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Syntax-Prosody Interactions in Irish

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<https://doi.org/10.7275/3545-6n54> https://scholarworks.umass.edu/open_access_dissertations/505

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SYNTAX-PROSODY INTERACTIONS IN IRISH

A Dissertation Presented

by

EMILY JANE ELFNER

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

February 2012

Department of Linguistics

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EMILY JANE ELFNER

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ACKNOWLEDGMENTS

This dissertation could not have been written without the input and support from many different people. First and foremost, I would like to thank my advisor, Lisa Selkirk. Her input and support throughout the last few years has been invaluable, and I couldn't have asked for more in an advisor. I feel privileged to have had the opportunity to work with her.

The input from other members of my dissertation committee has also been formative both in the development of this dissertation and in other projects I have worked on as a graduate student, and it has been an honour to work with each of them. I'd like to thank John Kingston for his input especially on the phonetic and data aspects of this dissertation. I always left meetings with the feeling of having learned something valuable and useful. John McCarthy has been a great teacher over the years, and has taught me more than I ever thought I would know about phonological theory and about how to develop an analysis from beginning to end. Mark Feinstein provided me with helpful insights on data presentation, and I'm sorry that I didn't have the chance to work with him more closely.

A special thanks goes out to Jim McCloskey, who agreed to be on this dissertation committee despite living thousands of miles away. His encouragement for this work on Irish has meant a lot to me, and I probably would not have followed through with this project had he not convinced me that it was a valuable and worthwhile pursuit. I'd also like to thank Jim for arranging two visits to UC Santa Cruz, where I had the opportunity to discuss this work with faculty and students.

Another group of people who are perhaps even more vital to this dissertation are the native Irish speakers who agreed to work with me over the years and have their speech recorded and analysed. Not all of the data I have collected has made it into this dissertation, but I am indebted to each of them just the same, as each recording session brings some new insight: Brigíd Bornstein, Michael Carney, Peggy Cloherty, Norita Ní Chartúir, Yvonne Ní Fhlatharta, Roitín Ní Fhlatharta, Fiona Ní Fhlaithearta, Breda Ní Mhaoláin, Áine Ní Neachtain, Máire Uí Fhlatharta, Baba Uí Loingsigh, and especially Michael Newell and Yvonne Ní Fhlatharta, who have met with me on several occasions. I am also indebted to those who have taught me Irish in a more formal setting over the last few years: Yvonne Ní Fhlatharta, Tom Moriarty (and everyone at the Irish Cultural Center in Chicopee), Michael Newell, and Máitiú de hAl.

For support in various stages of this project including fieldwork in Ireland, I'd like to thank Ryan Bennett for being a great collaborator, friend, and host, Máire Ní Chiosáin for being incredibly generous and supportive during my trip to Ireland (including putting me in touch with native speakers), and the many Celticists that I have met at Formal Approaches to Celtic Linguistics in Arizona and the sixth Celtic Linguistics Conference in Dublin. I would also like to thank Patricia Shaw, Daisy Sewid-Smith, Beverly Lagis, and my fellow Kwak'wala students for an amazing summer field methods course at UC Santa Barbara during InField in 2008. This course was an incredibly formative experience, and helped me a great deal with the fieldwork for this dissertation.

At UMass, I would like to thank faculty members not on my dissertation committee, as well as my fellow grad students, for making grad school a great

experience. Among the faculty, I would especially like to thank Kyle Johnson and Ellen Woolford, who have worked with me over the years on projects related to this dissertation, and Joe Pater, for many fascinating phonological conversations. I would also like to thank my classmates, Meg Grant, Jesse Harris, Misato Hiraga, Wendell Kimper, Pasha Siraj, and Martin Walkow, for getting me through first year and for being great friends and colleagues ever since. Thanks especially to Wendell, my fellow phonologist, for friendship and p-side support over the years. I'm also indebted to Leah Bateman, Noah Constant, Chris Davis, Karen Jesney, Seda Kan, Mike Key, Claire Moore-Cantwell, Kevin Mullin, Kathryn Pruitt, Anisa Schardl, Brian Smith, Robert Staubs, and many other grad students for both for their input and interest in my research, as well as contributing to making my time at UMass memorable. Finally, thanks to Martin, Pippin, Brian, Anisa, Snowflake, Gizmo, and Callie for reminding me about life outside linguistics.

A great thanks to my parents, Susan and Paul, my sister Alison, my grandparents, Uncle Allen, and the rest of my family and Calgary friends for supporting my decision to pursue a Ph.D. in the distant land of Massachusetts.

ABSTRACT

SYNTAX-PROSODY INTERACTIONS IN IRISH

FEBRUARY, 2012

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This dissertation is an empirical and theoretical study of sentence-level prosody in Conamara (Connemara) Irish. It addresses the architecture of the syntax-phonology interface and the relation between syntactic constituent structure and prosodic structure formation. It argues for a fully interactional view of the interface, in which the phonological form may be influenced by a number of competing factors, including constraints governing syntax-prosody correspondence, linearization, and prosodic well-formedness.

The specific proposal is set within the framework of Match Theory (Selkirk 2009b, 2011), an indirect-reference theory of the syntax-prosody interface in which correspondence between syntactic and prosodic constituents is governed by a family of violable MATCH constraints. These constraints call for a one-to-one correspondence between syntactic and prosodic structure, to the extent that prosodic structure may be recursive under pressure from the recursive nature of syntactic phrases. However, this direct correspondence can be overruled by other interacting constraints, including

prosodic markedness constraints and, as proposed here, other correspondence relations, as on the linearization of hierarchical syntactic structures.

This dissertation argues that the distribution of pitch accents in Conamara Irish provides direct evidence for Match Theory. It is proposed that two phrasal pitch accents, L-H and H-L, demarcate the edges of phonological phrases, where L-H accents specifically target only those phrases which are recursive. Using the distribution of these pitch accents as indicators for the presence of prosodic boundaries, the dissertation investigates a variety of syntactic structures in both the clausal and nominal domain. It is argued that there is a close correspondence between syntactic and prosodic structure in default cases, but that this direct correspondence may be subverted in favour of a structure which better satisfies higher-ranked prosodic markedness constraints.

Finally, this dissertation addresses pronoun postposing, a process pervasive in Irish dialects in word order appears to be sensitive to prosodic structure. This dissertation proposes to account for this phenomenon using the theoretical framework developed in the dissertation, in which the main patterns are accounted for through the interaction of MATCH constraints, prosodic markedness constraints, and a proposed violable constraint on the linearization of syntactic structure.

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CHAPTER 1

INTRODUCTION AND THEORETICAL BACKGROUND

1.1 Introduction

This dissertation is an empirical study of the sentence prosody of a single language, the Conamara (Connemara)¹ dialect of Irish (henceforth CI). CI is spoken on the west coast of Ireland, primarily in villages west of Galway city in Galway County, located within the Connemara Gaeltacht.²

The work presented here aims to provide an overview of the intonational and prosodic patterns for a wide array of syntactic configurations for declarative sentences for this dialect. One of the goals of this study is to fill a gap both in work on the prosodic system of Irish and on the typology of prosodic systems. To date, work on this variety of Irish is limited to a handful of projects, dating from de Bhaldraithe's (1945) short, impressionistic description of intonational contours in the Cois Fharraige dialects which are spoken along the coastal region just west of Galway city.³ This was followed by studies of intonational tunes and their meaning found in Blankenhorn (1979, 1981a) and Bondaruk (1994, 2004). More recently, detailed phonetic work on the form and alignment of pitch accents in CI and other dialects has been reported in a number of studies by Dalton and Ní Chasaide, including Dalton and Ní Chasaide (2005a, 2005b).

¹ The variant spellings *Connemara* and *Conamara* reflect the English and Irish spellings for the name of the region of Ireland west of Galway.

² A *Gaeltacht* refers to an Irish-speaking region, part of the collective regions (*an Ghaeltacht*) that are officially recognized by the Irish government as areas where Irish remains the predominant language used in the community.

³ As will be discussed in section 1.4, the speakers who contributed recordings for this dissertation are from areas just west of de Bhaldraithe's (1945) characterisation of the Cois Fhairrge dialect area.

This dissertation is the first to provide a detailed examination of CI tonal prosody which looks at a wide range of syntactic structures, and is the first to propose an analysis of the distribution of tonal elements in CI under the assumptions of prosodic structure theory (Selkirk 1978, 1986). The work presented here is unique in its attempt to provide a full phonological characterization of sentence prosody in CI.

This dissertation also aims to provide data which may be used in the study of prosodic typology. Because Irish to date is relatively poorly understood, it is hoped that the data provided in this thesis will pave the way for future work on prosodic theory and the syntax-phonology interface: as will be shown in this dissertation, the study of sentence prosody in CI appears to be especially instructive in distinguishing between theories of the interface between syntactic and prosodic structure, especially as relates to the degree to which syntactic and prosodic constituency correspond to one another.

The second goal of this thesis is theoretical: to investigate the predictions of Match Theory (Selkirk 2009b, 2011), a proposal that the correspondence of syntactic and prosodic constituents is governed by a violable family of syntax-prosody correspondence ('Match') constraints, as under an Optimality Theoretic (OT) framework (Prince & Smolensky 1993/2004). These constraints call for a one-to-one correspondence between syntactic constituents of certain types (word, phrase, clause) and prosodic constituents (prosodic word, phonological phrase, intonational phrase). Because syntactic structure shows recursive embedding of constituents of certain types (e.g. in the embedding of XPs in a sentence), prosodic structure is expected to show a parallel recursive structure. However, other types of constraints, such as constraints on prosodic well-formedness (as on rhythm) may intervene to result in the characteristic

non-isomorphic structures that have been widely discussed in work on prosodic theory (Nespor & Vogel 1986; Selkirk 1986, 1995). As a result, all instances nonisomorphism between syntactic and prosodic constituency must have its source in the phonology, since the Match constraints themselves call for strict isomorphism.

This theory departs from the assumptions of the Strict Layer Hypothesis (Nespor & Vogel 1986; Selkirk 1986; Pierrehumbert & Beckman 1988), which assumes that prosodic structure is fundamentally non-recursive, as well as from proposals that the requirements of the Strict Layer Hypothesis be relaxed and evaluated through violable constraints (Ito & Mester 1992; Selkirk 1995). The proposal that prosodic structure theory allow recursive prosodic structure is also made in Ito and Mester (2006, 2010, to appear), who propose that prosodic well-formedness constraints may induce recursive prosodic structure. In this dissertation, it will be shown that this departure is warranted in the discussion of the distribution of the two ‘default’ pitch accents in CI. I argue that these pitch accents are edge-demarcating accents and that one of these, the L-H rise, is associated only with the leftmost word in recursive phonological phrases. I support this claim with evidence from a variety of structures, and argue that this provides direct support for the proposal that prosodic structure may be recursive.

In section 1.3.1.2 of this chapter, I discuss how Match Theory and the particular interpretation of it proposed in this dissertation compares to edge-based theories of the syntax-prosody interface (Selkirk 1986) and its subsequent instantiations within the framework of OT (Selkirk 1995; Truckenbrodt 1995, 1999). I show that while it shares with these proposals the notion of ‘edge matching’, the predictions of Match Theory are

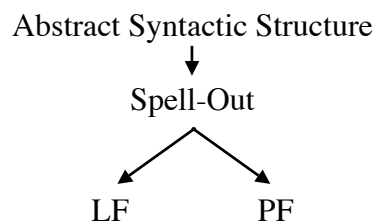
different from these earlier proposals. In particular, Match Theory predicts that recursive prosodic structure results naturally from the satisfaction of Match constraints.

A second way in which this dissertation departs from previous work on the syntax-prosody interface is in its rejection of the Lexical Category Condition (Selkirk 1995), the proposal that only the projections of lexical categories are visible to syntax-prosody mapping constraints, while the projections of functional categories are ignored. I argue that it is not the lexical/functional distinction that is relevant to Match constraints, but rather that these constraints are sensitive to whether or not syntactic projections introduce new material that is phonologically overt. This proposal is discussed throughout this thesis, particularly in chapter 5.

1.2 The Syntax-Phonology Interface

Broadly defined, the syntax-phonology interface encompasses a number of possible relations between morphosyntactic structure and its phonological realization. Under the assumptions of the Y-model of the grammar, syntactic structure serves as the input to both PF (phonological form) and LF (logical form), neither of which may influence their shared syntactic input or each other. This can be seen in the following schematic diagram:

(1) Y-model of the grammar



Syntactic structure is abstract because while it contains information about the hierarchical organization of words and grammatical features, it does not contain information about the phonological output of these words and grammatical features, their prosodic organization, or their linear order, nor does it contain information about semantic interpretation of these structures. These are determined during Spell-Out, as the abstract syntactic structure is sent to PF and LF, respectively.

This dissertation is concerned only with certain aspects of PF Spell-Out and the syntax-phonology interface. I operate under the assumption that these can be understood as correspondence relations that hold between elements of the morphosyntactic representation and elements of the phonological representation, and which are evaluated during syntactic Spell-Out, as proposed in Selkirk (2008, 2009a). As noted above, this appears to include three core relations between morphosyntactic elements and their phonological counterparts: (a) the relation between syntactic constituency and prosodic domains, (b) the relation between hierarchical structures and linear order, and (c) the relation between abstract morphosyntactic words or features and their phonological exponents.

The relation in (a), between syntactic constituency and prosodic domains, is the principal area investigated in this dissertation. The proposal made here assumes the basic premise of Match Theory (Selkirk 2009b, 2011), which itself is based on a long line of research in this area, particularly work on prosodic structure theory (Selkirk 1978: et seq.) and edge-based theories of syntax-prosody correspondence (Selkirk 1986, 1995). Match Theory assumes that syntax-prosody correspondence MATCH constraints govern the mapping from syntactic to prosodic structure, and that these constraints are

violable, as under an OT framework. The basic assumptions of Match Theory are compatible with the Y-model of the grammar detailed above: syntactic structure is the input to the phonological component, where an OT-like evaluation considers different possible prosodic phrasings for the given input structure. The output candidates differ with respect to their satisfaction of a ranked hierarchy of constraints, which includes both the MATCH constraints and other constraints, including constraints on prosodic well-formedness. Match Theory thus assumes a *direct interaction* between the various types of constraints that are responsible for determining prosodic constituency. For further discussion of the particular details of Match Theory, see section 1.3.1.

Also established at Spell-Out is (b), the relation between hierarchical syntactic structure and linear order. There has been much discussion of linearization procedures in the syntactic literature (Kayne 1994; Fox & Pesetsky 2005), where it is usually assumed that linearization algorithms are inviolable, and do not interact directly with other processes that also occur at Spell-Out. An alternative view is that linearization procedures are indeed governed by violable constraints, and that these constraints are evaluated concurrently with other constraints at Spell-Out. This view has been argued for in López (2009) to account for apparent cases of prosodically-motivated syntactic movement. In chapter 6, I take up the case of pronoun postposing in Irish, where it has been proposed that pronoun displacement is driven by prosodic considerations (Adger 1997; Doyle 1998; McCloskey 1999). Building on the analysis proposed in Elfner (2011), I develop an account of pronoun postposing where constraints on linearization interact directly with both syntax-prosody MATCH constraints and prosodic well-formedness constraints.

As concerns (c), I assume following work in the Distributed Morphology (DM) framework (Halle & Marantz 1993, 1994) that morphosyntactic structure contains only abstract information about words and morphosyntactic features. During Spell-Out, these abstract words and features are replaced with phonological content via a process of *Vocabulary Insertion*. Sometimes, as with most lexical roots, there is a simple one-to-one correspondence between the abstract root ($\sqrt{\text{CAT}}$) and its phonological form ([kæt]). In other cases, the relation may be more complex, and involve, for example, a many-to-one relation. For instance, the past tense of the English verb *go* ($\sqrt{\text{GO+PAST}}$) is expressed as a single opaque word *went* ([wɛnt]), while the past tense of a regular verb like *jump* ($\sqrt{\text{JUMP+PAST}}$) is the morphologically transparent word *jumped* ([dʒʌmpɪd]), which can be divided into root (*jump*) and suffix (*-ed*).

While I will not specifically discuss evidence bearing on relation (c), it is worth noting that Wolf's (2008) proposal that processes of vocabulary insertion also governed by violable correspondence constraints which interact directly with phonological constraints. While Wolf's proposal is primarily concerned with the interaction between morphology-phonology correspondence constraints and phonological markedness constraints, this proposal may be extended beyond the domain of the word. If, as assumed under the DM framework, there is no grammatical distinction between syntax and morphology, we might expect such interactions between vocabulary insertion and phonological well-formedness to hold at the level of the sentence, as part of the system of relations between words. The extent to which the predictions of these extensions of Wolf's theory are supported by empirical evidence will be left to future research.

Together, the arguments developed in this dissertation in favour of the above views on relations (a), (b), and (c) suggest a picture of the syntax-phonology interface in which Spell-Out concerns the direct interaction between constraints governing the different aspects of Spell-Out. In this view, constraints governing prosodic well-formedness, the correspondence between syntactic and prosodic constituents, linearization, and vocabulary insertion are violable and ranked such that we may expect to see any one of these relations privileged over the other. In cases of direct conflict, one of these relations will be privileged above the other, as determined by language-specific ranking of the relevant constraints. This predicts that languages will differ from one another with respect to which type of constraint is privileged, and in how conflicts are resolved.

It is primarily this characteristic that sets apart the theory of the syntax-prosody interface advocated for in this dissertation and recent proposals which revisit the idea that phonological domains are read directly off of syntactic constituent structure, with no separate prosodic system that mediates between the syntax and the phonetic implementation (Wagner 2005, 2010; Pak 2008). In the theory assumed here, prosodic structure is a distinct grammatical system with its own set of well-formedness constraints that may outrank the correspondence constraints governing the various syntax-phonology relations. I will argue in this dissertation that this view is necessary to account for the prosodic structure of sentences in CI. This claim is made on the basis that non-isomorphic prosodic structure is found only where a high-ranking prosodic constraint would be violated were the isomorphic structure to surface. The topic of

direct and indirect reference theories of the syntax-prosody interface will be returned to in chapter 7.

1.3 Prosodic Structure Formation

1.3.1 Match Theory

1.3.1.1 Match Theory

Match Theory (Selkirk 2009b, 2011) is a theory of prosodic constituency that proposes that prosodic constituency relates to syntactic constituency under pressure from violable syntax-prosody correspondence constraints. These constraints call for a one-to-one correspondence between syntactic and phonological constituents in the grammar.

Correspondence in Match Theory is proposed as an extension of Correspondence Theory as developed for the OT framework by McCarthy and Prince (1995, 1999), where it is used to establish relations between linguistic objects. In its original formulation, correspondence was used to establish relationships between levels of phonological representation, such as input-output and base-reduplicant relations. Match Theory is a particular proposal for how syntactic and prosodic constituency are related to one another, namely, that a correspondence relation exists between constituency in the syntactic component (the ‘input’) and prosodic constituency in the phonological component (the ‘output’). However, Match Theory may be thought of as part of a more general theory of the syntax-phonology interface, where correspondence constraints may govern the relationship between other elements of the morpho-syntactic component and their phonological exponents. For example, chapter 6 of this dissertation

discusses how pronoun postposing in Irish may be analysed by assuming a violable correspondence constraint governing the relation between hierarchical syntactic structure and linear order (see also López 2009; Elfner 2011; Bennett et al. in prep). Similarly, Wolf (2008) proposes that the relation between abstract morpho-syntactic elements and their phonological exponents is governed by violable constraints that make reference to this same notion of (morpho-)syntax-phonology correspondence.

As originally construed by Selkirk, Match Theory posits two sets of correspondence constraints which govern the relation between syntax and prosody for both the input-output relation (syntax-prosody) and the output-input relation (prosody-syntax). Once again in analogy with Correspondence Theory in OT, these two constraints can be thought of as analogs of DEP and MAX constraints. For either family of constraints, Selkirk proposes three basic correspondence constraints, governing different levels of the prosodic hierarchy. First, consider the family of constraints that govern the syntax-prosody relation. These constraints call for correspondence between syntactic constituents in the syntactic representation (syntactic clause, syntactic phrase, syntactic word) and prosodic constituents of specific types in the prosodic representation (intonational phrase or ι , phonological phrase or φ , prosodic word or ω).

Informally, these may be characterized as in (2):

(2) Syntax-prosody Match Constraints

- MATCH-CLAUSE: Syntactic clause \rightarrow Intonational phrase (ι)
- MATCH-PHRASE: Syntactic phrase (XP) \rightarrow Phonological Phrase (φ)
- MATCH-WORD: Syntactic word \rightarrow Prosodic Word (ω)

While a more formal definition will be offered below, these constraints may be analyzed as analogs of MAX constraints: they are violated when there is a syntactic

constituent in the input for which there is no corresponding prosodic constituent in the output.

While these prosodic categories (ι , φ , ω) originate from work on the Prosodic Hierarchy (Selkirk 1978, 1986; Nespor & Vogel 1986; Beckman & Pierrehumbert 1986; Pierrehumbert & Beckman 1988), Selkirk (2011) departs from the assumption that prosodic categories are strictly phonological in nature, and bear no inherent relation to syntactic structure. Selkirk (2011) proposes that there is no independent stipulation of category type above the level of the word in the phonological representation, but rather, that the three category types (ι , φ , ω) derive from the interface relations defined by the three proposed MATCH constraints. In this sense, the use of the traditional terms “Intonational Phrase”, “Phonological Phrase” and “Prosodic Word” refer to the prosodic constituents that correspond to syntactic clause, phrase, and word, respectively. Retained, however, is the notion that the prosodic categories are real phonological entities, such that phonological constraints may directly appeal to prosodic categories: in this case, phonological constraints reference the prosodic constituents of the relevant category type.

Next, consider the correspondence constraints governing the prosody-syntax relation. These constraints evaluate the correspondence relation between prosodic constituents that are found in the phonological representation and syntactic constituents in the syntactic representation, and can be informally represented as in (3):

(3) Prosody-syntax Match Constraints

MATCH-ι:	Intonational phrase (ι)	→	Syntactic clause
MATCH-φ:	Phonological Phrase (φ)	→	Syntactic phrase (XP)
MATCH-ω:	Prosodic Word (ω)	→	Syntactic word

These constraints may be thought of as analogs of DEP constraints: they are violated when there is a prosodic constituent in the output for which there is no corresponding syntactic constituent in the input.

1.3.1.2 Match Theory versus Edge-based Theories

Like the edge-based theory proposed in Selkirk (1986, 1995), Match Theory appeals to the idea that the *edges* of syntactic and prosodic constituents must be aligned. In these earlier proposals assuming edge-based alignment, the co-occurrence of the left and right edges of syntactic and prosodic constituents are evaluated separately, either using parameter settings (Selkirk 1986) or, in the OT analysis developed in Selkirk (1995), using violable alignment constraints (McCarthy & Prince 1993) which may be specified for edge (L/R), for syntactic constituent (clause, XP, word), and for prosodic constituent (ι, φ, ω). For example, the constraints responsible for aligning the left and right edges of syntactic XPs with prosodic φs are ALIGN-L(XP, φ) and ALIGN-R(XP, φ). Conversely, the opposite relation, which holds between the edges of prosodic φs and syntactic XPs, are captured by ALIGN-L(φ, XP) and ALIGN-R(φ, XP).

Initially, MATCH constraints may be thought of as the conjunction of ALIGN-L and ALIGN-R constraints: MATCH-PHRASE, for example, which calls for a syntactic constituent XP to be “matched” by a prosodic constituent φ or, in other words, require that the alignment of both edges be satisfied. However, as will be proposed in this

dissertation, there are differences in the evaluation of the ALIGN constraints which suggest that this analogy is too simplistic.

As discussed in Selkirk (2011), most analyses assuming an edge-based approach only consider languages which provide a phonological diagnostic for one of the edges of the prosodic domain in question. Match Theory, on the other hand, predicts the existence of prosodic boundaries for which there may not be any direct evidence. For example, this is true of classic edge-based analyses of ChiMwiini (Selkirk 1986), Xiamen Chinese (Chen 1987), and Tokyo Japanese (Selkirk & Tateishi 1991). A more thorough discussion of these analyses in light of Match Theory can be found in Selkirk (2011); here, I will summarize the discussion presented in that paper for one of these languages, ChiMwiini, as an illustration of how the edge-based analysis might compare to a possible analysis assuming Match Theory.

Selkirk (1986) proposes that phonological phrases in ChiMwiini are derived from a right-edge parameter setting; an alignment analysis would privilege the constraint ALIGN-R(XP, φ) over ALIGN-L(XP, φ). This analysis is consistent by the distribution of vowel length and a right-edge phrasal tone, both indicators of the right edge of φ , as reported in Kisseberth (2005). The following examples taken from Selkirk (2011) provide a direct comparison of the predicted prosodic phrasing as based on the edge-based account (shown in (c)) and as based on the Match Theory account (shown in (d)). The example sentence and gloss is given in (a) and the syntactic structure assumed by Selkirk (2011) (taken from Kisseberth 2005) is in (b).

(4)a. u-zile chi-búuku / na méeza ‘(s)he bought a book/ and a table’

b. ${}_{VP}[u-zile]_{VP} [{}_{NP}[chi-búuku] {}_{NP}[na meezá]]$

c. ${}_{\varphi}(u-zile \text{ chi-búuku}) {}_{\varphi}(na meezá)$ (ALIGN-R(XP, φ))

d. ${}_{\varphi}(u-zile ({}_{\varphi}(chi-búuku) ({}_{\varphi}(na meezá))))$ (MATCH-PHRASE)

(5)a. mw-ana w-a Núuru / m-someleeló / laazile
 ‘the child who Nuuru / read to (him) / fell asleep’

b. ${}_{DP}[mw-ana [w-a]_{clause} [{}_{NP}[Núuru] {}_{VP}[m-someleeló]]] {}_{VP}[laazíle]$

c. ${}_{\varphi}(mw-ana w-a \text{ Núuru}) {}_{\varphi}(m-someleeló) {}_{\varphi}(laazíle)$ (ALIGN-R(XP, φ))

d. ${}_{\varphi}(mw-ana w-a ({}_{\varphi}(Núuru) ({}_{\varphi}(m-someleeló))) ({}_{\varphi}(laazíle))$ (MATCH-PHRASE)

As discussed in Selkirk (2011), the prosodic phrasing predicted by the edge-based theory differs from that predicted by Match Theory by being non-isomorphic to the corresponding syntactic structure: in both examples, because only the right edges are preserved, we lose information relating to syntactic constituency.⁴ In contrast, the phrasing predicted by Match Theory is isomorphic with the syntactic structure. However, as Selkirk (2011) points out, both phrasings are equally consistent with the phonological processes of vowel lengthening and the distribution of the phrasal tone: right-edge boundaries are found in exactly the same places in both accounts, although Match Theory sometimes predicts the co-occurrence of several boundaries in the same place. Similarly, because there is no phonological diagnostic for the left edge of phrases, the presence of additional left-edge boundaries in the phrasing predicted by Match Theory do not incorrectly describe the prosody of the sentences.

⁴ In actuality, the non-isomorphism prediction comes from a combination of the edge-based theory of the interface and the assumptions of the Strict Layer Hypothesis (Beckman & Pierrehumbert 1986; Nespor & Vogel 1986; Selkirk 1986), which would rule out the nesting of the prosodic constituents. The summary here is therefore simplified; for further discussion, see Selkirk (2011).

Selkirk (2011) proposes that Xitsonga, a language with both right and left edge diagnostics, provides the necessary data to distinguish between the predictions of the edge-based and Match Theory under the assumption that the Strict Layer Hypothesis (Beckman & Pierrehumbert 1986; Nespor & Vogel 1986; Selkirk 1986) places conditions on prosodic structure formation, including a strict ban on recursive prosodic structure. In this case, Selkirk argues that only the isomorphic phrasing predicted by Match Theory is consistent with the phonological data from this language: because both left and right edges may be diagnosed using phonological cues, there is concrete phonological evidence for the array of boundaries predicted by Match Theory. In contrast, Selkirk argues that privileging either $\text{ALIGN-R}(\text{XP}, \varphi)$ and $\text{ALIGN-L}(\text{XP}, \varphi)$, under the assumption that recursive prosodic phrasing is strictly disallowed, predict prosodic structures that are inconsistent with the known properties of the language. For example, consider the following comparison of possible prosodic parses of an abstract Xitsonga sentence, taken from Selkirk (2011: 27):

(6)a. [_{NP}[noun adjective] _{VP}[verb _{NP}[noun adjective]]]

b. MATCH-PHRASE/MATCH- φ : φ (noun adj) φ (verb φ (noun adj))

c. $\text{ALIGN-R}(\text{XP}, \varphi) \gg \text{ALIGN-L}(\text{XP}, \varphi)$: * φ (noun adj) φ (verb noun adj)

d. $\text{ALIGN-L}(\text{XP}, \varphi) \gg \text{ALIGN-R}(\text{XP}, \varphi)$: * φ (noun adj) φ (verb) φ (noun adj)⁵

As seen in (c) and (d), the possible prosodic phrasings predicted by privileging $\text{ALIGN-R}(\text{XP}, \varphi)$ and $\text{ALIGN-L}(\text{XP}, \varphi)$, under the assumption that the Strict Layer Hypothesis holds, differ from the phrasing predicted by MATCH-PHRASE, which is confirmed by the

⁵ Note that this candidate satisfies both $\text{ALIGN-L}(\text{XP}, \varphi)$ and $\text{ALIGN-R}(\text{XP}, \varphi)$, but will only be chosen as optimal when ALIGN-L is higher ranked, assuming, as stated above, that the Strict Layer Hypothesis holds and recursive structure is disallowed or marked.

left- and right-edge diagnostics from the phonology. In (c), there is a missing left-edge between the verb and the noun. In (d), an additional right-edge boundary is found following the verb so as to allow for the presence of the left-edge boundary preceding the noun.

Selkirk points out that without the assumptions of the Strict Layer Hypothesis, the prosodic structure predicted by Match Theory, $\nu(\text{noun adj}) \nu(\text{verb } \nu(\text{noun adj}))$, actually satisfies both $\text{ALIGN-L}(XP, \varphi)$ and $\text{ALIGN-R}(XP, \varphi)$. However, without the assumption of additional constraints that would prefer the recursive prosodic structure, there is no motivation to choose the more recursive candidate over the one preferred by $\text{ALIGN-L}(XP, \varphi)$, which also satisfies $\text{ALIGN-R}(XP, \varphi)$. In the next section, I discuss the predictions of adding the constraint WRAP-XP , as proposed by Truckenbrodt (1995, 1999), which under certain ranking conditions allows recursive prosodic structure to emerge as optimal.

1.3.1.3 Match Theory versus Align/Wrap Theory

A proposal for a constraint that would favour the type of recursive prosodic structure in (6)d (ii) is found in Truckenbrodt (1995, 1999). Truckenbrodt, assuming an OT framework building on the proposal in Selkirk (1995), proposes to add to the edge-based theory a constraint WRAP-XP , which calls for every syntactic XP to be contained within a phonological phrase (φ). For example, Truckenbrodt (1999: 229) provides the following schematic illustration which shows an array of prosodic structures consistent with $\text{ALIGN-R}(XP, \varphi)$. Those marked with * violate WRAP-XP (but satisfy $\text{ALIGN-R}(XP, \varphi)$), while those marked with ✓ satisfy both WRAP-XP and $\text{ALIGN-R}(XP, \varphi)$.

- (7)a. $*_{\varphi}(\quad)_{\varphi}(\quad)$
 $[XP_2 \quad X_1]_{XP_1}$
- b. $\checkmark_{\varphi}(\quad)$
 $[X_1 \quad XP_2]_{XP_1}$
- c. $*_{\varphi}(\quad)_{\varphi}(\quad)$
 $[X_1 \quad XP_2 \quad XP_3]_{XP_1}$

The structures in (a) and (c) violate WRAP-XP because while the internal XPs are contained within φ structure, the larger XP_1 is not itself contained within a single φ . On the other hand, the structure in (b) satisfies WRAP-XP even though only a single φ is present: because both XPs, XP_1 and XP_2 are contained within this φ , the constraint is satisfied. MATCH-PHRASE, on the other hand, would not be satisfied with any of these structures: (a) and (c) because there is no φ corresponding to XP_1 (and also because of the extra left-edge boundary preceding X_1 in (a)), and because there is no φ corresponding to XP_2 in (b).

Unlike MATCH-PHRASE, this constraint does not require recursive prosodic structure in order to be satisfied. Truckenbrodt proposes, however, that some languages, in an attempt to satisfy both WRAP-XP and one or both ALIGN constraints, will produce recursive prosodic structure. For example, in his discussion of Kimatuumbi, recursive φ structure is produced under pressure to satisfy both ALIGN-R(XP, φ) and WRAP-XP. As shown in the following (somewhat abbreviated) tableau, a syntactic phrase with the structure $[X_1 \quad XP_2 \quad XP_3]_{XP_1}$ is parsed in Kimatuumbi as in candidate (c), with a recursive φ structure (Truckenbrodt 1999: 241). As seen in the tableau, crucially, both ALIGN-R(XP, φ) and WRAP-XP outrank NONRECURSIVITY; here and elsewhere, parentheses

indicate the boundaries of φ while square brackets indicate the boundaries of syntactic phrases:⁶

(8)OT tableau showing how WRAP-XP and ALIGN-R(XP, φ) compel a recursive prosodic structure in Kimatuumbi

$[X_1 XP_2 XP_3]_{XP_1}$	ALIGN-R(XP, φ)	WRAP-XP	NONREC
a. $(X_1 XP_2 XP_3)$	$XP_2!$		
b. $(X_1 XP_2) (XP_3)$		$XP_1!$	
c. $\varphi ((X_1 XP_2) XP_3)$			*

Candidates (a) and (b) are eliminated because they violate one of ALIGN-R and WRAP-XP: candidate (a) fails to indicate a right-edge boundary following XP_2 and candidate (b) fails to wrap XP_1 in a φ . Candidate (c) satisfies both constraints by parsing XP_1 as a φ , as well as an inner constituent $(X_1 XP_2)$. This occurs at the expense of a violation of NONRECURSIVITY, which is low-ranked in this tableau.

Note, however, that the recursive prosodic structure in (8)c is not perfectly isomorphic with the syntactic structure, and thus differs from a candidate that would satisfy MATCH-PHRASE. The contrast between candidate (c) in the above tableau and an additional candidate (d), which satisfies MATCH-PHRASE, is illustrated in (9):

(9)OT tableau showing how the isomorphic candidate is harmonically bounded by (c)

$[X_1 XP_2 XP_3]_{XP_1}$	ALIGN-R(XP, φ)	WRAP-XP	NONREC
a. $(X_1 XP_2 XP_3)$	$XP_2!$		
b. $(X_1 XP_2) (XP_3)$		$XP_1!$	
c. $\varphi ((X_1 XP_2) XP_3)$			*
d. $(X_1 (XP_2) (XP_3))$			**

Candidate (d) is isomorphic with the syntactic structure in the input: each of XP_2 and XP_3 are contained within their own φ . Like candidate (c), this candidate satisfies both

⁶ In this and all subsequent tableaux, I assume that the input is the abstract syntactic structure and the candidates reflect the output of Spell-Out, including the application of prosodic structure. See section 1.2 of this chapter for a discussion of the assumptions made in this thesis regarding syntactic Spell-Out.

ALIGN-R(XP, φ) and WRAP-XP. However, this candidate is harmonically bounded by candidate (c), because it incurs a gratuitous violation of NONREC.

In order for candidate (d) to win over candidate (c), all of ALIGN-R(XP, φ), WRAP-XP, and ALIGN-L(XP, φ) must dominate NONREC, as shown in (10):

(10) OT tableau showing that the isomorphic candidate wins if ALIGN-L is also high-ranked

$[X_1 XP_2 XP_3]_{XP_1}$	ALIGN-R(XP, φ)	WRAP-XP	ALIGN-L(XP, φ)	NONREC
a. $(X_1 XP_2 XP_3)$	XP ₂ !		XP ₂ XP ₃	
b. $(X_1 XP_2) (XP_3)$		XP ₁ !	XP ₂	
c. $((X_1 XP_2) XP_3)$			XP ₂ ! XP ₃	*
d. $\varphi (X_1 (XP_2) (XP_3))$				**

In contrast, under Match Theory, candidate (d) would win when MATCH-PHRASE is ranked above NONREC:

(11) OT tableau showing how Match Theory prefers candidate (d)

$[X_1 XP_2 XP_3]_{XP_1}$	MATCH-PHRASE	NONREC
a. $(X_1 XP_2 XP_3)$	XP ₂ ! XP ₃	
b. $(X_1 XP_2) (XP_3)$	XP ₂ ! XP ₁ !	
c. $((X_1 XP_2) XP_3)$	XP ₂ ! XP ₃ !	*
d. $\varphi (X_1 (XP_2) (XP_3))$		**

As argued in Selkirk (2011), this is the phrasing that tonal spreading would require in Xitsonga in cases where XP₂ and XP₃ are verbal complements and both contain a noun and a modifier.

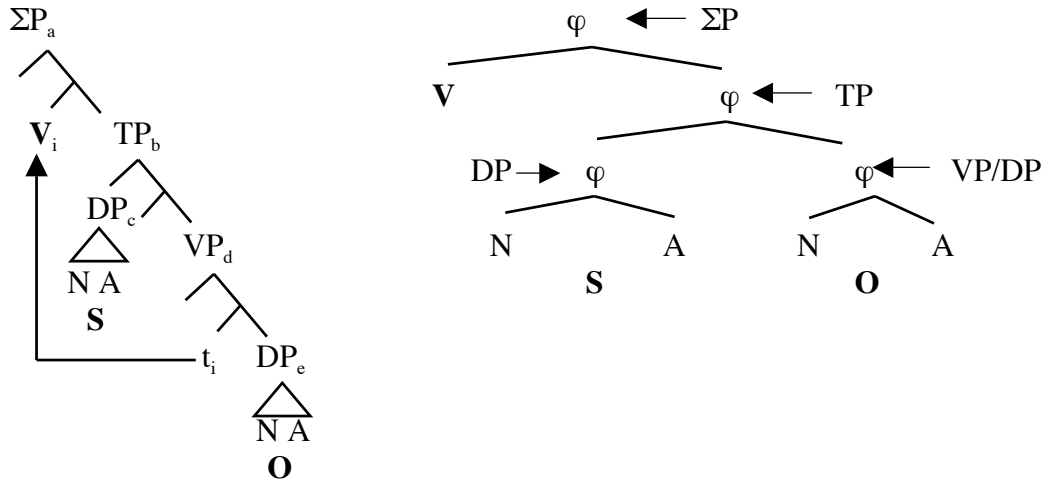
However, there is one area in which the ALIGN/WRAP theory and Match Theory appear to make empirically different predictions. In this dissertation, I will discuss data from Conamara Irish (CI) which I claim show direct evidence for the presence of isomorphic recursive prosodic structure along the lines of candidate (d). As will be argued in chapter 3, an account of the distribution of pitch accents in CI depends on the

assumption that prosodic structure can be recursive, and that this recursive structure is motivated by satisfaction of MATCH-PHRASE.

One particular structure that will be discussed in chapter 3 and throughout the dissertation is the prosody of basic transitive sentences in CI, which have the structure [V [SO]], where S and O are DPs, as can be seen in (12)a (based on McCloskey 1996b, 2009). Of particular interest is the syntactic constituent, TP, which groups together the subject and object to the exclusion of the sentence-initial verb: under the assumptions of the particular version of Match Theory that will be proposed in this dissertation (see discussion in [section 1.3.1.4] below), MATCH-PHRASE will be satisfied only if the constituent TP is “matched” by a φ in the prosodic representation, along with corresponding φ s for each of the two DPs in subject and object position and the φ corresponding to ΣP , which is headed by the verb.⁷ This prosodic structure, (V((S)(O))), is represented in tree form in (12)b:

⁷ Note that I assume that both lexical and functional projections must be “matched” by φ , in contrast to the proposal of Selkirk and Shen (1990), Selkirk (1995), Truckenbrodt (1995, 1999), and others. This topic will be discussed in chapter 5.

(12) a. Syntactic Representation b. Recursive Prosodic Representation



As seen in the following tableau, the structure in (12)b is produced by MATCH-PHRASE when it dominates NONREC:⁸

(13) OT tableau showing how Match Theory prefers the isomorphic candidate

${}_{\Sigma P}[V_{TP}[[DP_1][DP_2]]]$	MATCH-PHRASE	NONREC
a. (V DP ₁ DP ₂)	TP! DP ₁ DP ₂	
b. (V) (DP ₁) (DP ₂)	ΣP! TP!	
c. (V (DP ₁) (DP ₂))	TP!	**
d. \varnothing (V ((DP ₁) (DP ₂)))		***

In contrast, even the assumption that all of ALIGN-L(XP, φ), ALIGN-R(XP, φ), and WRAP-XP dominate NONREC will not succeed in choosing candidate (d) of the above tableau as optimal. As shown in the tableau in (14), candidate (d) is harmonically bounded by candidate (c):

⁸ For illustrative purposes, I assume the existence of the constraint NONREC. However, it is not clear whether its existence is necessary under the assumptions of Match Theory, and it will not play a (further) role in the analysis of Irish in this dissertation.

(14) OT tableau showing how the isomorphic candidate is harmonically bounded by (c)

${}_{\text{sp}}[V_{\text{TP}}[[DP_1] [DP_2]]]$	ALIGN-R(XP, φ)	WRAP-XP	ALIGN-L(XP, φ)	NONREC
a. (V DP ₁ DP ₂)	DP ₁ !		TP! DP ₁ DP ₂	
b. (V) (DP ₁) (DP ₂)		ΣP! TP		
c. \curvearrowright (V (DP ₁) (DP ₂))				**
d. (V ((DP ₁) (DP ₂)))				***

Candidate (d) incurs one more violation of NONREC as compared to candidate (c) because, in addition to parsing each DP as its own φ , it shows an additional grouping of DP₁ and DP₂, which in the Match Theory account is motivated by the TP constituent in the syntax. However, candidates (c) and (d) both perfectly satisfy all of the higher-ranked constraints because the TP constituent, while a distinct constituent in the syntax, shares both its left and right boundaries with the left and right boundaries of other syntactic phrases, namely the left boundary of DP₁ and the right boundary of DP₂. In consequence, there is no pressure from any of the constraints included in the tableau in (14) to parse a prosodic constituent that would correspond to the syntactic constituent TP present in the input.⁹ In other words, the ALIGN-WRAP-NONREC theory as proposed by Truckenbrodt makes typological predictions that are inconsistent with the empirical findings for CI that will be discussed in this dissertation.

In [chapter 3], I will discuss empirical data from the distribution of pitch accents in CI that I argue requires the prosodic structure as in candidate (d) of (13) and (14), and, as a result, provide direct evidence in favour of Match Theory in contrast to edge-based approaches to prosodic structure assignment. The next section is devoted to

⁹ Note that in Truckenbrodt's (1999) proposal, TP would not count as a constituent because of the added assumption that functional projections do not count in the evaluation of syntax-prosody interface constraints. However, as illustrated in the above tableau, the ALIGN/WRAP framework does not predict the existence of a prosodic constituent corresponding to TP even without the assumption that functional projections are invisible.

refining the characterization of the MATCH-PHRASE constraint that will be used throughout this dissertation.

1.3.1.4 MATCH-PHRASE

While Match Theory, as proposed in Selkirk (2009b, 2011), encompasses families of both syntax-prosody and prosody-syntax correspondence constraints, the discussion in this dissertation will primarily be concerned with the formalization of just one of the syntax-prosody MATCH constraints, MATCH-PHRASE. Throughout the thesis, I will be concerned with the relation between syntactic phrases and φ , as established by this constraint. While a full picture of the syntax-prosody interface and of the larger prosodic system of Conamara Irish would require reference both to the other syntax-prosody MATCH constraints (MATCH-WORD and MATCH-CLAUSE) and the prosody-syntax MATCH constraints (MATCH- ω , MATCH- φ , and MATCH- ι), we will see that MATCH-PHRASE has effects that are vital to developing an understanding of the sentence prosody of the language, and is worthy of the detailed discussion that will form the core of this dissertation. In this section, I set up the discussion that will follow in the chapters to come by proposing a formal definition of MATCH-PHRASE that will be used throughout the thesis.

So far in this section, I have presented Match Theory as a theory of the syntax-prosody interface that is distinct from its predecessors in edge-based theory, where both edge parameters and violable constraints have been used to characterize the correspondence between syntax and prosody (Selkirk 1986, 1995; Chen 1987; Selkirk & Shen 1990; Truckenbrodt 1995, 1999). As discussed above, Match Theory differs from these proposals primarily because recursive prosodic structure is proposed to be

the unmarked, rather than the marked, state: MATCH constraints call for a one-to-one correspondence between syntactic and prosodic constituents and, as a result, prosodic structure is predicted to show recursivity. Even though MATCH constraints are assumed to be violable, as under an OT framework, prosodic structure is predicted show a certain amount of recursivity provided that markedness constraints that specifically disfavour recursive prosodic structure (such as NONRECURSIVITY) are ranked below the MATCH constraints.¹⁰ In contrast, even those of the edge-based proposals that assume violable OT constraints (Selkirk 1995; Truckenbrodt 1995, 1999) predict that recursive prosodic structure will only be produced under certain constraint rankings, and that this recursive structure will be as minimal as possible.

However, the schematic, informal characterization of the MATCH constraints as given in (2) and (3) are not sufficient as a means of evaluating the degree of correspondence between syntactic and prosodic constituents. In section 1.3.1.2, it was observed that the MATCH constraints might be analysed as the conjunction of the relevant ALIGN-L and ALIGN-R constraints. This intuition is expressed in the formulation offered in Selkirk (2011: 17) for the general schema for the syntax-prosody MATCH constraints as follows:

¹⁰ One question that arises is whether or not there continues to be a need for a non-recursivity constraint if MATCH constraints are part of the grammar, and whether there is in fact empirical evidence that prosodic structure in some languages is non-recursive. Given the reanalysis of prosodic structure in several languages in Selkirk (2011) as being consistent with the recursive structure analysis predicted by Match Theory, it is possible that there is no pressure for languages to prefer non-recursive prosodic structure over recursive prosodic structure in the way stipulated by a NONRECURSIVITY constraint. However, for the purposes of this dissertation, I will not investigate this question further at this time and remain neutral as to whether or not this constraint is necessary.

(15) $\text{MATCH}(\alpha, \pi)$ (Selkirk 2011)

The left and right edges of a constituent of type α in the input syntactic representation must correspond to the left and right edges of a constituent of type π in the output phonological representation.

The formalization of MATCH-PHRASE based on the schema would therefore be as in

(16):

(16) $\text{MATCH-PHRASE}(\text{MATCH}(\text{XP}, \varphi))$ (Selkirk 2011)

The left and right edges of a constituent of type XP in the input syntactic representation must correspond to the left and right edges of a constituent of type φ in the output phonological representation.

However, as will be discussed in the next section, this definition will not prove to be sufficient to provide the necessary characterization of this correspondence relation as evidenced from the sentence prosody of CI.

1.3.2 Formalizing MATCH-PHRASE

1.3.2.1 Motivation for Redefining MATCH-PHRASE

In this section, I will discuss in further detail the formal definition and evaluation of the constraint MATCH-PHRASE . I propose to redefine MATCH-PHRASE in such a way as to formally define the notion of “edge”. Instead of referring to “edge correspondence”, as in the Selkirk (2011) definition given above, I propose to define MATCH-PHRASE by instead evaluating correspondence between sets of terminal nodes dominated by syntactic phrases.

The reasons for this revision are both formal and empirical. Formally, the definition that will be proposed here defines more clearly what is meant by the term “edge correspondence”. While in most cases the definition of MATCH-PHRASE proposed here and that given Selkirk (2011) make the same predictions, the new definition

improves on the previous one by providing a formal mechanism for evaluating correspondence between constituents. In many ways, this discussion follows in the spirit of Truckenbrodt's (1995: 141-144) proposed revision to how edge alignment is defined, where it is proposed that edge alignment refer to the correspondence of terminal strings rather than edges. He argues that the notion of "edge alignment", as used by McCarthy and Prince (1993), does not adequately capture the notion that it should be possible to determine whether the edges of two constituents align without requiring a "special symbol" to stand in for phrase edges in the terminal string. While I will not discuss his proposal in detail, the definition proposed here is motivated by many of the same formal requirements: in order to evaluate MATCH-PHRASE, and capture its desired effects, it is necessary to have a formal mechanism for evaluating exactly what is meant by edge correspondence.

Empirically, the data examined in this dissertation also show that the definition of MATCH-PHRASE given above is not sufficient to account for the range of patterns found in CI. In some cases, particularly in situations where MATCH-PHRASE is violated under pressure from other constraints, the definition given above can be shown to make incorrect predictions. These predictions will be discussed abstractly later in this section, with discussion of particular examples in CI left to later chapters (particularly chapter 5).

1.3.2.2 Redefining MATCH-PHRASE

Instead of defining MATCH-PHRASE in terms of edge correspondence, I propose instead that the constraint be defined in terms of correspondence between sets of terminal nodes dominated by syntactic nodes and their phonological exponents, which

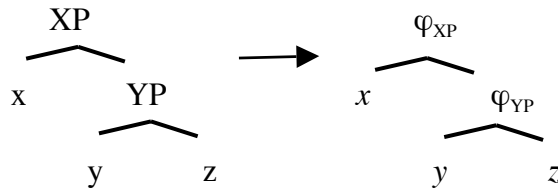
are dominated by prosodic nodes. In syntactic theory, terminal nodes are understood to be the labelled vocabulary items that do not themselves stand in a dominance relation with any other node: in simple terms, these correspond to the words in the tree if we ignore word-internal morphosyntactic structure. These terminal nodes are dominated by non-terminal syntactic nodes, which correspond to the syntactic categories in tree structure. Because MATCH-PHRASE is concerned with preserving syntactic constituency in the prosodic structure, it is necessary to refer to the relation of *exhaustive dominance*, which I define as follows:

(17) Exhaustive dominance:

A syntactic node α *exhaustively dominates* a set of terminal nodes β iff α dominates all and only the terminal nodes in β .

For example, consider a hypothetical syntax-prosody relation, as follows:

(18) Hypothetical syntax-prosody mapping by MATCH-PHRASE



In the syntactic structure, the syntactic node XP exhaustively dominates the set of terminal nodes $\{x, y, z\}$ and YP exhaustively dominates $\{y, z\}$. In the proposed corresponding prosodic representation, there are two φ constituents that exhaustively dominate the corresponding phonological exponents of these sets of terminal nodes: φ_{XP} exhaustively dominates $\{x, y, z\}$ and φ_{YP} exhaustively dominates $\{y, z\}$. In other words, there is a perfect match between the sets of terminal nodes exhaustively dominated by syntactic nodes in the syntactic representation, on the one hand, and the sets of the

exponents of these terminal nodes dominated by φ s in the phonological representation, on the other.

This relation between sets of terminal nodes in the syntactic and prosodic representation forms the basis of the proposed formulation of the MATCH-PHRASE constraint, which is defined as follows:

(19)MATCH-PHRASE_T: Suppose there is a syntactic phrase (XP) in the syntactic representation that exhaustively dominates a set of one or more terminal nodes α . Assign one violation mark if there is no phonological phrase (φ) in the phonological representation that exhaustively dominates all and only the phonological exponents of the terminal nodes in α .

To distinguish this definition from the one proposed in Selkirk (2011), I include the subscript _T for ‘terminal node’, as in MATCH-PHRASE_T. For the remainder of the discussion in this section, I will refer to the constraint as MATCH-PHRASE_T, but I refer to it simply as MATCH-PHRASE elsewhere in this dissertation, even though I continue to assume the definition in (19).

Formally, this definition of MATCH-PHRASE improves on the definition provided in Selkirk (2011) by providing a formal definition of the notion of “edge correspondence”. Like Truckenbrodt’s (1995: 141-144) revision to edge alignment, the definition of constituent correspondence as between sets of terminal nodes allows for a precise method of determining the position of constituent edges without requiring reference to the notion of “edge”. Under the current formalization, the notion of edge arises naturally as a consequence of how constituency is defined.

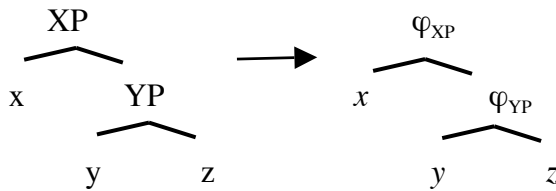
1.3.2.3 Empirical Predictions

In this section, I discuss, abstractly, the predictions of the revised definition of MATCH-PHRASE_T. I examine a number of hypothetical syntax-prosody correspondences,

both where MATCH-PHRASE is satisfied and where MATCH-PHRASE is violated. In each case, I show how MATCH-PHRASE_T is evaluated, under the definition proposed in (19). While the discussion in this section will be at an abstract level only, the situations discussed here will form the basis for the analysis of the patterns found in CI in subsequent chapters.

First, consider the situation presented in (20), a basic structure where a syntactic phrase YP, which dominates the terminal elements y and z , is itself dominated by the syntactic phrase XP, which dominates an additional terminal element x . The abstract syntactic and prosodic structures are as follows:

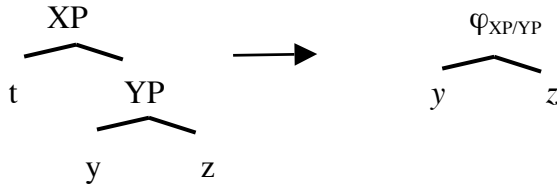
(20) Hypothetical syntax-prosody mapping by MATCH-PHRASE



Here, we see that in the prosodic structure, there is a distinct corresponding φ dominating each of the two distinct sets of terminal nodes dominated by YP and XP in the syntactic representation, $\{y, z\}$ and $\{x, y, z\}$, respectively. In so far as the definition of MATCH-PHRASE in (19) is concerned, the mapping in (20) satisfies the constraint.

Next, consider a syntactic structure where one or more of the syntactic terminal elements x , y , and z correspond to phonologically null elements in the phonological representation, such as, for example, when the element x in the representation in (21) is a trace rather than an element with a phonologically-overt exponent.

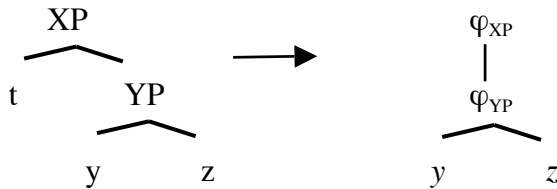
(21) Syntax-prosody mapping attested in CI



As formulated in (19), MATCH-PHRASE_T is consistent with the prosodic representation in (21), where a single φ dominates the set of terminal elements $\{y, z\}$, even though these are dominated by two different syntactic phrases in the syntactic representation. Because the constraint is defined in terms of sets of terminal nodes which have phonological exponents, both XP and YP will be satisfied by the presence of a φ that dominates the set of their phonological exponents: the only terminal element that distinguishes XP and YP is a trace, which has no phonological exponent.

MATCH-PHRASE_T is also satisfied by the mapping in (22), where there are two distinct φ which dominate $\{y, z\}$:

(22) Hypothetical syntax-prosody mapping by MATCH-PHRASE (redundant recursive structure)



Here, φ_{XP} and φ_{YP} are in a recursive relationship. As will be proposed in chapter 3, the tonal pitch accent L-H in CI appears only at the left edge of a recursive φ (i.e. one dominating another φ), and, as such, acts as an indicator for the presence of recursive structure in the prosodic representation. As will be discussed in that chapter, a syntactic structure as in (21) and (22) does not trigger the appearance of this pitch accent,

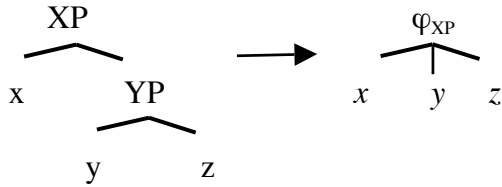
suggesting that the prosodic representation in (21), where a single φ stands in for congruent syntactic phrases, is the correct representation for this mapping in CI.

While the non-recursive representation appears to be the correct one for CI, it seems unnecessary to attempt to rule out the representation in (22) on the basis of correspondence. Instead, when compared to (21), it is sufficient to observe that (22) is inherently more complex in terms of its structure, and will be ruled out by economy principles, either as deriving by the basic principles of constraint interaction (Gouskova 2003) (like binarity constraints, as discussed chapter 4, section 4.2), or by the existence of a *STRUCTURE constraint like * φ .

The situation becomes more complicated when we consider situations in which MATCH-PHRASE is violated, rather than satisfied as in the above scenarios. Because MATCH constraints are assumed to be violable and in direct competition with other constraints at Spell-Out, it is possible that a situation may arise in which a constraint that outranks MATCH-PHRASE would result in a syntactic phrase that has no correspondent in the phonological representation.

First, consider a situation where every syntactic phrase dominates only phonologically overt terminal elements, but where one of the syntactic phrases is missing a corresponding φ . For example, this occurs in the mapping in (23), where a single φ dominates the set of terminal nodes $\{x, y, z\}$:

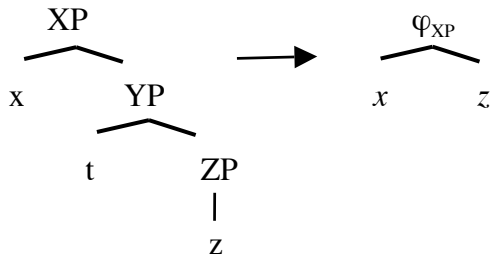
(23) Hypothetical syntax-prosody mapping



MATCH-PHRASE_T is violated by this mapping. In the syntactic representation, the phrases XP and YP exhaustively dominate distinct sets of terminal nodes, {x, y, z} and {y, z}, respectively, where each of the terminal nodes have phonologically-overt exponents. Because there is no φ in the phonological representation that exhaustively dominates the set of phonological exponents {y, z} (dominated by YP), MATCH-PHRASE_T is violated once.

Finally, consider a mapping in which YP dominates a trace and has as its complement another syntactic phrase, ZP, which dominates the terminal element z. In the phonological representation, however, x and z are dominated by a single φ :

(24) Hypothetical syntax-prosody mapping



In this case, MATCH-PHRASE_T will only be violated once, rather than twice (once each for YP and ZP). To see this, consider the following. In the syntactic representation, XP, YP, and ZP exhaustively dominate distinct sets of terminal nodes:

(25) Sets of terminal nodes dominated by syntactic phrases in (24)

- XP: {x, t, z}
- YP: {t, z}
- ZP: {z}

However, in the phonological representation, the number of distinct sets of the phonological exponents of those terminal nodes is different because the trace does not have a phonological exponent. In the prosodic representation, the sets of phonological exponents are as follows:

(26) Sets of phonological exponents of terminal nodes in (24)

XP: $\{x, z\}$
 YP/ZP: $\{z\}$

Crucially, this means that the prosodic representation in (24) is missing only a single φ , that which would dominate the phonological exponent of the terminal node z , as follows:

(27) φ constituents present in the prosodic representation in (24)

φ_{XP} : $\{x, z\}$
 Missing: $\varphi_{YP/ZP}$: $\{z\}$

As a result, MATCH-PHRASE_T is only violated once, because only the φ constituent that would exhaustively dominate z is non-existent.

MATCH-PHRASE_T and the Selkirk (2011) definition of MATCH-PHRASE make different predictions for the mapping in (24). Up to this point, MATCH-PHRASE_T and the Selkirk (2011) definition of MATCH-PHRASE make identical predictions for syntax-prosody mapping in the scenarios considered earlier in this section. However, in this particular case, the two definitions diverge in their evaluation.

MATCH-PHRASE , as defined in (16), should be violated twice: once by ZP, which has no corresponding φ , and once by YP, because it dominates the same set of phonologically-overt terminal elements. In chapters 4, 5, and 6 of this dissertation, I will present arguments from CI that provide evidence that syntactic phrases like YP that dominate the same set of phonologically-overt terminal elements as another syntactic

phrase do not count in the evaluation of MATCH-PHRASE. MATCH-PHRASE_T, however, predicts that there will be only a single violation of MATCH-PHRASE in scenarios like that in (24). In this case, therefore, MATCH-PHRASE_T appears to make a correct empirical prediction.

The motivation behind this formulation of the constraint as MATCH-PHRASE_T (henceforth simply MATCH-PHRASE) will become clear as the empirical data from CI is presented, discussed, and analyzed using Match Theory. I will show that evidence from the distribution of pitch accents supports the empirical predictions of MATCH-PHRASE_T, as discussed above. In terms of typology, the decision to formulate MATCH-PHRASE as above makes predictions that are consistent with the behaviour observed in CI. It is an empirical question whether or not this definition of MATCH-PHRASE will hold for other languages, one that will be left to future research.

1.3.3 Recursion-based Prosodic Subcategories

In recent work, Ito and Mester (2006, 2010, to appear) have proposed an alternative to prosodic domains theory (Selkirk 1986) that capitalizes on the possibility of assuming that prosodic structure may be recursive. Under prosodic domains theory, phonological processes are thought to apply within prosodically-defined domains, and may apply within any of the distinct domains denoted by the distinct prosodic categories (e.g. ι , φ , ω). Under Ito and Mester's proposal, in addition to targeting distinct prosodic categories, phonetic and phonological processes may target the subcategories created by recursive prosodic structure, such as the maximal and minimal layer of a recursive prosodic category. They argue that this assumption allows for a more elegant theory of prosodic domains, in which phonological processes that were

once thought to be evidence for distinct prosodic categories may be analysed as evidence for a nested structure drawing from a small set of distinct categories.

For example, Ito and Mester (to appear) reanalyze the proposal that Japanese distinguishes two distinct categories between the ω and ι levels, the Major Phrase (MaP) and the Minor Phrase (MiP) (also termed the intermediate and accentual phrases, respectively); see, among others, McCawley (1968), Selkirk and Tateishi (1988), Shinya et al. (2004). As shown in (28), the evidence for the MiP/MaP distinction comes from the presence of phonetic and phonological processes that are either delimited by the relevant boundaries or occur at one edge:

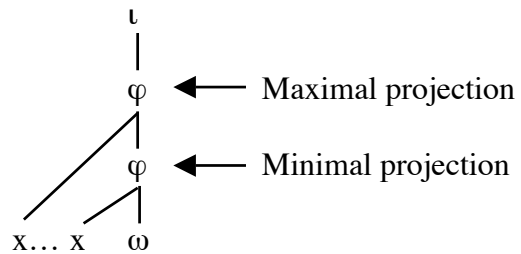
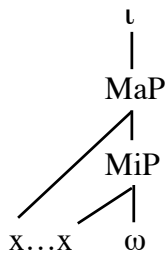
(28) Evidence for the MiP/MaP distinction in Japanese

- a. MiP: Domain of accent culminativity
- b. MiP: Domain of initial lowering (is observed at left edge)
- c. MaP: Domain of downstep

Ito and Mester argue that the evidence for the Major/Minor Phrase distinction, as diagnosed by the prosodic cues in (28), can be reanalysed as phonological processes that target the recursion-based subcategories of a recursive φ , φ_{Max} and φ_{Min} . This can be seen by comparing (29)a and (29)b:

(29) Reanalysis of MaP/MiP as maximal/minimal projections of recursive φ

- a. MaP/MiP distinction
- b. Maximal/minimal projections of recursive φ

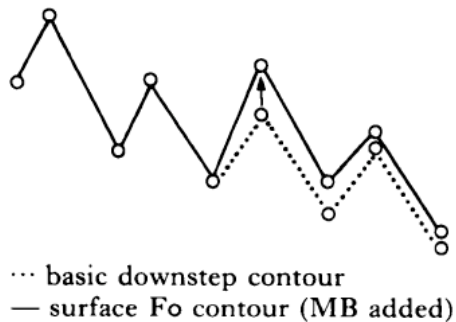


They propose that the two phonological processes that target MiPs, accent culminativity and initial lowering, can be reinterpreted as processes that target the minimal projection

φ_{Min} , while downstep can be reinterpreted to target the maximal projection φ_{Max} . They show that these facts of Japanese can be accurately captured with reference to the recursion-based subcategories of a single category φ .

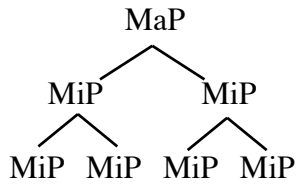
In addition, Ito and Mester (to appear) discuss Kubozono's (1989, 1992) boundary strength evidence for recursive MiP structure, and argue that the data can be better represented under the recursion-based prosodic subcategories theory. Kubozono (1989, 1992) provides evidence that sequences of four accented MiPs with the syntactic structure [[A B][C D]], are contained within one MaP (downstep occurs throughout), but that there is a pitch boost on the third element C, suggesting that the prosodic structure is not flat, [A B C D], as the SLH would predict. The following is a schematic illustration of the pitch boost found in MaPs with the internal hierarchical structure [[A B][C D]] (Kubozono 1989: 53):

(30) Pitch boost in sequences of four accented MiPs with the structure [[A B][C D]]



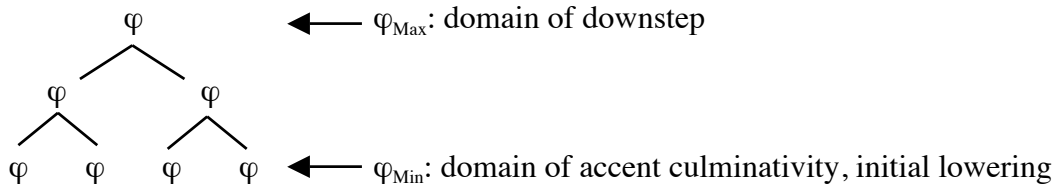
Kubozono argues that the pitch boost found in these structures can be taken as evidence that the four MiPs are organized hierarchically, as follows:

(31) Hierarchical organization of sequences of four accented MiPs [[A B][C D]]



Ito and Mester (to appear) argue that if MiPs and MaPs are replaced with a single category, φ , the relevant domains can still be determined based on the proposed maximal/minimal distinction: the minimal projection of φ is subject to the constraint on accent culminativity, while maximal projections are the domain of downstep (contrast with (28) above). The structure in (31) can therefore be reanalyzed assuming a single prosodic category, φ :

(32) Reinterpretation of (31) in terms of recursive φ



Finally, Ito and Mester propose that initial lowering (the presence of upward reset at the beginning of φ) would apply at the left edge of every φ , with the possibility that cumulative left edges might result in a greater degree of initial lowering when the left edges of multiple layers of φ align. Japanese thus exemplifies the three way distinction for domain-sensitive processes predicted by Ito and Mester's system: that with respect to a prosodic category, phonological processes may be sensitive to the category as a whole (initial lowering), or to the maximal or minimal subcategories (downstep and accent culminativity, respectively).

In addition to Kubozono's (1989, 1992) work on Japanese, evidence for phonetic gradience in boundary strength has also been used as arguments for recursion in prosodic domains in work on English and German (Ladd 1986, 1988; Wagner 2005, 2010; Féry & Truckenbrodt 2005; Féry & Schubö 2010; Schubö 2011). For example, Ladd (1988) looks at differences in the amount of pitch reset as determined by relative boundary strength by comparing the level of F0 peaks of pitch accents in sentences with contrasting coordinate structures, as in (33) below:

(33) Contrasting coordinate structures



Ladd (1988) specifically examines, in a series of three experiments, clausal coordinate structures, as in the examples below, where three clauses are coordinated as in the structures in (34):

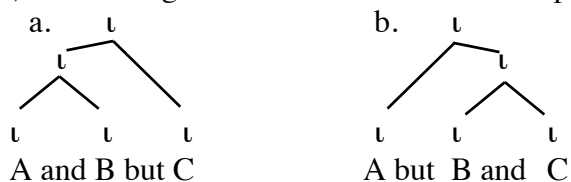
- (34) a. Ryan is a stronger campaigner, and Warren has more popular policies, but Allen has a lot more money.
 Structure: [[A and B] but C]
 b. Ryan is a stronger campaigner, but Warren has more popular policies, and Allen has a lot more money.
 Structure: [A but [B and C]]

Ladd found that there is indeed evidence that downstep is sensitive to the differences in the syntactic organization of the sentences in (34) and, additionally, that the amount of pitch reset appears to be sensitive to the relative strength of the prosodic boundaries. Specifically, Ladd proposes that the degree of pitch reset is higher following *stronger* boundaries, where relative boundary strength is related to the degree with which the clause is embedded in the sentence. Thus, the relative strength of the prosodic boundary separating the *but* clauses in the sentences with the structures in (33) are predicted to be

relatively stronger than the boundary separating the *and* clauses. In terms of pitch reset, Ladd (1988) observes that the F0 of the pitch accent following *but* is consistently higher than that following *and*, which he argues provides evidence that the prosodic boundaries of the two clauses differ in terms of their relative strength. Additional evidence for recursive prosodic domains in coordinate structures in English and German can be found in Wagner (2005), Féry and Truckenbrodt (2005), and Schübo (2011); see also Féry and Schübo (2010) for evidence of recursion in the prosodic structure of centre-embedded clauses in German.

This attention to relative boundary strength in coordinate and other structures can similarly be accounted for under the assumption that prosodic structure can be recursive. As Ito and Mester (to appear) propose for Japanese, Ladd’s observations about boundary strength in coordinate clauses may be accounted for under the assumption that intonational phrases (ι) may be recursive, as in the following structures:

(35) Contrasting coordinate structures: reinterpretation as recursive ι structures



As before, the relative strength of the boundaries separating prosodic constituents may be interpreted as correlating with the number of coinciding prosodic boundaries. In (35)a, there is a stronger boundary separating *B* and *C* than that separating *A* and *B* because *B* has two ι boundaries which coincide on its right edge, while *A* has only one ι boundary. Similarly, the reverse is true in (35)b: the relatively stronger boundary between *A* and *B* than between *B* and *C* may be attributed to the coincidence of the two ι boundaries at the left edge of *B*, while *C* has only one ι boundary.

In this dissertation, I will not be concerned with providing gradient phonetic evidence for recursion in prosodic structure of the type discussed above. Rather, the data presented in this dissertation provide evidence supporting Ito and Mester's proposal that the type of recursion seen in prosodic domains is indeed phonological in nature, and cannot be simply read off of the syntactic structure, as proposed in Wagner (2005, 2010). In chapter 3, I will argue that the distribution of pitch accents in Conamara Irish provides evidence in favour of Ito and Mester's proposal that is categorical in nature. More specifically, I argue that a certain pitch accent, the L-H rise, targets φ s that are recursive: namely, those φ that dominate another φ . As such, the presence of this pitch accent is indicative of the presence of recursion in prosodic structure, and suggests that recursive prosodic domains must be visible to the phonological component as well as the phonetics.

1.3.4 Contributions of this Dissertation

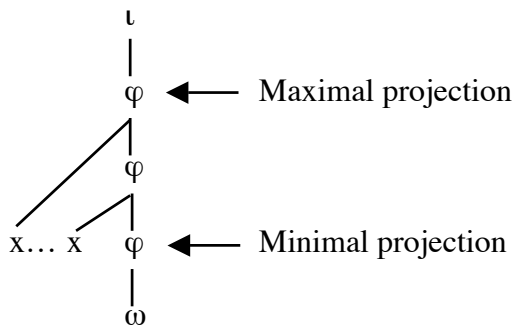
The theory of prosodic structure formation advocated in this dissertation incorporates elements of Match Theory (Selkirk 2009b, 2011) and the proposal made by Ito and Mester (2006, 2010, to appear) for the role of recursion-based prosodic subcategories. The main source of evidence for this theory will come from the phonological analysis of the pitch contours for sentences of Conamara Irish, which I will use to argue for the presence of two pitch accents found in declarative sentences, whose distribution is determined on the basis of prosodic structure. Specifically, I show that the distribution of these pitch accents provides direct evidence for the presence of recursion in prosodic structure, as grounded in syntactic structure following Match Theory: not only do the pitch accents appear to indicate the edges of the prosodic

category φ , one of these (an L-H rise) targets the left edge of only those φ which dominate another φ , or, in other words, those φ which are recursive. I argue that this provides categorical, non-gradient evidence for the presence of recursion in prosodic structure that is different from the gradient phonetic evidence for boundary strength discussed in previous work on recursive structures in prosody discussed in the previous section.

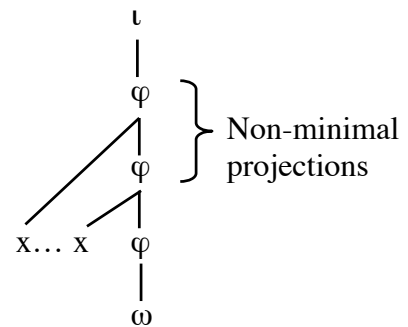
The distribution of the L-H pitch accent provides evidence in favour of the Ito and Mester proposal that recursion-based prosodic subcategories are part of the phonological representation of prosodic structure. In chapter 3, I argue that in addition to the maximal and minimal instantiations of prosodic subcategories, phonological processes may also have access to the class of *non-minimal* subcategories. Non-minimal prosodic subcategories are those which dominate another prosodic category of the same type; in other words, this includes all of the prosodic subcategories in a recursive structure except those which are minimal:

(36) Natural classes of recursion-based prosodic subcategories

a. Maximal/minimal projections of φ



b. Non-minimal projections of φ



This proposal, coupled with the assumptions of Match Theory, suggests a picture of prosodic structure where recursive prosodic domains are created under pressure to be isomorphic with syntactic constituents, and where this recursive structure is available to

the phonological component for the implementation of domain-sensitive phonological processes, including information about the domains created by recursion-based prosodic subcategories. In the case of CI, this information is relevant for the distribution of pitch accents.

Another aspect of the proposal for prosodic structure formation made in this dissertation regards the theory of syntactic grounding for prosodic structure made in Match Theory. Match Theory, as in Selkirk (2009b, 2011), proposes that a family of MATCH constraints govern syntax-prosody mapping by evaluating correspondence relations between syntactic constituents of various types (clause, phrase, word) and prosodic constituents (ι , φ , ω). Selkirk (2009b, 2011) assumes that MATCH constraints may apply to any type of syntactic constituent. For example, MATCH-PHRASE is sensitive to any kind of syntactic phrase. Selkirk does, however, leave open the possibility that there may be additional conditions placed on the evaluation of the MATCH constraints.

This question addresses previous proposals that prosodic structure formation is sensitive only to the projections of lexical categories, and that the projections of functional categories are invisible to syntax-prosody mapping principles. This was proposed as an extension of the edge-based alignment theories, as in Selkirk (1995) and Truckenbrodt (1995, 1999), as well as proposals within earlier frameworks (Selkirk 1984, 1986; Chen 1987; Hale & Selkirk 1987; Selkirk & Shen 1990). In this dissertation, I argue on the basis of data from CI that MATCH constraints treat lexical and functional projections equally, and show that functional projections are relevant in the creation of recursive prosodic domains. However, it is not the case that *all* syntactic

phrases are relevant in the formation of prosodic structure. Instead, I argue that what is relevant is whether or not the constituents created in the syntactic structure create phonologically distinct constituents. For example, the nesting of syntactic constituents is only retained in the prosodic representation if the constituents dominate distinct sets of phonological material.

The final piece of the theory of prosodic structure formation proposed in this dissertation is that constraints on the well-formedness of prosodic structures may overrule MATCH constraints and result in the creation of non-isomorphic structures. The role of prosodic constraints in prosodic structure formation is an integral part of both the Match Theory proposal in Selkirk (2009b, 2011) and in the theory of recursion-based prosodic subcategories of Ito and Mester, where it is assumed that recursive prosodic structure may be created under pressure to satisfy prosodic markedness constraints, as under the OT-based alignment theories of Selkirk (1995) and Truckenbrodt (1995, 1999). I will argue that this assumption is necessary to explain the presence non-isomorphic structures in CI, and that these departures from syntax-prosody correspondence (as governed by MATCH constraints) can be attributed to the influence of prosodic markedness constraints.

1.4 Language Background and Methodology

1.4.1 Dialect

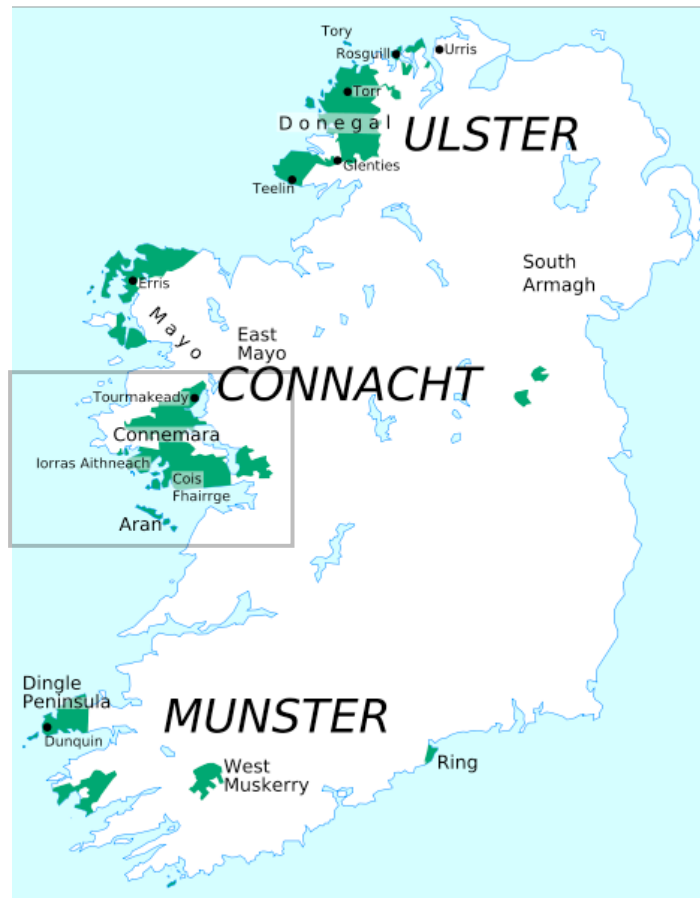
Modern Irish is an endangered language, now spoken primarily in rural communities in western Ireland in what is known as the *Gaeltacht*. *Gaeltacht* areas are those areas where Irish is still spoken as a community languages and which have been

officially recognized by the Irish government. The largest *Gaeltacht* in terms of both area and population is located in Galway county in the Connemara region; other *Gaeltacht* areas are found in the counties of Donegal, Mayo, Kerry, Cork, Waterford and Meath. Irish is officially recognized as one of the official languages of Ireland, and is widely spoken as a second language in Ireland. According to a 2006 census, 1.66 million people in Ireland have some knowledge of Irish.¹¹

Modern Irish is normally described as having three main dialects: Connacht (spoken in Galway and Mayo counties), Munster (spoken in the southern counties of Kerry and Cork), and Ulster (spoken in Donegal county). Historically, a fourth dialect, Leinster, was spoken in eastern Ireland but no longer has any native speakers. The map in (37) shows the locations of the official *Gaeltacht* areas, organized by dialect. The area enclosed in the square demarcates the Connemara *Gaeltacht*, which is the focus of this dissertation:

¹¹ Information cited from Údarás na *Gaeltachta*, accessed on October 24, 2011 at: http://www.udaras.ie/index.php/corporate_menu/an_ghaeltacht/4939

(37) Map showing the locations of officially recognized Gaeltacht areas in Ireland¹²



Dialect differences can be found in all areas of the grammar. Though dialects are generally mutually intelligible, there is a dialect continuum with the effect that northern and southern dialects are more highly differentiated (Ó Siadhail 1989: 2-5). The *Caighdeán Oifigiúil*, an attempt at establishing a standardized grammar for Irish based on the three main dialects, was first established in the 1950s. It is taught in schools, though under the influence of local dialects, and is used for official purposes.¹³

¹² Map available from:
http://en.wikipedia.org/wiki/File:Gaeltachtaí_Le_hainmneacha2.svg, accessed October 23, 2011.

¹³ See the website of the Houses of the Oireachtas (national parliament) of Ireland, <http://www.oireachtas.ie/parliament/>, particularly

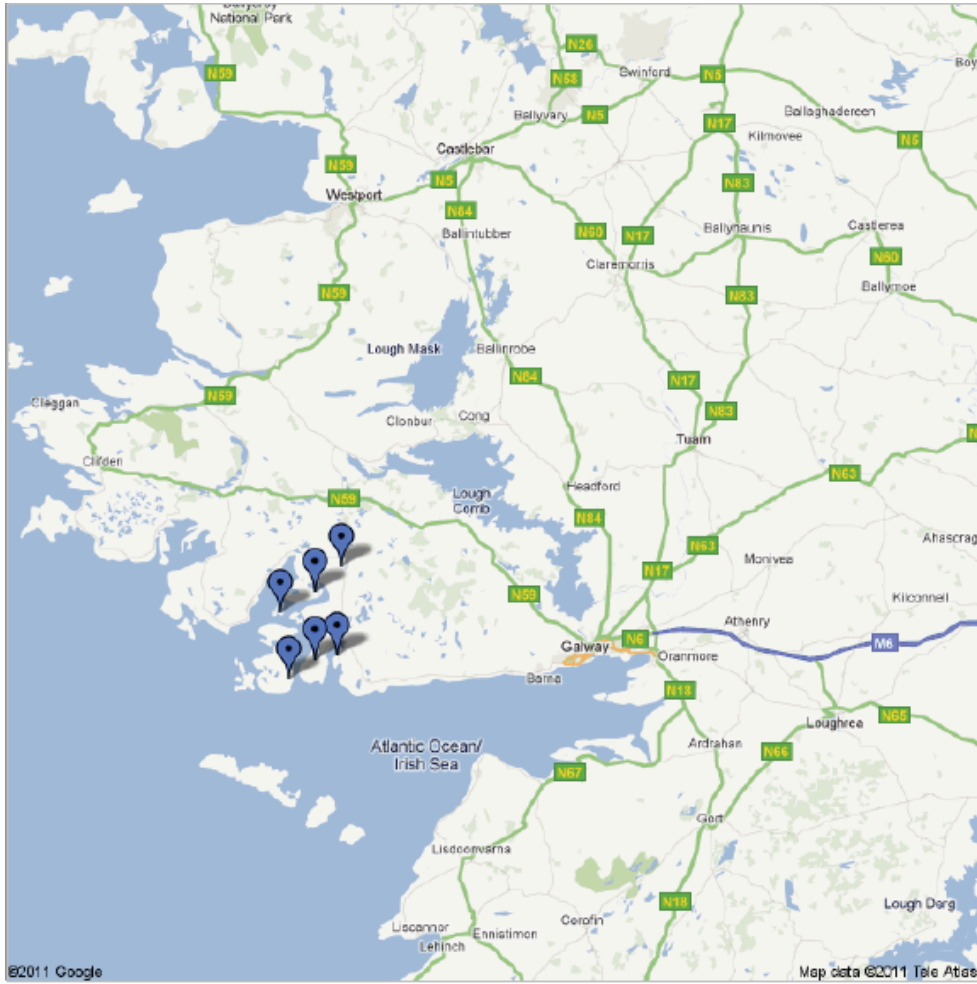
The data discussed in this dissertation is based largely on the speech of six speakers of the Connacht dialect, specifically, the Connemara (Conamara) dialect.¹⁴ Although not all of my speakers currently live in the Connemara Gaeltacht, they each grew up in the Gaeltacht and have at least one native speaker parent who is also a speaker from the Connemara Gaeltacht. The speakers used in this dissertation are primarily from areas just west of the area designated *Cois Fhairrge* by Tomás de Bhaldraithe, which he defines as “that area which stretches along the coast [west of Galway] from about Bearna [English: Barna], itself a few miles west of Galway city, to somewhere about Casla [English: Costelloe]” (de Bhaldraithe 1945: ix). The following map illustrates the hometowns for the eight native speakers whose speech was used in this thesis relative to Galway city. The location of these areas is marked by a square in the map in (37).¹⁵

<http://www.oireachtas.ie/viewdoc.asp?fn=/documents/a-misc/Rannog1.htm> for discussion of the history of the Caighdeán Oifigiúil, and <http://www.oireachtas.ie/viewdoc.asp?fn=/documents/a-misc/Caighdean20091105.pdf> for the grammar itself (in Irish). Accessed October 25, 2011.

¹⁴ Data from two additional speakers, MF and FF, are consulted occasionally but for the most part are not used.

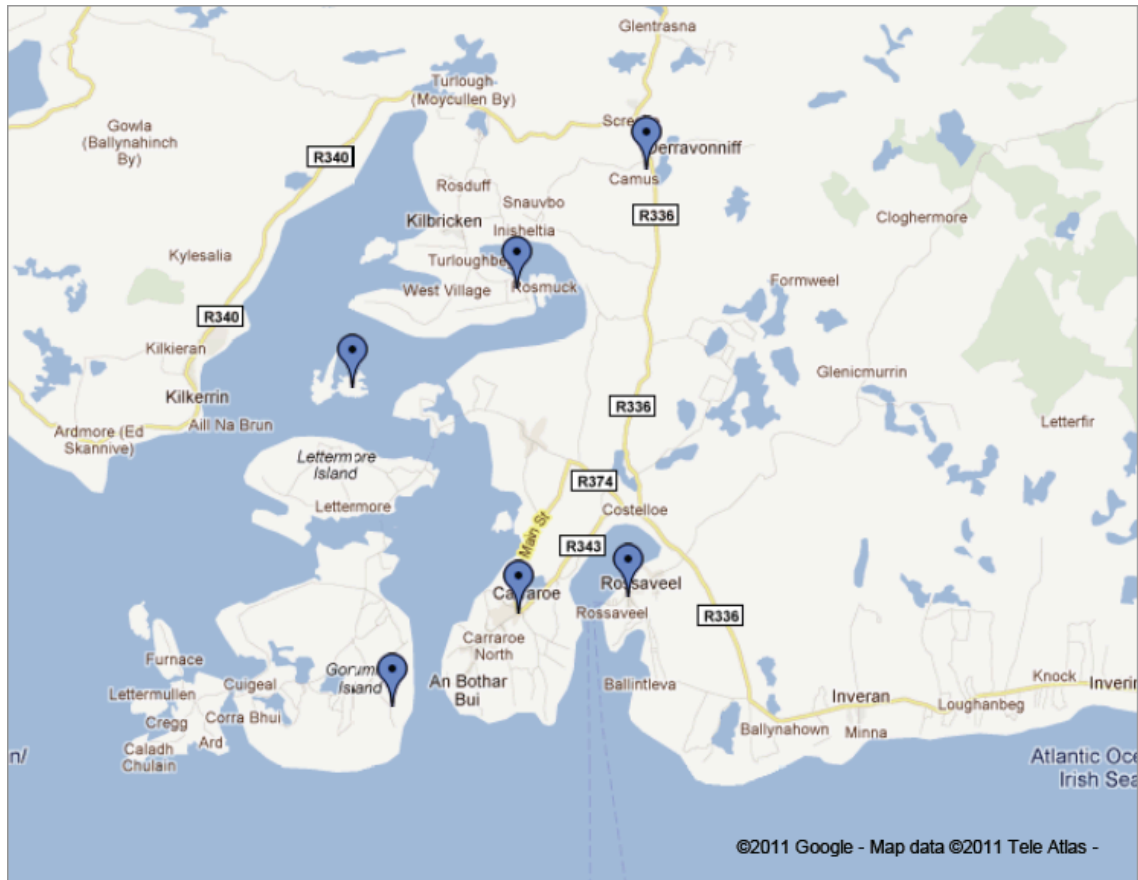
¹⁵ This map was created using Google Maps at maps.google.com. The map may also be viewed online at <http://g.co/maps/qadfs> as of October 23, 2011.

(38) Map marking the hometowns of the native speakers who contributed to this dissertation



The map in (39) also shows the speaker hometowns, zoomed in to show specific placenames.

(39) Zoomed-in map showing hometowns of speakers



Each of these towns is located within the area designated as the Connemara Gaeltacht.

1.4.2 Subjects

Data from eight native speakers of Connemara Irish are discussed in this thesis. All of the data were collected between March, 2009 and September, 2010. Recordings for one speaker, MN, were made in Boston, Massachusetts and reflect several recording sessions between March, 2009 and July, 2010. Two speakers, YF and MF, were recorded in July and August, 2009, in Carraroe, Ireland. Seven speakers, including YF but not MF, were recorded in September, 2010 in various locations in Ireland, including Dublin, Maynooth, Galway and Carraroe.

With the exception of MN, all speakers are female. Speakers range in age from 23 to 59. Each speaker uses Irish on a regular basis, in conjunction with work or community life, or when speaking to friends and family. Of the eight speakers, four continue to live and work in the Connemara Gaeltacht. All, with the exception of MN, use Irish daily in their workplace.

With the exception of YF, all speakers were raised by two native speaker parents and resided in the Connemara Gaeltacht for crucial parts of their childhood. YF has one non-native speaker parent, but was raised in an Irish household and community. All speakers are fully bilingual with English, as is now the case with virtually all native Irish speakers.

The following table shows the hometown, current town, age (at time of recording) and sex of the participants; town names may be cross-referenced with the map in (39):

(40) Personal data for speakers

Speaker	Home town	Current town	Age	Sex
AN	An Cheathrú Rua (Cararroe), co. Galway	Dublin, Ireland	24	F
BL	Ros a Mhíl (Rossaveel), co. Galway	Béal an Daingin, co. Galway, Ireland	59	F
BM	An Trá Bháin, Oileán Gharumna (Trawbaun, Gorumna Island), co. Galway	Galway, Ireland	25	F
FF	Camus, co. Galway	Cararroe, Ireland	23	F
MF	Inis Treabhair (Inishtravin), co. Galway	Carraroe, Ireland	52	F
MN	Ros Muc (Rosmuck), co. Galway	Boston, MA	50	M
NC	Cinn Mhara (Kinvara), Camus, co. Galway	Cararroe, Ireland	45	F
YF	An Cheathrú Rua (Carraroe), co. Galway	Maynooth, Ireland	38	F

1.4.3 Data Collection

The data were recorded in various locations, including speaker homes and workplaces. All of the Carraroe sessions with the exception of MF were recorded in classrooms at the Acadamh na hOllscolaíochta Gaeilge. All recording was conducted indoors, but not in controlled environments. The sessions were recorded using an Edirol R-09HR recorder with an AKG C 1000S condenser microphone, and analysed using Praat (Boersma & Weenink 2010).

The data used in this dissertation are from pre-constructed sentences. In each case, the target sentence was embedded in a context consisting of a preceding sentence (or pre-posed word followed by a pause) and a following sentence. The context was intended to both establish a consistent pragmatic context, as well as avoid list-effects for the target sentence. The sentences were presented to speakers in a pseudo-random order on index cards; the same order was kept for all recording sessions in which the same materials were used. Speakers were asked to read the sentences in a “neutral” voice, as though reading the news. They were asked to provide two (or in some cases, three) clear recordings of each scenario with no obvious disfluencies, and were encouraged to repeat renditions that they were not satisfied with. Upon occasion, I would also prompt a repetition of the sentence. In most cases, with the exception of YF, repetitions of each sentence were provided in succession; in the interest of time, it was not possible to have speakers read through the target sentences more than once.

For the most part, the phonological content of the sentences (the choice of particular words) was held constant, a result both of time constraints and from a desire to have data that was readily comparable. This is particularly true of the recording

sessions that took place in Ireland in July/August, 2009, and September, 2010, where the same materials were recorded by several speakers. For example, a paradigm for VSO sentences is as follows, where the verb, subject, and object are held constant, with modifying adjectives for subject and object variably absent:

- (41) a. Cheannaigh múinteoirí banúla málaí bána.
 bought teachers lady-like.PL bags white.PL
 ‘Lady-like teachers bought white bags.’
- b. Cheannaigh múinteoirí banúla málaí.
 bought teachers lady-like.PL bags
 ‘Lady-like teachers bought bags.’
- c. Cheannaigh múinteoirí málaí bána.
 bought teachers bags white.PL
 ‘Teachers bought white bags.’
- d. Cheannaigh múinteoirí málaí.
 bought teachers bags
 ‘Teachers bought bags.’

In other structures, word choice was similarly held constant so as to allow comparison between pitch accents between different sentences.

1.5 Outline of the Dissertation

The dissertation is organized as follows. Chapter 2 concerns the phonetics and phonology of tone in CI. This chapter provides additional information regarding the phonetic implementation of the alignment of pitch accents and provides a discussion of the phonological properties of the pitch accents, as well as a brief discussion of an optional process of verb deaccenting that was observed in the data. In this chapter, I also discuss the extent to which the speakers produce tonal patterns that are comparable, and argue that the data presented in this dissertation is representative of a larger pattern.

Chapter 3 discusses the distribution of two tonal pitch accents, L-H and H-L, and proposes that their distribution is dependent on the presence of recursion in prosodic structure, as predicted by MATCH constraints and the theory of recursion-based prosodic subcategories. It is argued, through the examination of the prosodic contours of sentences with different syntactic structures, that prosodic structure in CI, in default cases at least, is isomorphic with syntactic structure. Also discussed is the behaviour of function words with respect to pitch accent distribution.

Chapter 4 investigates sentences in CI whose prosodic structure, unlike those discussed in chapter 3, is not isomorphic with syntactic structure. I argue that departures from the one-to-one correspondence predicted by the MATCH-PHRASE constraint can be accounted for under the assumption that prosodic markedness constraints can outrank and overrule MATCH-PHRASE. In particular, I propose that the departures from MATCH-PHRASE observed in CI can be attributed to a combination of constraints on prosodic binarity and a constraint STRONG-START that militates against prosodic constituents that begin with a relatively weak prosodic element. I also discuss variation in the prosodic structure of certain sentences, which I argue are best analyzed using a framework that assumes weighted rather than ranked constraints, like Harmonic Grammar (Legendre et al. 1990; Smolensky & Legendre 2006; Pater 2009b; Jesney 2011).

Chapter 5 discusses the behaviour of functional projections in the proposed system of syntax-prosody mapping. I propose that MATCH-PHRASE does not distinguish between lexical and functional projections, but rather is sensitive to whether or not a projection is distinct from one that it dominates. Also discussed is the role of variation, which builds on the analysis in chapter 4.

Chapter 6 discusses pronoun postposing, a process where weak object pronouns are optionally displaced to a position further right in the sentence than canonical object position. I propose that the positioning of the pronouns is dependent on prosodic structure, and argue that pronoun postposing can be accounted for under the system of prosodic structure formation developed in the earlier chapters of the dissertation.

CHAPTER 2

THE PHONETICS AND PHONOLOGY OF TONE IN CONAMARA IRISH

2.1 Introduction

This chapter deals with several issues in the phonetics and phonology of tone in CI. This discussion is included here in order to provide the reader with relevant background information about the tonal system of CI. As will be discussed in chapter 3, the distribution of two tonal pitch accents, L-H rises and H-L falls, provides crucial information about prosodic phrasing, and is used as evidence for prosodic phrasing throughout this dissertation. The overall goal of this chapter is to help the reader interpret and understand the pitch tracks and analyses in subsequent chapters.

Section 2.2 of this chapter provides a brief description of the tonal prosody of a basic sentence in CI, which will serve as an illustration of the types of tonal movements that will be used in the analysis of syntax-prosody mapping in the later chapters of the dissertation. The next two sections of this chapter provide the reader with information on the formal characterization and phonetic implementation of the two pitch accents that depict tonal prosody in CI, L-H (rises) and H-L (falls). Section 2.3 deals with the phonetic implementation of the two pitch accents, L-H and H-L, and provides a characterization of phonetic alignment as based on qualitative observations from my own data, as well as from the production experiments conducted by Dalton and Ní Chasaide (2005a, 2005b). Section 2.4 provides a characterization of the pitch accents in phonological terms by first discussing their status as epenthetic phrasal pitch accents (section 2.4.1) and then providing a sketch of a phonological constraint-based account of their distribution, though I do not offer a complete analysis.

Section 2.5 presents a series of observations involving the optional absence of the L-H pitch accent on clause-initial verbs. The goal of this section is to alert the reader to the presence of variation with respect to whether or not the accent is realized, and to argue that the absence of the L-H accent should not be taken as counter-evidence to the claim that will be made in chapter 3, namely, that the realization of the L-H pitch accent on the verb is structurally determined.

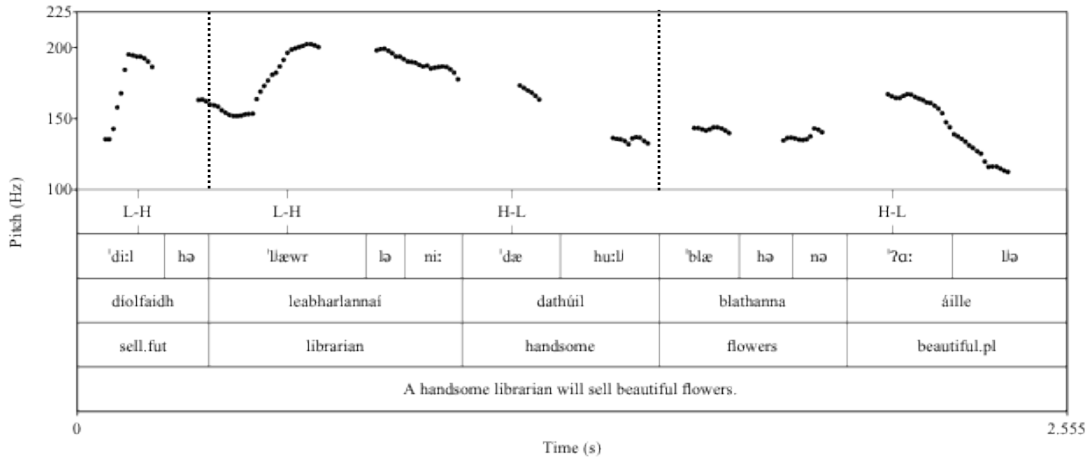
Section 2.6 discusses the question of the representativity of the pitch tracks chosen to illustrate specific patterns throughout the dissertation. First, section 2.6.1 argues that the six speakers whose data is used in this dissertation are comparable to one another by comparing the pitch tracks for utterances with identical prosodic structure. It is shown that while the phonetic implementation of pitch accents may vary slightly from speaker to speaker, each of the speakers considered here do produce the pattern that is described in this dissertation. Secondly, section 2.6.2 presents quantitative data regarding the realization and distribution of pitch accents. This section is intended to provide information about the range of variability between speakers by examining the presence and form of pitch accents in three structural locations: the noun in a branching non-final subject, the adjective in a branching non-final subject, and the leftmost noun in a branching final DP.

Section 2.7 concludes the chapter.

2.2 Pitch Accents in CI: Basic Patterns

Sentences in CI show a pattern of rises (L-H) and falls (H-L). The following pitch track shows the tonal pattern for a basic transitive VSO sentence, where S and O consist of noun-adjective sequences:

(1) Pitch track for a basic VSO sentence



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As indicated, rises (L-H pitch accents) appear on the verb (*díolfaidh* ‘sell.fut’) and the subject noun (*leabharlannaí* ‘librarian’), while falls (H-L pitch accents) appear on the subject’s modifying adjective (*dathúil* ‘handsome’) as well as on the object adjective (*áille* ‘beautiful.pl’). For each of the pitch accents, both tonal elements (L and H) of rises are generally realized within the first syllable of lexical words, with the L target of falls often extending to the next syllable. In CI, the first syllable generally carries main word stress with few exceptions¹⁶ (e.g. Ó Siadhail 1989; The Christian Brothers 2004). Further discussion of the phonetic implementation and phonological behaviour of these pitch accents is provided below.

The pitch level of subsequent unstressed and other tonally-unspecified syllables is interpolated from adjacent tones when the unspecified tone-bearing unit is surrounded by identical tones (H-H or L-L). For instance, the unstressed syllables in *leabharlannaí* ‘librarian’ are high because they occur between two H tones. In the case of syllables not

¹⁶ This stress pattern is found in all dialects except Munster (the southernmost dialect), which shows quantity-sensitivity in some contexts (e.g. O’Rahilly 1932 (1979); Blankenhorn 1981b; Green 1996; Green 1997).

associated with a pitch accent and which are surrounded by non-identical tones, the unspecified tone-bearing units tend to either show an interpolation between the two tones or an extended projection of the preceding tone. For instance, the lexical word *blathanna* ‘flowers’ in the above sentence, the only lexical word without either a rise or a fall, is realized at a relatively steady, low pitch level whose origin is the L tone from the fall on *dathúil* ‘handsome’. However, it is also fairly common for unaccented syllables to show an interpolation between non-identical tones; for a word like *blathanna* in the above sentence, situated between L and H tones, these syllables may instead exhibit a gradual rise. Both of these realizations are consistent with an analysis in which the syllables in this word are not associated with a pitch accent themselves, and receive their tonal specification from surrounding tones.

The rest of this section is concerned with a discussion of the phonetic properties of the two pitch accents, L-H and H-L. This discussion is intended to provide the necessary background to interpret the pitch tracks provided as illustration throughout the dissertation.

2.3 Phonetic Implementation of Pitch Accents

As will be discussed above, the tonal patterns of sentences in CI can be accounted for under the assumption that there are two distinct pitch accents, L-H and H-L. In this section, I describe the phonetic implementation of these pitch accents, focussing on details of alignment. The purpose of this section is to show that the phonetic alignment of the L and H tones in the two types of accent are consistent with the proposal that these are correctly characterized as pitch accents associated with the main-stressed syllables of prosodic words closest to the relevant domain boundary.

Moreover, this section aims to show that even though both accents show a preference to appear at domain edges, the assumption that the tonal sequences are pitch accents rather than boundary tones accounts for a range of facts concerning both pitch accents in CI sentences.

This section reports on observations regarding the phonetic implementation of L-H pitch accents. The discussion presented here builds on previous work which identifies CI as a non-lexical pitch accent language (Bondaruk 1994; Dalton & Ní Chasaide 2005a, 2005b), typical of intonational languages like English (Pierrehumbert 1980).

The particular analysis of the phonetic implementation and alignment properties of the pitch accents offered here builds on the results of a series of production experiments conducted by Dalton and Ní Chasaide (2005a, 2005b), which investigate the phonetic alignment of prenuclear and nuclear accents in CI and other dialects of Irish.¹⁷ Roughly speaking, the prenuclear accents identified by Dalton and Ní Chasaide correspond to the L-H accents discussed here, and the nuclear accents correspond to the H-L accents, with the primary difference in their analysis and the one presented in this dissertation being the characterization of their distribution rather than their phonetic properties. They conclude that CI prenuclear and nuclear accents are best analyzed as

¹⁷ Dalton and Ní Chasaide's (2005a, 2005b) use of the terms 'prenuclear' and 'nuclear' accents are not adopted here, because they do not account for the presence of the H-L accent in positions other than that associated with the nuclear accent of the sentence, nor do they account for the specific distribution of the L-H accent as being more complex than simply 'prenuclear'. Note that they assume a different system of intonational analysis, the IViE system (Grabe et al. 1998; Grabe et al. 2001), which was first used to model intonation in dialects of English. As a result, the L-H accent proposed here corresponds to their H*(+L) prenuclear accent, and the H-L accent to their H*+L nuclear accent.

pitch accents associated with stressed syllables. As will be shown in this section, this finding is supported by the qualitative observations reported here.

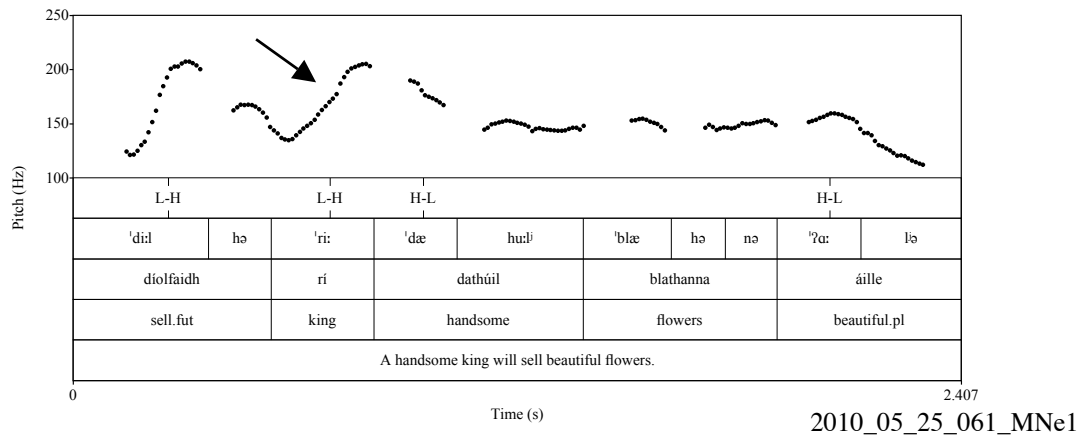
2.3.1 Alignment of L-H

The L-H accent, as will be proposed in chapter 3, is a tonal accent whose distribution is defined by its position in the prosodic structure of the sentence: it is associated with the leftmost word in non-minimal φ . Because word stress usually falls on the initial syllable in Irish, the beginning of the tonal rise associated with this accent will often coincide with the left-edge of the $\varphi_{\text{Non-min}}$. As reported in Dalton and Ní Chasaide (2005a, 2005b), the tonal rise is completed in the syllable within which it is located, with the pitch peak being realised at the end of the stressed syllable, often right on the transition between the stressed syllable and the following syllable. In words with more than one syllable, the rise is located in the stressed syllable, while the pitch of subsequent unstressed syllables is the result of interpolation between the H of the preceding L-H and the specification of the following pitch accent. While I have not conducted any formal experiment, it is reasonable to assume that the phonetic properties of words associated with an L-H pitch accent may be affected by the tonal material that follows, including other L-H or H-L pitch accents, as well as by the language-particular phonetic implementation of tonal sequences. For example, a string of several unstressed syllables located between two H tonal specifications may show a slight declination in pitch even though phonologically they should be realized with high tone.

Consider now the following pitch tracks for words associated with L-H accents containing varying numbers of syllables, as uttered by a single speaker. Each of the three nouns was extracted from the subject position of a VSO sentence, where the

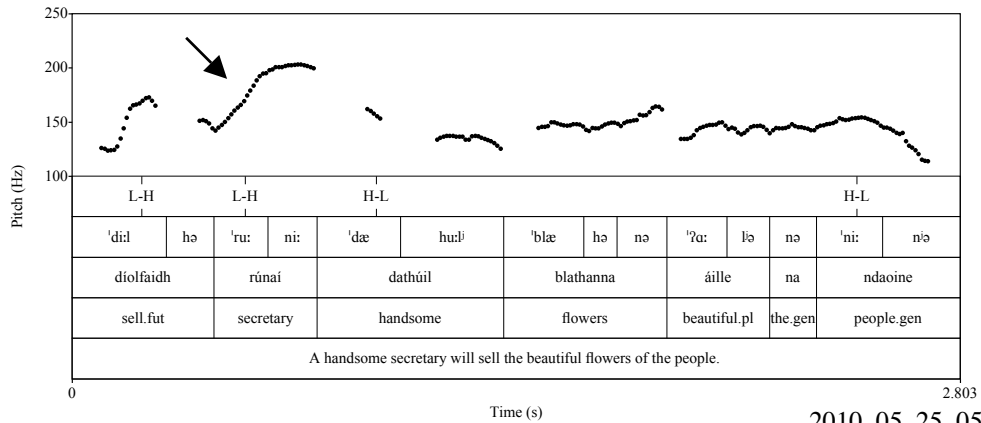
subject was followed by a modifying adjective carrying an H-L accent (creating the tonal sequence L-H H-L, where unstressed syllables are located between the two H tones). The pitch track in (2) shows the L-H rise in a single syllable word, [ri:] *rí* ‘king’. Here, there is a gradual rise in pitch beginning with the first segment [r] (a sonorant), and ending with a pitch peak at the end of the syllable:

(2) Pitch track for a single-syllable word with L-H accent



The pitch track in (3) shows the pitch track for a sentence containing [ru:ni:] *rúnaí* ‘secretary’, a two-syllable word. Here, the gradual rise in pitch completed within the first syllable [ru:] is similar to that observed in the single syllable word above, such that the peak is reached at the transition period between the vowel and the following consonant [n]. The two segments in the second syllable [ni:], in contrast, are relatively stable in pitch, in continuation of the peak pitch level attained at the end of the first syllable:

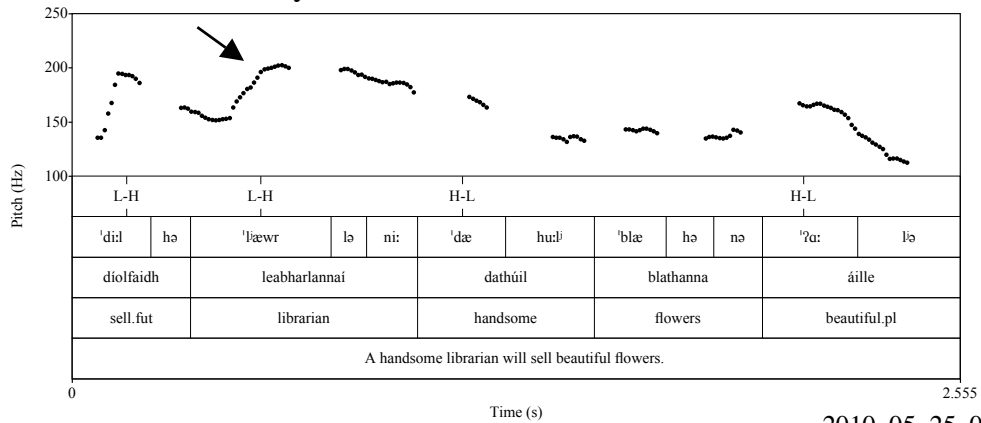
(3) Pitch track for a two-syllable word with L-H accent



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This pattern is again exemplified in (4) for the three-syllable word [l'ɪawr.lə.ni:] *leabharlannaí* 'librarian'. In this case, the rise is observed beginning at the end of the first segment [l'] and continues through to the end of the diphthong [aw]. There is a slight dip in pitch due to the influence of the segment [r]. The last two syllables remain at a relatively high pitch, with a slight declination of pitch observed in this stretch:

(4) Pitch track for a three-syllable word with L-H accent



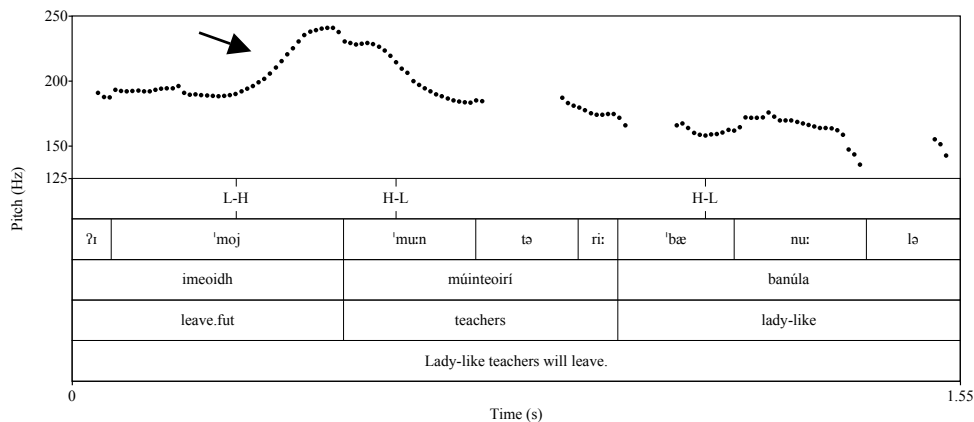
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This pattern appears to be consistent with the data collected for six speakers, with slight variation in the phonetic alignment of the pitch accent; for discussion of the representativity and consistency of the data presented here, see section 2.6. As discussed above, the details of the phonetic implementation may be dependent on a variety of contextual factors, including the presence of surrounding pitch accents and

the language-specific phonetic implementation of the pitch accents. However, I have not conducted an experiment to study these details, and I do not have sufficient data at present to comment on finer details than those presented here.

As noted above, because word stress is usually initial in Irish, the main-stressed syllable is often also the initial syllable of the $\varphi_{\text{Non-min}}$. However, two pieces of evidence support the assertion that the L-H accent is associated with the stressed syllable rather than simply the initial syllable. The first piece of evidence comes from the behaviour of exceptional words with non-initial stress. For example, as seen in the following pitch track, the verb [ʔɪ'moj] *imeoidh* ‘leave.FUT’¹⁸ shows a pitch rise which is located in the second syllable, rather than the first. The initial vowel [ɪ] is instead realised with a low, steady pitch:¹⁹

(5) Pitch track for a word with an L-H accent and non-initial stress



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Note that in this pitch track, the rise begins on the diphthong [oj] rather than on the preceding sonorant. It has been proposed that intervocalic consonants behave as codas following short vowels in CI (e.g. de Bhaldraithe 1945: 60). This would explain why

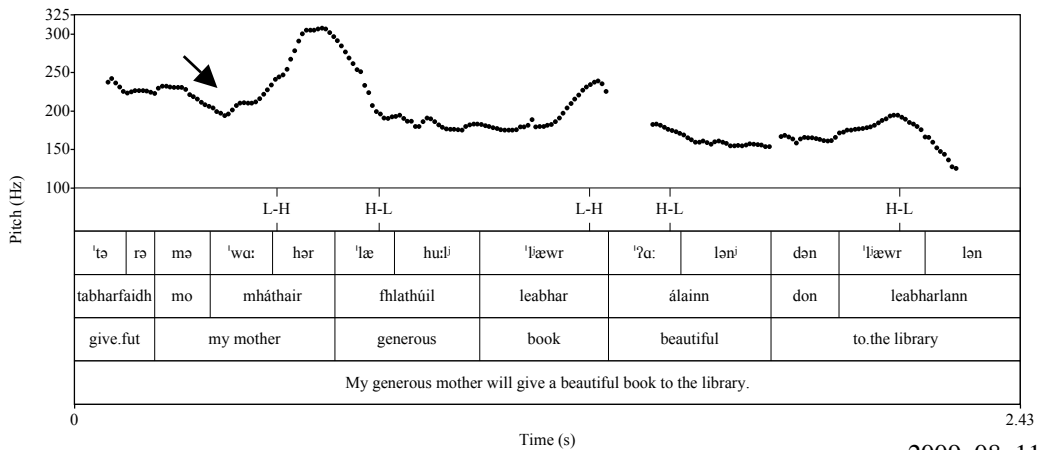
¹⁸ Stress is not necessarily non-initial in this word for all speakers, but was for this particular speaker.

¹⁹ This verb is taken from sentence-initial position.

the rise begins on the vowel rather than the onset in non-initial contexts, and would suggest that the alignment of the L-H accent is sensitive to syllable boundaries.

A similar pattern is observed when a word with an initial stressed syllable is preceded by one or more function words. As will be discussed in chapter 3, function words in Irish behave like unstressed syllables in lexical words. For example, when a noun preceded by a determiner is placed in a position where it would receive an L-H accent, the rise is observed on the first (stressed) syllable of the noun, rather than on the determiner, which is closer to the left edge of the phrase. This may be seen in the pitch track for [mə 'wɑ.hər] *mo mháthair* ‘my mother’, which is in subject position in a VSOX sentence, where the subject was modified by an adjective. In this case, the rise begins in the initial, stressed syllable of *mháthair* ‘mother’, while the possessive determiner *mo* ‘my’ has a relatively low, flat pitch level.

(6) Pitch track for noun with L-H accent preceded by function word



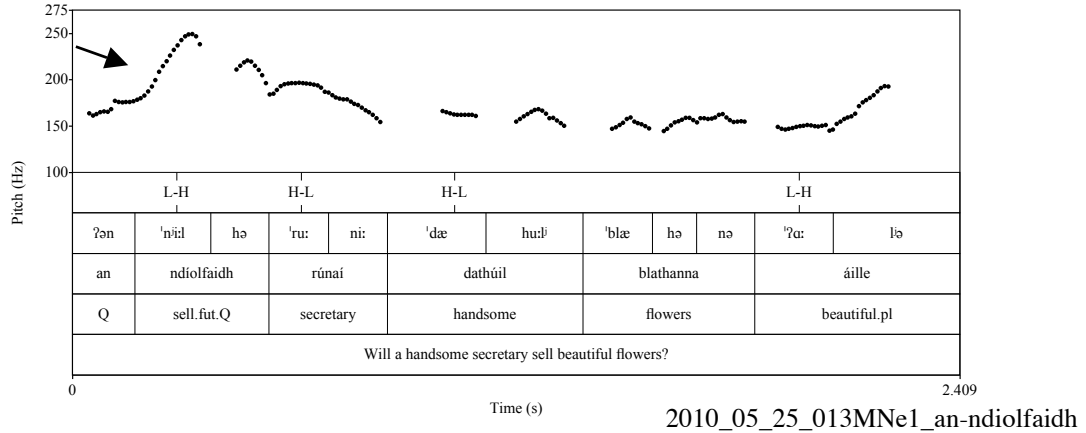
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This can also be seen in the following pitch track for a verb with initial stress preceded by the question particle *an*.²⁰ As above, the rise is observed in the initial syllable of the

²⁰ Yes/no questions in Irish are formed using sentence-initial question particles. For more information, see e.g. The Christian Brothers (2004).

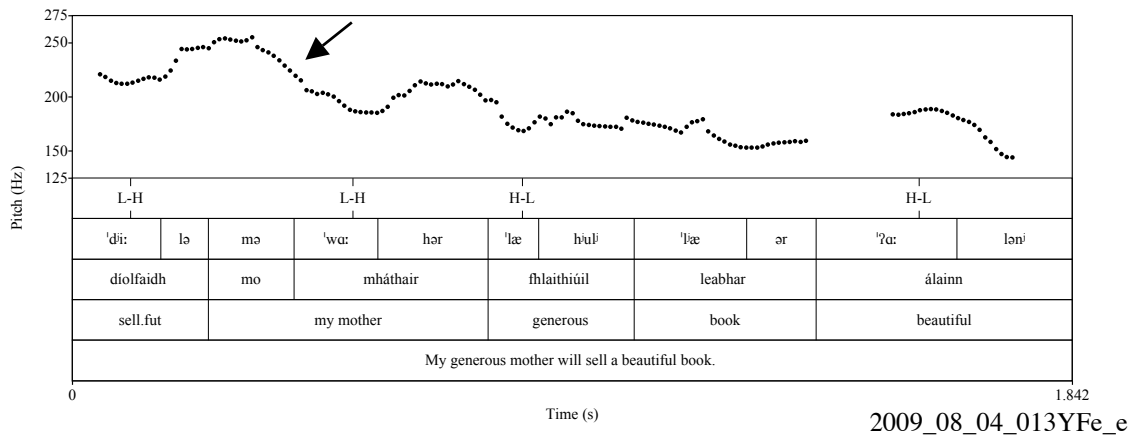
verb, while the preceding function word is realised with low, flat pitch. Note that the F0 dip in the verb is due to the segmental influence of [h]:

(7) Pitch track for a verb with an L-H accent preceded by a question particle



Based on the above discussion of function words, it would seem plausible to analyze the L tone of the L-H target as a left edge boundary tone, which associates with the leftmost syllable in $\varphi_{\text{Non-min}}$, whether or not it is stressed. However, when a function word preceding an L-H accent is itself preceded by an H tone (from a preceding L-H accent), the function word shows a gradual fall in pitch, as interpolated by the surrounding H and L tones. As expected if the L in the L-H accent is associated with stressed syllables (a “starred” tone), the L target is found at the beginning of the stressed syllable of the immediately following prosodic word. This can be seen in the following pitch track, where both the verb *díolfaidh* ‘sell.FUT’ and the subject noun *mháthair* ‘mother’ are associated with L-H accents. In this case, the possessive determiner *mo* ‘my’ is realized with a gradual fall in pitch from the H peak on *díolfaidh* and the L target on *mháthair*:

(8) Pitch track for a VSO sentence where the determiner shows a gradual fall in pitch rather than an L target



This pattern is confirmed in production studies reported in Dalton and Ní Chasaide (2005a, 2005b), which found that the peak of the pre-nuclear accent (the L-H accent described here) is consistently realised at the boundary between the stressed syllable and the following unstressed syllable, even when the number of preceding unstressed syllables is increased.

2.3.2 Alignment of H-L

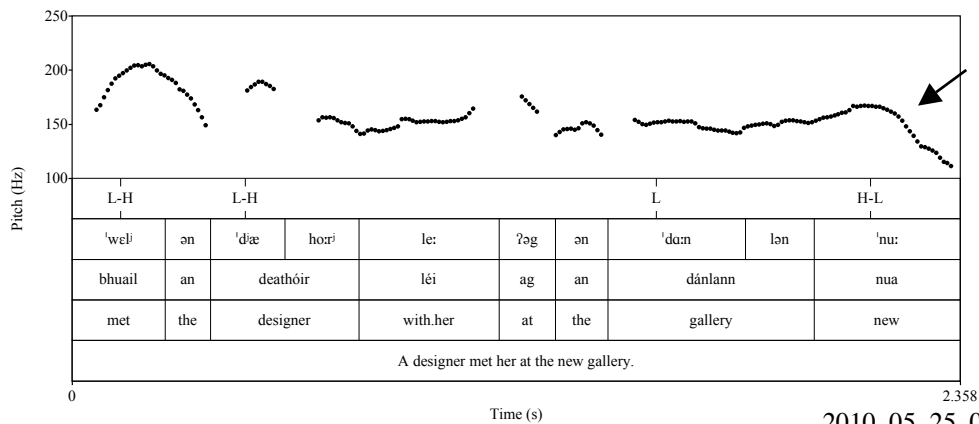
The H-L accent is a tonal pitch accent that associates with the rightmost word in every φ . Like the L-H accent, the H-L accent also associates with the main stressed syllable in prosodic words. As found in Dalton and Ní Chasaide (2005a, 2005b), words with an H-L accent (which corresponds to their characterization of the nuclear accent), the pitch peak is located in the vowel of the stressed syllable. In my data, the fall is usually realized gradually through subsequent unstressed syllables, while Dalton and Ní Chasaide observe that the L target is reached in the immediately following syllable.²¹ As

²¹ Based on my data alone, it might be more plausible to analyze the L target of the H-L accent as a boundary tone that associates with the right edge of φ . However, the observations made by Dalton and Ní Chasaide (2005a, 2005b) suggest that this is not

above, the discussion in this section is based on qualitative observations, and is not based on experimental results other than those reported in Dalton and Ní Chasaide.

This pattern may be seen by comparing the pitch tracks for words marked with an H-L accent with increasing numbers of syllables. First, consider the following pitch track containing a sentence-final one-syllable adjective, where the pitch fall is contained within the word:

(9) Pitch track for a single syllable adjective with an H-L accent

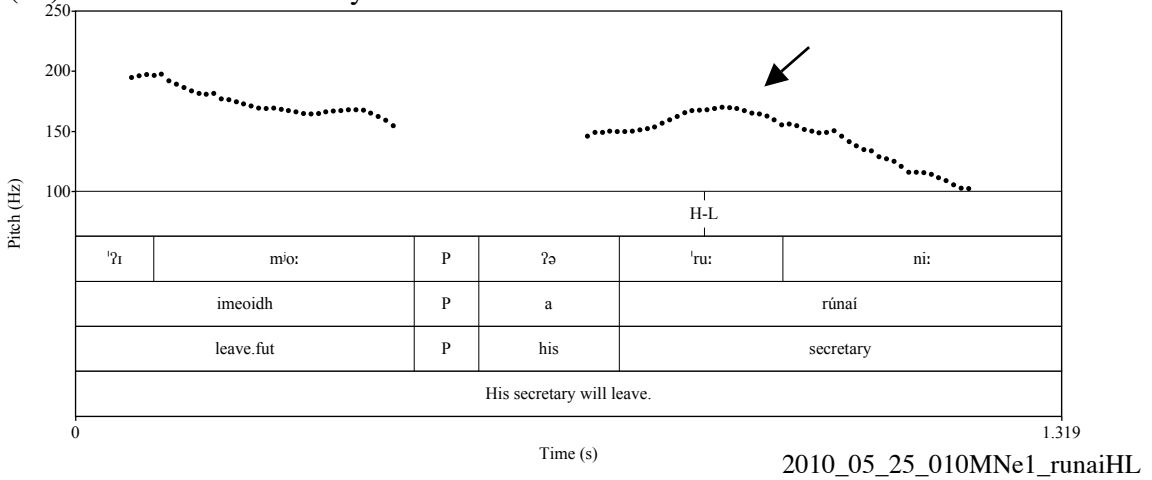


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In a two-syllable word, the fall begins on the first (stressed) syllable and continues to descend through the second (unstressed) syllable. The noun in this pitch track is in subject position of an intransitive sentence. In this case, the noun is not modified by an adjective and is sentence-final:

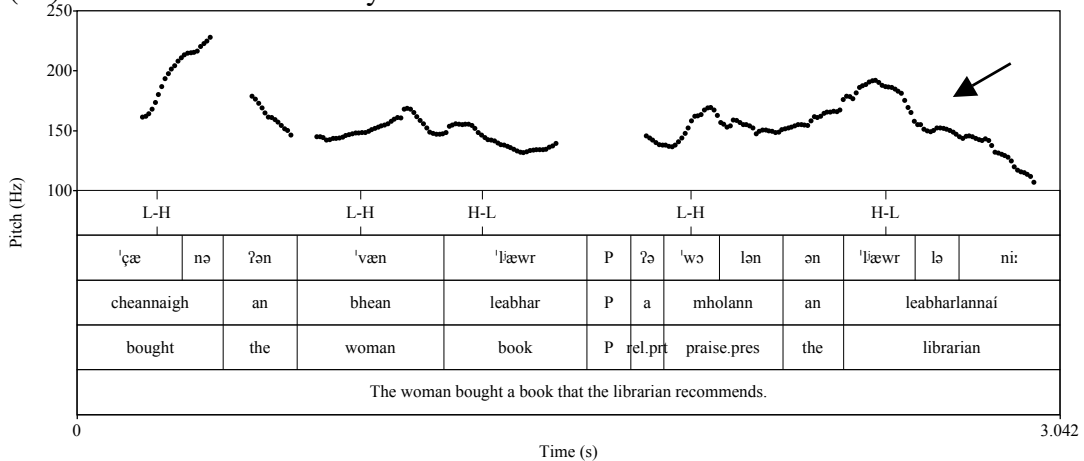
always the case. For the present, I will assume that the difference between my speakers and Dalton and Ní Chasaide’s speakers is one of phonetic implementation of the same H-L pitch accent rather than a difference in its phonological make-up. However, this question should be investigated further in future.

(10) Pitch track for a two-syllable noun with an H-L accent



This same pattern can be seen extended in a three-syllable word *leabharlannaí* ‘librarian’ associated with an H-L accent. This noun was extracted from a relative clause in sentence-final position:

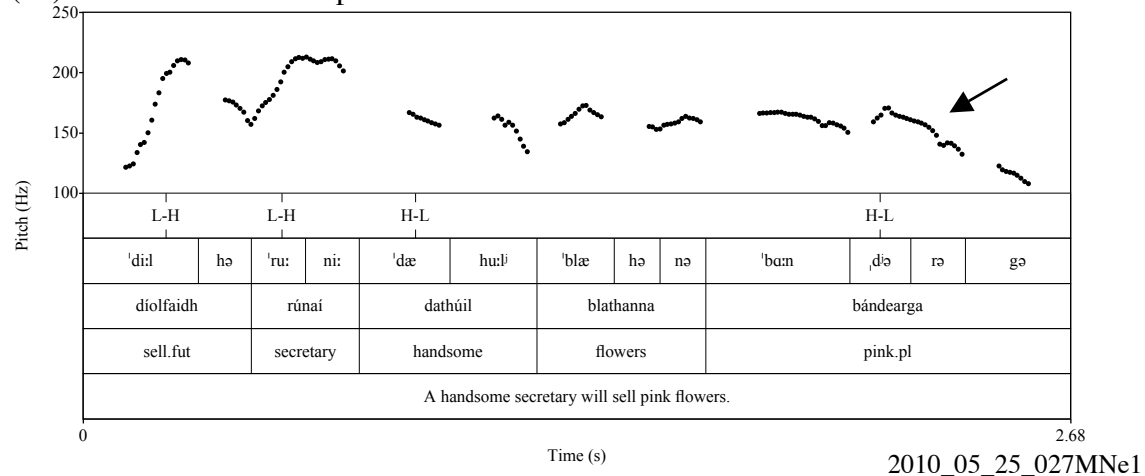
(11) Pitch track for a three-syllable noun with an H-L accent



As for the L-H accents, it can be seen that the H-L accent associates with the stressed syllable by examining words in which the stress is not word-initial. For example, the word *bándearga* ‘pink.PL’ is a compound (*bán* ‘white’ + *dearg* ‘red’), with main stress on the second part of the compound (*dearg*). As seen in the following pitch track, when this word carries an H-L accent, the first part of the compound has a steady pitch and

the fall in pitch begins on the first syllable of *dearga*, extending through the following two unstressed syllables:^{22, 23}

(12) Pitch track for a compound noun with non-initial stress and an H-L accent

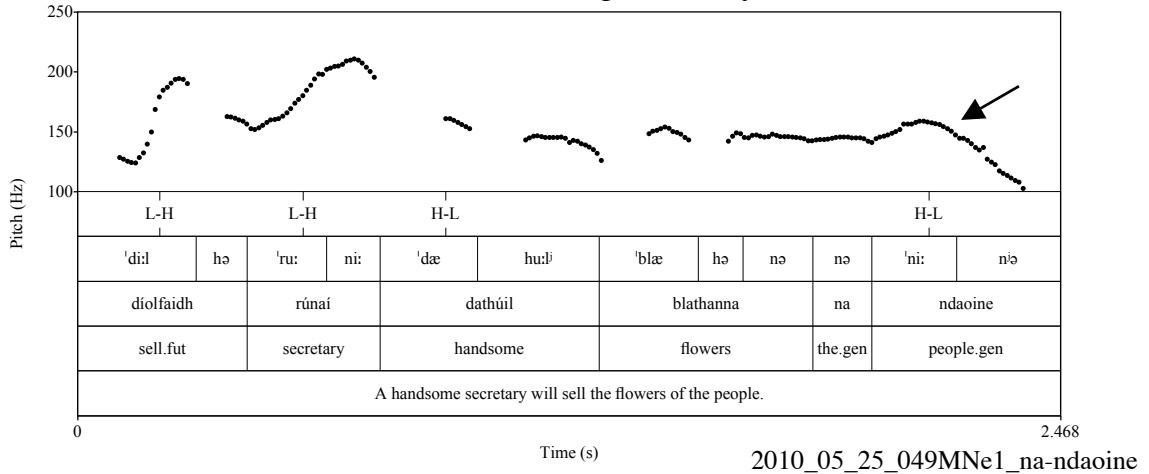


Similarly, if a word with an H-L accent is preceded by an unstressed function word, the fall in pitch does not begin until the stressed syllable of the lexical word. For example, the following pitch track shows a noun marked with an H-L accent that is preceded by a determiner. In this case, the determiner *na* shows a steady pitch as an extension of the previous unaccented noun (which is itself preceded by an H-L accent). Note the presence of the H target on the vowel of the noun, with a fall in pitch descending from this point to the end of the word:

²² Note that the initial steady pitch on the non-main stressed syllable may be due to interpolation between a preceding L-H accent and the immediately following H-L accent. In this particular case, the adjective *bándearga* is preceded by an unaccented noun. The relatively high pitch is at the same level as the preceding L tone, even though it is clearly higher than the final L tone.

²³ The medial lowering effect between the two parts of the compound is a segmental effect introduced by [dʲ].

(13) Pitch track for a noun with an H-L accent preceded by a determiner



Like the L-H accent, support for this description of the pattern was also found in Dalton and Ní Chasaide (2005a, 2005b), who characterize the accent (there, referred to as the ‘nuclear’ accent) in their transcription system as H*+L, with the H* aligned with the beginning of the vowel in the stressed syllable. They also observe that the timing of the H* peak is not affected by following unstressed syllables. In comparing this accent with the prenuclear (L-H) accent, they observe that the peak is realized earlier in the syllable. This is consistent with the characterization here that both accents are bitonal, with the “starred” tones corresponding to L*+H (with the L target on the stressed syllable, followed by H) and H*+L (with the H target on the stressed syllable).

As with the discussion of the L-H accent, the pitch tracks and observations presented here support the characterization of the intonational system of CI as one that results from a relatively sparse distribution of tonal entities, ignoring, for the present, the existence of pitch accents or boundary tones which may contribute semantic content to the sentence. I have shown that the above account of the phonetic implementation of these pitch accents accounts for aspects of the pitch contours that go beyond the local interpretation of the tonal targets. This picture of CI as an intonational language follows

that introduced in Pierrehumbert (1980) for the intonational system of English, which is prevalent in the analysis of intonational languages.

The main contribution in this thesis is an understanding the factors responsible for the distribution of the tonal L-H and H-L pitch accents, characterized as such by Dalton and Ní Chasaide (2005a, 2005b). In contrast to Dalton and Ní Chasaide (2005a, 2005b), I have shown both that the L-H accent and the H-L accent have distributional properties that are more complex than that proposed in those papers: in the larger context of more complex sentences, the L-H accent is a marker of recursive prosodic φ structure, while the H-L accent marks the right edge of φ . In other words, the characterization of these two accents as ‘prenuclear’ and ‘nuclear’ is not informative enough: the distribution of the both the L-H and H-L accents is more complex than would be expected from the characterization prenuclear and nuclear.

2.4 Phonological Aspects of Pitch Accents in CI

2.4.1 Non-lexical Status of Pitch Accents

I have argued that the distribution of L-H and H-L pitch accents in CI is indicative of prosodic phrasing. Instead of being present in the lexical specification of words, pitch accents in CI are epenthetic: they are inserted at the phrasal level and associate with the stressed syllables of prosodic words at the edges of certain types of prosodic domains. This characterization of the tonal system of CI is consistent with the phonological analyses of the tonal systems of other intonational languages like English, as first analysed by Pierrehumbert (1980), where tonal specification is sparse and indicative of higher-level phrasing, and is also consistent with previous descriptions of

various aspects of the intonational system of CI (de Bhaldraithe 1945; Blankenhorn 1979, 1981a; Bondaruk 1994, 2004; Dalton & Ní Chasaide 2005a, 2005b).

The data collected in this thesis have dealt with sentences elicited in a pragmatically neutral context, where all of the information in the sentence is assumed to be new and not the bearer of contrastive focus. I have assumed, in consequence, that the L-H and H-L pitch accents do not themselves contribute any meaning to the sentence, but rather are “default” accents inserted to provide information about prosodic structure. However, like other intonational languages, CI possesses an inventory of tonal morphemes that do contribute meaning. Previous work on intonational meaning in CI (de Bhaldraithe 1945; Blankenhorn 1979; Bondaruk 1994, 2004) has found that in addition to the default L-H and H-L accents that are found at prosodic phrase edges in the neutral declarative sentences discussed here, rising contours, level tones, and complex contours are also found in sentence-final position or on words singled out for a specific pragmatic function. The magnitude of falls and rises also appears to be semantically meaningful. For example, Blankenhorn (1979, 1981a) and Bondaruk (2004) report a distinction between three types of final fall, each of which are indicative of a different degree of emphasis or certainty, and which may be found in both declarative and interrogative sentences.²⁴

I will not attempt a full analysis of the tonal system of CI which would relate the insertion of default accents to how intonational meaning is conveyed in the language. However, it is clear that the interplay between the default accents and the other types of

²⁴ In fact, the sentences recorded for this dissertation may exhibit some of these distinctions for final falls. However, it is not possible at this time to further comment on the possible pragmatic differences exhibited by final falls.

tonal morphemes is complex, and that there is some degree of overlap, as in the magnitude and distribution of tonal rises and falls. For the purposes of this dissertation, however, it is sufficient to assume that in pragmatically-neutral all-new sentences, L-H and H-L accents are indicative of prosodic phrasing, and that we may safely abstract away from whatever they may contribute in the way of semantic or pragmatic meaning.

2.4.2 Phonological Constraints on Pitch Accent Distribution

If the default pitch accents L-H and H-L are epenthetic, their distribution must be attributed to phonological and prosodic factors. In OT terms, epenthetic elements violate the correspondence constraint DEP, which is violated when the element in question is present in the output but is absent in the input. More specifically, when pitch accents are inserted, they violate a constraint from the family of DEP(TONE) constraints, where TONE may be replaced with any tonal configuration. For the purposes of this analysis, I assume that the constraints in question are DEP(LH) and DEP(HL):²⁵

(14) DEP(L-H): assign one violation mark for every L-H tonal sequence present in the output that has no correspondent in the input.

(15) DEP(H-L): assign one violation mark for every H-L tonal sequence present in the output that has no correspondent in the input.

Epenthesis will result when a DEP constraint is dominated in the constraint hierarchy by one or more markedness constraints that would be violated by the absence of the epenthetic element. For phrasal pitch accents like the L-H and H-L accents discussed here, the constraints must make reference to the prosodic domain with which each pitch accent is associated ($\varphi_{\text{Non-min}}$, φ), as well as the particular edge with which it associates

²⁵ Alternatively, these constraints may be formulated as DEP(H) and DEP(L) constraints, meaning that each constraint would be violated once by the insertion of either the L-H or H-L contour. These details are not important for the brief analysis sketched here.

(L, R). In addition, the constraints must specify that the pitch accent should associate with a stressed syllable rather than the syllable closest to the relevant domain edge.

Because this dissertation focuses on developing an understanding of how pitch accents may be used as indicators of the boundaries prosodic phrases, I will not at this time make an attempt to develop an analysis with respect to the specific constraints involved in the insertion of pitch accents in CI. A proposal of this kind would require a discussion of the typology of pitch accents and tonal phonology, which falls outside of the scope of this dissertation. Instead, I believe that it is sufficient for the purposes of this dissertation to understand that the L-H and H-L pitch accents under discussion here are epenthetic, such that their distribution is determined by prosodic markedness constraints exerting the demands summarized in the above paragraph. For proposals on how to account for the distribution of epenthetic pitch accents in other languages using an OT framework, I refer the reader to works dealing with the phonology of tone and intonation, such as Yip (2002), Gussenhoven (2004), and Selkirk (2007), as well as work on tonal licensing (Zoll 1998, 2003).

2.5 Verb Deaccenting

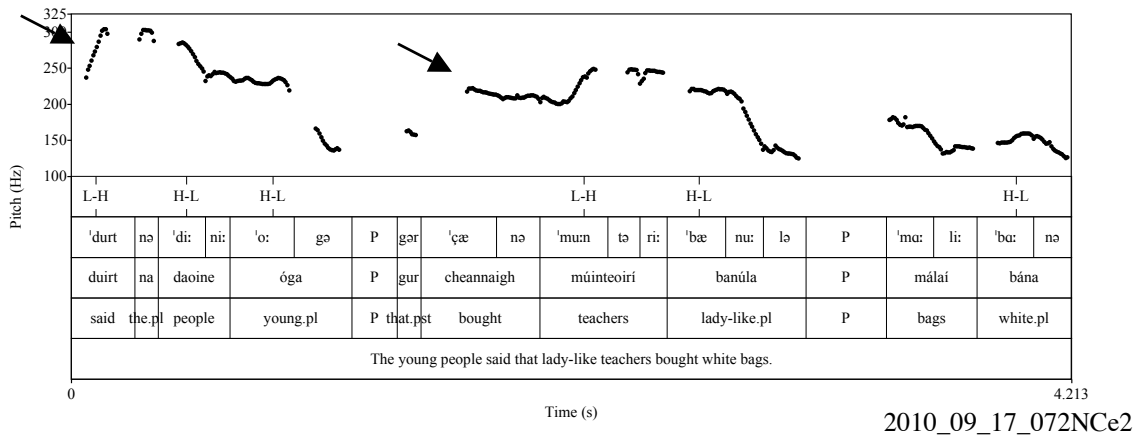
A last tonal pattern that requires some explanation is the behaviour of verbs in sentence-initial position. As will be proposed in chapter 3, the verbs in most finite sentences are predicted to be marked with an L-H accent because they adjoin to a φ , and are predicted to be dominated by $\varphi_{\text{Non-min}}$. However, this is not necessarily the case: while the verb in this position may be marked with an L-H pitch accent, the presence of the L-H appears to be optional. For example, this can be seen by comparing pitch tracks for two repetitions of the following sentence with an embedded VSO clause:

(16) Dúirt_{DP} [na daoine óga]_{VP} [CP [gur_{CP} _{SP} cheannaigh múinteoirí banúla
 said the.PL people young.PL that.PST bought teachers lady-like
 málaí bána]]
 bags white.PL
 ‘The young people said that lady-like teachers bought white bags.’

In this sentence, there are two verbs, each of which is in clause-initial position: *dúirt* ‘said’ in the matrix clause, and *cheannaigh* ‘bought’ in the embedded clause. Because each one adjoins to a $\varphi_{\text{Non-min}}$, the theory predicts that an L-H accent should be associated with the stressed syllable of each verb.

The following are two pitch tracks of the above sentence as uttered by two different speakers, and which show contrasting patterns in whether or not the verbs are associated with an L-H accent. First, the pitch track in (17) shows an L-H rise on the matrix verb, but no accent on the embedded verb:²⁶

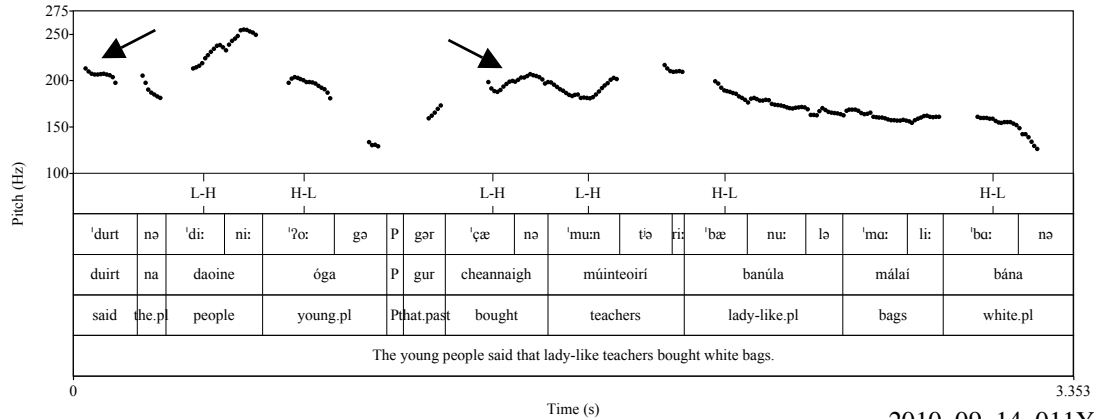
(17) Pitch track for VS[VSO] sentence, unaccented verb



²⁶ Two aspects of the pitch track in (17) require explanation. First, the relatively low pitch of the complementizer *gur* as compared to the unaccented verb may be accounted for as a combination of the lowering effect from the voiced stop [g] and an extension of the low target from the preceding L tone. Secondly, the relatively high pitch observed on the unaccented embedded verb *cheannaigh* ‘bought’ can be attributed to pitch reset rather than to the presence of an L-H accent: here, the embedded clause appears to show a beginning F0 that is comparable to the beginning F0 of the sentence. This may be indicative of a more general pattern where pitch reset is observed at clause boundaries, though no formal claim is made here.

In contrast, the pitch track in (18) shows the opposite pattern, where the embedded verb is marked with an L-H accent, while the matrix verb is not:

(18) Pitch track for VS[VSO] sentence, accented verb



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The comparison between these two repetitions of the sentence in (16) suggests that the presence of the L-H accent on the verb is optional. This contrast can also be seen in the pitch tracks used throughout this dissertation, where verbs sometimes show an L-H accent, as predicted, but often do not. At this time, it is unclear what factors condition the presence or absence of the accent on initial verbs. While no formal study has been conducted on this topic, I will offer some preliminary observations that may be used to guide future research.

One possible conditioning factor regards the frequency of the verb in question. In the data I have collected, common, irregular verbs like *tabhar* ‘give’ are almost never marked with an L-H accent. Similarly, there may be a bias in favour of realizing an L-H accent on verbs that are relatively unexpected in the discourse, as opposed to verbs that are predictable based on context or that are given.

It is likely that the probability of L-H accent realization on initial verbs is a complex question that depends on a number of interacting factors. The primary purpose

of this discussion is to alert readers to the pattern, and to propose that the absence of the L-H accent in any of the pitch tracks used for illustration should not be considered counter-evidence, but rather that the absence of the pitch accent may be explained with reference to factors like lexical frequency, discourse effects, and phonological environment. I assume that the absence of the L-H accent is not an indication that the proposed prosodic structure is incorrect, but rather that the absence of the L-H accent represents a type of “deaccenting”, where the L-H accent is predicted to surface but is not able to do so under pressure from other factors. A fuller description and analysis of the patterns of verb deaccenting will not be attempted in this dissertation, but should be investigated in future research.

2.6 Representativity of Generalizations

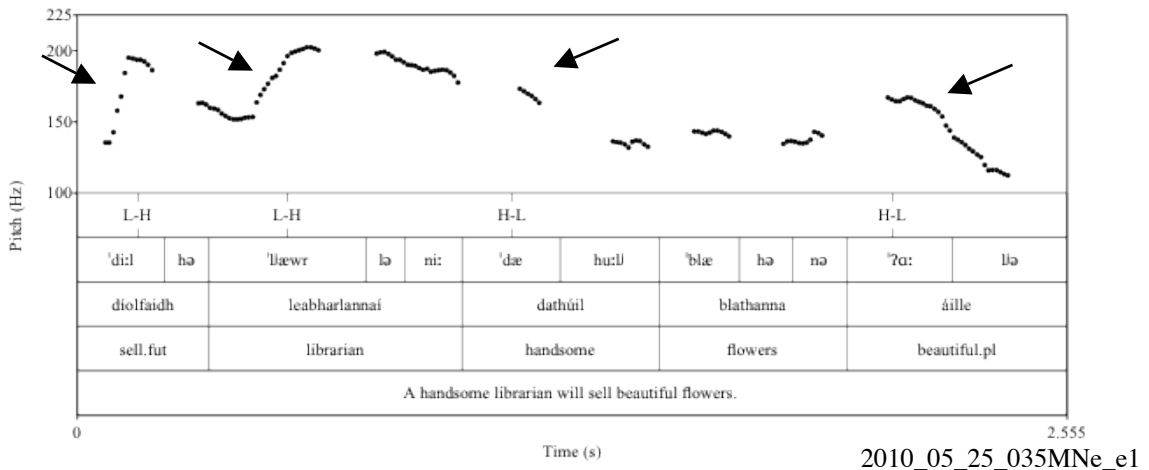
In this section, I will provide quantitative information regarding the representativity of the generalizations and pitch tracks used throughout this dissertation. In general, when illustrating a pattern, I provide the best example pitch track chosen from among my speakers and do not provide examples from each speaker for each sentence. This is done primarily for ease of illustration and for space constraints. The discussion in this section is intended to assure the reader that the pitch tracks chosen to illustrate particular patterns throughout the dissertation are representative of utterances that could have been produced by any of the speakers, and that the speakers are comparable with one another.

2.6.1 Sample pitch tracks for each speaker

Data from six native speakers of CI form the basis of the theory proposed in this dissertation (MN, BL, NC, BM, AN, YF), and can be found in the database.²⁷²⁸ While not all sentences produced by these speakers realized pitch accents on all predicted words, each of these speakers does produce sentences which show the “canonical” pitch accent patterns described and analyzed in this dissertation. In this section, I provide as an illustration sample pitch tracks for each speaker which show the predicted distribution of L-H and H-L pitch accents.

Repeated below is the pitch track used for illustration of basic tonal patterns for a VSO sentence given in (1), as produced by speaker MN:

(42) Pitch track for VSO sentence for MN



As discussed in section 2.2, this sentence is proposed to contain four pitch accents: two L-H rises on the verb (*diolfaidh* ‘sell.FUT’) and the subject noun (*leabharlannaí*

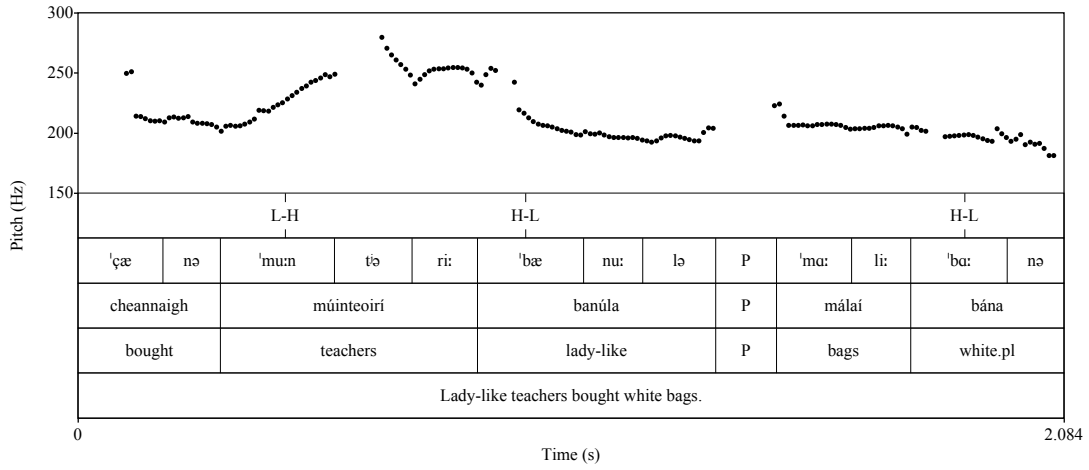
²⁷ Data, including original recordings, will be made available online at a future date in the form of a database. Until this time, these items are available upon request.

²⁸ Data from two speakers, FF and MF, are occasionally referred to in the dissertation, but were in general not included in the data analysis. FF, as discussed below in section 2.6.3, shows a different pattern of pitch accent realization from the other speakers, while for MF, only a small subset of the data are available.

‘librarian’), and two H-L falls on the subject adjective (*dathúil* ‘handsome’) and the object adjective (*áille* ‘beautiful.PL). While a formal account of the distribution of the pitch accents is developed in chapter 3, I will show here that this same basic pattern may be observed for each of the six speakers whose data are used in this dissertation.

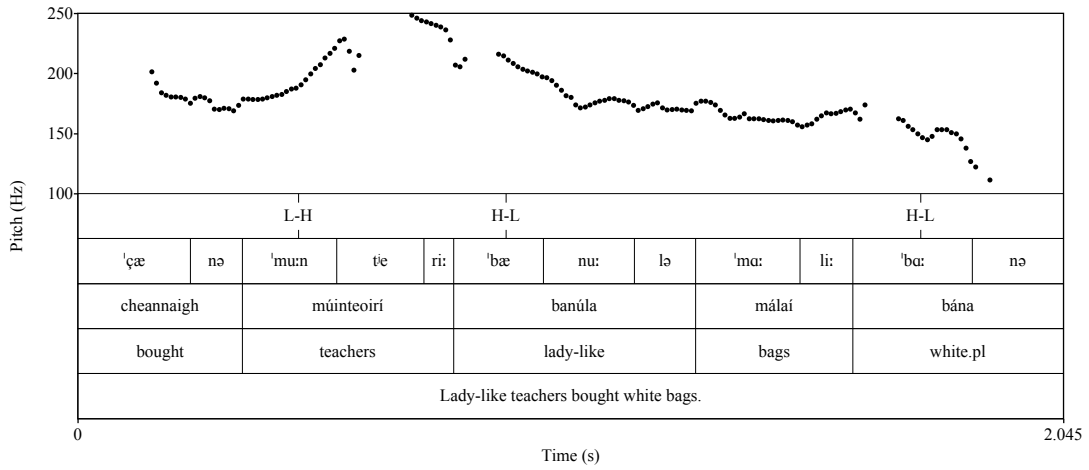
Pitch tracks for sentences with the same structure except different lexical content may be seen in (43), (44), and (45) for BM, YF, and AN, respectively. In each of these utterances, there is an L-H rise on the subject noun (*múinteoirí* ‘teachers’), and an L-H fall on each of the subject adjective (*banúla* ‘lady-like’) and the object adjective (*bána* ‘white.PL’). Note that in each of these utterances, the verb does not carry the L-H pitch accent and is either deaccented (as in (43) and (44)) or has a fall in F0, which may correspond to an H-L accent (as in (45)). As discussed in section 2.5, verb deaccenting is to be an optional process whose conditioning factors are at present not well understood. The fall in (45) may be attributed to the interference of a sentence-initial adverb (*inné* ‘yesterday’) that was used to frame the sentence; this is not shown here but a pitch track for the full sentence may be seen in the database. It is assumed that the presence of this adverb does not affect the prosodic structure of the sentence except for the verb, to which it is adjacent.

(43) Pitch track for VSO sentence for BM



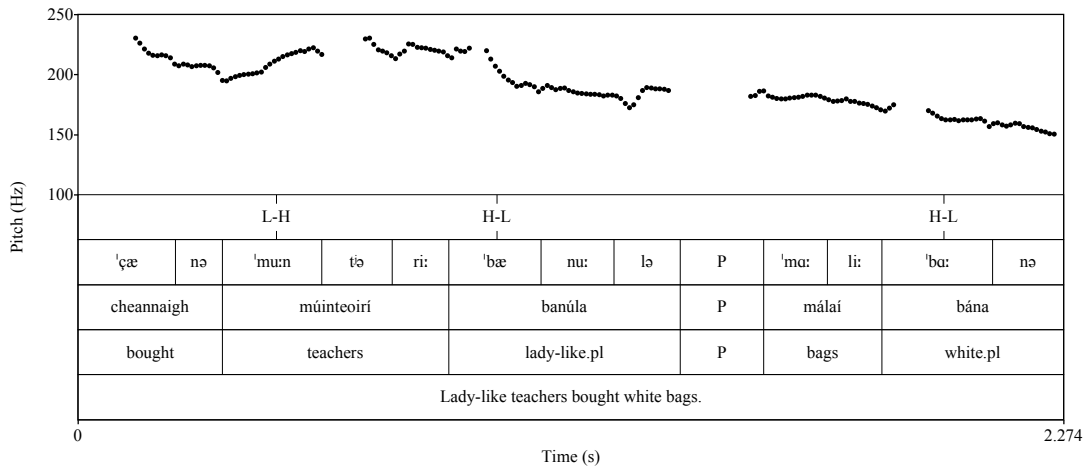
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(44) Pitch track for a VSO sentence for YF



2010_09_14_038YFe2

(45) Pitch track for a VSO sentence for AN



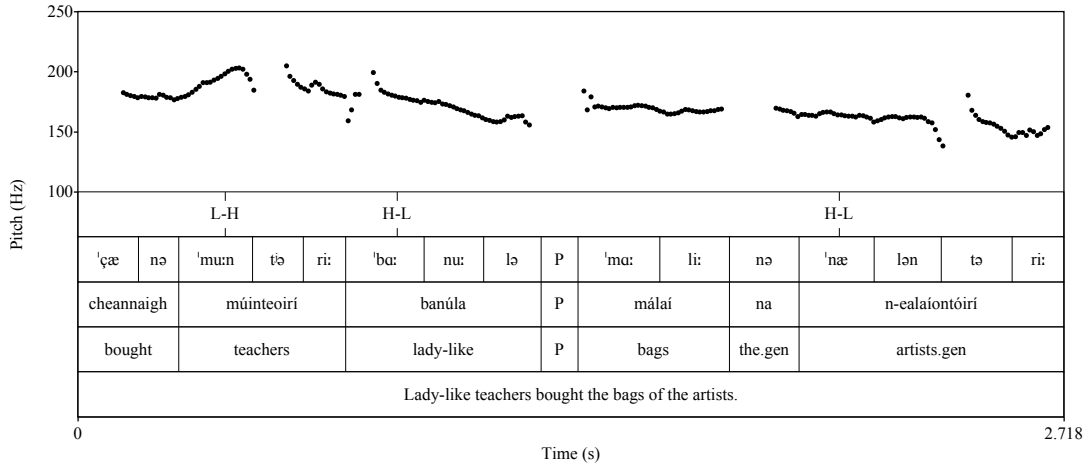
2010_09_13_042ANe1

For the remaining two speakers, BL and NC, this pattern is most clearly illustrated by the pitch tracks in (46) and (47). These are for sentences with a slightly different structure: instead of an object which consists of a noun-adjective sequence as in the examples above, the object consists of a possessive construction consisting of a noun-noun sequence (*málaí na n-ealaíontóirí* ‘the bags of the artists’). As will be discussed in chapter 3, sentences of this structure and content are prosodically identical to VSO sentences of the type discussed so far, where both subject and object are noun-adjective sequences. For further discussion of possessive constructions in CI and their prosodic structure, see chapter 3.

Like the examples for the other speakers above, the pitch tracks in (46) and (47) show an L-H rise on the subject noun (*múinteoirí* ‘teachers’) and H-L falls on the subject adjective (*banúla* ‘lady-like’) and the object adjective (*n-ealaíontóirí* ‘artists.GEN’). Note that in these sentences, like in those above, the verb is deaccented in (46) and shows a fall in (47). These patterns may also be attributed to the optional

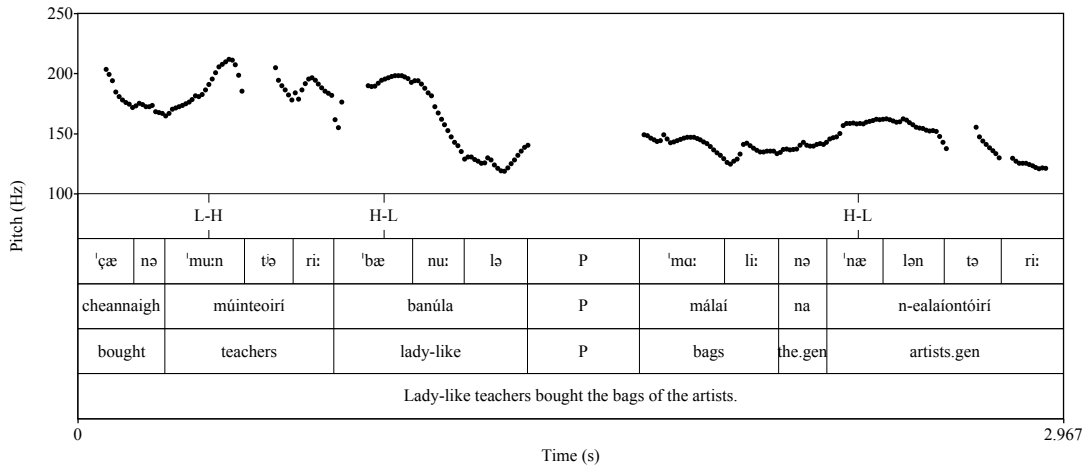
process of verb deaccenting and to interference from a sentence-initial adverb (*inné* ‘yesterday’).

(46) Pitch track for a VSO sentence for BL



2010_09_16_047BLe1

(47) Pitch track for a VSO sentence for NC



2010_09_17_107NCe2

In conclusion, an examination of six example pitch tracks for VSO sentences with branching subjects and objects (where the object was either a noun-adjective sequence or a noun-noun possessive construction) illustrates that each speaker produced pitch tracks that showed the same basic distribution of pitch accents with respect to the subject and object. The realization of the verb showed more variability; however, as

discussed above, this variability is explainable under the assumption that verb deaccenting is an optional process and that the sentence-initial adverb used to frame the sentences at times was incorporated into the prosodic phrasing of the sentence. Throughout this dissertation, I will assume that the speakers operate under the same basic principles of pitch accent insertion, though there may be variability in the phonetic implementation of the pitch accents.

2.6.2 Counts for the presence of predicted pitch accents

A second measure of representativity comes from a quantitative analysis of the pitch tracks that were collected for use in this dissertation. In this section, I provide counts for the distribution of individual pitch accents in sentences of comparable structures. This evaluation takes into account all repetitions of a subset of sentences that were collected and entered into the database for the six speakers discussed above. Three specific environments for pitch accents were examined, each of which were exemplified in the sample pitch tracks above: the presence of an L-H pitch accent on the leftmost noun in a branching non-final subject, the presence of an H-L pitch accent on the rightmost adjective in a branching non-final subject, and the absence of any pitch accent on the leftmost noun of a sentence-final DP.

2.6.2.1 Environment 1: Leftmost noun in a branching non-final subject

The first environment under consideration is the leftmost noun in a branching non-final subject. This includes VSO sentences of the type examined above, where the subject is a noun-adjective sequence followed by a direct object:

(48) Cheannaigh **múinteoirí** banúla málaí bána.
 bought teachers lady-like.PL bags white.PL
 ‘Lady-like teachers bought white bags.’

As seen in the sample pitch tracks discussed in the previous section, a noun in this position tends to bear an L-H pitch accent. This generalization is reflected in an examination of pitch accent realisation on nouns in this structural context for a subset of the sentences collected for this dissertation. This examination was conducted based on qualitative observations on the phonetic implementation of pitch accents in CI, as discussed in section 2.3 of this chapter. No formal measurements were taken, but the decisions about the characterization of the pitch accents for each of the sentences examined may be found in the database associated with this dissertation.

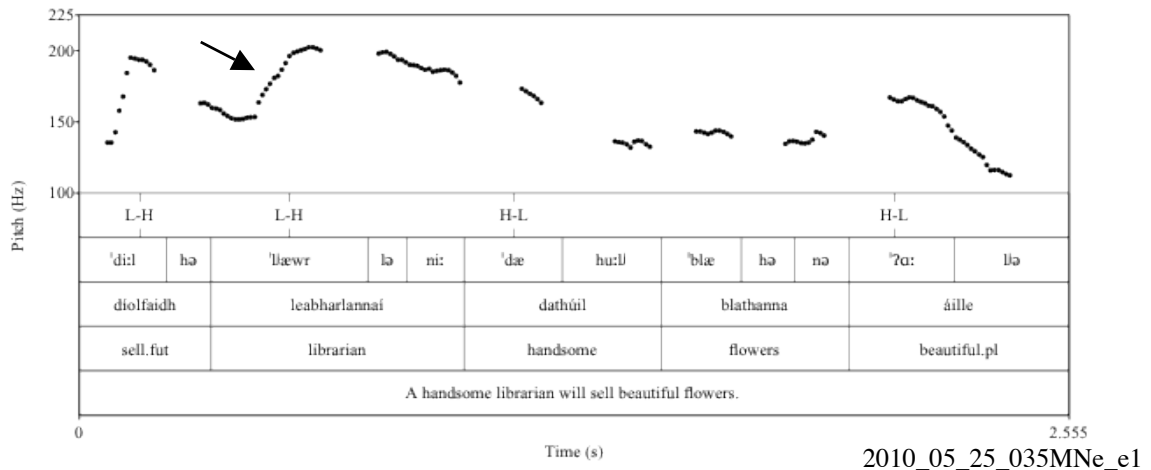
The barplot in (53) below shows the pitch accent realization on non-final branching subject nouns for sixteen sentence types. The numbers include multiple repetitions of the sentence type, where each speaker produced between one and three repetitions of each sentence type. Most speakers produced two repetitions for each sentence type. Three possibilities for the realization of the pitch accent were considered for nouns in this environment: either the noun was realized with an L-H pitch accent, an H-L pitch accent, or no pitch accent. The table below summarizes the diagnostics used for each of the three patterns.

(49) Table summarizing the diagnostics for pitch accents

Pitch accent	Diagnostic
L-H pitch accent	A rise in F0, with the peak reached by the end initial (stressed) syllable; subsequent unstressed syllables show a high plateau
H-L pitch accent	A fall in F0 which is observed in the vowel of the initial (stressed) syllable or as a decrease in F0 between the initial stressed syllable and subsequent unstressed syllables
No pitch accent	No discernable F0 movement

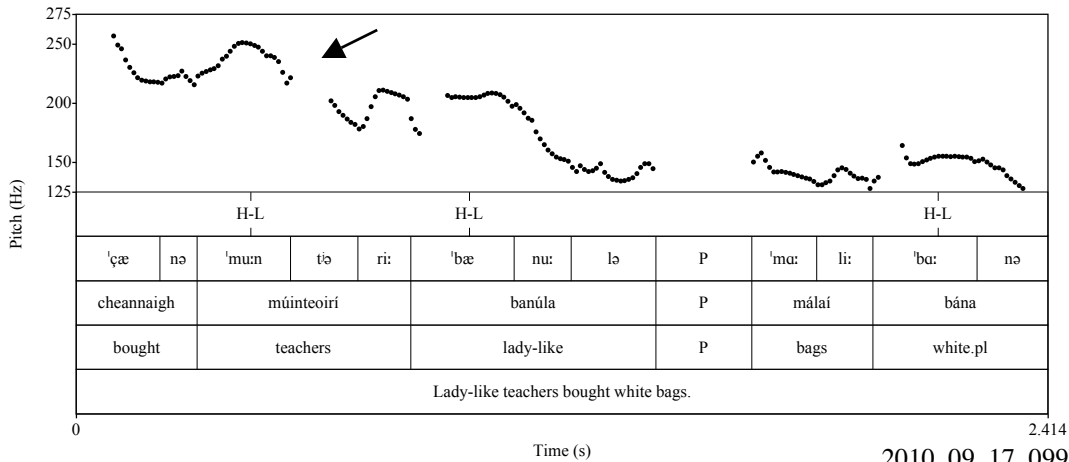
Examples of each of these patterns can be seen in the following pitch tracks. The L-H accent was seen in the sample pitch tracks discussed in the previous section, and shows a rise in F0 within the initial stressed syllable of the word with which it is associated. The F0 level of subsequent unstressed syllables in the word do not show a rise in F0, but rather the F0 level is extended in a plateau:

(50) Pitch track for VSO sentence showing an L-H accent on a branching subject noun



The H-L accent shows a fall in F0 throughout the initial stressed syllable, and which may be extended through to following unstressed syllables. This may be seen in the following example for a subject noun:

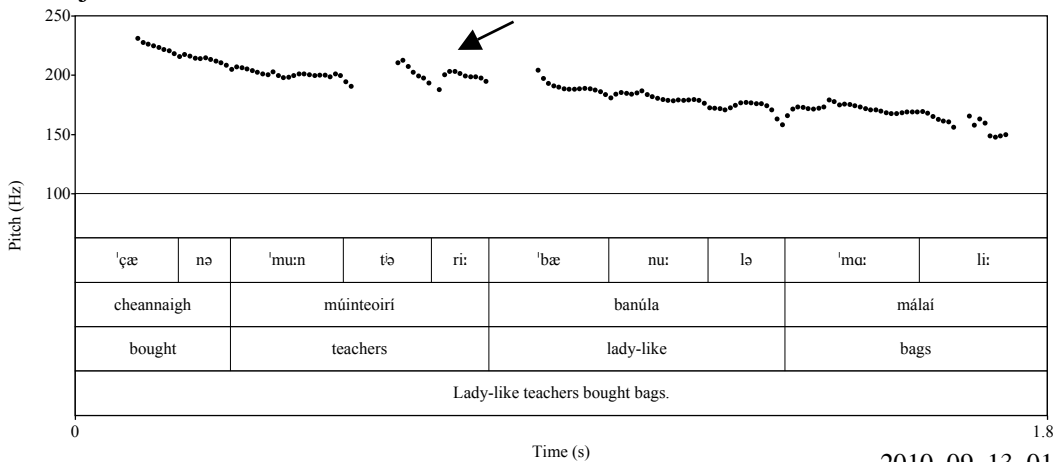
(51) Pitch track for VSO sentence showing an H-L accent on a branching subject noun



2010_09_17_099NCe1

Finally, examples with no discernable rise or fall in F0 were classified as not bearing a pitch accent. This can be seen in the following pitch track:

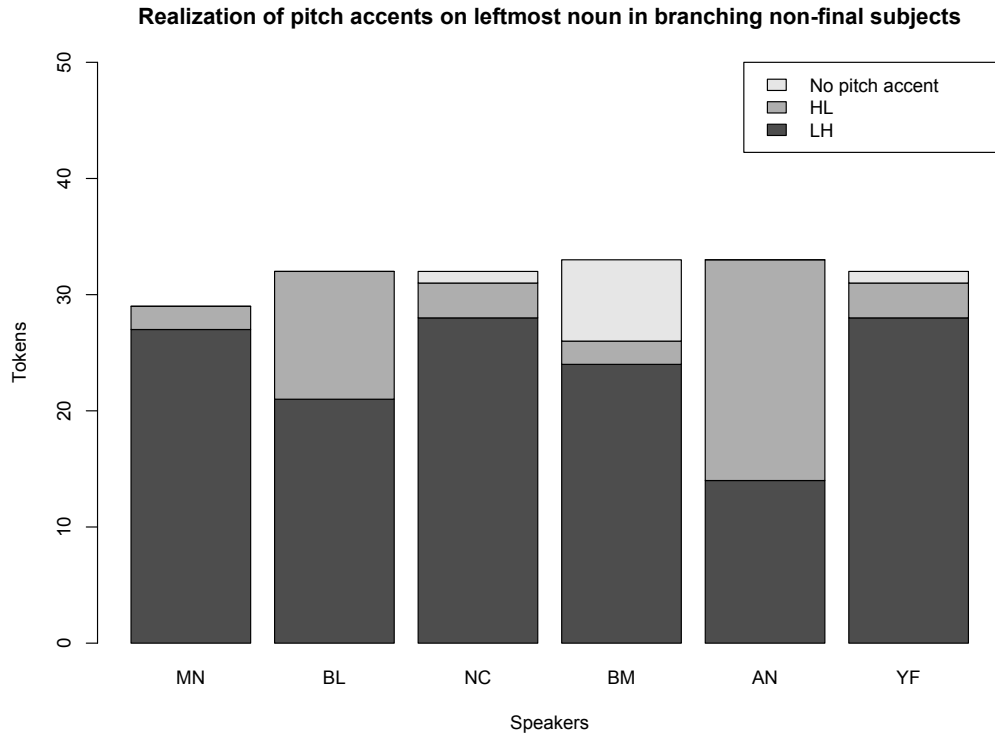
(52) Pitch track for VSO sentence showing no discernable pitch accent on a branching subject noun



2010_09_13_013ANe3

The results of the counts for the realization of pitch accents on the leftmost noun in branching non-final subjects is shown in the barplot in (53).

(53) Barplot illustrating number of tokens by speaker for the realization of pitch accents on the leftmost noun in a branching non-final subject



As can be seen in the barplot, all speakers except AN show an L-H pitch accent in the majority of tokens. This is the pattern that I assume to be the default for the neutral, all-new context examined in this dissertation. The alternative accent, H-L, is observed in a small number of cases for three of the speakers. While I assume that this is not the preferred pattern for speakers, the presence of this pattern may suggest that phrasing patterns are not categorically defined but rather subject to some degree of variation; this topic is taken up in chapter 4. Finally, two speakers, AN and BL, showed a large proportion of nouns with no discernable pitch accent (a majority for AN). Because this pattern is overall found in only a minority of cases, I assume that this pattern is either an artefact of the reading task (flat pitch tracks were found especially in sentences that

were produced early in the session) or illustrative of a different pragmatic context (such as where material is considered given rather than new information). Further investigation of the significance of the non-majority patterns is left to future research.

2.6.2.2 Environment 2: Rightmost adjective in a branching non-final subject

The second environment under consideration is the realization of the pitch accent on the rightmost adjective in branching non-final subjects. The sentences examined were from the same subset as those examined for subject nouns, except that it is the F0 contour of the adjective that is under consideration:

(54) Cheannaigh múinteoirí **banúla** málaí bána.
 bought teachers lady-like.PL bags white.PL
 ‘Lady-like teachers bought white bags.’

As seen in the pitch tracks examined so far, adjectives in this context often bear an H-L accent. This generalization is confirmed by an examination of the pitch accent realization of adjectives in this structural context. The same procedures were taken in determining which type of pitch accent was observed, as following from the diagnostics repeated below:

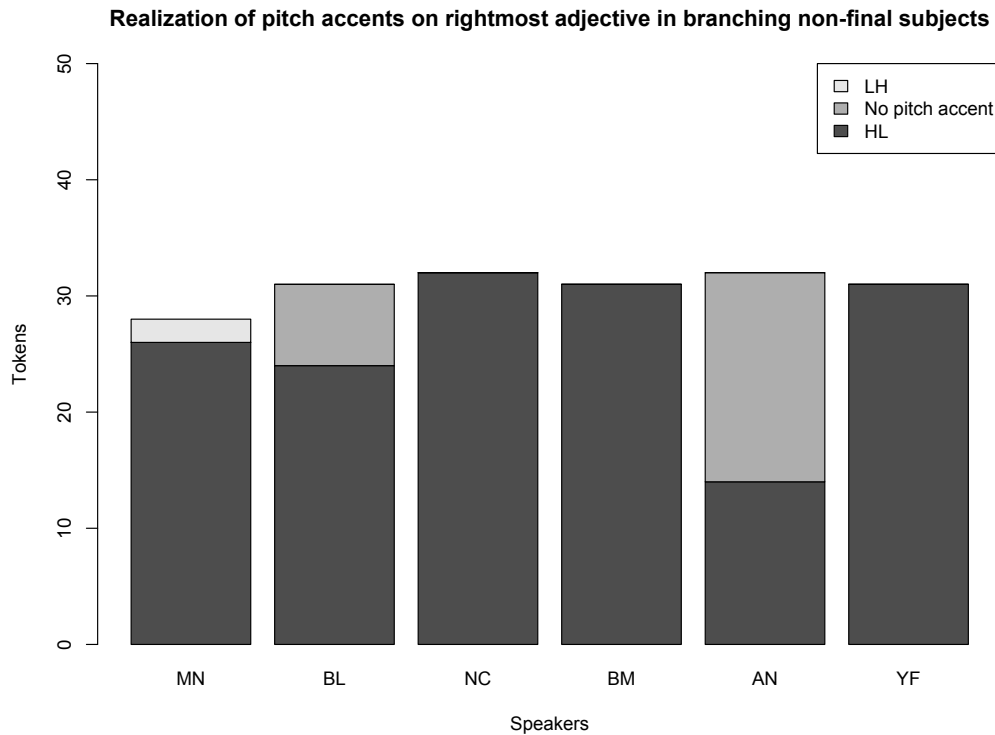
(55) Table summarizing the diagnostics for pitch accents

Pitch accent	Diagnostic
L-H pitch accent	A rise in F0, with the peak reached by the end initial (stressed) syllable; subsequent unstressed syllables show a high plateau
H-L pitch accent	A fall in F0 which is observed in the vowel of the initial (stressed) syllable or as a decrease in F0 between the initial stressed syllable and subsequent unstressed syllables
No pitch accent	No discernable F0 movement

Because the shapes of the pitch accents on nouns and adjectives are subject to the same diagnostics, I will not provide additional example pitch tracks for each type of

pitch accent in the interest of space. The barplot in (56) shows the results of the investigation of pitch accent realization on adjectives in branching non-final subjects.

(56) Barplot illustrating number of tokens by speaker for the realization of pitch accents on the rightmost adjective in a branching non-final subject

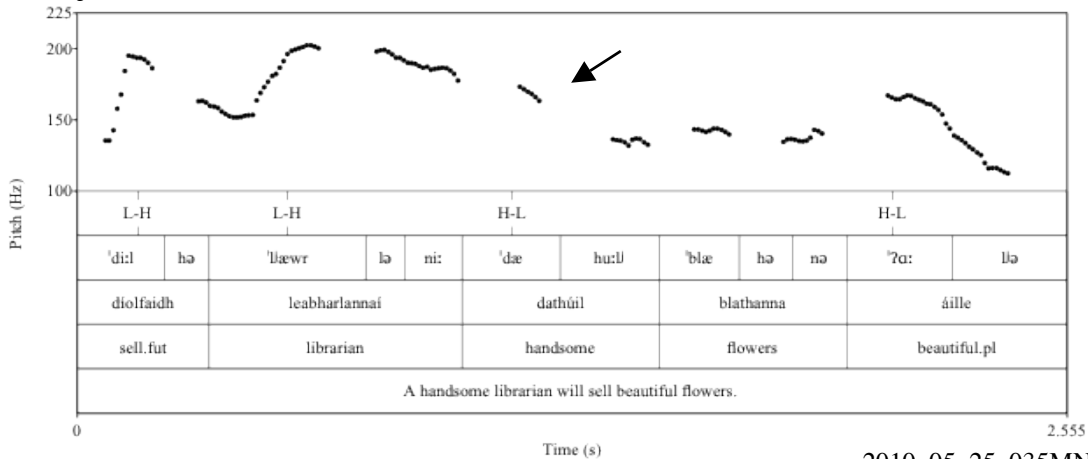


As seen in the barplot, all speakers except AN show an H-L pitch accent on the adjective in a non-final branching subject in a majority of tokens. As in the previous barplot, the speakers AN and BL show a large proportion of adjectives with no discernable pitch accent. This appears to be a consistent property of their data, though it is not at present clear whether or not this pattern represents a significant deviation from the pattern observed for other speakers or whether it is an artefact of the experimental setting.

One point of interest concerns the shape of the H-L accent, which in many cases is realised as a gradual decline in F0 on the initial stressed syllable, with no distinct H

target when it follows a word bearing an L-H accent. This can be seen in the following pitch track:

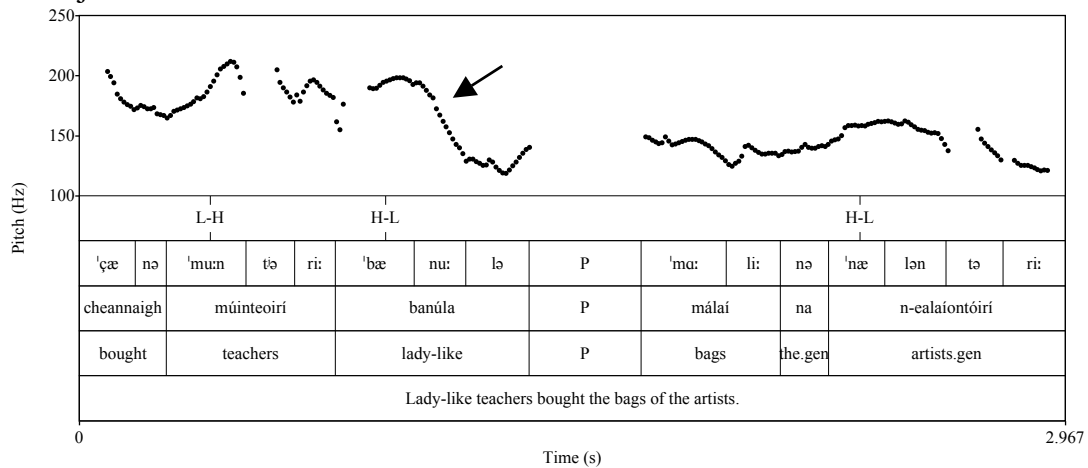
(57) Pitch track for VSO sentence showing an (H)-L accent on a branching subject adjective



2010_05_25_035MNe_e1

In contrast, however, some speakers do realize a distinct (downstepped) H tone target in this same context, as may be seen in the following pitch track:

(58) Pitch track for a VSO sentence showing an H-L accent on a branching subject adjective

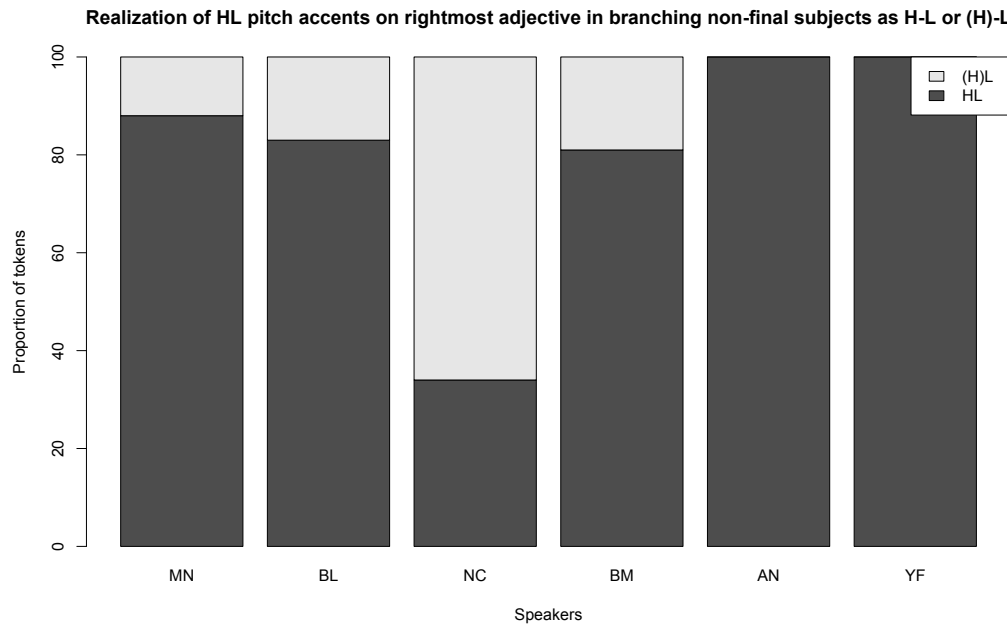


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The pattern in (57) is common and observed regularly for all speakers; only speaker NC realizes the accent as in (58) for a majority of cases. This is illustrated in the following barplot, which illustrates the proportion of H-L versus (H)-L (which represents the

possible deletion of the H target) for tokens where the adjective in a branching non-final subject showed a fall in F0 (not including tokens bearing an L-H accent or not bearing a pitch accent at all).

(59) Barplot illustrating number of tokens by speaker for the realization of falling pitch accents as H-L or (H)-L on the rightmost adjective in a branching non-final subject



It is possible that the pattern illustrated in (59) reflects a phonological process of H tone deletion where the second H tone is not realized when it follows another H tone. For the purposes of this dissertation, I treat this realization of falling pitch accents as H-L, which I assume represents the underlying representation. For further information on the realization of pitch accents in individual sentences, the pitch tracks are available in the database, with information about the transcription of pitch accents.

2.6.2.3 Environment 3: Leftmost noun in a branching final DP

The third environment considered here is the leftmost noun in the final DP. The sentences examined for this environment were from a slightly different set of sentences as the above two environments, as it was necessary to use sentences with a final

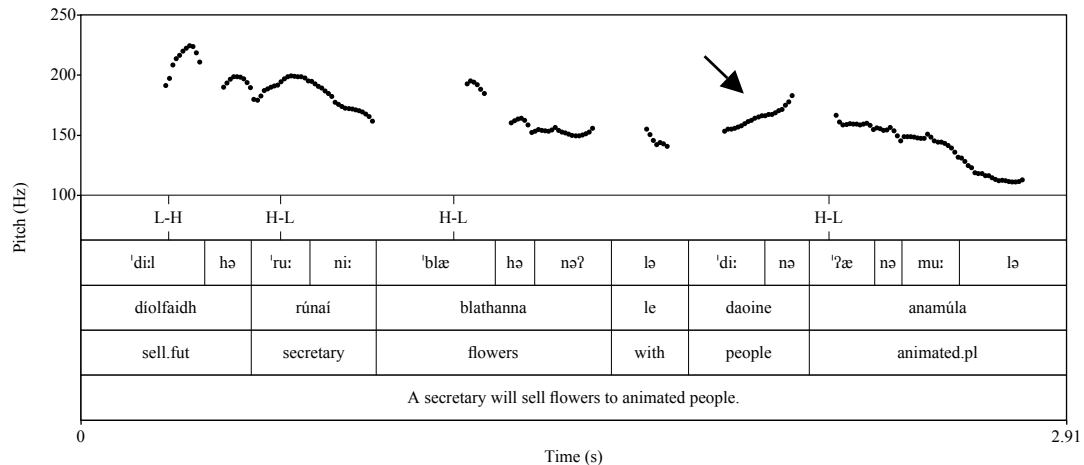
branching DP. However, the number of tokens considered here is similar to those considered above.

The target noun can be seen in basic VSO sentences like the following:

- (60) Cheannaigh múinteoirí banúla **málaí** bána.
 bought teachers lady-like.PL bags white.PL
 ‘Lady-like teachers bought white bags.’

As seen in the pitch tracks used so far for illustration, the noun in this environment usually does not bear a pitch accent, but instead shows no discernable rise or fall in F0 (as discussed above). In some cases, the noun may show what is referred to here as an *interpolated rise*, where a gradual rise in F0 is observed throughout the target noun, reaching a peak on the following word. The interpolated rise differs from the L-H pitch accent because the peak is not reached until the end of the word, while for the L-H accent, the peak is reached by the end of the first syllable and unstressed syllables show a high plateau rather than a rise in F0. An example of an interpolated rise may be seen in the following pitch track.

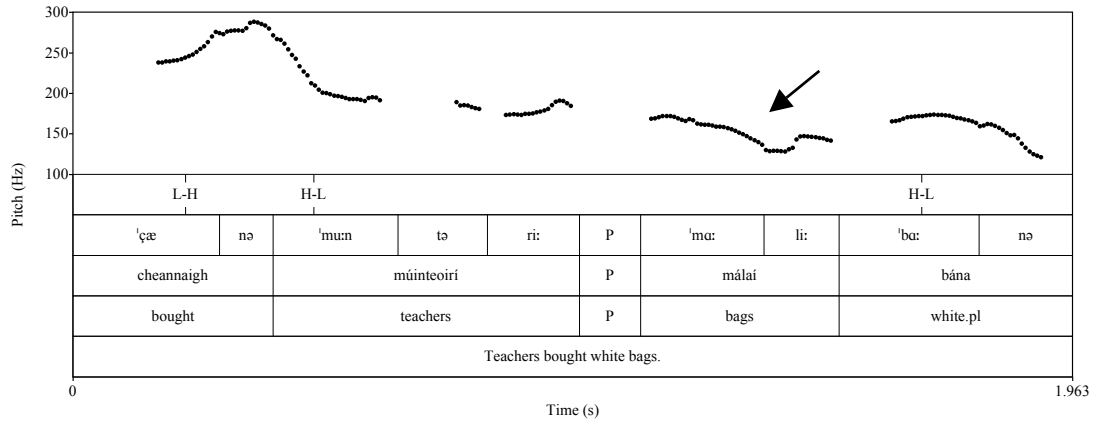
(61) Pitch track for a VSO sentence with an interpolated rise on the object noun



2010_05_25_009MNe1

In addition to the absence of a pitch accent and the interpolated rise, a number of sentences showed a small F0 fall, as in the following pitch track:

(62) Pitch track for a VSO sentence with an F0 fall on the object noun

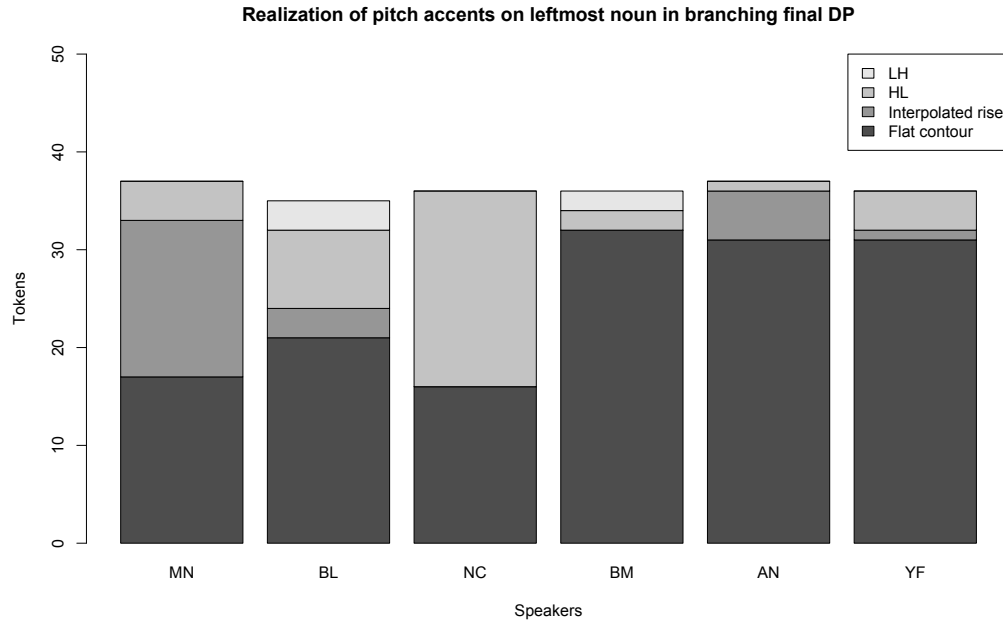


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Without further study, it is difficult to say whether or not the F0 fall as observed in (62) is the same as the H-L pitch accent observed elsewhere. For the purposes of this section, I have counted these as instances of H-L pitch accents, though I have not in general transcribed them as such in the dissertation.

The barplot in (63) shows the results of the investigation of the realization of pitch accents in the leftmost noun in non-final DPs.

(63) Barplot illustrating number of tokens by speaker for the realization of pitch accents on the leftmost noun in branching final DPs



For most speakers, with the exception of MN and NC, the majority of tokens were produced with no pitch accent and a flat F0 contour. For MN, a large proportion of tokens were produced with an interpolated rise, also indicative of accentless words.²⁹ NC, and to a lesser extent BL, showed a high proportion of H-L accents in this environment. However, as discussed above, it is possible that this is not representative of the same H-L accent observed elsewhere because of the relatively small size of the fall.³⁰ L-H accents (F0 rises), on the other hand, are observed only in a handful of cases.

²⁹ For MN but not for other speakers, many of the tokens with an interpolated rise on the final DP noun were followed by a vowel-initial adjective which was produced with an initial glottal stop. Because glottal stops may raise F0, it is possible that these interpolated rises are due to this segmental effect in many of these cases. Under this scenario, the realization of an accentless noun as having a flat F0 contour or an interpolated rise (or fall) may in part depend on segmental content.

³⁰ In some sentences, it is clear that the H-L is indeed an H-L accent, and that the pattern is indicative of an alternate phrasing that is often employed by NC but not by other speakers. This occurs in sentences where the final DP is branching, but is preceded by a non-branching DP (as in a VSOX sentence of the form [VNANNA]). This is not discussed here, but examples may be found in the database.

2.6.3 Summary

In summary, this section discussed the representativity of the data that will be used as illustration throughout this dissertation. The remaining chapters are devoted to developing an account of the distribution of the pitch accents introduced in this chapter, and will assume the background given here in the interpretation of the pitch tracks.

This section aims to accomplish two goals. First, in section 2.6.1, I provided sample pitch tracks from each of six speakers from sentences with similar syntactic structures and identical prosodic structures. These were intended to illustrate that each of these six speakers produced utterances that were consistent with one another, as well as with the claims made in this dissertation with respect to default patterns.

Section 2.6.2, on the other hand, aims to give the reader an idea of the range of patterns found in the data. By examining pitch accent realization in three structural environments, it was shown that certain patterns were found in a majority of speakers and a majority of the tokens. More specifically, we saw that L-H accents are found on the noun of branching non-final subjects, that H-L accents are found on the adjective of branching non-final subjects, and that no pitch accent is observed on the noun of a branching final DP. While further research is needed to reach firmer conclusions regarding the patterns observed here, the informal investigation reported here is meant to provide a basis for the generalizations made throughout the dissertation regarding the range of patterns that are observed throughout the data.

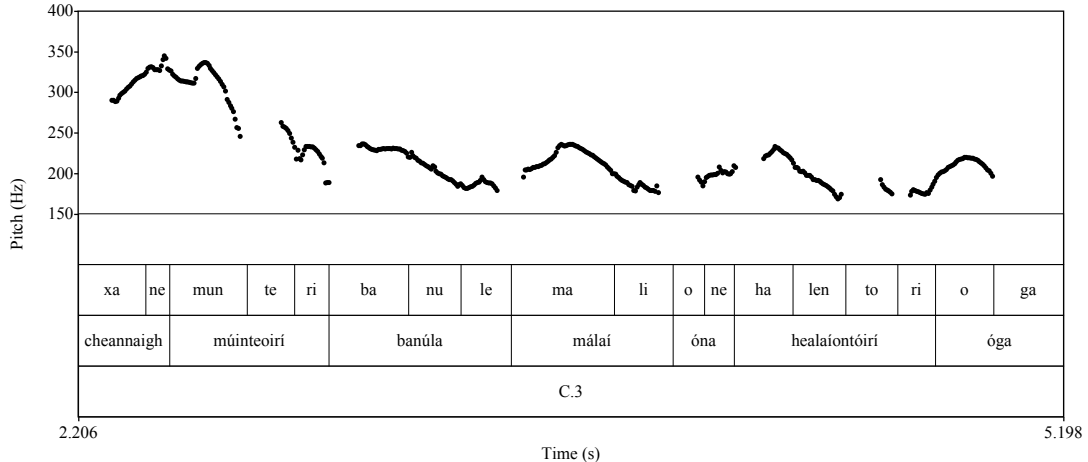
2.6.4 Speaker FF

The data from speaker FF were generally excluded from counts, although the data were examined along with the other data and are included in the database. The F0

contours for this speaker were different from those of the other speakers to such an extent that it was not possible to determine whether or not the speaker exhibited the same general patterns of pitch accent distribution, and whether the speaker provided a significant deviation from the speech of the other speakers or showed relatively minor differences in phonetic implementation.

While I do not have the resources to undertake a full analysis of FF's speech, I will note a few impressionistic observations. One main difference between the F0 contours for FF and those of the other speakers was the in a distinction between stressed and unstressed syllables at the word level. For FF, stressed syllables seem to consistently show a higher F0, while unstressed syllables consistently show a downtrend or decrease in F0.

(64) Pitch track for a VSOX sentence for FF



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As seen in this F0 contour, the stressed (initial) syllable of each lexical word is associated with an H peak, with a decrease in F0 in unstressed syllables. In the recordings, there is the strong impression that FF is emphasizing each word in the sentence. However, it is not possible without the analysis of other samples of FF's speech to determine whether this is characteristic of natural speech for FF (and thus

establishing a second pattern of pitch accent realization in CI), or whether the samples are an artefact of the experimental design. For the purposes of this study, I have not included FF's speech in counts or in the general analysis, though the samples are included in the database.

2.7 Conclusion

This chapter provided an overview and discussion of several topics in the phonetics and phonology in CI. While the focus of this dissertation is an investigation of prosodic structure and its relationship to syntactic structure, the primary source of evidence for these claims is the distribution of L-H and H-L pitch accents. In order to understand how to interpret the pitch tracks used to determine the locations of these pitch accents as will be discussed in subsequent chapters, it is necessary to have some understanding of how the details of the phonetic implementation of these accents provides information about the phonological distribution of these elements. To this end, the introduction of basic patterns in 2.2, the discussion of the properties of phonetic alignment in section 2.3 and the analysis of the phonological status of these pitch accents as epenthetic in section 2.4 were included to provide this information to the reader.

Section 2.5 was included in order to alert the reader to a pattern of verb deaccenting, where it has been shown that the L-H accent that is predicted to associate with verbs in finite clauses is optionally absent. I have proposed that the absence of this accent should not be taken as counter-evidence against the theory that will be developed in chapters 3, but rather can be accounted for under the assumption that there are factors that would prefer the verb to be unaccented under certain circumstances.

Finally, section 2.6 provided information about the representativity of the speakers and the data chosen to illustrate specific points throughout the dissertation. Section 2.6.1 showed that the six speakers produce the same basic pattern of pitch accent distribution in sentences of similar syntactic structure, while 2.6.2 provided a quantitative investigation of the realization of pitch accents in three environments (subject noun, subject adjective, noun in final DP), with the intention of showing that speakers, for the most part, converge on the same patterns. Section 2.6.3 summarized the results of section 2.6. Finally, section 2.6.4 provided a brief discussion of data from speaker FF, which were excluded from the analysis but which are available in the database.

CHAPTER 3

TONAL EVIDENCE FOR RECURSIVE PROSODIC PHRASING

3.1 Introduction

The goals of this chapter are two-fold. First, the chapter provides an overview of the distribution of tonal elements in Conamara Irish (CI), as based on recordings and pitch tracks from native speakers. I argue that the tonal prosody of CI can be given an insightful analysis under the assumption that intonational contours in CI are largely constituted of instances of two distinct tonal elements, L-H and H-L pitch accents. This sparse characterization of the tonal prosody of CI is consistent with work on other intonational languages, such as English (Pierrehumbert 1980).

The second goal of this chapter is to provide an analysis that accounts for the distribution of these elements under the framework of Match Theory (Selkirk 2009b, 2011). As discussed in chapter 1, Match Theory is an indirect reference theory of the syntax-phonology interface in which direct correspondence between syntactic constituents and prosodic phrases is called for by a family of correspondence constraints. Set within an Optimality Theoretic (OT) framework (Prince & Smolensky 1993/2004), the constraints are assumed to be violable and may interact with other constraints, as on prosodic well-formedness. In this chapter, I aim to show how this assumption of a close correspondence between syntax and prosody and the resulting recursive prosodic structure is necessary to account for the distribution of pitch accents in CI sentences.

The next three sections of this chapter are concerned with developing an analysis of the distribution of the pitch accents on the basis of prosodic structures that

would be predicted by the MATCH-PHRASE constraint defined in chapter 1. Section 3.2 provides an overview of the tonal properties of CI sentences: 3.2.1 illustrates the basic pattern, 3.2.2 provides an analysis for the distribution of L-H pitch accents, and 3.2.3 discusses the distribution of H-L pitch accents. Section 3.3 discusses structural evidence from finite embedded clauses, and 3.4, evidence from complex DPs, including adjectives (3.4.1), possessive constructions (3.4.2) and relative clauses (3.4.3).

In addition, section 3.5 takes up a discussion of the notion of non-minimality introduced in section 3.2.2, and introduces a puzzle regarding the behaviour of function words with respect to the creation of non-minimal φ domains in section 3.5.1. More specifically, it is observed that function words differ from lexical words by failing to trigger the formation of non-minimal phonological phrases (or words) when adjoined to phrases (or words) which are themselves minimal. Section 3.5.2 argues that this puzzle is best accounted for by refining the notion of “non-minimality” to differentiate between adjunctions involving function words and lexical words.

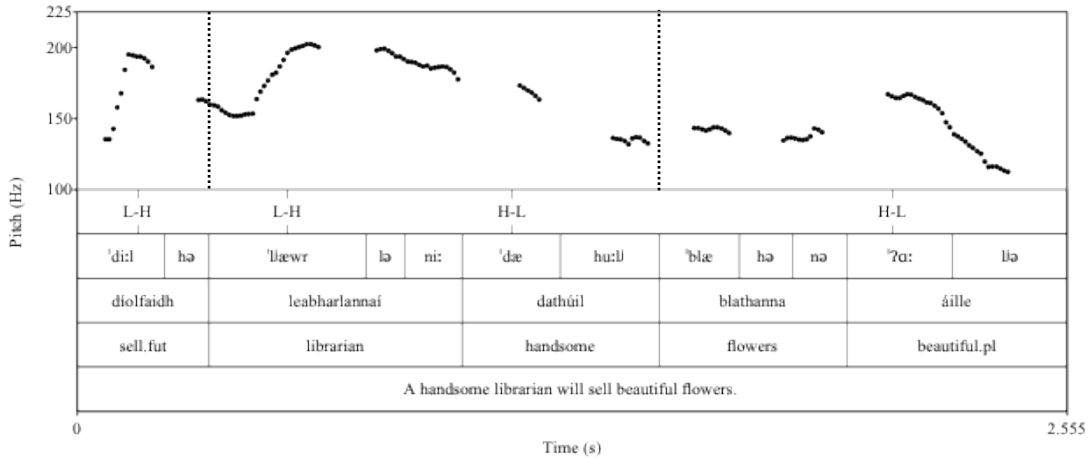
Section 3.6 concludes the chapter.

3.2 Tonal Cues to Prosodic Phrasing

3.2.1 Basic Patterns

As discussed in chapter 2, sentences in CI show a pattern of rises and falls, as evidenced by the distribution of two pitch accents, L-H and H-L. The following pitch track (repeater from chapter 2) shows the tonal pattern for a basic transitive VSO sentence, where S and O consist of noun-adjective sequences:

(1) Pitch track for a basic VSO sentence



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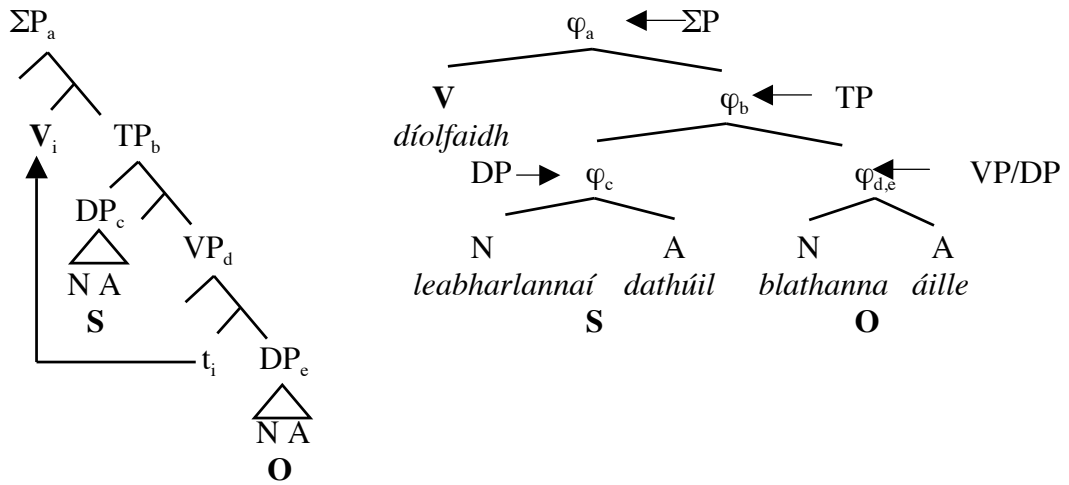
As discussed in chapter 2, rises (L-H pitch accents) appear on the verb (*diolfaidh* ‘sell.fut’) and the subject noun (*leabharlannaí* ‘librarian’), while falls (H-L pitch accents) appear on the subject’s modifying adjective (*dathúil* ‘handsome’) as well as on the object adjective (*áille* ‘beautiful.pl’). The object noun (*blathanna* ‘flowers’) is not associated with a pitch accent. For further details on the phonetic and phonological properties of the pitch accents, see chapter 2.

As discussed in chapter 1, Match Theory predicts a close relationship between syntactic structure and prosodic phrasing. The correspondence between the structure of a basic VSO sentence such as that in (1) and the predicted recursive prosodic structure is repeated below from chapter 1:^{31, 32}

³¹ The syntactic representation in (2)a is simplified, and does not include projections like *vP* that I will later assume to be relevant to the analysis. This simplification is for illustrative purposes, and should not be taken as a proposal for the syntactic structure of these sentences.

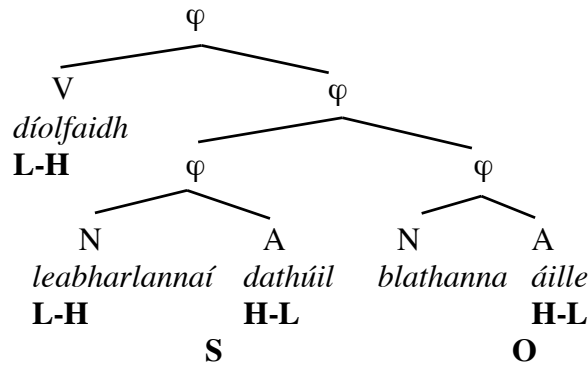
³² Note that the representation in (2) does not take into account possible one-word syntactic phrases like AP. These one-word φ constituents can be ruled out on the basis of prosodic markedness constraints on binarity, which are high-ranked in CI.

(2) a. Syntactic Representation b. Recursive Prosodic Representation



Taking the tonal transcription from the pitch track in (1), the pitch accents (L-H and H-L) are distributed as follows with respect to the recursive prosodic structure given in (2)b:

(3) Distribution of tonal elements in a VSO sentence, as based on (1)



In the next sections, I will provide evidence that the distribution of L-H and H-L pitch accents in CI reflect prosodic phrasing, and that their distribution can be described with reference to the presence of recursive prosodic structure.

3.2.2 Distribution of L-H Pitch Accents: Evidence for Non-minimal φ

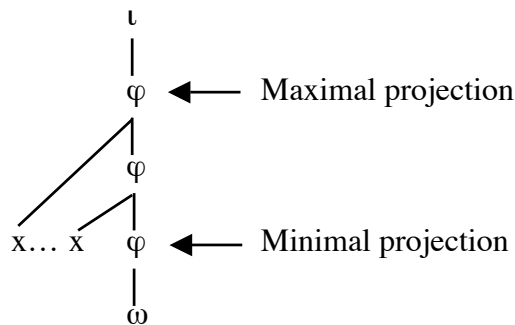
In recent work, Ito and Mester (2006, 2010, to appear) propose that domain-sensitive phonological processes can target one of three types of prosodic category, provided that prosodic structure may be recursive: phonological constraints may reference the general category (e.g. φ), the minimal category in a recursive structure (φ_{Min}), or the maximal category in a recursive structure (φ_{Max}). In order to account for the distribution of L-H pitch accents in CI, I will show that this proposal is on the right track, but that a three-way distinction is insufficient. I propose to extend this theory to include another natural class of recursion-based subcategories, the class of non-minimal projections:

- (4) $\kappa_{\text{Non-min}}$: If κ is a prosodic category of a certain type, a $\kappa_{\text{Non-min}}$ is a κ that dominates another κ .

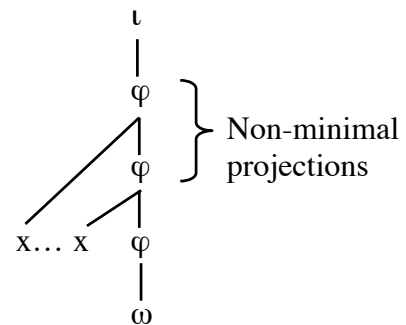
In prosodic representations, $\kappa_{\text{Non-min}}$ refers to the class of subcategories that are recursive: those that dominate a prosodic category of the same type. This is illustrated schematically below, in comparison with the maximal/minimal distinction:

- (5) Natural classes of recursion-based prosodic subcategories

a. Maximal/minimal projections of φ



b. Non-minimal projections of φ



Note that the class of non-minimal projections includes the maximal projection, and is distinguishable from the maximal projection only when there is more than one layer of recursive prosodic structure.

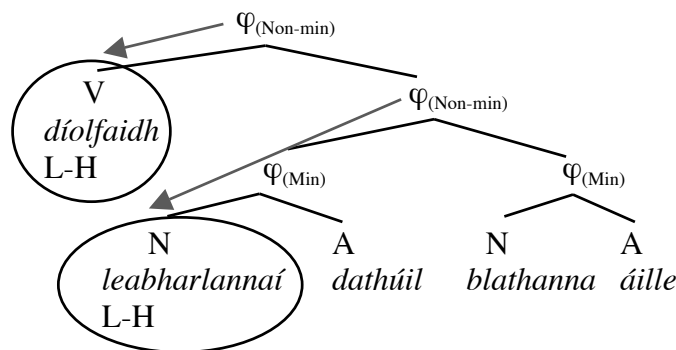
I argue that the constraints responsible for determining the distribution of L-H accents references the prosodic subcategory $\varphi_{\text{Non-min}}$.³³ More specifically, I propose that L-H accents in CI associate with the stressed syllable of the leftmost word of every $\varphi_{\text{Non-min}}$:

(6) Distribution of L-H pitch accents in CI

L-H pitch accents associate with the stressed syllable of the leftmost prosodic word in every $\varphi_{\text{Non-min}}$.

This can be illustrated with a closer examination of the distribution of L-H accents, as illustrated in the structure given in (3) for the sentence in (1). In this sentence, there are two $\varphi_{\text{Non-min}}$, each with an L-H accent associated with the leftmost word of the prosodic constituent:

(7) Distribution of L-H accents on the leftmost word in every $\varphi_{\text{Non-min}}$



This analysis correctly accounts for the absence of an L-H accent on the leftmost word of the object DP, *blathanna* ‘flowers’, which is at the left edge of φ_{Min} but not of $\varphi_{\text{Non-min}}$. In addition, the adjectives *dathúil* ‘handsome’ and *áille* ‘beautiful’, are similarly not

³³ See chapter 2 for a discussion of the phonological analysis of the distribution of L-H accents.

associated with an L-H accent because they are at the right, rather than left edge, of φ_{Min} and $\varphi_{\text{Non-min}}$.

Further evidence for the above analysis of the distribution of L-H pitch accents in CI comes from the investigation of sentences with different syntactic structures. Because the presence of recursive prosodic structure is predicted to be directly dependent on the complexity of the syntactic structure from which it is derived, the distribution of L-H pitch accents will also be dependent on this structure. As a first illustration, I will discuss sentences which extend the basic VSO structure discussed above by adding arguments (e.g. indirect objects), adjuncts or adverbs which result in an increase in the depth of embedding in the prosodic structure, and a resulting increase in the number of $\varphi_{\text{Non-min}}$.

In Irish, indirect objects, adjuncts and adverbs follow the object, as shown in the following sentence (Ó Siadhail 1989: 205) :

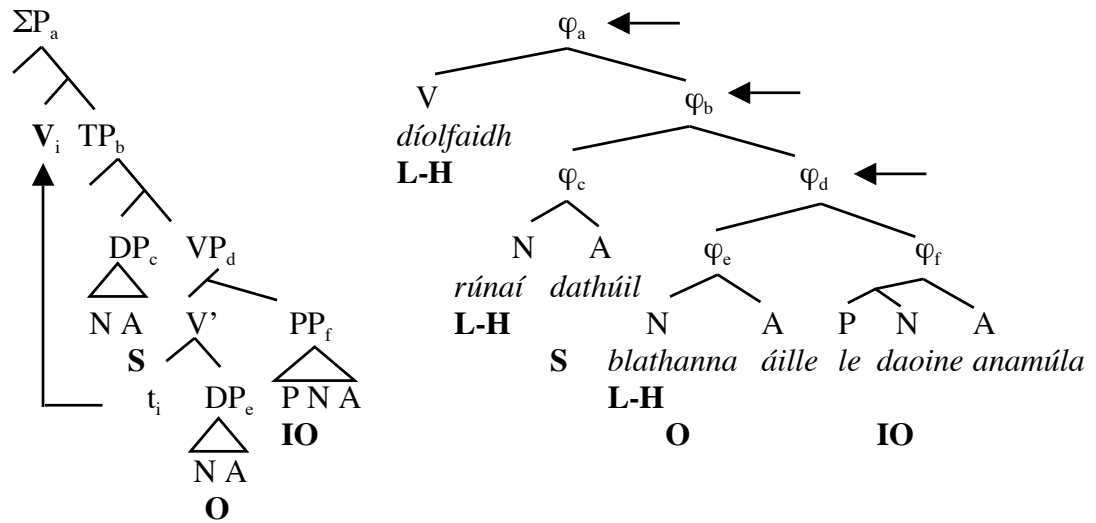
(8) Labhrann Mícheál Gaeilge le Cáit go minic.
speak.pres Mícheál Irish with Cáit often
'Mícheál often speaks Irish to Cáit.'

When an indirect object is added to a VSO sentence, the number of recursive layers of φ is predicted to increase upon the addition of each additional argument. This can be illustrated by adding an indirect object to the sentence in (1):

(9) Díolfaidh rúnaí dathúil blathanna áille le daoine anamúla
sell.FUT secretary handsome flowers beautiful.PL to people animated.PL
'A handsome secretary will sell beautiful flowers to animated people.'

The syntactic representation and the predicted corresponding recursive prosodic representation (as based on MATCH-PHRASE) is as follows:

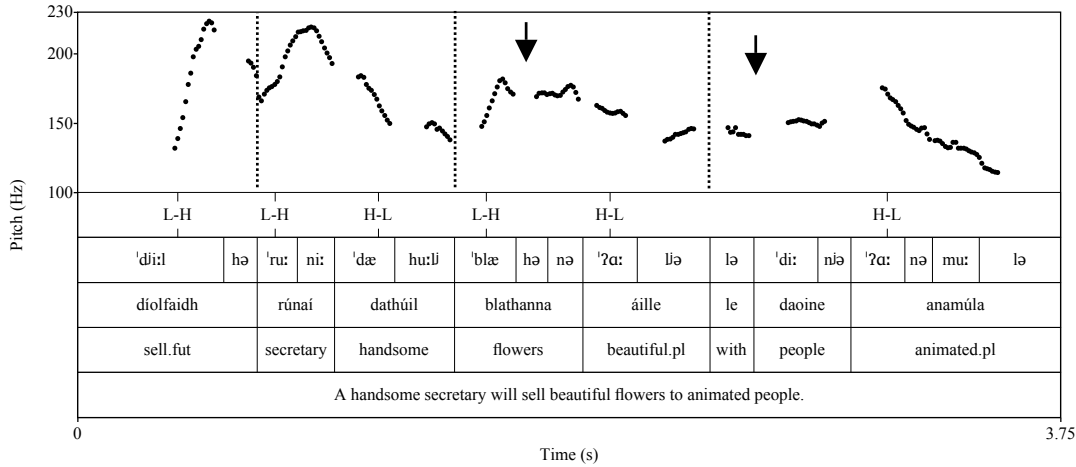
(10) a. Syntactic Representation b. Recursive Prosodic Representation



As indicated by the arrows, the prosodic representation in (10)b shows three recursive layers of φ as opposed to the two that were posited for the VSO sentence. The analysis developed above predicts that L-H pitch accents will fall on the leftmost word of each of the $\varphi_{\text{Non-min}}$, namely, the verb (*díolfaidh* ‘sell.fut’), the subject noun (*rúnaí* ‘secretary’), and, in this case, the object noun (*blathanna* ‘flowers’), which was not associated with a pitch accent in the basic VSO sentence. Instead, the leftmost (prosodic) word of the indirect object (*daoine* ‘people’)³⁴ is predicted not to be associated with an L-H accent, because it is leftmost in φ_{Min} but not $\varphi_{\text{Non-min}}$. This pattern can be seen in the pitch track for the sentence in (9):

³⁴ L-H accents appear to associate with the leftmost stressed syllable, meaning that it will fall on the leftmost lexical word, and skip over function words, such as determiners and prepositions, which are not prosodic words themselves. See section 3.5 for further discussion of the behaviour of function words.

(11) VSO sentence with indirect object



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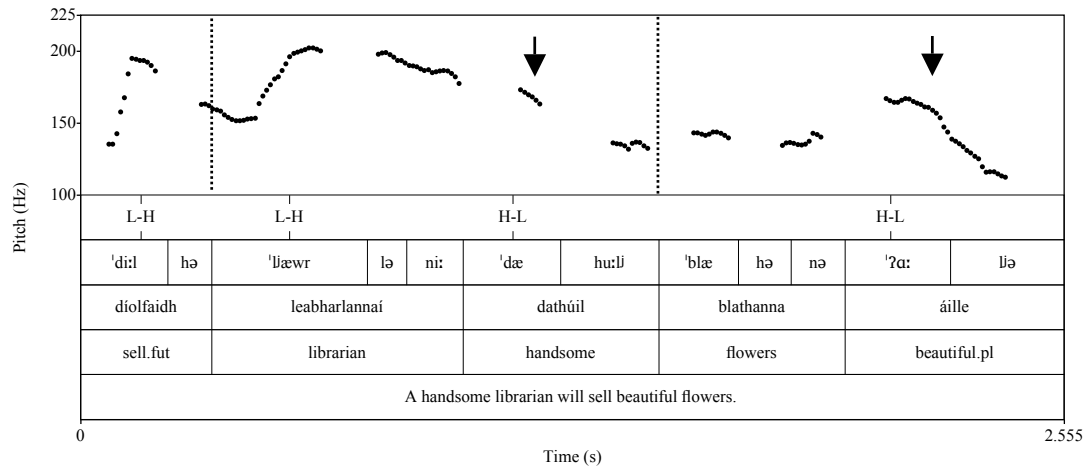
As predicted, this pitch track shows a clear L-H accent on the first syllable of the verb, subject noun, and the object noun, but no pitch rise on the leftmost prosodic word of the indirect object *daoine* ‘people’ that might be taken as evidence of an L-H pitch accent.³⁵

3.2.3 Distribution of H-L Pitch Accents: Right-edge demarcation

As seen in the pitch track for the basic VSO sentence in (1) (repeated below in (12)), both the adjective modifying the subject (*dathúil* ‘handsome’) and that modifying the object (*áille* ‘beautiful’) are associated with a H-L pitch accent:

³⁵ Note that sequences of two H tones (as in the subject of the above sentence) are often downstepped, resulting in a second H tone that is lower than the one preceding it and obscuring the expected H tone plateau.

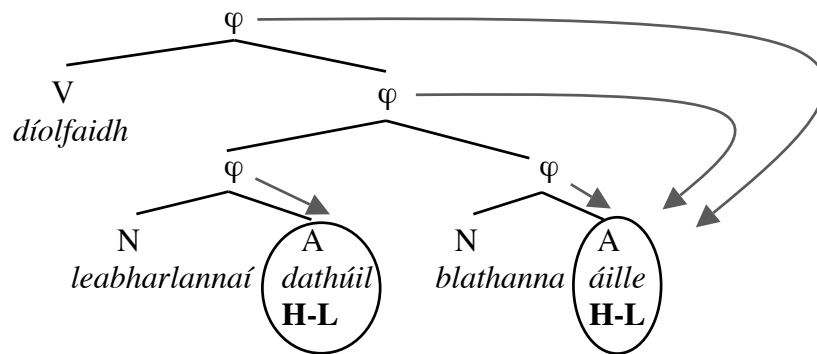
(12) Pitch track for a basic VSO sentence



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Like the distribution of L-H pitch accents, I propose that the distribution of H-L accents in CI provides information about to prosodic phrasing. In particular, H-L pitch accents appear to mark the right edge of the general category φ , as can be seen in the following prosodic representation for the above sentence:

(13) Distribution of H-L pitch accents as rightmost in φ

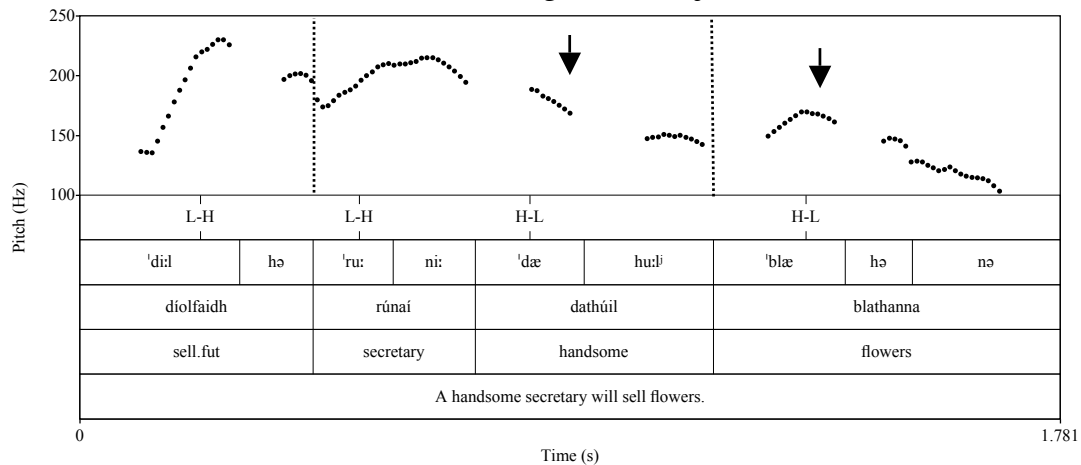


Because both adjectives are rightmost in at least one φ , this generalization correctly predicts the presence of an H-L accent on each of these words.

An alternative analysis compatible with the above sentence would be to analyse the distribution of the H-L accent as associating with the rightmost word in the prosodic subcategory φ_{Min} , as proposed by Ito and Mester (to appear) to be the domain of accent

culminativity in Japanese. However, additional data indicate that this is not the case. For instance, in a VSO sentence where the object is a single noun as opposed to a noun-adjective sequence as above, there is an H-L accent at the right edge of the sentence even though the final noun does not form a φ of its own (see discussion in chapter 4 about the role of prosodic markedness constraints, including binarity). This can be seen in the following pitch track, where both the subject adjective and the object noun are marked with an H-L accent:³⁶

(14) Pitch track for VSO sentence with single word object



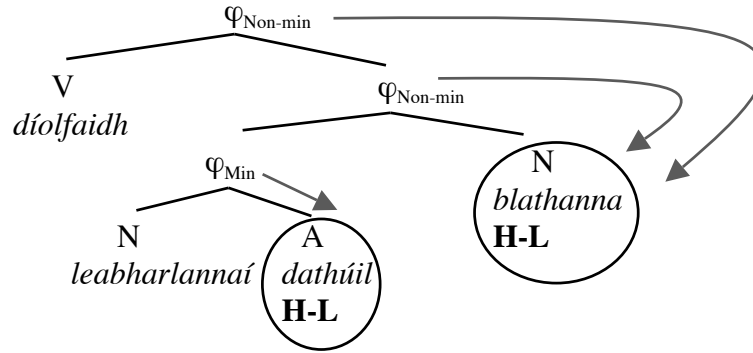
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Because single-word syntactic phrases do not form φ s of their own in CI,³⁷ the prosodic structure of (14) is as follows, where the object noun adjoins to the φ dominating the noun and adjective of the subject. This creates a $\varphi_{\text{Non-min}}$ which dominates the object noun, but does not result in the creation of a minimal φ at the right edge of the sentence:

³⁶ Note that the apparent rise on the first syllable of *blathanna* ‘flowers’ is due to segmental effects from the [bl] cluster. The H-tone peak falls on the vowel, and the subsequent fall in pitch on the following unstressed syllables is indicative of falls in CI. See discussion in Chapter 2 regarding the phonetic implementation of L-H and H-L accents in CI.

³⁷ Note that it is not plausible to assume that the object noun in (15) is dominated itself by a φ_{Min} . As will be discussed in chapter 4, φ constituents in CI appear to adhere to a strict binarity requirement, such that φ s must dominate at least two prosodic words.

(15) Distribution of H-L pitch accents as rightmost in $\varphi_{\text{Non-min}}$



If H-L accents associated only with φ_{Min} , we would be unable to account for the presence of an H-L accent on the object noun in sentences with this structure.

3.3 Structural Evidence I: Embedded Finite Clauses

Finite embedded clauses in Irish show the VSOX word order found in other types of finite clauses in Irish, including main clauses and relative clauses (see sections 3.2 and 3.4.3). Finite embedded clauses are introduced by one of the following complementizers, which agree with the verb for tense and which also occur in negative forms (Ó Siadhail 1989: 253-254):

(16) Clausal complementizers in Irish

	Non-past	Past
Affirmative	<i>go</i> (+eclipsis)	<i>gur</i> (+lenition)
Negative	<i>nach</i> (+eclipsis)	<i>nar/nár</i> (+lenition)

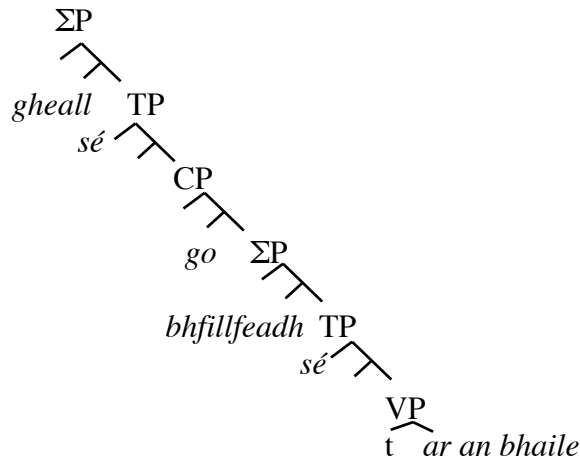
Examples are as follows (McCloskey 1996a: 50, 52):

- (17) a. Gheall sé go bhfillfeadh sé ar an bhaile
 promised he C return.COND he on home
 'He promised that he would return home.'
- b. Creidim gur fhill sé ar an bhaile
 believe.PRES.1SG C.PST returned he on home
 'I believe that he returned home.'

- (18) a. Creidim nach *bhfillfidh* sé choíche
 believe.PRES.1SG C.NEG return.FUT he ever
 ‘I believe that he will never return.’
 b. Creidim nár *fhill* sé choíche
 believe.PRES.1SG C.NEG.PST returned he ever
 ‘I believe that he never returned.’

The structure of sentences with a single finite embedded clause is as follows, where the finite embedded clause shares the same properties as the matrix clause and is introduced by one of the complementizers above:

(19) The structure of a sentence with a finite embedded clause



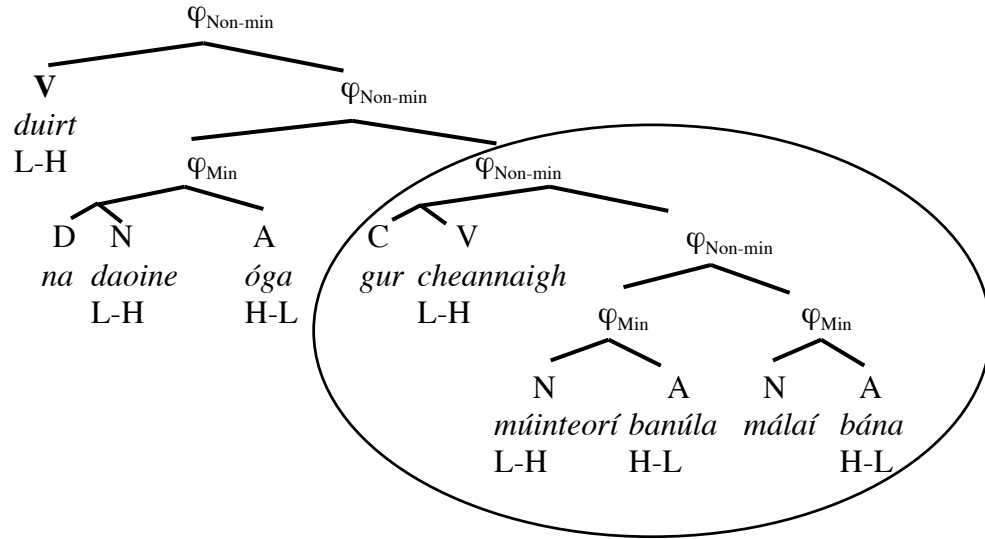
Consider the following sentence, a sentence with a finite embedded clause with VSO structure and where each DP is binary (N+Adj):

- (20) Dúirt na daoine óga _{CP}[gur cheannaigh múinteoirí banúla málaí
 said the.PL people young.PL C.PST bought teachers lady-like.PL bags
 bána]
 white.PL
 ‘The young people said that lady-like teachers bought white bags.’

MATCH-PHRASE predicts that this sentence will have the following prosodic structure, with the indicated L-H pitch accents and H-L pitch accents:³⁸

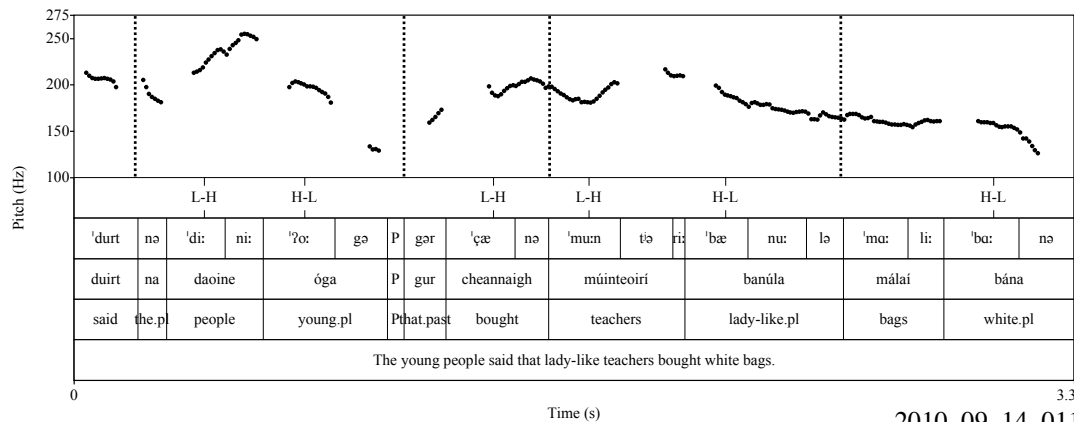
³⁸Functional heads like determiners and complementizers are phonologically realized as weak, unstressed elements that adjoin to material to their right. The prosodic structure

(21) Prosodic representation of a sentence with a finite embedded clause



The following pitch track illustrates the predicted pattern, where, within the embedded clause, both the verb (*cheannaigh* ‘bought’) and the first word of the subject (*múinteoirí* ‘teachers’) are associated with L-H pitch accents. Note that the verb of the main clause (*duirt* ‘said’) is deaccented in this case (see chapter 2 for discussion).

(22) Pitch track for sentence with a finite embedded clause (all DPs are binary)



The distribution of pitch accents in the embedded finite sentence is identical to that found in the VSO sentence, as in (1).

assumed in (21) for the determiner and complementizer is simplified for illustrative purposes only, and will be discussed further in section 3.5.

3.4 Structural Evidence II: Complex DPs

Match Theory makes the strong prediction that prosodic structure directly reflects syntactic constituency by default. In this chapter, I have argued that tonal L-H and H-L pitch accents are used in CI to demarcate the left and right edges of recursive φ ($\varphi_{\text{Non-min}}$) and of the general category φ , respectively. In this section, I consider evidence from three types of complex DP structures, DPs with one or more adjectives, possessive constructions, and relative clauses. I show that the distribution of tonal elements in these structures support the above analysis of the distribution of these tonal units in CI as a direct reflection of the syntactic structure.

3.4.1 Adjectives

Adjectives in Irish follow the noun, as can be seen in the following examples:³⁹

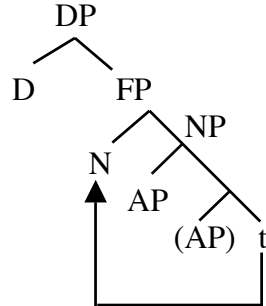
- (23) a. blathanna bána
flowers white.PL
b. blathanna bána áille
flowers white.PL beautiful.PL
'(beautiful) white flowers'
- (24) a. málaí bána
bags white.PL
b. málaí bána móra
bags white.PL big.PL
'(big) white bags'

I assume a noun-raising approach to adjective ordering in Irish, where the noun raises out of NP to the head of a functional projection to the left of the adjective or adjectives

³⁹ The example in (24)b runs counter to ordering predictions for Irish adjectives (SIZE > COLOR), as discussed in Sproat & Shih (1991: 587). My speakers accepted this ordering, but were only asked to read the sentence, and not to give naturalness or preference judgments. The ordering given here should not necessarily be taken as counter-examples to work on adjective ordering in Irish.

(following Cinque 1994; Longobardi 2001; for Irish, Guilfoyle 1988; Sproat & Shih 1991):⁴⁰

(25) The structure of DPs with one or more APs

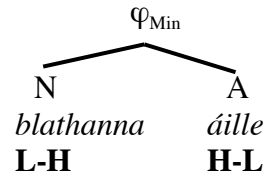
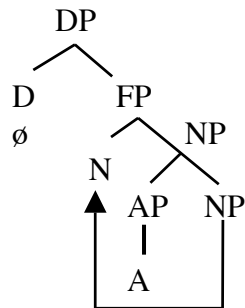


Given this structure, MATCH-PHRASE predicts that a DP that consists of a noun and one adjective will form a single φ , as was assumed in the previous section:

(26) The structure of DPs with a single adjective

a. Syntactic structure

b. Predicted prosodic structure

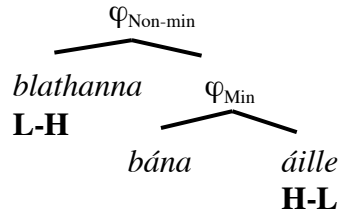


This rise-fall pattern was seen with the DP subjects and objects in the pitch tracks in (1), (11), and (14).

For DPs with two adjectives, MATCH-PHRASE predicts the following prosodic representation, which preserves the constituency between the two AP:

⁴⁰ See also Rouveret (1994) and Roberts (2005) for Welsh (cf. Willis (2006)) and Stephens (1993) for Breton.

(27) Prosodic representation of a DP with two adjectives

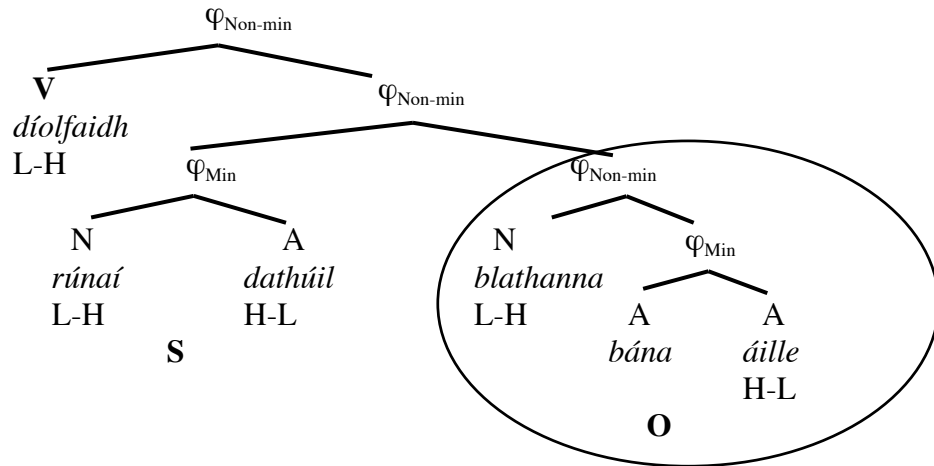


A DP of this type may be placed in object position of a VSO sentence, as in the following example:

(28) *Díolfaidh rúnaí dathúil blathanna bána áille*
 sell.FUT secretary handsome flowers white.PL beautiful.PL
 ‘A handsome secretary will sell beautiful white flowers.’

In a sentence of this type, the rise on the leftmost word is predicted to surface even when the structure is sentence-final. This can be seen in the predicted prosodic representation:

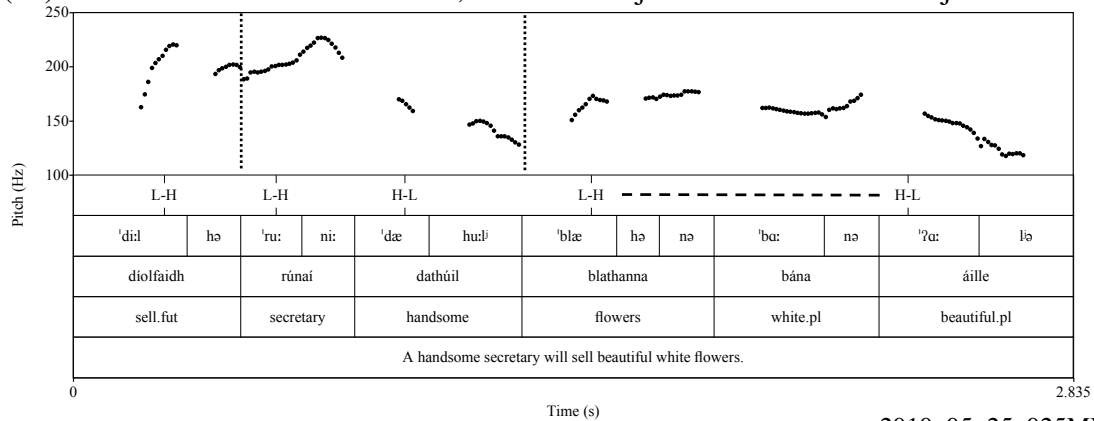
(29) Prosodic representation of complex DP object (N-Adj-Adj) in a VSO sentence



This pattern is attested in the following pitch track, where the DP with two adjectives is placed in object position. As seen in this pitch track, there is an L-H accent associated with the object noun *blathanna* ‘flowers’ and an H-L accent associated with the

sentence-final adjective *áille* ‘beautiful.pl’. The middle adjective *bána* ‘white.pl’, in contrast, is not associated with a pitch accent and shows a relatively steady pitch:⁴¹

(30) Pitch track for a VSO sentence, where the object is a DP with two adjectives



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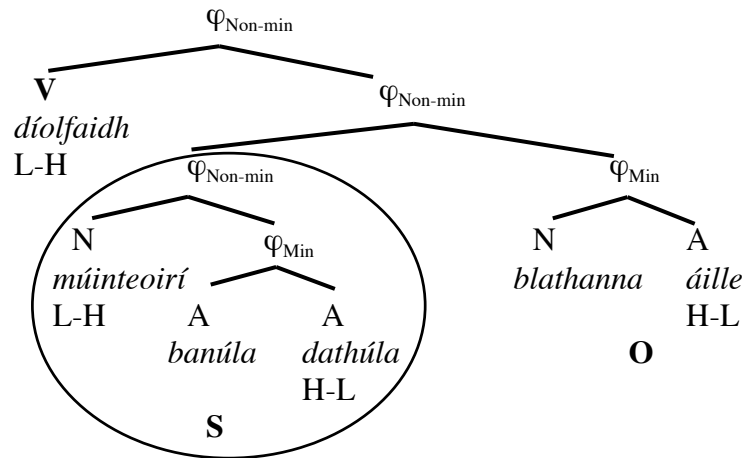
Similarly, this pattern is predicted to surface sentence-medially when the DP with two adjectives is placed in subject position, as in the following sentence:

(31) Cheannaigh _{DP}[múinteoirí banúla dathúla] málaí bána
 bought teachers lady-like.PL handsome.PL bags white.PL
 ‘Handsome, lady-like teachers bought white bags.’

As shown in the prosodic representation, the middle adjective is leftmost in φ_{Min} , even in sentence-medial position:

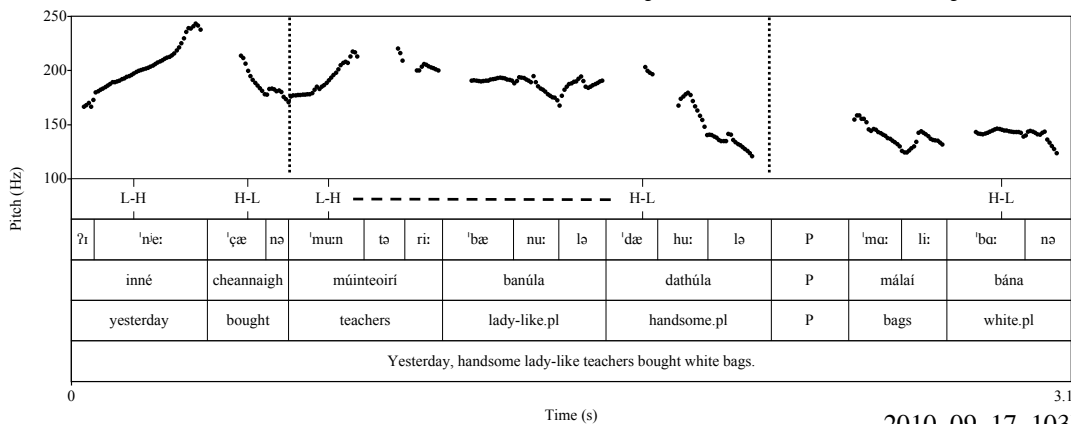
⁴¹ On *bána* ‘white.pl’, The initial dip in F0 can be attributed to segmental influence from [b] and the final rise in F0 to the presence of the glottal stop at the beginning of *áille* ‘beautiful.pl’.

(32) Prosodic representation of complex DP subject (N-Adj-Adj) in a VSO sentence



This can be seen in the following pitch track, where there is an L-H accent associated with the first word of the subject (*múinteoirí* ‘teachers’) and an H-L accent associated with the second adjective (*dathúla* ‘handsome.PL’). The adjective (*banúla* ‘lady-like.PL’) is not associated with a pitch accent, and as a result, has a relatively steady high pitch level, as interpolated from the two surrounding H tones:

(33) Pitch track for a VSO sentence, where the subject is a DP with two adjectives

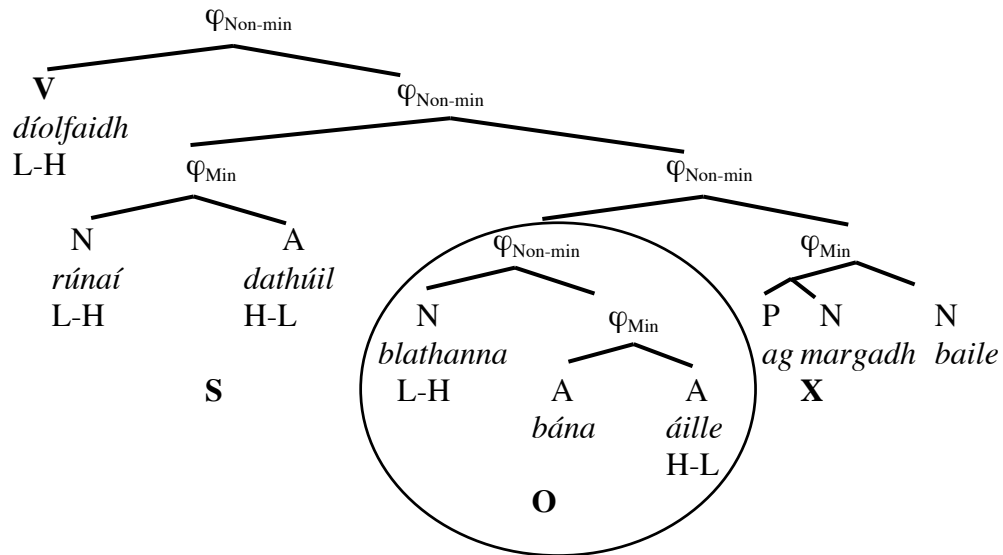


Finally, this same pattern can also be seen when an object with two adjectives is followed by an adjunct, as in the following sentence:

- (34) Cheannaigh múinteoirí banúla _{DP}[málaí bána móra] ag margadh baile
 bought teachers lady-like.PL bags white.PL big.PL at market town
 ‘Lady-like teachers bought big, white bags at a town market.’

The prosodic structure for this sentence predicts that the same pattern will surface even when the complex DP is non-final:

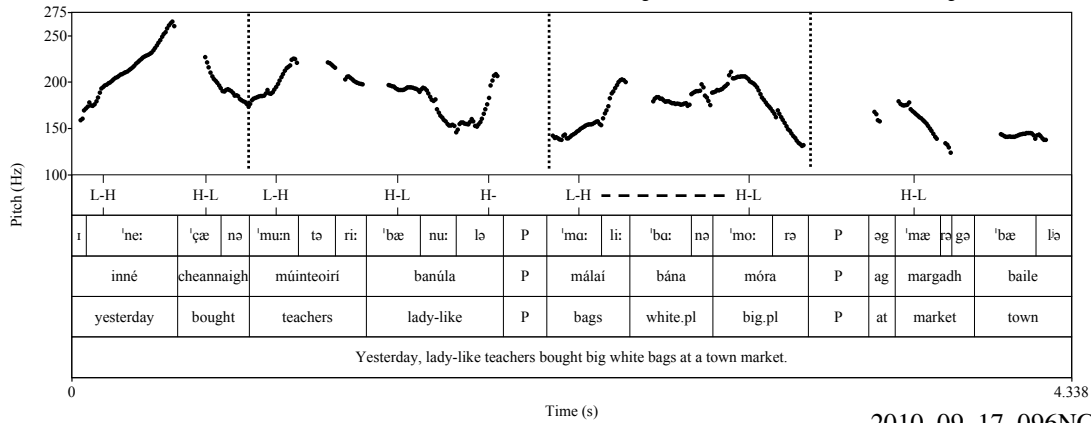
- (35) Prosodic representation of complex DP (N-Adj-Adj) in a VSOX sentence



This is illustrated by the following pitch track, where there is an L-H accent on the first word of the object (*málaí* ‘bags’), an H-L accent on the second adjective (*móra* ‘big.PL’), and a steady high pitch on the first adjective (*bána* ‘white.PL’):⁴²

⁴² This pitch track has two properties worthy of notice. First, note the presence of an H-boundary tone at the right edge of the subject. This boundary tone was observed in some cases for some speakers, but appears to be optional. Nothing more will be said here about this boundary tone, leaving the analysis of this tone to future research. Secondly, note that the H-L accent on the adjunct (*ag margadh baile* ‘at a town market’) falls on the noun rather than the adjective. This can likely be attributed to the speaker treating this sequence as a compound rather than a noun-adjective sequence.

(36) Pitch track for a VSOX sentence, where the object is a DP with two adjectives



The distribution of tonal elements in these sentences supports the analysis developed above where prosodic structure preserves the structure given in the syntax: the distribution of L-H and H-L pitch accents, including the behaviour of tonally unspecified words, is correctly predicted by the recursive prosodic representation predicted by Match Theory. Further, these examples show that an alternative analysis, where the H-L accent would appear only at the right edge of a φ that is final in the sentence, is untenable.

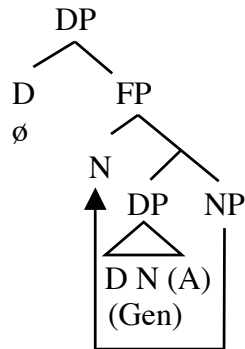
3.4.2 Possessives

In Irish, possessive constructions show the possessed object followed by the possessor in the genitive case:

- (37) a. blathanna na ndaoine
flowers the.GEN people.GEN
'the flowers of the people'
- b. blathanna na ndaoine anamúla
flowers the.GEN people.GEN animated.PL.GEN
'the flowers of the animated people'

The syntactic structure of a possessive construction as in (37)b is shown in (38), where I assume an N-raising analysis as for the adjective structures discussed in the previous section (Guilfoyle 1988; McCloskey 2006):

(38) The structure of a possessive DP

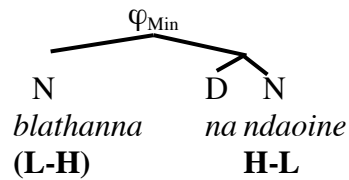
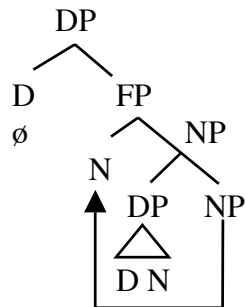


As in the adjective constructions discussed above, the structure in (38) predicts that for a possessive construction where both DPs consist of a single noun (e.g. (37)a, *blathanna na ndaoine* ‘flowers of the people’), the two nouns will form a single φ , with an obligatory H-L accent on the second noun as in DPs with a noun-adjective sequence:⁴³

(39) The structure of DPs with a single adjective

a. Syntactic structure

b. Predicted prosodic structure



As for DPs consisting of a noun-adjective construction, the presence of the L-H accent on the leftmost word *blathanna* ‘flowers’ depends on the structure in which it is placed.

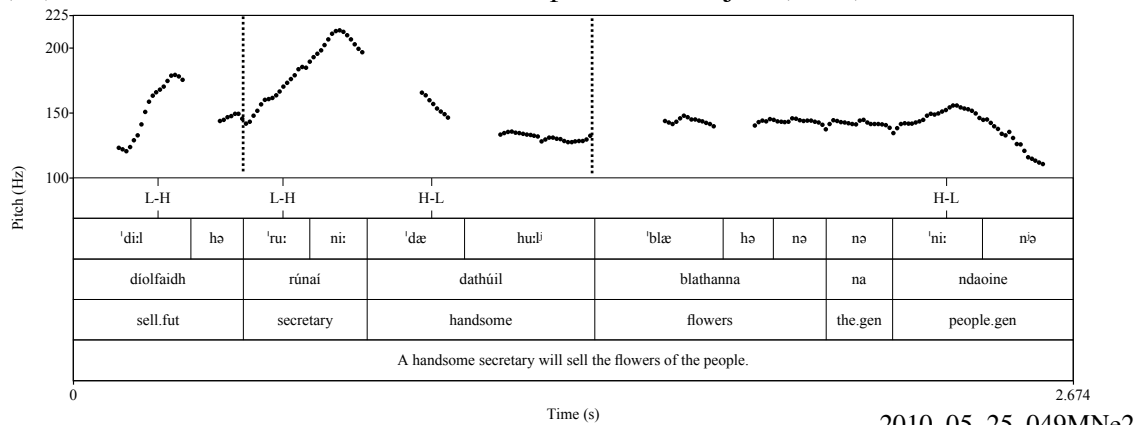
⁴³ Note that this structure requires the assumption that single-word syntactic phrases are not parsed as φ in CI. This appears to be generally true throughout the language; see chapter 4 for discussion.

In object position of a VSO sentence, such as the following, no L-H accent is predicted because the DP is sentence-final, and thus leftmost only in φ_{Min} :

(40) *Díolfaidh rúnaí dathúil [blathanna na ndaoine]*
 sell.FUT secretary handsome flowers the.GEN.PL people.GEN
 ‘A handsome secretary will sell the flowers of the people.’

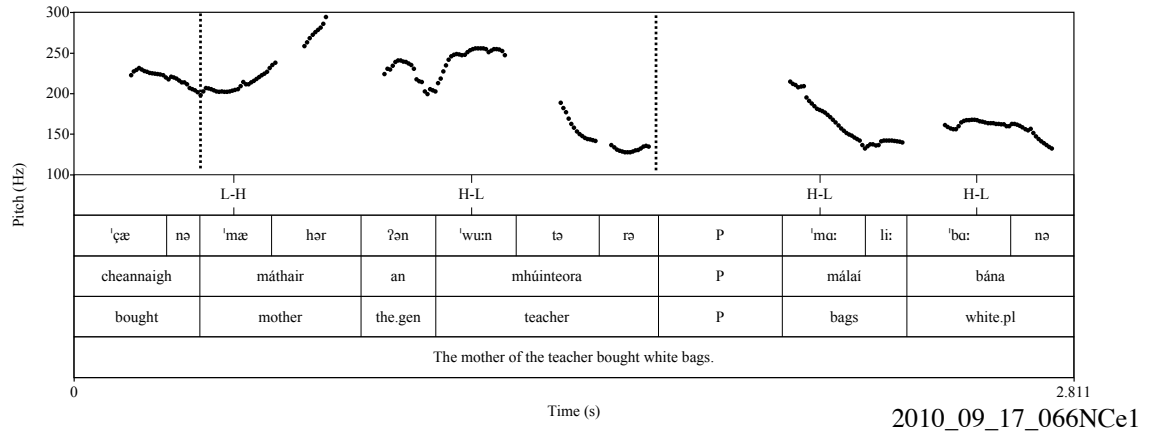
As seen in the pitch track for this sentence, there are L-H pitch accents on the verb (*díolfaidh*) and the subject noun (*rúnaí*), but not on the leftmost noun in the possessive phrase (*blathanna*):

(41) Pitch track for a VSO sentence with a possessive object (N+N)



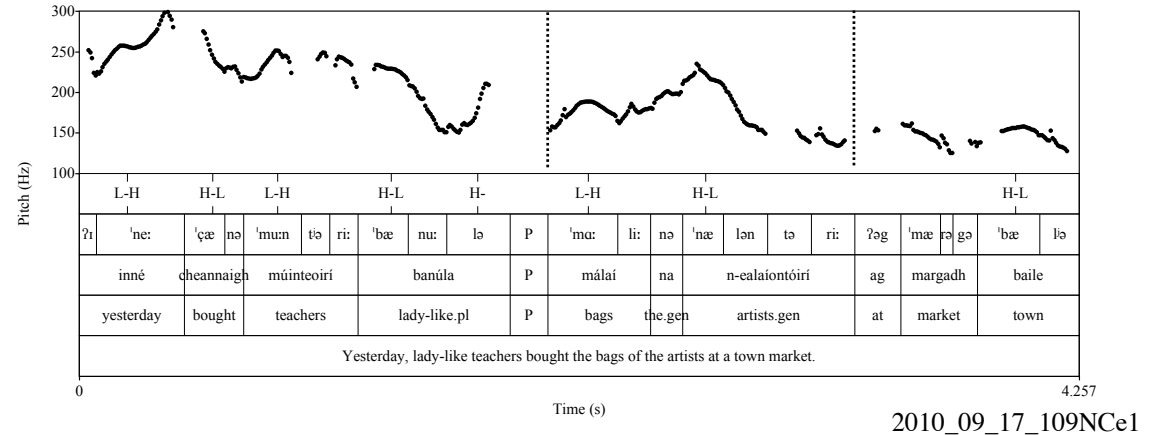
When placed in subject position of a VSO sentence, a possessive structure of this type is predicted to be associated with an L-H accent, as it is now leftmost in $\varphi_{\text{Non-min}}$. This can be seen in the following pitch track:

(42) Pitch track for a VSO sentence with a possessive subject (N+N)⁴⁴



Similarly, this can be seen for a possessive construction in object position, when followed by an adjunct:⁴⁵

(43) Pitch track for a VSOX sentence with a possessive object (N+N)



A comparison between simple N-Adj constructions (*múinteoirí banúla* 'lady-like teachers') and N-N possessive constructions (*málaí na n-ealaíontóirí* 'the bags of the artists') illustrates that the generalization about the distribution of the pitch accents is cross-categorical, and not restricted to any syntactic category type. As these examples show, the nested phrase organization in the syntax predicts, via MATCH-PHASE, the

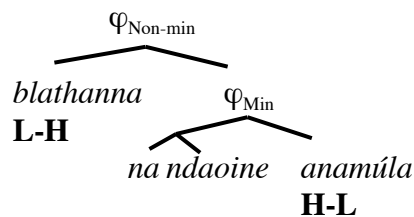
⁴⁴ It is unclear why there is a fall on *málaí* 'bags' in this sentence.

⁴⁵ Note that the H peak on the H-L accent on *n-ealaíontóirí* appears to be upstepped with respect to the previous accent, as opposed to downstepped, as is typical. This might be indicative of a pragmatic use for upstep, though this is not investigated here.

recursive prosodic structure that is required to explain the presence or absence of the L-H pitch accent. The rest of this chapter shows several more examples where the same basic tonal pattern is found for structures where the prosodic structure is predicted to be the same, even though the structures differ in terms of syntactic categories.

A further comparison between DPs with adjectives and possessive constructions comes from examining possessive constructions where the genitive-marked DP consists of a noun-adjective sequence, as in (37)b (*blathanna na ndaoine anamúla* ‘the flowers of the animated people’). In this type of construction, the two words in the possessed DP are predicted to form a φ which is embedded within the larger φ for the possessive construction:

(44) Prosodic representation of a DP with a possessive construction (N+N-Adj)



As for DPs with two adjectives (as discussed in the previous section), this structure predicts that an L-H pitch accent will be associated with the leftmost word of the DP (whether or not it is in sentence-final position) and that an H-L accent will be associated with the rightmost word of the DP. The noun *ndaoine* ‘people.GEN’ is predicted to show a relatively high pitch level, as interpolated from surrounding H tones.

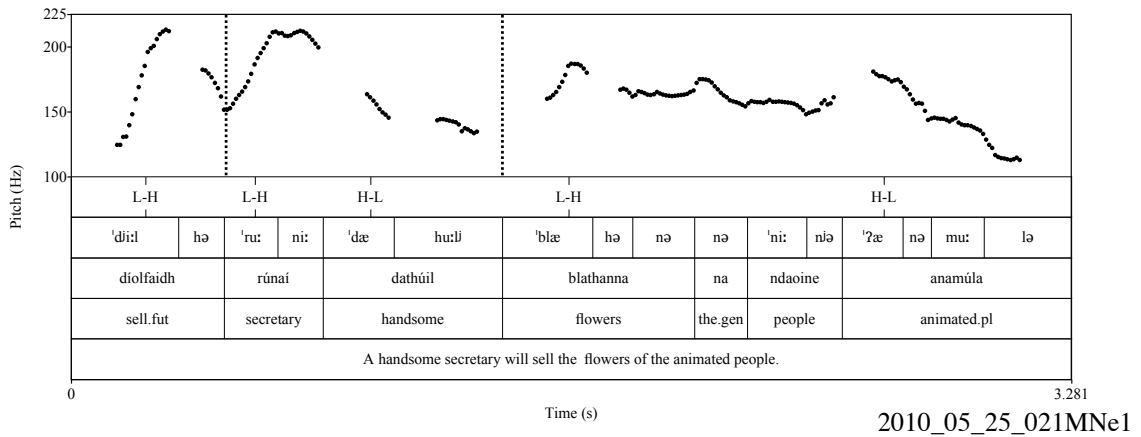
This pattern can be seen in a VSO sentence where this possessive structure is in object position, as in the following sentence:

(45) Díolfaidh rúnaí dathúil _{DP}[blathanna na ndaoine anamúla].
 sell.FUT secretary handsome flowers the.GEN.PL people.GEN animated.PL
 ‘A handsome secretary will sell the flowers of the animated people.’

In this sentence, MATCH-PHRASE predicts that the syntactic constituency of the object DP containing the possessive structure will be preserved, as was seen for two-adjective DPs in object position.

This pattern can be seen in the following pitch track, where the H tone from the L-H accent on *blathanna* is extended through *ndaoine*. The pitch falls with the H-L accent on the final word of the sentence, *anamúla*.⁴⁶

(46) Pitch track for VSO sentence with possessive object (N+N-Adj)



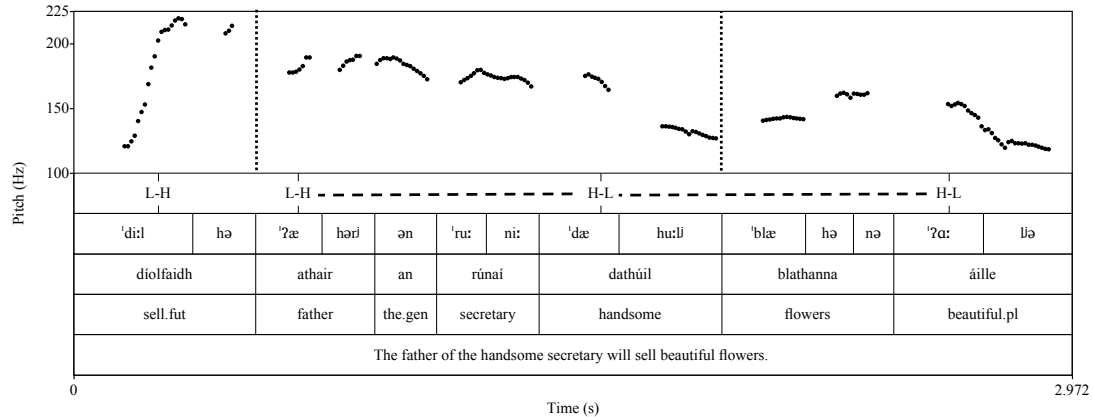
Alternatively, if the possessive construction is placed in subject position, Match Theory predicts that the structure of the possessive will be preserved, and that the tonal pattern noted above will surface, as was the case for N-Adj-Adj constructions. For example, consider the following VSO sentence, with a similar possessive construction in subject rather than object position:

⁴⁶ In this sentence, the extension of the H tone is obscured by declination of pitch following the H tone target on *blathanna* and by a fall in F0 on the determiner *na* ‘the.PL.GEN’. However, the motivation for this slight perturbation on the determiner is unclear. In addition, the H tone target on *anamúla* is not downstepped with respect to the previous H tone (on *blathanna*), giving the impression that the pitch level increases on *anamúla*.

- (47) *Díolfaidh [athair an rúnaí dathúil] blathanna áille*
 sell.FUT father the.GEN secretary.GEN handsome.GEN flowers beautiful.PL
 ‘The father of the handsome secretary will sell beautiful flowers.’

The following pitch track illustrates the predicted pattern:

- (48) Pitch track for VSO sentence with subject possessive construction⁴⁷



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This pattern is further illustrated by sentences with possessive constructions that are in object position, but which are followed by an adjunct, as in the following sentence:

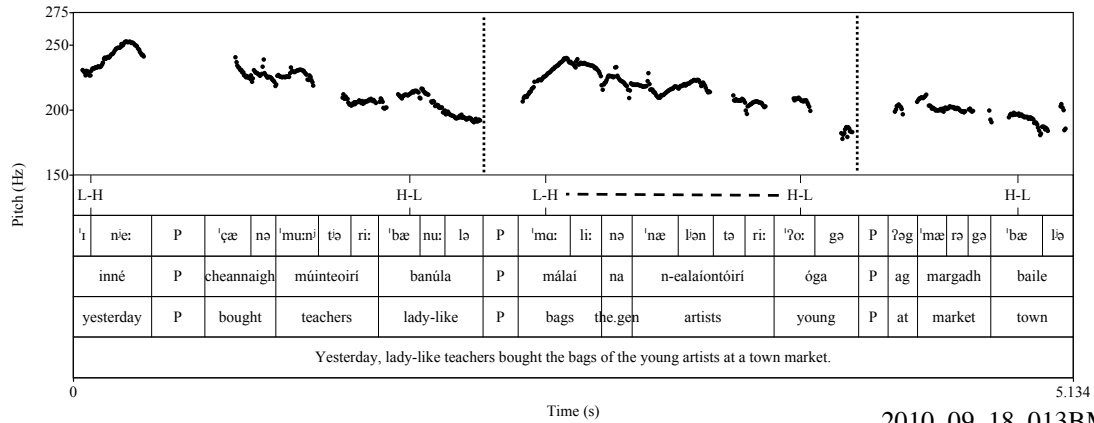
- (49) *Cheannaigh múinteoirí banúla_{DP} [málaí na n-ealaíontóirí óga] ag*
 bought teachers lady-like bags the.GEN artists young at
 margadh baile
 market town
 ‘Lady-like teachers bought the bags of the young artists at a town market.’

In this sentence, the complex DP object is non-final, as when in subject position. The following pitch track illustrates the expected pattern, with extension of the H tone from the L-H accent on *málaí* to the H tone from the H-L accent on *óga*:⁴⁸

⁴⁷ Note that in this recording, the L-H on the subject noun *áthair* ‘father.GEN’ is obscured by the word-initial glottal stop. Note also that the direct object *blathanna* ‘flowers’ shows a gradual rise from the L on *dathúil* to the H on *áille*.

⁴⁸ For this speaker, the first part of the sentence (the dislocated adjunct *inné*, as well as the verb and subject) is organized differently from the sentences discussed so far in this chapter. For the purpose of the discussion here, the differences in the first part of the sentence may be ignored.

(50) Pitch track for VSOX sentence with object possessive construction



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As before, this pattern is identical to that found for a non-final DP object with two adjectives.

This section illustrates how the analysis for the distribution of L-H pitch accents and falls developed in section 3.2 for main clauses in CI can be expanded to account for the distribution of tonal pitch accents in two types of complex DPs, adjective and possessive constructions. For each case, I showed how the distribution of L-H pitch accents and falls was predictable based on the structure of the construction, as well as its position within a sentence. This finding supports Match Theory, which predicts that prosodic structure will show recursivity as a result of the close relationship between syntactic and prosodic structure.

3.4.3 Relative Clauses

This section introduces the prosodic properties of relative clauses in CI. Relative clauses will be especially informative in this discussion because their structure combines a clausal domain with a nominal domain. While MATCH-PHRASE, as we have

seen, is not sensitive to the labels syntactic categories,⁴⁹ we expect to see pressure from this constraint to preserve both the clausal constituent (the relative clause) and the DP constituent (the head noun of the relative clause and its clausal complement). In this section, I present only a preliminary discussion of the prosody of relative clauses, but this topic will be discussed in more detail in chapter 5.

In Irish, relative clauses are traditionally described as being one of two types, referred to as “direct” and “indirect” relative clauses in Irish grammar (see e.g. McCloskey 1985; Ó Siadhail 1989: 311-319; Mac Congáil 2004: 176-188; The Christian Brothers 2004: 143-146; Stenson 2008: 1-10, 25-35). Among other differences, direct relatives have a gap in subject or object position (like English relative clauses) and indirect relatives have a resumptive pronoun (McCloskey 1985). In this chapter, I discuss the prosody of direct relative clauses only.

Direct relative clauses are introduced by the relative complementizer *a* followed by a clause with basic VSOX structure as in other finite clauses in Irish, excluding the head noun (McCloskey 1996a). The complementizer *a* triggers lenition⁵⁰ of the initial consonant of the verb (where applicable), which immediately follows the particle. This can be seen in the following examples, where (51) show relatives with a gap in subject position, and (52) show relative clauses with a gap in object position; lenition is indicated by italics (examples from Mac Congáil 2004: 176):

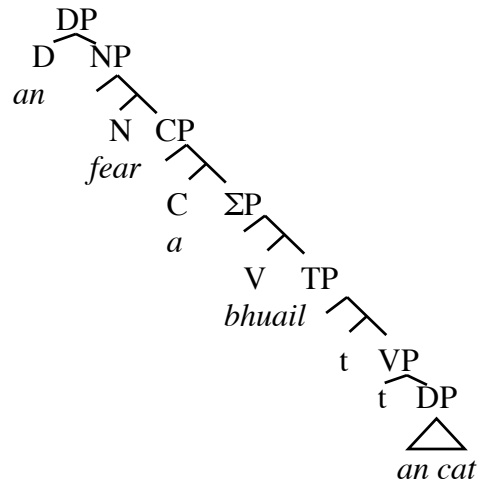
⁴⁹ This may seem like a strong claim. Further evidence that MATCH-PHRASE treats syntactic nodes equally will be argued for throughout this dissertation, particularly in chapter 5.

⁵⁰ Here, the term *lenition* refers to the Irish grammatical mutation and not to the phonological process in general.

- (51) a. an fear a *bhuail* an cat
 the man COMP hit the cat
 ‘the man who hit the cat’
- b. an bhean a ólann an tae
 the woman COMP drinks the tea
 ‘the woman who drinks the tea’
- c. na daoine a imíonn abhaile go luath
 the.PL people COMP go home early
 ‘the people who go home early’
- (52) a. an chulaith a *cheannaigh* mé
 the suit COMP bought I
 ‘the suit that I bought’
- b. an t-airgead a *chaithim* gach lá
 the money COMP spend.1SG every day
 ‘the money that I spend every day’
- c. an cluiche a *fheicfid* amárach
 the game COMP see.FUT.1PL tomorrow
 ‘the game that we will see tomorrow’

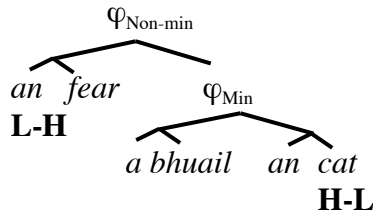
Relative clauses share the same syntactic properties as main clauses (McCloskey 1996a), and it can be assumed that the clauses have the same basic structure. The following illustrates a (simplified) syntactic structure for a relative clause where the subject of the relative clause is the head noun, as in (51)a:

(53) The structure of a subject-headed relative clause⁵¹



Match Theory predicts that the above syntactic representation will be preserved in the prosodic representation through the use of recursive prosodic categories. For a sentence with a relative clause with the structure in (53), MATCH-PHRASE predicts the following prosodic representation:

(54) Prosodic representation of a relative clause (single- ω head, object)



This pattern can be seen for the VSO sentence in (55), where a relative clause with the above structure is in object position:⁵²

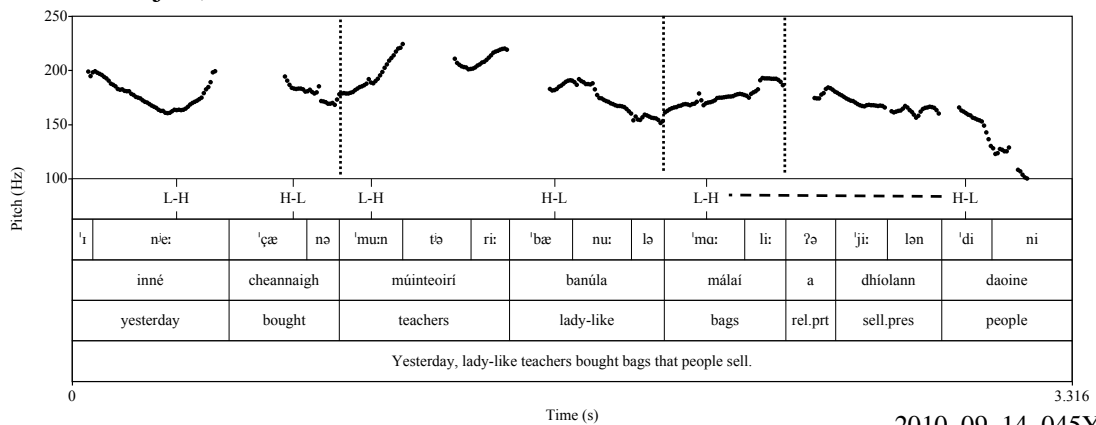
⁵¹ Presumably, the noun would raise to FP in this case, as it does in other DPs. For simplicity, I have not shown this movement here.

⁵² Note that the relative clause in this sentence is headed by its object rather than its subject. I did not control for this in the data collected for this dissertation, but possible differences between the two structures should be investigated in future research.

(55) Cheannaigh múinteoirí banúla _{DP}[málaí _{CP}[a dhíolann daoine]]
 bought teachers lady-like bags C sell.PRES people
 ‘Lady-like teachers bought bags that people sell.’

The pitch track in (56) illustrates the predicted pattern, where there is an L-H accent on the object noun that heads the relative clause (in this case, *málaí* ‘bags’) and an H-L accent on the final word in the relative clause (in this case, the subject of the relative clause, *daoine* ‘people’). As in the examples seen so far, the word that is leftmost in φ_{Min} but not $\varphi_{\text{Non-min}}$ is unspecified for tone, and receives its tonal specification through interpolation from surrounding tones. In this case, the verb *dhiolann* ‘sell.PRES’ is realized with a relatively high pitch from the interpolation of surrounding H tones:

(56) Pitch track for VSO sentence with object relative clause (single-word head noun and subject)



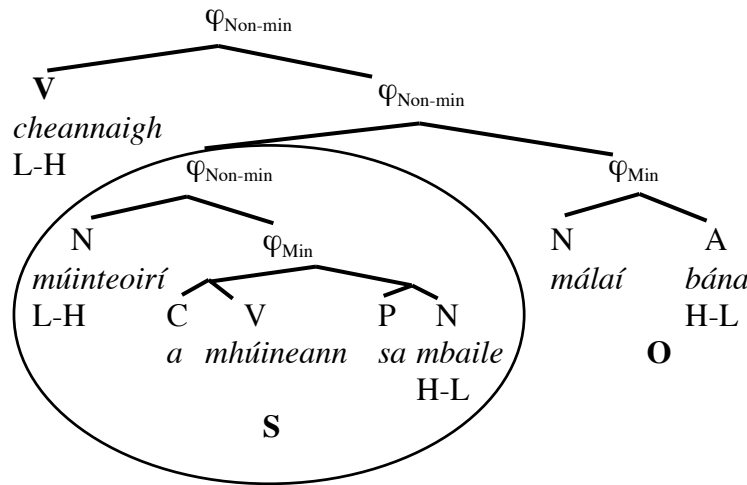
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In sentence-medial position, the same pattern should be visible. For example, consider the following sentence, which has a relative clause of the same structure in subject rather than object position:

(57) Cheannaigh _{DP}[múinteoirí _{CP}[a mhúineann sa mbaile]] málaí bána
 bought teachers C teach.PRES in.the home bags white.PL
 ‘Teachers who teach in the home bought white bags.’

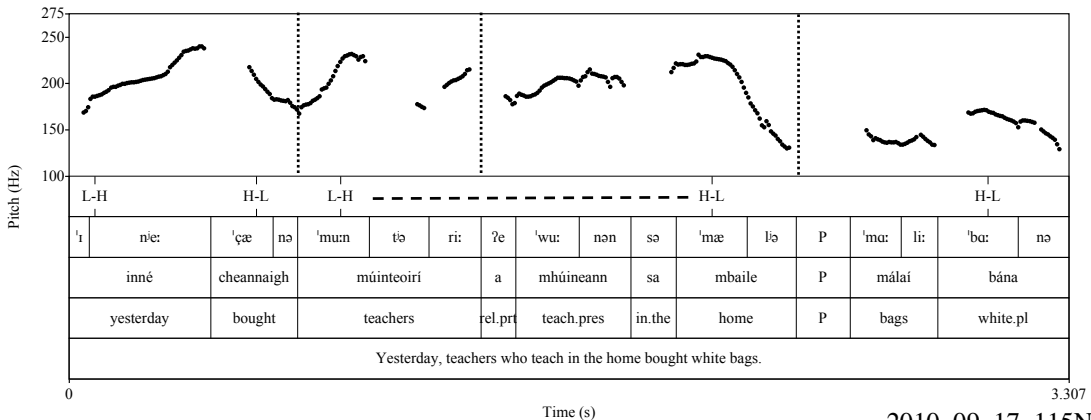
MATCH-PHRASE predicts that the structure of this sentence will be realized with the following prosodic representation (note that this is identical to the representation in (32) for sentences with complex DP constructions in subject position):

(58) Prosodic representation of possessive subject in a VSO sentence



This pattern may be seen in the following pitch track:

(59) Pitch track for VSO sentence with subject relative clause (single- ω head and adjunct)⁵³



In this pitch track, the H tone extends throughout the relative clause, as predicted from the prosodic representation.

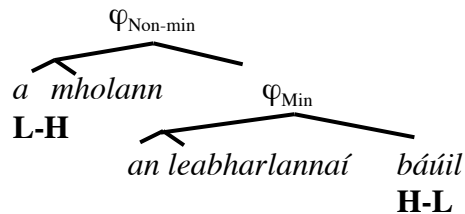
⁵³Because the H-L on *mbaile* is clause-final, it is not downstepped with respect to the previous H tone, a pattern seen commonly at the ends of sentences.

A further illustration of the role of MATCH-PHRASE in defining prosodic structure can be seen in the pitch track for the following sentence, which adds a modifying adjective inside a relative clause of the same structure as in (53):

- (60) Cheannaigh an bhean_{DP} [leabhar_{CP} [a mholann_{DP} [an leabharlannaí
 bought the woman book C praise.PRES the librarian
báúil]]
 sympathetic
 ‘The woman bought a book that the sympathetic librarian praises.’

Because the DP subject of the relative clause is now a binary phrase (*leabharlannaí báúil*, N+Adj), we expect that the DP will form its own φ in the prosody. As can be seen in the following prosodic representation of the relative clause, MATCH-PHRASE predicts that the verb will associate with an L-H pitch accent and that an H-L pitch accent will appear on the adjective:

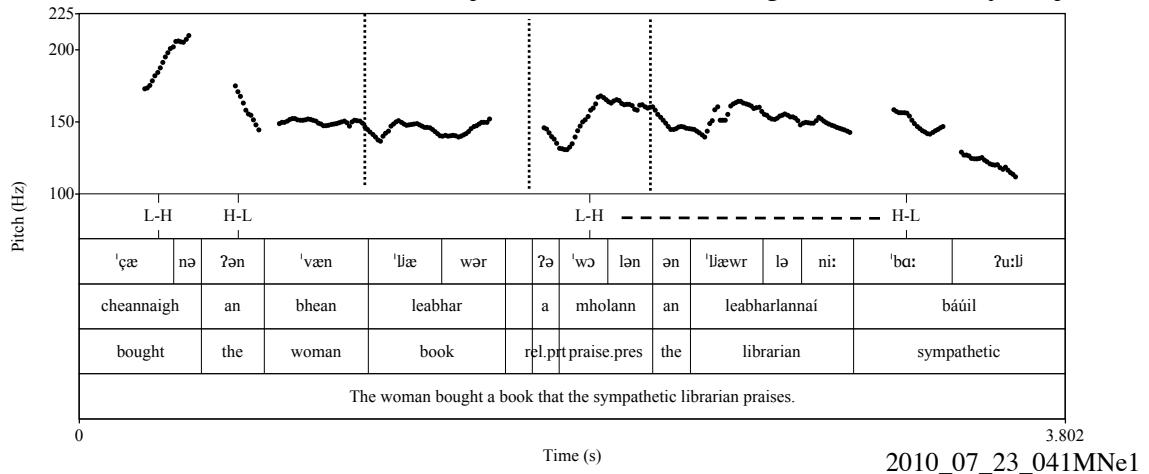
- (61) Prosodic representation of a relative clause (single- ω head, binary subject)



This pattern can be seen in the following pitch track for the sentence in (60):⁵⁴

⁵⁴ The dip in pitch between the verb and subject of the relative clause may be attributed to segmental interference from the segment [l] as well as to the presence of the determiner *an*.

(62) Pitch track for sentence with object relative clause (single- ω head, binary subject)



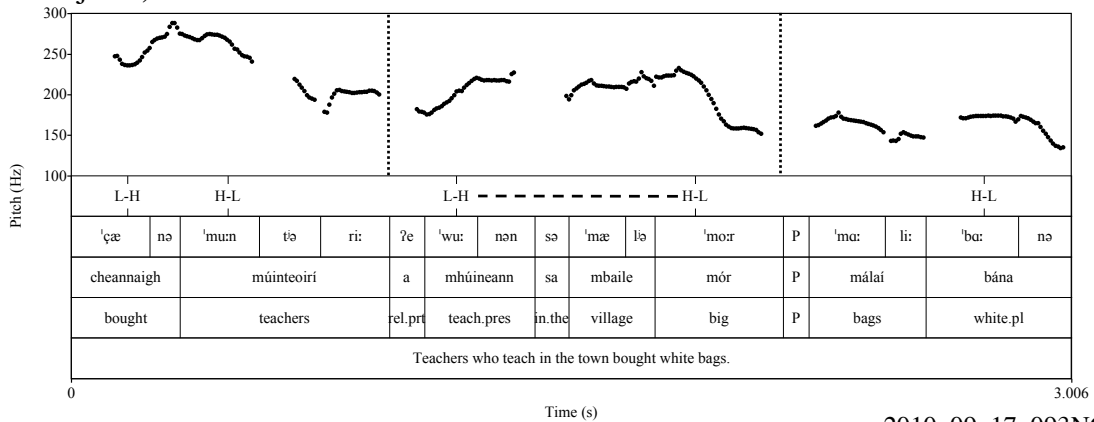
Note that in this example, the object (*leabhar* ‘book’), which is the head of the relative clause, is phrased together with the verb and the subject of the main clause, rather than with the relative clause, as Match Theory would predict. As will be discussed in chapters 4 and 5, purely prosodic constraints may interact with MATCH constraints to produce prosodic representations that are non-isomorphic with syntactic structure. This is especially common for structures where MATCH constraints would call for the adjunction of a sequence of single prosodic words to a prosodic structure: in relative and other types of embedded clauses, the verb may (as above, and as predicted by Match Theory) phrase together with the material inside the relative clause to its right, or it may alternatively phrase together with material to its left, such as the head noun of the relative clause. Because the verb is never binary itself, embedded clauses are especially prone to this type of non-isomorphic phrasing. An analysis of the interaction of prosodic markedness constraints with MATCH-PHRASE will be discussed in further detail in chapter 4, and further discussion of the interaction of prosodic constraints in relative clauses can be found in chapter 5.

This pattern is also found sentence-medially, as in the following sentence where a relative clause with the same structure is in subject position:

(63) Cheannaigh_{DP} [múinteoirí_{CP} [a mhúineann sa mbaile mór]] málaí bána
 bought teachers C teach.PRES in.the village big bags white.PL
 ‘Teachers who teach in the town bought white bags.’

As seen in the following pitch track, the relative clause in subject position shows the predicted pattern: an L-H accent on the verb (*mhúineann* ‘teach.pres’), an extension of the H tone through the noun of the adjunct DP (*mbaile* ‘town’), and an H-L accent on the adjective of the adjunct DP (*mór* ‘big’):

(64) Pitch track for VSO sentence with subject relative clause (single- ω head, binary adjunct)



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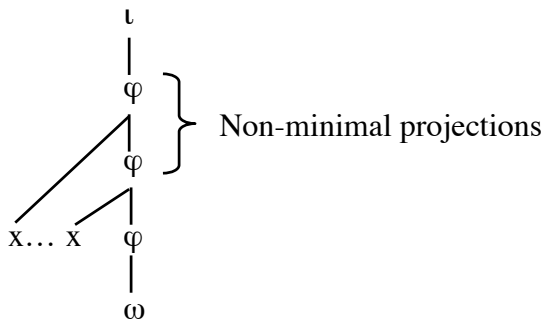
As in the previous example of the relative clause in object position, the head noun (*múinteoirí* ‘teachers’) phrases together with the preceding prosodic word (the verb *cheannaigh* ‘bought’) in order to form a binary φ , resulting in a violation of MATCH-PHRASE. See chapters 4 and 5 for further discussion.

3.5 Defining Prosodic Subcategories

3.5.1 A Puzzle: Function Words and Non-Minimal φ

In the previous sections of this chapter, I have argued that the distribution of the two pitch accents was indicative of prosodic phrasing: L-H accents fall on the leftmost word of $\varphi_{\text{Non-min}}$ and H-L accents on the rightmost word of any φ . The prosodic constituent $\varphi_{\text{Non-min}}$ was defined as any φ that dominated at least one other φ , as below:

(65) Non-minimal projections of φ



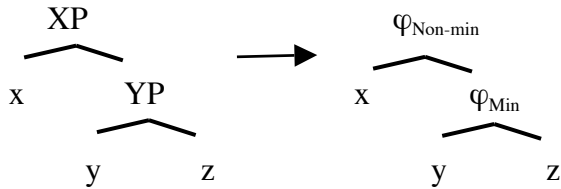
In that discussion, I assumed that $\varphi_{\text{Non-min}}$ were created as a result of the recursive prosodic structure created in satisfaction of the MATCH-PHRASE constraint as defined in chapter 1, which I repeat below:

(66) MATCH-PHRASE: Suppose there is a syntactic phrase (XP) in the syntactic representation that exhaustively dominates a set of one or more terminal nodes α . Assign one violation mark if there is no phonological phrase (φ) in the phonological representation that exhaustively dominates all and only the phonological exponents of the terminal nodes in α .

Under this definition, all phonologically overt terminal nodes are taken into account in the evaluation of MATCH-PHRASE, such that it is predicted that the prosodic component will call for a new φ for every distinct set of terminal nodes that is exhaustively dominated by at least one syntactic phrase. For example, for an abstract structure like the following, where XP and YP represent syntactic phrases and $\langle x,y,z \rangle$ phonologically

overt terminal nodes, MATCH-PHRASE would predict a prosodic structure with a $\varphi_{\text{Non-min}}$ dominating a φ_{Min} :

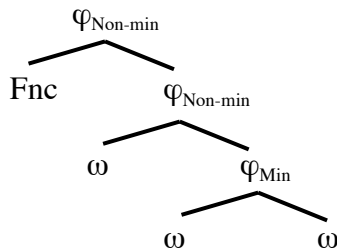
(67) Hypothetical syntax-prosody mapping by MATCH-PHRASE



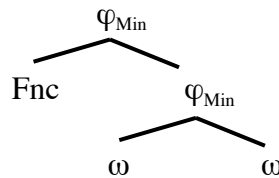
However, this is not always the case: there is evidence that in syntactic phrases headed by function words, the minimal/non-minimal status of the φ which corresponds to the functional projection is the same as the minimal/nonminimal status of the φ that corresponds to the phrasal sister of the function word. For example, the prosodic structures in (68) illustrate the structures resulting from the adjunction of a function word to $\varphi_{\text{Non-min}}$ and φ_{Min} . In either case, the prosodic category of the dominating node is identical to that of the node to which the function word adjoins:

(68) Adjunction of a function word to φ

a. Adjunction to $\varphi_{\text{Non-min}}$

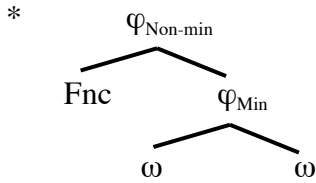


b. Adjunction to φ_{Min}



In contrast, the predicted structure as in (67) is not found when the adjoining element is a function word. This structure is only attested as a result of the adjunction of lexical words. The unattested configuration can be seen in (69):

(69) Adjunction of a function word to φ : Unattested prosodic structure



Evidence for the structures in (68) can be seen by comparing the pitch tracks of sentences where syntactic phrases headed by function words are found in the larger context of sentences, where they may be adjoined to both minimal and non-minimal φ .

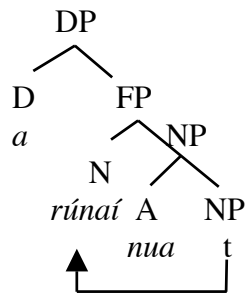
For example, consider a DP with overt determiner, noun, and adjective, like the following:

- (70) a *rúnaí* *nua*
 his/her secretary new
 ‘His/her new secretary’

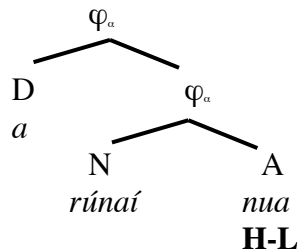
This is an example of a syntactic phrase headed by the function word *a*, a possessive determiner. This DP has the syntactic structure in (71)a and the prosodic representation in (71)b:

(71) The structure of a DP with a single adjective

a. Syntactic structure



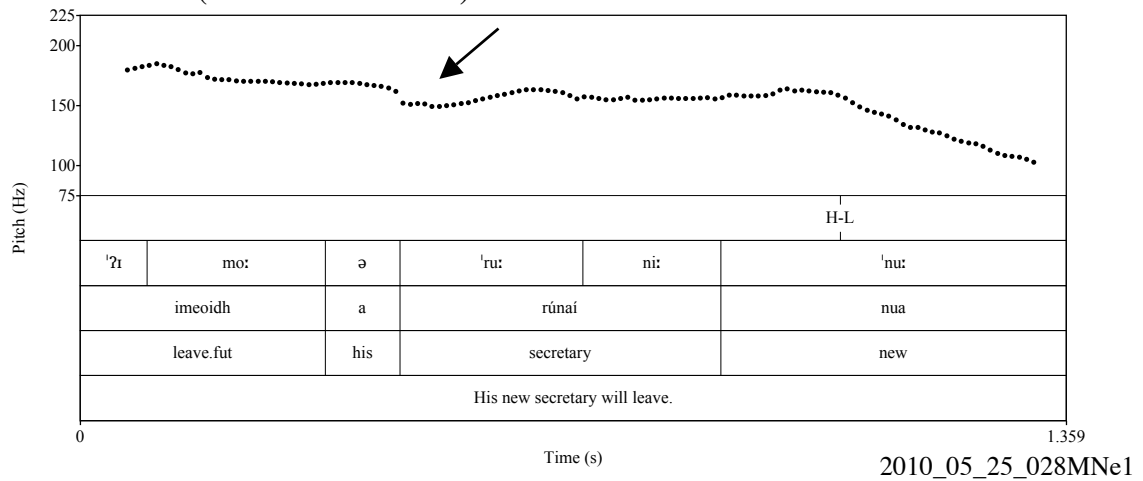
b. Predicted prosodic structure



When a DP of this type occurs in sentence-final position, as in object position of a VSO sentence, neither the φ_{Min} dominating the noun and the adjective, nor the φ_{Min} dominating the determiner and its complement, is associated with an L-H accent. As the

pitch track in (10) illustrates, this can be seen for the subject of an intransitive sentence (VS), where the subject is in sentence-final position as is the object of a VSO sentence. In this case, the subject DP has the overt possessive determiner, *a* ‘his/her’. There is no L-H accent, neither on the determiner itself, nor on the following noun; instead, the pitch is level until the final adjective *nua* ‘new’, which is marked with an H-L accent.⁵⁵

(72) Pitch track for an intransitive sentence with a binary subject and an overt determiner (no L-H on the noun)



However, if this DP corresponded to a non-minimal φ in the prosodic structure, as in (69), we would expect an L-H accent to appear, given the analysis presented above.

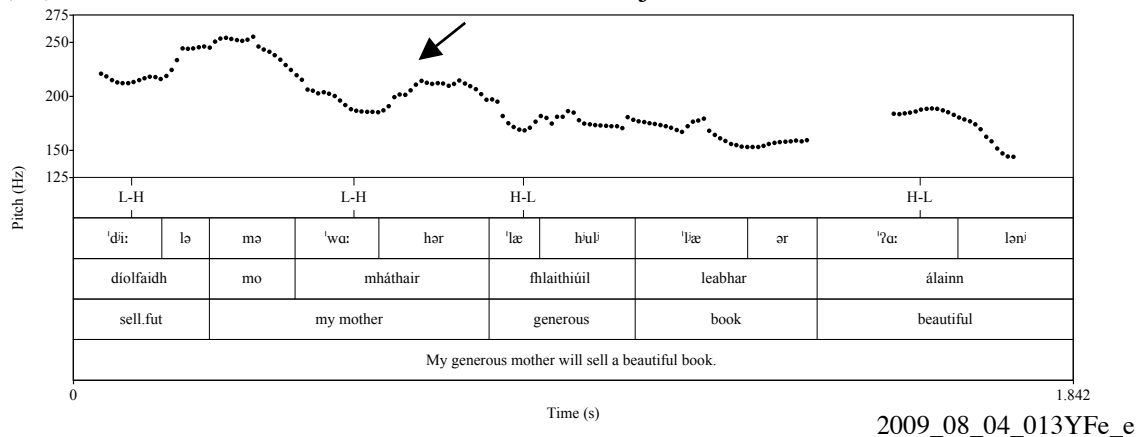
On the other hand, when a DP with an overt determiner occurs in non-final position in the sentence, as in subject position of a VSO sentence, we do observe the appearance of an L-H accent. For example, in the following VSO sentence, the subject DP has an overt determiner, *mo* ‘my’:

(73) Díolfaidh mo mháthair fhlaithiúil leabhar álainn.
 sell.FUT my mother generous.FEM book beautiful
 ‘My generous mother will sell a beautiful book.’

⁵⁵ Note that the verb does not bear an L-H accent in this case, either. This optional pattern of ‘verb deaccenting’ is a common pattern that was discussed in chapter 2.

As seen in the following pitch track, the subject DP *mo mháthair fhlaithiúil* ‘my generous mother’ is indeed marked with an L-H accent, which associates with the initial (stressed) syllable of *mháthair* ‘mother’.⁵⁶ Note that the determiner *mo* shows a fall in pitch, which is due to interpolation between the L-H accent on the verb *díolfaidh* and the L-H on *mháthair*:

(74) Pitch track for a VSO sentence where the subject DP has an overt determiner

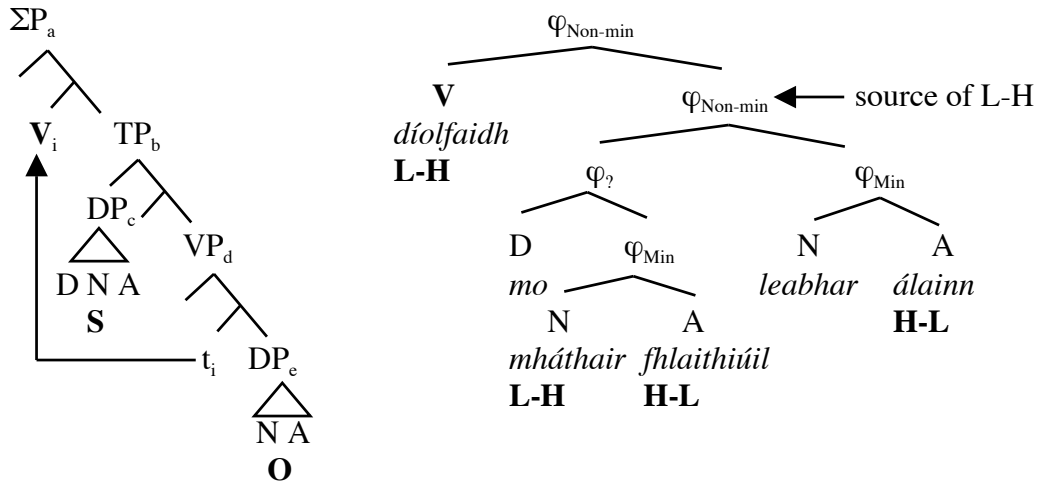


However, the L-H accent associated with the subject noun *mháthair* ‘mother’ can be attributed to another source: in precisely this position, the left edge of the φ corresponding to the DP coincides with the left edge of a higher φ , namely the one that corresponds to the TP that dominates both the subject and the object. As seen in several examples discussed in this chapter, that φ is non-minimal because it dominates the two φ that correspond to the subject and object DPs. This is illustrated in the following syntactic and prosodic representations:

⁵⁶ Note that the rise is slightly delayed in this example.

(75) Syntactic and prosodic representation for a VSO sentence where the subject has an overt determiner

a. Syntactic Representation b. Recursive Prosodic Representation



In consequence, the presence of the L-H with the φ corresponding to the subject DP can be ascribed to the position of the subject φ at the left edge of the higher non-minimal φ corresponding to TP. This comparison between DPs in sentence-final and sentence-medial position shows that the absence of the L-H accent in sentence-final position does not have a plausible phonological explanation. In other words, it cannot be the case that the L-H accent that would surface on a sentence-final DP is not realized because the function word, because it is stressless, does not make a suitable host for the pitch accent.

Note that the L-H accent that appears in the φ corresponding to the DP in subject position in (74) is in fact located on the stressed syllable of the immediately following noun, rather than on the stressless function word. This suggests that a permitted response to the phonological requirement that an L-H pitch accent appear at the left periphery of a non-minimal φ is to locate that L-H on the nearest stressed syllable to the left edge of the $\varphi_{Non-min}$. This indicates that it is not necessary for the L-H

pitch accent to associate with the very first syllable of $\varphi_{\text{Non-min}}$. See [chapter 2] for further discussion of the phonological and phonetic behaviour of the L-H pitch accent.

We are therefore left to conclude that the absence of the L-H pitch accent in the intransitive subject DP is due to (a) the fact that the left edge of the φ corresponding to the object DP coincides with no yet higher $\varphi_{\text{Non-min}}$ (in contrast to the subject of a VSO sentence) and (b) the absence of $\varphi_{\text{Non-min}}$ status for the DP itself. The question, then, is why the φ corresponding to the determiner-headed DP retains the minimal φ status of the NP that is sister to the determiner.

3.5.2 Redefining Non-Minimal φ

Above, I presented evidence that function words, while seeming to provide the relevant syntactic configuration for the creation of non-minimal φ domains in satisfaction of MATCH-PHRASE, do not trigger L-H insertion, in contrast with the data discussed in preceding sections for the adjunction of lexical words. The absence of the L-H accent in these cases could not be motivated on purely phonological grounds. Instead, the evidence suggests the generalization that the apparent $\varphi_{\text{Non-min}}$ constituents created by the adjunction of function words do not trigger L-H insertion at all.

There are two possible ways to approach this puzzle. The first would be to redefine how MATCH-PHRASE is evaluated: instead of being sensitive to all phonologically-overt terminal nodes, as in the definition given in (66), MATCH-PHRASE might be reformulated such that it is sensitive only to syntactic phrases that dominate lexical words, but not those phrases that dominate function words. Under this hypothesis, the adjunction of function words to prosodic structure would be irrelevant to

MATCH-PHRASE: they would be adjoined to the prosodic structure created by lexical words for purely prosodic reasons, namely, to avoid leaving phonologically-overt material unparsed, and there would be no pressure to preserve the constituency established in the syntax. This analysis is reminiscent of proposals which argue, under various frameworks and theoretical assumptions, that functional projections are not visible to constraints on syntax-prosody mapping (Selkirk 1984, 1986, 1995; Chen 1987; Hale & Selkirk 1987; Selkirk & Shen 1990; Truckenbrodt 1995, 1999). If we were to revise MATCH-PHRASE in the way described above, we would achieve a similar effect (prosodic invisibility of function words) without requiring that we make the assumption that functional projections are never visible to syntax-prosody correspondence constraints.

However, there are several reasons to disprefer this analysis. First, this revised definition of MATCH-PHRASE would predict that functionally-headed syntactic phrases will never be relevant to prosodic phrasing. However, as will be discussed in chapter 5, there is empirical evidence from CPs headed by phonologically-overt complementizers that functional projections that introduce only function words do indeed count for MATCH-PHRASE, and are relevant for determining phrasing in that context. Secondly, if MATCH-PHRASE were redefined in this way, the theory would predict that there would not be any pressure to remain faithful to syntactic constituent structure for function words, such that their phrasing would be determined purely on the basis of prosodic or other phonological factors. This prediction also appears to be false. As will be discussed in chapter 6, a function word which adjoins to a prosodic constituent that is of a higher category in the prosodic hierarchy violates a prosodic markedness constraint STRONG-

START, which is under some conditions responsible for non-isomorphic phrasing in CI (see chapter 5). CI distinguishes two types of function words in terms of their prosodic phrasing. On the one hand, pronouns and inflected prepositions⁵⁷ preferentially satisfy STRONG-START and adjoin to material on their left, violating MATCH-PHRASE. On the other hand, functional heads like determiners and bare prepositions preferentially violate STRONG-START by adjoining with material to their right. If there were no competing pressure for function words to phrase with their constituents, as from MATCH-PHRASE, we would predict that function words would never adjoin to their right in violation of STRONG-START. See chapters 4, 5, and 6 for further discussion of non-isomorphic prosodic structures in CI and the prosodic behaviour of function words in Irish.

Instead of modifying the definition of MATCH-PHRASE, I propose a second approach, which is to refine the notion of non-minimality proposed earlier in this chapter to account for the distribution of L-H accents. There, I defined non-minimality simply as a relation between prosodic categories of the same type, as follows, where κ stands in for a type of prosodic category:

(76) $\kappa_{\text{Non-min}}$: If κ is a prosodic category of a certain type, a $\kappa_{\text{Non-min}}$ is a κ that dominates another κ .

Recursive prosodic structures can be generated under pressure from MATCH-PHRASE, which requires a close correspondence between prosodic and syntactic structure. However, MATCH-PHRASE is insensitive to the *contents* of the prosodic structures: it is

⁵⁷ Inflected prepositions or prepositional pronouns refer to prepositions which are inflected for person, gender and number. For example, *liom* has the meaning ‘with me’. For further discussion of prepositional pronouns, see chapter 6.

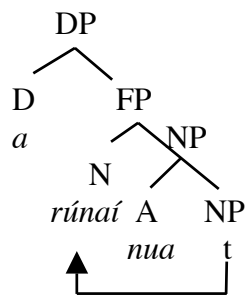
sensitive only to the distinction between word and phrase in the syntax, and evaluates the extent to which syntactic constituents correspond to prosodic constituents.

The data discussed in section 3.5.1 indicate that function words, unlike lexical words, do not trigger the creation of a $\varphi_{\text{Non-min}}$ even when they adjoin to another φ . Rather, function words act as though invisible with respect to the creation of recursion-based subcategories: when they adjoin to a φ_{Min} , there is no L-H insertion and when they adjoin to a $\varphi_{\text{Non-min}}$, they do not disrupt L-H insertion. This suggests that there is a *prosodic weight* requirement on the creation of non-minimal φ domains: function words are not prosodically *heavy* enough to create a new type of domain. In this sense, they simply project a copy of the prosodic (sub-)category of the prosodic constituent to which they adjoin.

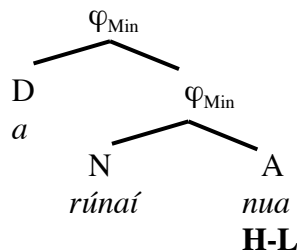
To see how this works, consider again the structure of the DP with an overt determiner, noun, and adjective:

(77) The structure of a DP with a single adjective

a. Syntactic structure



b. Predicted prosodic structure

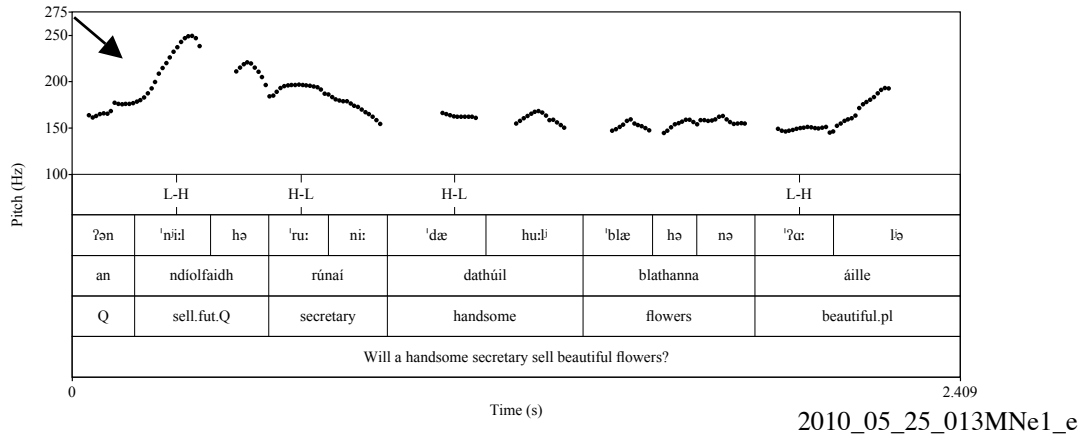


As seen in (77)b, the determiner *a* is adjoined in the prosodic representation to a φ_{Min} . However, rather than $\varphi_{\text{Non-min}}$, the dominating category is φ_{Min} . Because the dominating node is φ_{Min} , no L-H is predicted to surface. When this DP is in sentence-final position,

and leftmost only by φ_{Min} as in the intransitive sentence in (72), the DP will not be associated with an L-H at all.

Alternatively, if a function word is adjoined to a structure that is already $\varphi_{\text{Non-min}}$, the dominating category will be $\varphi_{\text{Non-min}}$. For example, this can be seen when a function word like a complementizer or a negative particle adjoins to the verb and its dominating structure. The following pitch track shows a yes/no question, which differs from the basic VSO sentence by the presence of the interrogative particle *an*, which occurs in sentence initial position.⁵⁸

(78) Pitch track for a VSO sentence where the subject DP has an overt determiner



Because *an* is a sentence-initial function word, it adjoins to the prosodic structure to its right, in this case the basic VSO sentence. The prosodic category dominating V already has the status of $\varphi_{\text{Non-min}}$ (as has been seen in previous discussions of VSO sentences), as evidenced by the presence of the L-H accent on the verb. As a result, the adjoining particle will adjoin to a $\varphi_{\text{Non-min}}$ and, as proposed above, be dominated by $\varphi_{\text{Non-min}}$ itself.

⁵⁸ Note that the subject noun *rúnaí* ‘secretary’ has an H-L accent rather than the predicted L-H accent. This suggests an alternative phrasing which is found in a small minority of sentences with this structure (see chapter 2, section 2.6.2, for further information on its frequency of occurrence). Note also that the final word *áille* ‘beautiful’ is associated with an L-H accent. I assume that this is an accent or boundary tone that is associated with yes/no questions, at least for this speaker.

However, because the function word cannot itself be associated with the L-H accent (because it is stressless), it is instead realized on the closest stressed syllable, the stressed syllable of the verb. Because the verb is already associated with an L-H accent on its stressed syllable (by virtue of being leftmost in the $\varphi_{\text{Non-min}}$ corresponding to ΣP), only a single L-H accent is observed.⁵⁹

While additional research is needed to determine whether or not this hypothesis is correct for other languages, I will propose here that the prosodic behaviour of function words is encoded in the grammar as a principle rather than as a violable constraint. This principle, which I refer to as the *Function Word Adjunction Principle*, may be defined as follows:

(79) *Function Word Adjunction Principle*

When a function word α , defined as a non-prosodic word,⁶⁰ is adjoined to a prosodic category of type β , the prosodic (sub)category of the dominating node in the prosodic structure is identical to that of β .

In OT terms, the principle can be seen as a condition imposed by GEN on the creation of prosodic structures. Typologically, this predicts that other languages will behave like CI in requiring function words respect syntactic constituent structure where possible, but will not themselves be responsible for changing the prosodic category of that to which they adjoin. This appears to be consistent with previous literature on the prosodic

⁵⁹ Note that in this pitch track, the subject noun is associated with an H-L accent and appears to phrase with the verb rather than the following adjective, to which it is more closely related syntactically. As will be discussed in chapter 4, this pattern appears to be quite rare in VSO sentences. While I do not have any additional data on questions or on other sentences with initial particles, it might be the case that the coincidence of the L-H accent that is generated by the adjunction of the particle *an* and the L-H that is generated by the $\varphi_{\text{Non-min}}$ corresponding to ΣP is in part responsible for the relatively large rise that is observed on the verb and the atypical phrasing, with the two accents interacting in a cumulative fashion.

⁶⁰ If a function word is promoted to the status of a prosodic word, the function word will behave like a lexical word and this condition will not apply.

behaviour of function words (Selkirk 1995; Werle 2009), though further comparison and analysis will be needed to see whether or not this principle holds in other languages.

3.6 Conclusion

In this chapter, I have developed an analysis of the distribution of L-H and H-L pitch accents in CI with the support of pitch tracks taken from recordings by native speakers. It was shown that Match Theory, and more specifically MATCH-PHRASE, correctly predicts that the prosodic representation directly reflects syntactic structure, and that, under these assumptions, the distribution of tonal elements in CI in a variety of sentence types can be accounted for. It was shown that in a variety of syntactic structures, including complex clauses, complex DPs, and embedded clauses, the L-H and H-L pitch accents are predictable from knowledge of the underlying syntactic structure.

In addition, section 3.5 presented a puzzle involving the adjunction of function words, and proposed a refinement of the notion of non-minimality. I argued that function words differ from lexical words in their ability to create new non-minimal φ domains, but still count under the evaluation of MATCH-PHRASE. This observation was proposed to fall from a principle imposed on the grammar, the *Function Word Adjunction Principle*. In chapters to follow, I will show how the assumption of this principle is able to account for the behaviour of function words in a variety of contexts. This will be especially true of the discussion in chapters 5 and 6.

One of the main innovations of Match Theory is the assumption that recursive prosodic structure is not only possible, but is preferred because it provides a better ‘match’ between syntactic and prosodic structure. In this chapter, I have shown that the

assumption that prosodic structure is by default recursive is necessary to correctly account for the distribution of pitch accents in CI.

CHAPTER 4

CONSTRAINTS ON PROSODIC WELL-FORMEDNESS

4.1 Introduction

While Match Theory (Selkirk 2009b, 2011) predicts a close correspondence between syntactic and prosodic structure, it assumes that prosodic structure is a grammatical system distinct from syntax, which may vary under pressure from purely prosodic constraints as for the desire for prosodic constituents to be binary (e.g. Inkelas & Zec 1990). Match Theory predicts that syntactic and prosodic constituent structure will be isomorphic with one another under ideal conditions, but may deviate from each other in order to accommodate other types of constraints. In this way, Match Theory differs from direct-reference theories which assert that domain-sensitive phonological processes make reference only to syntactic structure, without the need for prosodic structure (Cooper & Paccia-Cooper 1980; Kaisse 1985; Wagner 2005; Pak 2008); for further discussion, see chapter 7. In an OT framework, departures from isomorphism are predicted to occur when constraints on prosodic well-formedness outrank constraints on syntax-prosody correspondence (Selkirk 1995, 2009b, 2011; Truckenbrodt 1995, 1999).

In this chapter, I present evidence that prosodic phrasing in CI can deviate from syntactic structure in order to accommodate for constraints on prosodic well-formedness. I discuss the role of two prosodic markedness constraints, *STRONG-START* (Selkirk 2011; Elfner 2011; Bennett et al. in prep), which militates against prosodic constituents whose leftmost element is relatively less prominent prosodic category than its sister element, and *BIN- φ* , which militates against φ that are non-binary. I will show

that the interaction of these constraints with MATCH-PHRASE (see discussion in chapter 3) correctly accounts for cases where syntactic and prosodic structure correspond exactly and cases where they do not.

In section 4.3, I discuss certain patterns of variation present in my data, and propose that the patterns can be accounted for under the assumption that constraints are weighted rather than ranked, as under Harmonic Grammar Grammar (HG, Legendre et al. 1990; Smolensky & Legendre 2006; Pater 2009b; Jesney 2011). I show that the type of cumulative constraint interaction predicted by the framework provides a more accurate account of the attested patterns and the presence or absence of variation, and eliminates problems with the strict ranking account developed in earlier sections.

4.2 Role of Prosodic Constraints: Strong Start and Binariness

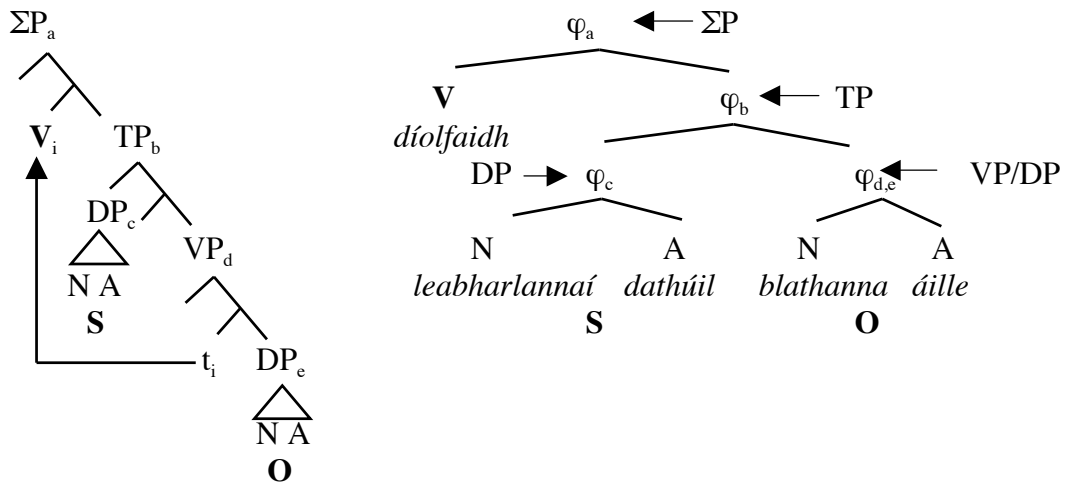
In this section, I introduce two prosodic markedness constraints, STRONG-START and BIN- φ , and show how they can be used to account for cases of non-isomorphism in CI prosody. In particular, I will look at phrasing in sentences with single-word subject DPs (a single N rather than N+Adj), which MATCH-PHRASE would predict to phrase with the object, given that they are both daughters of the TP constituent that excludes the verb, but which generally phrase together with the verb to its left. I argue that this phrasing is due to a dispreference for φ s that begin with a prosodic element that is weaker than the prosodic category of its sister, as well as to a binariness constraint militating against φ s that are non-binary. I argue that this interaction can be accounted for using OT where prosodic markedness constraints outrank MATCH-PHRASE. I then provide evidence from analogous syntactic structures that show the same phrasing patterns as motivated by the same constraints.

4.2.1 Light Subjects

4.2.1.1 Minimal Binarity and Single-word Phrases

As was seen in chapter 3, prosodic phrasing in CI often corresponds closely to syntactic structure. I argued that this correspondence was motivated by a syntax-prosody correspondence constraint MATCH-PHRASE, which calls for the phonological exponents of a set of terminal elements exhaustively dominated by a syntactic phrase (XP) to be dominated in turn by a φ . For example, the syntactic structure for a basic VSO sentence in CI corresponded to a prosodic representation with two layers of recursive φ ; this can be seen in the following representations, repeated from chapter 3:

(1) a. Syntactic Representation b. Recursive Prosodic Representation



I discussed evidence that prosodic phrasing in CI was consistent with the predicted structure in (1)b through an analysis of the distribution of two tonal elements in CI, L-H and H-L pitch accents. In particular, I argued that the distribution of these accents provides information about prosodic phrasing: L-H accents appear on the leftmost word of those φ that are non-minimal ($\varphi_{\text{Non-min}}$), and H-L accents on the rightmost word of any φ . This analysis was shown to provide an accurate account for a range of basic

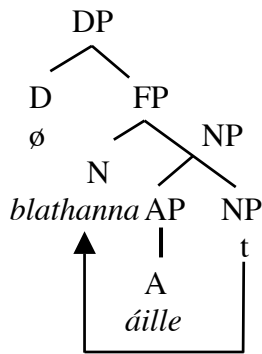
structures found in CI, including basic clauses, embedded clauses, and complex DP structures (adjectives, possessive constructions, and relative clauses).

Implicit in the discussion in chapter 3 was the assumption that the close correspondence between syntactic constituency and prosodic phrasing would only arise under ideal prosodic conditions. In other words, the structures considered in chapter 3 represent these ideal conditions: they do not violate any of the prosodic markedness constraints that may outrank MATCH-PHRASE in the grammar, meaning that there is no occasion to deviate from the close correspondence militated by MATCH-PHRASE.

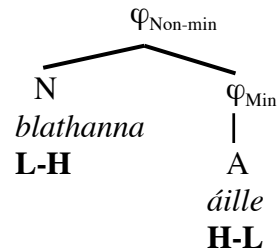
However, even in the structures assumed in chapter 3, there is still some reason to believe that there is some degree of non-isomorphism. For example, if we consider more carefully DP structures dominating noun-adjective sequences, we may expect to find pressure from the syntax to phrase the adjective as a φ separately from the noun, as in the following representation:

(2) The structure of DPs with a single adjective

a. Syntactic structure



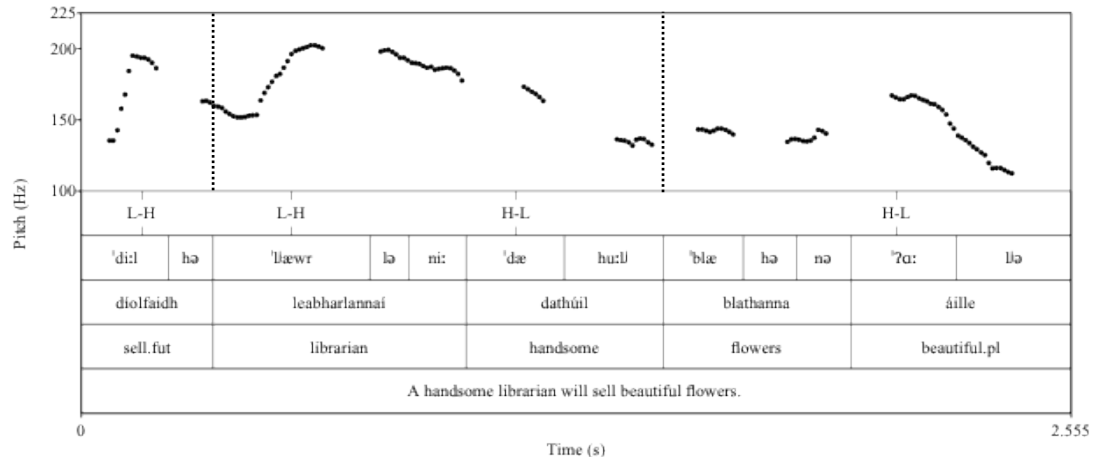
b. Predicted prosodic structure



However, evidence from the distribution of pitch accents indicates that this is not the correct prosodic representation: when a noun-adjective DP is in final position of the sentence (as for object DPs in VSO sentences), the noun is not marked with an L-H

accent, but is unspecified for tone, as seen in the following pitch track for a basic VSO sentence, repeated from chapter 3:

(3) Pitch track for a basic VSO sentence



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This shows that the noun is not initial in a non-minimal φ , but the representation (2)b predicts that the noun will always be marked with an L-H accent, regardless of its position in the sentence: because the adjective is dominated by φ , the φ dominating the noun and adjective phrase will always be non-minimal since it will contain the adjective. If the account of the distribution of pitch accents developed in chapter 3 is correct, adjectives must not be phrased as single-word φ s in CI, with the consequence that the φ dominating the noun-adjective sequence is minimal.

There are two ways that we can account for the observation that the single-word AP in (2)a does not itself behave as if it were a φ . The first is to assume that bare adjectives are not phrasal in the syntax, following bare phrase structure (Chomsky 1995). If we adopt this assumption, nothing more needs to be said: if adjectives are not syntactic phrases, there will not be any pressure from MATCH-PHRASE requiring φ status in the prosodic structure.

Alternatively, we can operate under the assumption that adjectives are phrases in the syntax, but that MATCH-PHRASE is outranked by a prosodic markedness constraint calling for prosodic constituents to be minimally binary:⁶¹

- (4) BIN-MIN(κ): assign one violation mark for every prosodic constituent of type κ that immediately dominates less than two daughter constituents.

I assume that binarity constraints like BIN-MIN(φ) are evaluated based on the number of daughters at the level immediately below the prosodic constituent being evaluated, rather than the total number of constituents that they dominate. Thus, for example, the highest level of recursive φ in the representation in (1)b does not violate BIN-MAX(φ) because it has only two daughters.

As shown in the following tableau for a noun-adjective DP, the adjective will not be phrased as a φ when BIN-MIN(φ) outranks STRONG-START:

- (5) Interaction between BIN-MIN(φ) and MATCH-PHRASE in a N-A DP

DP[\emptyset FP[N _{AP} [A _{NP} [t]]]]	BIN-MIN(φ)	MATCH-PHRASE
a. φ (NA)		*
b. (N(A))	*!	

Under either hypothesis, we correctly rule out a parse in which an adjective is phrased as a single-word φ . This predicts that other single-word phrases will behave similarly: for example, a noun that is not modified by an adjective will not phrase as a φ . For ease of exposition, I will ignore candidates which produce single-word φ s, as these will

⁶¹ I assume that the BINARITY constraint is divided into two distinct constraints, one imposing a restriction for prosodic constituents to be minimally binary (BIN-MIN(κ)) and one for prosodic constituents to be maximally binary (BIN-MAX(κ)) (Mester 1994; Hewitt 1994; Selkirk 2000; Ito & Mester 2006).

either be inconsequential for MATCH-PHRASE (as non-phrases) or else always be eliminated by undominated BIN-MIN(φ).⁶²

4.2.1.2 Strong-Start

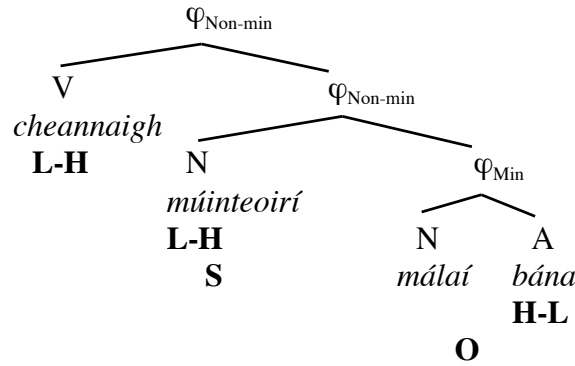
It is not always the case that prosodic structure is isomorphic with syntactic structure, even excepting the absence of single-word phrases, as discussed above. The first example comes from a simple variation of the VSO sentence in (1): instead of a subject DP containing both a noun and an adjective (*múinteoirí banúla* ‘lady-like teachers’), the subject consists of only a noun (*múinteoirí* ‘teachers’):

- (6) Cheannaigh múinteoirí málaí bána
bought teachers bags white.PL
‘Teachers bought white bags.’

Given a syntactic structure as in (1)a, MATCH-PHRASE predicts a prosodic representation as follows, with rises on the verb (*cheannaigh* ‘bought’) and the subject (*múinteoirí* ‘teachers’). As discussed above, the bare nominal subject may or may not be a syntactic phrase, but in either case, it is not itself expected to phrase as a φ .

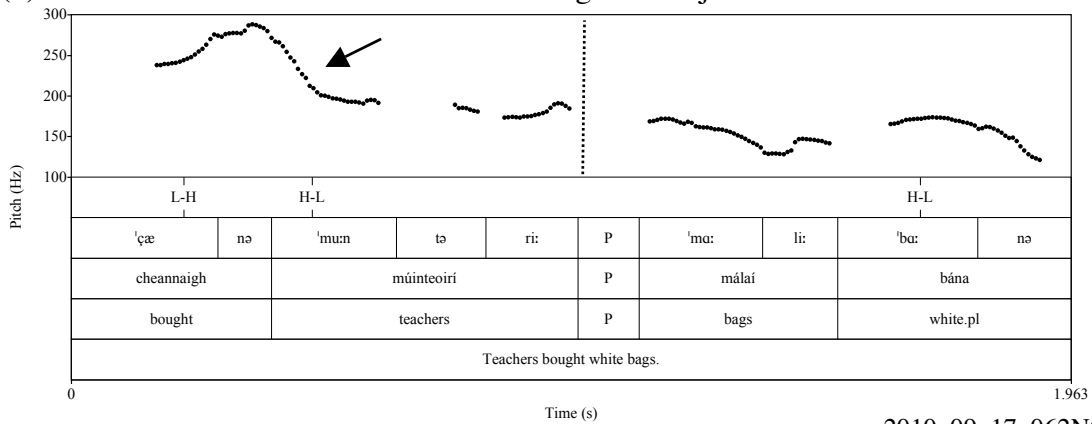
⁶² The question of whether or not there is cross-linguistic evidence for single-word phrases, and whether these phrases are syntactically motivated, is part of a larger research question, which I will not address in this dissertation. For example, Selkirk (2011) proposes that single-word DPs do count as φ in ChiMwiini, and similar proposals have been made elsewhere (e.g. (Selkirk & Shen 1990)). To account for these cases, we would have to assume that single-word φ s are avoided in CI due to the high-ranking BIN-MIN(φ) constraint, which is lower ranked in languages that allow single-word φ .

(7) Distribution of tonal elements in a VSO sentence (single- ω subject)



It turns out that this prosodic structure, under either hypothesis concerning the lack of φ status for the single-word subject, is not consistent with the attested tonal prosody for sentences of this type. As shown in the following pitch track, the subject noun is marked with an H-L accent, rather than an L-H accent as predicted above:⁶³

(8) Pitch track for a VSO sentence with a single- ω subject



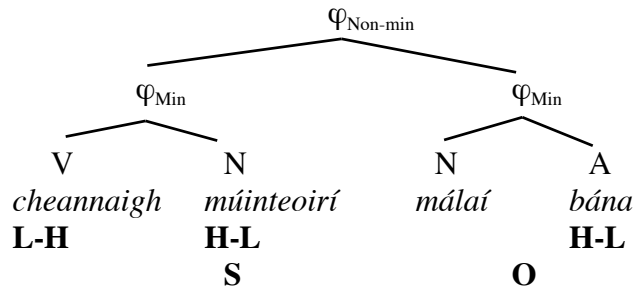
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If the analysis developed in the preceding chapter is correct, the presence of the H-L accent on the subject is indicative that it is rightmost in φ , rather than leftmost in $\varphi_{\text{Non-}}$.

⁶³ Note that the F0 peak for the H-L accent on *múinteoirí* ‘teachers’ is early, with most of the fall in pitch occurring before the end of the first syllable. This might be the result of the adjacent H peaks (from the concatenation of L-H and H-L): there does not appear to be any downstep between these two peaks, as appears to be common with adjacent H tones in CI. It is plausible that instead of employing downstep to distinguish the adjacent H tones, the second H tone target is deleted instead, which might lead to an early fall toward the L target.

ω_{\min} , as the prosodic representation predicted by MATCH-PHRASE would suggest. The tonal pattern seen in this pitch track is consistent instead with a prosodic representation like the following, where the verb and the subject are phrased together as a φ :

(9) Proposed prosodic representation for a VSO sentence (single- ω subject)



Match Theory, as an indirect reference theory of the syntax-phonology interface, assumes that prosodic structure is a distinct grammatical system with its own constraints on well-formedness: deviations from strict syntax-prosody correspondence are predicted to occur when a prosodic representation would violate a prosodic markedness constraint that outranks the relevant MATCH constraint. This suggests that the representation in (7) violates a high-ranking prosodic markedness constraint that the representation in (9) satisfies.

By phrasing together the verb and the subject, the representation in (9) creates a φ containing the two single ω that would be sister to the φ that dominates the two-word subject. Intuitively, the structure in (9) improves on the structure in (7) above by eliminating the two adjoined words or phrases and phrasing them together to form a binary φ . It is well-established that prosodic constituents are preferentially binary (Inkelas & Zec 1990), and it is not surprising that they should be preferred to adjunction structures like in (7). However, because binarity is stated in negative terms when phrased as a markedness constraint, the assumption that a binarity constraint outranks

MATCH-PHRASE will succeed in eliminating the parse in which the bare noun is parsed as a single-word φ , but will not require the verb and subject noun to phrase together. For example, the failure of BIN-MIN(φ) to eliminate the candidate structure in (7) in favour of (9) can be illustrated in the following tableau:⁶⁴

(10) BIN-MIN(φ) cannot rule out adjunction in a VSO sentence (single- ω subject)

$\Sigma P[V_{TP}[N_{VP}[DP[N Adj]]]]$	BIN-MIN(φ)	MATCH-PHRASE
a. $\ominus ((V N) (N Adj)) (= (9))$		*
b. $\wp (V (N (N Adj))) (= (7))$		
c. $(V ((N) (N Adj)))$	*!	

Candidate (b) is incorrectly chosen as the winner, because neither candidate actually violates BIN-MIN(φ) (as defined in (4)), and candidate (a) violates MATCH-PHRASE once.

Instead, what we need is a constraint that disprefers the rightward-adjunction structure and outranks MATCH-PHRASE. Following Selkirk (2011), I assume that right-adjunction in prosodic structures violates the prosodic markedness constraint STRONG-START:

(11) STRONG-START: assign one violation mark for every prosodic constituent whose leftmost daughter constituent is lower in the Prosodic Hierarchy than its sister constituent immediately to its right: $*(\kappa_n \kappa_{n+1} \dots)$ (after Selkirk 2011)

Selkirk (2011: 37) argues that STRONG-START is responsible for the promotion of preposed phrases as ι -Phrases rather than φ in Xitsonga, and suggests also that the

⁶⁴ This pattern, as well as others argued in this chapter to provide evidence for a weighted constraint framework, might be accounted for assuming Harmonic Serialism (HS), a serial OT framework where phonological operations are evaluated one-at-a-time (among others, McCarthy 2008b, 2008c). For example, the above incorrect result from BIN-MIN(φ) might be avoided in HS by serial derivation, where parsing a binary φ is considered to be superior to adjunction of the subject noun. However, further discussion of how the data might be accounted for using HS is beyond the scope of this dissertation.

constraint may be responsible for the promotion of words to φ at the left edge of intonational phrases (ι -phrases) in English, as evidenced by a preference to place a phrasal pitch accent on these words, as well as for the displacement of weak pronouns from ι -phrase initial position in Serbo-Croatian (Werle 2009). In chapter 6, I argue that this constraint is also responsible for the displacement of weak pronouns in φ -initial position in Irish (see also Elfner 2011; Bennett et al. in prep).

In the representation in (7), STRONG-START is violated twice: once by the verb *cheannaigh* (which is a ω that is dominated by a φ and sister to a φ) and once by the subject *múinteoirí* (for the same reason). Phrasing these two ω into a φ as in (9) eliminates both violations of STRONG-START: in this representation, the φ which contains the whole sentence dominates two φ , which are prosodic constituents of equal standing in the Prosodic Hierarchy. Under an OT framework, this suggests that STRONG-START outranks MATCH-PHRASE, as illustrated in the following tableau:

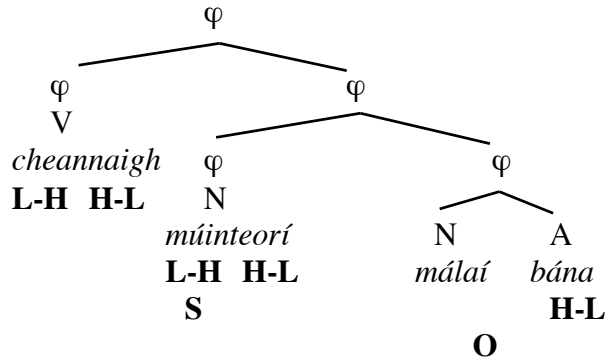
(12) Interaction between STRONG-START and MATCH-PHRASE in a VSO sentence (single- ω subject)

$\Sigma P[V_{TP}[N_{VP}[DP[N\ Adj]]]]$	STRSTART	MATCH-PHRASE
a. φ ((V N) (N Adj)) (= (9))		*
b. (V (N (N Adj))) (= (7))	*!*	

This ranking predicts that MATCH-PHRASE will be violated when doing so will avoid one or more violations of STRONG-START.

The representation in (9) is also preferred over other possible parses of this sentence which avoid violating STRONG-START. For example, parsing each of the verb and the subject noun as single-word φ s would also satisfy STRONG-START:

(13) Verb and subject parsed as φ in a VSO sentence (single- ω subject)



As discussed in section 4.2.1.1, this representation can be ruled out by the prosodic markedness constraint BIN-MIN(φ). However, unlike the noun-adjective cases discussed there, only the bare nominal subject is plausibly parsed as a syntactic phrase. In this structure, the verb does not have syntactic phrase status, and so is not subject to MATCH-PHRASE. A promotion to φ status, though a possible prosodic repair for STRONG-START, presumably also violates a type of prosody-syntax correspondence constraint, as proposed in Selkirk (2009b, 2011) (see chapter 1 for discussion). However, as above, we can assume that these single-word φ structures can be eliminated by the undominated constraint BIN-MIN(φ).

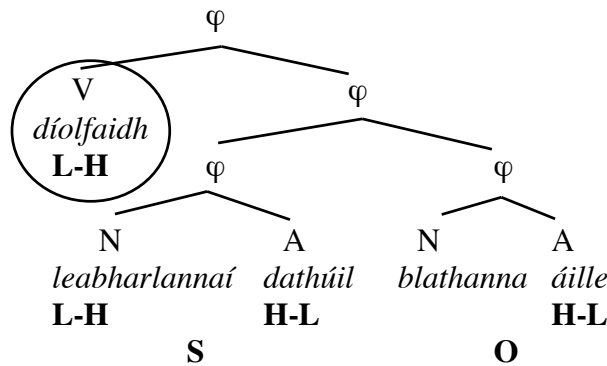
BIN-MIN(φ) is violated twice in (13), once by each of the φ dominating only the verb and the subject noun. By ranking this constraint above MATCH-PHRASE, we can correctly rule out parsing single- ω φ s as a way to avoid violating STRONG-START:

(14) Interaction between BIN-MIN(φ) and MATCH-PHRASE in a VSO sentence (single- ω subject)

$\Sigma P[V_{TP}[N_{VP}[DP[N \text{ Adj}]]]]$	BIN-MIN(φ)	MATCH-PHRASE
a. $\curvearrowright ((V N) (N \text{ Adj})) (= (9))$		*
b. $((V) ((N) (N \text{ Adj}))) (= (13))$	*!*	

This analysis correctly predicts the prosodic organization of basic sentences where the subject is a binary DP that satisfies BIN-MIN(φ), such as a DP containing a noun and an adjective or a simple noun-noun possessive construction, as discussed in chapter 2. In these sentences, the verb adjoins to the prosodic representation, violating STRONG-START:

(15) Prosodic representation of a VSO sentence (binary subject)



This violation of STRONG-START is tolerated only to avoid creating a more marked structure by violating higher-ranked constraints. For example, the verb is not promoted to φ -status because this would violate BIN-MIN(φ), which outranks STRONG-START:

(16) Interaction between BIN-MIN(φ) and STRONG-START in a VSO sentence (binary subject)

$\Sigma P[V_{TP}[DP[N Adj]_{VP}[DP[N Adj]]]]$	BIN-MIN(φ)	STRSTART	MATCH-PHRASE
a. φ (V ((N Adj) (N Adj)))		*	
b. ((V) ((N Adj) (N Adj)))	*!		

Similarly, the verb does not phrase together with the DP to its right, because this would violate BIN-MAX(φ) by creating a φ that dominates more than two elements. This indicates that BIN-MAX(φ) also outranks STRONG-START:⁶⁵

⁶⁵ This constraint ranking does not, however, rule out a parse that splits the subject DP in order to satisfy STRONG-START, as in (((VN)A)(NA)). The dispreference for this phrasing is discussed further in section 4.3.

(17) BIN-MAX(κ): assign one violation mark for every prosodic constituent of type κ that dominates more than two daughter constituents.

(18) Interaction between BIN-MAX(φ) and STRONG-START in a VSO sentence (binary subject)

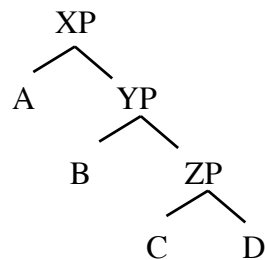
$\Sigma[V_{TP}[DP[N Adj]_{VP}[DP[N Adj]]]]$	BIN-MAX(φ)	BIN-MIN(φ)	STRSTART	MATCH-PHRASE
a. φ (V ((N Adj) (N Adj)))			*	
b. ((V N Adj) (N Adj))	*!			

This analysis would suggest that STRONG-START violations are tolerated in cases where it is not possible to satisfy binarity requirements.

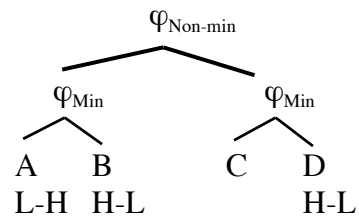
This analysis predicts that whenever two adjacent prosodic words are independently right-adjoined in the prosodic representation (in violation of STRONG-START), the two words will be phrased together to form a φ , in violation of MATCH-PHRASE. More abstractly, we expect analogous non-isomorphic phrasing whenever we encounter a syntactic structure [A [B [C [D]]]], such that it will be parsed prosodically as ((A B)(C D)):

(19) Syntactic structure [A [B [C [D]]]] parsed as ((A B)(C D))

a. Syntactic structure



b. Predicted prosodic structure



In the next section, I show how this prediction is borne out in other syntactic configurations, including embedded clauses and complex DPs.

4.2.2 STRONG-START Violations and Non-Isomorphism in Other Structures

In this section, I present evidence from other structures in Irish where A and B in [A [B [C [D]]]] structures are phrased together in departure from MATCH-PHRASE, as shown in (19). First, I discuss embedded clauses with single- ω subjects (finite embedded clauses and relative clauses), and then I discuss complex DPs with noun-adjective structures.

4.2.2.1 Finite Embedded Clauses

In chapter 3, I showed that embedded finite clauses in Irish show the same prosody as basic VSO sentences without embedding. Because embedded VSO sentences show the same structural properties as main clauses, the analysis developed above predicts that embedded clauses with a single- ω subject will also phrase the verb and subject together to satisfy STRONG-START in violation of MATCH-PHRASE.

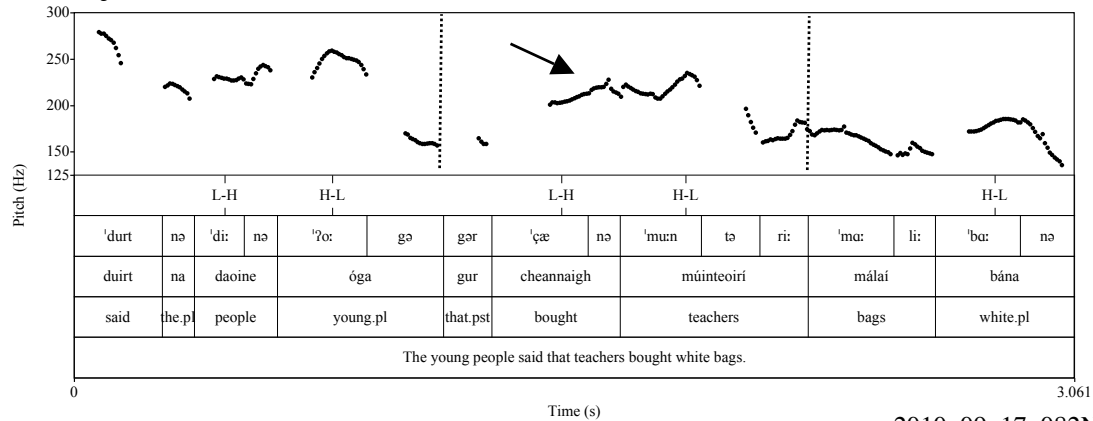
The following sentence contains an embedded finite clause with a single-word subject and a binary object:

- (20) Dúirt na daoine óga _{CP}[gur cheannaigh múinteoirí málaí bána]
said the.PL people young.PL that.PST bought teachers bags white.PL
'The young people said that teachers bought white bags.'

As with the basic sentences discussed above, the verb and subject are predicted to phrase together to form a φ in order to avoid the two violations of STRONG-START that the prosodic representation would incur if MATCH-PHRASE were to be fully satisfied. This pattern can be seen in the following pitch track, where the L-H accent on the verb

(*cheannaigh*) and the H-L accent on the subject (*múinteoirí*) in the embedded clause indicate that they form a single φ :⁶⁶

(21) Pitch track for a sentence with a finite embedded clause (single- ω embedded subject)



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This is expected under the OT analysis developed above, where different candidates for prosodic phrasing are evaluated by the constraint hierarchy:

(22) Constraint interaction in a finite embedded clause (embedded single- ω subject)

$\Sigma P[V_{TP}[DP[N Adj]_{CP}[c_{\Sigma P}[V_{TP}[N_{VP}[DP[N Adj]]]]]]]$	BIN-MIN(φ)	STR-START	MATCH-PHRASE
a. φ (V (N Adj) ((cVN) (N Adj)))		*	*
b. (V ((N Adj) (cV (N (N Adj))))		**!*	
c. (V ((N Adj) ((cV) ((N) (N Adj))))	*!*	*	

As the tableau shows, it is more harmonic to phrase the verb and single-word subject together in the embedded clause than to adjoin them to the structure separately, just as in the basic VSO sentence.

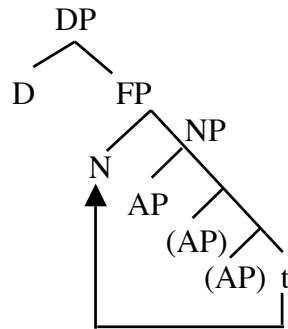
⁶⁶ Note that there is a slight dip and rise between the end of the verb *cheannaigh* and the subject *múinteoirí*. This suggests that the H of the H-L pitch accent on *múinteoirí* is in this case more prominent than that of the preceding L-H.

4.2.2.2 Complex DPs: Adjectives, possessives

The analysis developed above predicts that any sequence of two STRONG-START violations will be eliminated, no matter their source in the syntax. In this section, I look at parallel structures found in the DP domain.

In [chapter 2], I assumed a noun-raising analysis for DPs in Irish (Cinque 1994; Longobardi 2001; Guilfoyle 1988; Sproat & Shih 1991), where the noun raises from a position low in the DP to the head of a functional projection above NP, as in the following tree structure:

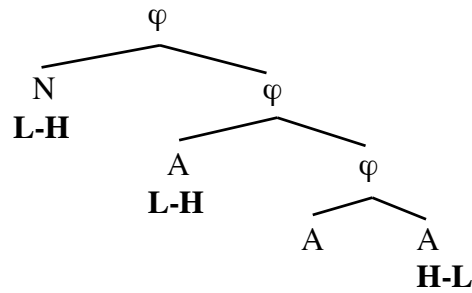
(23) The structure of DPs with one or more adjectives



In chapter 2, it was shown that DPs with two adjectives behaved as predicted by MATCH-PHRASE, with the two adjectives phrasing together and the noun adjoining onto the structure.

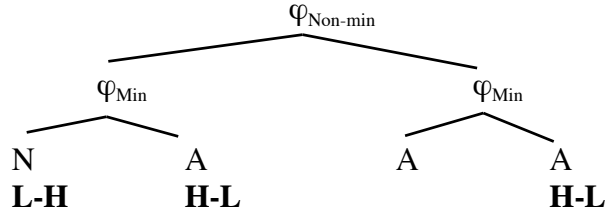
For a DP with three adjectives, MATCH-PHRASE predicts that the two lower adjectives will phrase together into a φ and that both the upper adjective and the noun will adjoin onto the structure, as in the following prosodic representation:

(24) Predicted isomorphic prosodic representation for a DP with three adjectives



However, as was the case for clauses with single-word subjects, the prosodic representation in (24) violates STRONG-START twice, once for the noun and once for the highest adjective. Given the constraint ranking argued for in the previous section, we predict that the noun and the higher adjective will phrase together as a φ , in violation of MATCH-PHRASE, as in the following prosodic representation:

(25) Predicted prosodic representation for a DP with three adjectives



As shown in the following tableau, this representation is predicted to be preferred over the representation in (24) as well as one in which both the noun and the higher adjective are promoted to φ (candidate c in the tableau):

(26) Constraint interaction in a finite embedded clause (embedded single- ω subject)

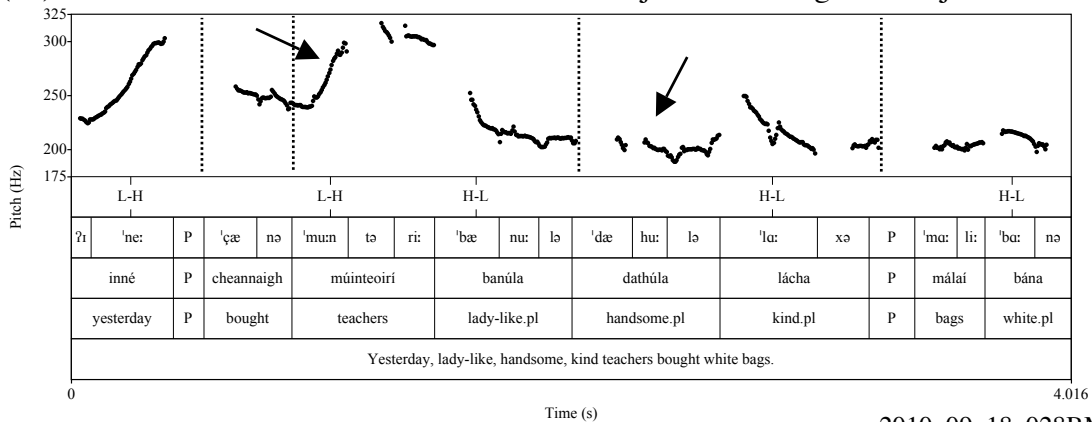
DP[\emptyset _{FP} [N _{AP} [A] _{AP} [A] _{AP} [A]]]	BIN-MIN(φ)	STRSTART	MATCH-PHRASE
a. φ ((N A) (A A))			*
b. (N (A (A A)))		*!*	
c. ((N) ((A) (A A)))	*!*		

The predicted pattern can be seen in the following sentence, where the DP with three adjectives is in subject position:

(27) Cheannaigh_{DP} [múinteoirí banúla dathúla lácha] málaí bána
 bought teachers lady-like.PL handsome.PL kind.PL bags white.PL
 ‘Handsome, kind, lady-like teachers bought white bags.’

As shown in the pitch track for this sentence, there is, as predicted, an L-H accent on the subject noun, *múinteoirí*, and an H-L accent on the highest adjective, *banúla*, indicating that they form a φ , just as in the finite clauses discussed above. The second adjective *dathúla*, unspecified for tone, has a relatively low pitch level which extends from the L on *banúla* and the final adjective *lácha* is marked with an H-L accent, indicating the right edge of both the lower and upper φ :

(28) Pitch track for a VSO sentence with a DP subject containing three adjectives



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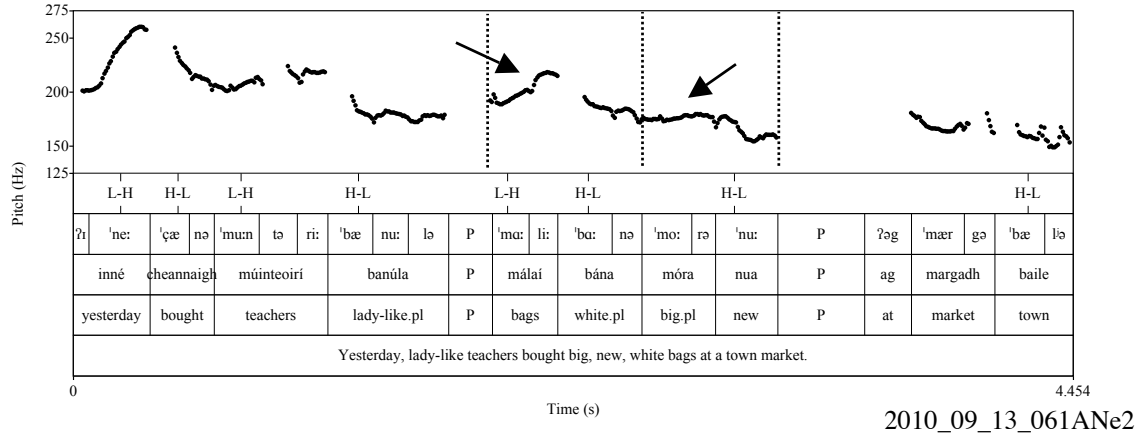
This pattern can also be seen in a sentence where the DP with three adjectives is placed in object position of a VSOX sentence:

(29) Cheannaigh múinteoirí banúla_{DP} [málaí bána móra nua] ag margadh baile
 bought teachers lady-like.PL bags white.PL big.PL new at market town
 ‘Lady-like teachers bought new, big, white bags at a town market.’

The pitch track for this sentence shows the predicted L-H accent on the object noun *málaí* and H-L accents on the first and third adjectives, *bána* and *nua*. Note especially that the second adjective, *móra*, is unspecified for tone and does not show an L-H

accent because it is leftmost in a minimal φ . Instead, it shows an extension of the L tone from the preceding word, as in the previous example.

(30) Pitch track for a VSOX sentence with a DP object containing three adjectives



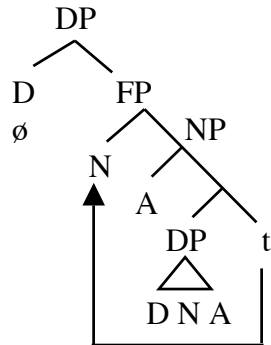
The same pattern can be seen for DPs that contain a possessive construction, where both nouns are modified by an adjective, as in the following:

(31) blathanna áille na ndaoine anamúla
 flowers beautiful.PL the.GEN.PL people.GEN animated.PL
 ‘the beautiful flowers of the animated people’

As for DPs with one or more adjectives, I assume a noun-raising analysis for DPs with possessive constructions, which predicts a structure like the following for the DP in

(31):

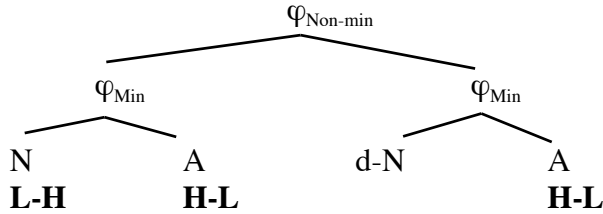
(32) The structure of DPs with an adjective and a possessive DP



As with DPs containing three adjectives, MATCH-PHRASE predicts a prosodic structure in which the higher noun and adjective each adjoin independently onto a φ to their right,

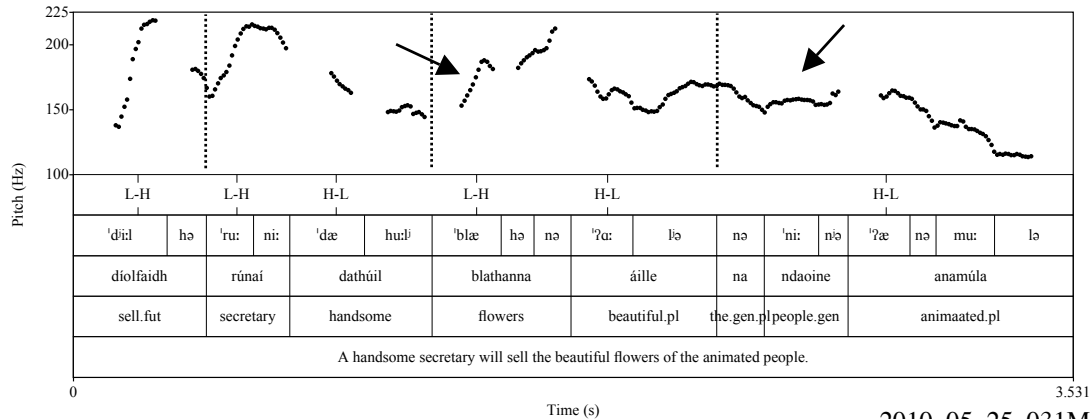
incurring two violations of STRONG-START. However, as before, this structure may be improved by phrasing the higher noun and adjective into a φ , as in the following prosodic representation:

(33) Predicted prosodic representation for a DP with an adjective and a two-word possessive construction



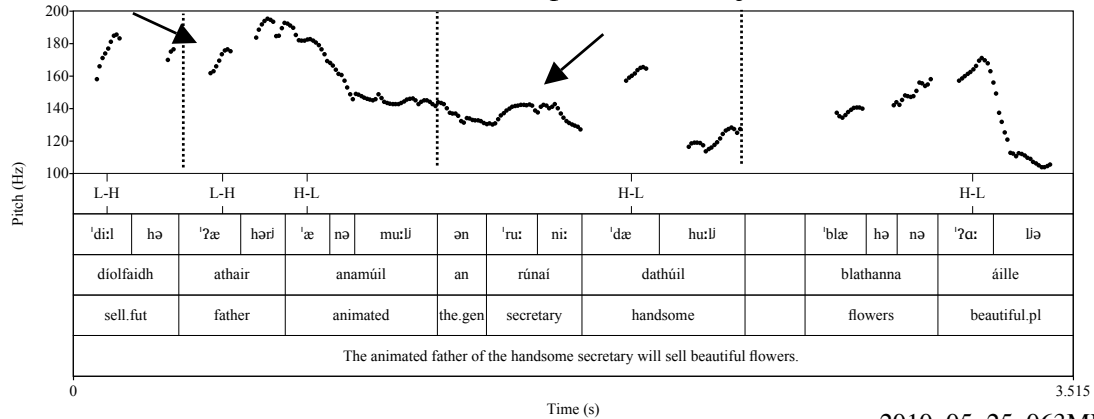
As before, this representation predicts that the first noun of the DP will be marked with an L-H accent whether it is final or non-final in the sentence. This pattern can be seen in the following pitch tracks, where (34) shows the construction in sentence-final object position, (35) shows the construction in subject position, and (36) shows the construction in non-final object position. First, in (34), we can see the L-H accent on the object *blathanna* ‘flowers’, and H-L on the adjective *áille* ‘beautiful.pl’, and another H-L fall on the final adjective *anamúla* ‘animated.pl’. The noun *ndaoine* is unspecified for tone, as leftmost in φ_{Min} but not $\varphi_{Non-min}$:

(34) Pitch track for a VSO sentence with a possessive object (N+A-N+A)



In (35), the same L-H H-L H-L patten is seen beginning on the first word of the subject possessor *áthair* ‘father’ and ending on the adjective *dathúil* ‘handsome’:

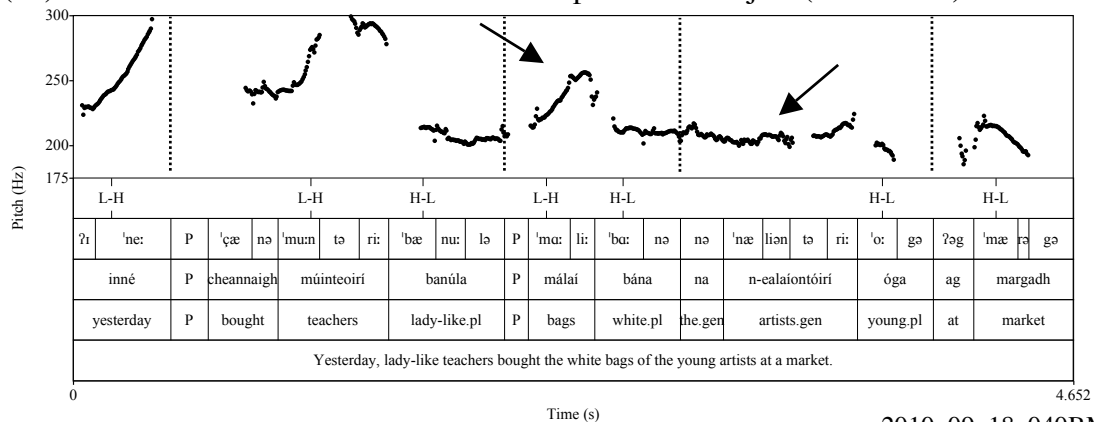
(35) Pitch track for a VSO sentence with a possessive subject (N+A-N+A)



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Finally, in (36), the same pattern is seen beginning on the adjective *málaí* ‘bags’ and ending on *óga* ‘young’:

(36) Pitch track for a VSOX sentence with a possessive object (N+A-N+A)



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This discussion of the prosody of complex DPs, in comparison with finite clauses in the previous sections, shows that the analysis correctly predicts that a syntactic structure of the form [A [B [C [D]]]] will be parsed prosodically as ((A B)(C D)), as motivated by ranking STRONG-START over MATCH-PHASE. This is true whether the syntactic phrase is a DP, as motivated by both [N [A [A [A]]]] and [N [A [N [A]]]] structures, or whether the domain is a clause, as in [V [N [N [A]]]]. As an indirect reference theory,

Match Theory predicts a close correspondence between syntactic and prosodic constituency except when such correspondence would violate a high-ranking prosodic markedness constraint, under which cases prosodic constituency are predicted to deviate from syntactic constituency.

4.3 Variation in Prosodic Phrasing

4.3.1 Variation in VSO Sentences

The pattern discussed in section 4.2 is categorical in my data: a sequence of two STRONG-START violations in [A [B [C [D]]]] structures, as in VSO sentences with single-word subjects, will almost always be resolved by phrasing two words together in violation of MATCH-PHRASE. However, as will be discussed in this section, this is not true of other structural configurations: in particular, single violations of STRONG-START are not resolved uniformly, and show variation between isomorphic structures, as predicted by MATCH-PHRASE, and non-isomorphic structures, as predicted by STRONG-START. In this section, I will discuss how this pattern of variation is best accounted for under the assumption that constraints are weighted rather than strictly ranked, as was assumed in section 4.2.

For example, consider the following sentence, which is VSO with both single-word subject and object:

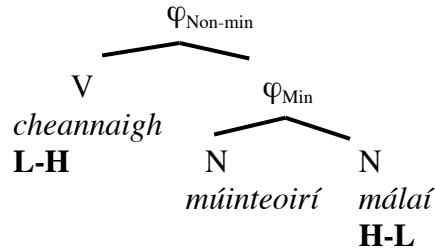
- (37) Cheannaigh múinteoirí málaí
bought teachers bags
'Teachers bought bags.'

Given the syntactic structure alone, we predict the existence of a constituent that groups together the subject and the object. In the prosodic representation predicted by MATCH-

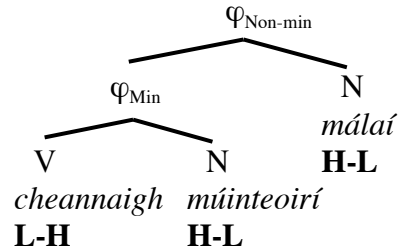
PHRASE, the subject and object are accordingly grouped together, leaving the verb to adjoin to the right in violation of STRONG-START. Alternatively, the influence of STRONG-START, as discussed in the previous section, predicts a preference to group the verb and subject together, leaving the object to adjoin to material on its left. This phrasing satisfies STRONG-START but incurs a violation of MATCH-PHRASE. These possibilities are illustrated schematically below:

(38) Possible prosodic representations of VSO sentences with single-word subject and object

a. MATCH-PHRASE satisfied



b. STRONG-START satisfied



The analysis developed in section 4.2 proposes that departures from MATCH-PHRASE occur as a result of ranking STRONG-START above MATCH-PHRASE in the language's constraint hierarchy. Given this ranking, we predict that speakers will prefer the representation in (38)b to that of (38)a, as can be seen in the following tableau:

(39) Prediction: verb and subject phrase together

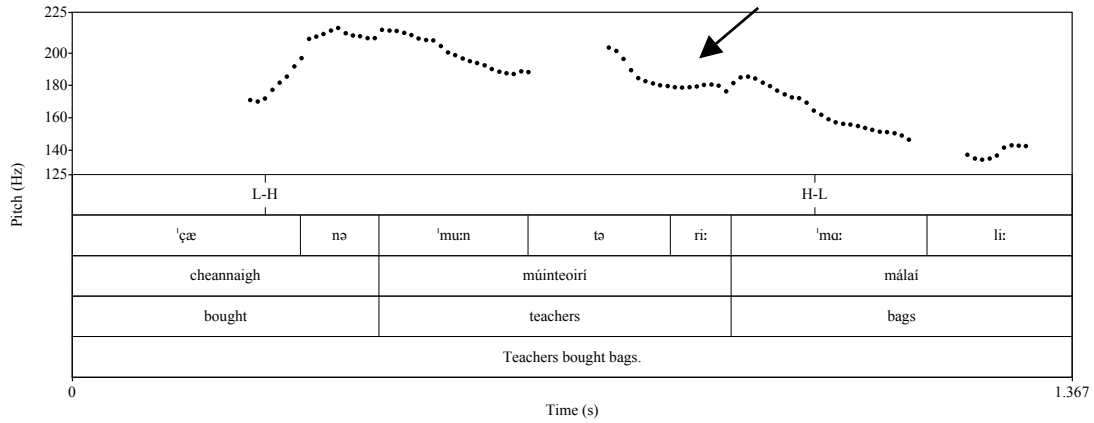
$\Sigma P[V_{TP}[N_{VP}[N]]]$	STRSTART	MATCH-PHRASE
a. $\sigma((V N) N)$		*
b. $(V (N N))$	*!	

However, this pattern for cases with single-word subject and object, while well attested, is not strongly preferred by speakers. Of four speakers,⁶⁷ the recordings from two speakers showed tonal evidence supporting (38)b (a H-L accent on *múinteoirí*) and two

⁶⁷ The data from three speakers were excluded because the tonal evidence was not clear enough to be interpreted with confidence.

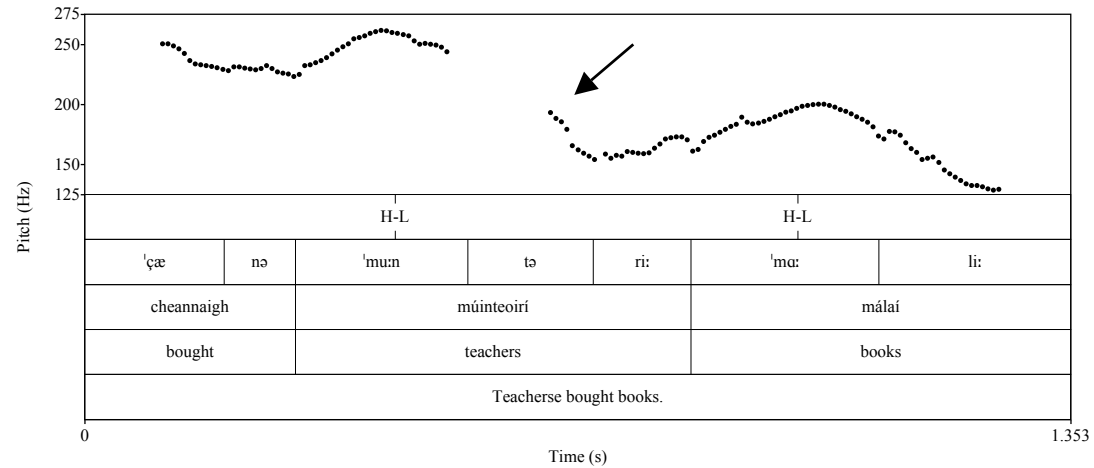
supported (38)a (no accent on *múinteoirí*, but rather an H plateau extending from the rise on *cheannaigh*). Example pitch tracks for each pattern are shown below:

(40) Pitch track showing MATCH-PHRASE pattern (VSO, LL)



2010_09_14_023YFe3

(41) Pitch track showing STRONG-START pattern (VSO, LL)

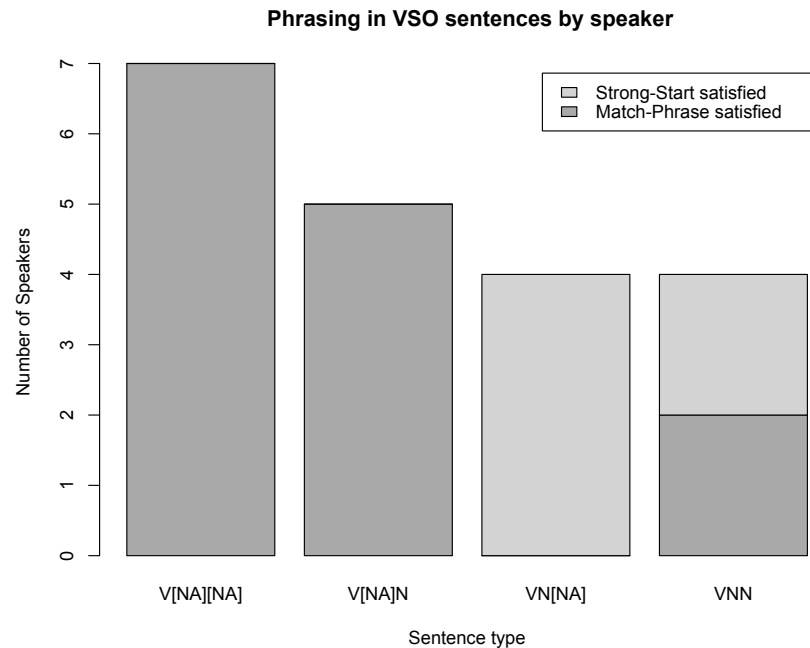


2010_09_17_084NCe1

Interestingly, this type of variation is not found in all members of the paradigm for VSO sentences, in which the binarity of the subject and object are varied. For example, consider the following bar graph, which illustrates the phrasing possibilities for VSO sentences by number of speakers, where the number of words in the subject and object are varied between two words and one. Within the paradigm of VSO sentences discussed here, we find variation between speakers only where S and O are single

words; speakers are consistent in their choice of phrasing in other sentence types. Note that the number of available tokens are limited, and that this barplot should only be seen as a preliminary illustration of the generalization. Further data collection is needed in order to more confidently establish the robustness of this pattern.⁶⁸

(42) The distribution of phrasing possibilities by speaker in VSO sentences



In this graph, we can see that the preference for satisfying MATCH-PHRASE is almost categorical for VSO sentences when the subject is binary (either binary or single-word subject), and that a preference for satisfying STRONG-START is found when the subject is a single word and the object is binary. In contrast, VSO sentences with single-word subjects and objects vary between a preference for satisfying STRONG-START and MATCH-PHRASE.

⁶⁸ In this barplot, I have excluded speakers who produced pitch tracks with no discernable pitch accents on any non-initial words (see chapter 2, section 2.6 for discussion of this type of F0 contour). It is for this reason that there are different numbers of speakers indicated for each column.

The puzzle here is why speakers behave uniformly in some cases—when all phrases are binary (as in chapter 3) or when there are two adjacent STRONG-START violations (as in section 4.2)—but vary in their choice of phrasing in others. The analysis developed in this section attempts to take this observation into account, arguing that the patterns cannot be accounted for using standard OT (as assumed in section 4.2), but rather are best accounted for using Harmonic Grammar, a framework that assumes that constraints are weighted rather than ranked, such that constraint violations are cumulative rather than evaluated based on strict ranking. The arguments are based on the observed pattern of variation and the role of depth of embedding in determining prosodic phrasing.

4.3.2 Cumulativity Effects

In section 4.2, I developed an analysis of the deviations from strict syntax-prosody correspondence using standard OT, in which constraints are strictly ranked. Under this proposal, violations of MATCH-PHRASE are tolerated because their satisfaction would result in violations of STRONG-START or BIN- φ , which both outrank MATCH-PHRASE. However, it was shown in section 4.3 that this preference is not always apparent in other sentence types where STRONG-START or BIN- φ are expected to prevail if they really do outrank MATCH-PHRASE. Instead, speakers showed a pattern of variation, with an (apparently) equal preference for satisfying MATCH-PHRASE and STRONG-START. Interestingly, this variation is observed only in a subset of sentences, and not across the board. In this section, I discuss possible ways of accounting for this pattern of variation, and conclude that the pattern fits most closely with Harmonic

Grammar, a theory in which constraints are weighted rather than ranked, suggesting that the proposal in section 4.2 is too simplistic.

There are several proposals to account for phonological variation under standard OT (for an overview, see Coetzee & Pater 2011). One of the most prevalent is the Partially-Ordered Constraints model (POC, Kiparsky 1993; Anttila 1997). Under this theory, variation arises because the grammar provides only a partial ranking of constraints—in other words, some constraints are not ordered with respect to one another. In order to evaluate a candidate set for which only a partial ranking is available, a ranking consistent with the partial order is chosen randomly. Because different orderings choose different candidates as optimal, the output for these evaluations is variable.

Anttila (1997) proposes that POC theory can be used to derive the relative probability of optimal candidates in a partially-ordered grammar. For example, if two constraints, C1 and C2, are unranked with respect to each other, there is a 50% probability that C1 will outrank C2 and a 50% probability that C2 will outrank C1. In the CI data considered here, we could assume that MATCH-PHRASE and STRONG-START are unranked in the grammar, and that this is responsible for the variation that is observed in some types of VSO sentences. However, provided that the ranking of only these two constraints is sufficient to account for the variable patterns, POC incorrectly predicts that variation should be observed in all forms of the VSO sentence, not just when there is a single word subject and object: we predict that MATCH-PHRASE will not always prevail when there is a binary subject, and that STRONG-START will not always be satisfied when there is a single-word subject and binary object. This theory predicts

that the distribution of both types of structures should be roughly at chance—and the observation that such structures are rare would argue against an analysis using the POC model of variation. The theory offers no explanation for why variation should be observed only in a subset of possible environments.

A similar problem arises with other probabilistic models of variation such as Stochastic OT (Boersma 1997, 1998; Boersma & Hayes 2001). Stochastic OT retains classic OT's assumption of strict ranking in evaluation, but assumes that this ranking is determined by numerical values which correspond to rankings in the evaluation. When an amount of noise is assumed in the evaluation, the numerical values assigned to the constraints are predicted to vary, resulting in variation with respect to the optimal candidate. However, as for POC theory, Stochastic OT also predicts that constraints will behave uniformly with respect to variation in the grammar, meaning that the pattern of variation only in a subset of VSO sentences is unexpected.

Instead, the observed pattern of variation can best be accounted for using Harmonic Grammar (HG, Legendre et al. 1990; Smolensky & Legendre 2006; Pater 2009b), and in particular a version which implements a noisy evaluation to account for variation, as proposed by Coetzee and Pater (2011). HG differs from classic OT by assuming that constraints are assigned numerical weights rather than a strict ranking. The optimal candidate is chosen on the basis of its Harmony score (H) in relation to competing candidates. The H score of each candidate is cumulative, in the sense that the H score of each candidate consists of the sum of the number of violations (s) of each constraint (k) multiplied by that constraint's weight (w), as shown in the following formula (Pater 2009b):

(43) Calculation of Harmony in HG

$$H = \sum_{k=1}^k w_k \cdot s_k$$

For example, consider the following pair of tableaux, where two constraints, C1 and C2, are each violated once by two candidates, *Candidate (a)* and *Candidate (b)*. In OT, the ranking of C1 and C2 determines which candidate is optimal; if C1 outranks C2, *Candidate (a)* will win. In HG, on the other hand, the relative weight of C1 and C2 determines the winner: *Candidate (a)* wins if C1 is assigned a higher weight than C2.

(44) a. OT tableau: strict ranking C1 » C2

/input/	C1	C2
☞ Candidate (a)		*
Candidate (b)	*!	

b. HG tableau: single violations of C1 and C2

<i>weight</i>	1.5	1	
/input/	C1	C2	<i>H</i>
☞ Candidate (a)		-1	-1
Candidate (b)	-1		-1.5

OT and HG make different predictions when a candidate incurs multiple violations of constraint. Given the right weighting conditions for the constraints involved, multiple violations of a lower-weighted constraint may result in a lower harmony score for a candidate as compared to a candidate which incurs a single violation of the higher-weighted constraint. For example, consider the following hypothetical tableau, which is like (44)b, except that candidate (a) violates C2 twice instead of once.

(45) HG tableau: two violations of C2 is worse than a single violation of C1

<i>weight</i>	1.5	1	<i>H</i>
/input/	C1	C2	
Candidate (a)		-2	-2
☞ Candidate (b)	-1		-1.5

If C1 is assigned a weight of 1.5 and C2 a weight of 1, two violations of C2 will result in a relatively lower H score (-2) than a single violation of C1 (-1), meaning that *Candidate (b)* emerges as the optimal candidate. This is an example of a *gang effect*, where multiple violations of lower weighted constraints accumulate to result in the optimality of a candidate that incurs fewer violations of a higher-weighted constraint (see e.g. Pater 2009b). In contrast, if C1 and C2 are strictly ranked, as in standard OT, the number of violations of C2 is irrelevant if C1 outranks C2: a single violation of the higher ranked constraint is fatal.

(46) OT tableau: strict ranking C1 » C2

/input/	C1	C2
☞ Candidate (a)		**
Candidate (b)	*!	

Whether or not there is evidence for cumulative constraint interaction, as in the gang effects predicted by HG, has been the topic of much discussion in recent literature, with evidence coming from typology, learning, and variation (e.g. Pater 2009a, 2009b; Potts et al. 2010; Jesney & Tessier to appear; Jesney to appear, 2011; Coetzee & Pater 2011).

If we assume here an HG framework where constraints are weighted rather than ranked, we expect to find cumulativity effects in decisions relating to prosodic phrasing: instances where candidates which incur multiple violations of a constraint are predicted to be dispreferred in comparison to candidates which incur fewer violations. For the case at hand, where we are examining the interaction between MATCH-PHRASE and STRONG-START, the number of violations of each constraint might be expected to play a role in determining optimality. For instance, even if we assume that STRONG-START and MATCH-PHRASE are equally weighted in the grammar, the number of violations of each

constraint will determine the optimal candidate: the candidate which incurs the fewest constraint violations is predicted to be the winner.

For example, as discussed at the end of section 4.2.1.2, speakers appear to tolerate a single violation of STRONG-START in VSO sentences where S and O are binary. Under an OT analysis where STRONG-START outranks MATCH-PHRASE, candidate (b) is incorrectly predicted to be optimal, as shown in the following OT tableau:

(47) OT tableau for a VSO sentence with branching subject and object: incorrectly predicts that a single violation of STRONG-START eliminates candidate (a)

$\Sigma P[V_{TP}[DP_1[N A] VP[DP_2[N A]]]]$	STRSTART	MATCH-PHRASE
a. ☹ (V ((NA) (N A)))	*! V!	
b. ☺ (((VN)A) (N A))		** DP1! TP!

The contrast between these two candidates appears to be the number of violations of MATCH-PHRASE relative to the number of violations of STRONG-START: because rephrasing the verb to form a binary phrase with the DP would result in two violations of MATCH-PHRASE, one for TP and one for DP, this structure is dispreferred. Under the assumption that STRONG-START and MATCH-PHRASE are weighted (equally), these two violations of MATCH-PHRASE are more costly than a single violation STRONG-START.⁶⁹

This is illustrated in the following HG tableau:⁷⁰

⁶⁹ Note that alternative parses which violate BIN-MIN(φ) and BIN-MAX(φ) can be ruled out by assuming that these constraints are weighted high enough that a single violation of these constraints will result in a lower H-score than the winning candidate in (48).

⁷⁰ Another phrasing option employed by speakers is to “deaccent” the verb, such that the verb does not bear a pitch accent. Presumably, this is an option that in some way removes the violation of STRONG-START. The basic pattern was discussed in [chapter 3]. However, I will ignore this option for the present as there seems to be free variation

(48)HG tableau for a VSO sentence with branching subject and object: a single violation of STRONG-START is tolerated because satisfying STRONG-START would incur two violations of MATCH-PHRASE

<i>weight</i>	1	1	<i>H</i>
$\Sigma P[V_{TP}[DP_1[N A] VP[DP_2[N A]]]]$	STRSTART	MATCH-PHRASE	
a. $\curvearrowright (V ((NA) (N A)))$	-1 V!		-1
b. $((((VN)A) (N A)))$		-2 DP1! TP!	-2

Candidate (b) is dispreferred because it has a lower H score than candidate (a), even assuming that the two constraints are weighted equally: we correctly derive the preference for adhering to MATCH-PHRASE in structures with a single initial STRONG-START violation.

This is one case in which HG and standard OT make different predictions with respect to phrasing, and where the HG analysis fares better. In order to make the OT analysis work in this case, we would have to assume the existence of an additional constraint that would disprefer candidate (b); however, it is unclear what this constraint would be. The HG analysis captures the intuition that prosodic structure may deviate from syntactic structure under certain circumstances, as when the structure violates a prosodic markedness constraint that is privileged in the grammar, but that there is a cost associated with deviating too far from the structure given by the syntax. Under this account, MATCH-PHRASE continues to exert an influence on prosodic structure, even when in direct conflict with a prosodic markedness constraint like STRONG-START.

This account also correctly predicts that multiple violations of prosodic markedness constraints will be more likely to result in non-isomorphic prosodic

between this option and the phrasing assumed in (48), where the violation of STRONG-START is tolerated (as evidenced by the presence of an L-H accent on the verb).

representations. For instance, as discussed in section 4.2, the preferred repair for a VSO sentence with single-word subject and binary object is, contrary to expectation, to phrase V and S together to form a φ , resulting in a single additional violation of MATCH-PHRASE (because of the loss of the TP constituent). By violating MATCH-PHRASE, the preferred structure avoids the two violations of STRONG-START incurred by V and the single-word subject, an example of a *trade-off* between constraint violations (Pater 2009b). A trade-off results in a candidate whose H score is higher than expected because a single violation of a constraint results in the elimination of two violations of another constraint, rather than just one.

Following the HG analysis above, we can correctly derive the optimality of this repair because the cumulative markedness of two violations of STRONG-START will result in a lower H score than a single violation of MATCH-PHRASE, even if we continue to assume an equal weighting of the two constraints. This is shown in the following tableau:

(49) HG tableau for a VSO sentence with one-word subject and branching object: two violations of STRONG-START are worse than a single violation of MATCH-PHRASE

<i>weight</i>	1	1	<i>H</i>
$\Sigma_P[V_{TP}[N_{VP}[DP_2[N A]]]]$	STRSTART	MATCH-PHRASE	
a. φ ((V N) (N A))		-1 TP!	-1
b. (V(N (N A)))	-2 V! N!		-2

In this case, the HG analysis derives the same result as the ranking analysis developed in section 4.2, where STRONG-START outranks MATCH-PHRASE. However, unlike the OT analysis, the HG analysis does not predict that STRONG-START will always prevail over MATCH-PHRASE; rather, this analysis allows both constraints to play an equal role

in determining output forms, as it is the overall number of violations that determines the optimal candidate.

The advantage of this analysis over an analysis with strict ranking as in standard OT can be seen in cases where both constraints are violated equally, such that two or more candidates have equal H scores, assuming that STRONG-START and MATCH-PHRASE have (roughly) the same weight. In VSO sentences with a single-word subject and object, both possible phrasing options violate either STRONG-START or MATCH-PHRASE once, such that there is no clear winner when the constraints are weighted equally: both candidates will have an H score of -1:^{71,72}

(50) HG tableau for a VSO sentence with one-word subject and object: single violations of STRONG-START and MATCH-PHRASE

<i>weight</i>	1	1	
$\Sigma P[V_{TP}[N_{VP}[N]]]$	STRSTART	MATCH-PHRASE	<i>H</i>
a. φ ((V N) N)		-1 TP!	-1
b. φ (V(N N))	-1 V!		-1

We can account for variation by assuming that there is a certain amount of noise in the determination of constraint weights at EVAL, as is assumed under the Noisy HG model (Boersma & Pater 2008; Pater 2009b; Coetzee & Pater 2011). Because STRONG-START and MATCH-PHRASE have a roughly equal weight, small deviations in the determination

⁷¹ I am abstracting away from the violations incurred because single-word φ s are generally not tolerated. For example, MATCH-PHRASE is violated when a DP containing a single noun is not phrased as a φ , but this is dispreferred by BINMIN- φ , which presumably has a relatively higher weight in the grammar. As such, both candidates in (50) violate MATCH-PHRASE at least twice more for not phrasing the DPs as single-word φ s. However, these additional violations will not affect their *relative* H scores, and therefore can be ignored for now.

⁷² Note that even though the two constraints considered here have the same weight, this result could not be achieved using standard OT with unranked constraints. For problems relating to constraint disjunction, see discussion in McCarthy (2008a).

of their weight would result in free variation. If noise is random, we expect to see more variation in this case than in either of the two previous examples, where larger amounts of noise would be necessary in order to overcome the differences in the H scores. In these cases, we predict that the choice of one candidate as optimal should be relatively stable.

While more data is needed to be sure of the significance of this pattern, the variation in this environment, as well as in other sentence types, seems to be better understood as free variation than as differences in speaker grammars. There are two reasons for this:

- When looking at a broader range of sentence types, speakers are inconsistent in their choice of ranking/weighting STRONG-START and MATCH-PHRASE.
- For some sentences, contrasting phrasing was attested between repetitions for a single speaker.

If this pattern were to hold up over a larger number of repetitions and a larger sample of speakers, it would provide strong evidence in favour of employing weighted constraints, at least in the determination of prosodic phrasing: as discussed in the previous section, proposals for variation in OT such as Partially-ordered Constraints or Stochastic OT predict that variation between repairs should be observed in all contexts where the conflict between the constraints is relevant, and as such, cannot account for variation in a single member of a paradigm. See Coetzee and Pater (2011) for an HG account of a similar pattern of variation in the realization of voiced geminates in Japanese loanwords.

4.4 Conclusion

In this chapter, I have presented evidence bearing on (a) the existence of phonological domains that are non-isomorphic to syntactic constituency, in violation of MATCH-PHRASE, and (b) the motivation of these departure from MATCH-PHRASE as a result of prosodic markedness. We saw this first in conjunction with [A [B [C [D]]]] structures that were phrased as ((A B) (C D)) under pressure from the prosodic markedness constraints STRONG-START, BIN-MIN(φ) and BIN-MAX(φ). This analysis was shown to hold for structures of this type both in the clauses and DP structures. The second piece of evidence for the role of prosodic markedness constraints in motivating departures from syntactic structure was taken from the realm of variation, where it was shown that speakers varied with respect to whether or not the structure of VSO sentences with single-word subjects and objects respect MATCH-PHRASE or STRONG-START. I argued that the particular pattern of variation, where variation was observed only in one member of the paradigm, was best accounted for under the assumption that constraints are weighted rather than ranked, as in HG. The contrast between categorical phrasing preferences in some structures but not in others suggests a non-uniform response to violations of STRONG-START, which supports the analysis proposed here which makes use of constraint interaction. This provides evidence against direct-reference theories of the syntax-prosody interface, which equates phonological domains with syntactic domains. This topic will be discussed in chapter 7.

CHAPTER 5
THE ROLE OF FUNCTIONAL PROJECTIONS IN SYNTAX-PROSODY
MAPPING

5.1 Introduction

In the theory developed in this dissertation, both lexical and functional projections in the syntax play a role in prosodic structure because both are evaluated by the constraint MATCH-PHRASE. This constraint, whose definition is repeated below, is violated by any syntactic phrase that dominates phonologically-overt terminal nodes that are not parsed as a φ in the phonological representation:

- (1) MATCH-PHRASE: Suppose there is a syntactic phrase (XP) in the syntactic representation that exhaustively dominates a set of one or more terminal nodes α . Assign one violation mark if there is no phonological phrase (φ) in the phonological representation that exhaustively dominates all and only the phonological exponents of the terminal nodes in α .

This definition does not distinguish between lexical and functional projections. So far in this dissertation, I have shown evidence that functional projections of many different types are indeed relevant for MATCH-PHRASE and prosodic structure assignment, as evidenced by the distribution of the tonal pitch accents L-H and H-L. For example, in the discussion of VSO sentences in chapters 3 and 4, we saw that there was pressure to preserve in the prosodic representation the TP constituent in the syntactic representation which groups together the subject and object. With its non-lexical, functional head T(ense), TP is a functional phrasal projection.

The claim that functional projections are analyzed (“seen”) by a syntax-prosody interface constraint like MATCH-PHRASE runs counter to previous proposals that functional projections are invisible to prosodic structure assignment (Selkirk 1984,

1986, 1995; Chen 1987; Hale & Selkirk 1987; Selkirk & Shen 1990; Truckenbrodt 1995, 1999). In the more recent proposals, this assumption has the effect that constraints on syntax-prosody mapping, like ALIGN-XP and WRAP-XP, only refer to lexical projections. For example, Truckenbrodt (1999: 226) invokes the *Lexical Category Condition* (LCC) of Selkirk (1995), a principle governing syntax-prosody mapping constraints:

(2) Lexical Category Condition

Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, or to empty syntactic elements and their projections.

Note that the second part of the LCC relating to empty syntactic elements and projections is also assumed by MATCH-PHRASE by referring to the *phonological exponents* of syntactic terminal nodes: empty syntactic elements do not have any phonological exponents, and are thus ignored in the evaluation of MATCH-PHRASE.

While the evidence from CI shows that functional and lexical projections arguably have equal status with respect to syntax-prosody correspondence between phrases, I have maintained a distinction between lexical and functional words (Selkirk 1986, 1995), which was discussed in detail in chapter 3. There, I argued that unlike lexical words, function words are not parsed as prosodic words and, as such, are not prosodically ‘heavy’ enough to project a distinct prosodic category or prosodic subcategory, and proposed that this preference is encoded in the grammar by the *Function Word Adjunction Principle*. For example, a function word that adjoins to a φ_{Min} does not warrant the projection of the dominating node as $\varphi_{\text{Non-min}}$. Rather, the adjunction of a function word warrants only the projection of the category type to which it adjoins, in this case φ_{Min} . The specialness of function words in CI arguably lies in

their lack of prosodic word status. This lack of ω status is shown by the fact that function words are ignored in the assignment of pitch accents: L-H and H-L pitch accents in CI associate with the stressed syllable of the prosodic word closest to the relevant edge of the relevant domain, skipping over function words. While the lack of prosodic word status can be given responsibility for the fact that the adjunction of function words in prosodic structure does not result in a dominating φ node whose prosodic subtype is distinct from that of the constituent that is sister to the function word, it does not mean that function words are invisible at the syntax-prosody interface. Rather, under the theory proposed here, function words, as phonologically overt elements, do count in the evaluation of MATCH-PHRASE, a proposal that was also made in chapter 2. Moreover, we have seen evidence that syntactic functional projections like TP count for MATCH-PHRASE as seen in VSO sentences.

In this chapter, I will discuss evidence that supports the definition of MATCH-PHRASE as given in (1) above. First, section 5.2 looks at intransitive (VS) sentences. Here, I argue that the TP projection is not relevant to MATCH-PHRASE because it dominates only the subject DP and no other phonological material; unlike in VSO sentences, where the TP dominates both subject and object, the TP constituent in intransitive sentences dominates exactly the same phonological material as the subject DP within it, and so no distinct φ for that TP is introduced in the prosodic representation. Instead, I show that sentences with this intransitive structure behave as expected when the number of words in the subject DP is manipulated, with variation in cases where MATCH-PHRASE and STRONG-START trade violations.

Section 5.3 examines embedded clauses and yet another prediction made by MATCH-PHRASE. In these sentences, there is a stronger than expected dispreference for allowing prosodic phrasing to cross the CP boundary. This is discussed first for relative clauses (5.3.1), then for verbal complement clauses (5.3.4). I argue that the apparent “blocking” effect that occurs at CP boundaries can be attributed to the presence of phonologically overt complementizers, even though they are function words. The presence of phonologically overt functional heads, as in this case, has the consequence that MATCH-PHRASE requires a distinct φ node in the prosodic representation that corresponds to the CP in the syntactic representation. Section 5.3.5 discusses the consequences of the assumption that functional projections headed by function words are relevant to prosodic structure assignment, and looks at the predictions for other constructions in CI. Section 5.4 concludes the chapter.

5.2 Intransitive Sentences

In chapter 4, I proposed that the patterns of variation exhibited by VSO sentences was best captured using HG, a framework that assumes weighted rather than ranked constraints. By introducing the notion of cumulative evaluation, the number of violations for each constraint becomes much more important than under the assumption that constraints are strictly ranked. While in OT the number of violations is crucial only in choosing between candidates that are otherwise tied, constraint violations in HG are crucial in determining the optimal candidate, such that every violation counts.

Under these assumptions, details of syntactic structure will affect our predictions of syntax-prosody mapping as determined by MATCH-PHRASE. The definition of MATCH-PHRASE proposed in chapter 1 limits the evaluation of MATCH-PHRASE to those

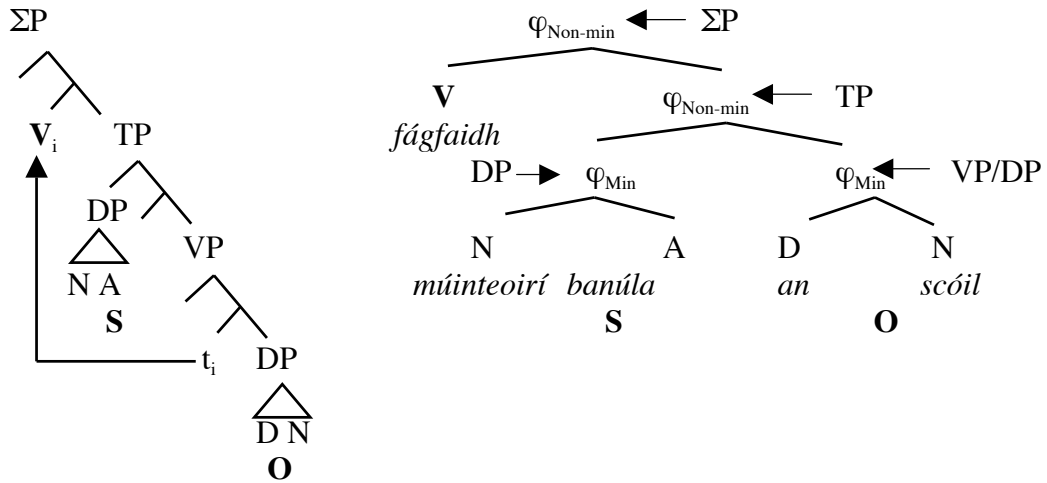
syntactic domains that introduce new, phonologically-overt material; in formal terms, this was expressed by the idea that two syntactic phrases that dominate identical sets of terminal nodes do not require distinct φ in the phonological component, but may be dominated by a single φ . Similarly, when multiple phrases in the syntax exhaustively dominate the same set of terminal nodes, MATCH-PHRASE is only violated once if there is no φ in the prosodic representation that exhaustively dominates the phonological exponents of this set of terminal nodes.

In the examples discussed in chapter 4, MATCH-PHRASE was violated by the failure to parse a distinct set of terminal elements into a φ . However, I have not yet discussed what happens when two syntactic phrases dominate the same set of terminal nodes. For example, consider the role of the syntactic phrase TP in transitive and intransitive sentences:

- (3) a. Fágfaidh_{TP}[múinteoirí banúla an scóil].
 leave.FUT teachers lady-like the school
 ‘Lady-like teachers will leave the school.’
 b. Imoidh_{TP}[múinteoirí banúla].
 leave.FUT teachers lady-like
 ‘Lady-like teachers will leave.’

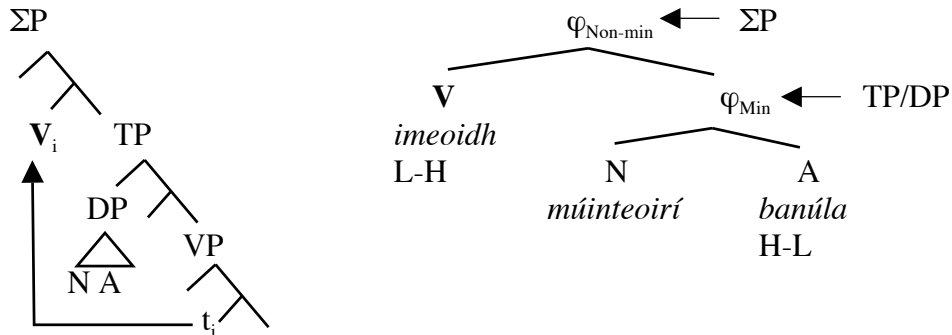
In (3)a, the TP introduces new, phonologically overt terminal elements in the form of the subject DP *múinteoirí banúla* ‘lady-like teachers’, which is phrased together with the object to form a φ :

(4) Syntactic and prosodic representation of a transitive sentence
 a. Syntactic Representation b. Recursive Prosodic Representation



In (3)b, in contrast, the only overt phonological material that is introduced by TP is the subject DP; because there is no object and the verb has moved up to ΣP , the VP is empty:

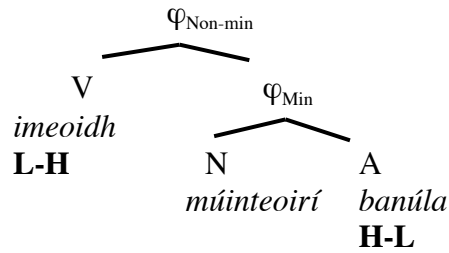
(5) Syntactic and prosodic representation of an intransitive sentence
 a. Syntactic Representation b. Recursive Prosodic Representation



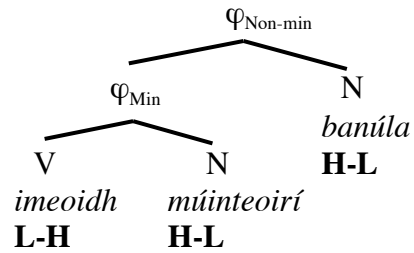
The definition of MATCH-PHRASE developed in this dissertation, in combination with STRONG-START, predicts that the prosodic representation in (5)b will not necessarily be the only one, but that it will occur in variation with a structure that phrases together the verb and subject. As with VSO sentences with single-word subject and object, the two structures in competition are predicted to be the following:

(6) Possible prosodic representations of intransitive sentence (binary subject)

a. MATCH-PHRASE satisfied



b. STRONG-START satisfied



This is illustrated in the following tableau, where it can be seen that the candidates have equal H-scores:

(7) HG tableau: VS: single violations of STRONG-START and MATCH-PHRASE

<i>weight</i>	1	1	
$\Sigma P[V_{TP}[DP[NA]]]$	STRSTART	MATCH-PHRASE	<i>H</i>
a. φ (V(N A))	-1 V!		-1
b. φ ((V N) A)		-1 DP/TP!	-1

Indeed, both structures are attested in my corpus at roughly equal rates, though from a relatively small sample:⁷³

(8) Option (a): 4 repetitions/2 speakers

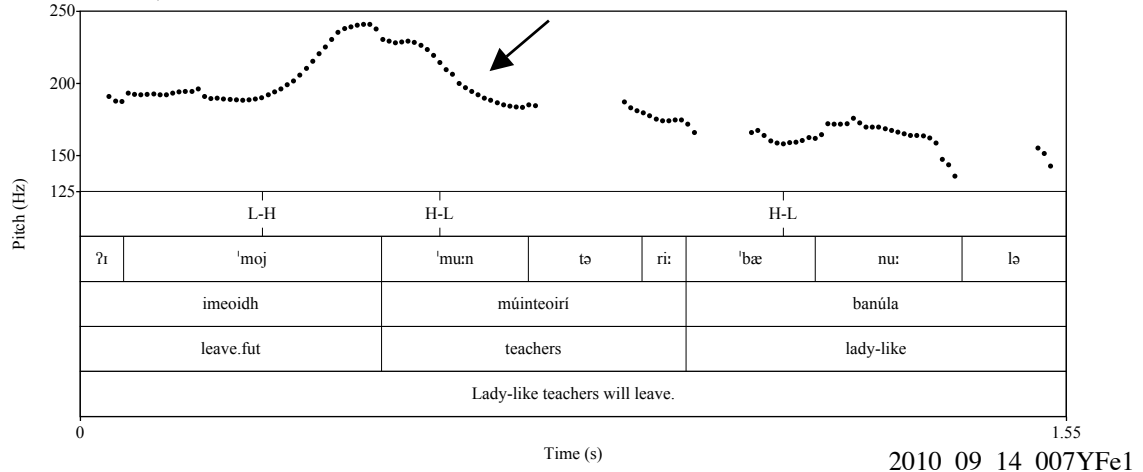
Option (b): 3 repetitions/3 speakers

Sample pitch tracks are below. The pitch track in (9) illustrates option (a), which satisfies MATCH-PHRASE. This can be seen by the sequence of L-H H-L accents on the verb and noun, followed by another H-L accent on the adjective:⁷⁴

⁷³ Data were excluded from this count if the pitch track did not show any pitch accents.

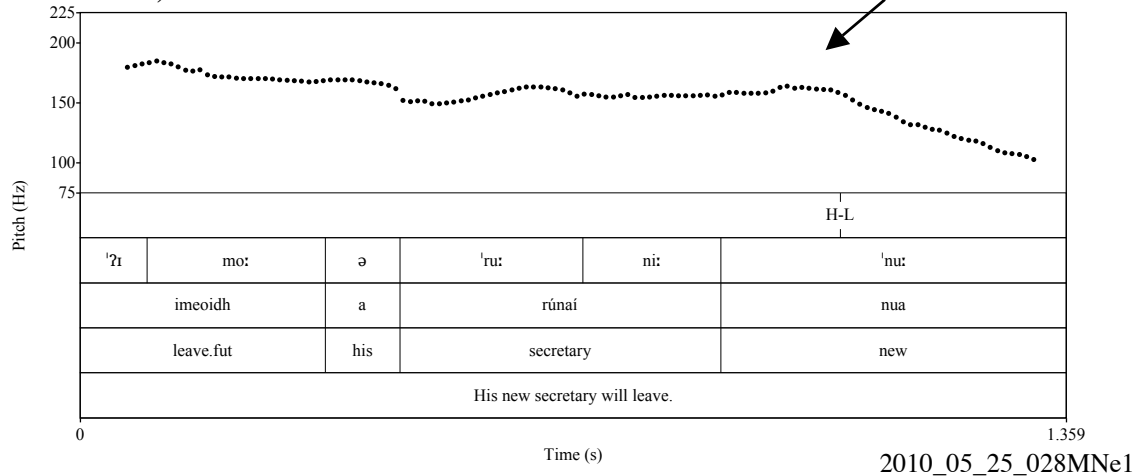
⁷⁴ Note that the pitch peak on the final word, *banúla* ‘lady-like’, appears to be late in its realization. However, this word still appears to bear an H-L accent because of the drop in pitch on the final syllable (although here, F0 is masked by the appearance of creaky voice).

(9) Pitch track for an intransitive sentence with a binary subject (MATCH-PHRASE satisfied)



The pitch track in (10) illustrates option (b), where the verb and noun are phrased together. This phrasing is evidence from the stable pitch on the noun and the H-L accent on the adjective. Like many verbs, the verb in this example is unaccented:

(10) Pitch track for an intransitive sentence with a binary subject (STRONG-START satisfied)



Intransitive sentences with binary subjects behave, as expected, like VSO sentences with single-word subject and object. If instead both TP and DP were each to count for MATCH-PHRASE, we would incorrectly predict that speakers would favour the prosodic representation that satisfies MATCH-PHRASE, as in (9), and disprefer that in (10).

This pattern provides support for the proposed definition of MATCH-PHRASE, where syntactic phrases are relevant to prosodic structure only when they introduce new, phonologically overt material. While I will not discuss other cases at present, the theory predicts that this will generally be true of syntactic phrases, whether in the clausal or nominal domain.

5.3 Apparent Blocking Effects: CP boundaries

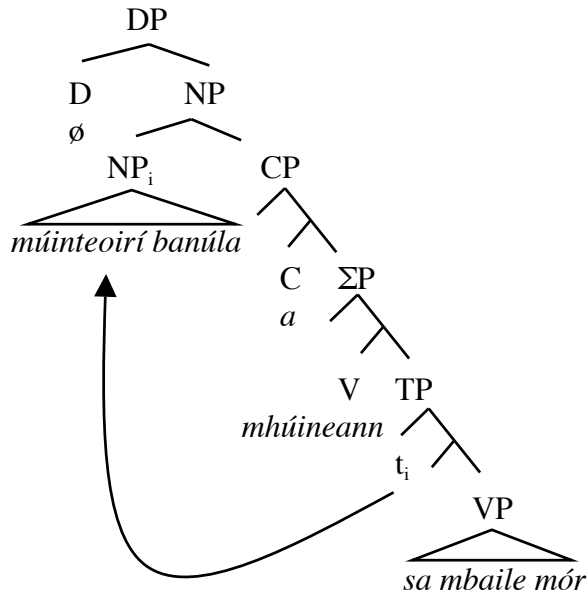
5.3.1 Relative Clauses

Relative clauses in Irish show VSO word order in the clause, just as in matrix sentences (see also chapter 3 for an introduction to relative clauses in Irish). For example, consider a sentence with a subject relative clause, where the head of the relative clause is binary (N-A) and the argument of the relative clause (in this case, a PP adjunct which immediately follows the verb) is also binary:

- (11) Cheannaigh _{DP}[*múinteoirí banúla* _{CP}[*a* _{SP}[*mhúineann* _{PP}[*sa mbaile*
 bought teachers lady-like.PL C teach.PRES in.the town
mór]]] *málaí bána*.
 big bags white.PL
 ‘Lady-like teachers who teach in the big town bought white bags.’

The syntactic structure of the relative clause in this sentence is as follows (repeated from chapter 3):

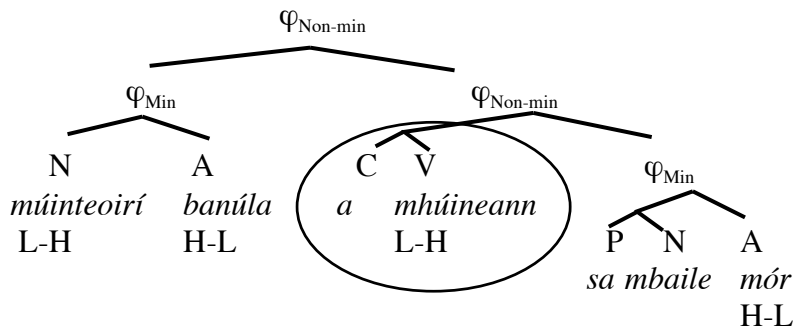
(12) The structure of a subject-headed relative clause



Unlike sentence-initial verbs, the verb *mhúineann* in the relative clause has the option of phrasing either with the DP to its left (*múinteoirí banúla* ‘lady-like teachers’) or with the PP to its right (*sa mbaile mór* ‘in the (big) town’). In accordance with the above structure, MATCH-PHRASE would prefer the verb to phrase with the following PP, as in the following prosodic representation.⁷⁵ Note that in this case, we would expect the verb to be marked with an L-H pitch accent as the leftmost element in a non-minimal φ:

⁷⁵ Note that the complementizer *a* behaves as a proclitic on the verb. See chapter 3 for further discussion of the prosodic behaviour of function words.

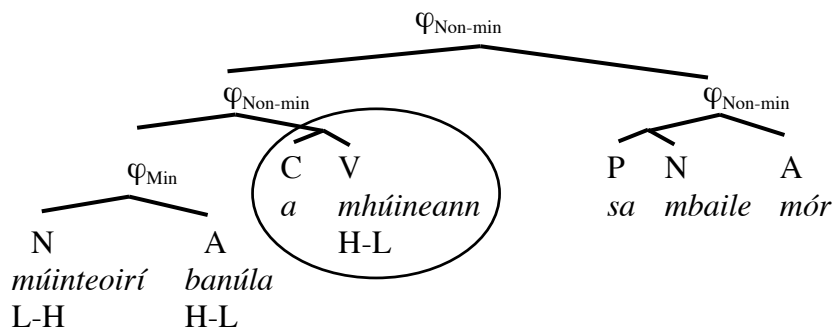
- (13) Option (a): Prosodic representation of a relative clause: verb phrases to the right;
MATCH-PHRASE is satisfied but STRONG-START is violated



MATCH-PHRASE: ✓
STRONG-START: * (V!)

However, the verb in this structure violates STRONG-START. This violation can be avoided by phrasing the verb with the DP to its left, *múinteoirí banúla*. In this case, the embedded verb does not violate STRONG-START, but does violate MATCH-PHRASE at least once for the Σ P that is broken up by this phrasing. Tonally, we expect to see an H-L accent on the embedded verb, indicating that it is at the right edge of a φ :

- (14) Option (b): Prosodic representation of a relative clause: verb phrases to the left;
STRONG-START is satisfied but MATCH-PHRASE is violated

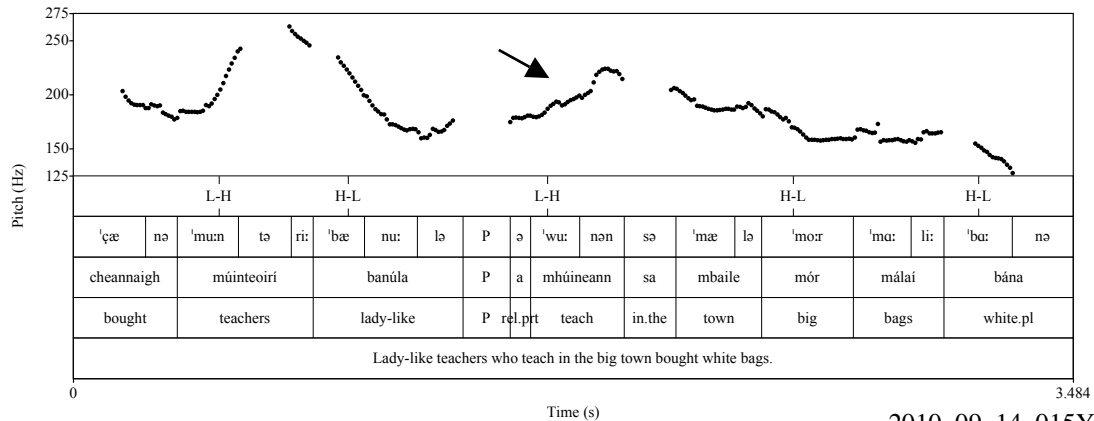


MATCH-PHRASE: *
STRONG-START: ✓

In this particular configuration of words, speakers almost never phrase the verb with the DP to the left (option (b)), but instead phrase it with material to its right, preserving syntactic constituency (option (a)). Whether the relative clause is in subject position (as

in (11)), sentence-final object position, or in object position followed by another adjunct, there is a strong preference for phrasing the verb together with the material to the right rather than with material to the left, just as for the complement clauses discussed above. This can be seen in the following pitch track, where the verb embedded in the relative clause (*mhúineann* ‘teach’) shows an L-H accent. This is typical of sentences where the verb in a relative clause is preceded and followed by a binary argument:⁷⁶

(15) Pitch track for a VSO sentence with a subject relative clause (all binary arguments)



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In terms of the data analysis in chapter 4, this pattern is categorical: in this context, speakers seem to show a uniform preference for phrasing the verb to the right.

Under the analysis pursued in chapter 4, the absence of option (b) above (where the verb phrases across the CP boundary) can be accounted for as another example of a cumulativity effect: in order for the verb to phrase to the left and satisfy STRONG-START, two syntactic constituents, CP and ΣP, are broken up, such that MATCH-PHRASE would be violated twice. Unlike for the intransitive sentences discussed in the previous

⁷⁶ The verb may also be unaccented, as in other positions. This seems to be especially common when the relative clause is in object position that is final in the sentence. However, even in these cases, the verb does not phrase with material to its left.

section, CP is predicted to count for MATCH-PHRASE because it dominates a phonologically-overt terminal node (the complementizer *a*) which is not also dominated by ΣP .⁷⁷

(16) Candidates for phrasing in a relative clause, assuming that CP counts in the evaluation of MATCH-PHRASE

<i>weight</i>	1	1	
$DP[N A_{CP}[c_{\Sigma P}[V_{TP}[DP[NA]]]]]$	STR START	MATCH-PHRASE	<i>H</i>
a. σ ((NA)(c-V (NA)))	-1 c-V!		-1
b. (((NA) c-V) (NA))		-2 CP! Σ P!	-2

If this is the correct analysis, we expect that additional violations of STRONG-START might result in speakers phrasing the verb across the CP boundary, either categorically (if the number of STRONG-START violations is larger than the number of MATCH-PHRASE violations) or optionally (if the number of STRONG-START violations is equal to the number of MATCH-PHRASE violations). In the next section, I discuss data from relative clauses with other configurations of words that suggest that this is a correct prediction.

5.3.2 Prosodic Phrasing in Subject Relative Clauses

In this section, I will discuss a set of patterns related to the phrasing of relative clauses. Above, I presented evidence that speakers show a strong (apparently

⁷⁷ Note that I am assuming that the complementizer does not incur itself a violation of STRONG-START. As will be discussed in [chapter 6], there is evidence that STRONG-START should be seen as a family of constraints rather than as a single constraint. The conclusion argued for there is that function words, as non-prosodic words, violate a different version of STRONG-START than do prosodic words (STRONG-START(σ)), while only prosodic words violate the constraint as it is used in the above tableaux (STRONG-START(ω)).

categorical) dispreference for phrasing the verb across the CP boundary in relative clauses, when the verb is both preceded and followed by a binary phrase (DP dominating N+A). However, in this section, I show this is true only in this particular environment: when the verb is either preceded or followed by a single noun, this categorical preference seems to disappear, and we see variation among several options.

As we have seen in several examples, speakers tend to keep together the material contained in DPs. For instance, in a typical VSO sentence with a binary subject DP (a N-A sequence or an N-N possessive construction), the material inside the DP tends to be phrased together even though the verb incurs a STRONG-START violation. In the HG tableau in (17) (repeated from chapter 4), I argued that this dispreference for breaking up DPs arises from a cumulativity effect from the two violations of MATCH-PHRASE, which results in a lower H score as compared to the single violation of STRONG-START:

(17) HG tableau: VSO, HH: a single violation of STRONG-START is tolerated because satisfying STRONG-START would incur two violations of MATCH-PHRASE

<i>weight</i>	1	1	<i>H</i>
$\Sigma P[V_{TP}[DP_1[N A] VP[DP_2[N A]]]]$	STRSTART	MATCH-PHRASE	
a. φ (V ((NA) (N A)))	-1 V!		-1
b. (((VN)A) (N A))		-2 DP1! TP!	-2

In subject relative clauses, we would expect to see similar effects of cumulativity in two places. First of all, as discussed in the previous section, phrasing across a CP boundary incurs two violations of MATCH-PHRASE instead of just one. Similarly, relative clauses are also DPs, so we expect that phrasing the head of the relative clause separately from the rest of the relative clause should also incur two violations of MATCH-PHRASE: one

for separating the material in the DP, and a second for splitting the TP (if the relative clause is in subject position) or for splitting the VP (if the relative clause is in object position). As the number of words in the head of the relative clause or inside the relative clause itself (as for its arguments) is varied, we expect that speakers will be sensitive to both of these boundaries, and that this will affect their choices in phrasing.

In section 5.3.1, I discussed relative clauses where the embedded verb is preceded and followed by a binary DP. In these examples, the single STRONG-START violation incurred by the verb was not sufficient to result in speakers phrasing the verb across the CP boundary, a result that I argued was due to a cumulativity effect from the two violations of MATCH-PHRASE that such a move would incur. However, this boundary can be overcome when there are additional adjacent violations of STRONG-START to consider. For example, when the head noun in a relative clause is not followed by an adjective, the head noun may phrase with the matrix verb rather than with the verb in the relative clause, although this depends on the contents of the relative clause. For example, consider the sentence in (18), which differs minimally from the example discussed in 5.3.1 by the absence of the modifying adjective for the head noun *múinteoirí* ‘teachers’:

- (18) Cheannaigh_{TP} [_{DP} *múinteoirí* [_{CP} a [_{SP} *mhúineann sa mbaile mór*]]] málaí
 bought teachers C teach.PRES in.the town bags
 bána].
 white.PL
 ‘Teachers who teach in the town bought white bags.’

In this sentence, the verb in the relative clause (*mhúineann*) is followed by a PP that contains two lexical words, *sa mbaile mór*, which will form its own φ . This leaves three adjacent words, *cheannaigh* (the matrix verb), *múinteoirí* (the head noun), and

mhúineann (the relative clause verb), each separated from the other by one or more syntactic phrase boundaries.

The HG tableau in (19) compares the violation profiles for four possible candidates for a sentence with a subject relative clause like in (18), and predicts equal H scores for the three first candidates, suggesting that we might expect to find these three structures occurring in free variation, following the analysis developed in chapter 4.

(19)HG tableau: subject relative clause, with a non-binary head noun and a binary PP adjunct

<i>weight</i>	1	1	<i>H</i>
$\Sigma P[V1_{TP}[DP1[N_{CP}[c_{\text{PP}}[V2_{PP}[p\ NA]]]]]_{VP}[DP2[N\ A]]]$	STRSTART	MATCH-PHRASE	
a. $\text{☞ } (V ((N (c-V (p-NA))) (NA)))$	-3 V1!N!V2!		-3
b. $\text{☞ } (((VN) (c-V (p-NA))) (NA))$	-1 V2!	-2 TP!DP1!	-3
c. $\text{☞ } (V (((N\ c-V) (p-NA)) (NA)))$	-1 V1!	-2 CP!ΣP!	-3
d. $(((VN)\ c-V) (p-NA)) (NA))$		-4 TP!DP1!CP!ΣP!	-4

Candidate (a) adjoins each of the matrix verb, head noun, and relative verb to the right, satisfying MATCH-PHRASE but incurring three STRONG-START violations. Candidate (b) phrases together the matrix verb and the head noun, incurring two violations of MATCH-PHRASE (one each for breaking up the TP and the DP constituent) and one violation of STRONG-START incurred by the relative clause verb. Candidate (c) phrases together the head noun and the relative verb, violating MATCH-PHRASE twice (once each for CP and ΣP), and leaves the matrix verb to adjoin to the structure and incur a single STRONG-START violation. Finally, candidate (d), which satisfies STRONG-START by phrasing together the matrix verb and the head noun, and by adjoining the relative verb to the left rather than to the right, incurs four violations of MATCH-PHRASE (TP, DP, CP, ΣP),

resulting in an H score of -4, lower than that of the three other candidates. This would predict that candidates (a), (b), and (c) should be attested and in variation, but not candidate (d).

While my data are limited⁷⁸ for these structures, the data suggest that this hypothesis is on the right track: each of candidates (a), (b), and (c) are attested in at least one repetition. However, there does appear to be a bias in favour of candidate (b), where the CP boundary is preserved. This phrasing is attested for multiple speakers, while (a) and (c) are only attested in a single repetition each.⁷⁹

(20) Number of instances of candidates (a), (b), and (c)

Candidate (a)	(V ((N (c-V (p-NA))) (NA)))	1 repetition/1 speaker
Candidate (b)	((((VN) (c-V (p-NA))) (NA)))	6 repetitions/4 speakers
Candidate (c)	(V (((N c-V) (p-NA)) (NA)))	1 repetition/1 speaker

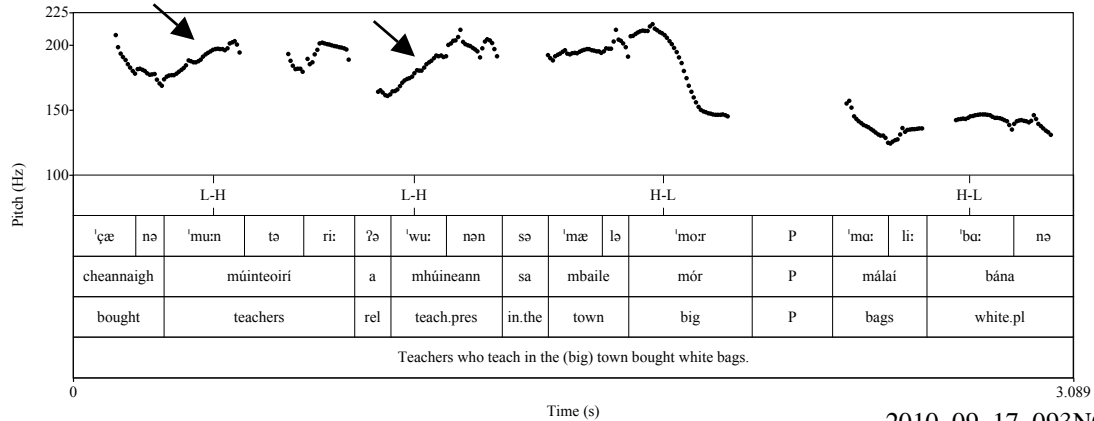
A larger sample of recordings would help determine whether the bias toward candidate (b) is significant or merely an artefact of the small sample considered here.

The three attested patterns are illustrated in the following pitch tracks. First, candidate (a), where each of the matrix verb, head noun, and relative verb are right adjoined, can be seen in the pitch track in (21). While the verb does not show an L-H accent, there are clear L-H accents on the head noun *múinteoirí* and on the verb *mhúineann*. I assume that the matrix verb is deaccented in this sentence, following the pattern found in many other sentences (see chapter 2 for discussion).

⁷⁸ Unfortunately, many of the repetitions of the relative clause sentences in this section did not show sufficient tonal movement to be suitable for analysis, and so were excluded.

⁷⁹ The speakers who produced a token of candidates (a) and (c) also produced a token each of candidate (c).

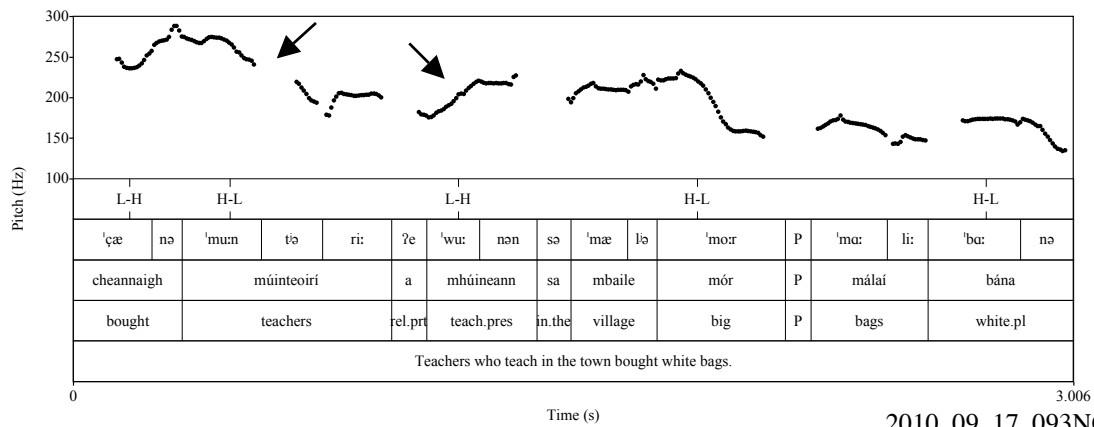
(21) Pitch track for VSO sentence with a subject relative clause, where the head noun is a single word (Candidate (a) from (19))



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Candidate (b), where the matrix verb and the head noun are phrased together and the relative verb is adjoined to the right, can be seen in the pitch track in (22). This phrasing is evident from the L-H H-L sequence on the matrix verb and head noun, which is followed by an L-H accent on the relative verb:⁸⁰

(22) Pitch track for VSO sentence with a subject relative clause, where matrix verb and head noun phrase together

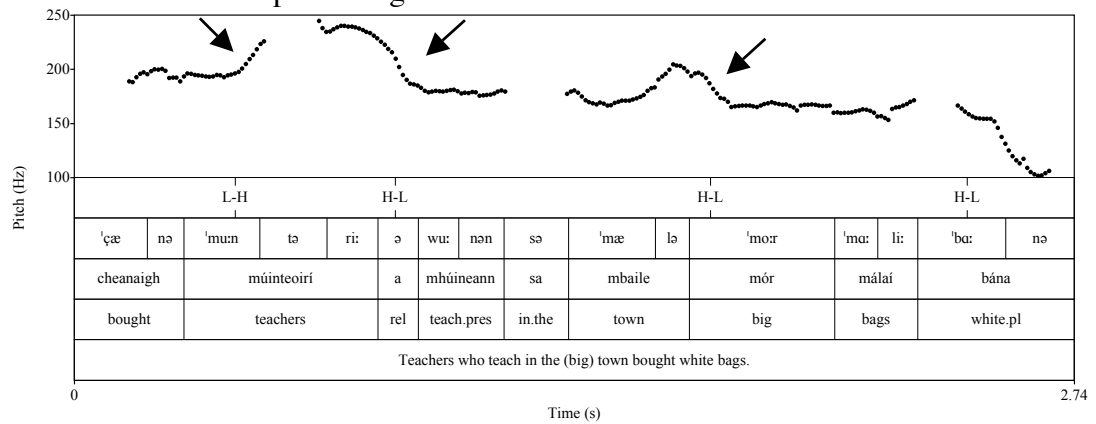


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⁸⁰ Interestingly, the two renditions illustrated in (21) and (22) were produced by the same speaker in the same session. This would support the idea that the patterns are in free variation.

Finally, candidate (c) is exemplified in the pitch track in (23). This phrasing is evident from the L-H H-L sequence on the head noun *múinteoirí* and the relative verb *mhúineann*. Note that the matrix verb is deaccented in this sentence, as in (21).^{81,82}

(23) Pitch track for VSO sentence with a subject relative clause, where the head noun and the relative verb phrase together



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A larger sample of recordings will be needed to determine whether all three possible phrasings are equally well-attested.

A similar, yet distinct, pattern of variation is attested in sentences which are identical to that in (18), except that the PP adjunct in the relative clause is reduced from two lexical words (*sa mbaile mór* ‘in the (big) town’) to one (*sa mbaile* ‘in the home’), as in the following sentence:

(24) Cheannaigh_{DP} [múinteoirí a mhúineann sa *mbaile*] málaí bána.
 bought teachers C teach.PRES in.the home bags white.PL
 ‘Teachers who teach in the home bought white bags.’

⁸¹ Note also that the timing of the pitch accents in (23) is also slightly unusual: the H-L accent on the relative verb begins on the preceding function word *a*, and the H-L fall on *mór* begins at the end of *mbaile*.

⁸² This speaker also produced a token of candidate (b).

In sentences of this type, two patterns of phrasing were equally well-attested: speakers either phrased together the verb and the head noun, as in (a) below, or right-adjointed the head noun, as in (b):

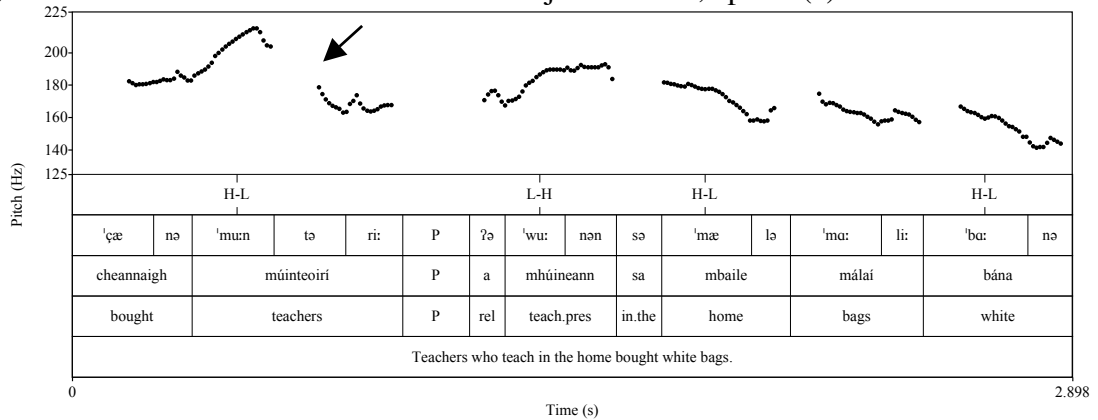
(25) Attested phrasings for subject relative with single-word adjunct (as in (24))

Option (a): ((VN) ((c-V p-N) (NA))) 5 repetitions/3 speakers

Option (b): (V ((N (c-V p-N)) (NA))) 5 repetitions/3 speakers

These two phrasing options may be seen in the following pitch tracks. Option (a) is shown in the pitch track in (26), as evidenced by the H-L accent on the head noun *múinteoirí*:⁸³

(26) Pitch track for a VSO sentence with a subject relative, option (a)

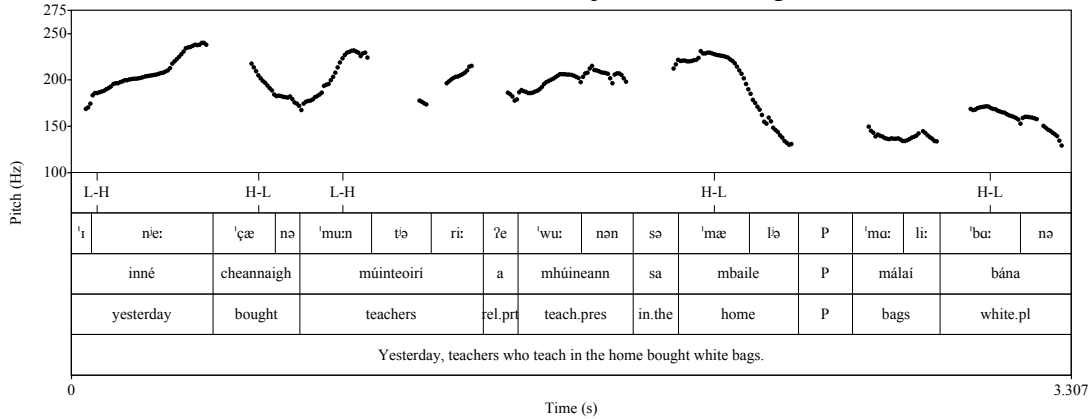


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Option (b) is shown in the pitch track in (27), where the head noun *múinteoirí* is marked with an L-H accent.

⁸³ Note that there is an apparent L-H accent on the relative verb, *mhúineann*, indicating that it is at the left edge of $\varphi_{\text{Non-min}}$. This suggests that the phrasing for this sentence is ((VN) ((c-V p-N) (NA))) (as indicated in (25)), where the relative clause and the object form a constituent to the exclusion of the matrix verb-head noun φ . This is opposed to a phrasing in which the relative clause is phrased with the matrix verb and head noun, as in (((VN) (c-V p-N)) (NA)). The former appears to be the preferred phrasing among the speakers who employed option (a) in these sentences. However, it is unclear given the current analysis why one of these structures would be preferred over the other.

(27) Pitch track for a VSO sentence with a subject relative, option (b)



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Apparently absent is the third option observed in the above section, in which the head noun and the relative verb are phrased together, as in (V (((N c-V) p-N)) (NA))). As shown in the HG tableau in (28), the absence of this third option is expected under the account proposed here, as its H score is lower than the H score for options (a) and (b).

(28) HG tableau: subject relative clause, with a non-binary head noun and a non-binary PP adjunct

<i>weight</i>	1	1	<i>H</i>
$\Sigma P[V1_{TP}[DP1[N_{CP}[c_{\Sigma P}[V2_{PP}[p N]]]]]_{VP}[DP2[N A]]]$	STRSTART	MATCH-PHRASE	
a. $\left[\left(V \left(\left(N \left(c-V \right) p-N \right) \right) \right) \left(NA \right) \right)$	-2 V1!N!		-2
b. $\left(\left(\left(VN \right) \left(c-V \right) p-N \right) \right) \left(NA \right)$		-2 TP!DP1!	-2
c. $\left(V \left(\left(\left(N \left(c-V \right) \right) p-N \right) \right) \right) \left(NA \right)$	-1 V1!	-2 CP!ΣP!	-3
d. $\left(\left(\left(\left(VN \right) \right) c-V \right) p-N \right) \left(NA \right)$		-4 TP!DP1!CP!ΣP!	-4

Interestingly, the absence of the modifying adjective in the relative PP adjunct results in one fewer STRONG-START violation in candidate (a) as compared to (19), which fully satisfies MATCH-PHRASE, resulting in an H score of -2, as compared to -3. Candidate (b) also has an H score of -2, as resulting from the two MATCH-PHRASE violations incurred by phrasing together the matrix verb and the head noun. Candidates (c) and (d) have

relatively lower H scores: candidate (c) because the MATCH-PHRASE is violated twice while STRONG-START is not satisfied, and candidate (d) because MATCH-PHRASE is violated four times. Both of these candidates are harmonically bounded, and therefore predicted to be absent.

5.3.3 Phrasing in Object Relatives

The pattern is again slightly different when relative clauses with the above structures are placed in object position. Consider the following sentences, which place a relative clause (with a binary argument) in object position: the two sentences contrast minimally with respect to whether or not the head noun is modified by an adjective:

- (29) a. Cheannaigh múinteoirí banúla_{DP}[*málaí bána* a dhíolann daoine bochta].
 bought teachers lady-like bags white.PL C sell.PRES people poor.PL
 ‘Lady-like teachers bought white bags that poor people sell.’
- b. Cheannaigh múinteoirí banúla_{DP}[*málaí* a dhíolann daoine bochta].
 bought teachers lady-like bags C sell.PRES people poor.PL
 ‘Lady-like teachers bought bags that poor people sell.’

As for subject relatives of the same type, the head noun in (29)a, *málaí* ‘bags’, always phrases together with the modifying adjective *bána* ‘white’, along the lines of the subject relative clauses and for other noun-adjective sequences. In (29)b, the head noun does not have a modifying adjective. In analogy with the subject relatives, we expect to find some variability in the phrasing of the head noun. As shown in the following HG tableau, three possible phrasings are predicted to have equal H scores, given the assumption made in the previous section that only functional projections that introduce phonologically overt material count for MATCH-PHRASE:

(30)HG tableau: object relative clause, with a non-binary head noun and a binary relative clause subject

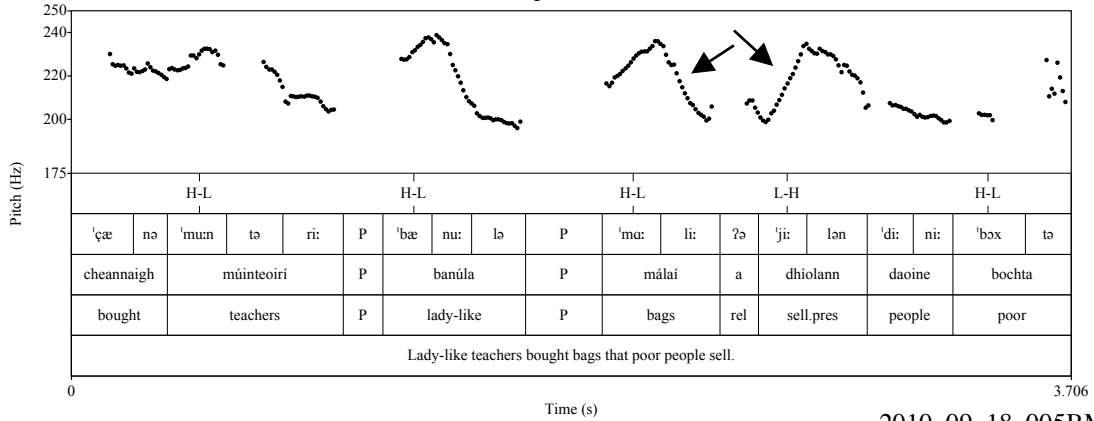
<i>weight</i>	1	1	<i>H</i>
$\Sigma P[V1_{TP}[DP1[NA]_{VP}[DP2[N]_{CP}[c]_{\text{p}}[V2_{DP3[NA]]]]]]]$	STRSTART	MATCH-PHRASE	
a. $\text{☞ } (V ((NA) (N (c-V (NA))))))$	-3 V1!N2!V2!		-3
b. $\text{☞ } (V (((NA) N) (c-V (NA))))$	-2 V1!V2!	-1 DP2!	-3
c. $\text{☞ } (V ((NA) ((N c-V) (NA))))$	-1 V1!	-2 CP!ΣP!	-3

If this is correct, we would expect to find all three phrasings attested, and in free variation.

Unfortunately, the data available for this particular sentence are especially limited, with most of the recordings excluded because the tonal prosody is not clear enough to interpret with confidence. However, acceptable recordings for two speakers suggest that at least candidates (b) and (c) from the above tableau are attested. These patterns are shown in the following pitch tracks. Candidate (b) is seen in (31), where the head noun of the object relative clause is marked with an H-L accent and the relative verb with an L-H accent:⁸⁴

⁸⁴ There is a slight disfluency in the first half of the sentence, as seen in the pause/hesitation between the subject noun and adjective.

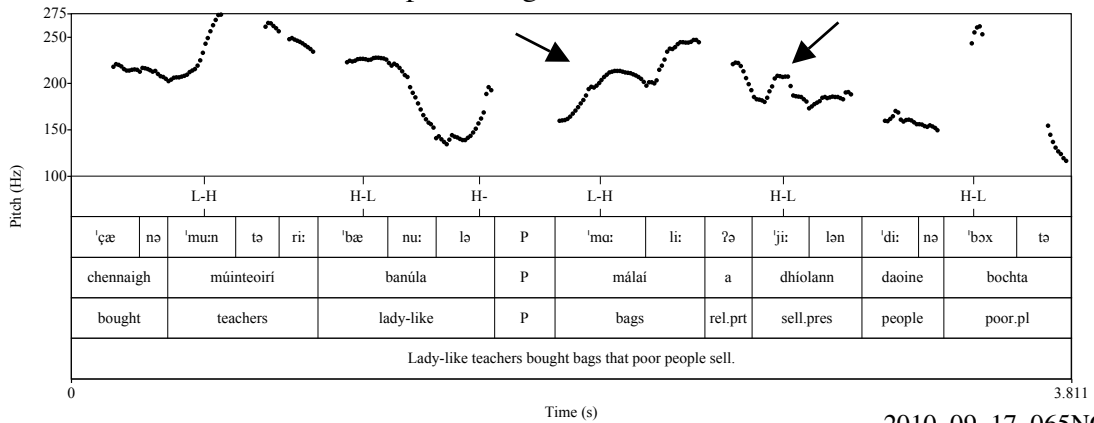
(31) Pitch track for VSO sentence with object relative, candidate (b)



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Candidate (c) can be seen in (32), where the L-H accent on *málaí* and the H-L accent on *dhiolann* indicate that they are phrased together.

(32) Pitch track for a VSO sentence with an object relative clause, where the head noun and the relative clause verb phrase together



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The option reflected in candidate (a) of the tableau in (30) was not attested; however, because usable data was only available from two speakers (in two repetitions), this is perhaps not surprising. More data will be necessary to determine whether or not all three patterns are equally well attested. However, it is worth noting at this point that of the two attested patterns, one of them allows for phrasing across the CP boundary. As discussed above, this pattern is predicted by the account proposed here.

Finally, consider sentences like the following, where the head noun is not followed by an adjective, and where, also, the subject of the relative clause is not a binary phrase:

- (33) Cheannaigh múinteoirí banúla_{DP}[*málaí* a dhíolann *daoine*].
 bought teachers lady-like bags C sell.PRES people
 ‘Lady-like teachers bought bags that people sell.’

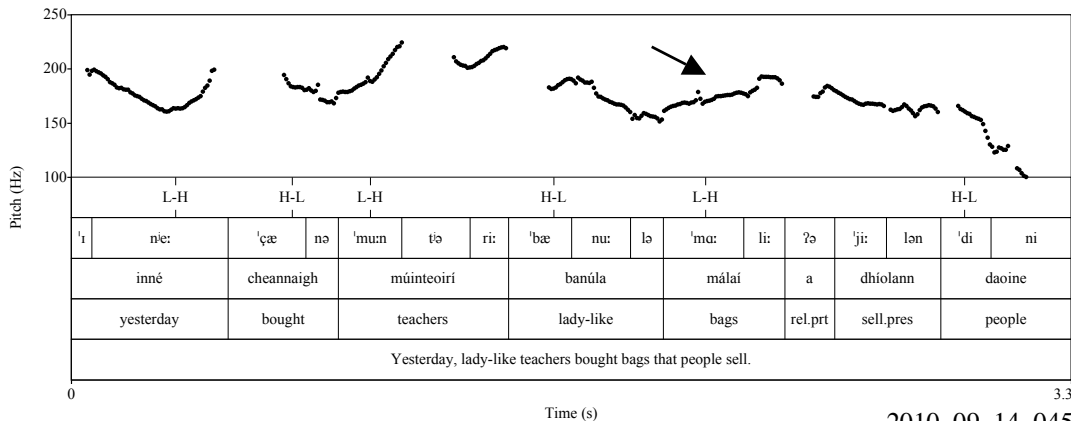
As for subject relative clauses with this configuration, the head noun shows variation in phrasing among two options:

- (34) Attested options for phrasing the head noun in (33)
 Option (a): (V ((NA) (N (VN)))) 2 repetitions/2 speakers
 Option (b): (V (((NA) N) (VN))) 2 repetitions/1 speaker

As above, I have relatively little usable data for these structures and this discussion should be seen as a stepping-off point for future research.

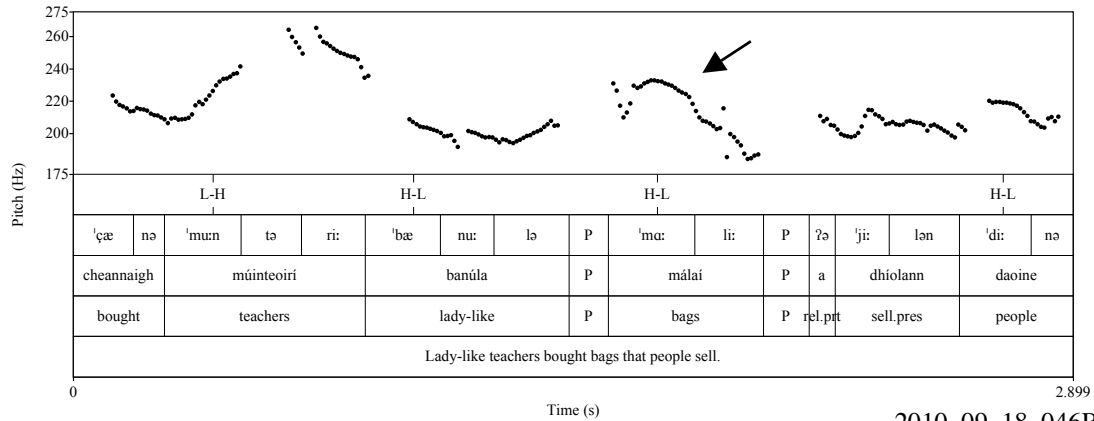
These two options can be seen in the following pitch tracks. First, (35) shows option (a), where the right-adjunction of the head noun *málaí* is indicated by its L-H accent and the absence of either accent on the relative clause verb:

(35) Pitch track for a VSO sentence with object relative clause, option (a): phrasing the head noun to the right



Secondly, (36) shows option (c), where the head noun adjoins to the material to its left, namely the matrix subject, as indicated by the H-L accent on *málaí*:

(36) Pitch track for a VSO sentence with object relative clause, option (c): phrasing the head noun with the subject to its left



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These two patterns are predicted to occur, as can be seen in the HG tableau in (37).

(37) HG tableau: object relative clause, with a non-binary head noun and a binary relative clause subject

<i>weight</i>	1	1	<i>H</i>
$\Sigma P[V1_{TP}[DP_1[NA]_{VP}[DP_2[N_{CP}[c_{\text{rel}}[V2 N]]]]]]$	STRSTART	MATCH-PHRASE	
a. $\text{☞ } (V ((NA) (N (c-V N))))$	-2 V1!N2!		-2
b. $\text{☞ } (V (((NA) N) (c-V N)))$	-1 V1!	-1 DP2!	-2
c. $(V ((NA) ((N c-V) N)))$	-1 V1!	-2 CP!ΣP!	-3

Note that candidate (c), where the head noun and relative verb are phrased together, is not predicted to occur.

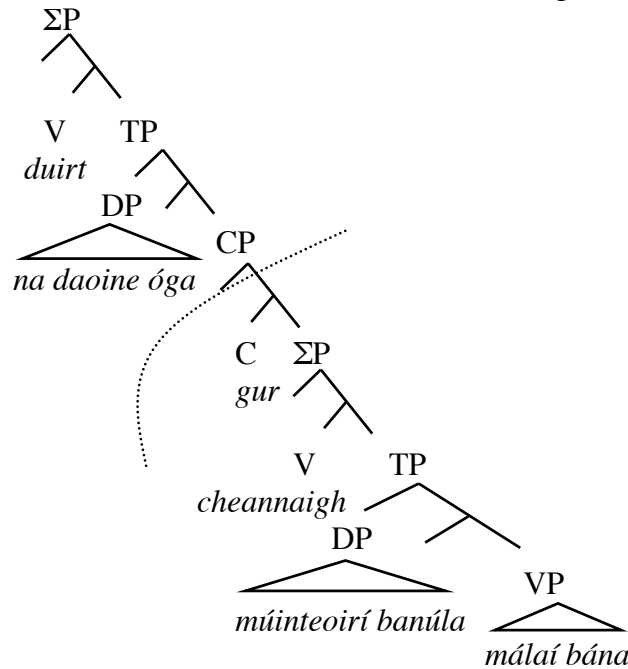
5.3.4 Verbal Complement Clauses

Given the phrasing data from relative clauses, we predict to see similar patterns in other types of embedded clauses. For example, consider sentences with a verbal complement clause, as in the following example:

- (38) Dúirt_{DP} [na daoine óga]_{VP} [CP [gur_{CP}]_{VP} [cheannaigh múinteoirí banúla
 said the.PL people young.PL that.PST bought teachers lady-like
 málaí bána]]]
 bags white.PL
 ‘The young people said that lady-like teachers bought white bags.’

As before, there is pressure from MATCH-PHRASE to phrase the verb to the right, as can be seen in the following syntactic representation:

- (39) The structure of a sentence with a verbal complement clause



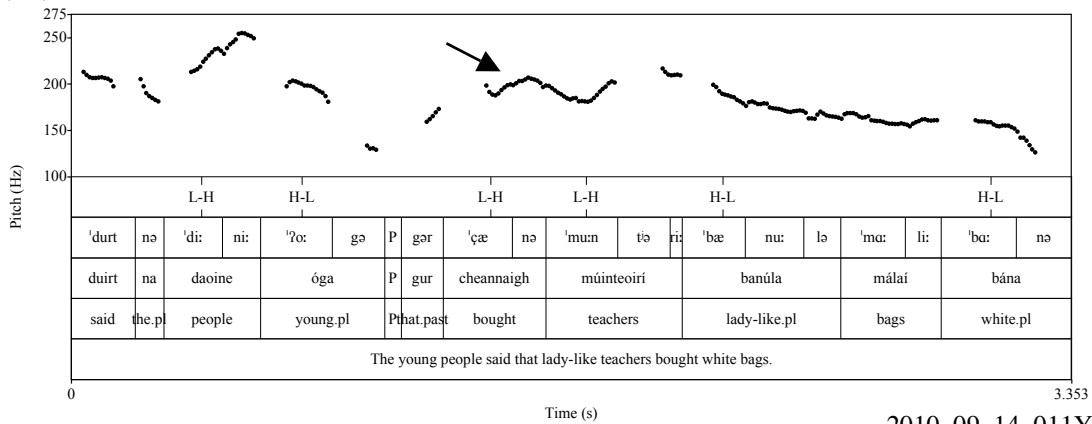
As with the relative clauses discussed in section 5.3.1, the verb in the embedded clause in this sentence is both preceded and followed by a binary DP: to its left, the matrix clause subject *na daoine óga* ‘the young people’ and to its right, the embedded clause subject *múinteoirí banúla* ‘lady-like teachers’. As shown in the following tableau, the current analysis predicts that speakers should prefer to phrase the verb to the right, in satisfaction of MATCH-PHRASE, rather than phrase it to the left, which would satisfy STRONG-START but violate MATCH-PHRASE twice:

(40) Candidates for phrasing in an embedded complement clause

<i>weight</i>	1	1	
$\varepsilon_P[V_{TP}[DP[N A]_{CP}[c_{\varepsilon_P}[V_{TP}[DP[NA]]]]]]$	STR START	MATCH-PHRASE	<i>H</i>
a. $\varphi(V((NA)(c-V(NA)))$	-1 c-V!		-1
b. $(V(((NA) c-V) (NA)))$		-2 CP!ΣP!	-2

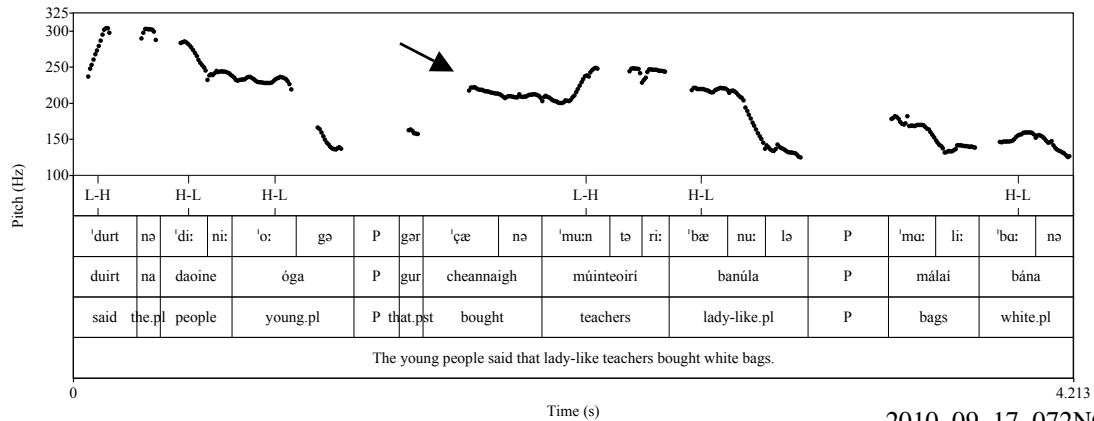
As predicted, speakers do not phrase the verb with the subject of the matrix clause (candidate (b)), but instead phrase it with material to its right, preserving syntactic constituency (candidate (a)). As in non-embedded contexts, the verb is often unaccented (showing a flat tonal pattern; see discussion in chapter 3), but clearly phrases with the material to its right—it does not show H-L accent associated with the right edge of φ . For example, this can be seen in the following two pitch tracks; the first shows the verb marked with a rise in its accented form (marked with an L-H accent), and the second shows the verb with flat tonal prosody, but phrased with the material to its right:

(41) Pitch track for VS[VSO] sentence, accented verb



2010_09_14_011YFe1

(42) Pitch track for VS[VSO] sentence, unaccented verb



2010_09_17_072NCe2

Unfortunately, I do not have data bearing on other possible configurations of the verb in verbal complement clauses, and so it is not possible at present to know whether or not the verb may phrase across the CP boundary when it is preceded by a single word, rather than a binary phrase. For example, if the matrix clause consisted of a verb only (as for an impersonal sentence), the current analysis would predict that speakers would vary between phrasing the two verbs together (incurring two MATCH-PHRASE violations) and satisfying MATCH-PHRASE (incurring two STRONG-START violations).

While this question must be left to future research, it is useful to speculate on the consequences of such data for the proposal in this thesis. For example, consider the following sentence, where the verb in the embedded clause is preceded only by the verb in the matrix clause, which is in the autonomous form:

- (43) Dúradh gur cheannaigh múinteoirí banúla málaí bána.
 say.AUT.PST that.PST bought teachers lady-like.PL bags white.PL
 ‘It was said that lady-like teachers bought white bags.’

Unlike in the examples discussed above, this example would appear to trade two STRONG-START violations (one each for the two verbs) for two MATCH-PHRASE violations:

(44) Phrasing of the verb in a verbal complement clause (matrix verb is in its autonomous form)

<i>weight</i>	1	1	
$\varepsilon_P[V_{TP}[VP[CP[c_{\varepsilon_P}[V_{TP}[DP_1[NA]]VP[DP_2[NA]]]]]$	STR START	MATCH-PHRASE	<i>H</i>
a. $\curvearrowright (V (c-V ((NA) (NA)))$	-2 V1!V2!		-2
b. $\curvearrowright ((V c-V ((NA) (NA)))$		-2 CP!ΣP!	-2

Because the two candidates in this tableau tie in their H-scores, we predict that speakers should show variation between the two. If future research finds this to be true, it would provide additional support for the cumulativity analysis proposed here, as well as for the idea that CPs, whether relative clauses or verbal complement clauses, behave similarly in terms of their prosodic behaviour.

However, it would also be expected, given typological observations, if verbs in embedded complement clauses were to turn out to be resistant to phrasing across the CP boundary, even in the above hypothetical condition. For example, Pak (2008) finds that CPs in Luganda form an separate phonological domain in verbal complement clauses but not in relative clauses. While she concludes that this difference is due to a syntactic distinction specific to Luganda (that relative clauses are not CPs, but verbal complements are), it is useful to note that a prosodic difference between verbal complements and relative clauses may have some typological precedent.⁸⁵

⁸⁵ There is some evidence from pronoun postposing in Irish that verbal complement clauses do form an ‘opaque’ prosodic domain. Pronoun postposing refers to a productive process in which weak object pronouns are displaced to the right from canonical object position, arguably for prosodic reasons (see chapter 6 for detailed discussion of the prosodic aspects of this process). When the subject of the matrix clause with a verbal complement clause is a pronoun, the pronoun may not be postposed (Bennett et al. in prep):

5.3.5 Predictions for Other Cases

This theory predicts that other functional projections with overt functional heads will count for MATCH-PHRASE such that a failure to parse the constituent as a φ will incur a violation. For example, in the DP domain, we expect that DPs with an overt determiner will be more resistant to rephrasing as compared to DPs without an overt determiner, as in the following:

- (45) a. málaí bána
bags white.PL
'white bags'
b. na málaí bána
the.PL bags white.PL
'the white bags'

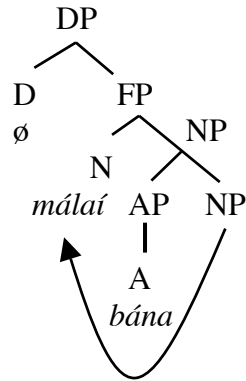
As shown in the syntactic and prosodic representations, the presence of the overt determiner will not result in the creation of a new type of prosodic subcategory (as discussed in chapter 3):

-
- (1) a. chulag ráite é gur áithaí folmha is mó a dheineann an torann.
I-heard/said it C.PRES vessels empty that-most C make.PRES the noise
'I heard it said that it's the empty vessels that most make noise.'
b. *chulag ráite gur áithaí folmha is mó a dheineann an torann é.

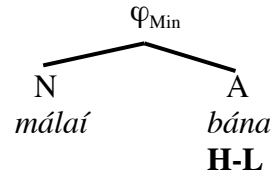
Because pronoun postposing occurs freely over non-clausal domains, examples like this suggest that verbal complement clauses form a different type of prosodic domain, across which pronoun postposing appears to be blocked in other contexts.

(46) The structure of DPs with no overt determiner

a. Syntactic structure

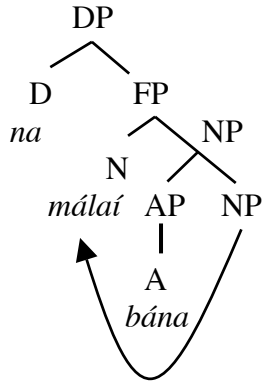


b. Predicted prosodic structure

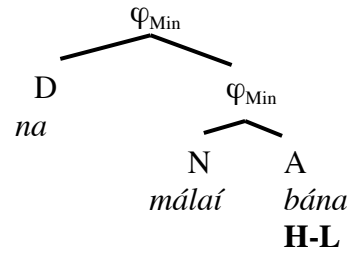


(47) The structure of DPs with an overt determiner

a. Syntactic structure



b. Predicted prosodic structure



However, (47) is predicted to contrast with (46) in terms of the evaluation of MATCH-PHRASE, because the DP in (47) dominates phonologically overt material that not dominated by FP as in (46). In other words, if the DP in (47) is not parsed as a φ , MATCH-PHRASE will be violated one more time as compared to (46).

In some cases, this extra violation may not represent the crucial difference between two candidates. However, under some conditions, we expect to see a difference between DPs with overt and null determiners. Similarly, we may expect to see similar

effects from PP versus DP structures, such as the following, depending on the presence or absence of phonologically-overt function words:⁸⁶

- (48) a. an leabhar
the book
b. ar leabhar
on book
'on a book'
c. ar an leabhar
on the book
'on the book'

In short, any phonologically-overt function word is expected to play a role in the evaluation of MATCH-PHRASE under the current analysis, which may affect the analysis under certain conditions. Unfortunately, I do not at present have access to sufficient data that would bear on whether or not this prediction holds out, and I will leave this question to future research. If it turns out that there is no difference between these cases under the right conditions, it may be that the definition of MATCH-PHRASE will need to be refined. However, the data from relative clauses would suggest that at least some of these functional elements do indeed play a role, and these facts will need to be taken into account.

5.4 Conclusion

This chapter examined additional evidence for the proposal that functional and lexical projections have equal status in the theory of syntax-prosody mapping. The arguments in this chapter were built on the observations made in chapter 3 of this

⁸⁶ In addition, Irish has several prepositions which carry a definite meaning but do not require an overt determiner; often, the definite meaning is conveyed by a different initial mutation. For example, *i gcarr* 'in a car' versus *sa gcarr* 'in the car' but *ar charr* 'on a car' versus *ar an gcarr* 'on the car'. Depending on the syntactic analysis of these forms, we may predict a difference in behaviour.

dissertation, where it was shown that functional projections like TP in basic VSO sentences were relevant in the creation of prosodic constituents. In this chapter, I examined two predictions of the proposal, and provided empirical evidence supporting each one.

First, I argued on the basis of evidence from intransitive sentences (VS) that TP is only evaluated by MATCH-PHRASE when it dominates overt phonological material that is not also dominated by any syntactic phrase contained within it. In the case of intransitive sentences, TP dominates only the subject, which is also dominated by DP. Because these two syntactic nodes dominate the same overt phonological material, it is predicted that TP will not be counted in the evaluation of MATCH-PHRASE. I show that this is indeed the case by looking at a pattern of variation in the phrasing of intransitive sentences with binary subjects that is unexpected if TP does indeed count for MATCH-PHRASE.

The second half of this chapter examined embedded clauses, both relative clauses and complement clauses, and argued that the functional projection CP may be responsible for the higher-than-expected dispreference for phrasing across the CP boundary. This again falls from the definition of MATCH-PHRASE proposed in this thesis: because complementizers are phonologically overt, it is expected that their dominating projection (CP) will count in the evaluation of MATCH-PHRASE.

Finally, it was observed that if the above account is correct, we should expect to see similar effects for other functional projections. For example, we predict that DPs should behave differently under certain circumstances with respect to prosodic phrasing when they have an overt preposition or determiner, as opposed to when they do not.

While I do not at this time have access to data that would specifically bear on this question, the issues raised in this chapter open up interesting venues for future research.

CHAPTER 6

PROSODY AND DERIVATION IN PRONOUN POSTPOSING

6.1 Introduction

This chapter deals with pronoun postposing, a process that is pervasive in all Irish dialects. Pronoun postposing refers to the optional displacement of weak pronouns from canonical object position to a position farther right in the sentence (Chung & McCloskey 1987; Duffield 1995; Adger 1997, 2007; Doyle 1998; McCloskey 1999; Elfner 2011; Bennett et al. in prep). Following much previous work on the topic (Adger 1997, 2007; McCloskey 1999; Elfner 2011; Bennett et al. in prep), I argue that pronoun postposing is prosodically motivated rather than the result of a syntactic movement operation (Chung & McCloskey 1987; Duffield 1995; Doyle 1998).

The goal of this chapter is to develop an account of pronoun postposing that explains what prosodic factors are relevant to the displacement of pronouns, and how these prosodic factors interact with syntactic linearization to produce the postposed orders. The proposal here is that while word order is manipulated in sentences with pronoun postposing, this is indicative of an interaction at Spell-Out between prosodic markedness constraints and violable constraints on linearization, rather than movement in the syntax (Chung & McCloskey 1987; Duffield 1995; Doyle 1998).

The account that I develop in this chapter draws from the analysis of the prosodic representation of CI sentences from the earlier chapters in this dissertation, including the role of syntax-prosody MATCH constraints, STRONG-START, and the use of weighted constraint interaction to account for optionality and variation. This is

combined with a proposal for how linearization is evaluated at Spell-Out, such that it can interact directly with both MATCH and prosodic markedness constraints.

This chapter is organized as follows. Section 6.2 introduces the process of pronoun postposing, and discusses why a prosodic account is required. Section 6.3 argues that pronoun postposing is motivated by the avoidance of violations of STRONG-START(σ), a more specific version of the STRONG-START constraint introduced in chapter 4. Section 6.4 develops a proposal for defining linearization as a violable constraint that is evaluated at Spell-Out, building on Kayne's (1994) LCA. Section 6.5 develops an analysis of pronoun postposing as constraint interaction, and proposes that pronoun postposing is best analysed as one of several possible strategies for avoiding violations of STRONG-START(σ). Section 6.6 develops a proposal using phase-based Spell-Out (Chomsky 2000, 2001), which provides a more accurate account of the data. Section 6.7 provides an account of the subject-object asymmetry. Section 6.8 discusses the distinction made in Irish between pronouns and non-pronominal function words. Section 6.9 provides an account of partial postposing. Section 6.10 concludes the chapter.

6.2 Basic Patterns

Pronoun postposing is a process which optionally displaces certain weak pronouns rightward in the sentence. The most basic case can be seen in VSO transitive sentences with an adjunct or indirect object. For example, the weak pronoun object *í* 'it/her' in (1)b is syntactically the direct object, but surfaces at the right edge of the sentence, in a position that is to the right of the adjuncts. In contrast, the non-

pronominal direct object *an chathaoir* ‘the chair’ in (1)a is realised in canonical direct object position, which precedes adjuncts (Ó Siadhail 1989: 207-208):

- (1)a. Bhris sé an chathaoir leis an ord aréir.
broke he the chair with the hammer last-night
‘He broke the chair with the hammer last night.’
b. Bhris sé leis an ord aréir í.
broke he with the hammer last-night it.FEM
‘He broke it with the hammer last night.’

Aside from the surface word order, there is no reason to believe that the sentences in (1)a and (1)b differ in their underlying syntactic representation: both the noun *an chathaoir* and the pronoun *í* take on the role of direct object. Instead, there are a number of factors that suggest that pronoun displacement is motivated by prosodic considerations rather than syntactic movement.

6.2.1 Prosodic Status of Pronouns

Firstly, the process only targets bare pronouns, never full DPs or emphatic pronouns (Chung & McCloskey 1987; Duffield 1995; Adger 1997; Doyle 1998; McCloskey 1999; Bennett et al. in prep). Prosodically, weak pronouns are distinguished from full DPs and emphatic pronouns by virtue of being phonologically unstressed and reduced: full vowels may be realized as schwa, though vowels may retain their full quality (Bennett et al. in prep). Following a standard prosodic analysis of function words (Selkirk 1995), these properties suggest that pronouns, like other function words in Irish, do not have the status of prosodic words.

This lack of prosodic word status for weak pronouns is supported by their effect on the prosodic status of the prosodic phrases to which they are adjoined. As discussed in chapter 3, when weak pronouns or other function words adjoin to a minimal φ , they

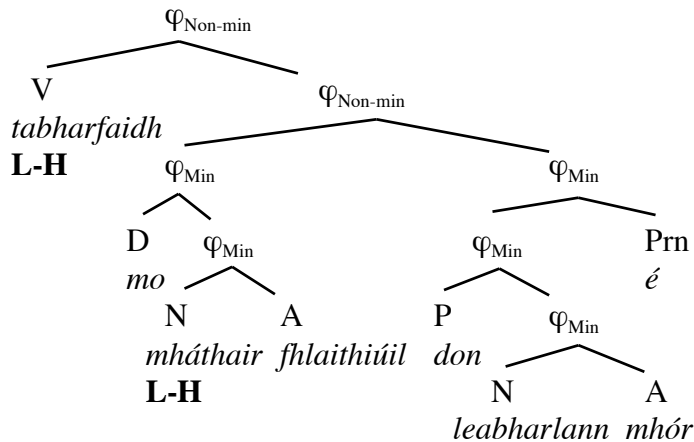
fail to provide the common dominating node with non-minimal status. This has the result that no L-H insertion occurs as the result of the additional prosodic structure created by the adjoined pronoun.

For example, consider the following VSOX sentence with a postposed object:

- (2) *Tabharfaidh mo mháthair fhlaithiúil don leabharlann mhór é*
 give.FUT my mother generous to.the library big it.MASC
 ‘My generous mother will give it to the big library.’

This sentence has the same basic form as the VSOX sentences discussed in [chapter 2], with binary subject (*mo mháthair fhlaithiúil* ‘my generous mother’) and adjunct (*don leabharlann mhór* ‘to the big library’). Ignoring the underlying syntactic structure for the time being, we expect the postposed pronoun *é* ‘it’ to prosodically adjoin to the φ to its left (the PP adjunct), as in the prosodic representation in (3).

- (3) Predicted prosodic representation for a VSOX sentence with a postposed object pronoun

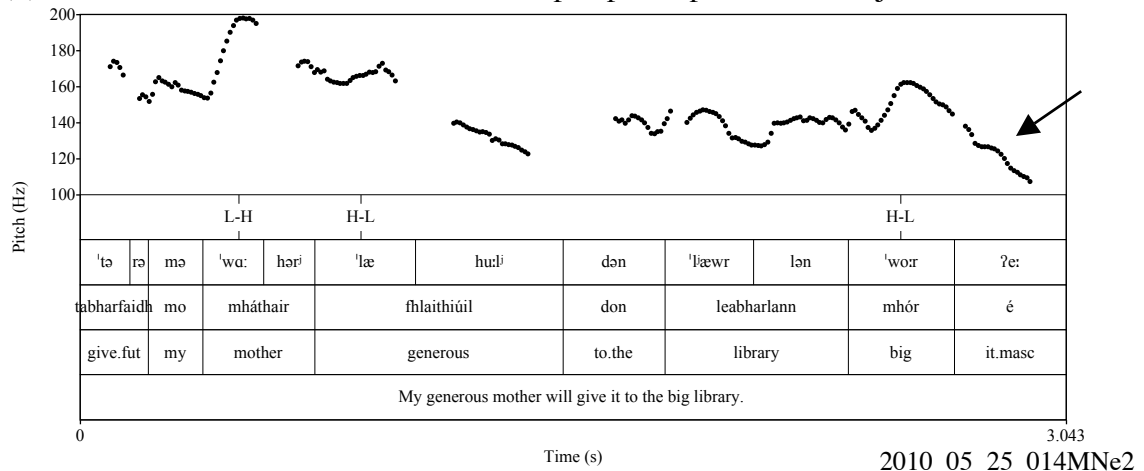


If pronouns do behave like other function words by not creating non-minimal φ s, we would expect to see L-H accents only on the verb *tabharfaidh* (though optionally) and on the subject noun *mháthair*. However, we do not expect to see an L-H accent on the

first lexical word of the adjunct, *leabharlann*, because it is predicted to be leftmost in φ_{Min} rather than $\varphi_{\text{Non-min}}$, as is indicated in the predicted prosodic representation.

As exemplified in the following pitch track, this does appear to be the case: there is no L-H accent on *leabharlann*, the leftmost word of the PP adjunct. Note also that the H-L accent begins on the final adjective *mhór* rather than on the pronoun *é*, and that pitch continues to descend throughout the pronoun as it does for final unstressed syllables in polysyllabic words:⁸⁷

(4) Pitch track for a VSOX sentence with a postposed pronominal object



This pattern suggests that weak pronouns in Irish behave like function words, which, as discussed in chapter 3, are prosodically distinct from lexical words such as nouns and adjectives: they are not substantial enough in a prosodic sense to permit promotion of a prosodic category to non-minimal status. The observation that pronoun postposing specifically targets weak pronouns rather than prosodic words suggests that pronoun postposing is sensitive to the distinct prosodic status of pronouns.

⁸⁷ Note that the dip in F0 between the second and third syllable of *leabharlann* ‘library’ is a segmental effect due to the [rl] sequence.

6.2.2 Optionality and the Absence of Pragmatic and Discourse Effects

A second characteristic of pronoun postposing is that it appears to be a fully optional process, largely unrestricted by pragmatic and discourse effects. For example, the sentence in (1)b where the pronoun *í* ‘her/it’ is postposed is also judged to be grammatical when the pronoun is realized in canonical object position, as in (1)a, where the object was a full DP. This contrast is illustrated in (5).

- (5)a. Bhris sé *í* leis an ord aréir.
broke he it.FEM with the hammer last-night
‘He broke it with the hammer last night.’
b. Bhris sé leis an ord aréir *í*.
broke he with the hammer last-night it.FEM
‘He broke it with the hammer last night.’

Interestingly, the choice between (5)a and b does not appear to give rise to any overt semantic, pragmatic or discourse effects, and there is evidence that both forms may be used in identical pragmatic contexts (McCloskey 1999; Bennett et al. in prep), though see Mulkern (2003, 2011) for evidence suggesting that postposing may be, to some extent, conditioned by discourse context in natural speech. For the purposes of this discussion, I assume that discourse does not directly impose strict conditions on the positioning of the pronoun, but rather that postposing is a fully optional process. This assumption does not preclude the possibility that discourse context may sometimes condition the positioning of the pronoun in natural speech.

The positioning of the pronoun has significant effects on the prosodic structure of the sentence, as well as on the phonological realization of the weak pronoun. In postposed position, the pronoun is unstressed and may be reduced; as in the example in (4), it behaves like an unstressed syllable in a polysyllabic word and adjoins to the prosodic phrase on its left. However, when the pronoun is not postposed, it may be

realised prosodically in one of two ways. On the one hand, unpostposed pronouns may behave like sentence-final pronouns, unstressed and optionally reduced, and adjoin to a prosodic phrase on their left, normally the subject in a VSOX sentence. Alternatively, the pronoun may be strengthened, in which case it appears to behave like a prosodic word rather than like a function word. These contrasts are reported in Bennett et al. (in prep). I assume that the description of these patterns is accurate, though, unfortunately, I do not at present have access to sufficient primary data to back up this claim.

A purely syntactic account of pronoun postposing would be unable to connect the observations that pronoun postposing is optional, and that this optionality appears to reflect the availability of several different prosodic parses of the pronoun. Under a syntactic account, where pronoun postposing would arise from an optional syntactic movement operation, there would be no way to explain why postposed pronouns must be unstressed, while pronouns *in situ* can be either unstressed or strengthened to prosodic word status. In the sections that follow, I will show that a prosodic analysis of pronoun postposing allows us to connect these two facts: prosodic phrasing, as discussed in this thesis, can be subject to variation as a result of cumulative constraint interaction. I will argue that pronoun postposing can be seen as one of several different repair strategies to avoid the parsing of weak pronouns that would be realised with a prosodic structure that violates a high-ranked prosodic markedness constraint. In contrast, encliticization and strengthening *in situ* can be seen as alternative repairs that also avoid violating this prosodic markedness constraint. See also Bennett et al. (in prep) for additional elaboration of this argument.

6.2.3 Variation in Pronoun Placement: Partial Postposing

In addition to optionality with respect to whether or not pronoun postposing occurs, there is also variation with respect to the position in which the postposed pronoun surfaces. In addition to sentence-final position, the pronoun in sentences with more than one adjunct may surface in any position immediately following a syntactic phrase, as in the following examples (example in (7) from Ó Siadhail (1989: 209)):

- (6)a. Bhris sé leis an ord í aréir.
broke he with the hammer it.FEM last-night
'He broke the chair with the hammer last night.'
- b. Bhris sé leis an ord aréir í.
broke he with the hammer last-night it.FEM
'He broke it with the hammer last night.'
- (7)a. Fágadh [é ina loighe ar an talamh taobh thiar den scioból aréir]
left it lying on the ground behind the barn last-night
- b. Fágadh[ina loighe é ar an talamh taobh thiar den scioból aréir]
left lying it on the ground behind the barn last-night
- c. Fágadh[ina loighe ar an talamh é taobh thiar den scioból aréir]
left lying on the ground it behind the barn last-night
- d. Fágadh[ina loighe ar an talamh taobh thiar den scioból é aréir]
left lying on the ground behind the barn it last-night
- e. Fágadh[ina loighe ar an talamh taobh thiar den scioból aréir é]
left lying on the ground behind the barn last-night it
'It was left lying on the ground behind the barn last night.'

Each position is judged to be grammatical by speakers, though data discussed in Bennett et al. (in prep) suggests that sentences where the pronoun is postposed around the first adjunct only (examples like (6)a and (7)b above) are the most frequent in natural speech.

As proposed in chapter 4, variation occurs when two or more outcomes are equally favoured by the relevant set of constraints, which I assume interact cumulatively as in an HG framework. Under this light, the variety of positionings available to the postposed pronoun makes sense if we assume that pronoun postposing

is triggered by the desire to avoid violating a prosodic markedness constraint: we see variation, as in (6) and (7) above, because the prosodic markedness constraint driving postposing is equally satisfied in each of these positions. The preference for the closest available position for postposing can perhaps be accounted for with reference to some additional constraint on locality or processing; however, I will assume that all positions are equally available to speakers. A formal analysis of this pattern will be taken up in section 6.9.

6.2.4 Subject-Object Asymmetry

While the motivation for pronoun postposing appears to be prosodic in nature, the process itself is syntactically conditioned in a sense to be made precise. Above, I discussed one of the most basic sentence types which exhibit pronoun postposing: VSOX sentences with pronominal objects. In sentences of this structure, both the position and pronunciation of the pronoun as weak or strong is subject to variation, under the conditions discussed in the previous sections.

However, not all pronouns may postpose: under certain syntactic conditions, pronoun postposing is judged to be ungrammatical by native speakers. A striking contrast can be found by comparing subject and object pronouns in basic transitive sentences (VSOX): subject pronouns in basic transitive sentences never postpose. For example, in the sentence from (1) above, the subject pronoun *sé* ‘he’ is required to be immediately post-verbal; allowing the pronoun to surface in a position following the object DP or either adjunct renders the sentence ungrammatical:

- (8)a. *Bhris sé an chathaoir leis an ord aréir.*
broke he the chair with the hammer last-night
‘He broke the chair with the hammer last night.’

- b. *Bhris an chathaoir sé leis an ord aréir.
- c. *Bhris an chathaoir leis an ord sé aréir.
- d. *Bhris an chathaoir leis an ord aréir sé.

In terms of the prosodic status of *in situ* subject pronouns in sentences like (8)a, the pronoun is usually pronounced in its weak form, enclitic on the verb.⁸⁸

The contrast becomes even clearer when compared to sentences where the verb is in the autonomous (impersonal) form. In these passive-like sentences, the object pronoun is immediately postverbal, but behaves like other object pronouns because it may be postposed. This may be seen in the following example:

(9) Díoladh leabhar ar mhargadh baile.
 sell.PST.AUT book on market town
 ‘A book was sold at the town market.’

- (10) a. Díoladh é ar mhargadh baile.
 sell.PST.AUT him on market town
 ‘It was sold at the town market.’
- b. Díoladh ar mhargadh baile é.
 sell.PST.AUT on market town it
 ‘It was sold at the town market.’

Irish impersonal sentences differ from passives in languages like English because the subject of the impersonal does not raise to syntactic subject position, but rather remains low in canonical object position, which I assume to be within the VP (Stenson 1989; McCloskey 2007). Examples like (8) and (9) suggest that pronoun postposing is syntactically conditioned, such that object pronouns (whether or not they are immediately post-verbal) meet the requirements for postposing, while subject pronouns do not. A formal analysis of this contrast is taken up in section 6.7.

⁸⁸ It is at this point unclear whether or not subject pronouns may optionally be realized in their strong form. For the purposes of this discussion, I assume that the enclitic form is the preferred realization.

6.3 Defining the Environment for Pronoun Postposing

In chapter 4 of this dissertation, I introduced the constraint STRONG-START, as originally proposed in Selkirk (2011). The definition of this constraint is repeated below from chapter 4:

(11) STRONG-START: assign one violation mark for every prosodic constituent whose leftmost daughter constituent is lower in the Prosodic Hierarchy than its sister constituent immediately to its right: $*(\kappa_n \kappa_{n+1} \dots)$ (after Selkirk 2011)

In the context of the discussion in chapter 4, I discussed the role of STRONG-START in determining prosodic structure. For example, STRONG-START was shown to play a role in phrasing together the verb and a single-word subject in VSO sentences, resulting in deviations from MATCH-PHRASE. Under the framework proposed there, constraints were argued to be weighted rather than strictly ranked, allowing for cumulative constraint interaction that was used to account for patterns of variation.

In this chapter, I argue that pronoun postposing is also triggered by STRONG-START, but that STRONG-START is best understood as a family of constraints rather than as a single constraint. Prior to this chapter, all STRONG-START violations were triggered by φ -initial prosodic words followed by a φ ; in contrast, STRONG-START was not violated when the prosodic word was followed by another prosodic word or by an element that is less than a prosodic word, like a function word. The relevant contrasts are as illustrated below:

(12) STRONG-START violations for initial prosodic words

Configuration	Example	STRONG-START violated?
($\omega \varphi$)	(N (NA))	yes
($\omega \omega$)	(N N)	no
($\omega \sigma$)	(N prn)	no

As can be seen in the above table, STRONG-START is violated only when a prosodic word ω is sister to a prosodic constituent that is *higher* in the prosodic hierarchy. In the cases discussed so far in this thesis, this occurs when the prosodic word is sister to φ .⁸⁹

Pronouns, like other function words, are by default smaller than prosodic words. In terms of the prosodic hierarchy, I assume that they have the status of a bare syllable (σ), although it may be more suitable in some cases to give them the status of foot (ϕ), as when the pronoun or function word contains two or more syllables. Under the definition of STRONG-START given in (11), a pronoun will violate STRONG-START whenever it is sister to a prosodic constituent that has the status of a prosodic word or higher. This is illustrated in the following table:

(13) STRONG-START violations for initial pronouns

Configuration	Example	STRONG-START violated?
($\sigma \varphi$)	(prn (NA))	yes
($\sigma \omega$)	(prn N)	yes
($\sigma \sigma$)	(prn prn)	no

Unlike prosodic words, initial pronouns violate STRONG-START when they are sister to either a φ or a ω .

For example, consider the structure of a basic VSOX sentence with an object pronoun that remains in canonical object position (i.e. is not postposed), as in the following example:⁹⁰

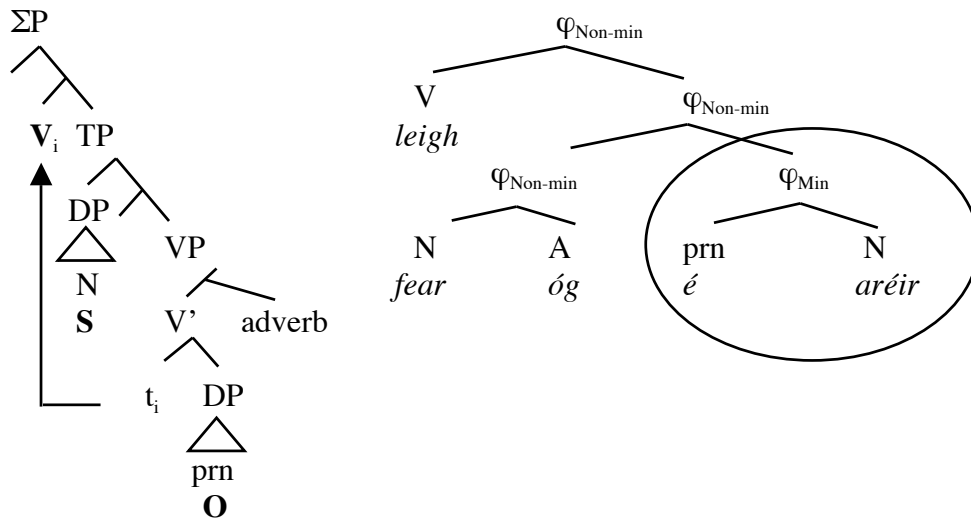
(14) Léigh fear óg é aréir
 read man young it last.night
 ‘A young man read it last night.’

⁸⁹ STRONG-START would also be violated by a prosodic word followed by an intonational phrase ($\omega \iota$).

⁹⁰ Note: This example has not been confirmed by native speakers.

When a pronoun is in object position of a basic VSOX sentence, MATCH-PHRASE (if fully satisfied) will create a prosodic constituent in which the object pronoun is initial in a prosodic constituent containing the object and the adjunct. This can be seen in the syntactic representation and corresponding prosodic representation (assuming full satisfaction of MATCH-PHRASE), as given below:

(15) a. Syntactic Representation b. Recursive Prosodic Representation



In this sentence, the pronoun *é* ‘it’ is sister to a prosodic word, *aréir* ‘last night’. This configuration violates STRONG-START. Postposing the pronoun to sentence-final position would remove this violation of STRONG-START by removing it from initial position, as would promoting the pronoun to prosodic word status, giving the pronoun equal prosodic status with its sister, or phrasing the pronoun to the left, which would also remove the pronoun from initial position within the φ_{Min} .

However, it is clear that a distinction must be made between the violation of STRONG-START that is incurred by a pronoun in the prosodic representation in (15), and the violations of STRONG-START as incurred by prosodic words in φ -initial position, as discussed in previous chapters. While both pronouns and prosodic words avoid

surfacing in positions where STRONG-START violations would be incurred, the repair strategies for pronouns and prosodic words are different. As seen previously, violations of STRONG-START that are incurred by prosodic words are either avoided by altering the prosodic phrasing, in violation of MATCH-PHRASE, or, alternatively, may be tolerated under certain conditions. In contrast, violations of STRONG-START incurred by pronouns appear never to be tolerated, and give rise to three possible repairs: postposing, whereby the linear order of the words is rearranged, strengthening (i.e. promotion to prosodic word status),⁹¹ or alteration of prosodic phrasing. Prosodic words that violate STRONG-START are not resolved by changing the word order, nor may they be promoted to φ status.

I propose that this contrast between prosodic words and pronouns is best understood by assuming that STRONG-START is not a single constraint, as defined in (11), but rather represents a family of constraints, STRONG-START(κ), where κ represents a prosodic category:

(16) STRONG-START(κ): assign one violation mark for every prosodic constituent whose leftmost daughter constituent is of type κ and is lower in the Prosodic Hierarchy than its sister constituent immediately to its right: $*(\kappa_n \kappa_{n+1} \dots$

Relevant to the discussion here is the existence of two constraints of this family, STRONG-START(ω) and STRONG-START(σ):

⁹¹ As seen in the example of strengthening given above, strengthening may in some cases be accompanied by an alteration of prosodic phrasing (adjunction to the left). In section 6.6, I argue that this is due to the fact that the while the strengthened pronoun no longer violates STRONG-START(σ), it still violates STRONG-START(ω), a fact that becomes relevant under the phasal analysis proposed in that section.

(17) **STRONG-START(ω)**: assign one violation mark for every prosodic constituent whose leftmost daughter constituent is of type ω and is lower in the Prosodic Hierarchy than its sister constituent immediately to its right: $*(\omega \varphi \dots ; *(\omega \iota \dots ;$ and so on.

(18) **STRONG-START(σ)**: assign one violation mark for every prosodic constituent whose leftmost daughter constituent is of type σ and is lower in the Prosodic Hierarchy than its sister constituent immediately to its right: $*(\sigma \omega \dots ; *(\sigma \varphi \dots ;$ and so on.

STRONG-START(ω) can only be violated by prosodic words, while **STRONG-START(σ)** is violated by constituents that consist of a bare syllable, including pronouns. The discussion relating to the **STRONG-START** violations incurred by prosodic words discussed in previous chapters should from this point be assumed to refer to **STRONG-START(ω)** rather than the general constraint **STRONG-START**.

Because **STRONG-START(ω)** and **STRONG-START(σ)** are independent constraints, the weight assigned to these constraints may also be different. In chapters 4 and 5, I argued that the weight assigned to **STRONG-START(ω)** was equal to that assigned to **MATCH-PHRASE**, which resulted in a cumulative interaction between the two constraints that determined whether prosodic phrasing would be sensitive to **MATCH-PHRASE** or **STRONG-START(ω)**. In contrast, violations of **STRONG-START(σ)** behave very differently, suggesting that the constraint has a distinct violation profile as compared to **STRONG-START(ω)** and, correspondingly, a different weight in the grammar.

6.4 Linearization and Constraint Interaction

6.4.1 The LCA

Consider the contrasting behaviour of pronouns and prosodic words with respect to postposing in object position of a **VSOX** sentence: word order may be manipulated only in the case of pronouns, even though a version of **STRONG-START(κ)** may be

violated in either case. Manipulations of word order, including pronoun postposing, violate a constraint on linearization; if this constraint is evaluated simultaneously at Spell-Out along with MATCH constraints and prosodic markedness constraints like STRONG-START(κ), we expect that manipulations of word order will be evaluated as alternative candidates (see also López 2009; Elfner 2011).

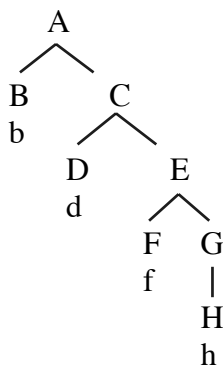
In defining linearization as a violable constraint evaluated at Spell-Out, I will make use of the Linear Correspondence Axiom (LCA) as proposed by Kayne (1994). The LCA derives linear word order by establishing precedence relations between terminal nodes on the basis of hierarchical relationships in the syntactic structure. More specifically, the LCA, as proposed by Kayne, makes use of the relation of *asymmetric c-command*, defined as follows:

(19) Asymmetric C-Command:

A syntactic node α asymmetrically c-commands a syntactic node β iff α c-commands β and β does not c-command α .

In the following hypothetical tree, the set of asymmetric c-command relations (A) are as follows:

(20) Abstract syntactic tree structure



(21) Set of asymmetric c-command relations (ordered pairs)

$A = \{ \langle B, D \rangle, \langle B, F \rangle, \langle B, G \rangle, \langle B, H \rangle, \langle D, F \rangle, \langle D, G \rangle, \langle D, H \rangle, \langle F, H \rangle \}$

The LCA establishes precedence relationships on the terminal nodes of syntactic phrases on the basis of these asymmetric c-command relationships:

(22) Linear Correspondence Axiom (LCA, Kayne 1994, paraphrased):

If a syntactic node α asymmetrically c-commands a syntactic node β , then the set of terminal nodes dominated by α linearly precede the set of terminal nodes dominated by β .

In the hypothetical example above, the set of asymmetric c-command relations (A) can be translated into precedence relations for terminal nodes ($d(A)$):

(23) $A = \{ \langle B, D \rangle, \langle B, F \rangle, \langle B, G \rangle, \langle B, H \rangle, \langle D, F \rangle, \langle D, G \rangle, \langle D, H \rangle, \langle F, H \rangle \}$
 $d(A) = \{ \langle b, d \rangle, \langle b, f \rangle, \langle b, h \rangle, \langle d, f \rangle, \langle d, h \rangle, \langle f, h \rangle \}$

The only possible linear ordering that respects the precedence relationships $d(A)$ is *bdfh*.⁹²

6.4.2 The LCA as a Violable Constraint

Linearization is one of several operations that are thought to occur as part of syntactic Spell-Out (see, for example, literature within the Distributed Morphology framework, such as Embick (2010)). However, there are diverse opinions on the question whether linearization occurs *concurrently* with other Spell-Out operations, such as prosodic structure assignment, or whether Spell-Out operations are ordered. In this chapter, I provide evidence that linearization and prosodic structure assignment must be evaluated simultaneously, and as such, compete with each other directly for constraint satisfaction. See also López (2009) for a similar proposal made on the basis of data from clitic dislocation in Romance languages.

⁹² This interpretation of the LCA requires that the LCA cannot see inside words or intermediate projections.

López (2009) argues that if we consider just linearization and prosodic structure, there are three distinct possibilities for the order in which Spell-Out operations might be applied and evaluated:

- (24) a. Prosodic structure assignment precedes linearization;
- b. Linearization precedes prosodic structure assignment;
- c. Prosodic structure assignment and linearization are applied simultaneously.

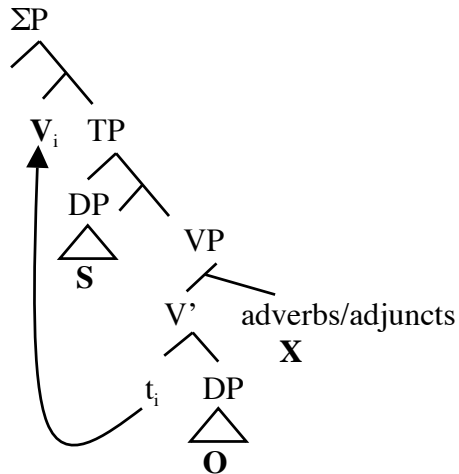
As discussed throughout this dissertation, we have seen evidence that prosodic structure assignment needs to refer directly to syntactic structure. In addition, it seems uncontroversial to assert that linearization also needs to refer to syntactic structure, assuming that the LCA is correct in deriving linear order from hierarchical relations. I therefore come to the same conclusion as does López: if both prosodic structure and linearization need to refer directly to syntactic structure, only option (c) can be true: they are evaluated concurrently at Spell-Out. If this were the case, it would not be surprising if prosodic structure were to affect linear order. Like López' proposal regarding clitic dislocation in Romance, pronoun postposing also provides evidence that prosodic structure can affect word order (see also Elfner 2011; Bennett et al. in prep).

Developing a linearization algorithm that will work in all cases is a complex question and one that cannot be resolved satisfactorily in this dissertation. Instead, I will attempt to identify the necessary characteristics of the linearization constraint or constraints, and formulate the violable constraint in such a way as to achieve the desired results.

The LCA, as defined in section 6.4.1, is not without its problems. For instance, the LCA requires syntactic structures to be exclusively left-branching; otherwise, the requisite asymmetric c-command relationships cannot be established. In Irish, this has

implications for the assumed syntactic structure in VSOX sentences, where I have, up to this point, assumed that the object remains low in the complements position of VP, with right-branching adjuncts merged above this position. This can be seen in the following tree, which assumes that objects remain low:

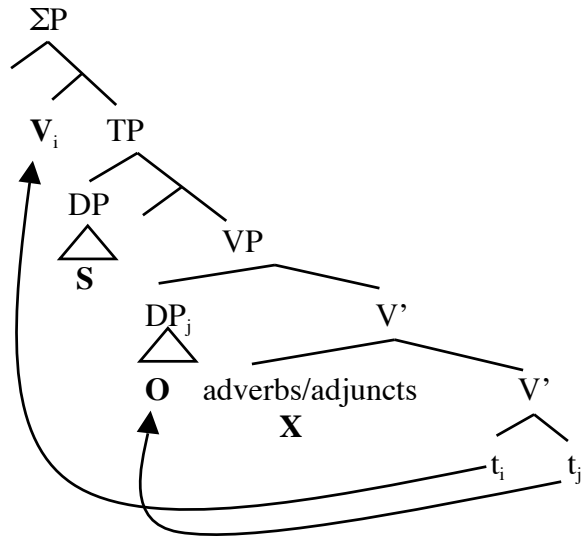
(25) Syntactic representation for a VSOX sentence, assuming low objects



Under Kayne's LCA, the direct object is not in an asymmetric c-command relationship with adverbs or adjuncts adjoined to VP, and, as such, there is no established precedence relation which orders $\langle O, X \rangle$.

For the purposes of this analysis, I will assume that direct objects in Irish undergo obligatory object shift and surface in (one of) the specifiers of VP, where they asymmetrically c-command VP adjuncts (Johnson 1991; Chomsky 2008), which can be assumed to be left-branching. This structure is as below:

(26) Syntactic representation for a VSOX sentence, assuming object shift to Spec,VP



Given a linearization algorithm following the basic principles of the LCA, the tree structure in (26) will correctly establish a precedence relationship $\langle O, X \rangle$, where direct objects will by default precede adjuncts and adverbs that are merged in VP. In the case of direct objects which are larger than pronouns (full DPs), this precedence relation is preserved: in most cases, these objects must precede adjuncts or adverbs.⁹³ When the direct object is a pronoun, however, the object may either remain in canonical object position (strengthened or left-leaning) or it may be postposed. Postposing violates the precedence relation $\langle O, X \rangle$.

The LCA, like the MATCH constraints, establishes a type of correspondence relation between the syntactic component and the phonological component: terminal nodes which are in a certain type of hierarchical relation with each other (asymmetric c-command) correspond to a precedence relation. In defining the LCA as a violable constraint, we must establish that the constraint will be violated when this

⁹³ With the exception of a small set of adverbs that may intervene between the subject and the object (Carnie 1995; McCloskey 1996b: 269-270).

correspondence relation is not met. I propose the following preliminary definition of the LCA constraint, which I will refer to as LINEARCORRESPONDENCE (LINCORR):

(27) LINEARCORRESPONDENCE (LINCORR): assign one violation mark for every syntactic node α whose terminal nodes do not precede the set of terminal nodes dominated by a syntactic node β which α asymmetrically c-commands.

This definition of the constraint evaluates the asymmetric c-command relation between each pair of syntactic nodes and their respective sets of terminal nodes. Note that this constraint is defined *categorically* rather than *gradiently*: once the linear precedence relation is violated, the terminal nodes dominated by α may be linearized to any position. In other words, there is no penalty associated with increasing the distance between the base position to which these terminal nodes would have surfaced and the final landing site.

This assumption has direct repercussions for the analysis of partial postposing (see section 6.2.3), where postposed pronouns may surface following any adjunct in sentences with more than one adjunct. Because pronoun placement appears to be optional (or at least conditioned by non-prosodic factors), this formulation of the constraint is equally violated by each possible position. If the constraint were defined gradiently, on the other hand, we would expect a categorical preference for pronouns to surface in the landing position closest to default object position; as discussed above, while there may be such a preference in postposing, this preference is not categorical. A formal account of partial postposing will be taken up in section 6.9.

6.5 Pronoun Postposing as Constraint Interaction

Because prosodic structure assignment and linearization occur simultaneously at Spell-Out, we expect that they may interact with one another provided that each are

governed by violable constraints. As proposed above, pronoun postposing appears to have several characteristics typical of prosodic or phonological interactions resulting from violable constraint interaction: the process targets words belonging to a prosodically-defined class (function words, which are not parsed as prosodic words),⁹⁴ the process is optional and gives rise to multiple repair strategies which have direct effects on prosodic structure, and the placement of the pronoun is subject to variation in its final landing position. In section 6.3, I argued that weak pronominal objects in VSOX sentences violate the prosodic markedness constraint STRONG-START(σ) when they are directly followed by an adjunct that is a prosodic word or greater. Pronoun postposing removes the violation of STRONG-START(σ) by displacing the pronoun to a position following rather than preceding the adjunct, and, as such, may be seen as a repair strategy which avoids violating this constraint. Since pronoun postposing violates LINCORR, we can assume that this constraint is in direct competition with STRONG-START(σ). In sentences where pronouns are postposed, we know that the relative weight of LINCORR must be less than the weight of STRONG-START(σ), because LINCORR is violated in preference to STRONG-START(σ) (here, w stands in for ‘weight’):

(28) Weighting condition resulting in pronoun postposing
 $w(\text{STRONG-START}(\sigma)) > w(\text{LINCORR})$

However, before making an explicit proposal regarding the interaction between these constraints, it is necessary to develop a deeper understanding of the other two *in situ* repair strategies for STRONG-START(σ), strengthening (i.e. promotion to prosodic word status) and encliticization.

⁹⁴ For discussion of why non-pronominal function words do not postpose, see section 6.8.

6.5.1 Strengthening as a repair strategy

As discussed in section 6.2, pronoun postposing is an optional process: while pronouns may be postposed, they may also grammatically surface in canonical object position in VSOX sentences. However, the pronoun is never pronounced as a weak proclitic, as might be expected given pressure to preserve syntactic constituency and the status of pronouns as non-prosodic words. Such a configuration would violate STRONG-START(σ):

(29) Violations of STRONG-START(σ) by weak unpostposed pronouns

*($\sigma \omega$)

*($\sigma \varphi$)

In addition to pronoun postposing, which avoids violating STRONG-START(σ) by removing the pronoun from initial position, there are two additional repair strategies available to speakers: the pronoun may be ‘strengthened’, such that it is promoted to prosodic word status, or the pronoun may be realized as an enclitic on the preceding prosodic word or φ . I argue that these repair strategies are in direct competition with pronoun postposing, and that the observed variation suggests that each strategy is equally costly in terms of constraint violation. This section outlines the analysis for strengthening, while the next section deals with encliticization.

Section 6.2.2 provides evidence that object pronouns in VSOX sentences that are not postposed may be pronounced in a ‘strong’ form. Evidence that the pronoun was capable of bearing the same pitch accents that are observed on prosodic words but not function words (see chapter 3) suggests that these pronouns are prosodically different from other pronouns: they have the status of prosodic words.

Promotion of a function word to prosodic word status violates a constraint on prosody-to-syntax mapping that has not yet been discussed in this dissertation. Following previous work on this topic (Selkirk 1995; Werle 2009), I assume that only lexical words are by default mapped onto prosodic words—the syntax-prosody mapping governed by the constraint MATCH-WORD (Selkirk 2009b, 2011), which may be defined as below:

(30) MATCH-WORD: assign one violation for every lexical word in the syntactic component that does not stand in a correspondence relation with a prosodic word in the phonological component.

In contrast, function words are not governed by MATCH-WORD, such that there is no impetus to parse them as prosodic words.

As proposed in Selkirk (2009b, 2011), Match Theory assumes a set of correspondence constraints that govern input-output relations (syntax-to-prosody, like the MATCH-PHRASE constraint discussed throughout this thesis), as well as output-input relations (prosody-to-syntax). Selkirk (2009b, 2011) discusses empirical evidence necessitating the existence of constraints in both directions; see also Selkirk (1995) and Werle (2009) for discussion of this distinction at the word level.

When a function word is parsed as a prosodic word, as in the case of the strengthened pronouns, this creates a prosodic word in the phonological component that has no corresponding lexical word in the syntactic component. The resulting prosodic word violates the prosody-syntax counterpart to MATCH-WORD, which may be formulated as MATCH- ω . MATCH- ω (Selkirk 2011), an output-input correspondence constraint which calls for the correspondence between prosodic words in the

phonological component and syntactic words (here, defined as *lexical* words) in the syntactic component:⁹⁵

(31) MATCH- ω : assign one violation for every prosodic word in the phonological component that does not stand in a correspondence relation with a lexical word in the syntactic component.

This constraint, as formulated here, will be violated by any function word that is parsed in the prosodic component as a prosodic word. For further discussion of other formulations and historical precedence, see discussion of the LEX=WD constraint in Prince and Smolensky (1993/2004) and WDCON in Selkirk (1995); see also Werle (2009).

The constraint STRONG-START(σ) was argued in 6.3 to be distinct from STRONG-START(ω) in terms of its violation profile, on the basis that only pronouns may be postposed, but never prosodic words. This distinction also provides an explanation for why pronouns may surface in object position if they are strengthened: such pronouns no longer incur a violation of STRONG-START(σ). Following the logic of the previous section, this suggests that, given that pronouns are strengthened, the relative weight of STRONG-START(σ) is greater than MATCH- ω :

(32) Weighting condition resulting in pronoun strengthening
 $w(\text{STRONG-START}(\sigma)) > w(\text{MATCH-}\omega)$

⁹⁵ Unlike the MATCH-PHRASE constraint discussed in chapter 1 and onwards, I have not defined this constraint in terms of relations between sets of terminal nodes. Given that syntactic words may consist of bundles of abstract morphemes which are spelled-out as dependent affixes, as assumed under Distributed Morphology (for an overview, see Embick 2010), this may prove to be necessary in the definition of MATCH- ω and MATCH-WORD (the syntax-prosody constraint). Further discussion of this topic is, however, beyond the scope of this project and is left for future research.

Because strengthening and postposing are in direct competition and there is variation in terms of which repair strategy is chosen, this would suggest that LINCORR and MATCH- ω have a roughly equal weight, as discussed in chapter 4:

(33) Weighting condition resulting in variation between postposing and strengthening
 $w(\text{LINCORR}) = w(\text{MATCH-}\omega)$

When constraints are assigned using a noisy grammar, variation is predicted to occur: when $w(\text{LINCORR})$ is greater than $w(\text{MATCH-}\omega)$, strengthening is observed, while postposing is observed when the opposite weighting conditions hold.

6.5.2 Encliticization and Derivation-by-phase

The third observed repair strategy for pronoun objects can be referred to as *in situ encliticization*, where the weak object pronoun is realized as a weak enclitic on a preceding prosodic constituent, often the subject:

(34) ${}_{\text{sp}}[\text{V } {}_{\text{TP}}[\text{S } {}_{\text{vp}}[\text{prn } [\text{X}]]]] \rightarrow (\text{V } ((\text{S-prn}) \text{X}))$

As discussed in previous chapters, pronouns in this position may maintain their status as non-prosodic words, and, as such, they will not bear the H-L pitch accent associated with prosodic words at the right edge of a φ .⁹⁶ In contrast, right-adjoined prosodic words in a comparable φ -final positions necessary receive an H-L accent (see, for example, discussion in chapter 3).

At first glance, this repair strategy might appear to represent a simple interaction between STRONG-START(σ) and MATCH-PHRASE, which would be violated when the object is phrased with the subject rather than with the adjunct. However, as I will

⁹⁶ Discussed below are examples of strengthened pronouns which may be phrased with material to the left and may bear pitch accents.

discuss below, this approach is not consistent with the proposals for constraints and constraint interactions in CI that have been argued for in this thesis so far.

This point can be understood by reviewing the claims made regarding weighting conditions and constraint interaction argued for so far in this thesis. In chapters 4 and 5, I discussed evidence from prosodic phrasing and proposed that MATCH-PHRASE evaluates prosodic representations with respect to syntactic nodes that introduce new phonologically-overt material, such that syntactic projections that do not introduce new phonologically-overt material will be ignored by MATCH-PHRASE. In VSOX sentences with the structure in (34), the VP constituent is broken-up prosodically when the pronoun is phrased with material to its left, incurring (apparently) only a single violation of MATCH-PHRASE. Even if we assume the existence of additional functional projections between the subject and the object, such as *vP*, these projections will not introduce any phonologically-overt material and, as such, will be ignored by MATCH-PHRASE. Provided that the evidence provided in support of this definition of MATCH-PHRASE is valid, we cannot assume at this point that there is more than one violation of MATCH-PHRASE incurred by phrasing the pronoun to the left (as an enclitic) in the prosodic representation in (34).

Consider next that we know from chapter 4 that MATCH-PHRASE and STRONG-START(ω) have equal weights, because we observed variation between candidates which showed equal violations of these constraints. If STRONG-START(ω) has a relatively smaller weight as compared to STRONG-START(σ) (as argued above in section 6.3), then the same must hold of the relation between STRONG-START(σ) and MATCH-PHRASE:

(35) Weighting condition between STRONG-START(σ) and MATCH-PHRASE
 $w(\text{STRONG-START}(\sigma)) > w(\text{MATCH-PHRASE}), w(\text{STRONG-START}(\omega))$

We also know that in order for pronoun postposing to occur, $w(\text{STRONG-START}(\sigma))$ must be greater than both $w(\text{LINCORR})$ and $w(\text{MATCH-}\omega)$, which have equal weights. Because only pronouns and not prosodic words are targeted for postposing, this indicates that $w(\text{LINCORR})$ and $w(\text{MATCH-}\omega)$ must in turn be greater than $w(\text{STRONG-START}(\omega))$; otherwise, we would expect that manipulation of word order would be a valid strategy to avoid violations of $\text{STRONG-START}(\omega)$:

(36) Weighting condition between LINCORR and $\text{STRONG-START}(\omega)$

$$w(\text{STRONG-START}(\sigma)) > w(\text{LINCORR}), w(\text{MATCH-}\omega) > w(\text{STRONG-START}(\omega)),$$

$$w(\text{MATCH-PHRASE})$$

In turn, this would suggest that $w(\text{LINCORR})$ and $w(\text{MATCH-}\omega)$ is greater than $w(\text{MATCH-PHRASE})$:

(37) Weighting condition between LINCORR and MATCH-PHRASE

$$w(\text{STRONG-START}(\sigma)) > w(\text{LINCORR}), w(\text{MATCH-}\omega) > w(\text{STRONG-START}(\omega)),$$

$$w(\text{MATCH-PHRASE})$$

However, we have observed that the strategy of encliticization is in variation with the other two repair strategies, postposing and strengthening. In keeping with the analysis of variation assumed in this thesis, this would seem to indicate that the relative weight of LINCORR and MATCH-PHRASE (in addition to $\text{MATCH-}\omega$) should be equal. Further, if the relation in (37) did hold, and no further penalty were assigned to encliticization of object pronouns, we would expect encliticization to be the preferred strategy, with postposing and strengthening observed only very rarely. Because we know that MATCH-PHRASE and LINCORR cannot have equal weight (due to the reasoning above), we know that the analysis of encliticization cannot be as simple as an interaction between MATCH-PHRASE and $\text{STRONG-START}(\sigma)$. Instead, we need a way to capture the

observation that encliticization, postposing, and strengthening are equally preferred repair strategies, and occur in variation.

6.6 Phasal Spell-Out

An alternative to the approach sketched in the previous section is to assign a greater cost specifically to prosodic structures which separate direct objects from other material within the VP. One way to achieve this which is in keeping with recent work in syntactic and prosodic theory is to assume that Spell-Out is not evaluated all at once, as in the global evaluation assumed so far in this dissertation, but rather proceeds derivationally in chunks, as in Multiple Spell-Out (MSO) approaches the syntax-phonology interface (Uriagereka 1999). Phase Theory (Chomsky 2000, 2001) is a specific proposal using MSO in which the merging of certain functional heads (for Chomsky, C and ν), which trigger Spell-Out of the material contained in their complement; this corresponds to the *Spell-Out Domain* (SOD) of that phase head. Once spelled-out, the material within each SOD is thought to be impenetrable to syntactic and prosodic operations: among other properties, it has been proposed that SODs are relevant to prosodic structure building as units of prosodic constituency (among others, Dobashi 2003, 2004; Adger 2006; Ishihara 2007; Kratzer & Selkirk 2007).⁹⁷

Among the proposals for phase-triggering heads, Chomsky's original proposal argues that ν and C show the relevant properties of phase-heads (Chomsky 2000, 2001). In Irish, ν is merged above VP; following McCloskey (2009), I assume that the verb in finite (VSO) clauses moves through ν on its way to Σ P and that external arguments

⁹⁷ Other proposals have argued that SODs are relevant for the creation of phonological domains which do not necessitate the assumption that these are also prosodic domains (e.g. Kahnemuyipour 2004; Wagner 2005, 2010; Pak 2008)

(subjects) are merged in Spec, v P before they are moved to Spec,TP. If we assume that v is a phase-head in Irish, we predict that the material contained in the complement of v will be spelled-out as a distinct unit before the material above v P. In Irish, this creates a division exactly between the subject and the object in VSO sentences. If v is merged directly above VP, the material in the complement of v will correspond to the VP. Because direct objects undergo object shift to Spec,VP, they will also be initial in the SOD corresponding to the complement of v .

As discussed above, I assume that prosodic structure building and linearization are evaluated concurrently at Spell-Out. Because the SOD is a self-contained unit, prosodic structure will be assigned without reference to the yet-to-be-spelled-out material above the object. This means that only two of the three possible repairs for STRONG-START(σ) can actually be carried out within the v P phase: an initial pronoun may be postposed, presumably to a position within the phase, or the pronoun may be promoted to prosodic word status. However, it is not immediately possible to employ the encliticization approach: the material to the left of the pronoun, including the subject, is not yet visible.

One way to understand this third option is to assume that STRONG-START(σ) is initially violated, such that the pronoun is parsed in initial position in the v P phase. When the material above Comp, v P is spelled-out at the next phase, the prosodic phrasing that was originally put in place within the SOD of v is revised, such that the STRONG-START(σ) violation is removed in exchange for a revision to the prosodic phrasing set down in the previous phase. Assuming that syntactic structure is no longer visible once a phase has been spelled-out, this change in phrasing would not violate

MATCH-PHRASE, but rather a faithfulness constraint that militates against changes to prosodic structure that has already been established in earlier phases.

Under this analysis, there are three possibilities for prosodic phrasing in Spell-Out of the νP phase in a VSOX sentence with a pronominal object: either the pronoun is postposed (in violation of LINCORR), is promoted to prosodic word status (in violation of MATCH- ω), or it is left weak and *in situ* (in violation of STRONG-START(σ)). Because we observe variation between the three repairs, these three constraints must be assigned equal weights, suggesting that the repair chosen is determined based on noise present in the assignment of constraint weights, as discussed in chapter 4. We also know that STRONG-START(σ) and LINCORR must have a relatively higher weight than STRONG-START(ω):

$$(38) \text{Weighting conditions between constraints} \\ w(\text{STRONG-START}(\sigma)) , w(\text{LINCORR}) , w(\text{MATCH-}\omega) > \\ w(\text{STRONG-START}(\omega)) , w(\text{MATCH-PHRASE})$$

The variation between the three repairs may be illustrated by an HG tableau for the SOD of ν in a VSOX sentence with a pronominal object. For concreteness, I will assume for concreteness that STRONG-START(σ), LINCORR, and MATCH- ω have a weight of 2, while STRONG-START(ω) and MATCH-PHRASE have a weight of 1.

(39) HG tableau illustrating three possible parses in the SOD of νP in a VSOX sentence with a pronominal object

<i>weight</i>	2	2	2	H
$\nu P[\nu P[\acute{e} [ar\acute{e}ir]]]$	STRONG-START(σ)	MATCH- ω	LINCORR	
a. $\curvearrowright (\acute{e} \text{ } \omega \text{ } (ar\acute{e}ir))$	-1			-2
b. $\curvearrowright (\text{ } \omega \text{ } (\acute{e}) \text{ } \omega \text{ } (ar\acute{e}ir))$		-1		-2
c. $\curvearrowright (\text{ } \omega \text{ } (ar\acute{e}ir) \acute{e})$			-1	-2

Because the three candidates each violate one of the three relevant constraints once, each candidate is predicted to have an equal likelihood of winning, everything being equal.

If candidate (a) wins, the prosodic phrasing set in place in the SOD of the ν P phase will be re-evaluated during Spell-Out of the higher (CP) phase, with the consequence that there will be a second opportunity to remove the STRONG-START(σ) violation. As discussed briefly above, we can assume that changing prosodic structure that is already put in place violates a faithfulness constraint that is violated when prosodic boundaries already put in place are changed. For now, I will refer to this constraint as FAITH- φ , defined as below:

(40) FAITH- φ : assign one violation for every φ in the input that is not preserved in the output.

If we assume that FAITH- φ has a lower weight as compared to STRONG-START(σ), we correctly derive the observation that pronominal objects never violate STRONG-START(σ) in the surface pronunciation: unless the pronoun is initial in the sentence, there will always be a word to its left, and STRONG-START(σ) will always be satisfied in preference to FAITH- φ :

(41) HG tableau illustrating Spell-Out of higher phase: alteration to prosodic structure when STRONG-START(σ) is violated in the winning candidate

<i>weight</i>	2	1	H
${}_{\nu P}[\text{léigh}]_{TP} [{}_{DP}[\text{fear óg}]_{\nu P} [(\acute{e} \text{ (aréir)})]]]$	STRONG-START(σ)	FAITH- φ	
a. ${}_{\nu P}(\text{léigh})_{\nu P} ({}_{\nu P}(\text{fear óg}))_{\nu P} (\acute{e} \text{ (aréir)})$	-1		-2
b. $\text{ }_{\nu P}(\text{léigh})_{\nu P} ({}_{\nu P}({}_{\nu P}(\text{fear óg}) \acute{e}))_{\nu P} (\text{aréir}))$		-1	-1

Candidate (a) in the tableau in (41) cannot win as long as the pronoun is not sentence-initial.

In contrast, the other two repairs, postposing and strengthening, will not lead to violations of FAITH- φ when the higher SOD is spelled-out. Unlike STRONG-START(σ), both LINCORR and MATCH- ω are syntax-phonology correspondence constraints that refer to the correspondence relationship between syntactic structure and the phonological representation. As a result, they will *not* be violated by already-spelled-out prosodic structure, assuming that once syntactic structure is spelled-out, we lose information about syntactic constituency and hierarchical relations.

For example, consider the following tableau, which illustrates the evaluation of candidates for the higher phase when candidate (c) from (39) (the candidate with the postposed pronoun) wins in the Spell-Out of the ν P phase in a VSOX sentence:

(42)HG tableau illustrating Spell-Out of higher phase: no alteration to prosodic structure when the pronoun is postposed

<i>weight</i>	2	1	H
${}_{\nu P}[\text{léigh}_{TP}[\text{DP}[\text{fear óg}]_{\nu P}[\omega((\text{aréir}) \acute{e})]]]$	LINCORR	FAITH- φ	
a. $\curvearrowright \varphi(\text{léigh}_{\varphi}(\varphi(\text{fear óg})_{\omega}((\text{aréir}) \acute{e})))$			
b. $\varphi(\text{léigh}_{\varphi}(\varphi(\varphi(\text{fear óg})_{\omega}(\text{aréir})) \acute{e}))$		-1	-1

Because LINCORR refers to the relationship between syntactic structure and linear order, the postposed pronoun in the complement of ν will no longer incur a violation of LINCORR. This means that the pronoun does not violate STRONG-START(σ) or any other constraint considered here. Therefore, any violations of FAITH- φ incurred by candidates at this stage are gratuitous.

Similarly, strengthened pronouns will surface faithfully in the Spell-Out of the higher phase. The tableau in (43) illustrates Spell-Out of the higher phase when candidate (b) from (39) (the strengthening candidate) is chosen as optimal. In this case, both STRONG-START(σ) and MATCH- ω are satisfied by leaving the strengthened

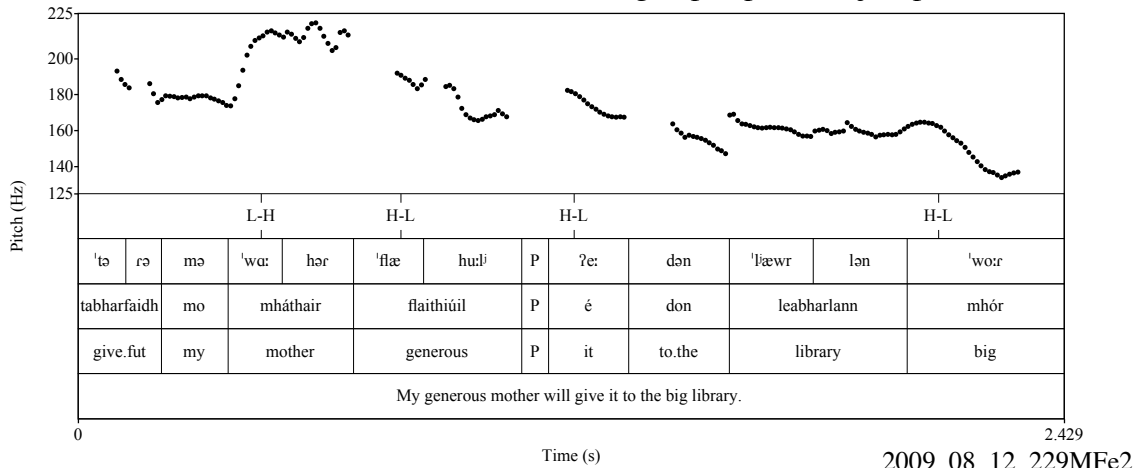
pronoun in place; any violation of FAITH- φ would be gratuitous considering only this constraint set:

(43) HG tableau illustrating Spell-Out of higher phase: no (necessary) alteration to prosodic structure when strengthened pronoun is the winning candidate

<i>weight</i>	2	2	1	H
$\text{_{\sigma}P}[\text{léigh}_{\text{TP}}[\text{DP}[\text{fear óg}]_{\text{VP}}[(\text{é})_{\text{P}}(\text{aréir})]]]$	STRONG-START(σ)	MATCH- ω	FAITH- φ	
a. $\varphi(\text{léigh}_{\varphi}(\varphi(\text{fear óg})_{\varphi}(\text{é})_{\omega}(\text{aréir})))$				0
b. $\varphi(\text{léigh}_{\varphi}(\varphi(\varphi(\text{fear óg})_{\omega}(\text{é})_{\omega}(\text{aréir}))))$			-1	-1

However, we might expect to see violations of FAITH- φ under pressure from other constraints, like STRONG-START(ω). For example, in the pitch track in (44), the strengthened pronoun bears an H-L pitch accent, suggesting that it is rightmost in a φ and has been phrased with material to its left.

(44) Pitch track for a VSOX sentence with a strong unpostposed object pronoun



This phrasing can be explained by assuming that the initial strengthened pronoun may exchange a violation of FAITH- φ in response to STRONG-START(ω), as illustrated in the following tableau (I assume that FAITH- φ and STRONG-START(ω) are assigned equal weights):

(45) HG tableau illustrating Spell-Out of higher phase: alteration to prosodic structure under pressure from STRONG-START(ω) when strengthened pronoun is the winning candidate

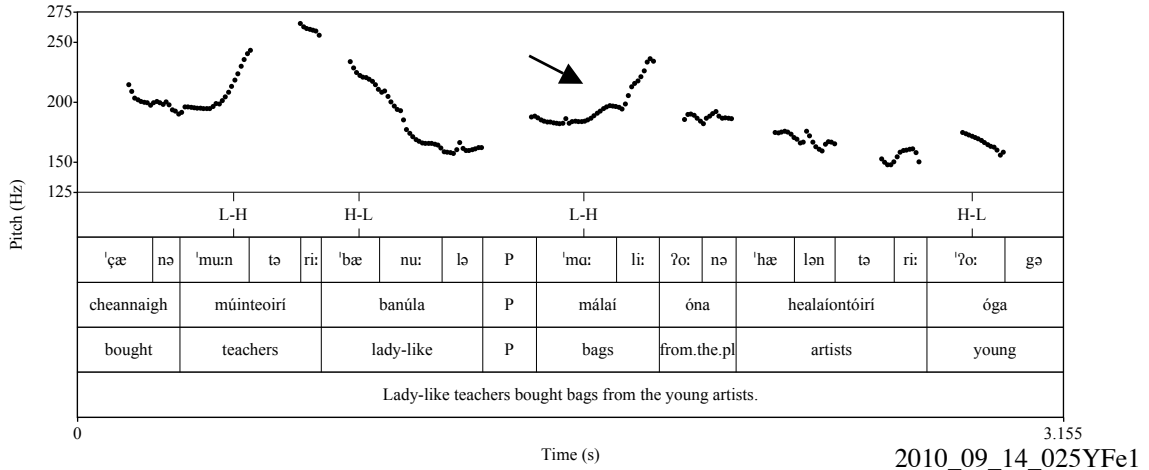
<i>weight</i>	1	1	H
${}_{\text{p}}[\text{léigh}]_{\text{TP}}[\text{DP}[\text{fear óg}]_{\text{VP}}[(\acute{\text{e}})_{\omega}(\text{aréir})]]]$	STRONG-START(ω)	FAITH- φ	
a. φ (léigh φ (fear óg) φ (($\acute{\text{e}}$) ω (aréir)))	-1		-1
b. φ (léigh φ ((φ (fear óg) ω ($\acute{\text{e}}$) ω (aréir)))		-1	-1

More data is needed to determine whether candidates (a) and (b) in (45) are equal and in variation, or whether candidate (b) is preferred.

This analysis predicts that prosodic words should also be subject to this type of rephrasing in a similar environment. This appears to be the case: in VSOX sentences where the object is a single noun, speakers may either phrase the object with material to the left (in violation of FAITH- φ) or with material to the right (in violation of STRONG-START(ω)).⁹⁸ Both options can be seen in the following pitch tracks. First, the pitch track in (46) shows the nominal object (*málaí* ‘bags’) phrased with material to the right, as evidenced by the presence of the L-H pitch accent. This representation violates STRONG-START(ω) but satisfies FAITH- φ :

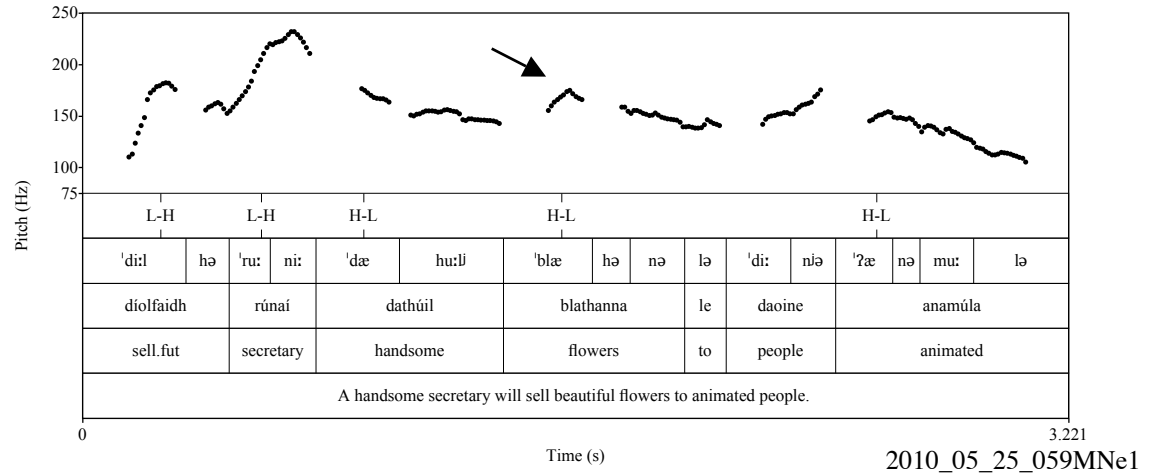
⁹⁸ However, most speakers (five of seven) chose to phrase the object to the right, and just one phrased it to the left. One produced an alternative phrasing (see fn. 99). Without more data, it is not possible to determine whether this tendency is significant or not.

(46) Pitch track for VSOX sentence with a single-word object; object phrases with material to its right (satisfies MATCH-PHRASE)



In contrast, the pitch track in shows the nominal object phrase with material to the left, as evidenced by the H-L accent. This representation violates FAITH- φ in exchange for satisfaction of STRONG-START(ω):

(47) Pitch track for VSOX sentence with a single-word object; object phrases to the left



The interaction between FAITH- φ and STRONG-START in the phasal derivation of the above VSOX sentences with single-word objects may be seen in the following tableaux:⁹⁹

⁹⁹ In fact, one speaker did produce the prosodic phrasing in candidate (b), suggesting that the number of violations of MATCH-PHRASE assumed here is incorrect (assuming

(48) HG tableau illustrating prosodic phrasing in ν P phase of a VSOX sentence with single-word object

<i>weight</i>	1	1	H
ν P[ν P[málaí [óna healaíontóirí óga]]]	STRONG-START(ω)	MATCH-PHRASE	
a. \varnothing (málaí (óna healaíontóirí óga))	-1		-1
b. \varnothing ((málaí óna healaíontóirí) óga)		-2	-2

(49) HG tableau illustrating Spell-Out of higher phase: alteration to prosodic structure under pressure from STRONG-START(ω)

<i>weight</i>	1	1	1	H
ν P[cheannaigh _{TP} [DP[múinteoirí banúla] ν P[(málaí (óna healaíontóirí óga))]]]	STRONG-START(ω)	FAITH- φ	MATCH-PHRASE	
a. \varnothing (cheannaigh ((múinteoirí banúla) (málaí (óna healaíontóirí óga))))	-1			-1
b. \varnothing (cheannaigh ((múinteoirí banúla) málaí (óna healaíontóirí óga)))		-1		-1

While more data is necessary to determine whether or not pronouns that are strengthened in this context consistently behave like other prosodic words, the comparison discussed here supports the analysis of strengthened pronouns proposed in this chapter.

6.7 Accounting for the Subject-Object Asymmetry

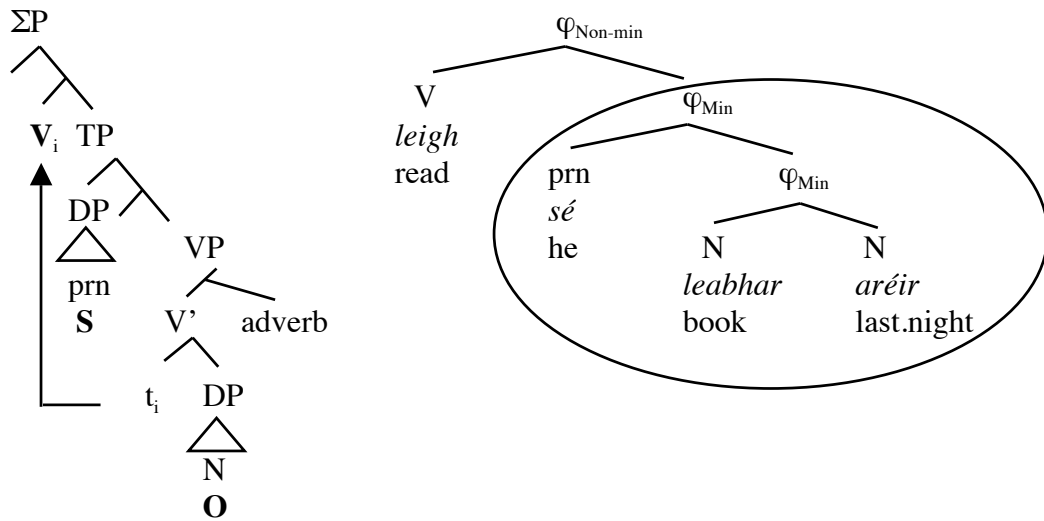
In addition to providing an account for why encliticization of object pronouns is only one of three possible repairs for STRONG-START(σ), the assumption that Spell-Out is derivational and proceeds by phases is also needed to explain the behaviour of weak pronouns in other syntactic positions. One of these is the subject-object asymmetry, which was introduced in section 6.2.4: while object pronouns in VSOX sentences freely postpose, subject pronouns never postpose. This can be seen in the following example, repeated from (8):

one violation each for PP and DP). Further discussion of this is beyond the scope of this section.

- (50) a. Bhris sé an chathaoir leis an ord aréir.
 broke he the chair with the hammer last-night
 ‘He broke the chair with the hammer last night.’
 b. *Bhris an chathaoir sé leis an ord aréir.
 c. *Bhris an chathaoir leis an ord sé aréir.
 d. *Bhris an chathaoir leis an ord aréir sé.

If we were to assume that phases were not relevant in the assignment of prosodic structure, we would be unable to pinpoint the difference between subject and object pronouns: because subject pronouns occupy subject position in Spec,TP, they will in turn be initial in the φ which corresponds to TP under pressure from MATCH-PHRASE:

- (51) a. Syntactic Representation b. Recursive Prosodic Representation



In the prosodic representation in (51)b, the subject pronoun *sé* ‘he’ violates STRONG-START(σ). While subject pronouns are never postposed, the prosodic representation of the pronoun *in situ*, as above, also never seems to surface: instead of violating STRONG-START(σ), subject pronouns are parsed as enclitics on the preceding prosodic word, usually the verb. This suggests that, unlike object pronouns, the encliticization repair to STRONG-START(σ) is somehow less costly than postposing, strengthening, or tolerating

the violation of STRONG-START(σ) (even if only temporarily during Spell-Out of the lower phase).

In the previous section, I argued that the assumption that v is a phase-defining head results in the desired effect that pronominal objects are more resistant to being phrased with the preceding prosodic word than we might expect given the assumptions of MATCH-PHRASE. Subject pronouns, however, are not at the left edge of the higher phase, and, as a result, there is no phase boundary separating subject pronoun from the preceding prosodic word, in this case, the verb. This suggests that the constraint violated by encliticization in this case is MATCH-PHRASE rather than FAITH- φ , which we know has a relatively lower weight as compared to LINCORR, STRONG-START(σ), and MATCH- ω . As a result, encliticization is predicted to be the preferred phrasing for subject pronouns. Note that this is exactly parallel to the conditions imposed by BINMIN- φ on the phrasing of single-word subjects, as discussed in chapter 4, where single-word subjects were phrased together with the verb in order to avoid incurring two violations of STRONG-START(ω).

This may be seen in the following tableaux, which illustrate the derivation for a sentence as in (51). As proposed in the previous section, the material in the complement of v is spelled-out first, as the SOD of the vP phase. In this case, the subject pronoun is not spelled-out as part of this phase:

(52) HG tableau illustrating prosodic phrasing in vP phase of a VSOX sentence with pronominal subject (non-pronominal object)

<i>weight</i>	2	2	2	1	H
vP [VP [leabhar [aréir]]]	STRONG-START(σ)	LINCORR	MATCH- ω	MATCH-PHRASE	
a. φ (leabhar aréir)					0

When the material above ν is spelled-out on the higher CP phase, which includes the verb and the subject, the subject pronoun would be at the left edge of a φ if MATCH-PHRASE were respected, but it is not at the left edge of an SOD. Consequently, the subject pronoun is able to encliticize onto the verb and incur only a single violation of the lower-weighted MATCH-PHRASE:

(53) HG tableau illustrating Spell-Out of higher phase: alteration to prosodic structure under pressure from STRONG-START(ω)

<i>weight</i>	2	2	2	1	H
${}_{\text{P}}[\text{léigh}]_{\text{TP}}[{}_{\text{DP}}[\text{sé}]_{\text{VP}}[(\text{leabhar aréir})]]]$	STRONG-START(σ)	MATCH- ω	LINCORR	MATCH-PHRASE	
a. \varnothing ${}_{\text{P}}({}_{\text{P}}({}_{\text{P}}(\text{léigh}) \text{sé}) (\text{leabhar aréir}))$				-1	-1
b. ${}_{\text{P}}({}_{\text{P}}(\text{léigh}) ({}_{\text{P}}(\text{sé}) (\text{leabhar aréir})))$	-1				-2
c. ${}_{\text{P}}({}_{\text{P}}(\text{léigh}) ({}_{\text{P}}({}_{\text{P}}(\text{sé}) (\text{leabhar aréir}))))$		-1			-2
d. ${}_{\text{P}}({}_{\text{P}}(\text{léigh}) ({}_{\text{P}}(\text{leabhar aréir}) \text{sé}))$			-1		-2

Candidate (a), the encliticization candidate, has a lower H score as compared to the other candidates, which represent the three repair strategies for object pronouns: (initial) toleration of the STRONG-START(σ) violation (candidate (b)), strengthening/promotion to prosodic word status (candidate (c)), and postposing (candidate (d)).

This account of the phrasing of subject pronouns as enclitics on the preceding prosodic word illustrates that the assumption of phase theory, at least as it relates to the assumption that ν is a phase-defining head, provides an explanation not only for the analysis of object pronouns, but also for the difference in behaviour observed between subject and object pronouns.

6.8 Linearization of Heads versus Specifiers

Above, I argued that pronoun postposing was the result of an interaction between LINCORR (a constraint on linearization based on the LCA) and STRONG-START(σ): assuming that assignment of prosodic structure follows from MATCH-

PHRASE, object pronouns surface in initial position of a φ , thus violating STRONG-START(σ). The pronoun is postposed to remove the pronoun from φ -initial position and avoid incurring a violation of STRONG-START(σ). This was coupled with the additional assumption that syntactic Spell-Out is phasal: this was used to account both for the dispreference for encliticization of object pronouns and the preference for encliticization of subject pronouns.

In this section, I discuss the behaviour of non-pronominal function words like determiners and prepositions. Like pronouns, they are usually prosodically unstressed and reduced, and do not have the status of prosodic word. In addition, these function words are found in phrase-initial position: for example, both determiners and prepositions precede their complements, as seen in the following examples:

- (54) a. an mála
 the bag
 ‘the bag’
 b. na málaí
 the.PL bags
 ‘the bags’

- (55) a. ar chrann
 on tree
 ‘on a tree’
 b. ar an gcrann
 on the tree
 ‘on the tree’

However, unlike pronouns, postposing is not possible, even though configurations like those in (54) and (55) appear to violate STRONG-START(σ):

- (56) a. *mála an
 b. *málaí na
 c. *chrann ar
 d. *an gcrann ar; *gcrann ar an; etc.

Surprisingly, these function words are neither strengthened (promoted to prosodic word status), nor do they appear to be realised as enclitics on a preceding prosodic word. Instead, they are pronounced in their unstressed and reduced form, and appear to behave as proclitics on a following prosodic word, creating exactly the structure argued above to incur a violation of STRONG-START(σ).

That non-pronominal function words are not promoted to prosodic word status is evident from the reduced quality of the vowel (often [ə]) and, depending on the environment and segmental composition of the word, elision of segmental information, sometimes corresponding to the entire word (de Bhaldraithe 1945: 57-58). The examples in (57) show (a) elision of the vowel [ə] in the definite article *an* ‘the’, (b) elision of the consonant [n] in the definite article *an* ‘the’, (c) elision of [g]/[gʲ] in the preposition *ag* ‘at’ before consonant-initial verbal nouns, (d) elision of [n] in the interrogative particle *an* before consonant-initial words, and (e) total elision of the interrogative particle *an*:¹⁰⁰

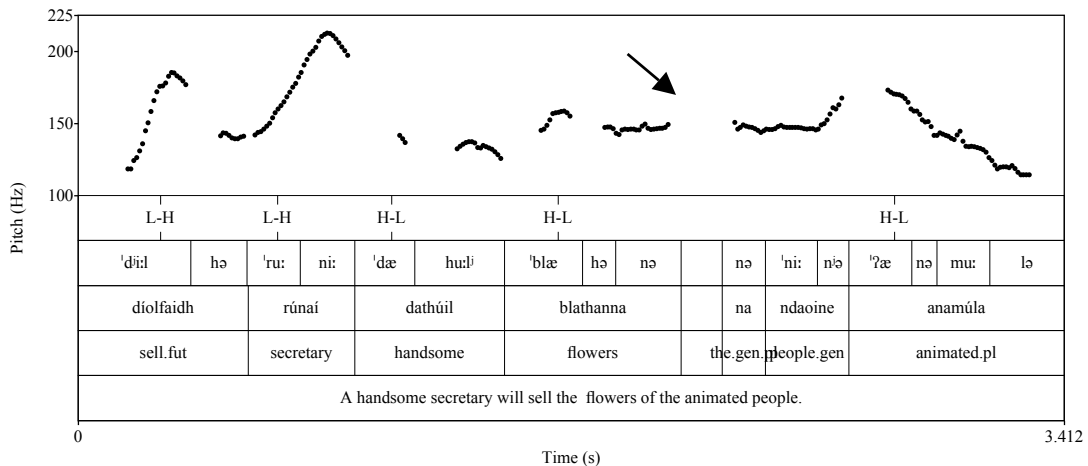
- (57) a. [næ:ŋgəx] *an eangach* ‘the net’
 b. [ə ka:lʲi:nʲ] *an cailín* ‘the girl’
 [æs ə gupɑ:n] *as an gcupán* ‘from the cup’
 c. [ə dʲi:nʲə] *ag déanamh* ‘doing’
 d. [ə mʲi:nʲ] *an mbíonn?* ‘is it?’
 e. [wulʲ tu:] *an bhfuil tú?* ‘are you?’

As discussed in de Bhaldraithe, these patterns of segmental deletion in function words are part of a larger pattern involving elision of reduced vowels and consonants in prosodically weak positions.

¹⁰⁰ Phonetic transcription is a transliteration into IPA of the transcription as given and described in de Bhaldraithe (1945).

The evidence that non-pronominal function words are proclitics in all environments rather than enclitics is less concrete, but this appears to be the correct assumption. For one, such function words remain in their weak form even when sentence-initial: unlike pronouns, they are not strengthened in this environment, and are subject to elision processes, as discussed above.¹⁰¹ In sentence-internal position, it appears to be the case that they can be preceded by prosodic pauses in certain environments: this can be seen in the following example, which shows a pause before the determiner *na* ‘the.GEN’:

(58) Pitch track for a VSO sentence with a possessive object; pause is before the determiner *na*



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However, no systematic study of the distribution of pauses has yet been done, and the data should be understood to be preliminary. Green (2000) also assumes that non-pronominal function words in Irish are proclitics, although no concrete evidence for this is presented for sentence-internal structures. In what follows, I will assume that non-

¹⁰¹ The prosodic behaviour of sentence-initial pronouns is not discussed in this thesis. For further discussion, see Bennett et al. (in prep).

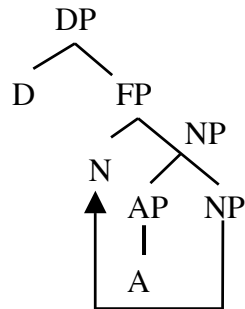
pronominal function words are always weak proclitics, and as such, are distinguished from pronominal function words prosodically.

The prosodic representation of a simple DP consisting of a determiner-noun-adjective configuration is as follows:

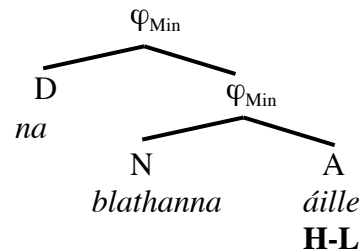
- (59) *na blathanna áille*
 the.PL flowers beautiful.PL
 ‘the beautiful flowers’

(60) The structure of a DP with determiner-noun-adjective

a. Syntactic structure



b. Predicted prosodic structure



As discussed in chapter 3, function words like *na* project only the prosodic category to which they adjoin; in this simple structure, the category projected is φ_{Min} .

The prosodic representation violates STRONG-START(σ) because *na*, as a function word, does not have the status of prosodic word and is sister to φ . Because this is the representation that surfaces for these constructions, we must eliminate the three possible alternative repairs, as observed for pronouns: postposing, strengthening, and encliticization.

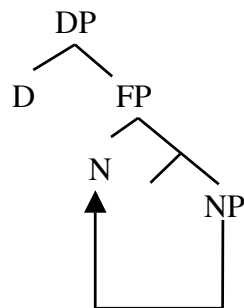
First, in order to rule out postposing as an option, I propose that it is not the violation of STRONG-START(σ) that is in question, but rather the definition of the LINCORR constraint. So far, this constraint is defined only in terms of asymmetric c-command relations, as in the LCA (repeated from (27)):

(61) LINEARCORRESPONDENCE (LINCORR): assign one violation mark for every syntactic node α whose terminal nodes do not precede the set of terminal nodes dominated by a syntactic node β which α asymmetrically c-commands.

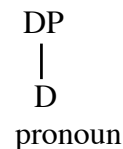
It is possible that this definition is too simple because it does not take into account syntactic relations in such a way as to distinguish pronouns from other function words. Syntactically, pronouns differ from function words by being phrasal (dominated by the maximal category DP) (Cardinaletti & Starke 1999). In contrast, most other function words (including determiners, prepositions, and complementizers) are not phrasal, but rather are simply syntactic heads. This contrast can be seen in the following abstract structures comparing determiners with pronouns:

(62) The structure of determiners and pronouns

a. Determiners



b. Pronouns



As seen in (62)a, functional heads like determiners asymmetrically c-command their complement and directly establish linear precedence relations with the terminal nodes in their complement (the noun in the DP above). The minimal projection dominating pronouns, however, will not asymmetrically c-command any material; rather, the maximal projection of the pronoun (DP) will asymmetrically c-command its complement, which will include the head and complements of the maximal projection which dominates DP. I propose instead that the LINCORR constraint is properly defined in two parts: one pertaining to heads, which *themselves* may asymmetrically c-

command a syntactic node, and one pertaining to specifiers, where it is the *maximal projection* that may asymmetrically c-command a syntactic node.¹⁰² The revised definition of LINCORR as two separate constraints is as follows:

(63) LINCORR(WORD): assign one violation mark for every word (minimal projection) x^0 which does not precede the set of terminal nodes dominated by a syntactic node α which x^0 asymmetrically c-commands.

(64) LINCORR(PHRASE): assign one violation mark for every syntactic phrase (maximal projection) x^{\max} whose terminal nodes do not precede the set of terminal nodes dominated by a syntactic node α which x^{\max} asymmetrically c-commands.

LINCORR(WORD) will apply to all minimal categories: determiners like *na*, which are syntactic heads, as well as pronouns, which are also of the category D. In the case of non-pronominal function words, this predicts the desired result: that they will precede their complements. In the case of pronouns, LINCORR(WORD) is vacuously satisfied because the minimal projection of the pronoun D does not stand in an asymmetric c-command relation with any syntactic node.

In contrast, LINCORR(PHRASE) evaluates the precedence relations established by maximal projections, and, as such, requires specifiers to precede heads (which in turn precede complements). It is this constraint that is violated by pronoun postposing: by allowing the pronoun to surface in a position following a phrase that its maximal projection asymmetrically c-commands, the corresponding precedence relation does not hold.

¹⁰² López (2009) proposes a ‘two-part LCA’ constraint, which encompasses the two linearization constraints proposed here. However, he assumes that linearization is computed by Merge using pairs of terminal nodes, which is very different from what is proposed here, and, further, does not propose to separate the two parts of the constraint into two separate constraints.

Having divided the LINCORR constraint in this way, it is now possible to develop an account which explains why non-pronominal function words (in other words, functional heads) can never be postposed. We can achieve this pattern by establishing LINCORR(WORD) in the constraint hierarchy: because a violation of STRONG-START(σ) is tolerated but postposing is not, $w(\text{LINCORR}(\text{WORD}))$ must be greater than $w(\text{STRONG-START}(\sigma))$. This contrasts with the weighting relations established in earlier sections of this chapter, where it was proposed that LINCORR (now assumed to be LINCORR(PHRASE)) had a weight equal to STRONG-START(σ):

$$(65) w(\text{LINCORR}(\text{WORD})) > w(\text{LINCORR}(\text{PHRASE})), \text{STRONG-START}(\sigma)$$

The failure of postposing for non-pronominal function words like determiners, assuming this set of weighting conditions, is illustrated in the following tableau (for ease of illustration, I assume LINCORR(WORD) has a weight of 3):

(66) HG tableau illustrating the failure of postposing for non-pronominal function words

<i>weight</i>	3	2	2	H
$\text{DP}[\text{an}_{\text{FP}}[\text{NP}[\text{mála}]]]$	LINCORR(WORD)	STRONG-START(σ)	LINCORR(PHRASE)	
a. \varnothing (an $_{\circ}$ (mála))		-1		-2
b. ($_{\circ}$ (mála) an)	-1			-3

In contrast, postposing an object pronoun during the $v\text{P}$ phase does not incur a violation of LINCORR(WORD) but rather a violation of LINCORR(PHRASE), whose weight is equal to that of STRONG-START(σ), as discussed previously.

The second question relates to why non-pronominal function words cannot be strengthened in order to avoid a violation of STRONG-START(σ). There are a few different ways to approach this question. and, unfortunately, I will not be able to provide a definitive answer here. The first approach would be to focus again on the syntactic difference between pronouns and non-pronominal functional heads. As

discussed above, pronouns differ from functional heads by virtue of being phrasal, or in other words, by being simultaneously maximal and minimal. Under the assumptions of MATCH-PHRASE, we predict that there should be pressure to parse pronouns as φ s, although, like single-word DPs, such φ s will be eliminated because they are non-binary. Even so, it seems possible that because pronouns are syntactically ‘bigger’ that they are also more word-like than functional heads. A possible theory might involve creating an ordered hierarchy relating to relative ‘word-hood’, which ranks word types with respect to preference of being parsed as prosodic words:

(67) Word hierarchy (ordered in terms of preference for being parsed as prosodic words)
Lexical words > Pronouns (phrasal function words) > Functional heads

This hierarchy is reminiscent of the pronoun/clitic distinction proposed by Cardinaletti and Starke (1999), who offer a number of semantic, syntactic and prosodic reasons to make a three-way distinction between strong, weak, and clitic pronouns. While I will not attempt to develop this theory further in this dissertation, this approach would predict that pronouns should make better prosodic words than do functional heads, and should be more readily promoted to prosodic word status. Conversely, they are not as readily parsed as prosodic words as are lexical words, and, as such, are only parsed as prosodic words when the prosodic conditions would demand that this be the case.

A second option would be to appeal to lexical access: perhaps pronouns differ from other functional heads by virtue of having both strong and weak forms listed in their lexical entries. To my knowledge, function words other than pronouns are never pronounced in strengthened form in Irish, though they may appear accented or stressed

in a restricted set of contexts (Jim McCloskey, p.c.).¹⁰³ The absence of the possibility of pronouncing non-pronominal words as prosodic words might therefore be due to their absence in the lexical entries for these words. This account would be supported by data from languages other than Irish, where it has been observed that the differences between strong and reduced forms of function words can be idiosyncratic, or in other words, not produced by phonological processes that are active elsewhere in the grammar of the language. For example, reduction of the English word *not* to *n't* cannot be explained by any productive phonological process in the language, suggesting that both forms are

¹⁰³ One of these contexts is in right-node raising constructions where a preposition is stranded, such as the following (McCloskey 1986: 184):

- (i) Níl sé in aghaidh an dlí a thuilleadh a bheith ag éisteacht le nó
 is-not it against the law anymore be(-fin) listen.PROG with or
 ag breathnú ar ráidió agus teilifís an Iarthair.
 look.PROG on radio and television the West.GEN
 'It is no longer against the law to listen to, or to watch, Western radio and television.'

In this sentence, the preposition *le* 'with' is stranded from its complement (*ráidió* 'radio'). In this case, the preposition appears to be realized with an 'accent' or stress, in contrast to its usual reduced form. However, unlike the strong forms of pronouns, this accent does not appear to be accompanied by vowel lengthening (Jim McCloskey, p.c.). Note that this is the only environment in which prepositions may be stranded in Irish (McCloskey 1986: 184), so this type of strengthening is also very rare.

The second possible context for accenting is found for negative complementizers in contrastive contexts, as in the following dialogue:

- (ii) A: Dúirt Ciarán go raibh Eoghan le briseadh as a phost.
 B: Ní hé, a bhastaird! Dúirt sé NACH raibh sé le briseadh as a phost.

A: Ciarán said that Eoghan was to be sacked (was to be broken out of his job).

B: No, you bastard. He said that Eoghan was NOT to be sacked.

However, it is unclear both whether this should be considered 'strengthening' in the same sense described above for pronouns, and whether or not similar patterns may be found for other function words in contrastive contexts.

listed available lexical entries for this word; for further discussion of this topic, see Selkirk (1972, 1984, 1995) and Kaisse (1985).

Either option seems like a plausible explanation for why pronouns may be promoted to prosodic word status, while non-pronominal function words do not appear to have that option. I will not pursue this analysis further at this time, as either analysis has implications either for Irish or for typological predictions that cannot be verified at this time.

The third repair to be eliminated is encliticization: why do non-pronominal function words appear to avoid being phrased as enclitic onto a preceding prosodic word? In this case, we might want to appeal once again to the syntactic difference between functional heads and phrasal pronouns: perhaps there is a stronger requirement for heads to be contained within the same prosodic phrase as their complement than for specifiers to be phrased with material in the same syntactic phrase. This might be achieved, for example, by refining the definition of MATCH-PHRASE in such a way as to increase its sensitivity to the internal structure of syntactic constituents. However, it is unclear whether attempting to implement this observation in the theory proposed in this thesis would adversely affect earlier observations relating to the prosodic phrasing of lexical heads like nouns which, as discussed in chapters 4 and 5, may be separated from their complements under certain prosodic conditions. Unfortunately, further discussion of this topic is beyond the scope of this chapter, and is left for future research.

This analysis is supported by the behaviour of another class of function words found in CI, prepositional pronouns, which are similar to pronouns as being non-heads in the syntax. In Irish, most simple prepositions may be inflected for person and

number, and do not take a complement. For example, the following shows a paradigm shows the various inflected forms for the preposition *le* ‘with’:

(68) Inflectional paradigm for *le* ‘with’

liom ‘with me’
leat ‘with you’
leis ‘with him’
léi ‘with her’
linn ‘with us’
libh ‘with you (pl)’
leo ‘with them’

These prepositional pronouns behave like pronouns with respect to pronoun postposing (Ó Siadhail 1989; McCloskey 1999): when they are found in object position (post-subject), they may be postposed around one or more adjuncts, as illustrated in the following sentences (McCloskey 1999: 195):

- (69) a. Labharfaidh mé leis ar An Chlochán Liath amárach
 speak.FUT I with.him on Dunloe tomorrow
 ‘I’ll speak to him in Dunloe tomorrow.’
 b. Labharfaidh mé ar An Chlochán Liath amárach leis
 speak.FUT I on Dunloe tomorrow with.him
 ‘I’ll speak to him in Dunloe tomorrow.’

This behaviour makes sense when we consider the prosodic and syntactic properties of these prepositional pronouns. Like pronouns and other function words, they are prosodically weak and subject to reduction of vowels and the elision of segmental material (e.g. de Bhaldraithe 1945: 57-58), and the reduction of some disyllabic prepositions to a single syllable (e.g. *agam* ‘at me’ > [əm] in CI). Like pronouns and unlike functional heads, prepositional pronouns are simultaneously maximal and minimal, and are thus expected to behave syntactically like pronouns rather than heads with respect to LINCORR(PHRASE), and, as such, are predicted to be postposable. Unfortunately, I do not have sufficient data to make any claims with respect to whether

or not the strategies of *in situ* encliticization and strengthening are employed for prepositional pronouns, though it is clear that postposing is also optional in this case.

6.9 MATCH-PHRASE and Partial Postposing

As discussed above, pronominal objects in VSOX sentences with more than one adjunct may postpose to any position following any adjunct:

- (70) a. Bhreis sé leis an ord í aréir.
 broke he with the hammer it.FEM last-night
 ‘He broke the chair with the hammer last night.’
 b. Bhreis sé leis an ord aréir í.
 broke he with the hammer last-night it.FEM
 ‘He broke it with the hammer last night.’
- (71) a. Fágadh [é ina loighe ar an talamh taobh thiar den scioból aréir]
 left it lying on the ground behind the barn last-night
 b. Fágadh[ina loighe é ar an talamh taobh thiar den scioból aréir]
 left lying it on the ground behind the barn last-night
 c. Fágadh[ina loighe ar an talamh é taobh thiar den scioból aréir]
 left lying on the ground it behind the barn last-night
 d. Fágadh[ina loighe ar an talamh taobh thiar den scioból é aréir]
 left lying on the ground behind the barn it last-night
 e. Fágadh[ina loighe ar an talamh taobh thiar den scioból aréir é]
 left lying on the ground behind the barn last-night it
 ‘It was left lying on the ground behind the barn last night.’

Above, I proposed that LINCORR (revised to LINCORR(PHRASE)) be defined *categorically* rather than *gradiently*, such that a single violation of this constraint is incurred by the displacement of the object pronoun, but that no greater penalty is incurred by placing the pronoun a greater distance from its base position. Each of the sentences in (70) and (71)b-e violate LINCORR(PHRASE) exactly once.

In terms of prosodic phrasing, we expect that the adjuncts will be incorporated into prosodic structure using the same basic principles that were discussed in the earlier chapters of this dissertation: MATCH-PHRASE exerts a pressure for the elements within

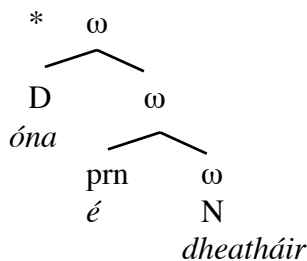
syntactic XPs to be phrased together, while prosodic constraints like STRONG-START(ω) and BIN-MIN(φ) will call for deviations from this phrasing. As discussed previously, I have been assuming that the adjuncts in VSOX sentences are VP-adjoined: this would suggest a pressure for the material within the VP (O-X) constituent to be contained within a single φ . However, it is unclear whether each VP adjunct creates itself a distinct phrasal constituent; in other words, it is possible that there is no internal structure within the VP that has phrasal status. If we assume that MATCH-PHRASE is sensitive only to the status of VP in its entirety as a syntactic phrase, we predict that MATCH-PHRASE should not be violated by pronoun postposing, as long as the pronoun surfaces in some position where it is adjacent to VP-internal material. In other words, it seems plausible that partial postposing, as in (70) and (71), violates neither MATCH-PHRASE nor LINCORR(PHRASE).

The validity of this assumption is confirmed by a restriction placed on the possible landing sites: pronouns can be postposed to the edges of syntactic phrases, but they cannot be postposed *inside* them. In other words, if an adjunct consists of more than one word (lexical or functional), the pronoun cannot surface inside it. For example, in the sentence in (72), the pronoun may be realised canonical object position, as in (a), or may be postposed to a position following either adjunct, as in (b) and (c). However, the pronoun may not intervene between any of the elements within each adjunct, as shown in (d), (e), and (f):

- (72) a. Fuair an sagart é [óna dheatháir] [an lá cheana].
 got the priest it.MASC from.his brother the day other
 ‘The priest got it from his brother the other day’
- b. Fuair an sagart [óna dheatháir] é [an lá cheana].
 got the priest from.his brother it.MASC the day other
- c. Fuair an sagart [óna dheatháir] [an lá cheana] é.
 got the priest from.his brother the day other it.MASC
- d. *Fuair an sagart [óna é dheatháir] [an lá cheana].
 got the priest from.his it.MASC brother the day other
- e. *Fuair an sagart [óna dheatháir] [an é lá cheana].
 got the priest from.his brother the it.MASC day other
- f. *Fuair an sagart [óna dheatháir] [an lá é cheana].
 got the priest from.his brother the day it.MASC other

While each of the possible postposing landing sites in (72)b-f each violate LINCORR(PHASE) equally, the sentences in (d-f) are marked on additional dimensions. In the sentences in (d) and (e), the pronoun is postposed to a position immediately following another function word: as discussed above, non-pronominal function words are parsed as proclitics, and also violate STRONG-START(σ). If the pronoun is also parsed as a proclitic, STRONG-START(σ) will not be satisfied by postposing to this position, as shown in the following possible prosodic representation:

(73) Pronoun postposing around a function word still violates STRONG-START(σ) is pronoun is parsed as proclitic



It is in theory possible for the preposition and the pronoun to phrase together, perhaps forming a prosodic word of their own. However, as discussed in the previous section, it does not appear that function words other than pronouns are ever promoted to prosodic

words in Irish and, at any rate, this does not appear to be a strategy that is employed by Irish speakers in this environment.

Sentence (f) shows that pronouns may not be postposed to a position between two prosodic words that are contained within the same syntactic phrase, like *lá cheana* ‘other day’ in this example. In this case, postposing would indeed satisfy STRONG-START(σ); however, we can assume that postposing to this position is marked because it incurs a gratuitous violation of MATCH-PHRASE: when the pronoun intervenes between *lá* and *cheana*, there is no longer a single prosodic phrase φ that dominates all and *only* the terminal nodes dominated by the syntactic phrase that dominates these two prosodic words (a DP). This violation of MATCH-PHRASE is gratuitous because this candidate is compared with sentence like (b) and (c) which also violate LINCORR(PHRASE), but fully satisfy MATCH-PHRASE.

6.10 Conclusion and discussion

In this chapter, I developed an account of pronoun postposing that was motivated by the interaction of prosodic constraints with violable constraints on linearization. Pronoun postposing was argued to be one of three possible strategies in response to the violation of STRONG-START(σ) that would be incurred by leaving the pronoun in place. These three strategies, postposing, strengthening and *in situ* encliticization, were shown to occur in variation. I developed an account using weighted constraints, building on the analysis of constraint interaction in chapter 4, and phase-based Spell-Out. I argued that variation arises as a response to the interaction between STRONG-START(σ), MATCH(ω), and LINCORR(PHRASE), which have equal weights in the grammar, and that speakers choose to allow a violation of one of these constraints

during Spell-Out of the *vP* phase: if **STRONG-START**(σ) is violated, the pronoun remains in canonical object position and is rephrased as an enclitic on the preceding prosodic word upon Spell-Out of the higher phase; if **MATCH**(ω) is violated, the pronoun is strengthened and promoted to prosodic word status; and, finally, if **LINCORR**(PHRASE) is violated, the pronoun is postposed to phrase-final position, where it does not violate **STRONG-START**(σ). The analysis was shown to be able to account for the subject-object asymmetry and the availability of partial postposing options, and, in addition, was extended to provide a discussion of differences between pronouns and non-pronominal function words, which behave differently in all respects.

This account has the advantage of connecting several different characteristics of pronoun postposing. First, the account derives the contrast between pronouns and full DPs by arguing that there is a prosodic difference between them: pronouns, like other function words, do not have the status of prosodic words. In initial position, this property risks violation of **STRONG-START**(σ), which is not violated by prosodic words. Secondly, this account accounts for the optional nature of pronoun postposing by connecting pronoun postposing with other possible strategies that may be employed to satisfy **STRONG-START**(σ) and, in doing so, connects pronoun postposing with other possible parses of weak object pronouns, strengthening in place and *in situ* encliticization. The variation is accounted for using the tools of the weighted constraint framework already proposed to account for variation in the phrasing of other types of sentences. Thirdly, the account, which required the assumption that Spell-Out is phase-based in order to correctly predict that encliticization would occur in variation with

strengthening and postposing, was easily extended to provide an account of the subject-object asymmetry.

The account of pronoun postposing proposed here motivates pronoun postposing using prosodic considerations, but allows for syntactic structure to play a key role in restricting the environments in which postposing is observed. While not discussed here, pronoun postposing occurs in a range of syntactic environments other than the basic VSOX sentences analysed in this chapter, each of which may be connected under the assumption that the pronoun is at the left edge of a phasal SOD. Conversely, environments where postposing is blocked, including but not limited to subject position, are unified by the absence of this phase boundary. The analysis developed in this chapter would appear to capture many of these environments straightforwardly, although, in many cases, a more sophisticated understanding of the syntactic structure would be necessary to develop a full account. For this reason, I will not extend the analysis to other syntactic environments; for further discussion of a range of syntactic environments under a similar prosodic analysis, see Bennett et al. (in prep).

CHAPTER 7

CONCLUSION

7.1 Overview of Results

This dissertation was an empirical and theoretical analysis of sentence prosody in Conamara Irish (CI), with particular reference to the distribution of tonal pitch accents. This dissertation identified two pitch accents, L-H rises and H-L falls, whose distribution were argued to be indicative of prosodic structure and that, more particularly, their distribution provided direct evidence for the presence of recursion in prosodic structure. This formed the basis for an analysis of the patterns using the framework of Match Theory (Selkirk 2009b, 2011), a theory of the syntax-prosody interface where it is proposed that syntactic and prosodic structure are related to each other through a family of syntax-prosody correspondence (“MATCH”) constraints calling for a one-to-one mapping between syntactic and prosodic constituents. Under Match Theory, MATCH constraints are violable, as in an OT framework, and are predicted to interact with other violable constraints, including markedness constraints evaluating the well-formedness of prosodic structure.

The CI data analysed in this dissertation supported the Match Theory view of the syntax-prosody interface not only by providing direct evidence for the type of recursive prosodic structure predicted by the MATCH constraints, but also by showing that their interaction with prosodic markedness constraints can result in departures from one-to-one correspondence. I argued that the types of non-isomorphic structures found in CI can be motivated under the assumption that prosodic markedness constraints such

as BIN-MIN(φ) and STRONG-START interact directly with MATCH-PHRASE, as predicted by Match Theory.

This assumption also provided an explanation for structures in which speakers appear to show some degree of variation with respect to which structure is chosen as optimal in production. Based on the observed patterns of violation and variation, I proposed that the interactions between MATCH-PHRASE and the prosodic markedness constraint STRONG-START was best accounted for under Harmonic Grammar (Legendre et al. 1990; Smolensky & Legendre 2006; Pater 2009b; Jesney 2011), where constraints are violable, as in OT, but weighted rather than ranked. I argued that the predictions of this framework, which allow for constraint violations to be evaluated cumulatively, correctly accounts for the patterns of phrasing and variation in CI.

The analysis was extended to account for another aspect of CI grammar, pronoun postposing, where it was argued that the displacement of weak pronouns in certain syntactic configurations is prosodically rather than syntactically determined. I proposed that the basic patterns in pronoun postposing can be accounted for under the assumption that the linearization of hierarchical syntactic structure is also governed by a violable constraint, LINCORR, which interacts at Spell-Out with both the MATCH constraints and prosodic markedness constraints. Under this assumption, it was possible to develop a formal analysis of pronoun postposing where the displacement of weak pronouns is motivated by an interaction between violable constraints on linearization and prosody.

7.2 Theoretical Implications

In addition to its empirical contributions in the domain of Irish prosody, the dissertation makes several claims which bear on prosodic theory. In this section, I discuss some areas on which the analysis of CI proposed dissertation makes contributions.

7.2.1 Constraint Interaction at Spell-Out

One of the main theoretical objectives of this dissertation was to develop a theory of the syntax-phonology interface which is fully interactional. Under the view developed in this dissertation, syntactic Spell-Out consists of a number of interactional components, including constraints governing the correspondence between syntactic and prosodic structure (MATCH constraints), constraints governing the correspondence between syntactic structure and linear order (LINCORR constraints), and prosodic markedness constraints. Throughout the dissertation, I argued, on the basis of data from CI, that each of these constraints is violable such that it may be violated by a conflicting, higher-ranked (or higher-weighted) constraint. These interactions provide evidence in favour of a view of Spell-Out in which a number of operations occur simultaneously and where constraints governing these operations interact directly with one another.

Various aspects of this proposal have been proposed before. Selkirk (1995), Truckenbrodt (1995, 1999), and others have argued that syntax-prosody correspondence constraints may interact with prosodic markedness constraints, and López (2009) has proposed that linearization may interact with syntax-prosody correspondence

constraints. However, this dissertation makes a unique contribution by showing a range of interactions between these areas, all observed to occur within the same language.

7.2.2 Direct versus Indirect Reference

Match Theory, as proposed in Selkirk (2009b, 2011) and as developed in this dissertation, is an *indirect reference* theory of the syntax-phonology interface. Match Theory assumes that prosodic structure formation is a part of the phonological component of the grammar, formally distinct from syntactic structure, and which is subject to well-formedness constraints on prosodic structure. This idea follows from a long line of work in prosodic theory, with its roots in early proposals regarding the prosodic hierarchy (Selkirk 1978: et seq.; Beckman & Pierrehumbert 1986; Pierrehumbert & Beckman 1988; Nespor & Vogel 1986).

This idea contrasts with what can be referred to as *direct reference* theory, in which it is assumed that prosodic constituent structure is not a distinct grammatical system (among others, Cooper & Paccia-Cooper 1980; Kaisse 1985; Wagner 2005, 2010; Pak 2008). Rather, proponents of this type of analysis assume that phonological and phonetic processes that would appear to make reference to prosodic domains actually refer directly to syntactic constituent structure. Under this account, syntactic and prosodic domains are predicted to be isomorphic with one another, at least at a basic level. Much work on indirect reference theories arose from the observation that this prediction is incorrect: syntactic and prosodic domains do not seem to consistently correspond in a one-to-one fashion.

With recent advancements in work using cyclic Spell-Out (either using phases, as discussed in chapter 6, or through cycles defined in some other way), it has been

proposed that a direct reference approach to the syntax-prosody interface is once again plausible. Such proposals can be found in Wagner (2005, 2010) and Pak (2008).

For example, Wagner (2005, 2010) proposes that there is no distinct system of prosodic structure. Prosodic domains may be read directly off of syntactic structure, except that because Spell-Out is cyclic in nature, the formation of prosodic domains depends on a number of interacting components, including syntax, semantics, and information structure. Wagner uses evidence from the relative strength of prosodic boundaries to argue that syntactic subordination is preserved as recursion in prosodic domains, such that the relative strength of a prosodic boundary increases with the depth of embedding. However, for Wagner, there is no sense that prosodic boundaries are determined by a separate prosodic component of the grammar with well-formedness constraints of its own. Rather, the determination of prosodic domains is assumed to be predictable based on a well-defined system of syntactic, semantic and information structural principles.

Pak (2008) proposes that domain-sensitive phonological processes are defined not on the basis of prosodic domains, but instead on domains that are created during syntactic Spell-Out. Pak accepts the assertion that syntactic constituents and the domains relevant to domain-sensitive phonological processes are not always isomorphic, but proposes that instead of assuming that prosodic structure is a distinct prosodic system, that phonological domains may be derived from principles of linearization and phase-based Spell-Out. While Pak argues that the domains produced by this system are non necessarily isomorphic with syntactic structure, it is still the case

that there are no constraints that would pertain to the well-formedness of the domains or to relations between the domains in a given utterance.

Match Theory assumes a more direct correspondence between syntactic and prosodic structure than was previously assumed in earlier work using an indirect reference approach: like the direct reference approach, isomorphic structures are produced in the absence of prosodic well-formedness constraints. However, Match Theory allows for the presence of prosodic markedness constraints that may influence prosodic structure formation.

In this dissertation, I have argued in favour of the Match Theory approach on two grounds. First, I have shown that in many instances, CI sentences show a one-to-one correspondence between syntactic and prosodic structure, such that the phonological process of pitch accent insertion is sensitive to the presence of recursion in prosodic structure. On the other hand, I have also shown that the MATCH-PHRASE constraint may be overruled by prosodic markedness constraints such as BIN-MIN(φ) and STRONG-START, as discussed in chapters 4, 5, and 6. Because these constraints make demands on prosodic structure rather than syntactic structure, this is taken as evidence that the MATCH-PHRASE alone is not sufficient to account for the range of patterns found in CI.

Because these constraints evaluate the phonological content of prosodic domains and their relationship to other domains within the larger prosodic structure, it does not seem likely that the patterns described in this dissertation can be accounted for without reference to prosodic markedness constraints. Neither Wagner nor Pak make any provision for the types of prosodic markedness constraints observed here. In order to

make a direct reference theory compatible with the data observed for CI, it would be necessary to assume that syntactic structure is itself sensitive to prosodic markedness constraints like STRONG-START, such that the syntactic structure of sentences may be altered when a prosodic markedness constraint would be violated. In the case of a VSO sentence with a two-word versus one-word subject, for example, it would be necessary to assume that the subject in one case forms a syntactic constituent with the object, as in [V[[NA]O]] and forms a constituent with the verb in the other, as in [[VN]O]. While such a contrast would be surprising syntactically, it is not surprising prosodically, where we expect to find an interaction between prosodic markedness constraints and syntax-prosody correspondence constraints.

7.2.3 Evidence for Recursion in Prosodic Structure

As discussed above, Match Theory departs from previous work on prosodic theory by assuming a direct, though violable, correspondence between syntactic and prosodic constituent structure. A result of this departure is that prosodic structure may show recursivity as a means of preserving information about syntactic structure. The presence of recursion in prosodic structure goes against the assumptions of the Strict Layer Hypothesis (Selkirk 1978: et seq.; Beckman & Pierrehumbert 1986; Pierrehumbert & Beckman 1988; Nespor & Vogel 1986). In addition, as discussed in chapter 1, the Match Theory analysis makes different predictions regarding the presence of recursive prosodic structure than do previous OT-based accounts, as proposed in Truckenbrodt (1995, 1999) and Selkirk (1995).

In this dissertation, I argue in favour of Match Theory's prediction that prosodic structure may be recursive in order to preserve information about syntactic constituency

in prosodic structure. In particular, I have shown that the distribution of pitch accents in CI is sensitive to the presence of recursion in prosodic structure. The distribution of the L-H pitch accent provides a unique diagnostic for the presence of recursion because the insertion of pitch accents is phonological, rather than syntactic, in nature. This finding is confirmed by the presence of non-isomorphic structures, where the appearance of pitch accents can be shown to be derived from prosodic structure as influenced by prosodic markedness constraints.

The analysis of the distribution of the L-H pitch accent in CI supports the theory of prosodic domains proposed by Ito and Mester (2006, 2010, to appear), where domain-sensitive phonological constraints may refer explicitly to the domains created by the recursion of prosodic categories. The proposed distribution of the L-H pitch accent in CI as leftmost in a non-minimal φ requires that the phonological constraints responsible for pitch accent insertion be sensitive not only to prosodic categories, but also to the domains created by the recursion of these categories.

In recent years, much of the evidence cited as support for the presence of recursion in prosodic structure has come from examinations of relative boundary strength (Ladd 1986, 1988; Wagner 2005, 2010; Féry & Truckenbrodt 2005; Féry & Schubö 2010; Schubö 2011). The data discussed in this dissertation provide evidence that recursive prosodic structure may be recognized in the phonological, as well as the phonetic, component of the grammar.

7.2.4 Functional and Lexical Projections

Another way in which this dissertation makes a substantial theoretical contribution is in the proposal that there is no distinction between lexical and functional

projections made by the prosodic component. This proposal runs counter to previous proposals that functional projections are ignored in the mapping from syntactic to prosodic structure (Selkirk 1984, 1986, 1995; Chen 1987; Hale & Selkirk 1987; Selkirk & Shen 1990; Truckenbrodt 1995, 1999).

The analysis developed to account for the patterns of pitch accent distribution in CI proposes that lexical and functional projections are evaluated in the same way by MATCH-PHRASE. As argued throughout the dissertation, both functional and lexical projections are necessary to derive the constituent structure found in the prosodic structure. However, it was not the case that all syntactic projections were evaluated by MATCH-PHRASE; rather, only those syntactic phrases which dominate a distinct set of terminal nodes are relevant to the evaluation of the constraint. This proposal was supported by empirical evidence discussed in chapter 5.

7.2.5 Evidence for Cumulative Constraint Interaction

In addition to the above proposals regarding the architecture of the syntax-phonology interface and the nature of prosodic structure, this dissertation also makes a contribution in the domain of OT theory and the question of whether constraints are strictly ranked or weighted. As discussed in chapters 4, 5, and 6, data from CI provide evidence in favour of a framework like Harmonic Grammar, in which constraints are weighted rather than ranked, such that constraint violations are cumulative. I argued that this assumption provide a way to account for both the basic patterns of prosodic phrasing in CI and cases where speakers showed variation.

This has implications both for phonological theory, where there is much debate as to the extent to which cumulative constraint interaction is observed (Pater 2009b;

Jesney 2011), and for theories of variation, especially within prosodic theory. If it is indeed the case that patterns of variation observed in prosodic phrasing can be accounted for formally with reference to weighted constraint interaction, this would provide support for the theory proposed here in which a number of different processes compete during Spell-Out in a fully interactional nature.

7.3 Future directions

In many ways, this dissertation is merely the beginning of many important lines of research, both with respect to developing an understanding of the prosodic system of Conamara Irish and with respect to developing an understanding of the syntax-phonology interface, particularly as regards prosodic structure formation. While it is hoped that some progress has been made in both of these areas, much work remains to be done.

The primary focus of this dissertation was the prosodic system of Conamara Irish. As discussed previously, much of the data described in this dissertation had not before been subject to formal study or theoretical analysis. In this light, the goal of data collection pursued in this dissertation was to collect samples of a wide range of syntactic structures for several speakers. This goal was accomplished, but it also meant that in many cases, there was insufficient evidence to make firm conclusions. In future work, it will be necessary to focus on collecting data on specific patterns so as to confirm the generalizations proposed in this dissertation.

In addition, while the theory proposed here accounts for the patterns observed in CI, it remains to be seen whether or not the prosodic systems of other languages can be accounted for under this theory and whether or not the predictions made by the theory

can be confirmed by data from other languages. The answer to these questions lies both in the reanalysis of existing accounts of prosodic systems in light of the proposals made here, as well as in the pursuit of field work on languages whose prosodic systems remain to be described.

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