligned at the VC /-aln-/ boundary in both syllable structures as shown in Figure 8.6. This in turn leads to the erroneous conclusion that in DroghE peak alignment of PN accents for CVC and CV(C) accented sylalbes is the same as that in Peninsular Spanish for CV syllables. Establishing the intrinsic alignment of a particular pitch accent for a given syllable in a particular dialect/language is crucial to make comparisons between different dialect/languages and to account for phonological rules.

7.7 Pre-nuclear and Nuclear Peak Alignment Compared

I posited that for a given syllable and a given pitch accent intrinsic alignment is distinct for PN and N accents. In order to validate this claim, peak alignment is compared across the PN and N accents in similar rhythmic contexts.

The pitch accent that is compared across the PN and N accents is H*. In N accents H* is followed by (L-L%), the typical nuclear contour in DroghE statements. Figure 7.13 shows all four contexts which are compared. The PN peaks are represented in Panels A, B, C, and D̆ and their counterparts in the N peaks are represented by Panels Ȧ, Ḃ, Ċ, and Ḋ. The four compared contexts are:

1. Panels A and Ȧ show the influence of the number of unstressed syllables 'preceding' PN and N /man/, respectively.

2. Panels C and Ċ show the influence of the number of unstressed syllables 'preceding' PN and N /ma(n)/, respectively.

3. Panels B and Ḃ show the influence of the number of unstressed syllables 'following' PN and N /man/, respectively.

4. Panels D̆ and Ḋ show the influence of the number of unstressed syllables 'following' PN and N /ma(n)/.

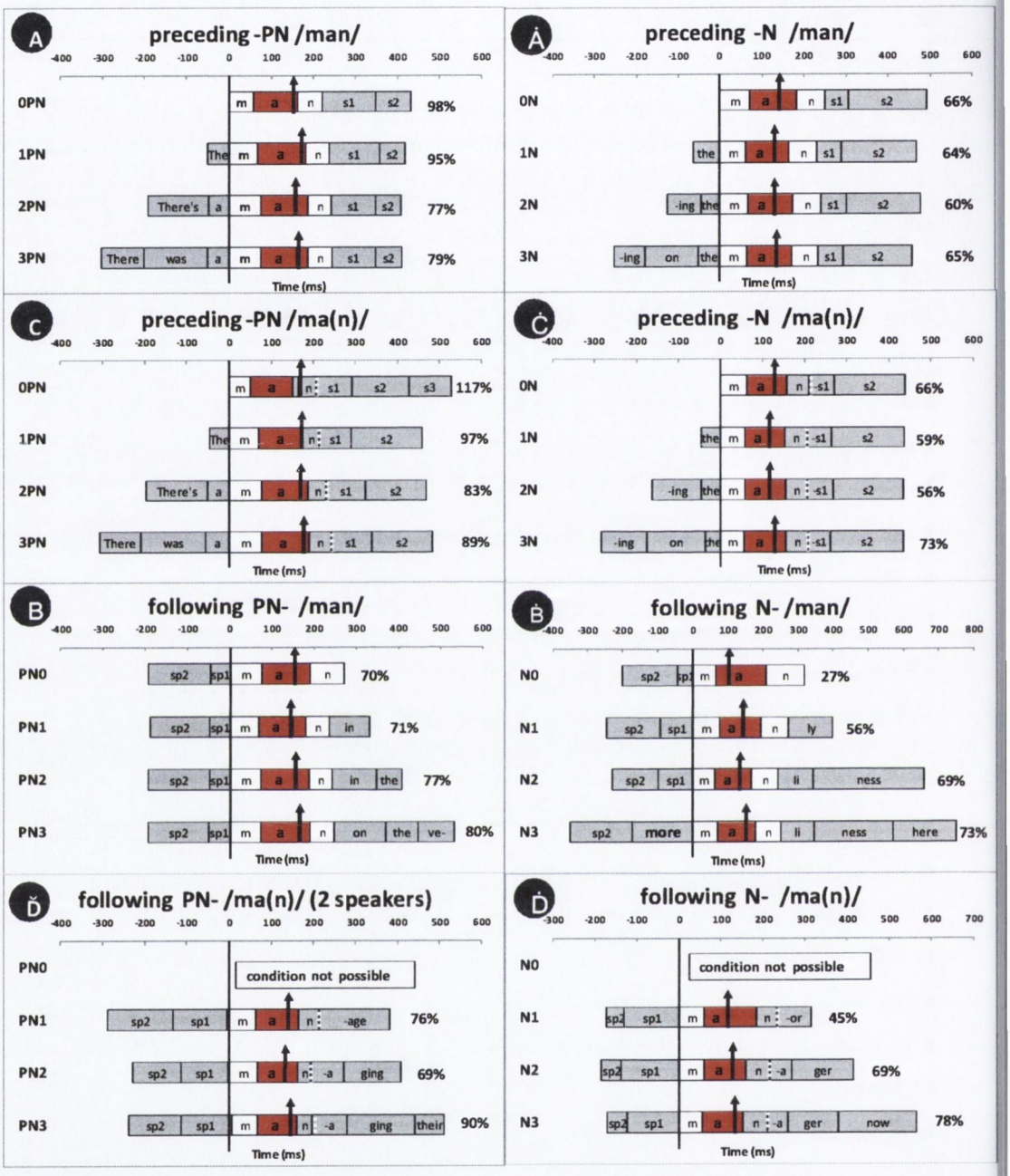

Figure 7.13 Panels A-Ȧ, C-Ċ, B-Ḃ, and Ď-Ḋ reproduced for comparison across PN and N accents in the accented syllables /man/ and /ma(n)/

- General observation

The general observation is that PN peaks are realised at a time point 70%~80% into the vowel, whereas N peaks are realised slightly earlier at a time point 60%~70% into the vowel. This observation seems to hold in both syllable structures in all rhythmic contexts.

- Statistical Analysis

The (H) values across PN and N accented syllables were compared in individual rhythmic contexts and for each syllable structure. Statistical results for 'PN vs. N' across Panels A-Ȧ, C-Ċ, and B-Ḃ are summarised in Table 7.9. Statistical tests were not conducted across the (H) values across Ď and Ḋ since the values in Ď are based on two different speakers.

Statistical results show that in all individual contexts the (H) values in N accents are significantly smaller than those in PN accents as shown in Table 7.9. In other words, N peaks are significantly earlier than PN peaks. The only two exceptions were in the /man/ data in Panels B-Ḃ. Peak alignment in N2 was earlier than that in PN2 but not significantly: $F(1,50) = 4.135$, $p = 0.473$. Also, peak alignment difference between PN3 and N3 were not significant: $F(1,36)$[24] $= 2.17$, $p = 0.149$. It is not clear why the peaks are not significantly earlier in N2 and N3 for /man/ than their corresponding PN peaks. It is unlikely that the accented syllable *more* is the reason. Preceding tonal clash did not show influence on nuclear peaks for both /man/ and /ma(n)/ in 0N conditions in Ȧ and Ċ, respectively, where the peak was 66% within the vowel and earlier than the corresponding 0PN conditions in A and C respectively.

[24] It should be noted that the (H) values of speaker RK were excluded from conditions N3 as the word *here* was accented in this speakers renditions of the sentence *We need some more manliness here.*

Table 7.9 Statistical results of the factor 'PN vs. N' for (H) in Panels A-Ȧ, C-Ċ, and B-Ḃ, red = significant difference

PN vs. N	Position	(H) alignment		
		df	F-ratio	p-value
A Ȧ -man	0PN vs. 0N	(1,44)	27.58	≤0.0001
	1PN vs. 1N	(1,49)	33.46	≤0.0001
	2PN vs. 2N	(1,51)	9.58	0.0032
	3PN vs. 3N	(1,44)	13.32	0.0007
C Ċ -ma	0PN vs. 0N	(1,51)	53.02	≤0.0001
	1PN vs. 1N	(1,46)	45.73	≤0.0001
	2PN vs. 2N	(1,39)	24.47	≤0.0001
	3PN vs. N3	(1,40)	6.51	0.0146
B Ḃ man-	PN0 vs. N0	(1,48)	75.13	≤0.0001
	PN1 vs. N1	(1,48)	10.92	0.0018
	PN2 vs. N2	(1,50)	4.135	0.473
	PN3 vs. N3	(1,36)	2.17	0.1493

- Discussion

Overall, N peaks are aligned earlier than PN peaks in both syllables. This finding has been reported previously for other dialects and languages including American English (Silverman and Pierrehumbert, 1990), Dutch (Schepman et al., 2006), Irish (Dalton and Ní Chasaide, 2007), RP and SSE (Ladd et al., 2009) and is becoming an well established phenomenon in alignment studies.

Two explanations are usually cited for this phenomenon. Both explanations are related to the proximity to prosodic boundaries, particularly final boundaries. One explanation is related to final lengthening. Silverman and Pierrehumbert (1990) found that PN peaks are directly influenced by the following contexts via the amount of prosodic lengthening which the accented syllable undergoes. They conclude that prosodic lengthening will align peaks earlier in lengthened syllables. The effect of final lengthening is well established. Price et al. (1991) have shown that syllables tend to be longer in words before major breaks (break index 4) than before smaller breaks (break indices 0-3), particularly word-final syllables. Wightman et al. (1992) have shown that not only is pre-boundary segment lengthening a cue to boundaries but that the different lengthening can distinguish among distinct levels of boundaries, mainly, four levels of perceptual distinct boundaries (0-1, 2, 3, and 4-6). They

find that the domain of pre-boundary lengthening is the rhyme (both vowel and consonant(s)) of the final pre-boundary syllable.

The Second explanation why N peaks are earlier than PN peaks has to do with tonal crowding and the proximity to the following boundary tone. Ladd et al. (2009) investigate the two hypotheses (the proximity to boundary tone/edge of word) by comparing nuclear peaks in sentences like:

1. *I was speaking with Len.* vs. *He was squeezing a lemon.*
2. *He broke the lens.* vs. *I found Len next.*

They found that the peaks in *Len* and *lens* were always earlier than those in *lemon* and *Len next*, respectively. In addition, they did not find a clear effect of vowel length on the alignment in nuclear peaks which was evident in pre-nuclear peaks in their RP and SSE (Scottish Standard English) data. PN peaks were earlier in accented syllables with long vowels than those with short vowels. Hence, they conclude that in nuclear accents "any underlying effect of vowel length may be overridden by the need to align the nuclear peak early enough to execute the phrase-final fall" (Ibid.: 158).

The present findings support the second explanation. The influence of the following unstressed material on the alignment of PN peaks was not evident. Conversely, the size of the following unstressed material influenced the alignment of N peaks. Therefore, it is the proximity of N peaks to the boundary tone which triggers tonal repulsion. It should be noted that actual alignment differences, though robust, are small between PN and N peaks because of the very strong trend of peak alignment within the accented vowel in DroghE.

Lengthening and segment-durations of the accented syllable are relevant issues to alignment and deserve a separate investigation which falls out of the scope of the present study. Nonetheless, we have noticed a general trend regarding segment-durations of the accented syllables which is worth mentioning. The duration of the onset in PN syllables was larger than that in N syllables. Conversely, the duration of the coda in N syllables was larger than that in PN syllables. The duration of the vowel in both PN and N syllables remained the same. We include afigure that shows segment-durations for /man/ and /ma(n)/ in all PN and N conditions in Appendix 7.

7.8 Summary

In this chapter the following four questions were posited:

1. **When** do the PN and N intrinsic alignments of the H* accent in DroghE occur?
2. **What** are the characteristics of the PN and N intrinsic alignments for such an accent?
3. **How much extrinsic variation** is there in DroghE if the rhythmic context is varied?
4. Is there a difference in intrinsic alignment (for both PN and N peaks) if the accented **syllable structure changes** from CVC to CV(C)?

Intrinsic alignments of PN and N peaks for H* accents in DroghE were investigated by testing the '$2^{+}A2^{+}$' hypothesis. This hypothesis suggests that the intrinsic alignment for a given syllable will occur when the accented syllable (A) is preceded and followed by 'at least two' unstressed syllables. for H* accents in DroghE, the formula which shows PN intrinsic alignment is $2^{+}PN$, while that which shows N intrinsic alignment is $N2^{+}$. In other words, it takes two or more preceding unstressed syllables for PN intrinsic alignment to occur and two or more following unstressed syllables for the N intrinsic alignment to occur. This entails that the size of 'preceding' unstressed material influences PN peak alignment while the size of 'following' unstressed material influences N peak alignment.

The PN peaks of H* accents in DroghE are intrinsically aligned at a time point 70% ~80% into the vowel of the accented syllable. The N peaks are intrinsically aligned at a time point 60% ~75% into the vowel of the accented syllable. These findings were obtained for accented syllables with the short vowel /a/.

Furthermore, DroghE is similar to Dublin English and Cois Fharraige Irish, a southern variety of Irish, in that extrinsic alignment shifts are very small and do not exceed the boundaries of the accented vowel (except in the case of 0PN). In this respect DroghE is different from Belfast English. In contexts of zero anacrusis, PN accents in Belfast English showed more cases of delayed peaks outside the accented syllables compared to Cambridge English (Nolan and Farrar, 1999).

Significant differences in peak alignment between the two syllable structures CVC and CV(C) were not evident. This suggests that peak alignment might not be controlled by

syllable structure. Peak alignment in other syllable structures (e.g. VC, CV:C, CV:, or CCV:) merits further investigation.

The answers to question two have shown that, in DroghE, N peaks are earlier than PN peaks. This well established phenomenon in alignment studies is reported to have two sources: final pre-boundary lengthening and tonal repulsion from the following boundary tone. The present findings support the latter explanation. General observations of the data suggest that PN syllables can be longer the closer they are to a following pitch accent. However, PN peak alignment was not influenced by its proximity to the following pitch accent. The relation between tonal alignment in PN and N accents and segment-durations is an area that merits further investigation.

Chapter 8 Conclusion

8.1 Introduction

This chapter summarises the main findings of his study, particularly of Chapters 4, 5, 6, and 7. The first section summarises the segmental features that are found in DroghE. The second section summarises the findings of the intonational studies: the tonal pattern findings, the phonetic marking of interrogative intonation, and the peak alignment features in DroghE. The chapter concludes with a section on implications and future perspectives regarding IrE in general and intonational studies in particular.

8.2 Segmental Study

The findings presented in this study show that DroghE is a typically Southern variety of IrE. The vocalic system and consonantal features are summarised below separately.

8.2.1 Vowels

Northern IrE differs strikingly from the southern varieties by having a general loss of vowel length distinctions. Based on this criterion, DroghE can be considered a typical southern variety since it observes a robust vowel length distinction between short and long vowels: FLEECE-KIT, FACE-DRESS, TRAP-BATH, LOT-THOUGHT, and FOOT-GOOSE. The analysed data show that the vocalic system of DroghE consists of six short vowels [ɪ, ɛ, ə, a, ɑ, ʊ], four long vowels [i:, a:, ɑ:, ʉ:], and five diphthongs [ɒɪ/ɑɪ, ɔɪ, ɛʉ, oʊ, eɪ]. The one clear northern feature in DroghE is the realisation of the GOOSE vowel as a long high central rounded vowel [ʉ:]. Another feature that can be regarded as a northern trace, but less so than the realisation of GOOSE, is the realisation of the MOUTH vowel as a front open-mid and unrounded first element which glides towards a central rounded close vowel [æʉ] or [ɛʉ]. However, DroghE seems to share several features with Dublin English.

A striking feature in DroghE is the neutralization of the vowels of STRUT and FOOT which gives homophonous pairs such as *could-cud* and *took-tuck*, a feature thought by Hickey (2007) to be particular to local Dublin English. This suggests that the variety under study

did not undergo the FOOT-STRUT Split. The vowel is realised as a short rounded close-mid back vowel of a /ʊ/ quality. The TRAP and BATH vowels have the same vowel quality but are distinct in vowel length; /a/ and /a:/, respectively. However, the lexical content of these sets can differ from that in RP. For example, words such as *aunt* and *matter* belong to the TRAP set in this variety. Similarly, the vowels of LOT and THOUGHT are realised as open back unrounded vowels but are distinct in duration: /ɑ/ and /ɑ:/, respectively. As is often reported for Southern IrE, the vowels in words such as *soft* and *boss* belong to the THOUGHT set, realised with a long and open /ɑ:/.

Perceptual and acoustic analysis suggests that the PRICE-CHOICE opposition is partially neutralised, resulting in homophonous pairs such as *vice-voice*, *aisle-oil,* and *buy-boy*. The neutralization was observed for over half of the informants where the vowels are collapsed as /ɒɪ/. However, for other speakers the PRICE-CHOICE opposition is retained as /ɑɪ/ - /ɔɪ/, respectively. Unlike rural Southern IrE varieties and similar to Dublin English, the vowels of FACE and GOAT have diphthongal realisations: [eɪ] and [oʊ/oᵘ], respectively.

In /Vɹ/ contexts, the variety does not appear to have undergone the NURSE Merger which results in the EARN-URN opposition, /ɛɹ/ vs. /ʊɹ/, giving minimal pairs such as *earn-urn* and *ferry-furry*. The vowels of KIT + /ɹ/ and STRUT + /ɹ/, LIR and URN, have a similar vowel quality; *urn* [ʊɹn]- *Lir* [lʊɹ].

The lexical sets AIR and ERR were proposed to represent SQUARE and DRESS + /r/, /e:r/ vs. /ɛr/, respectively, which are contrasted in many varieties of IrE. However, this opposition is not evident in DroghE as the vowels in *herd* and *paired* have a similar vowel quality. Therefore, the vowels of AIR, ERR and EARN, /ɛɹ/, are neutralised in DroghE. Finally, there is no opposition between the three sets NORTH-FORCE-CURE. The pairs *horse-hoarse* and *pore-poor* are homophonous.

8.2.2 Consonants

There are a number of consonantal findings which clearly align DroghE with Southern IrE varieties. First of all, there is the lack of dental fricatives as they are most frequently

realised as alveolar stops, the contrast with 'original' /t, d/ tends to be lost. Dental stop realisations of dental fricatives do occur but to a lesser extent. Therefore, a salient feature in DroghE is the very frequent use of the alveolar stops /t/ and /d/ in place of the dental fricatives /θ/ and /ð/, respectively, in all environments.

The lenition of /t/ as a slit [t̪] word-finally and inter-vocalically is also a common characteristic in the analysed data. Furthermore, glottalisation of /t/ is as frequent as the use of slit [t̪] word-finally and inter-vocalically. The realisation of /l/ is clear in all environments. Finally, DroghE exhibits instances of a weak articulation of /ɹ/ word finally, which can be transcribed as [e̪]. In addition, the opposition between /w/ and /ʍ/ is only residually present in DroghE where words such as *what* and *whales* have [w], and in this respect, DroghE may be closer to Northern IrE and to RP than to Southern IrE.

8.3 Intonational Study

The emphasis of this work is on the intonational aspects of the IrE dialect under study. The tonal patterns of DroghE were described for the four utterance types: statements (ST), wh-questions (WQ), yes-no questions (YQ), and declarative questions (DQ). A modified version of the ToBI system was used. Interrogative intonation was investigated by analysing the phonetic markings of the f0 scaling to report on the differences between questions and statements. Finally, peak alignment in initial pre-nuclear and nuclear pitch accents was investigated by reporting on the intrinsic realisation of the peak and the extrinsic shifts conditioned by the rhythmic context.

8.3.1 Tonal Inventory of DroghE

In this work, a labelling system particular to DroghE was devised, which can also prove to be useful in describing other IrE varieties. This is essentially the ToBI system modified by using the 0% boundary tone, as used in IViE. However, it is represented here as (%). This modification to the ToBI generates the nuclear contour (H* L-%), which is not an uncommon nuclear contour in DroghE.

The tonal patterns in DroghE are characteristic of a typical Southern IrE variety and show similarity to those reported for Dublin (Malahide) English (Grabe, 2004, Grabe et al., 2003, Grabe and Post, 2002). Furthermore, the tonal patterns found are quite different from the typical Ulster varieties of English which commonly share a rising nuclear contour.

For the analysed utterance types, there are two tonal patterns in DroghE. One is a sequence of falling accents (H* H* H* L-L%). This tonal pattern is the default in ST, WQ, and YQ. The other tonal pattern has a sequence of H* followed by a scooped-fall (H* H* L+H* L-L%) which is the default in DQ.

However, it was found that although the majority of falling nuclear contours had (L-L%) edge-tones, it was not uncommon to have gradual and non-steep falls (H* L-%) in different utterance types, but not in DQ. In the modified ToBI proposed in this study, these falls are termed 'fall, plateaus' and have been observed earlier by Sullivan (2006) for Malahide English and Wexford English.

8.3.2 Question Intonation in Drogh E

Examining the f0 scaling of crucial points in the f0 contour and characterizing the f0 global trend revealed subtle and important differences between utterance types. These differences were not apparent in the phonological description which, for example, can only describe the f0 contour as either a nuclear fall (H* L-L%) or a scooped-fall (L+H* L-L%).

In terms of pitch accents, ST, WQ, and YQ were characterised by realising the PN peaks with higher f0 than in N peaks. In contrast, DQ were characterised by N peaks which were higher in f0 than initial PN peaks. In terms of global trends, ST and WQ were similar in having quite steep upper and lower regression lines. YQ were characterised by having similar downtrends; however, they were less steep than ST and WQ. In contrast, DQ typically had uptrends in the upper regression lines, reflecting the high scaling of the N peak. Other f0 metrics that pertain in other languages such as register span and an overall raised resister level do not play a role in question characterisation in DroghE.

8.3.3 Tonal Alignment in DroghE

In this study, I have proposed that alignment features can be either intrinsic or extrinsic. Intrinsic alignment refers to the default alignment of the H (high) and L (low) f0 turning points of a particular pitch accent relative to the segmental string when there are no

rhythmic or temporal constraints. Extrinsic alignment refers to the shifts away from the default alignment which potentially may arise when there are constraints imposed by the rhythmic context, tonal environment (tonal crowding, proximity to phrase boundary) and other factors such as degree of emphasis, changes in pitch range, changes in tempo, etc.

Making the difference between these two kinds of alignment is important when describing pitch accents in a particular language or even a particular dialect. Alignment of pitch accents in languages and dialects may vary in terms of their intrinsic timing differences e.g. between Northern and Southern German (Atterer and Ladd, 2004) or in terms of the extrinsically conditioned variation e.g. between Inis Oírr Irish and Cois Fharraige Irish (Dalton and Ní Chasaide, 2007).

The intrinsic alignments of PN and N peaks for H* accents in DroghE were investigated by proposing and testing the '$2^{+}A2^{+}$' hypothesis. This hypothesis suggests that the intrinsic alignment for a given syllable will be manifest when the accented syllable (A) is preceded and followed by 'at least two' unstressed syllables. It was found that for H* accents in DroghE, it takes two or more preceding unstressed syllables for PN intrinsic alignment to be realised and two or more following unstressed syllables for the N intrinsic alignment to be realised. This entails that the size of 'preceding' unstressed material influences PN peak alignment while the size of 'following' unstressed material influences N peak alignment.

The PN and N intrinsic alignments of H* accents in DroghE were characterised. The PN intrinsic peaks are aligned typically at a timepoint 70% ~80% into the accented vowel. The N intrinsic peaks are aligned typically at a timepoint 60% ~75% into the accented vowel. These findings were obtained for accented syllables with the /a/ short vowel.

Furthermore, we have found that DroghE is similar to Dublin English in terms of the tonal patterns observed. It is also similar to the Cois Fharraige variety of Connaught Irish, a southern variety of Irish, in that extrinsic alignment shifts are very small and do not exceed the boundaries of the accented vowel (except in the case of 0PN). However, with the current dearth of alignment studies in IrE, we cannot draw conclusions as to where DroghE is placed amongst other IrE varieties based on its intrinsic and extrinsic alignment features.

Significant differences in peak alignment between the two syllable structures CVC and CV(C) were not evident. This suggests that peak alignment might not be controlled by

syllable structure. Peak alignment in other syllable structures (e.g. VC, CV:C, CV:, or CCV:) merits further investigation.

8.4 Future Directions

This study contributes to our understanding of the segmental and prosodic characteristics of IrE, and draws attention to the phonological versus the phonetic levels of its systems. It also shows how this variety differs from other varieties of IrE based on the literature, which in the case of intonation, is rather scant. There are a number of ways in which it would be interesting to extend this work.

There is some evidence of a synchronic variation in DroghE which is likely to be linked to language change in process. For example, although more than half of the informants in the segmental study neutralise the vowels of PRICE and CHOICE, the rest of informants maintain a distinction, similar to standard varieties, even though the quality distance is reduced. Similarly, although it was found that DroghE maintains a distinction between the vowels of EARN and URN, a few speakers exhibit the NURSE Merger and collapse the two vowels. It is possible that with time the direction towards adopting more standard forms would increase. Similar questions arise with the consonantal data. An interesting avenue for further research would be to take specific items such as these, and investigate their occurrence across different social groups (differing in age, social status, gender) and to quantify the extent and direction of apparent change. Looking at different speech styles, ranging from the extremely formal to the extremely informal would also be revealing in this context.

A question asked at the outset was whether the DroghE variety was a clearcut instance of a southern accent of IrE, or whether it might have northern influences in its segmental and intonation systems, due to its location in the border region of northern and southern varieties. The answer seems to be that DroghE is a typical southern variety, particularly with regards to its intonation, which shows no influence at all of the intonational patterns and features of NIrE. Based on the segmental system, the same conclusion is reached, noting however some vocalic features -particularly the very front realisation of the /u/ phoneme- that would suggest at least a northern influence.

The current knowledge of the intonation of IrE particularly the characteristic final rises of NIrE intonation, was reinforced by our analysis of the SPICE-Ireland data of 102 prosodically annotated spoken texts. In general, NIrE has clearly higher instances of rising contours in comparison to SIrE. This finding holds in different speaking styles (formal-informal) and in different speech domains (e.g face-to-face conversations, telephone conversations). In NIrE, instances of rises (L*H) were found in declaratives as well as in different kinds of questions, listing items, or continuants. In SIrE, however, falling contours were the dominant patterns. Furthermore, our analysis showed that the speech style (formal-informal) has an impact on the use of rises in SIrE but not in NIrE. In SIrE instances of rises are twice as high in informal speech compared to formal speech. This reinforces the disntinctive use of rises in NIrE which was not different across formal and informal speech (48% and 51% respectively).

Accordingly, and based on our current findings of tonal patterns in DroghE, we highlight the importance of intergrating intonational studies in addition to segmental phonology when conducting linguistic fieldwork in dialectology, and particularly in a population of IrE speakers. As is typical in linguistic studies, the linguistic border has generally been defined primarily in terms of segmental characteristics. However, it seems likely that the most dramatic marker may be the intonation structure, given how diametrically different Northern IrE and Southern IrE varieties are. Taking intonation into account as the primary marker would be particularly interesting. Subtle differences in tonal patterns may not always be discernable for the researcher. However, these tonal and subtle differences could be the primary markers for the layman to differentiate between a 'local' or a 'foreign' accent.

Therefore, it would be of interest to extend this work by looking at (at least some of) the same materials for other varieties of Irish English. Of particular interest would be the North-South dialect border regions. Furthermore, it would be interesting to see whether the segmental and intonational features remain aligned in the border regions. For example, are there varieties, where the intonation is characteristically northern, but the segmentals firmly southern?

Dialectal studies, being inherently rather comparative in nature, are potentially very useful in providing insights as to how intonation and segmental systems of languages work. In

this regard, it is crucial for the study to tackle both the phonological and phonetic levels of dialect differences into account.

These kinds of studies bring to the fore issues of what constitutes the same pattern across different languages and dialects, and point to the need for research also on methodological issues. Despite the advances with ToBI, the unification of the labelling used to describe different dialects and languages is a major problem in the intonation literature, as often one cannot be sure whether a particular described difference is 'real' or might be a consequence of a different labelling convention. A related issue concerns some of the terminology used in the intonation literature, which can be very fluid and confusing to students embarking on intonation studies, and which necessitates 'agreed upon' definitions. For example, the term 'final lowering' is used in the literature to refer to different notions. It is loosely understood to be the phrase-final lowering of pitch accent beyond the declination line, however Liberman and Pierrehumbert (1984) use it to refer to the lowering of the nuclear peak. Similarly, it would be helpful if terms such as 'register span', 'pitch range', or 'key' are universally defined.

One final area I intend to extend concerns the understanding of alignment in terms of the two types, intrinsic and extrinsic, proposed in this thesis. It would be particularly interesting to investigate further how what we term intrinsic alignment varies with the structure and segmental composition of the syllable, and to investigate whether the 'rules' governing variation in intrinsic alignment (e.g., variation with segmental composition of the syllable) tend towards universal principles, or whether they show considerable language/dialect differences.

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Appendices

Appendix 1: P.L Henry's Symbols (a)

Henry (1958) mentions that the symbols he uses are generally in accord with the recommendations of the IPA. He provides explanation for the 'less usual symbols only' (1958: 205-07). He does not use the square brackets used here. In Henry (1957), capitalized letters indicate what he calls 'intensified variants' of consonants e.g.: [P], [B], [K], [M], and [H].

Vowel	Explanation
ɪ	low and retracted [i]
ɨ	lowered and retracted [ɪ]
ɣ	rounded [ɨ] = low, retracted [y]
ø	(close) rounded [e]
ö	rounded central vowel half way between [o] and [ø]
ǫ	vowel subject to some variation, usually produced (with inner rounding) between the [ə] and [ʌ] areas = advanced, lowered and partly unrounded [ʊ], [o]
ʊ	low and advanced [u]
ɒ	slightly rounded [ɑ]
ɯ	u-coloured [ə]
ɐ	a-coloured [ə]
ɨ̈	central [i]
ʉ̈	central [u]
ʊ̈	slightly centralized [ʊ]
u̇ (u̇)	slightly centralized [u]
a˃	very slightly retracted [a]
a˃	[a] retracted half way to [ɑ]
ɛ˃	retracted [ɛ]
ɐ̟	open [e]
u̟ (u̟)	open [u]
o̟	open [o]
ü̟	very open (and advanced) [u]
o̟ (o̟)	very open (and advanced) [o]
e̞	close [e]
o̞	close [o]

P.L Henry's Symbols (b)

Consonant	Explanation
ᴛ	voiceless blade-alveolar, dental, or interdental plosive [t]
ᴅ	voiced counterpart of [ᴛ]
ɴ	voiced blade-alveolar, dental, or interdental [n]
ʟ	voiced blade-alveolar, dental, or interdental lateral [l]
ṯ	palatal counter part of [ᴛ]
ḏ	palatal counter part of [ᴅ]
ṉ	palatal counter part of [ɴ]
ʎ	palatal counter part of [ʟ]
p̣	half-fortes [p]
ṭ	half-fortes [t]
ḳ	half-fortes [k]
ḅ	half-lenes [b]
ḍ	half-lenes [d]
g̣	half-lenes [g]
š	denotes [s] with somewhat retracted articulation, and acoustic quality reminiscent of [ʃ]
ž	denotes [z] with somewhat retracted articulation, and acoustic quality reminiscent of [ʒ]
t	fricative [t]
d̂	fricative [d]
g̑	fricative [g]
ʁ	uvular [r]
ʀ	rolled [r]
ʔ	glottal stop

Diacritic	Explanation
ˌ	palatalisation
ʷ	labialisation
◡ or ◠	synchronic articulation (r͡ʃ, r͡ʒ)
ˈ	primary stress
ˌ	secondary stress
ː	long
·	over-long
ˑ	not quite half-long
·	half-length
‿	used occasionally to symbolize glides (n‿um)

Appendix 2: Vowels (Corpus A)

List 1

Vowel	Main words	Lexical Set
ɐ, ɔ̃, ɤ	*Hudd*	STRUT
ʊ	*hood*	FOOT
u:	*who'd*	GOOSE
a	*had*	TRAP
a(:ʔ)	*half*	BATH
ɑ	*Hod*	LOT
ɑ:, ɔ:	*hawed*	THOUGHT
i:	*heed*	FLLECE
ɪ	*hid*	KIT
ɛ	*head*	DRESS
ɑɪ, ʌɪ	*hide*	PRICE
ɔɪ, ɒɪ	*Hoyed*	CHOICE
æʊ, ɐʊ	*how'd*	MOUTH
ɔ:	*hoed*	GOAT
e:	*hayed*	FACE
i:	*happy, early*	*happ*Y
ə	*sofa*	*comm*A

List 2

Vowel	/Vɹ/ vowels	Wells' Lexical Sets
ɐɹ / ʌɹ	*turn, dirt, bird*	NURSE
i:ɹ	*hear*	NEAR
e:ɹ	*hair*	SQUARE
ɔ:ɹ	*Corr, born*	NORTH
o:ɹ	*four*	FORCE
u:ɹ	*poor*	CURE
a:ɹ	*far, hard*	START

Appendix 2: Vowels (Corpus B)

List 1

Vowel	Extra Words	Lexical Set
ɵ, ɔ̃, ɤ	*could-cud, took-tuck, bus, mud, hug, done, come, double, dull*	STRUT
ʊ	*cook, rook*	FOOT
u:	*school, two*	GOOSE
a	*ant, Mater* (well known hospital in Dublin), *Pam*	TRAP
a(:ʔ)	*aunt, matter, palm, path, dance, father, spa*	BATH
ɑ	*pot, bother, soft, boss*	LOT
ɑ:, ɔ:	*bought, halt*	THOUGHT
i:	*piece-peace*	FLLECE
ɪ	*peculiar, secure* (in unstressed syllables)	KIT
ɛ	*any, many*	DRESS
ɑɪ, ʌɪ	*pint, vice, aisle, buy, height, rice-rise*	PRICE
ɔɪ, ɒɪ	*point, voice, oil, boy*	CHOICE
æʊ, ɛʊ	*cow*	MOUTH
ɔ:	*coat, toe, bold*	GOAT
e:	*pace, eight, day, break, steak*	FACE
i:	*happy, early*	*happ*Y
ə	*vowel-owl, lion-line*	*comm*A
ŋ, əŋ	*rotting-rotten*	*-ing*

List 2

Vowel	Wells' Lexical Sets	Further Potential /Vɹ/ Oppositions	
ɛɹ / ʌɹ	NURSE	/ɛɹ/ - /ʌɹ/	*per-purr, earn-urn, ferry-furry*
e:ɹ	SQUARE	/e:ɹ /- /ɛɹ/	*pair-per, paired-herd*
i:ɹ	NEAR	/i:ɹ/ - /ɪɹ/	*nearer-mirror, Lear-Lir, mere-myrrh*
ɔ:ɹ	NORTH	/ɔ:ɹ/-/o:ɹ/	*horse-hoarse*
o:ɹ	FORCE		
u:ɹ	CURE	/u:ɹ/ - /o:ɹ/	*poor -pore, tour-tore*

Appendix 3 Consonants (Corpus C)

	Investigated aspects	Context	Item	Embedded in sentences
1	**Dental fricative /θ/**	# -	*thin* *thought*	*... to be thin* *Say ----again.*
		V-V	*ether*	*Tin and ether are chemicals.*
		- #	*path*	*Say ----again.*
		- ɹ	*three*	*McGeogh builds the three floors.*
		- l	*athlete*	*The athlete arrived in surprise.*
		- s	*faiths*	*Say ----again.*
	Dental fricative /ð/	# -	*then*	*Then, he turned the helm.*
		V-V	*breather* *bother, father*	*... a breather* *Say ----again.*
		- #	*breathe,*	*Whales breathe air.*
2	**Lenition of /t/**	V- #	*site* *heat*	*Keogh mines the tree site* *Dry the right seed to the right heat.*
		C - #	*belt* *ant, aunt, halt*	*Rosaleen put on her belt.* *Say ----again*
		V-V	*eater* *better* *Mater, matter*	*'E' in 'eater' is a vowel.* *Her knees are better now.* *Say ----again.*
		- # #V	*right (industry)* *art (of)* *goat (again)*	*Try the right industry.* *Attack is the art of a spider.* *Say ----again.*
		- # #h	*right heat*	*Dry the right seed to the right heat.*
	Lenition of /d/	- #	*breed*	*The lying hens breed.*
		n - #	*end*	*The best scene is the end.*
		ɹ - #	*bird*	*A cock is a bird.*
		V-V	*breeder* *spider*	*Assign each animal to a breeder.* *Attack is the art of a spider.*
3	**/l/**	# -	*Laura*	*Laura, the peel is rotting.*
		V-V	*follow*	*The girls follow their mother.*
		- #	*peel*	*Laura, the peel is rotting.*
		- C	*milk*	*Sorry' the milk is rotten.*
4	**/ɹ/**	# -	*rice*	*Try the rice seed.*
		#C -	*bring*	*Bring the right pot.*
		t -	*try, tree*	*Try the rice seed.*
		d -	*dry*	*Dry the right seed to the right heat.*
		V-V	*sorry*	*Sorry' the milk is rotten.*
		V ˈ-V	*arrive*	*The athlete arrived in surprise.*
		- #	*far*	*Say ----again.*
		- C#	*farm*	*Say ----again.*
		unstressed σ	*surprise*	*The athlete arrived in surprise.*
5	**/w/ vs. /ʍ/**	spelt with 'w'	*Wales*	*Say ----again.*
		spelt with 'wh'	*whales*	*Whales breathe air.*
6	**/k/+ front vowels**	- front V	*cabs* *kick*	*Due to the gig the cabs were busy.* *A kick of a horse hurts.*
	/g/+ front vowels	- front V	*geese* *gig*	*Scents made geese feel at ease.* *Due to the gig the cabs were busy.*
7	**Yod Coalescence**	tj	*tune*	*Tune into the scene.*
		dj	*due*	*Due to the gig the cabs were busy*
		nj	*nuclear*	*Nuclear education is what we need.*
8	**/h, k, g/ preceding /j/**	hj	*humane* *humorous*	*It's human fate to sin.* *It's humorous.*
		kj	*Keogh*	*Keogh mines the tree site.*
		gj	*McGeogh*	*McGeogh builds the three floors.*

Appendix 4: Consonants (Corpus D): The Cinderella Story

Once upon a time there was a girl called Cinderella. But everyone called her Cinders. Cinders lived with her mother and two stepsisters called Maureen and Rosaleen. Maureen and Rosaleen were very unfriendly and they were lazy girls. They spent all their time buying new clothes and going to parties. Poor Cinders had to wear all their old hand-me-downs! And she had to do the cleaning!

One day, a royal messenger came to announce a ball. The ball would be held on Saturday at the Royal Palace, in honour of the Queen's only son, Prince William. Maureen and Rosaleen thought this was divine. Prince William was gorgeous, and he was looking for a bride! They dreamed of wedding bells!
When the evening of the ball arrived, Cinders had to help her sisters get ready. They were in a bad mood. They'd wanted to buy some new gowns, but their mother said that they had enough gowns. So they started shouting at Cinders. 'Find my jewels!' yelled one. 'Find my hat!' howled the other. They wanted hairbrushes, hairpins and hair spray.

When her sisters had gone, Cinders felt very down, and she cried. Suddenly, a voice said: 'Why are you crying, my dear?'. It was her fairy godmother!
The girl poured her heart out: ' Maureen and Rosaleen have it all!' she cried, 'even though they're awful, and fat, and they're dull! And I want to go to the ball, and meet Prince William!'
'You will, won't you?' laughed her fairy godmother. 'Go into the garden and find me a pumpkin'. Cinders went, and found a splendid pumpkin which the fairy changed into a dazzling carriage.
'Now bring me four white mice,' the godmother said. The girl went, and found one... two...three...four mice. The faiiry godmother changed the mice into four lovely horses to pull the carriage.
Then the girl looked at her old rags. 'Oh dear!' she sighed. 'Where will I find something to wear? I don't need jewellery... you need shoes, and... something needs to be done about your hair. And would you like a blue gown or a green gown?'
For the third time, Cinders' godmother waved her magic wand. A ballgown, a robe and jewels appeared. And there were some elegant glass slippers. 'You look wonderful,' her fairy godmother said, smiling. 'Just remember one thing - the magic only lasts until midnight!' And off Cinders went to the ball.

In the Royal Palace, everyone was amazed by the radiant girl in the beautiful ballgown. 'Who is she?' they asked. Prince William thought Cinders was the most beautiful girl he had ever seen. 'Have we met?' he asked. 'And may I have the honour of this dance?'
Prince William and Cinders danced for hours. Cinders was so glad that she failed to remember her fairy godmother's warning. Suddenly the clock chimed midnight! Cinders ran from the ballroom. 'Where are you going?' Prince William called. In her hurry, Cinders lost one of her slippers. The Prince wanted to find Cinderella, but he couldn't find the girl. 'I don't even know her name,' he sighed. But he held on to the slipper.
After the ball, the Prince was resolved to find the beauty who had stolen his heart. The glass slipper was his only clue. So he declared: 'The girl whose foot will fit this slipper shall be my wife'. And he began to search the kingdom. Every girl in the land was willing to try on the slipper. But the slipper was always too small.

When the Royal travellers arrived at Cinders' home, Maureen and Rosaleen tried to squeeze their feet into the slipper. But it was no use; their feet were enormous! 'Do you have any other girls?' the Prince asked Cinders' mother. 'One more,' she replied. 'Oh no,' cried Maureen and Rosaleen. 'She is much too busy!' But the Prince insisted that all girls must try the slipper.
Cinders was embarrassed. She didn't want the Prince to see her in her old apron. And her face was dirty!
'This is your daughter?' the Prince asked, amazed. But then Cinders tried on the glass slipper, and it fitted perfectly!

The Prince looked carefully at the girl's face, and he recognised her. 'It's you, my darling isn't it?' he yelled. 'Will you marry me?' Maureen and Rosaleen were horrified and asked: 'It was you at the ball, Cinders?'. They couldn't believe it! Then Cinders married William, and they lived happily ever after.

Appendix 5: Tonal Patterns & Interrogative Intonation

(Corpus E & F)

STATEMENTS (ST)

1. *Laura was mowing the lawn.*
2. *Liam is annoyed with Mandy.*
3. *Ray married Mandy.*
4. *We live down the Boyne Valley.*
5. *A: I don't know how to use this machine.*
   B: Here is the manual.

6. Set 1: *Manny lives in Mallow.*
7. Set 2: *Amanda is selling the mandolin.*
8. Set 3: *Manny has a meeting with the manager.*

WH_QUESTIONS (WQ)

1. *Where are you from?*
2. *A: I don't know how to use this machine.*
   B: Where's the manual?

3. Set 1: *When did Manny live in Mallow?*
4. Set 2: *When is Amanda selling the mandolin?*
5. Set 3: *A: quick question Anne; When does Manny have a meeting with the manager?*
   B: They're meeting at one.

YES-NO_QUESTIONS (YQ)

1. *And where are you going? Would you be in Mallow?*
2. *May I leave the meal early?*
3. *A: I don't know how to use this machine.*

B: Is this the manual?

4. Set 1: *Does Manny live in Mallow?*
5. Set 2: *Is Amanda selling the mandolin?*
6. Set 3: *A: I meant to ask you Anne; Does Manny have a meeting with the manager?*
   B: No, he's off today.

DECLARATIVE QUESTIONS (DQ)

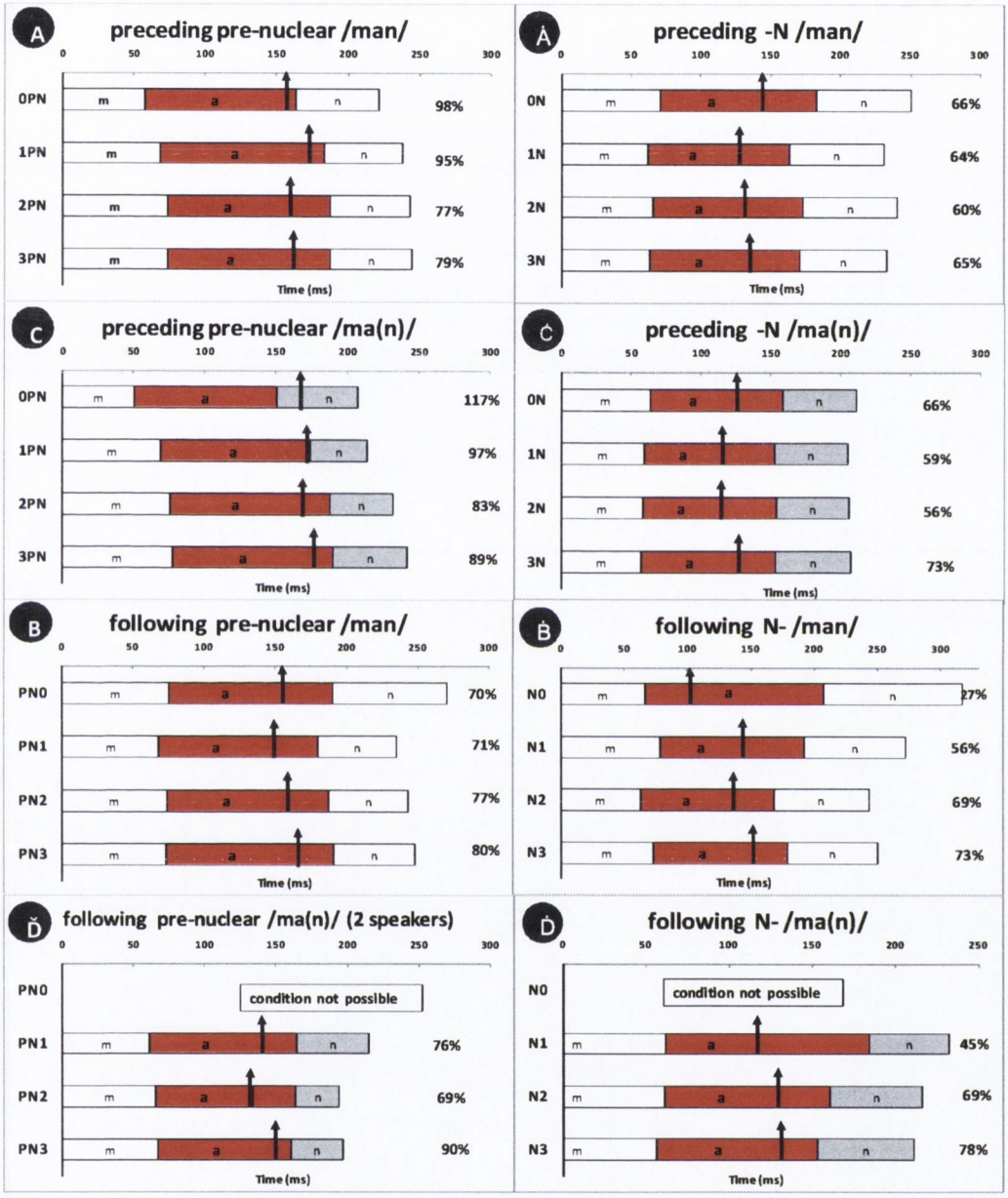
1. *What kind of an accent is that you have? .....You live in Mallow?*
2. *A: Can I have a look at that?*
3. *B: You mean the manual?*

4. Set 1: *Pat: Manny told us to drop in on him on our way through Mallow.*
   Fran: Oh that's interesting..... Manny lives in Mallow?
5. Set 2: *Pat: Amanda is down at the flea market, getting rid of a few things.*
   Fran: Oh!.....Amanda is selling the mandolin?
6. Set 3: *A: Hi Anne, any idea?..... Manny has a meeting with the manager?*
   B: Haven't a clue.

Appendix 6: Alignment (Corpus G)

Syllable Structure	Initial Pre-nuclear (PN)	
	Preceding syllables (-PN)	Following syllables (PN-)
CVC	(A) *(0)* ***Man*** *is an omnivore.* *(1) The* ***man*** *in the lobby is waiting for you.* *(2) There's a* ***man*** *in the lobby for you.* *(3) There was a* ***man*** *in the lobby for you.*	(B) *There's a* ***man*** *waiting for you. (0)* *There's a* ***man*** *in Navan. (1)* *There's a* ***man*** *in the lobby for you. (2)* *There's a* ***man*** *on the veranda for you. (3)*
CV(C)	(C) *(0)* ***Man****ny is in love with Mary.* *(1) The* ***ma****nor was renovated.* *(2) There's a* ***ma****nor on Wellington Street.* *(3) There was a* ***ma****nor on Wellington Street.*	(D) ---------- *The* ***ma****nor opens on a Sunday. (1)* *The* ***ma****nor was renovated again. (2)* *The* ***ma****nor was unusually glamorous. (3)*
Syllable Structure	**Nuclear (N)**	
	Preceding syllables (-N)	**Following syllables (N-)**
CVC	(Ȧ) *(0) Mel has a new* ***man****dolin.* *(1) Mel plays the* ***man****dolin.* *(2) Mel is playing the* ***man****dolin.* *(3) Mel is playing on the* ***man****dolin.*	(Ḃ) *I'm meeting the* ***man****. (0)* *He's handsome and* ***man****ly. (1)* *It's an example of* ***man****liness. (2)* *We need some more* ***man****liness here.(3)*
CV(C)	(Ċ) *(0) Mel is a good* ***ma****nager.* *(1) Melvin sued the* ***ma****nager.* *(2) Mel was dating the* ***ma****nager.* *(3) Mel was depending on the* ***ma****nager.*	(Ḋ) ---------- *We'll dine in the* ***ma****nor. (1)* *Mel is meeting the* ***ma****nager. (2)* *Mel is meeting the* ***ma****nager now. (3)*

Appendix 7: Syllable-segment Durations



Segment-durations (ms) of the accented syllables in PN and N accents, vowel durations are in red, the onset and coda consonants are in white. The ambisyllabic consonant in /ma(n)/ is in grey, the averaged proportional alignment (H = ↑) is given in percentages for each condition.

Appendix 8 – Informants' Profiles

No.	Chapter	Informant	Age[1]	Years in Drogheda	Parents' town(s)	Primary Schooling[2]	Secondary Schooling
1.	Segments: 4	CD	18	18	F: Drogheda M: Drogheda	Donacarney National School	St. Mary's Diocesan School
2.	Segments: 4	CM	16	16	F: Drogheda M: Drogheda	Donacarney National School	St. Mary's Diocesan School
3.	Segments: 4	LD	16	16	F: Drogheda M: Galway	Donacarney National School	St. Mary's Diocesan School
4.	Segments: 4	ND	17	13	F: Slane (Meath) M: Colbinstown (Kildare)	St Patricks N.S Slane (Meath)	St. Mary's Diocesan School
5.	Segments: 4	OC	16	16	F: Drogheda M: Drogheda	St. Mary's National School	St. Mary's Diocesan School
6.	Segments: 4	MO	17	17	F: Drogheda M: Laytown (Meath)	St. Patrick's & St. Joseph's	St. Josephs secondary CBS
7.	Segments: 4	DW	17	17	F: Drogheda M: Drogheda	Collystown National School (Clogherhead, Louth)	St. Josephs secondary CBS
8.	Segments: 4	CC	18	18	F: Drogheda M: Drogheda	Congress Avenue	St. Oliver's School
9.	Segments: 4	NB	18	18	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS
10.	Segments: 4	SK	20	19	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS
11.	Segments: 4	StK	18	18	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS
12.	Intonation: 5, 6, 7	GM	16	16	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs Newfoundwell
13.	Intonation: 5, 6, 7	GO	17	17	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS
14.	Intonation: 5, 6, 7	IF	16	16	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS
15.	Intonation: 5, 6, 7	JG	16	16	F: Drogheda M: Garriston (N. Dublin)	St. Josephs Primary CBS	St. Josephs secondary CBS
16.	Intonation: 5, 6, 7	RK	16	16	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS
17.	Intonation: 5, 6, 7	SS	15	15	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS
18.	Intonation: 5, 6, 7	TO	16	14	F: Drogheda M: Drogheda	St. Patrick's National School	St. Josephs secondary CBS
19.	Alignment: 7	RB	16	16	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS
20.	Alignment: 7	SO	16	16	F: Drogheda M: Drogheda	St. Josephs Primary CBS	St. Josephs secondary CBS

[1]Age is at time of recording (recordings were carried out in 2007, 2008, and 2009)

[2] Primary and secondary schooling is in Drogheda unless indicated otherwise