CONSTRAINING THE PHONOLOGY-PHONETICS INTERFACE

With exemplification from Spanish and Italian dialects

by

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In this thesis, I address the interrelated issues of phonological underspecification and phonetic specification. Working within the model of Modified Contrastive Specification, I provide evidence for underspecification of height features from the phonological and phonetic patterning of vowels in Iberian Spanish and Italian dialects. I argue that a) the feature [high] is present in inventories only when it is required to appear in order to mark a contrast between high and non-high vowels in the non-low region, and b) that the mid vowels [e] and [o] are underlingly underspecified for height features.

Given the evidence for underspecification, I explore the relationship between the underspecified phonological representations and more fully specified phonetic representations. To do so, I first present data showing that phonologically underspecified vowels display predictable patterns of phonetic variation. I then derive such patterns from the phonetic rule of enhancement, a rule which inserts non-contrastive features in order to more fully specify underspecified representations.

The main goal of this thesis, then, is to argue that the interface between underspecified phonological representations and maximally specified phonetic representations is highly constrained. I demonstrate that there are a limited number of ways to interpret phonologically underspecified representations. I also show that the interpretation of phonetic data—i.e. phonemicization—is similarly constrained, arguing in particular for the possibility of phonemicization without reference to rules.
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I enjoy reading the 'acknowledgments' page of a thesis because I feel like I get glimpses as to what the author is really like. This is because I believe that at least fifty percent of a person is the people they know, interact with, and like. I'm no exception, and I'd like to let you know about some of the people that have had a hand in my thesis. They're wonderful people.

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Table of Contents

Chapter 1: Introduction

1.1 Introduction: Phonological specification and phonetic specification .................................................. xii
  1.1.1 Evidence for Modified Contrastive Specification ................................................................. xii
  1.1.2 The underspecification for height of mid vowels ................................................................. xiii
  1.1.3 Patterns of phonetic instantiation ......................................................................................... xv
  1.1.4 A constrained interface between the phonological and the phonetic components .................. xv
  1.1.5 A reanalysis of Pasiego [high] harmony .............................................................................. xvi
  1.1.6 Summary ................................................................................................................................... xvii

Chapter 2: Modified Contrastive Specification

2.1. Introduction ....................................................................................................................................... 1
  2.1.1 Preliminaries .......................................................................................................................... 3
  2.2. Theoretical Assumptions ............................................................................................................ 3
    2.2.1. Vowel Geometry ................................................................................................................ 3
    2.2.2. Modified Contrastive Specification ..................................................................................... 4
      2.2.2.1. Conventions ................................................................................................................... 5
      2.2.2.2. Three types of contrastively determined inventories ................................................... 6
      2.2.2.3. Asymmetrical inventories .............................................................................................. 7
    2.2.3. Predictions concerning rule types ....................................................................................... 9
  2.3. Metaphony (raising) ..................................................................................................................... 10
    2.3.1. Examples of metaphony in Spanish and Italian dialects ..................................................... 10
    2.3.2. Preliminary formalization of metaphony as a spreading rule .......................................... 14
      2.3.2.1. Raising: a preliminary formalization .............................................................................. 14
      2.3.2.2. Raising versus centralization/laxing ........................................................................... 17
  2.4. Vowel representations and domains ........................................................................................... 23
  2.5. A raising dialect (desinential /E,A,O,U/ inventory, Pasiego Montañése) ..................................... 29
    2.5.1. Pasiego stem vowel inventory ............................................................................................. 29
    2.5.2. Pasiego desinential vowel inventory .................................................................................... 30
      2.5.2.1. The mass neuter ........................................................................................................... 31
    2.5.3. ‘Skewed’ Desinential Vowel Raising in Pasiego .................................................................. 32
      2.5.3.1. Raising triggered by /U/ ([u]) ....................................................................................... 32
      2.5.3.2. Raising triggered by /I/ ([i])? ....................................................................................... 33
      2.5.3.3. Summary ................................................................................................................      39
    2.5.4. Metaphony triggered by stem vowels in Pasiego ................................................................. 40
  2.6. Raising and the mid/high contrast in Asturian-Leonese dialects .................................................... 42
    2.6.1. Preliminaries ..................................................................................................................... 43
    2.6.2. Western Asturias ................................................................................................................ 45
    2.6.3. Central Asturias ................................................................................................................ 50
      2.6.3.1. General ........................................................................................................................ 50
      2.6.3.2. Lena (Central Asturias region) ...................................................................................... 53
        2.6.3.2.1. The desinential inventory of Lena ........................................................................... 53
        2.6.3.2.1.1. Nominal desinences ........................................................................................... 54
          2.6.3.2.1.1.1. The variation between [a] and [es] and between [u] and [os] ....................... 54
        2.6.3.2.1.2. Lena verbal desinences ....................................................................................... 56
        2.6.3.2.2. Metaphony in Lena ............................................................................................... 56
      2.6.4. North Central Asturias ...................................................................................................... 58
      2.6.5. Eastern Asturias ................................................................................................................. 61
        2.6.5.1. General ........................................................................................................................ 61
Chapter 3: Mid vowels have no height features

3.1. Introduction .................................................. 131
3.2. Evidence from Pasiego that /E/ and /O/ have no height features .................. 123

3.2.1. Complexity .................................................. 123
Table of Contents

3.2.1.1. Segmental complexity .................................................. 123
3.2.1.2. Syntagmatic complexity .............................................. 124
3.2.1.3. Paradigmatic complexity ............................................. 126
3.2.2. Spanish stress and vowel distribution .................................. 128
   3.2.2.1. Stress ..................................................................... 128
   3.2.2.2. Defining metrical heads and dependents ....................... 132
   3.2.2.3. Evidence for HDAs at the foot level .............................. 133
   3.2.2.4. Secondary stress ...................................................... 138
   3.2.2.5. Evidence for HDAs at the rhyme level ......................... 139
   3.2.2.6. Conclusion: HDAs in Spanish and implications for rule types .................................................. 140
3.2.3. Two phonological analyses of metaphor ................................ 141
   3.2.3.1. Pasiego metaphor ..................................................... 141
   3.2.3.2. A delinking analysis ................................................. 143
   3.2.3.3. A spreading analysis ............................................... 145
   3.2.3.4. Implications of the spreading analysis ......................... 147
   3.2.3.5. Conclusions .......................................................... 147
3.3. Potential counterexamples ...................................................... 148
3.3.1. Sonority ........................................................................ 148
   3.3.1.1. Evidence for the sonority hierarchy in vowels .................. 149
   3.3.1.2. Is sonority the factor that determines vocalic syllabification? ............................................................................. 151
   3.3.1.3. Is sonority structural or inherent?.................................. 152
   3.3.1.4. An alternative analysis of sonority ................................ 153
   3.3.1.5. Summary .............................................................. 155
3.3.2. Vowel coalescence .......................................................... 156
   3.3.2.1. Sanskrit ................................................................. 156
   3.3.2.2. Ewe coalescence ...................................................... 159
   3.3.2.3. Coalescence and inventories ...................................... 160
   3.3.2.4. Summary .............................................................. 161
3.3.3. Diphthongization ............................................................. 162
3.3.4. Conclusion ................................................................... 164
3.4. Summary and conclusions ...................................................... 166

Chapter 4: Phonetic variation of /E/ and /O/

4.1. Introduction ........................................................................ 168
4.2. The variability in phonetic instantiation argument ..................... 169
4.3. Height variation in three-vowel systems vs. five-vowel systems .... 171
   4.3.1. /E/ and /O/ are more phonetically variable in inventories with fewer contrasts .................................................. 172
   4.3.1.1. Representations .......................................................... 172
   4.3.1.2. Variation for height and place ...................................... 173
   4.3.1.3. Height variation in Iberian Spanish dialects .................... 174
   4.3.2. /E,O/ are more variable than /I,A,U/ ................................. 180
   4.3.3. Conclusions .............................................................. 183
4.4. Evidence for underspecification from variability of /E/ and /O/ in
   Pasiego .............................................................................. 184
   4.4.1. Context-sensitivity ......................................................... 185
   4.4.2. Pasiego place variation ................................................ 185
   4.4.3. Place variation in Pasiego ............................................. 186
   4.4.3.1. Loci of place-impoverished variants ............................ 188
   4.4.3.2. Verbal prefixes ......................................................... 188
   4.4.3.3. Stems ................................................................. 189
   4.4.3.4. Penults of antepenultimately-stressed words ............... 191
   4.4.3.5. Summary .............................................................. 192
Table of Contents

4.5. Conclusions.................................................................................................................. 193

Chapter 5: Phonetic Enhancement

5.1 Introduction: Interpreting empty vowels................................................................. 195
5.2 A model of phonetic enhancement............................................................................ 196
  5.2.1. Phonetic enhancement within Minimal Contrastive Specification.................... 196
  5.2.2. Extension of Rice's model to enhancement of vowels........................................ 198
  5.2.3. Height variation in Spanish and Catalan dialects............................................. 199
    5.2.3.1 Review of data on height variation ......................................................... 199
    5.2.3.2 Analysis of height variation in Spanish and Catalan dialects ................... 203
  5.2.4. The place of enhancement in the phonology................................................. 206
    5.2.4.1 The phonetics-phonology interface (outline) ........................................... 207
    5.2.4.2 Spreading in Pasiego vs. enhancement in Tudanca .................................. 207
    5.2.4.3 Enhancement and complexity in mid harmony languages ......................... 210
    5.2.4.4 Contrastive features and enhancement features ....................................... 216
      5.2.4.4.1 The role of contrastive features ......................................................... 216
      5.2.4.4.2 The role of enhancement features ..................................................... 218
    5.2.4.5 The Contrastiveness Exclusivity Principle .............................................. 218
  5.2.5. Summary ........................................................................................................... 222

5.3 Enhancement for place............................................................................................. 223
  5.3.1 Feature geometry ............................................................................................... 223
  5.3.2 Place contrasts .................................................................................................. 225
    5.3.2.1 A two-feature theory of vowel place ....................................................... 225
    5.3.2.2 The coronality of front vowels .................................................................. 226
    5.3.2.3 Summary ................................................................................................... 228
  5.3.3 The relationship between [peripheral], [dorsal], and [labial] ............................. 229
    5.3.3.1 [RTR] ....................................................................................................... 230
  5.3.4 Summary of place features ................................................................................ 231
  5.3.5 Variation for place in Pasiego ............................................................................ 232
    5.3.5.1 Deriving the variation between [e-ɔ] and [o-q] in Pasiego ............................. 232
    5.3.5.2 The significance of enhancement ............................................................... 236
  5.3.7 Summary ........................................................................................................... 238

5.4 Interpreting reduced vowels...................................................................................... 238
  5.4.1 Enhancement vs. reduction .............................................................................. 239
    5.4.1.1 The problem of reduction ......................................................................... 242
      5.4.1.1.1 Eastern Aragonese reduction ............................................................... 244
      5.4.1.1.2 Catalan reduction .............................................................................. 246
      5.4.1.1.3 Summary ........................................................................................... 249
    5.4.1.2 Interpreting reduced and unreduced vowels in the same domain .............. 251
  5.4.2 Pasiego pretonic raising revisited ....................................................................... 254
    5.4.2.1 A reanalysis of pretonic raising ................................................................. 254
      5.4.2.1.1 Obligatory tonic raising ...................................................................... 254
      5.4.2.1.2 Exceptions to pretonic raising............................................................ 256
      5.4.2.1.3 Evidence for a reduced inventory in the prefixes ................................. 258
        5.4.2.1.3.1 The prefixes /dEs-/ and /rE-/ ...................................................... 258
        5.4.2.1.3.2.1 The prefix /trEs-/ ................................................................. 259
Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4.2.1.3.2.2.</td>
<td>The prefix /En-/ and word-initially before nasals</td>
</tr>
<tr>
<td>5.4.2.1.3.2.3.</td>
<td>Word-initially before an s+stop cluster</td>
</tr>
<tr>
<td>5.4.2.1.3.2.4.</td>
<td>Evidence for a restricted inventory in the penult of antepenultimately-stressed words</td>
</tr>
<tr>
<td>5.4.2.2.</td>
<td>The patterning of unstressed stem vowels</td>
</tr>
<tr>
<td>5.4.2.2.1.</td>
<td>The inventory of unstressed stem vowels</td>
</tr>
<tr>
<td>5.4.2.2.2.</td>
<td>Disharmonic vowels</td>
</tr>
<tr>
<td>5.4.2.2.3.</td>
<td>Free variation between [e<del>i] and [o</del>u] of mid /E,O/</td>
</tr>
<tr>
<td>5.4.2.2.4.</td>
<td>Variation of high vowels as [e<del>ø], [o</del>ø]</td>
</tr>
<tr>
<td>5.4.2.2.5.</td>
<td>A comparison of Pasiego unstressed stem vowels with other patterns</td>
</tr>
<tr>
<td>5.4.2.2.6.</td>
<td>Conclusion: Pasiego unstressed stem vowels</td>
</tr>
<tr>
<td>5.4.3.</td>
<td>Reduction and enhancement</td>
</tr>
<tr>
<td>5.5.</td>
<td>Constraining the phonetics-phonology interface</td>
</tr>
<tr>
<td>5.5.1.</td>
<td>The path from phonemic representations to phonetic representations</td>
</tr>
<tr>
<td>5.5.2.</td>
<td>The path from phonetic representations to phonemic representations</td>
</tr>
<tr>
<td>Chapter 6:</td>
<td>Conclusion</td>
</tr>
<tr>
<td>6.1</td>
<td>Conclusion</td>
</tr>
<tr>
<td>6.1.1</td>
<td>Organically-derived characteristics</td>
</tr>
<tr>
<td>6.1.2</td>
<td>Complexity</td>
</tr>
<tr>
<td>6.1.3</td>
<td>Contrastively-defined domains</td>
</tr>
<tr>
<td>6.1.3.1</td>
<td>Contrasts within inventories</td>
</tr>
<tr>
<td>6.1.3.2</td>
<td>Paradigmatic domains</td>
</tr>
<tr>
<td>6.1.4</td>
<td>Conclusion</td>
</tr>
<tr>
<td>References</td>
<td></td>
</tr>
</tbody>
</table>
List of Appendices

Appendix A: Maps .............................................................................................................. 117

Map A: Spain .................................................................................................................. 117
Map B: Western and Central Asturias ........................................................................... 118
Map C: Montañese (Santander) .................................................................................... 119
Map D: Italy ................................................................................................................... 120
Introduction

1.1 Introduction: Phonological specification and phonetic specification

In this thesis, I address the twin issues of phonological underspecification and phonetic specification, discussing in particular the following question: Given strong evidence for underspecification in the phonology, what is the relationship between the underspecified phonological representations and the more fully specified phonetic representations? I motivate the importance of this question by providing evidence for underspecification of height features from the phonological and phonetic patterning of vowels in Iberian Spanish and Italian dialects. I then present data showing that phonologically underspecified vowels display patterns of phonetic variation. I analyse these patterns within a model of the phonetics-phonology interface. I argue in particular that the interface between underspecified phonological representations and maximally specified phonetic representations is highly constrained.

1.1.1 Evidence for Modified Contrastive Specification

I present evidence arguing that certain features are systematically underlyingly absent unless contrasts motivate their presence, placing this work within the tradition of Modified Contrastive Specification,¹ as developed in Avery and Rice (1989), Rice (1993a,b), Rice and Avery (1991, 1993), Rose (1993), Walker (1993), and Wu (1994). Modified Contrastive Specification (henceforth MCS) is based on the tradition of Contrastive Underspecification (CU), developed in Clements (1988), Mester and Itô (1989), and Steriade (1987).² MCS inherits from CU a concern for the twin issues of how contrasts are determined, and how the domains of contrasts are determined.

MCS proposes that contrasts are derived via a fixed hierarchy of features which encodes markedness. When building up contrasts within inventories, marked

¹ See Paradis and Prunet (1991) for this name.
features are always employed. Unmarked features, on the other hand, are only used if a contrast forces them to be present (Rice and Avery 1991, 1993). For example, Avery and Rice (1989) argue that in a /p t k/ system, the marked feature [peripheral] derives the contrast between /p k/ and /t/. However, the unmarked feature [coronal] is not forced to appear in a /p t k/ inventory; /t/ is unspecified for place while /p,k/ are [peripheral]. (A feature dominated by [peripheral] then derives the contrast between /p,k/.) In an inventory such as /p t t k/, on the other hand, contrasts exist within the [coronal] place of articulation, such that /t/ contrasts with retroflex /t/. In such an inventory, the unmarked feature [coronal] is forced to appear on the representations of both /t/ and /t/ (Avery and Rice 1989: 183-4).

In chapter 2, I present evidence for the above-defined characteristics of MCS from the patterning of height in Iberian Spanish and Italian dialects. I assume that—at least for Spanish and Italian dialects—the contrast between [low] and non-low is primary in the height domain. I then argue that the feature [high] is unmarked, appearing in inventories only when forced by the presence of a mid versus high contrast within non-low vowels. I argue in particular that if there is no contrast between mid and high vowels within the non-low vowels of a given inventory, then the feature [high] does not appear in representations in that inventory. Conversely, if there is a contrast between mid and high vowels within the non-low vowels of a given inventory, then the feature [high] appears in representations in that inventory. I present evidence for these claims from the rule of vowel raising or [high] harmony known as metaphony in Iberian Spanish and Italian dialects.

1.1.2 The underspecification for height of mid vowels

A consequence of the algorithm for height specification described above and developed in chapter 2 is that mid vowels underlyingly have no height features. I argue in favour of this hypothesis in chapter 3, using the evaluation metric of

In chapter 3, I formalize the rule of metaphony, arguing that in Spanish, and particularly in the dialect of Pasiego (spoken in Northwestern Spain), certain metrical positions support greater complexity than other positions. This has consequences for the analysis of metaphony. I argue that a spreading analysis of metaphony creates greater complexity, while a delinking analysis of metaphony creates less complexity of representations. Given that the target of metaphony is a vowel in a position which supports the maximal amount of complexity in Pasiego, and given that there is no reason to believe that Pasiego requires less complexity in this position, a spreading analysis of [high] harmony is the optimal analysis of Pasiego metaphony.

Adopting a spreading analysis in turn has consequences for the representation of mid vowels in 5-vowel languages such as Pasiego. In particular, a spreading analysis presupposes that mid vowels have no underlying height features, while phonologically high vowels are characterized by the feature [high]. In contrast, delinking analyses of Pasiego metaphony (e.g. Goad 1993) presuppose that mid vowels have more height structure than high vowels.

In the remainder of chapter 3, I reanalyse cases in the literature which have been used to argue that mid vowels have underlying height features. In demonstrating that such cases can be reanalysed without the assumption of height features, I show that it might be universally the case that mid vowels underlyingly have no height features.
1.1.3 Patterns of phonetic instantiation

In chapter 4, I turn to the phonetic patterning of underspecified vowels in Iberian Spanish dialects and Catalan in order to show that underspecified vowels display patterns of phonetic instantiation. I argue that vowels which are underspecified for height features are also more phonetically variable for height, and that, on the other hand, vowels which are specified for height features pattern as a class in being less variable for height. I also argue that vowels which are underspecified for place features—e.g. [coronal]—can vary for place. For example, the non-back mid vowel in Pasiego can be realized as front [e] or as central [ə], a type of variation which derives from the presence or absence of the feature [coronal] in the phonetic representation. The main theme of this chapter, then, is that phonetic variation is largely predictable from context.

1.1.4 A constrained interface between the phonological and the phonetic components

I address the issue of the relationship between the phonological representation and its phonetic interpretation in chapter 5.3

Part of chapter 5 is devoted to arguing that there is an unambiguous path between underspecified phonological representations and specified phonetic ones. In order to make this argument, I adopt and develop for vowels the model of phonetic enhancement developed in Avery and Rice (1989), Rice (1993a,b), and Wu (1994).4 This model derives from Stevens, Keyser, and Kawasaki (1986) and Stevens and Keyser (1989).

Phonetic enhancement derives universal phonetic representations from language-particular phonemic representations by inserting non-contrastive features on

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3 This issue has long been a topic of concern in North American linguistics. For example, the Biuniqueness Principle (Chao 1934, Harris 1944) was an attempt to account for this relationship.
4 Wu (1994) also extends the model of phonetic enhancement to vowel pattering.
underspecified representations in the phonetic component (Avery and Rice 1989; Rice 1993b). I show in chapter 5 that enhancement for [high] and for [coronal] derives the patterns of phonetic variation introduced in chapter 4. I also discuss the relationship between phonological rules such as spreading and delinking, and the phonetic rule of enhancement.

Another major theme developed in chapter 5 is that there is an unambiguous relationship between a given phone and the phoneme it realizes. I argue that phonemic representations can be determined without reference to the rules of a given language, using only evidence from paradigmatic and syntagmatic relationships among phonetic instantiations of a given vowel. I thus argue for a non-tautological definition of the phoneme.

1.1.5 A reanalysis of Pasiego [high] harmony

Finally, in this thesis I make several contributions to the analysis of Pasiego (Spanish) [high] harmony or metaphony. First, I reexamine data from the Pasiego dictionary in Penny (1969) which shows that the generalizations in the literature concerning Pasiego height harmony in pre-main-stress vowels are overly broad.5 Hualde (1989) and McCarthy (1984) argue that the syllables preceding the main-stress syllable are categorically subject to height harmony, such that if the main stress vowel is [high], then any preceding mid vowels raise to high, while if the main stress vowel is non-high, then, any preceding mid vowels remain mid. (McCarthy 1984 additionally argues that [high] vowels preceding main stress lower to mid before non-high main-stress vowels. I return to this topic—total height harmony—below.) However, I show that, among other things, a) pre-main-stress mid vowels can raise when followed by a non-high main stress vowel, and b) pre-main-stress mid vowels may fail to raise when followed by a [high] main stress vowel. I present a reanalysis

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5 This data also includes the examples of free variation for height discussed in Hualde (1989) and McCarthy (1984).
of pre-main-stress [high] harmony in Pasiego which takes into account this new data, and which also resolves the controversial issue (cf. McCarthy 1984, Vago 1988) of whether or not Pasiego has total height harmony in pre-main-stress syllables. I argue for an intermediate account, along the lines of Penny (1969: 53), in which Pasiego is, in a sense, ‘acquiring’ a process of total height harmony. However, I argue that pre-main-stress height harmony—and the patterning of pre-main-stress vowels in Pasiego in general—is more perspicuously analysed as enhancement for [high] (i.e. phonetic insertion of [high]) or its lack.

1.1.6 Summary

This thesis employs MCS, phonetic enhancement, and complexity theory to synthesize a model of the phonology-phonetics interface which bridges the gap between phonologically underspecified representations and maximally specified phonetic representations. In doing so, it accounts for phonological and phonetic patterning in Spanish and Italian dialects.
2.1. Introduction

In this chapter, I argue for the model of Modified Contrastive Specification (MCS; Avery and Rice (1989), Rice (1993a,b), Rice and Avery (1991, 1993), Wu (1994) in which feature specification is a consequence of contrasts within an inventory. Specifically, I argue that the presence of contrasts forces the presence of features in vowel representations.

I also argue that features form an implicational hierarchy in which the presence of feature B implies the presence of feature A. For example, in Spanish and Italian dialects, the feature [high] implies the presence of the feature [low]. In a two-height system, low vowels are marked as [low], while non-low vowels are unmarked; only in a three-height system does the feature [high] become active. Thus, [high] can be active only if contrasts exist in the non-low vowels in a system; otherwise, the feature [high] does not occur.3

The claim that features are added only as contrasts or distinctions are added differs from several alternatives that have been proposed in recent work. One claim—proposed by, among others, Calabrese (1994), van der Hulst (1989), and Steriade (1993)—is that phonetically high vowels are also phonologically [high], even when [high] is not forced to appear in order to mark a contrast. In this chapter and in chapter 4, I argue specifically against this assumption. In the version of MCS which I defend in this chapter, phonetically high vowels are phonologically non-low, and sometimes also non-high. For example, in [i,a,u] inventories, the phonetically

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1 See also Clements (1988), Mester and Itô (1989), Steriade (1987) and Toronto Working Papers in Linguistics, volume 13, number 1 (Proceedings of the Workshop on Contrast in Phonology) for discussion of contrastive (under)specification.

2 This thesis does not argue for the theory of Contrastive Specification, but rather supports any theory that assumes that contrastiveness guides the choice of underlying representations.

3 Note that in this approach, unlike in the binary feature approach, lack of the feature [high] is not equivalent to the presence of the feature [low]. Rather, the contrast between [high] and its lack is relative only to the non-low domain.
high vowels [i, u] are considered to be phonologically non-low and non-high, because [i,u] occur in an inventory with only two height contrasts, low and non-low. However, in [i,e,a,o,u] inventories, [i,u] are phonologically specified for [high], as well as being phonetically high, because they occur in an inventory with three height contrasts, informally referred to as low, mid and high.

The second claim (which I will ultimately reject), proposed in work by Archangeli and Pulleyblank and others (e.g. Abaglo and Archangeli 1989, Archangeli 1988, Archangeli and Pulleyblank 1994) is that the specification of a phonetically high vowel as phonologically high is partly dependent on the rules of the language in question. For example, Abaglo and Archangeli (1989) argue, based on the patterning of Yoruba /i/ and Gengbe /e/, that Yoruba /i/ and Gengbe /e/ have the same representation, with no underlying features, even though Gengbe and Yoruba have the same inventory of /i,e,a,o,u/ and share the same system of contrasts.

In response to Archangeli and Pulleyblank, I present in this chapter a body of evidence that argues for Modified Contrastive Specification. I argue that vocalic representations are determined by examining inventories alone, without any recourse to rules, thereby implicitly arguing against the claim that representations are determined by examining language-particular rules.

The particular evidence that I examine in favour of the claim that contrast forms the basis for the specification of features comes from a vowel raising rule that occurs in Spanish and Italian dialects. I argue that raising of a mid vowel to a high vowel is only possible in dialects for which a mid/high contrast exists. In the absence of such a contrast, raising cannot occur. This, I argue, is a consequence of specification: it is only in the presence of the mid/high contrasts that the feature [high] is found.

---

4 The underdot indicates lower-mid vowels in these examples only.
This chapter is organized as follows: in §2.2, I outline my assumptions concerning vowel geometry and Modified Contrastive Specification. In §2.3, I introduce the rule of raising, a rule known as metaphony in the Spanish and Italian literature. In §2.4, I argue that vowel inventories in Spanish and Italian dialects divide into two, namely a) the inventory of vowels that can occur in stems and b) the inventory of vowels that can occur in desinences. The latter claim then paves the way for the observation that raising only occurs in dialects in which the inventory of desinences contains phonologically high vowels, i.e. raising is only possible when there is a contrast between mid and high vowels in the inventory of desinences. The remaining sections (§2.5 through §2.10) provide evidence for this claim through a survey of Spanish and Italian dialects. §2.11 provides a summary and conclusions. Throughout I will defend the claim that contrastively-defined inventories determine which rules are possible in a given language or dialect.

2.2. Theoretical Assumptions

Prior to laying out my claims, I introduce necessary background assumptions in this section. I discuss vowel geometry and Modified Contrastive Specification in particular.

2.2.1. Vowel Geometry

I assume a model of feature geometry along the general lines of Clements (1985) and Sagey (1986), as illustrated in (1). (Nodes intermediate between the root node and the Aperture and Place nodes are not shown in (1)).

(1) Vowel feature geometry

```
                     Root
                      |
                     Place Aperture
                   [dorsal] [coronal] [labial] [low] [high]
```
Following Clements (1989a), Goad (1991), Odden (1991), van der Hulst (1989) and others, I assume that vowels have a place node and an aperture node. I focus on the aperture node in this chapter; further discussion of the place node follows in chapters 3 and 5.

In §2.2.2, I argue that the height feature [low] distinguishes low from non-low vowels, and that the feature [high] does not appear in vowel representations unless forced to do so in order to contrast sounds in more complex inventories.

I use monovalent features in (1) and throughout, although my arguments are logically independent of this particular assumption. See, Avery and Rice (1989), Goad (1991, 1992), van der Hulst (1989), Mester and Itô (1989), Rice and Avery (1991), and Steriade (1993), among others, for arguments for monovalent features. As discussed in §2.2.2, what is important is that there are features which mark contrasts; whether the feature in question is, for example, [+high] or [high] is of secondary importance.

2.2.2. Modified Contrastive Specification

I assume the model of underspecification known as Modified Contrastive Specification (MCS),5 as developed in Avery and Rice (1989), Dyck (1990), Rice (1993a, b), Rice and Avery (1993), Rose (1993), Walker (1993) and Wu (1994). MCS claims 1) that there is a monotonic algorithm for adding contrasts to vowel inventories, and 2) that as contrasts are elaborated within inventories, features are added in order to express these contrasts. The particular features that I focus on are vowel height features. I assume, based on evidence from Spanish and Italian dialects discussed in §2.5-§2.10, that the algorithm for adding height contrasts to inventories distinguishes the following:

\[\text{See Paradis and Prunet (1991) for this name.}\]
(2) Contrastive determination of vowel height:

a. low vs. unmarked vowels
b. high vs. unmarked vowels

Thus, in a two height system, low vowels are marked as [low], while high vowels are unmarked; only in a three height system does the feature [high] mark high vowels. The importance of this observation is that [high] can be active only if contrasts exist in the non-low vowels in a system; otherwise, the feature [high] does not occur. I outline the more specific workings of MCS below, discussing in turn 5-vowel inventories, 3-vowel inventories, and asymmetrical (4-vowel) inventories. First, however, I introduce some conventions which will be used in the remainder of this thesis.

2.2.2.1. Conventions

I use the symbols /I,E,È,A,O,Ò,U/ as abbreviations for the following combinations of features.

(3) Abbreviations

<table>
<thead>
<tr>
<th></th>
<th>Coronal</th>
<th>ø</th>
<th>Labial</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>I</td>
<td></td>
<td>U</td>
</tr>
<tr>
<td>ø</td>
<td>E</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Low</td>
<td>È</td>
<td>A</td>
<td>Ô</td>
</tr>
</tbody>
</table>

The symbol /I/ designates [high, coronal], or a phonologically high front vowel. /U/ denotes [high, labial], a high, labial (i.e. back) vowel. /E/ designates a front mid vowel with no height features, abbreviated as [Ø, coronal]. /O/ designates a back mid vowel (similarly with no height features, abbreviated as [Ø, labial]). /È/ designates a low front vowel ([low, coronal]), usually realized as [ɛ] in Italian dialects. The symbol /A/ designates the representation [low, Ø], or a low vowel with no underlying
place features. Finally, \( \hat{O} \) designates a low back vowel ([low, labial]), usually realized as [ɔ] in Italian dialects.\(^6\)\(^7\)

I now discuss the representations predicted by MCS for 5-, 3- and 4-vowel inventories, given the hierarchy in (2).

2.2.2.2. *Three types of contrastively determined inventories*

In a typical 5-vowel inventory ([i,e,a,o,u]), three heights, or two height contrasts, must be distinguished. Example (4) shows the height features required in a 5-vowel inventory.

(4) **Height contrasts in a symmetrical 5-vowel inventory:**

<table>
<thead>
<tr>
<th></th>
<th>I, U</th>
<th>E, O</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>[high]</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[low]</td>
<td></td>
<td></td>
<td>√</td>
</tr>
</tbody>
</table>

The contrast between low and non-low vowels (eg. /I/ vs. /I,E,U,O/) is marked by the presence of the feature [low], following the discussion in §2.2.2. The contrast within the class of non-low vowels (/I,U/ vs. /E,O/) is marked by the presence of the feature [high]. Under the assumption that contrasts are minimally specified—i.e. that features are added in an inventory only as they become necessary to capture contrasts—the mid vowels in (§4) are unmarked for height (as opposed to being marked for both [high] and [low]). This is because the features [low] and [high], as well as the absence of either feature in the mid vowels, are sufficient to capture the three height contrasts in (§4). Evidence that the mid vowels in (§4) have no height features is provided in chapters 3 and 4.

\(^6\) The assumption that /I,E/ are underlingly [coronal] or front is revised in chapter 5 in accordance with the argument that [coronal] is not always present in the representation of non-back vowels. However I assume in this chapter that [coronal] is underlying in non-back vowels. This assumption has no effects on the claims of this chapter, as this chapter focusses on the aperture node, and abstracts away from the place node.

\(^7\) Following Clements (1989a), I assume that the vowels [E,O] in 7-vowel systems are phonologically low vowels rather than, for example, phonologically [-ATR] vowels.
In the 3-vowel inventory, there is only one height contrast, that between the vowel /A/ and the vowels /E/ and /O/.

\[(5)\] Contrasts in a symmetrical 3-vowel inventory:

<table>
<thead>
<tr>
<th></th>
<th>I,U</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>[high]</td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

As shown in (5), there are two possible ways to represent the height contrast in a 3-vowel system; one is to make a high/non-high split, marking the high vowels /I/ and /U/ as [high] and leaving the low vowel /A/ unmarked (5.a); the other is to make a low/non-low split, marking the low vowel with [low] and leaving the high vowels unmarked (5.b). In this chapter, I present evidence from Spanish and Italian dialects in favour of the split in (5.b). I leave open the question as to whether the split in (5.b) is universal or particular to the Romance languages, but see chapters 3 - 5 for further arguments for (5.b).

One final comment about the symbols /E,O/ is in order. As shown by a comparison of (4) and (5), the symbols /E,O/ represent vowels that are unspecified for height. As discussed in §2.1, I assume that these phonologically non-low vowels can vary for height, and that they can even be realized as the phonetically high vowels [i] and [u] in 3-vowel systems. (See chapter 4 for description of the phonetic variability for height of /E,O/.) However, the important point is that /E,O/ have no height features, i.e. they are not ‘mid’ in the sense of having height features.

### 2.2.2.3. Asymmetrical inventories

In addition to the symmetric inventories discussed above, there is a class of asymmetrical inventories with interesting properties that argue for MCS. In Spanish and Italian dialects, typical asymmetrical inventories are realized as [i,e,a,o], [i,e,a,u], or [ɔ,a,o,u]. (An important proviso here is that the inventories to which I
refer in this discussion are the inventories of vowels occurring in final word markers or desinences. In §2.4.1, I argue that the inventory of desinences is separate from that of stems.) While one might imagine these surface asymmetrical inventories to be underlyingly symmetrical—with, for example, surface merger between /i/ and /e/ in the [ɔ,a,o,u] case—there is evidence that such inventories are underlyingly asymmetrical. In particular, the patterning of vowels in Spanish and Italian dialects provides evidence that only one vowel is phonologically high in these asymmetrical inventories.

Underlyingly asymmetrical inventories have a height contrast between mid and high vowels in either the front or the back of the vowel space, but not in both regions. In MCS, this means that in asymmetrical inventories there should be only one phonologically high vowel, occurring in the region where the mid/high contrast exists.

(6) a. No contrast for mid/high front vowels: 
   b. No contrast for mid/high back vowels:

<table>
<thead>
<tr>
<th></th>
<th>E</th>
<th>A</th>
<th>O</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>[high]</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>[low]</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[labial]</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>E</th>
<th>A</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>[high]</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[low]</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[labial]</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

For example, in the inventory in (6.a), the feature [high] is required only for the back vowels, while in the inventory in (6.b) the feature [high] is required only for the front vowels. In other words, each of the inventories in (6) has only one phonologically high vowel. This is because a contrast for height exists only in the back vowel region in (6.a) and only in the front vowel region in (6.b).

In summary, 5-vowel systems have two phonologically high vowels, /I/ and /U/; 3-vowel systems have no phonologically high vowels (although they may be

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8 Examples of phonetic realizations of the phonological inventory /E,A,O,U/ include [ɔ,a,o,u], [e,a,o,u] or [i,a,o,u]. Examples of phonetic realizations of the phonological inventory /I,E,A,O/ include [i,e,a,o] and [i,e,a,u].
phonetically realized as \[i,a,u\]—see chapter 4); and 4-vowel systems have one phonologically high vowel—either /I/ or /U/—but not both.\(^9\)

### 2.2.3. Predictions concerning rule types

The model of MCS thus makes predictions about the types of rules that are possible in a given vowel inventory. Recalling the representations in (4), symmetrical 5-vowel systems could allow for rules referring to the feature [high] since this feature is present in such inventories. However, such inventories do not require rules referring to [high]; they merely allow for that option. On the other hand, the type of 3-vowel inventory shown in (5.b) should not have rules referring to the feature [high], because such an inventory contains no phonologically high vowels. Finally, asymmetrical vowel systems should pattern in a distinctive manner. In the asymmetrical inventory shown in (6.a), only /U/ should be a possible trigger for a rule referring to [high], since only /U/ is marked for this feature. Likewise, in the inventory type shown in (6.b) only /I/ should be a possible high trigger, since only /I/ is marked for the feature [high]. Rules referring to the unique high vowel /U/ are possible, but not obligatory, in (6.a), while rules referring to the unique high vowel /I/ are possible, but not obligatory, in (6.b).

The predictions outlined above are summarized in (7). (The notation \([\emptyset]\) means that the vowel is unmarked for height; I abstract away from place features here.)
(7) Predictions concerning possible rules:

<table>
<thead>
<tr>
<th>Vowel system</th>
<th>Contrastive height features required</th>
<th>Possibility of rules with high vowel triggers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-vowel (Type (5.b))</td>
<td>E [ø] A [low] O [ø]</td>
<td>no; no phonological feature [high]</td>
</tr>
<tr>
<td>4-vowel (Type (6.a))</td>
<td>E [ø] A [low] O [ø] U [high]</td>
<td>yes; triggered by /U/; only /U/ is phonologically [high]</td>
</tr>
<tr>
<td>4-vowel (Type (6.b))</td>
<td>I [high] E [ø] A [low] O [ø]</td>
<td>yes; triggered by /I/; only /I/ is phonologically [high]</td>
</tr>
<tr>
<td>5-vowel (Type (4))</td>
<td>I [high] E [ø] A [low] O [ø] U [high]</td>
<td>yes; triggered by both /I/ and /U/, both of which are phonologically [high]</td>
</tr>
</tbody>
</table>

As shown in (7), MCS makes fine-grained predictions about the possibility and nature of phonological rules referring to [high] in 3-, 4-, and 5-vowel inventories. In the remainder of this chapter, I consider the predictions outlined in (7) in some detail through an examination of Spanish and Italian dialects. I now turn to a discussion of metaphony in order to argue that these predictions are realized.

2.3. Metaphony (raising)

The raising rule discussed in this thesis is known in the Romance literature as ‘metaphony.’ The term ‘metaphony’ encompasses several different types of phenomena, including a) an incipient phonetic process, b) historic residue, and c) a productive, synchronic process. I will not discuss the incipient phonetic process further. However, I discuss historical metaphony in §2.10.2.3. I concentrate on the productive, synchronic process in the bulk of this chapter.

2.3.1. Examples of metaphony in Spanish and Italian dialects

The effects of metaphony are illustrated in (8) through (18). (8) exemplifies Spanish metaphony, using Pasiego as an example, while (9) and (10) exemplify the
two types of metaphony found in Italian dialects, Neapolitan metaphony (9) and Arpinate metaphony (10). Map D in the appendix to this chapter shows where these different dialects are located.

Spanish dialects have the vocalic inventory [i,e,a,o,u], plus the diphthongs [je] (<ie>)11 and [we] (<ue>) (Penny 1991: 46). I represent this inventory as /I,E,A,O,U/. For the purposes of metaphony, the Spanish diphthongs [je] and [we] behave identically to [e], raising to high in a metaphonizing environment (compare (8.i,ii) and (8.iii,iv).13


11 In this thesis, I use the following conventions to differentiate between various types of representations:

/ / phonemic representations
[ ] phonetic representations
{} intermediate representations
<> orthographic representations

In examples, the foreign text is in phonetic transcription, unless otherwise noted. Within examples, square brackets are also used to highlight particular material. Uppercase letters, either enclosed or unenclosed in slash brackets, are to be interpreted as the phonemic representations introduced in §2.2.

12 See chapter 4 for more fine-grained phonetic detail concerning vowels in Spanish dialects.

13 The analysis that Spanish has the inventory [i,e,a,o,u] plus the radical alternating diphthongs [je, we] is based on the historical development of Spanish and on diphthong/monophthong alternations. Historically, as summarized in Penny (1991: 46), Spanish vowels developed from Latin as follows:

(i)

<table>
<thead>
<tr>
<th></th>
<th>Early &amp; Classical Latin</th>
<th>Vulgar Latin</th>
<th>Old and Modern Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>ĩ ɨ ē œ ɛ æ a ə õ ə au ũ ū</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i e e a ɔ o u</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i e je a we o u</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown above, the diphthongs [je] and [we] are reflexes of historical [ɛ,ɔ]. In Modern Spanish, on the other hand, [je] and [we] are radical alternating diphthongs, i.e. stressed diphthongs which alternate with unstressed [e, o]. For example, the radical alternating diphthong [we] in b[wé]no ‘good’
(8) Pasiego (Spanish) metaphony (Penny 1969) (centralization/laxing not shown):

<table>
<thead>
<tr>
<th>Unmetaphonized</th>
<th>Metaphonized and neutral (only the mid vowels raise)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. afilit[ě]ros</td>
<td>afilit[í]ru ‘needle-cases, needle-case’</td>
</tr>
<tr>
<td>ii. g[ó]rdо</td>
<td>g[ú]rdu ‘fat (neuter), fat (masculine)’</td>
</tr>
<tr>
<td>iii. ab[jé]rtos</td>
<td>ab[jí]rtu ‘open (pl), open (sg.)’</td>
</tr>
<tr>
<td>iv. k[wé]rpоs</td>
<td>k[wí]ru ‘bodies, body’</td>
</tr>
<tr>
<td>v. luz m[í]yos</td>
<td>il m[í]yu ‘mine (pl.), mine (sg.)’</td>
</tr>
<tr>
<td>vi. bjúdu</td>
<td>bjúdu ‘widow, widower’</td>
</tr>
<tr>
<td>vii. br[á]θos</td>
<td>br[á]θu ‘arms, arm’</td>
</tr>
</tbody>
</table>

In Spanish dialects, the vowels /E,O/ raise to [i,u] as a result of metaphony (8.i,ii,iii,iv), while /I,U,A/ are generally unaffected. For example, as shown in (8.i), the stressed mid vowel [é] raises to [í] when [u] follows, but remains [é] when [o] follows; similarly, as shown in (8.ii), [ó] raises to [ú] when [u] follows, but remains [ó] when [o] follows.

Italian dialects of the Italo-Western vocalism have the inventory [i,e,ɛ,a,ɔ,o,u]. I represent this inventory as /I,E,È,A,Ò,U/ (cf. example (13)). As

alternates with the monophthong [o] in b[o]ndád ‘goodness.’ For further discussion and references concerning the diphthong/monophthong alternations see chapter 3.

14 Metaphonizing dialects spoken in Lena (NW Spain) raise /A/ to [e], while metaphorizing dialects spoken in the Nalón valley of Spain raise /A/ to [o]. Further discussion is provided in footnotes 16 and 29.

15 Italian dialects fall into two types with respect to the development of vowels from Latin. The Northern Italian or Italo-Western vocalism developed as in (i).

(The symbols used are as follows: ò, ő a long vs. a short vowel
è a lower mid vowel, equivalent to [ɛ]
ě a higher mid vowel, equivalent to [e]

(i) Northern Italian vocalism (Rohlfs 1949/1966: 6):

<table>
<thead>
<tr>
<th>Vulgar Latin</th>
<th>Northern Italian</th>
</tr>
</thead>
<tbody>
<tr>
<td>ĩ ĭ ě ě ā ő ď ū ū</td>
<td>i ě ě ě ā ő ŏ u</td>
</tr>
</tbody>
</table>

In the Sicilian vocalism, on the other hand, all but the low mid vowels of Vulgar Latin merged to either /i/ or /u/:
discussed in the previous section, Italian metapthonizing dialects essentially fall into two types, known as Neapolitan and Arpinate: In both types, the mid vowels [e,o] raise to [i,u] as a result of metapthony, as in (9.v-viii) and (10.iii,iv,vii,viii). However, it is the treatment of [e,o] which distinguishes the two types of metapthonizing Italian dialects.

Example (9) illustrates a Neapolitan dialect:

(9) Neapolitan (Italian; Neapolitan metapthony (Bichelli 1973: 45-6)):

<table>
<thead>
<tr>
<th>Unmetaphonized</th>
<th>Metaphonized</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. io v[é]nno</td>
<td>ii. tu v[i]nn{i}</td>
</tr>
<tr>
<td>ii. tu v[i]nn{i}</td>
<td>you sell</td>
</tr>
<tr>
<td>iii. io c[ó]rro</td>
<td>iv. tu c[ú]rr{i}</td>
</tr>
<tr>
<td>iv. tu c[ú]rr{i}</td>
<td>you run</td>
</tr>
<tr>
<td>v. io p[é]rdo</td>
<td>vi. tu p[je]rd{i}</td>
</tr>
<tr>
<td>vi. tu p[je]rd{i}</td>
<td>you lose</td>
</tr>
<tr>
<td>vii. io c[ó]cio</td>
<td>viii. tu c[wó]c{i}</td>
</tr>
<tr>
<td>viii. tu c[wó]c{i}</td>
<td>you cook</td>
</tr>
</tbody>
</table>

Vowels in curly brackets {} in (9) are phonologically high vowels which surface as reduced vowels in final position. See §2.10.1.1 for details. Examples (9.i-iv) illustrate the raising of [e,o] to [i,u]. By comparison, as shown in (9.v-viii), metapthonized [e,o] in the Neapolitan dialects become the diphthongs [je] and [wo]. [a] is unaffected by raising.

Example (10) illustrates an Arpinate dialect:

(i) Sicilian vocalism (Rohlfs 1949/1966: 10):

<table>
<thead>
<tr>
<th>ð</th>
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<th>ð</th>
<th>ð</th>
<th>ð</th>
<th>ð</th>
<th>ð</th>
<th>ð</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>é</td>
<td>ê</td>
<td>a</td>
<td>õ</td>
<td>õ ŭ ŭ</td>
<td>Vulgar Latin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>é</td>
<td>ê</td>
<td>a</td>
<td>õ</td>
<td>õ ŭ ŭ</td>
<td>Sicilian</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Sicilian, both *ê and *ô merged with high vowels, while in the Northern Italian vocalism, these same vowels became mid vowels.
Roiate (Italian; Arpinate metaphony (Orlandi 1989)):

<table>
<thead>
<tr>
<th>Unmetaphonized</th>
<th>Metaphonized</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. m[é]se</td>
<td>month</td>
</tr>
<tr>
<td>ii. m[í]si</td>
<td>months</td>
</tr>
<tr>
<td>iii. cr[ó]ce</td>
<td>cross</td>
</tr>
<tr>
<td>iv. cr[ú]ci</td>
<td>crosses</td>
</tr>
<tr>
<td>v. p[é]le</td>
<td>foot</td>
</tr>
<tr>
<td>vi. p[é]j</td>
<td>feet</td>
</tr>
<tr>
<td>vii. f[ó]rte</td>
<td>strong</td>
</tr>
<tr>
<td>viii. f[ó]rti</td>
<td>strong</td>
</tr>
</tbody>
</table>

As shown in (10.i-iv), [e,o] raise to [i,u], as in the Neapolitan dialect. However, as shown in (10.v-viii), the lower mid vowels [e,o] raise to [e,o] in Arpinate dialects. [a] is unaffected by raising.

A preliminary analysis of the rule of metaphony based on the above examples follows below.

2.3.2. Preliminary formalization of metaphony as a spreading rule

I begin this section with a preliminary account of metaphony as raising in §2.3.2.1; I provide a more detailed account in chapter 3. In §2.3.2.2, I discuss a process which accompanies raising in Spanish dialects, namely the process of centralization or laxing. I then motivate the reason why I abstract away from centralization/laxing in this thesis.

2.3.2.1. Raising: a preliminary formalization

Following Calabrese (1984-5, 1987), Hualde (1989), Kaze (1989, 1991), and Vago (1988), I assume that metaphony is a rule that spreads the feature [high] to target mid vowels, causing the latter to become high. I make the following modifications to their binary feature analysis in order to incorporate a) the assumption that features are monovalent, and b) the assumption that mid vowels have no height features. Example (11) formalizes the metaphony process.

(11) Metaphony:

Trigger: phonologically high vowel
Target: mid vowel (i.e. a vowel without the features [high] or [low])
Operation: spread [high]
The rule proposed in (11) operates as shown in (12) (for Spanish) and (13) (for Italian), where the representations of the target vowels are shown.

(12) Spanish metaphony:

a. Underlying vowels:

<table>
<thead>
<tr>
<th>I, U</th>
<th>E, O</th>
<th>A</th>
</tr>
</thead>
</table>

b. Metaphonized vowels:

<table>
<thead>
<tr>
<th>I, U</th>
<th>E→i</th>
<th>A</th>
</tr>
</thead>
</table>

\[\begin{array}{c|c|c|c|}
\text{[high]} & \text{[low]} & \text{[low]} & \text{[high]} \\
\text{[low]} & \text{[low]} & \text{[high]} & \text{[low]}
\end{array}\]

As shown in (12), in Spanish metaphonizing dialects, the feature [high] spreads to the mid vowel targets (/E,O/), i.e. the vowels that are unmarked for height (12.a); the resulting representation for the underlying mid vowels /E,O/ are surface high vowels [i,u] (12.b).

(13) Italian metaphony:

Underlying vowels:

<table>
<thead>
<tr>
<th>I, U</th>
<th>E, O</th>
<th>È, Ô</th>
<th>A</th>
</tr>
</thead>
</table>

Metaphonized vowels:

<table>
<thead>
<tr>
<th>I</th>
<th>E→[i]</th>
<th>È→[e, e]</th>
<th>A</th>
</tr>
</thead>
</table>

\[\begin{array}{c|c|c|c|c|}
\text{[high]} & \text{[low]} & \text{[low]} & \text{[high]} & \text{[low]}
\end{array}\]

As shown in (13), in Italian dialects, the feature [high] spreads to the higher mid vowel targets (/E,O/); the resulting representations for the underlying higher mid vowels /E,O/ are the surface high vowels [i,u]. The raising of /E,O/ to [i,u] is directly comparable to Spanish raising. This means that, even without considering any other type of target, the raising of /E,O/ to [i,u] is enough to show which desinential vowels trigger raising and which do not. (Recall that showing which vowels trigger raising is the focus of this chapter.) However, a brief discussion of raising of lower mid /È/ and /Ô/ in Italian is also in order for the sake of completeness.
Calabrese (1984-5, 1987) and Kaze (1989, 1991) in their analyses of raising in Italian argue that the feature [+high] spreads to the low mid vowels /È,Ò/. This creates an illicit representation which is subject to adjustment, either through a) delinking of [+low], to create [e,o] in the case of Arpinate metaphony, or through b) sequentialization of [+high] followed by [+low], resulting in diphthongs such as [je, wo]) in the case of Neapolitan metaphony. I provisionally adopt Calabrese’s and Kaze’s analyses of metaphony to lower mid vowels in this thesis, recognizing, however, that these analyses fail to address several important questions, including a) why metaphony to lower mid vowels is less marked than metaphony to the low vowel [a], even though [e,ò,a] all contain the feature [low] in their representations,\footnote{Interestingly, there is evidence which suggests that metaphony of the lower mid vowels is somewhat less ‘natural’ than metaphony of the higher mid vowels. Maiden (1991: 115) observes that in general, metaphony of the lower mid vowels presupposes metaphony of the higher mid vowels in Italian dialects.} b) why (or if) metaphony in the case of the low vowels is able to target non-empty vowels, and c) why (or if) metaphony is allowed to create illicit, non-structure-preserving representations.

Briefly, however, a potential response to the latter two questions might involve the following observations and train of thought: first, metaphony of [e,ò,a] only occurs when the latter vowels are stressed and long. If length is a concomittant of stress, as assumed in many analyses of Italian, then the second half of a long vowel

Metaphony of the low vowel /A/ is also attested. In some Spanish dialects—e.g. Lena, and the Nalón valley of Spain, as reported in Rodríguez-Castellano (1954, 1955)—and in some Italian dialects, metaphony raises the low vowel [a] to a vowel that ranges from the low front vowel [æ] to the mid vowel [e]. Maiden (op. cit.) observes that metaphony of [a] implies metaphony of the mid vowels in Italian, and this is also the case in Spanish.

It appears from the above facts that the extension of metaphony to lower mid vowels and to low vowels requires creating successively more marked outputs; the implicational hierarchy discussed in Maiden (1991) supports the idea that such outputs are somehow more marked.
(i.e. the second mora or timing unit) may be epenthetic; i.e. intermediate representations would be \{È V\} and \{Ô V\}, where V represents an epenthetic vowel. If this is the case, the epenthetic vowel may also be empty, an assumption commonly made of epenthetic vowels. It may be, then, that metaphony targets these empty, epenthetic vowels. The difference between the low vowels \[e,\varsigma,a\] and the non-low vowels \[e,o\] with respect to metaphony would be that metaphony would only target the second mora of the low vowels, while targeting both morae of the non-low vowels.

If metaphony were to target only the second mora of long low vowels, problematic representations could result: for example, metaphony to \{È V\}, \{Ô V\} and \{Â V\} would ultimately result in the diphthongs \[éI\] \[ôI\] and \[âI\], which, for independent reasons, might be dispreferred. In other words, the problem that in Kaze and Calabrese’s accounts involved creation and repair of illicit vowel representations might be rephrased as a problem of creation and repair (or blocking) of dispreferred tautosyllabic vowel sequences. Thus, it may be possible to analyse metaphony of \[e,\varsigma,a\] in a manner consistent with the assumptions that the target of metaphony is empty of height features, and that \[\text{[high]}\] and \[\text{[low]}\] do not cooccur in the same representation.

2.3.2.2. Raising versus centralization/laxing

The preliminary analysis of Pasiego metaphony presented in (11) contrasts with an alternative analysis which I address in this section. In the literature, Pasiego metaphony has been viewed as involving two processes, namely raising and centralization (Hualde 1989) or laxing (McCarthy 1984). (Centralization and laxing denote the same phenomenon.) However, the relationship between raising and centralization/laxing is a matter of some difference of opinion. I argue here, following Hualde (1989) and contra McCarthy (1984), that centralization or laxing is a secondary phenomenon that is dependent on raising. In contrast, McCarthy’s
account has the opposite causality, where raising is dependent on the prior operation of laxing. I motivate my decision to omit centralization/laxing from the Pasiego data below.

McCarthy’s (1984) analysis of Pasiego raising is problematic for the arguments in this chapter for several reasons. To illustrate, I compare my analysis with McCarthy’s in (14). The analyses essentially differ in terms of their morphological analyses of the masculine singular (m.s.) and the mass neuter (m.n.). The term mass neuter is discussed further in §2.5.2.1; for the purposes of this discussion, it suffices to know that there are two different morphological categories that need to be differentiated in Pasiego.

(14) Comparison of analyses of Pasiego

a. Hualde’s/my analysis:

<table>
<thead>
<tr>
<th>ending</th>
<th>m.s.</th>
<th>m.n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[u]</td>
<td>[o]</td>
</tr>
<tr>
<td>floating feature</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

b. McCarthy’s analysis:

<table>
<thead>
<tr>
<th>ending</th>
<th>m.s.</th>
<th>m.n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[u]</td>
<td>[u]</td>
</tr>
<tr>
<td>floating feature</td>
<td>[-tense]</td>
<td>—</td>
</tr>
</tbody>
</table>

The analysis shown in (14.a) reflects Hualde’s (1989) analysis: Following Hualde (1989), I argue in §2.5 that Pasiego has a mid vowel /O/ ([o]) which does not trigger metaphony, and a high vowel /U/ ([u]) which does trigger metaphony. The high vowel /U/ ([u]) realizes the masculine singular ending, and the mid vowel /O/ ([o]) realizes the mass neuter ending. In contrast, McCarthy argues that Pasiego has only one ending, the high vowel [u], plus a floating feature [-tense], which is associated with masculine singular words (14.b).

These two radically different analyses of the inventory of endings are made possible because of a) the phonetic instantiation of Pasiego final back vowels, and b) the fact that all and only vowels in masculine singular words ending in [u] are centralized. I discuss each of these points in greater detail. As described in Penny (1969), final back vowels are realized as a centralized high back vowel [u:], a lowered high back vowel [u], and a raised mid back vowel [o]. In Penny’s (1969) analysis,
[u:] realizes a high back vowel phoneme, or /U/, while [u, o] realize a mid back vowel phoneme, or /O/. I adopt this analysis as well. On the other hand, McCarthy argues that because the instantiations [u:, u, o] are so phonetically similar, only one back vowel phoneme should be posited, namely a high back vowel /u/.

McCarthy also notes, as mentioned above, that all and only the vowels in masculine singular words are centralized. Some examples contrasting masculine singular and mass neuter nouns are provided in (15) for illustration. As in McCarthy (1984), I use upper-case letters (in this section only) to indicate centralized vowels.

(15) Centralization in masculine singular words (McCarthy 1984: 294):

<table>
<thead>
<tr>
<th>[+tense] words</th>
<th>[-tense] words</th>
</tr>
</thead>
<tbody>
<tr>
<td>m.n.</td>
<td>m.s.</td>
</tr>
<tr>
<td>a. málu</td>
<td>b. mÁlU</td>
</tr>
<tr>
<td>c. límpju</td>
<td>d. lÍmpjU</td>
</tr>
<tr>
<td>e. súðju</td>
<td>f. sÚðjU</td>
</tr>
</tbody>
</table>

As shown in (15), and as more fully motivated by other examples provided in McCarthy (1984: 293-4), only masculine singular nouns (15.b,d,f) contain [-tense] vowels, while other categories of words contain [+tense] vowels (15.a,c,e). McCarthy takes this observation to mean that [-tense] is a morpheme-level feature that associates to masculine singular nouns only.

Example (16) illustrates McCarthy’s analysis (the symbols used are taken directly from McCarthy).
(16) McCarthy’s (1984) analysis of metaphony in Pasiego:

a.  b.

[konéxu] ‘rabbit, m.s.’  [konéxus] ‘rabbit, m. pl.’

i. Association of [+high] [+high]
   [-tense] to m.s. words:
   kon é xu  konéxus
   
   [-tense]

ii. Raising [+high]
    konéxu   n/a
    
    [-tense]

iii. High harmony [+high] n/a
     konéxu
     
     [-tense]

iv. final lowering [kUñxU] [konéxos]

(I omit [-high] feature values in (16); McCarthy assumes a full-specification account which adds some details—for example feature-changing and fission—that are irrelevant for this discussion.) As shown in (16.i), McCarthy assumes one [+high] ending, /u/; in (16.a), [-tense] spreads to all the vowels in the masculine singular word; this operation does not occur in the masculine plural word, because the morphological environment for the presence of this feature is not present. As shown in (16.i), raising targets stressed [-tense] vowels, causing the mid vowel /e/ to raise in (16.a). An additional process illustrated in (16.iii) spreads [+high] leftwards. Finally, a rule illustrated in (16.iv) lowers final /u/ to [o] in the [konéxos] example.

In contrast, Hualde’s (1989) analysis is illustrated in (17).
Hualde’s (1989) analysis of Pasiego metaphony:

a. [+high]  
   \[konéxu\] ‘rabbit, m.s.’

b. [+high]  
   \[konéxos\] ‘rabbit, m.pl.’

i. High harmony:  
   \[konéxu\] n/a

ii. redundant [-ATR]  
   [+high]  
   \[konéxu\]  
   [-ATR]

iii. spreading of  
   [-ATR]  
   [+high]  
   \[konéxu\]  
   [-ATR]

As shown in (17), Hualde assumes two final desinences, namely [+high] /u/ in \[konéxu\] and [-high] /o/ in \[konéxos\]. High harmony spreads from the high ending /u/, as shown in (17.i). Then the feature responsible for centralization—[-ATR] in Hualde’s analysis—is redundantly assigned to [+high] final vowels. Afterwards, as shown in (17.iii), [-ATR] spreads in an autosegmental fashion (Hualde 1989: 792). Crucial to Hualde’s account—and to mine—is the assumption that there is only one [+high] back vowel ending, namely masculine singular /u/. Other back vowel endings have [-high] back vowels—for example, the mass neuter has /o/ and the masculine plural has /os/.

If McCarthy’s analysis is correct, then the Pasiego example has nothing to do with the claims outlined in §2.2.3, namely that a contrast between mid and high vowels is necessary in order for phonologically high vowels to appear. However, I argue against McCarthy’s account on the following grounds. First, Hualde has the essential insight that the presence of centralization only on masculine singular nouns
is an accident: “It is simply the case that all items with this ending [i.e. the ‘centralizing’ ending /-u:/] are masculine singular countable.” Against McCarthy’s hypothesis that the centralization feature is a morpheme-level feature, Hualde notes that there are many examples of masculine singular nouns which are not centralized (Hualde 1989: 793). Essentially, any masculine singular count noun which does not end in /u:/ also lacks centralized vowels. Some examples from Penny (1969) illustrating Hualde’s analysis are provided in (18). As in the previous section, upper-case letters in this example denote centralized vowels.

(18) Masculine singular count nouns and centralization (Penny 1969: 108):

<table>
<thead>
<tr>
<th>[-ón] (augmentative suffix)</th>
<th>[-u:] suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. āruyón</td>
<td>A rÚyU</td>
</tr>
<tr>
<td>b. buñikón</td>
<td>bU rĩkũŨU</td>
</tr>
<tr>
<td>c. kantón</td>
<td>kÁntU</td>
</tr>
<tr>
<td>d. muñilón</td>
<td>mU rĩlũũUkũŨ</td>
</tr>
<tr>
<td>e. kurbón</td>
<td>kwrbU</td>
</tr>
</tbody>
</table>

Example (18) lists masculine singular count nouns. The masculine singular count nouns which have the augmentative suffix [-ón] (first column) have no centralization while those ending with [U], (i.e. centralized /-u/; (second column)) have centralization. Many similar examples—i.e. derivational suffixes which do not change the gender of the masculine noun to which they attach but which replace [U]—are found in Penny (1969). Because of such examples, I conclude that McCarthy’s analysis must be incorrect.

In summary, I adopt the main features of Hualde’s (1989) account of the relationship between raising and centralization. Raising is a phonological process triggered by high vowels. Centralization is a phonetic concomitant of raising, occurring when the trigger is a final high vowel. It occurs only with /-u:/ because this
is the only phonologically high vowel desinence. Centralization results when a
certain feature—present on word-final, phonologically high vowels—spreads to other
vowels within a given domain (in Pasiego, the clitic group (Hualde 1989)). Finally,
this analysis assumes a partial system for Pasiego desinences which includes a) /-U/
([u]) for masculine singular count nouns, and b) /-O/ ([ʊ, ʊ]) for nouns designated as
neuter singular or mass.\footnote{There is also a masculine plural count noun ending, which Penny (1969) and
Hualde (1989) analyse as /-Os/. Mass or neuter singular nouns have no plural
counterpart. For further discussion, see §2.5.2.1.}

Further description and analysis of Pasiego metaphony follows below; I refer
to metaphony as ‘raising’ below to emphasize that raising is the central phenomenon
under discussion.

\subsection*{2.4. Vowel representations and domains}

At this point, I turn to the relationship between the data briefly introduced
above and the claims of Modified Contrastive Specification, presented in §2.2.3 and
repeated in modified form below for convenience:
(7) Predictions concerning possible rules:

<table>
<thead>
<tr>
<th>Vowel system</th>
<th>Contrastive height features required</th>
<th>Possibility of rules with high vowel triggers</th>
</tr>
</thead>
<tbody>
<tr>
<td>a 3-vowel (Type (5.b))</td>
<td>E [ø] A [low] O [ø]</td>
<td>no; no phonological feature [high]</td>
</tr>
<tr>
<td>b 4-vowel (Type (6.a))</td>
<td>E [ø] A [low] O [ø] U [high]</td>
<td>yes; triggered by /U/; only /U/ is phonologically [high]</td>
</tr>
<tr>
<td>c 4-vowel (Type (6.b))</td>
<td>I [high] E [ø] A [low] O [ø]</td>
<td>yes; triggered by /I/; only /I/ is phonologically [high]</td>
</tr>
<tr>
<td>d 5-vowel (Type (4))</td>
<td>I [high] E [ø] A [low] O [ø] U [high]</td>
<td>yes; triggered by both /I/ and /U/, both of which are phonologically [high]</td>
</tr>
</tbody>
</table>

At first glance, Spanish and Italian dialects appear to support the (less interesting) claim that metaphony may or may not occur in languages or dialects with a mid/high contrast: this is because Spanish and Italian dialects have the kinds of inventories shown in (7.d,e), inventories which force phonetically high vowels to also be phonologically high—in 5-vowel [i,e,a,o,u] inventories and 7-vowel [i,e,e,a,ɔ,o,u] inventories, the presence of a contrast between mid and high vowels forces the presence of the feature [high] on phonetically high vowels. This claim predicts that all Spanish and Italian dialects could have metaphony, but need not.

However, I make a more interesting claim, namely that metaphony is asymmetrical in Spanish and Italian dialects with an asymmetrical mid/high contrast.
I make a prior assumption, namely that the vowel inventories of Spanish and Italian dialects must be divided into two inventories—a stem inventory, and a desinential inventory. Evidence for this assumption is discussed in this section. But first, to indicate the conclusions of this section in advance, given the assumption that Spanish and Italian have two inventories, stem and desinential, and given that raising is triggered by desinential vowels, it is possible to make the following claims: First, dialects with only three vowels in the desinential inventory, as in (19), should never exhibit raising. Parentheses in (19) indicate that the dialects in question may have fewer than three vowels, i.e. that the vowels in parentheses may be absent.

(19) Desinential inventories of non-raising dialects:

\[
\begin{array}{c}
(E) \\
(O) \\
(A)
\end{array}
\]

As shown in (19), dialects with three or fewer vowels in the desinential inventory should have no phonologically [high] vowels, and thus have no raising trigger.

Second, dialects with four or five vowels in the desinential inventory could exhibit raising triggered, as illustrated in (20):  

(20) Desinential inventories of dialects in which raising is possible:

a. 4-vowel desinential inventories:

\[
\begin{array}{c}
(U) \\
(I) \\
(E) \\
(O) \\
(A)
\end{array}
\]

b. 5-vowel desinential inventories:

\[
\begin{array}{c}
(I) \\
(U) \\
(E) \\
(O) \\
(A)
\end{array}
\]

This claim derives from the same basic insight presented in Penny (1970), namely that productive metaphony only exists where a dialect maintains the distinction between masculine singulars ending in [-u] and mass neuters ending in [-o]. I claim that Penny’s observation derives from the presence of a mid/high contrast, rather than the presence or absence of mass neuters.
Most interestingly, as shown in (20.a), 4-vowel inventories with contrasting heights in the non-low front desinence vowels should, if they have raising, exhibit raising triggered by /I/, while those with height contrasts in the non-low round desinence vowels should exhibit raising triggered by /U/. Finally, as illustrated in (20.b), 5-vowel inventories with contrasting heights in both the front and back non-low vowel regions should, if they have raising, exhibit raising triggered by both /I/ and /U/. I demonstrate below that the above predictions are realized in Spanish and Italian dialects. By dividing vowel inventories into stem inventories vs. desinential inventories, I provide evidence for the MCS claim that [high] only appears in the representations of phonetically high vowels when there is a contrast between mid and high vowels in a given vowel region.

I motivate the distinction between stem inventories and desinential inventories below.

The desinence has been treated as having a special status distinct from that of the stem in the Romance literature. This is because the desinence has distinct morphological and phonological properties, reviewed below, and often undergoes a distinct historical development in the history of Spanish and Italian.

The desinence includes “...the (possibly null) element or elements situated at the right edge of the word” (Roca 1990: 135), while the stem includes any remaining segments to the left (cf. Harris 1980, 1983, Hooper and Terrell 1976, Roca 1988, 1990). In a paradigm which keeps the stem constant, the desinence can be identified because it is clearly variable: for example, in the paradigm <hablo> I speak <hablas> you speak <habla> he/she speaks the constant stem is <habl- > while the desinences are <-o>, <-as>, <-a>. In addition to this formal criterion, a battery of characteristics distinguishes the stem from the desinence, as surveyed in (21).
Stems vs. desinences (from Harris 1983, Roca 1990):

<table>
<thead>
<tr>
<th>Stem</th>
<th>Desinence</th>
</tr>
</thead>
</table>
| participates in derivational processes | • does not participate in derivational processes  
• systematically missing word-internally in compounds; i.e. only occurs at the right edge. |
| domain of word-stress | outside of the domain of word-stress |
| minimal word consists of a stem | desinence may be null |
| unpredictable lexical item | 1) partially predictable from:  
   a) morphological gender  
   b) phonotactic constraints ([e] insertion)  
2) partially unpredictable lexical item (i.e. some instances of desinences are lexicalized) |

larger inventory:  
Sp. [i,e,a,o,u]  
It. [i,e,a,o,u]  
smaller inventory:  
Standard Sp. [(i),e,a,o,(u)]  
Standard It. [i,e,a,o]

As summarized in (21), the desinence is outside of the domain of derivational processes and of word-stress; words obligatorily consist of stems, but not all words have desinences; the desinence is partially predictable from morphological requirements and from phonotactic requirements on consonant sequences—for example, words ending with [nt] in Spanish require the desinence [e] for phonotactic purposes; and finally, the number of vowels used in desinences is often smaller than the number of vowels used in stems. In the example shown in (21), the inventory of Standard Spanish noun desinences includes core [e,o,a] and non-core [i,u] (Harris 1991), indicated by parentheses around [i,u] in (21), while in Standard Italian, the inventory of noun desinences includes [i,e,a,o].

The asymmetry in size between the (smaller) desinential inventory and the (larger) stem inventory is not unique to Spanish and Italian dialects. It is a common type of asymmetry, occurring in typologically diverse languages. For example, in Bantu languages, mid vowels only appear in stems and are absent from the underlying representations of suffixes (Steriade 1993, citing Guthrie 1970). In Finnish, case endings employ only the vowel /a ~ ä/ (Prince 1984: 236). And in Beaver, an
Athapaskan language, only /i,u,ə/ occur in the inflectional domain, while the full range of vowels, /i,e,a,o,u,ə/, occurs in lexical stems and in derivational morphemes (Randoja 1990: 279).

The above examples illustrate that smaller affixal inventories are often subsets of stem inventories— in the Bantu (Lamba) example, stems include the vowels /i,e,a,o,u/, while affixes include only /i,a,u/ underlyingly. Given this ‘subset principle’ (discussed in Prince 1984), one might imagine that affixal inventories could be derived from stem inventories by means of phonological processes such as reduction: for example, one might hypothesize that in Lamba, /i,e/ reduce to /i/ in affixes. If this hypothesis were true, then affixal inventories would be derivative of stem inventories, rather than being truly separate inventories. However this hypothesis is untenable. For example, in the case of Spanish, as summarized in (21), while the desinential ending /E/ ([e]) is predictable from phonotactics, one cannot claim that the remaining desinential vowels are somehow created by reduction of stem vowels. This is because the affixal (desinential) vowels also carry morphological significance, i.e. they are lexically listed and unpredictable. In other words, while the subset principle is an important characteristic describing the relationship between stem and desinential vowels, it does not reduce to a phonological process. The subset principle is a separate phenomenon that characterizes the difference between desinential and stem vowels, and the reason why this property holds of desinential vowels is at present unknown (but see Dresher and van der Hulst 1993 for discussion). I conclude from the above that desinential inventories cannot be derived from stem inventories, and that desinential vowels in Spanish and Italian dialects (and perhaps in general) form separate inventories from stem vowels.

Lieber (1992: 112ff) has made a similar proposal concerning the distinction between inflectional affixes and stems, namely that inflectional affixes have impoverished Categorial Signatures, i.e. an impoverished inventory of morphosyntactic features.
Given the above conclusion, I now illustrate how the predictions in (19) and (20) substantiate the claims of MCS. The predictions are summarized below:

(22) **The correlation between inflectional (desinential) inventories and metaphony/raising**: if there is a mid/high contrast in the inflectional inventory, then a phonologically high trigger exists in that inventory. Dialects with such an inventory could also have the process of metaphony. Dialects without high triggers, as defined above, cannot have metaphony.

### 2.5. A raising dialect (desinential /E,A,O,U/ inventory, Pasiego Montañese)

I will begin to substantiate the predictions in (22) by discussing the raising dialect of Pasiego, showing that in Pasiego, only desinential /U/ exists as a high trigger for raising, and that Pasiego has asymmetrical raising. I introduce the patterning of the stem and desinential inventories of Pasiego in §2.5.1 and §2.5.2.

#### 2.5.1. Pasiego stem vowel inventory

Example (23) shows that Pasiego has the stem 5-vowel inventory /I,E,A,O,U/, as well as the falling diphthongs [je] and [we]. The stem vowels are enclosed in square brackets; the final vowel of the word is the desinence.

(23) **Pasiego, stem vowels (Penny 1969):**

<table>
<thead>
<tr>
<th>Non-raised</th>
<th>Raised (only the mid vowels raise)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. afili[t̠]ros</td>
<td>afili[t̠]ru</td>
</tr>
<tr>
<td>b. ab[j̠]rtos</td>
<td>ab[j̠]rtu</td>
</tr>
<tr>
<td>c. g[õ]rdo</td>
<td>g[û]rdu</td>
</tr>
<tr>
<td>d. k[w̠r]pos</td>
<td>k[w̠r]pu</td>
</tr>
<tr>
<td>e. br[á]θos</td>
<td>br[á]θu</td>
</tr>
<tr>
<td>f. luz m[î]yos</td>
<td>il m[î]yu</td>
</tr>
<tr>
<td>g. bj[ú]da</td>
<td>bj[ú]du</td>
</tr>
</tbody>
</table>

As discussed earlier, the stem vowels [é] (/E/; (23.a,b) and [ó] (/O/; (23.c,d)) raise to [í] and [ú] under the influence of final high /U/ ([u]). The remaining vowels are always realized as [a] (/A/ (23.e)), [i] (/I/ (23.f)) and [u] (/U/ (23.g)).

In Pasiego, raising is also triggered by the stem vowels [í] and [ú], affecting mid vowels to the left of the stressed stem vowels (the words in (23) are not long
enough to illustrate this process). This aspect of raising will be discussed in briefly in §2.5.4, and will be analysed in chapter 5.

2.5.2. **Pasiego desinential vowel inventory**

Example (24) shows that Pasiego has four desinential vowels, realized as [ə,a,o,u]. The desinential vowels are enclosed in square brackets in (24).

(24) **Pasiego desinential vowels (Penny 1969):**

<table>
<thead>
<tr>
<th>Masculine</th>
<th>Neuter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Singular</strong></td>
<td><strong>Singular</strong></td>
</tr>
<tr>
<td>(Count)</td>
<td>(Mass) Singular</td>
</tr>
<tr>
<td>/-u/</td>
<td>/-o/</td>
</tr>
</tbody>
</table>

a. mízm[u] mézm[o] mézm[a] ‘same, m.sg., neuter, f.sg.’
b. lixí[r] lixér[o] lixér[a] ‘light(weight), m.sg., neuter, f.sg.’
c. flúx[u] flóx[o] flóx[a] ‘lazy, m.sg., neuter, f.sg.’
d. íst[ə] ‘this (m.sg.)’; ést[a] ‘this (f.sg.)’; ést[o] ‘this (neuter sg.)’

Evidence for underlying /U/, /A/ and /O/ is provided in (24.a-c), and evidence for /E/ ([ə]) is shown in (24.d). I discuss the neuter singular category in §2.5.2.1 below. Pasiego has no distinction between mid and high front desinential vowels, as shown in (24), but does have a contrast between mid and high back vowels in the desinential inventory, as shown in (24.a-c)—the Pasiego desinential inventory is an example of the asymmetrical inventory /E,A,O,U/.

MCS predicts that dialects with type /E,A,O,U/ inventories should have only one high trigger, /U/. This prediction is borne out, in that dialects with desinential

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20 Pasiego verbs and adjectives also use desinences that are realized as [ə,a,o,u]. Pasiego also has a second person plural imperative ending for second conjugation verbs that is realized either as [éy] or as [í:]. The form [éy] and its assimilated variant [í:] are composed of a thematic vowel [e], and a second person plural ending [y] (yod). See example (31) for further discussion.

21 The masculine singular ending is used for masculine count nouns and adjectives. The neuter singular ending serves the special purpose of indicating mass nouns and adjectives (Penny 1970).
inventories equivalent to that in Pasiego (cf. (24)) have a ‘skewed’ type of raising that is only triggered by /U/ ([u]). I illustrate this claim in §2.5.3.

2.5.2.1. The mass neuter

The category designated as ‘mass’ in (24) requires further explanation which I provide in this section. In Pasiego, as in many metaphonizing dialects, there is a special category of word known variously as the ‘neuters of matter’ (neutros de materia; Penny 1970: 21), or the mass neuter. I refer to this desinence as the neuter singular in this chapter. This category denotes mass objects, abstract qualities, and substances in general, as opposed to count objects, concrete qualities, and specific items. In Pasiego, the mass neuter has a special desinential ending, [-o] (/O/), e.g. [késo] cheese (in general), which is distinct from the masculine singular ending [-u] (/U/), e.g. [un kísu] a (piece of) cheese, an individual cheese. Unlike the masculine singular, which has the plural counterpart [-os] (/Os/) (m.pl.), the mass neuter has no plural counterpart.

The mass neuter category can be realized in several ways. The realization in Pasiego was described above. In contrast, in Cabranes, an Eastern Asturian dialect discussed in §2.6.5.1.1, the mass neuter employs the same desinence as the masculine singular. The morphological distinction between desinential /U/ and /O/ thus exists no longer. However, a syntactic distinction between mass and count nouns is maintained in the phenomenon of non-concordance, described in §2.6.5.1.

In Italian dialects, the category of mass neuter may be realized as described above. In addition, however, many dialects have a mixed mass neuter category which draws from several etymological sources. It is not uncommon to have a moribund [-o] desinence in such dialects, but the usual method of denoting the mass neuter is with ‘defective’ nouns, i.e. nouns which occur either only in the singular or in the plural. For examples, refer to the discussion of Servigliano in §2.8 and Neapolitan in
§2.10. Also refer to the following sources: Alonso (1962), Blaylock (1965), Leonard (1978), Maiden (1991), and Penny (1970), among others.

2.5.3. ‘Skewed’ Desinential Vowel Raising in Pasiego

2.5.3.1. Raising triggered by /U/ ([u])

The examples in (25) illustrate that Pasiego has raising triggered by /U/ ([u]), but does not have raising triggered by /O/ ([o]). (In addition, the examples in (25.c) provide for comparison the stressed vowels which are unaffected by raising, viz. [í, á, ú].) For convenience, the underlying stem vowels representations are shown in the leftmost column in (25).

(25) Raising triggered by desinential /U/ ([u]) in Pasiego (Penny 1969: 151):

<table>
<thead>
<tr>
<th>Raised forms:</th>
<th>Non-Raised forms:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. /E/</td>
<td></td>
</tr>
<tr>
<td>lix[í]ru</td>
<td>lix[é]ra</td>
</tr>
<tr>
<td>‘light(weight) m.sg.’</td>
<td>‘light(weight) f.sg.’</td>
</tr>
<tr>
<td>gw[í]nu</td>
<td>gw[é]na</td>
</tr>
<tr>
<td>‘good m.sg.’</td>
<td>‘good f.sg.’</td>
</tr>
<tr>
<td>nw[í]stru</td>
<td>nw[é]stra</td>
</tr>
<tr>
<td>‘our m.sg.’</td>
<td>‘our f.sg.’</td>
</tr>
<tr>
<td>b. /O/</td>
<td></td>
</tr>
<tr>
<td>fl[ú]xu</td>
<td>fl[ó]xa</td>
</tr>
<tr>
<td>‘lazy m.sg.’</td>
<td>‘lazy f.sg.’</td>
</tr>
<tr>
<td></td>
<td>fl[ó]xo</td>
</tr>
<tr>
<td>‘lazy, neuter singular’</td>
<td></td>
</tr>
<tr>
<td>pal[ú]tu</td>
<td>pal[ó]ta</td>
</tr>
<tr>
<td>‘match’</td>
<td>‘match (alternative form)’</td>
</tr>
<tr>
<td>c. /A/</td>
<td></td>
</tr>
<tr>
<td>m[á]lu</td>
<td>m[á]la</td>
</tr>
<tr>
<td>‘bad m.sg.’</td>
<td>‘bad f.sg.’</td>
</tr>
<tr>
<td>/I/</td>
<td></td>
</tr>
<tr>
<td>l[í]mpju</td>
<td>l[í]mpja</td>
</tr>
<tr>
<td>‘clean m.sg.’</td>
<td>‘clean f.sg.’</td>
</tr>
<tr>
<td>/U/</td>
<td></td>
</tr>
<tr>
<td>s[ú]θju</td>
<td>s[ú]θja</td>
</tr>
<tr>
<td>‘dirty m.sg.’</td>
<td>‘dirty f.sg.’</td>
</tr>
</tbody>
</table>

The examples in (25.a) and (25.b) provide evidence for raising triggered by desinential /U/, and for lack of raising triggered by desinential /O/ and /A/. Words with the same stem can end with desinential /U/ ([u]) or /A/ ([a]) or /O/ ([o]). The stems that end with desinential /U/ ([u]) surface with a high, stressed vowel, while the stems that end with desinential /A/ ([a]) or /O/ ([o]) preserve the underlying mid quality of the stressed vowel. For example, the underlying /O/ in [flóxo] and in

In the literature (e.g. Penny 1969, Hualde 1989), it has been argued that some instances of desinential [ə] trigger raising. The assumption is that [ə] realizes a high front vowel desinence which is reduced to [ə] in word-final position. As illustrated in (26), however, most instances of desinential [ə] do not trigger raising.

(26) Lack of raising triggered by /E/ [ə]:

a. /E/ sj[ê]tə ‘seven’ sw[ê]rtə ‘luck’
b. /O/ t[ô]rpə ‘torpid’ t[ô]rə ‘tower’

The mid vowels /E/ ([ê]; (26.a)) and /O/ ([ô]; (26.b)) are generally not raised when the final desinence is /E/ ([ə]). I argue below against the hypothesis that the desinence [ə] ever triggers raising.

2.5.3.2. Raising triggered by /I/ ([ə])?

The literature on Spanish contains several arguments to the effect that Pasiego [ə] is a reduced vowel, instantiating both underlying /I/ and /E/ (cf. Hualde 1989, Penny 1969); a corollary of this argument is that instances of surface [ə] that derive from underlying /I/ trigger raising in Pasiego. I argue against the latter analysis in this section. I present the strongest potential examples below, arguing that they provide evidence for metaphony triggered by an historical process rather than a synchronic process. I thus argue that Pasiego has an asymmetrical desinential inventory, /E,A,O,U/, rather than a symmetrical inventory, /I,E,A,O,U/. This argument then paves the way for demonstrating one of the more interesting claims of MCS, namely that given asymmetrical inventories such /E,A,O,U/, and given the existence of a rule of metaphony, then the language in question should display asymmetrical metaphony.
Table (27) presents a paradigm which has been used as evidence for a productive, synchronic process of metaphony triggered by desinential [ə], analyzed by Hualde (1989) as /I/, a high vowel.

(27) Pasiego: Raising triggered by desinential /I/ ([ə])? (Penny 1969:115):

<table>
<thead>
<tr>
<th></th>
<th>feminine</th>
<th>masculine</th>
<th>neuter</th>
</tr>
</thead>
<tbody>
<tr>
<td>pl.</td>
<td>[é]stas</td>
<td>[é]stos</td>
<td>-------</td>
</tr>
<tr>
<td>sg.</td>
<td>[é]sa</td>
<td>[í]sə</td>
<td>[é]so</td>
</tr>
<tr>
<td>pl.</td>
<td>[é]sas</td>
<td>[é]sos</td>
<td>-------</td>
</tr>
</tbody>
</table>

The stems in (27) alternate between [est]/[ist] and [es]/[is]. These alternations provide apparent evidence for raising, as shown in the derivation in (28):

(28) Possible derivation of f.sg. and masc. sg. demonstrative pronouns, illustrating raising triggered by word-final underlying /i/:

<table>
<thead>
<tr>
<th></th>
<th>Non-raised:</th>
<th>Raised:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>/est + a/</td>
<td>/est + i/</td>
</tr>
<tr>
<td>Metaphony</td>
<td>---------</td>
<td>{íst + i}</td>
</tr>
<tr>
<td>Other rules, Surface form</td>
<td>[ésta]</td>
<td>[ístə]</td>
</tr>
</tbody>
</table>

As illustrated in (28), Hualde (1989) assumes schwa to be the word-final realization of both underlying /E/ and /I/, and assumes that the high-vowel variants of the stems in (27) are the result of raising triggered by underlying /I/, which reduces to [ə] afterwards.

However, I maintain that the high vowel variants of the stems in (27) are fossilized forms, left over from an earlier stage when Pasiego had a desinential inventory that also contained /I/, and also a productive raising process triggered by /I/. There is evidence in favour of the latter analysis over Hualde’s analysis in (28). First, the neuter singular form in (27) unpredictably has either non-raised [est] or raised [ist] in the derivational stem, even though the desinential vowel in the neuter singular is non-high [-o] (/O/), a vowel which does not trigger raising. (The unpredictable
form is reported in Penny 1969: 115, footnote 4.) This fact favours the fossilization analysis, providing evidence for lexicalization or unpredictability.

Another argument in favour of the fossilization analysis is that there is a quantitative difference between raising triggered by [u] (/U/) and raising triggered by [ə] (/I/). For example, raising triggered by [u] (/U/) occurs with all masculine singular nouns (examples number in the thousands); on the other hand, Penny (1969) reports only six cases of raising triggered by [ə] in nouns. These six cases are listed in (29).

(29) Apparent instances of raising triggered by [ə] in the nouns (SS = Standard Spanish):

<table>
<thead>
<tr>
<th>Penny (1969)</th>
<th>SS equivalent</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. m[ú]ntə/m[ó]ntə</td>
<td>monte</td>
<td>mountain</td>
</tr>
<tr>
<td>b. pw[í]ntə</td>
<td>puente</td>
<td>bridge</td>
</tr>
<tr>
<td>c. xw[í]ntə/xw[í]ntə</td>
<td>fuente</td>
<td>fountain</td>
</tr>
<tr>
<td>d. n[ú]cə/n[ó]cə</td>
<td>noche</td>
<td>night</td>
</tr>
<tr>
<td>e. xw[í]rtə/xw[í]rtə</td>
<td>fuerte</td>
<td>strong</td>
</tr>
<tr>
<td>f. t[æ]rdə</td>
<td>tarde</td>
<td>afternoon</td>
</tr>
</tbody>
</table>

Based on a comparison between Standard Spanish and Pasiego, examples (29.a-c) might be analysed as metaphonized forms containing underlying mid stem vowels with metaphony triggered by the desinential vowel /I/ ([ə]); however, such an analysis would be based solely on comparative evidence from the height of the stressed vowels in these Pasiego examples with the height of their Standard Spanish equivalents. There are no synchronic alternations from Pasiego to support the hypothesis that the high stressed vowels in (29.a-c) are raised over the hypothesis that these high vowels are underlyingly high.

For examples (a) and (f), I have substituted IPA transcriptions based on Penny’s description of the vowels involved. Penny uses [u:] for the centralized, high back rounded vowel, [a] (an extremely fronted [a], similar but not quite like [ɛ]) for [æ], and [i:] for the centralized, high front unrounded vowel.
On the other hand, examples (29.a-d) show that non-raised forms exist alongside of the raised forms, indicating that no clear case for metaphony triggered by final [-ə] can be made. Example (29.f)—listed by Penny as an example of metaphony—illustrates the effect on /A/ of centralization, a process that accompanies raising (/A/ becomes [æ] rather than [a] as a result of centralization; for details on centralization, see Hualde 1989, McCarthy 1984, Penny 1969 and §2.3.2.2); however, it does not illustrate raising, the process in question. (29.f) is a somewhat anomalous form, since the stressed vowel is centralized, and none of the other potential examples of raising triggered by [ə] involve centralization. For example, the form [ístə] is not realized as [íˈstə], with the centralized vowel [i].

The examples in (29) do not provide compelling evidence for a productive process of raising triggered by [ə]. In particular, there are no alternations between mid and high stressed vowels such as those which provide evidence for raising by desinential /U/ in (25), and therefore there is no reason for providing a more abstract, underlying form than the surface forms shown in (29). I conclude that high stem vowels in (29) are lexically listed, and not the result of raising: (24.a-c) have the underlying forms /mUnt-E/ [múntə], /pwInt-E/ [pwíntə], and /xwInt-E/ [xwántə]. (24.d) has two lexical entries, viz. /nUć-E/ [núćə] and /nOć-E/ [nóćə]. (24.e) has the lexical entry /xwErt-E/, realized as [xwėrtə], with a slightly phonetically raised [ɛ], and (24.f) is anomalous. Note that in the plural of this word, [tárdəs] ‘afternoons’, centralization of the stem vowel [á] is not recorded (Penny 1969: 51).

Other evidence for raising triggered by [ə] includes the patterning of the second person singular imperatives of the second conjugation (Hualde (1989)). The following is a comprehensive list of second conjugation imperatives (the other 74 second conjugation verbs listed in Penny 1969 do not include imperative forms).
Examples (30.a-d) display apparent metaphony: the underlying mid vowel, which surfaces in the infinitives, raises to high when followed by [ə]; these are the clearest examples providing evidence for the possible derivation in (28). Hualde argues that in this type of example, second singular imperatives have the underlying high desinence [i]; this desinence triggers raising of the stressed stem vowel, and then reduces to [ə].

The other examples in (30) are less clear exemplars of Hualde’s hypothesis. Examples (30.e,f) have raised diphthongs rather than simple high vowels. Penny claims that the presence of diphthongs in (30.e,f)—although not the raising of the diphthongs—represents influence from Castilian; examples (30.e,f), then, may not clearly argue for an original dialect characteristic. Example (30.g) has both metaphonized and non-metaphonized alternants; this form indicates that metaphony in the forms in question might be lexicalized. The remaining examples provide no

<table>
<thead>
<tr>
<th></th>
<th>2nd conjugation infinitives:</th>
<th>2s imperatives; apparent raising:</th>
<th>page of reference:</th>
<th>translation:</th>
<th>metaphony?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b[e]bér</td>
<td>b[i]bè b[i]bilu tôu</td>
<td>p. 46 p. 124</td>
<td>Drink! Drink it all!</td>
<td>yes yes</td>
</tr>
<tr>
<td>b</td>
<td>g[o]yér</td>
<td>g[ù]yè</td>
<td>p. 124</td>
<td>Look!</td>
<td>yes</td>
</tr>
<tr>
<td>c</td>
<td>korér</td>
<td>kùrè</td>
<td>p. 124</td>
<td>Run!</td>
<td>yes</td>
</tr>
<tr>
<td>d</td>
<td>m[e]tér</td>
<td>m[i]tè m[i]tilw àj</td>
<td>p. 425 p. 65</td>
<td>Put! Put it here!</td>
<td>yes</td>
</tr>
<tr>
<td>e</td>
<td>g[o]llbér</td>
<td>g[wel]blè g[wí]blè</td>
<td>p. 124 p. 378</td>
<td>Return! Return!</td>
<td>yes</td>
</tr>
<tr>
<td>f</td>
<td>g[o]lér</td>
<td>g[wel]lè</td>
<td>p. 378</td>
<td>Smell!</td>
<td>yes</td>
</tr>
<tr>
<td>g</td>
<td>k[o]mér</td>
<td>k[ó]mè k[kú]mè</td>
<td>p. 124</td>
<td>Eat!</td>
<td>no; two alternate forms</td>
</tr>
<tr>
<td>h</td>
<td>p[o]nér</td>
<td>p[ó]n</td>
<td>p. 124</td>
<td>Take!</td>
<td>n/a</td>
</tr>
<tr>
<td>i</td>
<td>t[e]nér</td>
<td>t[é]n</td>
<td>p. 124</td>
<td>Have!</td>
<td>n/a</td>
</tr>
<tr>
<td>j</td>
<td>[a]θér</td>
<td>[á]θè</td>
<td>p. 124</td>
<td>Do!</td>
<td>n/a</td>
</tr>
<tr>
<td>k</td>
<td>d[i]θír, diθér, iθér (same lexical item)</td>
<td>d[i]θè</td>
<td>p. 120</td>
<td>Say!</td>
<td>no</td>
</tr>
</tbody>
</table>
evidence for or against the hypothesis in question: two are truncated forms to which metaphony cannot apply (30.h,i); and two contain vowels are unaffected by metaphony (30.j,k).

Rather than the metaphony-and-reduction account illustrated in (28), I maintain that the raised forms in (30) are historic residue whose raised variants are strongly favoured by analogy from the second plural imperatives of the second conjugation. The latter have two regular alternants which contain either raised or non-raised vowels, as illustrated in (31).

(31) Second singular and plural imperatives of the second conjugation (based on Penny 1969: 124):

<table>
<thead>
<tr>
<th></th>
<th>Infinitive</th>
<th>2s imperative form</th>
<th>2 pl imperative forms(^\text{23})</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>stem + ér</td>
<td>stem + ò</td>
<td>stem + éy or stem + ĭ</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>b[ë]bér</td>
<td>b[i]bö</td>
<td>b[ë]béy or b[i]bï:</td>
<td>drink</td>
</tr>
<tr>
<td>c</td>
<td>g[o]yér</td>
<td>g[i]yö</td>
<td>g[o]yéy or g[u]yï:</td>
<td>hear</td>
</tr>
<tr>
<td>d</td>
<td>k[o]rër</td>
<td>k[ù]rø</td>
<td>k[o]rëy or k[u]rï:</td>
<td>run</td>
</tr>
<tr>
<td>e</td>
<td>m[e]tër</td>
<td>m[i]tö</td>
<td>m[e]téy or m[i]tï:</td>
<td>put</td>
</tr>
<tr>
<td>f</td>
<td>g[o]lër</td>
<td>g[wë]lø</td>
<td>g[o]léy or g[u]lï:</td>
<td>smell</td>
</tr>
</tbody>
</table>

(31.a) gives the morphological structure of the examples. In particular, the stem is followed by an affix, either the infinitival [ér] (/Er/), the second singular imperative [ə], or the two alternative second plural imperative endings [éy] and [î:]. In Pasiego, the imperative ending [î:] derives from {éy} via assimilation Penny (1969: 124). My synchronic morphological analysis of the imperative ending [éy] is based on the historical development of this ending: historically, [éy] derives from a thematic vowel, /e/, followed by /y/ (yod). The yod derives from the Vulgar Latin second person plural marker *TE (Penny 1969:123). I assume that synchronically, [éy] is composed of the thematic vowel /e/ and a person/number ending, /y/.

\(^{23}\) All of the forms in (31) are extrapolated from Penny’s description of 2.pl. imperatives of second conjugation verbs; the verb [komér] in (30) is the only example actually provided in the text.
A comparison of the infinitival forms and the second singular imperative forms establishes that the underlying vowels of the stems in (31) are mid /E/ or /O/, and that raising has apparently taken place in the second singular imperative forms.

In the second plural imperative forms which have the affix [í:] (derived from /e+y/) the stem vowels are also raised. The stem vowels in square brackets in the second plural imperative forms in (31) are raised by a process of raising which has not yet been discussed; this aspect of metaphony is triggered by stressed vowels, and it targets /E,O/ preceding main word stress (see §2.5.4 for details).

Taking the verb [komér] ‘to eat’ as an example, the second-plural imperative generally has two forms, either [koméj] (without metaphony) or [kumí:] (with metaphony). I hypothesize that the second singular imperative forms of this verb, namely [kómø] and [kúmø] may have been formed on analogy with the similar second plural imperatives. Other forces which might favour the preservation of ‘raised’ vowel variants include confusion between the second and third conjugations: for example, the verb ‘to hear’ is both a second conjugation verb [goyér] and a third conjugation verb [guyír] (Penny 1969). Given such potential explanations as analogy, and confusion between the second and third conjugations, I argue that the source of raising in the stem vowels of second singular imperatives is unclear. Thus, none of the apparent examples discussed above present clear arguments for raising triggered by [ø].

2.5.3.3. Summary

In summary, I conclude that instances of raising triggered by desinential [ø] in Pasiego represent lexicalized historical residue rather than synchronically-derived forms. Raising triggered by desinential [u] (/U/), on the other hand, is synchronic and productive, as demonstrated in §2.5.3.1. Pasiego thus exemplifies the type of
patterning predicted for type /E,A,O,U/ inventories in (5)—in such inventories, only /U/ is phonologically high, and only /U/ can trigger raising.\textsuperscript{24}

In summary, the Pasiego data provides evidence that raising is only possible where the appropriate phonological trigger exists:

(32) Metaphony in Pasiego:

Desinential inventory: Triggers of metaphony:

\begin{tabular}{ccc}
\toprule
 & U & U \\
E & O & A \\
\bottomrule
\end{tabular}

In particular, when there is a mid vs. high contrast in the front vowel region, as in the stem inventory (32.a), then metaphony triggered by /I/ is possible; however, when there is no mid vs. high contrast in the front vowel region, as in the desinential inventory (32.b), then no phonologically high front vowel trigger exists. This example shows that even in the same dialect, the presence of possible triggers is constrained by the types of contrasts within a given inventory.

2.5.4. \textit{Metaphony triggered by stem vowels in Pasiego}

Pasiego has been analysed as having an additional process of raising that is triggered by high stressed vowels and which targets mid vowels preceding main stress (c.f. Hualde 1989, McCarthy 1984, Penny 1969). For completeness, I briefly introduce this process here, but reserve further discussion until chapter 5 for reasons discussed below.

Metaphony triggered by stem vowels is illustrated in (33):

\textsuperscript{24} An alternative hypothesis which might explain the lack of raising triggered by Pasiego /E/ ([ə]) is that schwa is not phonetically high. This phonetic explanation would not require the concept of contrast as developed in this chapter. Evidence against the phonetic hypothesis is provided in chapter 4.
Modified Contrastive Specification 41

(33) Pasiego; Raising within the stem, triggered by derivational /I/ and /U/ (Penny 1969: 52-53; 121); morphemes are separated by dots:

Raised forms: Non-raised forms:
a. r[i]gúr.u r[e]gér.os ‘marsh, marshes’
k[u]θ.in.a k[o]θ.ér ‘cooking (n.), to cook’
k[u]θ.in.u k[o]θ.ér ‘large type of pot, to cook’
b. g[u]lú.s.u g[o]lós.os ‘curious, nosy’
m[i]ntrírús.u k[o]nléxos ‘cooking’
p[u]trúc.os k[o]nléxos ‘large type of pot’
θ[i]ríxu θ[e]róxos ‘bolt, bolts’
k[u]nixu k[o]nixu ‘rabbit, rabbits’

Example (33.a) shows that when the stressed (stem) vowel is [í], the preceding vowel is also high; (33.b) shows that when the stressed (stem) vowel is [ú], the preceding vowel is high. The non-raised forms show that when the stressed vowel is non-high, the preceding vowel is also non-high.

In the literature on Pasiego, it is argued that all the vowels in a derivational stem must agree for [high], so that a form like ‘*[m_enterůsos] is not possible (cf. Hualde 1989, McCarthy 1984, Penny 1969; see also chapter 5, §5.4.2 for discussion).

More direct evidence for this argument comes from examples such as [putrůc̥os] colts. In this example, the stem vowel [ú] alone is sufficient to cause raising, since the desinential vowel is non-high [-o]. Another example comes from the forms [kuθína] cooking and [kuθínu] large pot which illustrate that it is the presence of the stem vowel [í]—rather than the desinential vowel [u]—that causes the first vowel of the stem [kuθ-]—underlying /kOθ-/—to surface as high. Morphologically, the forms in question contain a root /kOθ-/ , a derivational affix /-In/ , and a desinence, either /-A/ or /-U/ (Penny 1969: 106). Again, the presence of a high stem vowel alone is sufficient to trigger raising in the form [kuθína].

If the process illustrated in (33) were metaphony, it would provide striking evidence for my hypothesis. However, in chapter 5, I introduce data showing that the patterning of pre-main-stress vowels is not as categorial as the above description leads one to believe. In particular, I show that a) raising of mid vowels before high
stressed vowels may fail to occur; b) mid vowels can raise even when the stressed vowel is non-high; and c) high vowels may lower to mid before non-high stressed vowels. This evidence shows that pretonic raising is clearly different from the type of raising that is triggered by desinences and which targets main-stress vowels. The former is not categorial, while the latter is virtually exceptionless. Because pretonic raising patterns differently from raising between desinences and main-stress vowels, I analyse pretonic raising as a different type of process, i.e. not as metaphony. I reserve discussion of pretonic raising to chapter 5, §5.4.2, at which time the necessary theoretical background will have been introduced.

2.6. **Raising and the mid/high contrast in Asturian-Leonese dialects**

In this section, I present additional evidence for the claim that raising is possible only when there are contrastively-defined phonologically high vowels in the desinential inventory. I examine the group of Asturian-Leonese dialects, some of which display metaphony, exemplifying the correlation between 1) the presence/absence of a mid/high contrast in the desinential inventory and 2) the presence/lack of raising. In particular, I demonstrate the following:

1) In Asturian-Leonese, there is no robust desinential /I/ (this claim reflects some historical facts which are discussed below), and no raising triggered by /I/.

2) In Asturian-Leonese, raising triggered by desinential /U/ only occurs where there is still a robust distinction between desinential /U/ and /O/; raising does not occur in dialects that have lost this contrast.25

These facts have been noted in the literature, as shown by the following quotation from Penny.

---

25 Pretonic metaphony, discussed earlier, occurs only in the Montañese dialects of Spanish. (Some Italian dialects have pretonic metaphony as well.)
(34) Asturian-Leonese dialects in general:
...metaphony only operates regularly where 1) the vowel resulting from [Vulgar Latin] -U(M) has been fully closed to -u and 2) the morphemic distinction of -u and -o is pertinent. That is to say that metaphony can only be observed to operate regularly (i.e. in 100 per cent of possible cases) in areas where mass-nouns possess a special ending ([-o]). (Penny 1970: 27)

In summary, I will demonstrate in the following section that raising can only occur in dialects with the desinential inventory in (35.a); raising cannot occur in the dialects with the desinential inventory in (35.b). Parentheses in (35) indicate desinences similar to Pasiego ‘raising-[ə]’, i.e. desinences which are historical archaisms.

(35) Desinential inventories and raising in Asturian-Leonese:

a. Raising triggered by /U/:
   ![Table]

   (I)  U   (I)  (U)
   E    O   E    O
   A    A

   I illustrate the above claims in more detail through the following survey of Asturian-Leonese dialects. (The reader is referred to Maps A through C in the appendix to this chapter for details of the geographic layout of the Asturian-Leonese dialects.)

2.6.1. Preliminaries

In this section, I survey Asturian-Leonese dialects, drawing on Granda’s (1960) survey of desinences in Asturian-Leonese, and also on several other primary sources. The type of data relevant for the following discussion of the desinences is listed in (36). As discussed earlier, the angle brackets <> denote orthographic representations.
(36) Types of data relevant for Asturian-Leonese desinences

a. demonstrative pronouns
   <este/isti> this
   <ese/isi> that
   <illi/elli/él> he
   <aquelli> that one (further away)

b. nouns and adjectives
   desinential <-i> or <-e>, required for phonotactic purposes
   <-o> or <-u> masculine singular
   <-os> or <-us> masculine plural
   <-o> neuter singular, in dialects that have it

c. verbs
   <-sti/-ste> 2nd person singular preterite
   <-stis/-stes/-steis> 2nd person plural preterite
   <-o> 1st person singular present tense
   <-mos> 1st person plural present tense
   <-on> 3rd person plural present tense
   <-ndo> gerund

For this section, I use an underlined I to indicate the variants high front [i] and lowered high front [i] reported in the literature, an underlined E to indicate the variants mid front [e] and raised mid front [ê], an underlined U to indicate the phonetic variants high back rounded [u], lowered high back rounded [u], and raised high back rounded [u], and an underlined O to indicate the variants mid back rounded [o], centralized mid back rounded [ɔ], raised mid back rounded [o], and centralized, raised mid back rounded [o]. Small-case letters are used to indicate attested examples, eg. the desinence [i]. Finally, the penultimate vowel of every form is a stressed stem vowel, while the final vowel of every form is an unstressed desinence vowel.

§2.6.2 through §2.6.7 are organized as follows: I discuss front vowel desinences, followed by back vowel desinences; then I present a conclusion as to what comprises the desinential inventory of each dialect.
2.6.2. Western Asturias

The desinential inventory of Western Asturian dialects is summarized in (37).

(37) Western Asturian desinential inventory:

<table>
<thead>
<tr>
<th>Phonetic/orthographic inventory</th>
<th>Phonological inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) u/o</td>
<td>(I)</td>
</tr>
<tr>
<td>i/e</td>
<td>E</td>
</tr>
<tr>
<td>a</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>A</td>
</tr>
</tbody>
</table>

Western Asturian (WA) dialects have several archaic desinences which are realized as [i]; the parentheses around (I) indicate that this phoneme is marginal or archaic. The phoneme /E/ is realized as either [e] or [i] in WA dialects, depending on such factors as a) dialect-particular phonetic realization, and b) phonetic influence from adjacent segments (i.e. from palatal consonants). The phoneme /O/ is realized either as [o] or [u], depending on the abovementioned factors. Finally, /A/ is realized as [a]. I review evidence for these observations below.

Example (38) summarizes the available data for front vowel desinences in Western Asturias. The term ‘general’ indicates the overall pattern; specific dialect forms are named by dialect location (municipality).
(38) Front vowel desinences in WA (Granda 1960: 88):

a. pronominal forms:

   general: 
   
   [e]st[i]/[e]st[e]  this m.s.  
   [e]s[i] / [e]s[e]  that m.s.  

   Bandujo and Villanueva de Teberga:

   [i]st[i]  vs.  [e]sta  this m.s.  vs  this f.s.  
   [i]s[i]  vs.  [e]sas  that m.s.  vs.  that f.pl.

b. nominal forms

   general
   
   [i ~ e]26

   Quirós  nuets<e>  night
   Tameza  anuets<e>  night
   Proaza  anuets<e>, anuech<i>, nueuech<e>  night

c. verbal forms:

   Salas, Labio  <mataste>  <matastes>  you s. killed, you pl. killed  
   <perdisti>  <perdistes>  you s. lost, you pl. lost  
   <partiste>  <partiestes>  you s. left, you pl. left

   Soto de los Infantes  <mataste>  <matastes>  you s. killed, you pl. killed  
   <perdisti>  <perdistes>  you s. lost, you pl. lost  
   <partiste>  <partiestes>  you s. left, you pl. left

As summarized in (38.a,b), the WA pronominal and nominal desinences in question vary between [i] and [e], even in the speech of the same person (Rodríguez-Castellano 1954, cited in Granda 1960: 100). In one locale (Bandujo and Villanueva de Teberga), there are some possible historical examples of metaphony in that both the stem and the desinence vowel are high in the masculine singular pronominal form [isi] but not in the feminine singular form [esta]. However the general situation, as illustrated by both the pronominals and the nominals, is unpredictable variation between [i] and [e]; this observation provides evidence for only one front vowel desinence as there is no evidence for contrast between /I/ and /E/.

The verb examples in (38.c) illustrate two important points. First, the choice of the desinence [i] or [e] is apparently random—for example, in Salas, we find both

---

26 “This vowel, like [o], is variable and short, easily turning into either one or the other variant.” My loose translation of “...se trata, al igual de la o, de una vocal fluctuante y breve que con facilidad se inclina hacia una u otra variante.” Rodríguez-Castellano (1954: 151), cited in Granda (1960:100).
[partist] and [perdisti] in 2nd person singular preterites. Second, the height of the penultimate vowel is independent of the height of the desinence vowel—in the same examples just mentioned, the penultimate vowel is [i], while the desinence vowel is either [i] or [e].

To explain the complex patterning illustrated in (38.c), I adopt Granda’s analysis in which the verbal endings <-sti> and <-stis> are viewed as retentions of the Vulgar Latin final high vowel, while the verbal endings <-ste> and <-stes> are modernized versions (Granda 1960). In a given dialect, both [i] and [e] verbal desinences may occur, depending on how much that dialect perpetuates the historic state of affairs (Granda 1960: 93). Crucially, however, the (lack of) patterning demonstrated in (38.c) provides no evidence for metaphony triggered by [i] (/I/). Instead, it provides evidence for a marginal desinential I/E distinction which was more active in the past than in the present. I conclude that the forms containing [i] in (38) provide evidence for a marginal, archaic desinence /(I)/ rather than for a full contrast between desinential /I/ and /E/. For analysis of archaic desinences such as /(I)/, see §2.10.2.3.

Table (39) summarizes the evidence concerning the U/O distinction in WA. Each row summarizes the desinences found in a given municipality; the second column summarizes the desinence vowels found in masculine singular and masculine plural nouns and adjectives (masculine plurals are sometimes not reported). The third column summarizes available evidence as to whether there is a special category of neuter singular ([-o], /O/) vs. masculine singular ([-u], /U/). Finally, the fourth column summarizes the vowels found in verb desinences.
The U/O distinction Western Asturias (Granda 1960: 30-4):

<table>
<thead>
<tr>
<th>Municipality</th>
<th>desinences for masc. sing. vs. masc. pl. (nouns and adjectives)</th>
<th>evidence for masc. sing. vs. neuter sg. (nouns and adjectives)?</th>
<th>verb desinences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples from several municipalities:</td>
<td>tsob[u] wolf</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>tiemp[ü] time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>cuerpa[o] body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>rouc[u/o] gloss not provided in the source</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>perr[o] dog</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navia (various sites)</td>
<td>U (m.s.)</td>
<td>no evidence for a special form for mass-nouns (Penny 1970: 23)</td>
<td>U</td>
</tr>
<tr>
<td>Villayón, Cangas del Narcea, Luarca, Cudillero, Tineo, Salas, Belmonte, Somiedo, Castrillón, Illas, Grado, Tameza, Proaza</td>
<td>U or O (m.s.), depending on the locale</td>
<td>not reported</td>
<td>U or O, depending on the locale</td>
</tr>
<tr>
<td>Allande</td>
<td>U (m.s.)</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td></td>
<td>U (m.s.) vs. Os (m.pl.) in one village only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ibias</td>
<td>U (m.s.)</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td></td>
<td>Us (m.pl.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pravia</td>
<td>O (m.s.)</td>
<td>not reported</td>
<td>not reported</td>
</tr>
</tbody>
</table>

As illustrated in (39), in Western Asturias, the back vowel desinences generally use one phoneme whose phonetic realization varies between open [u] and close [o], and also can be realized as the fronted variant [ü]. Examples of the variation in the nominal desinences are provided in (39)—note that the masculine singular desinence can vary between [u] and [o], and can even be as far front as [ü]. Examples from the verbal desinences are shown in (40):

---

I analyse this type of example in more detail §2.6.3, reserving discussion until then because the U vs. Os pattern is not common in the Allande dialect.

---
(40) Back vowel verbal desinences in Western Asturias:

a. Cangas del Narcea

Villaoril

\[\text{conoz}[\circ] \] I know
\[\text{merz}[u] \] translation not provided in the source
\[\text{cantan}[o] \] translation not provided in the source

Escrita

\[\text{fadem}[o]s \] translation not provided in the source
\[\text{fadiend}[o] \] translation not provided in the source

b. Salas

Arbodas

\[\text{perdiem}[o]s \] we lose

La Espina

\[\text{perdiem}[o]s \] we lose

In Cangas del Narcea, a close, mid back rounded vowel is preferred in one locale (Villaoril), while more open [o] is preferred in Escrita and in Salas.

Returning to (39), in some locales, the masculine singular desinence is [u], while the masculine plural desinence is [os]. For example, in Santa Olaya de Allande (Concejo of Allande), masculine singular nouns end with [u], as in [tsobu] wolf and [suenu] sound while masculine plurals end with [os] as in [fios] sons, [ximelgos] twins? (translation not provided in the source) (Granda 1960: 32). The analysis for these observations is similar to that for Pasiego discussed in §2.5.2.1, namely that the masculine singular desinence is underlyingly /U/ while the masculine plural desinence is /Os/. I do not believe that this type of variation provides strong evidence for a phonological distinction between desinential /U/ and /O/—in the literature, variation such as [u] vs. [os] is viewed as the result of historical development; for example, either as the retention of Vulgar Latin ū (from the desinence *ūm accusative (Granda 1960: 43) or as the development of a general tendency to raise masculine singular [u] in absolute final position (cf. Granda 1960). (For a synchronic analysis of this variation, see §2.6.3.2.1.1.1.) In the literature, the distinction between masculine singular [u] and mass neuter [o] is viewed as better evidence for a phonological distinction between desinential /U/ and /O/, a position which I adopt here.
In summary, the data in (40) provide evidence for one back rounded desinence, /O/, which is realized as a vowel ranging between [u] and [o]. There is little evidence for a contrast between desinential /U/ and /O/ in WA.

Penny (1970) observes only a ‘slight tendency to metaphony’ in Western Asturias but gives no examples. I assume that the latter description can be interpreted as the historical remnants of a once-productive process.

Given the productive desinential inventory of [i/e, a, o/u] (where ‘i/e’ indicates phonetic variation between [i] and [e], while ‘o/u’ indicates phonetic variation between [o] and [u]), metaphony is not expected in Western Asturias. Thus, WA dialects lend some support to the hypothesis that metaphony cannot occur unless the feature [high] is phonologically motivated: there is no evidence for the feature [high] in the vowel system, and no metaphony occurs.

2.6.3. Central Asturias

2.6.3.1. General

The desinential inventory of Central Asturian dialects is summarized in (41):

(41) Central Asturian desinential inventory

<table>
<thead>
<tr>
<th>Phonetic inventory</th>
<th>Phonemic inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>(I)</td>
</tr>
<tr>
<td>i/e</td>
<td>E</td>
</tr>
<tr>
<td>a</td>
<td>A</td>
</tr>
<tr>
<td>u</td>
<td>U</td>
</tr>
<tr>
<td>o</td>
<td>O</td>
</tr>
</tbody>
</table>

Central Asturian dialects have archaic [i] desinences, indicated by /(I)/. The phoneme /E/ is realised as a vowel ranging between [i] and [e], and /A/ is realized as [a]. Central Asturian dialects have a robust phonemic distinction between /U/ and /O/. Evidence for these observations is provided below. (42) summarizes the range of forms that front vowel desinences exhibit.
Central Asturian front vowel desinences (Granda 1960: 89, 102, 107):

Municipality:

a. Demonstrative pronouns: Personal pronouns:

   Aller [i/e]st[i/e] this m.s. [i]st[i] that m.s.
   vs. [e]sta this f.s.
   Lena <isti> this m.s. <illi> he
   <isi> that m.s. <elli> he

   Mieres, Langreo <isti> this m.s.
   <isi> that m.s. no data

   b. Nominal desinences:

   Gozón <llichi> milk
   Lena <nuiche> (no final <i> in this dialect) night
   Mieres <nuichi> night
   Aller usually [e]
   but also <nuichi>, <nueche>, <nuiche> night

c. 2nd s. preterites 2 pl preterites

   Lena <-iste> <-istes>
   <viniste> you s. came
   Llanos del <mateste> you s. killed <perdistis> you pl. lost
   Somerón <partistis> you pl. left
   Zureda <matestis> you pl. killed <perdistis> you pl. lost
   <partistis> you pl. left
   Aller <-sti> <-ste/-stes>

As shown in (42.a,b), the Central Asturian (CA) pronominal and nominal desinences in question vary between [i] and [e]; most of the data in (42) records phonemicized spellings, indicated by angle brackets; however, when phonetic data is available, the data indicate that the vowel in question is phonetically gradient.

The data from CA preterite forms, exemplified in (42.c), illustrate the same type of situation that we find in WA, namely that archaic <i> desinences coexist

---

alongside modernized <e> desinences in the same dialect. In addition, as shown in
the Zureda examples, the height of the <i> desinence does not trigger metaphony—
compare <matestis> and <perdistis>. In summary, the CA inventory of front vowel
desinences includes /(I),E/, where /(I/) is archaic and /E/ is realized as a non-low front
vowel of varying height. For analysis of archaic desinences, see §2.10.2.3.

Table (43) summarizes Granda’s (1960) data concerning Central Asturian
back vowel desinences:

(43) Metaphony in Central Asturias (Granda 1960: 36-7, 79):

<table>
<thead>
<tr>
<th>Municipality</th>
<th>masc. sing. vs. masc. pl.</th>
<th>masc. sing. vs. neuter sg.</th>
<th>verb forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lena</td>
<td>U (m.s.) O (m.pl.)</td>
<td>m.s. U n.s. O</td>
<td>O (see following section)</td>
</tr>
<tr>
<td>Mieres</td>
<td>U (m.s.) &lt;un tsubu&gt; a wolf</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td></td>
<td>O (m.pl.) &lt;los tsobos&gt; the wolves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aller</td>
<td>m.s. [u] m.pl. [os]</td>
<td>m.s. [u] n.s [o]</td>
<td>U or O eg. Nembra: [matemó] we kill [perdiemos] we lost [partiemus] we left</td>
</tr>
<tr>
<td>Laviana</td>
<td>U (m.s.)</td>
<td>not reported</td>
<td>O eg. &lt;llabramos&gt; gloss not provided in the source &lt;diximos&gt; we said</td>
</tr>
</tbody>
</table>

In some areas of Central Asturias, (Mieres, Lena, parts of Aller), the masculine
singular ending is U, while the masculine plural ending is Os. In the municipality of
Mieres, the singular is [tsubu] ‘wolf’ vs. plural [tsobos] ‘wolves’ (Granda 1960: 36). I
adopt the same analysis of these facts here as in §2.6.3.2.1.1.1, namely that in these
dialects the relevant underlying desinences are /U/ (masculine singular), /Os/ (masculine plural), and /O/ (neuter singular).

While the nominal masculine singular desinence is generally U, the verbal desinence tends toward O. This distribution provides evidence for a phonological U/O distinction, which could possibly be exploited (i.e. by having a raising process) in Central Asturian dialects. As discussed below, two of the Central Asturian dialects, namely Lena and Aller, do have raising.

Finally, as shown in (43), the metaphonizing dialects of Lena and Aller have two distinct vowels, U, for the masculine singular, and O, for the neuter singular desinence. This distinction between U and O in Lena and Aller is phonologically and morphologically significant and cannot be derived from either phonetic factors such as complementary distribution or from other factors such as dialect-particular variation. This type of evidence supports my claim that where there is a phonological contrast between U and O, it is possible to have the phonological rule of metaphony triggered by /U/, as is the case in Lena and Aller. I exemplify this point further by discussing the dialect of Lena in greater detail.

2.6.3.2. Lena (Central Asturias region)

2.6.3.2.1. The desinential inventory of Lena

Lena has essentially the same desinential inventory as Pasiego (type /E,A,O,U/); in addition, as shown in (44), Lena has archaic /(I)/ desinences.

(44) Lena desinential inventory:

\[
\begin{array}{c|c}
(I) & U \\
E & O \\
A & \\
\end{array}
\]

The desinential inventory of Lena is realized as [(i),e,a,o,u], while in Pasiego, it is [ə,a,o,u]. I discuss Lena noun/adjectival desinences first, and then the verbal desinences.
2.6.3.2.1.1. Nominal desinences

The nominal desinences of Lena are illustrated in (45). +M indicates the application of metaphony, and -M indicates the lack of application of metaphony. In addition, the first column provides the underlying form of the stressed stem vowel.

(45) Desinentional vowel inventory of Lena:

<table>
<thead>
<tr>
<th></th>
<th>+M</th>
<th>-M</th>
<th>-M</th>
<th>-M</th>
<th>-M</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>/O/</td>
<td>cós[a]</td>
<td>cós[es]</td>
<td>thing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>/E/</td>
<td>gwís[u]</td>
<td>gwís[os]</td>
<td>egg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>/O/</td>
<td>pót[e]</td>
<td>pót[a]</td>
<td>pot (m.s.), wide pot (f.s.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>/O/</td>
<td>túnt[u]</td>
<td>tónt[a]</td>
<td>tónt[o]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>/I/, /E/</td>
<td>íst[i]</td>
<td>ést[a]</td>
<td>ést[o]</td>
<td>stupid</td>
<td></td>
</tr>
</tbody>
</table>

Lena desinences include, for the nouns and adjectives, feminine singular [-a] vs. feminine plural [-es] (45.a); masculine singular [-u] vs. masculine plural [-os] (45.b); the desinence [-e], required for phonotactics in some nouns (45.c); and the neuter singular desinence [-o] (45.d), which usually signifies mass nouns. In addition, there are some isolated instances of desinential [-i] for two masculine singular pronouns one of which is illustrated in (45.e).

2.6.3.2.1.1.1. The variation between [a] and [es] and between [u] and [os]

Before going on, it is necessary to discuss the status of alternations such as that between feminine singular [-a] and feminine plural [-es], and between masculine singular [-u] and masculine plural [-os]. Specifically, I address the question of whether the alternations are phonologically conditioned. The vowel alternations between the feminine singular desinence [-a] vs. the feminine plural desinence [-es] (45.a) initially appear to resemble allophonic vowel alternations, and similarly for the alternations between the masculine singular [-u] and the masculine plural [-os]. To amplify, Harris (1991) argues that in Standard Spanish, feminine plural [-as] and
masculine plural [-os] consist of the desinences feminine [-a] and masculine [-o], plus the plural morpheme [-s]. On the other hand, the feminine singular consists simply of the desinence [-a], while the masculine singular consists of the desinence [-o]. If this is also the case in Lena, then one could argue that feminine plural [-es] consists of a feminine morpheme realized as [-e] when followed by the plural morpheme [-s], and similarly that the masculine plural consists of a masculine morpheme realized as [-o] when followed by the plural morpheme [-s]. Given this analysis, it might be possible to analyse the variation between feminine singular [-a] and feminine plural [-e(s)] as allophony; similarly, masculine singular [-u] vs masculine singular [-o(s)] could be seen as allophony: The allophonic rule would be triggered by [-s], and would target underlying feminine /-A/ and masculine /-U/. However, it is difficult to imagine a rule that would raise /-A/ to [-e], while lowering /-U/ to [-o] when followed by [-s].

For this reason, I reject the allomorphy analysis. Instead, I posit that in dialects with variation between [-u] and [-os], and between [-a] and [-es], the desinences have been reanalysed such that [-u] (/U/) is the masculine singular desinence, while [-os] (/Os/) is the masculine plural desinence; similarly, [-a] (/A/) is the feminine singular desinence, while [-es] (/Es/) is the feminine plural desinence. In other words, I hypothesize that there is no synchronic allophonic relationship between the vowel in singular [-a] and [-u] and the vowel in plural [-es] and [-os]. This hypothesis seems to agree with the general tone of standard analyses of such dialects as Lena, which are viewed as having retained some archaic desinences while undergoing regular developments for other desinences (see §2.6.2 for further discussion). Such would be the case, for example with masculine singular [-u], which is viewed as an archaism, while [-os] is viewed as the regularly developed form.

In summary, as shown in (45), Lena nominal desinences draw from the set [(i),e,a,o,u], where [-i] is an archaic desinence. Of particular note is that a

29 One potential candidate rule would neutralize height features before /s/. If this were the case, then the surface contrast between m.s. [-u] and m.pl. [-os] would not provide evidence for an underlying U/O contrast.
comparison of the masculine singular vs. neuter singular endings in (45.d) reveals that Lena has a contrast between desinential /U/ and /O/.

I now turn to a description of the verbal desinences of Lena.

2.6.3.2.1.2. Lena verbal desinences

The verbal desinences of Lena are illustrated in (46).


a.  <cuerrre>  he/she runs
b.  <fago>  I do
c.  <ría>  I/he/she used to laugh
d.  <dormiste>  You (s) slept
e.  <comieste>/ <comiste>  You (s) ate

As shown in (46.a-c), Lena verbs employ the regular desinences [-e], [-o], and [-a] (as in Standard Spanish). The examples in (46.d,e) illustrate that Lena does not have desinential [-i] in the verb forms.

In conclusion, Lena has the desinential inventory /I/, E,A,O,U/, which is realized as [(i),e,a,o,u]. Lena has metaphony triggered only by desinential /U/, as discussed in the following section.

2.6.3.2.2. Metaphony in Lena

As shown above, the distinction between desinential /U/ and /O/ in Lena is robust; this correlates with the fact that raising triggered by /U/ ([u]) is also well-attested. The forms in (47) are orthographic, but I use square brackets to highlight the relevant vowels.
(47) Lena mass and count adjectives (Neira Martínez 1955: 70-72):  

<table>
<thead>
<tr>
<th>Masculine (Count)</th>
<th>Feminine</th>
<th>Neuter (Mass)</th>
</tr>
</thead>
<tbody>
<tr>
<td>t[ú]nt[u]</td>
<td>t[ó]nta</td>
<td>t[ó]nt[o]</td>
</tr>
</tbody>
</table>

‘good’

‘stupid’

‘lazy’

Example (47) shows that Lena maintains a morphological distinction between mass and count nouns and adjectives—the former have the inflectional vowel /O/, while the latter have the inflectional vowel /U/; more importantly, raising occurs in the count adjectives, which have /U/. For example, the underlying mid vowel of the stem /bOn-/ is raised to <búnu> in the masculine singular, and remains as <bóno> in the neuter singular.

As summarized in (48), Lena has an inflectional vowel inventory and a raising process comparable to Pasiego’s.

---

In Lena, /U/ also triggers fronting/raising of the vowel [á]. Compare for example the forms [gwépu] beautiful (masculine count) vs. [gwápo] or [gwápa] beautiful (mass neuter, feminine singular). For completeness, I describe this phenomenon below. As shown by the following citation, Lena ‘e’ (from underlying /a/) is distinct in pronunciation from underlying /e/.

...it should be mentioned that the vowel e resulting from this raising [of a>e] is not a clear and precisely articulated vowel; instead, it possesses a mixed timbre, which makes it impossible to confuse [inconfundible] with an e that does not result from vocalic metaphony... (Galmés de Fuentes 1960: 21, my translation).

The description of Lena ‘e’ is reminiscent of Penny’s description of Pasiego /a/, which undergoes a process known as centralization to become [æ] as a result of metaphor in stems (see §2.5.4 for further discussion of this type of metaphor). (For example, the Pasiego cognate of the Lena word <getu> cat (cf. Standard Spanish ‘gato’) is pronounced [gétø] (Penny 1969: 413), with a ‘centralized’ low vowel. An example of a non-centralized low vowel in Pasiego is [gáta, gátøna] caterpillar (Penny 1969: 214).) I assume that centralization, not raising, occurs in the Lena case as well. Centralization has been analysed as a process that is distinct from raising. See §2.3.2.2 for discussion of centralization.
(48) Final vowel inventory of Lena: Triggers of metaphony in Lena:

\[
\begin{array}{ccc}
(I) & U & \text{inflectional } U \\
E & O & \\
A & \\
\end{array}
\]

Lena exemplifies the type of metaphony characteristic of Central Asturian metaphonizing dialects. Central Asturian dialects have the asymmetrical inventory /\(I\),E,A,O,U/ and an asymmetrical process of metaphony which is triggered only by /U/. On the other hand, [i] does not trigger productive raising, even though it is phonetically high.

2.6.4. North Central Asturias

North Central Asturian dialects have the inventory shown in (49).

(49) North Central Asturian desinential inventory:

\[
\begin{array}{cc}
\text{Orthographic} & \text{Phonological} \\
(i) & (I) \\
e & U \\
o & E \\
a & O \\
\end{array}
\]

North Central Asturian dialects have archaic (I) desinences, and otherwise a full complement of desinences.

The front vowel desinences are illustrated in (50).

(50) North Central Asturian front vowel desinences (Díaz Castañón 1966: 83-88):

a. final /E/ in nouns: \(<\text{réde}>, <\text{huéspede}>, <\text{séde}>, <\text{paréde}>\) net, guest, thirst, wall
b. demonstrative pronouns: [isti], [isi] this, m.s.; that, m.s.
c. personal pronouns: [elli], [illi] he
d. 2 s. imperatives [facei], [perdonai] do!, pardon!
e. 2 nouns: [llich], [terde]/[terdi] milk, afternoon

---

Sources include Díaz Castañón (1957, 1966) and Galmés de Fuentes (1960).
In North Central Asturias, the final front vowel desinence that is written as <e> in (50.a) is generally realized as [ə] where this vowel is conserved (Díaz Castañón 1966: 83; 90). In North Central Asturias there are also some cases of preservation of etymological [i] in desinences, which are summarized in (50.b-e).

The desinential inventory of back vowels includes /U/ and /O/.


<table>
<thead>
<tr>
<th>Municipality</th>
<th>masc. sing. vs. masc. pl.</th>
<th>masc. sing. vs. neuter sg.</th>
<th>verb forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carreño</td>
<td>U/Qs</td>
<td>m.s. U n.s. O</td>
<td>U or O</td>
</tr>
<tr>
<td>Gozón</td>
<td>U/Qs</td>
<td>m.s. U n.s. O</td>
<td>U or O</td>
</tr>
</tbody>
</table>

As shown in (51), the masculine singular ending is U while the masculine plural ending is Qs. Some examples include the following:


a. guet[u] gat[os] cat (m.s.), cats (m.pl.)
b. tunt[u] tont[os] stupid (m.s.), stupid (m.pl.)

I analyse the type of variation illustrated in (52) as in §2.6.2.1.1.1, namely that the presence of [u] is archaic, and that the presence of [u] vs. [os] is not strong evidence for an underlying /U/ vs. /O/ distinction.

As summarized in (51), Northern Central Asturian dialects also have a robust distinction between masculine singular and neuter singular, marked respectively by U vs. Q.32 Example (53), illustrates the neuter singular usage (53.a) and the masculine singular usage (53.b).

---

32 It is interesting to note that metaphony in Northern Asturias affected some vowels to a different extent than others. Both Galmés de Fuentes and Díaz Castañón note that metaphony must have regularly raised [e] (from VL [ai], and [we] (from VL [o]) to [i] and [wi] respectively. On the other hand, [je] (from VL [ê]) only partially raised to [ji]; also many words with [e] (from VL [ê, î]) never raised; and [o] (from VL [ô, à]) raised to [u] in only two examples in the data. (Díaz Castañón 1957, Galmés de Fuentes 1960)
(53) Northern Central Asturian masculine singular vs. neuter singular (Díaz Castañón 1966:153):

a. No hay má pan dur[o] there is no more hard bread (neuter singular)
   not there.is more bread hard

b. pero isti boll[u]33 tá dur[u] but this loaf is hard (masculine singular)
   but this loaf is hard

The neuter singular forms signify a mass noun, in the above example, hard bread in general; the masculine singular forms signify a count noun, in the above example, a particular loaf of bread. The neuter singular desinence is [o] while the masculine singular desinence is [u].

Díaz Castañón (1957, 1966) and Galmés de Fuentes (1960) attest that metaphony triggered by desinential [u] exists in Northern Central Asturias. An example of metaphony is shown in (52.b), where final [u] causes the underlying stem vowel [o] to raise to [u] in [túntu].

To summarize the situation in North Central Asturias, I quote Díaz Castañón (1966: 84) concerning front vowels.

We hold, then, that the -i, -e contrast is phonetically feasible, but unnecessary phonologically and structurally: it perpetuates in the language a non-useful duality, since it does not create a change in [grammatical] signification. It is diachronically but not synchronically justified.34 (My translation; see note 27 for Spanish).

33 Note that in the form <bollu>, phonetically [bóllu], the main stress vowel fails to be raised. I take this as an indication that metaphony is becoming moribund in the dialects in question. Supporting this claim, Díaz Castañón (1957, 1966) and Galmés de Fuentes (1960) focus on the many examples of metaphony still present in these dialects, but also state that there are exceptions. Díaz Castañón (1957: 21) states that metaphony in the municipality of Carreño (see map B in the appendix accompanying this chapter) is non-robust, while metaphony in the municipality of Gozón is still robust.

34 Tenemos, pues, que la distinción -i, -e es factible fonéticamente, pero innecesaria fonológica y estucturalmente ya que hace perdurar en el sistema de la lengua una dualidad no útil, puesto que no responde a una diferenciación en el significado. Tiene justificación diacrónica [sic.], pero no sincrónica. (Díaz Castañón 1966: 84)
In conclusion, North Central Asturias has the desinential inventory /I,E,A,O,U/ realized as [(i),œ,a,o,u]. North Central Asturian dialects also have synchronic metaphony triggered only by the phonologically high desinence /U/.

2.6.5. Eastern Asturias

2.6.5.1. General

The desinential inventory of Eastern Asturian dialects is shown in (54).

(54) Eastern Asturian desinential inventory:

<table>
<thead>
<tr>
<th>Orthographic and Phonetic</th>
<th>Phonological</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) u/o</td>
<td>(I) (U)</td>
</tr>
<tr>
<td>i</td>
<td>E O</td>
</tr>
<tr>
<td>a</td>
<td>A</td>
</tr>
</tbody>
</table>

Eastern Asturian (EA) dialects have archaic [i] desinences, providing evidence for archaic /I/; they also have an archaic distinction between U/O only in pronominal forms (see the Cabranes example in §2.6.5.1.1. for a specific example). For this reason, the desinence /(U)/ in (54) is in parentheses. The non-archaic desinences employ /E,A,O/: the desinence /E/ is generally realized with high vowel variants, e.g. [i] (although this desinence is realized as [e] in the Eastern Asturian dialect of Cabranes discussed in §2.6.5.1.1). The desinence /O/ varies phonetically between [u] and [o]. Finally, /A/ is realized as [a]. Evidence for these observations is provided below.

Example (55) summarizes the available data concerning Eastern Asturian front vowel desinences.
Eastern Asturian front vowel desinences (Granda 1960: 89, 103, 108):

Municipality:

a. demonstrative pronouns: personal pronouns:

Amieva
- <esti> this, m.s.
- <esi> that, m.s.
- <illi> he
- <elli> he

Caso
- <isti> this, m.s.
- <isi> that, m.s.

Morcín, Llanes,
Ribadesella,
Colunga
- no data
- <elli> he
- <illi> he

Cabranes
- <esti> this, m.s.
- <esi> that, m.s.
- <aquelli> that, m.s.
- <elli> he
- <illi> he

Santander
- final [i/e/ə]\(^{35}\)
- él he (Penny 1969)

b. nominal forms:

Amieva
- <llechi> milk
- <noche> night

Ribadesella
- final <-i> in general

Caso
- <nuechi> night
- <llechi> milk

C. 2s preterite 2pl preterite

Cabranes
- <-sti>
- <-stes>\(^{36}\)

The front vowel desinences in question are generally realized as [i], although in the Santander (Montañese) area, this vowel is quite variable. As shown in (55.c), the verbal desinences retain some instances of archaic <i>, while some have modernized <e>. The above data, however, provide no strong evidence for an I/E distinction. Instead, the data illustrates a notable characteristic of Eastern Asturian dialects, namely the tendency to raise final vowels.

Example (56) illustrates Eastern Asturian back vowel desinences.

\(^{35}\) This analysis of the front vowel inventory is my own. See the discussion of Pasiego in §2.5.3.

\(^{36}\) (Canellada 1944: 108, cited in Granda 1960: 108)
(56) Eastern Asturias (Granda 1960: 35-37, 78-9):

<table>
<thead>
<tr>
<th>Municipality</th>
<th>masc. sing. vs. masc. pl.</th>
<th>masc. sing. vs. neuter sg.</th>
<th>verb forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morcín</td>
<td>U/O</td>
<td>not reported</td>
<td>U or O</td>
</tr>
<tr>
<td></td>
<td>Us/Os</td>
<td></td>
<td>[matámus]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>we kill</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[matémus]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>we kill</td>
</tr>
<tr>
<td>Riosa</td>
<td>U &lt;fíchu&gt; signature</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td>Quirós</td>
<td>U or O</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td>Santo Adriano</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Las Regueras</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parres</td>
<td>U &lt;fornu&gt; oven</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td>Cabranes</td>
<td>U/Os</td>
<td>I (ms.) vs I (ns);</td>
<td>O³⁷ (see</td>
</tr>
<tr>
<td></td>
<td></td>
<td>but all adjectives end</td>
<td>following</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with -u, whether ms or</td>
<td>section)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Ribadesella, Llanes</td>
<td>U &lt;llobu&gt; wolf</td>
<td>non-concordance</td>
<td>not reported</td>
</tr>
<tr>
<td>Amieva, Cangas de</td>
<td>U &lt;llobu&gt; wolf</td>
<td></td>
<td>O³⁸</td>
</tr>
<tr>
<td>Onís, Caso</td>
<td>Qs &lt;llobos&gt; wolves</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Eastern Asturian dialects, the masculine singular desinence is generally U, while the masculine plural desinence is generally Qs. The variation between U and Qs is analysed as in §2.6.2, namely that the presence of [u] is archaic, and that the presence of [u] vs. [os] is not strong evidence for an underlying /U/ vs. /O/ distinction.

Examples of the range of phonetic variation of the masculine singular desinence are shown in (57).

(57) The masculine singular desinence in Tene (Morcín, Eastern Asturias; Granda 1960: 35)):

- loc[ʊ/ə] crazy m.s.
- top[ʊ] mole
- beis[ə] kiss

---

³⁷ U appears in past participles (Canellada 1944: 40-2)
³⁸ Only forms from Caso are reported in Granda (1960).
The phonetic variants in (56) are generally higher variants. However, evidence that these vowels are not phonologically high is discussed below.

As summarized in (56), in Eastern Asturian dialects such as Cabranes, the distinction between masculine singular desinential /U/ and neuter singular desinential /O/ still exists, but only in the accusative pronouns <lu> and <lo>. This provides some evidence for an underlying U/O contrast in Eastern Asturian dialects. In order to further investigate several puzzling aspects of the Eastern Asturian type of desinential inventory, I exemplify and discuss the dialect of Cabranes below.

2.6.5.1.1. Cabranes

Cabranes has the desinential inventory /(I),E,A,O,(U)/. (The parentheses indicate that the desinence in question is marginal; an apparent idiosyncracy of Cabranes is that the front vowel desinence is usually realized as [e], while the back vowel desinence is realized as [u]). The examples in (58) illustrate Cabranes desinences. The examples in (58) are in phonetic transcription, with square brackets for highlights.

(58) Desinences in nouns and adjectives (Canellada 1944: 12-24):

a. el fiy[u] mī[u8]  
   my son  
   los fiy[z] mī[z]s  
   my sons
b. la fiy[a] mī[a]  
   my daughter  
   les fiy[es] mī[es]  
   my daughters
c. la sīdr[e]  
   the cider  
   la pwērt[e]  
   the door

Cabranes nouns, pronouns, and adjectives employ the regular desinences [-a] (//-A/) (feminine singular), [-es] (//-Es/) (feminine plural), [-u] (//-U/) (masculine singular), and [-os] (//-Os/) (masculine plural). I assume the analysis discussed in §2.6.2 for this type of variation, namely that the presence of [u] is archaic, and that the presence of [u] vs. [os] is not strong evidence for an underlying /U/ vs. /O/ distinction. In addition, the desinence [e] occurs for phonotactic purposes (i.e. to syllabify a sequence of two word-final alveolar consonants). While there is some evidence for
an U/O distinction in Cabranes, namely the [-u] vs. [-os] desinences, the prototypical evidence of masculine singular [-u] versus neuter singular [-o] is missing. I conclude that the evidence from the nouns for an U/O distinction is weak. In summary, the nouns provide evidence for a desinential [e,a,o/u] or /E,A,O/ inventory, where [o/u] denotes that weak evidence for an O/U distinction.

The pronominal forms have the following desinences: Example (59) shows the available evidence for a desinence /i/ in the pronouns.

(59) Pronouns with desinential [i] (Canellada 1944: 15):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>ést[i]</td>
</tr>
<tr>
<td>b</td>
<td>éś[i]</td>
</tr>
<tr>
<td>c</td>
<td>aké[i]</td>
</tr>
<tr>
<td>d</td>
<td>é[i]</td>
</tr>
</tbody>
</table>

The pronouns make use of the desinence [-i] (masculine singular, used for three demonstrative pronouns). Within the pronominal/nominal/adjectival system, however, the use of desinential [-i] is archaic.

Example (60) illustrates the accusative pronouns of Cabranes, which provide some evidence for a desinential U/O distinction.

(60) Cabranes accusative pronouns (Canellada 1944: 23)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[lu]</td>
<td>m.s. accusative</td>
</tr>
<tr>
<td>[la]</td>
<td>f.s. accusative</td>
</tr>
<tr>
<td>[lo]</td>
<td>n.s. accusative</td>
</tr>
</tbody>
</table>

For the third person singular accusatives only, there is a distinction between [lu] (masculine singular), and [lo] (neuter singular). Within the pronominal/nominal/adjectival system, the use of desinential /-o/ is otherwise marginal. In summary, the pronominal inventory provides evidence for an archaic [(i)] desinence, as well as evidence for the desinences [a, o,u].

Example (61) illustrates the verbal desinences of Cabranes.
Regular verbal desinences (Canellada 1944:41-43)

a. cuntár to count  
cúnt[o] I count  
cúnt[a] he/she counts

b. durmír to sleep  
dwérn[o] I sleep  
dwérn[e] he/she sleeps

The verbs utilize the regular desinences [-o], [-e], and [-a].

In addition, example (62) illustrates the evidence for desinential [-i] (/I/) in verb forms.

The desinence [i] in verbs (Canellada 1944: 15,42):

a. 2nd singular imperatives: mét[i] ‘put!’ kó[r][i] or kú[r][i] ‘run!’

b. preterites: [durmísti] ‘you s. slept’
   cf. [durmjéstes] ‘you pl. slept’

The verbal desinence [i] occurs in second singular imperatives, in second singular preterites (which have the ending [-sti]) and in several strong preterites. I assume that the presence of [i] in the verb forms is an archaic feature.

In summary, Cabranes has the following desinences: In the nouns, [e,a,o/u]; in the pronouns, archaic [(i)], and [a,o,u]; and in the verbs, [(i),e,a,o]. From these data, I conclude that Cabranes has the inventory [(i),e,a,o/u]. This gives the phonological inventory /(I),E,A,O,(U)/, where evidence for /I/ and /U/ is only from archaic forms.

2.6.5.1.2. Summary

In summary, Eastern Asturian dialects—as exemplified by Cabranes—have several archaic features which are responsible for the somewhat ‘mixed’ status of the /(I),E,A,O,(U)/ desinential inventory: Eastern Asturian dialects retain the archaic desinence /I/ in some verb forms; they also maintain the archaic distinction between /U/ and /O/ in the accusative pronouns. Additionally, as discussed in §2.6.5.1, the distinction between /U/ and /O/ is perhaps also maintained via the general use of
desinential /O/ in verb forms as opposed to the general use of /U/ in the nominal and adjectival system.

Metaphony should not occur in Eastern Asturias, given its /I,E,A,O,(U) desinential inventory, with marginal /I/ and /U/ desinences. Confirming this prediction, Penny (1970) indicates that metaphony in this region is ‘irregular, partial and rare.’ I assume from this description that metaphony in Eastern Asturias is of the ‘historical residue’ type. This assumption is further supported by the fact that dialects such as Cabranes maintain the U/O distinction only in the accusative pronouns, suggesting that this distinction is residual in nature.

2.6.6. **Santander**

The desinential inventory of Santander province dialects is summarized in (63).

(63) Santander desinential inventory:

- **a. Metaphonizing dialects:**
- **b. Non-metaphonizing dialects:**

<table>
<thead>
<tr>
<th>Phonetic</th>
<th>Phonemic</th>
<th>Phonetic</th>
<th>Phonemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>inventory</td>
<td>inventory</td>
<td>inventory</td>
<td>inventory</td>
</tr>
<tr>
<td>u:</td>
<td>U</td>
<td>e /ø</td>
<td>ø E O</td>
</tr>
<tr>
<td>ø /ø</td>
<td>ø /ø</td>
<td>e /ø u A</td>
<td>ø E O</td>
</tr>
</tbody>
</table>

Santander dialects have one front vowel desinence, realized as close variants of schwa. (Examples from Pasiego, which is a dialect from Santander, were provided in §2.5.3.2). The back vowel desinences are described below.

The dialects of Santander divide into two groups with respect to desinential back vowel inventories.

---

39 This observation is based on data from Tudanca (Penny 1978), from Pasiego (Penny 1969), and from the Atlás Lingüístico de la Península Ibérica (ALPI).
Santander back vowel desinences:

<table>
<thead>
<tr>
<th>Municipality</th>
<th>masc. sing. vs. masc. pl.</th>
<th>masc. sing. vs. neuter sg.</th>
<th>verb forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>La Montaña (Vega de Paz, Tudanca)</td>
<td>[u:] [ø]s</td>
<td>m.s. [u:]</td>
<td>[ø]</td>
</tr>
<tr>
<td>the rest of Santander</td>
<td>U &lt;largu&gt; long U's &lt;picachus&gt; peaks</td>
<td>non-concordance (Penny 1970: 24)</td>
<td>not reported</td>
</tr>
</tbody>
</table>

In the Montañese area (including the dialects of Pasiego and Tudanca), there is a phonemic contrast between U and O, which marks the masculine singular vs. the neuter singular. In addition, as in Cabranes, desinential /U/ is more common in the nominal system, while desinential /O/ is more commonly used in the verbal system. In Pasiego and Tudanca, raising is constant and regular (Penny 1970: 24). See §2.5.3.1 for details.

On the other hand, in the rest of Santander, there is no contrast between U and O; masculine nouns end with desinential -U or -Us, which is realized as [u]. There is no separate desinence for neuter singular nouns. Penny (1970: 24) reports that raising is slight, but extant in the rest of Santander. I assume from this statement that instances of metathony are the result of historical residue in this area.

2.6.7. *The desinential inventory in the rest of the Asturian-Leonese area (León)*

In the remainder of the Asturian-Leonese area, referred to as León, the desinential inventory is as shown in (65).

(65) Leonese desinential inventory:

<table>
<thead>
<tr>
<th>Phonetic inventory:</th>
<th>Phonemic inventory:</th>
</tr>
</thead>
<tbody>
<tr>
<td>i/e u a</td>
<td>E O A</td>
</tr>
</tbody>
</table>

---

The front vowel /E/ is realized as either [i] or [e], depending on the dialect area; /A/ is realized as [a]; and /O/ is realized generally as [u]. Evidence for these observations follows below.

Example (66) summarizes available data concerning front vowel desinences in the Leonese area.
Leonese front vowel desinences (Granda 1960: 89,90, 103, 108):

Municipality:

a. Demonstrative pronouns: Personal pronouns:

| Trascastro, | <este> this, m.s. | <él> he |
| Carrizo de la Ribera, | <ese> that, m.s. | |
| Maragatería y Astorga, Sanabria, Babia y Laciana, S. Ciprián, Cespedosa de Tormes, Mérida |
| S. Martín de Trevejo, and Sierra de Gata | <esti>this, m.s. | <él> he |

b. Nominal desinences:

| S. Martín de Trevejo | <mairi> | <vezis> | gloss not provided in the source |
| León, Zamora, Salamanca (provinces) | | | djént[ɔ̃, ɔ̃, ɪ] tooth |

c. 2s preterite 2pl preterite

| Maragatería y Astorga | <-isti> | <-istes> |
| La Cabrera | <-stes> | <-stes> |
| Alta; S. Ciprián de Sanabria |
| Cespedosa de Tormes; Trevejo | <-astis> | <-istis> |
| Ribera de Salamanca | <-sti> | <-stis> |
| <stes> | <-stis> |
| Aldeadávila y Corporario | <-sti/-stis> | <-stis> |
| Masueco | <-tes> | <-tis> |
| Mieza, Vilvestre, & Hinojosa | <-te> | <-tes>, <-teis> |
| Sanabria | <-ste> | <-stes> |

---

41 This data is from Map 69 of the ALPI.
As shown in (66.a,b), Leonese nominal desinences vary between [i] and [e]. There is, however, no evidence for a phonological distinction between /I/ and /E/ within any given dialect.

The verbal desinences in (66.c) illustrate an extremely complex situation; each dialect appears to require dialect-particular or even verb-particular statements as to which desinence to use. For example, in the municipality of Maragatería y Astorga, both <-isti> and <-iste> are used for 2s preterites, and 2pl preterites use three forms, <-istes>, <-estis>, and <-istis>. In two municipalities, Cespedosa de Tormes and Trevejo, the 2pl preterites <-astis> and <-istis> are etymologically correct (Granda 1960), indicating that these dialects have a very conservative verbal morphology. Finally, in Ribera de Salamanca, both <-sti> and <-stes> are used for 2nd singular preterites, while <-stis> serves for 2nd plural preterites. What these data show is a great deal of mixing which is best described in lexical entries (see §2.10.2.3 for further analysis); what they do not provide is evidence for a distinction between /I/ and /E/; at most, one might propose an archaic desinence, /(I)/.

In the remainder of the extra Asturian-Leonese area, the inventory of back vowel desinences includes /U/, and marginally, [o].

(67) Leonese back vowel desinences (Granda 1960: 38-9, 79):

<table>
<thead>
<tr>
<th>Municipality</th>
<th>masc. sing. vs. masc. pl.</th>
<th>masc. sing. vs. neuter sg.</th>
<th>verb forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>León, Zamora, Salamanca, Cáceres, S. Ciprían de Sanabria, Aliste, and Leonese-speaking areas in Portugal (eg. the Mirandese dialect)</td>
<td>U</td>
<td>IO [le]</td>
<td>U</td>
</tr>
<tr>
<td>León</td>
<td>U</td>
<td>U</td>
<td></td>
</tr>
<tr>
<td>León</td>
<td>Us</td>
<td></td>
<td></td>
</tr>
<tr>
<td>eg. León &lt;diabru&gt; devil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;llobu&gt; wolf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;fillu&gt; son</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The dialects in question are characterized by the use of final U where Standard Spanish generally has Q, as shown in (67). For example, in the municipality of Aliste, the back vowel desinence can be realized as [u, ū, u/ō, ō, ə/ə]; these variants
can be found in all dialects, but there is a tendency to use the more open variants in the Eastern part of Aliste (Granda 1960: 39, citing an unpublished thesis by José María Baz Argüello entitled Aliste; page 34-40).

The desinence /O/ might also exist marginally in the accusative pronoun system: In one dialect area (Cespedosa), the accusative pronoun <lo> is used for ‘cosas inertes’ [inert things; i.e. mass nouns]; otherwise <le> is used for the direct object (Penny 1970: 24). In other dialects, only the masculine singular accusative pronoun <lo> exists, and there is no category signifying mass neuter objects. The use of <lo> appears to be an archaic characteristic that does not warrant positing a distinction between /U/ and /O/. Metaphony is not reported for the Leonese areas described in this section.

2.6.8. Summary of the dialect survey

Table (68) summarizes the data presented in previous sections concerning Asturian-Leonese desinences, and highlights the significance of this data for the predictions made in (7) (and reviewed below) concerning Modified Contrastive Specification.

---

42 The use of ‘le’ for the direct object is a dialect characteristic known as ‘leismo.’
(68) Asturian-Leonese desinential inventories:

<table>
<thead>
<tr>
<th>Area</th>
<th>Phonetic/orthographic Inventory</th>
<th>Phonological inventory</th>
<th>high desinential vowels</th>
<th>synchronic metaphony?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Western Asturias</td>
<td>(i) u/o i/e a</td>
<td>(I) E O A</td>
<td>(I)</td>
<td>no</td>
</tr>
<tr>
<td>b. Central Asturias</td>
<td>(i) u i/e o o a</td>
<td>(I) U E O A</td>
<td>(I) U</td>
<td>yes, triggered by /U/</td>
</tr>
<tr>
<td>c. Eastern Asturias</td>
<td>(i) u/o i/e o o a</td>
<td>(I) (U) E O A</td>
<td>(I)</td>
<td>no</td>
</tr>
<tr>
<td>d. North Central Asturias</td>
<td>(i) u o o o a</td>
<td>(I) U E O A</td>
<td>(I) U</td>
<td>yes, triggered by /U/</td>
</tr>
<tr>
<td>e. Santander (Montañíñse dialects)</td>
<td>ɔ/ɔ ɔ u/ɔ a</td>
<td>(I) U E O A</td>
<td>(I) U</td>
<td>yes, triggered by /U/</td>
</tr>
<tr>
<td>f. Santander (remainder)</td>
<td>ɔ/ɔ ɔ ɔ u ɔ a</td>
<td>E O A</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>g. Remainder of Asturian-Leonese area</td>
<td>i/e u a</td>
<td>E O A</td>
<td>none</td>
<td>no</td>
</tr>
</tbody>
</table>

Western Asturian dialects (68.a) have several archaic desinences which are realized as [i]; the parentheses around (I) indicate that this phoneme is marginal or archaic. The phoneme /E/ is realized as either [e] or as [i] in Western Asturian dialects, depending on such factors as dialect-particular phonetic realization and phonetic influence from adjacent segments (in this case, from palatal consonants). The phoneme /O/ is realized as either [u] or [o], depending on the abovementioned factors. Finally, /A/ is realized as [a]. The only phonologically high desinences in Western Asturian dialects are those which employ desinential, archaic (I); this suffix no longer participates in a synchronic process of metaphony.

A similar account can be made for Central Asturias (68.b), except that in Central Asturias, there is a robust distinction between desinential /U/ and /O/. Metaphony triggered by /U/ is attested in Central Asturias. North Central Asturias
(68.d) and the Montañese areas of Santander (68.e) receive essentially the same analysis as Central Asturias.

The situation in Eastern Asturias (68.c) is similar to that in Western Asturias (68.a), except that in Eastern Asturias, a marginal distinction between desinential /U/ and /O/ survives in the accusative pronouns. Metaphony cannot and does not occur in Eastern Asturias.

In the remainder of the Santander province (68.f), the phoneme /E/ is realized as [ə], while /O/ is realized as [u]; the desinential inventory is generally /E,A,O/. Finally, in the remainder of the Asturian-Leonese area (68.g), the phoneme /E/ is realized as either [i] or [e], depending on dialect-particular phonetic implementation. At least one dialect in this area has a marginal distinction between /U/ and /O/; however, in general, the desinential inventory in this area is /E,A,O/ with no phonologically high vowels. Metaphony does not occur in the remainder of Santander, nor in the remainder of the Asturian-Leonese area.

The Asturian-Leonese survey summarized in (68) confirms several predictions: 1) metaphony cannot and does not occur if there is no robust contrast between mid and high vowels in either the front or back vowel region; 2) metaphony can occur if there is a robust contrast between mid and high vowels in either the front or back vowel region; it does occur in Central and North Central Asturias, and in the Montañese dialects of Santander. The survey further demonstrates that raising in Asturian-Leonese dialects is asymmetrical, just as the inventories of these dialects are asymmetrical: the desinential inventories of the raising dialects have phonologically high /U/, and raising triggered only by this suffix. In dialects which have phonetically high [i], [i] realizes a non-high, non-low phoneme /E/; for this reason, raising triggered by [i] cannot and does not occur in these dialects.

At this point, several of the predictions outlined in (7), repeated below, remain to be tested:
(7) Predictions concerning possible rules:

<table>
<thead>
<tr>
<th>Vowel system</th>
<th>Contrastive height features required</th>
<th>Possibility of rules with high vowel triggers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-vowel (example (5.b))</td>
<td>E ([\emptyset]) A [low] O [\emptyset]</td>
<td>no; no phonological feature [high]</td>
</tr>
<tr>
<td>4-vowel (example (6.a))</td>
<td>E ([\emptyset]) A [low] O [\emptyset] U [high]</td>
<td>yes; triggered by /U/; only /U/ is phonologically [high]</td>
</tr>
<tr>
<td>4-vowel (example (6.b))</td>
<td>I [high] E ([\emptyset]) A [low] O [\emptyset]</td>
<td>yes; triggered by /I/; only /I/ is phonologically [high]</td>
</tr>
<tr>
<td>5-vowel (example (4))</td>
<td>I [high] E ([\emptyset]) A [low] O [\emptyset] U [high]</td>
<td>yes; triggered by both /I/ and /U/, both of which are phonologically [high]</td>
</tr>
</tbody>
</table>

In particular, it is still necessary to show that type (6.b) (/I,E,A,O/) and type (4) (/I,E,A,O,U/) desinential inventories exist, and that they allow respectively asymmetrical and symmetrical metaphony. For historical reasons, no Spanish dialects display the relevant type of desinential inventories. However, Italian dialects do. For this reason, I discuss select Italian dialects in the following sections, justifying my selection by providing a brief survey of the types of metaphonizing dialects in Italy.

2.7. **Italian dialects: a brief survey**

Map D of Italy in the appendix accompanying this chapter illustrates the Italian dialects which are discussed in this thesis. The numbers 1-5 on Map D indicate the type of desinential inventory characteristic of each area; areas shaded with [x] have the type of metaphony which is discussed in subsequent sections; areas shaded with dots have asymmetrical metaphony triggered by /I/; areas circumscribed by the symbol [T] have types of metaphony which will not be discussed in this thesis.
Italian dialects have many phenomenon which are described as metaphony, but I focus on the types within the x-shaded areas of the map for the following reasons. In the x-shaded area, metaphony is triggered by both /I/ and /U/ (some classes of apparent exceptions are discussed in §2.9 and §2.10); in the same area, metaphony targets the mid vowels /e,o/, creating [i,u], and also targets /e,o,ε/ creating either /e,o/ or [je, we/wo/wε]. In the dot-shaded areas of Veneto and Emiliano-Romagnolo, metaphony is asymmetrical; the dialects in question have either desinential /i,e,a,o/ or /i,e,a,u/ inventories, and metaphony is triggered by /I/ only. While these latter observations support my thesis, I exclude the above dialects for reasons discussed below.

In T-bordered and dot-shaded dialects, subsequent historical developments have often complicated or obscured the metaphonic alternations. T-bordered dialects are dialects with relic metaphony. For example, in Northern Italian regions, metaphony may have reflexes other than raised vowels, and metaphony is, besides, residual (Maiden 1991: 115,117). In Emiliano-Romagnolo dialects, metaphony appears to be of the residual historical type, since the desinence /I/ does not actually appear in modern dialects (Devoto and Giacomelli 1972: 59).

Dot-shaded dialects are those dialects with complex or atypical conditions on target vowels. In Venetian dialects which still have metaphony (eg. Padova), metaphony triggered by /I/ only affects the higher mid vowels (/e,o/) (Marcato 1980, Maiden 1991: 114). And in Abruzzo-Molise dot-shaded dialects, there is a complex configuration of metaphonic types, including: a) metaphony triggered by [i] in closed syllables and by [i,u] in open syllables, and affecting only high-mid vowels; b) metaphony triggered by [i,u] and affecting only high-mid vowels; c) metaphony triggered by [i] that affects only low mid vowels, and metaphony triggered by both [i,u] that affects only high mid vowels; d) metaphony triggered by [i] that targets all vowels, including [a]; and e) metaphony triggered by [i] that affects only [a], and
otherwise metaphony triggered by [i,u] that targets all mid vowels (Maiden 1991: 114-115).

In the x-shaded dialects, as mentioned above, metaphony targets both lower and higher mid vowels. Within this area, only a narrow group of dialects (i.e. those denoted by ‘5’ in the map of Italy appended to this chapter) actually have the surface desinential inventory [i,e,a,o,u]; I discuss one such dialect, Servigliano (Southern Marches) in §2.8. The remaining dialects have three or fewer surface desinential vowels, and represent apparent counterexamples to the predictions in (7), which require that metaphorizing dialects have distinct non-low vowel heights as a prerequisite to having the rule of metaphony. I discuss these dialects in §2.9 and §2.10, arguing that they are not counterexamples.

2.8. An /I,E,A,O,U/ inventory vs. an /I,A,O,U/ inventory: Comparison of Servigliano and Pasiego

In this section, I present evidence for the prediction concerning /I,E,A,O,U/ inventories. If such inventories have raising triggered by the desinence, it will be triggered by /I/ and /U/ both. I discuss the Italian dialect of Servigliano.

Servigliano has the desinential vowels [i,e,a,o,u], and the desinential inventory /I,E,A,O,U/, as illustrated in (69)-(71).

(69) Servigliano regular noun desinences (Camilli 1929: 226):  

<table>
<thead>
<tr>
<th></th>
<th>Masculine</th>
<th>Feminine</th>
<th>Neuter</th>
</tr>
</thead>
<tbody>
<tr>
<td>singular</td>
<td>-u</td>
<td>-a</td>
<td>-o</td>
</tr>
<tr>
<td></td>
<td>-e</td>
<td>-e</td>
<td>-e</td>
</tr>
<tr>
<td>plural</td>
<td>-i</td>
<td>-e</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>-i</td>
<td>-i</td>
<td></td>
</tr>
</tbody>
</table>

I have not included the desinences that Camilli calls ‘antiquated types, existing only as residue’ (Camilli 1929: 226).
The regular noun desinences summarized in (69) include five vowel phonemes. Examples of the [i,e,a,o,u] desinential inventory of Servigliano are provided in (70) and (71). Square brackets highlight examples of the desinential vowels.

Example (70) illustrates the desinences of demonstrative pronouns in Servigliano.

(70) Demonstrative pronouns (Camilli 1929: 228):

<table>
<thead>
<tr>
<th></th>
<th>m. sg.</th>
<th>f. sg.</th>
<th>neuter</th>
<th>m. pl.</th>
<th>f. pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>this one</td>
<td>quist[u]stu</td>
<td>quest[a]sta</td>
<td>quest[o]sto</td>
<td>quest[i]sti</td>
<td>quest[e]ste</td>
</tr>
<tr>
<td>that one</td>
<td>quiss[u]ssu</td>
<td>quess[a]ssa</td>
<td>quess[o]sso</td>
<td>quiss[i]ssi</td>
<td>quess[e]sse</td>
</tr>
<tr>
<td>that one</td>
<td>quill[u]llu</td>
<td>quell[a]lla</td>
<td>quell[o]llo</td>
<td>quell[i]lli</td>
<td>quell[e]lle</td>
</tr>
</tbody>
</table>

Example (71) illustrates the desinences of definite articles in Servigliano.

(71) Definite articles (Camilli 1929: 227):

<table>
<thead>
<tr>
<th></th>
<th>m. sg.</th>
<th>f. sg.</th>
<th>neuter</th>
<th>m. pl.</th>
<th>f. pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>l[u]</td>
<td>l[a]</td>
<td>l[o]</td>
<td>l[i]</td>
<td>l[e]</td>
<td></td>
</tr>
</tbody>
</table>

The highlighted vowels in (70) and (71) provide evidence for the U/O distinction within the pronouns, and also evidence for the I/E distinction.

Further evidence from nominal forms for the U/O distinction is shown in (72).

(72) Example of mass vs. count distinction:

a. lu-pîlù nîru ‘the single black hair’

b. lo-pîlo nîro ‘black hair in the mass’

c. lâuro ‘bay (tree)’

d. lâuru ‘curlicue (rigogolo)’

e. látro ‘thievery’

f. lâtru ‘thief’

g. lu peššu ‘a single fish’

h. lo pešso ‘fish in general’

(The above examples are from Camilli 1929, cited in Leonard 1978:156).) As shown in (72), metaphony is no longer completely regular in Servigliano—for example, note in (72.g) the stressed vowel remains [e] despite the suffix vowel [u]. As also

---

Demontstrative pronouns are complex constructions consisting of a noun (eg. [quistu]) followed by an adjective (eg. [stu]) (Camilli 1929).
illustrated in (72), the distinction between /U/ and /O/ exists, and has even been analogically extended—again in the examples of (72.g,h), the etymologically correct desinence *e has been replaced by [-u] or [-o], depending on the type of category (i.e. mass or count). All Servigliano forms in /-u/ are masculine singular, and all the forms in /-o/ are typically nouns designating substances, collectives, and abstract concepts—i.e. typically mass-neuter nouns (Leonard 1978: 155); as shown in (72.g-h). The evidence shown above, then, illustrates that metaphony is no longer entirely productive in Servigliano. However, the desinential inventory is /I,E,A,O,U/.

With the reservations expressed in the above comments, Servigliano has productive raising triggered by desinential /I/ and /U/; examples supporting this claim are shown in (73)-(74).


<table>
<thead>
<tr>
<th>Unmetaphonized</th>
<th>Metaphonized</th>
</tr>
</thead>
<tbody>
<tr>
<td>m[é]tto</td>
<td>m[í]tti</td>
</tr>
<tr>
<td>sp[ó]sa</td>
<td>sp[u]su</td>
</tr>
<tr>
<td>fj[ó]re</td>
<td>fj[ú]ri</td>
</tr>
<tr>
<td>kw[é]sto</td>
<td>kw[í]stu</td>
</tr>
</tbody>
</table>

‘I put’        ‘you put’        ‘husband’       ‘flowers’       ‘this (m. sg.)’

The examples in (73) illustrate the stressed high mid vowels [é] and [ó] raising to high [í] and [ú].

Example (74) provides a fuller picture of the relationship between desinences and metaphony in Servigliano. The examples in (74) represent Camilli’s summary of regular metaphonic processes in Servigliano (further data are not provided in the source).
Recall from §2.3.1 that Servigliano has Arpinate metaphony, which results in the raising of one degree of \([e,o]\) and \([E,O]\). Example (74) shows that stressed mid vowels raise one degree when the final vowel is high—\([\acute{e},\acute{o}]\) become \([\acute{i},\acute{u}]\), and \([\acute{E},\acute{O}]\) become \([\acute{e},\acute{o}]\) (74.a,b). Servigliano also metaphonizes target vowels preceding main-word-stress (as in Pasiego, §2.5.4), so that pretonic mid vowels also raise to high when followed by a stressed high vowel (74.c,d). (The distinction between higher-mid and lower-mid vowels is neutralized in unstressed position; therefore there are no target lower-mid vowels preceding main word stress, as shown in (74.c,d).)

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45 No complete verb forms are given as examples in the grammatical overview.
A comparison of Pasiego raising with the desinential inventory /E,A,O,U/ (§2.5) and Servigliano raising with the desinential inventory /I,E,A,O,U/ in (73) shows that the possibility of a high front trigger only exists when an inventory has a contrast between mid and high front vowels. In Pasiego, with /E,U,O,A/, the sole trigger of raising is /U/, while in Servigliano, with /I,E,A,O,U/, raising is triggered by both /I/ and /U/.

2.9. A type /I,E,A,O/ inventory: Calvello (Italian) raising

In this section, I turn to Calvello, a Lucanian dialect, in order to illustrate the claim that asymmetrical inventories may have asymmetrical raising triggered by /I/ only.

Calvello has a surface desinential inventory of [ə] and a regular process of metaphony. Calvello is thus a potential counterexample to my claim that a dialect must have a mid-high contrast in order to have a phonologically high trigger. However, I demonstrate following Kaze (1989) that the underlying desinential inventory of Calvello is /I,E,A,(O),(U)/—where /(O)/ and /(U)/ indicates that the contrast between desinential /O/ and /U/ is moribund—and that metaphony is triggered only by the desinence /I/.

2.9.1. Vowel reduction in Calvello

In Calvello, all word-final unstressed vowels are reduced to schwa, creating a surface single-vowel desinential inventory (Kaze 1989: 24-25). Evidence that reduction is a synchronic process is that the underlying quality of the final—and inflectional—vowels can be recovered under certain conditions. This is shown in (75), which illustrates the patterning of word-final vowels which receive a secondary degree of stress.
82

(75) Calvello stress and vowel reduction (all forms are 2 sg. imperative) (Kaze 1989: 28; Gioscio 1985: 82-3):

<table>
<thead>
<tr>
<th>verb</th>
<th>gloss</th>
<th>verb + enclitic</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>vinn[ə]</td>
<td>sell!</td>
<td>vənn[i]lə</td>
<td>sell it!</td>
</tr>
<tr>
<td>/vinn[ə]lə</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rāmm[ə]</td>
<td>give me!</td>
<td>ramm[i]lə</td>
<td>give me it!</td>
</tr>
<tr>
<td>/rāmm[ə]lə</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lēv[ə]</td>
<td>remove!</td>
<td>ləv[á]lə</td>
<td>remove it!</td>
</tr>
<tr>
<td>/lēv[ə]lə</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The ‘verb’ column in (75) illustrates verbs with final schwa—the only surface pattern for verbs without attached enclitics. The ‘verb + enclitic’ column illustrates the same verbs with an attached enclitic, [lə] (the ‘l’ of this enclitic has geminated in the above examples). The forms in the ‘verb + enclitic’ column have two alternative stress patterns. If the penultimate vowel—rather than the antepenultimate vowel—is stressed, the underlying qualities of [i] or [a] surface (i.e. reduction to schwa does not take place). On the other hand, the final vowels in the ‘verb’ column and the penultimate vowel of the antepenultimately-stressed forms in the ‘verb + enclitic’ column undergo vowel reduction in unstressed, word-final position.

2.9.2. Evidence for a type /I,E,A,(O),(U)/ desinential inventory

Taking vowel reduction into account, it can be demonstrated that Calvello has a desinential /I,E,A,(O),(U)/ vowel inventory. The desinential vowels [a], [u], and [i] can be recovered under secondary stress, as shown in (76).

(76) Calvello desinential vowels under secondary stress (Kaze 1989: 28; Gioscio 1985: 31-2):

<table>
<thead>
<tr>
<th>single word form</th>
<th>gloss</th>
<th>phrasal form</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>/I/</td>
<td>kwir[ə] that/those</td>
<td>kwir[ı] kána</td>
<td>those dogs</td>
</tr>
<tr>
<td>/U/</td>
<td>kwir[ə] that/those</td>
<td>kwir[ù] kána</td>
<td>that dog</td>
</tr>
<tr>
<td>/A/</td>
<td>kwir[ə] that/those</td>
<td>kwir[ə] kásə</td>
<td>that house</td>
</tr>
<tr>
<td>/A/</td>
<td>nóv[ə] new [m. sing.]</td>
<td>nóv[á] nóvə</td>
<td>very new</td>
</tr>
</tbody>
</table>
For example, when the word [nɔvə] is doubled in the phrase [nɔvə nɔvə], the first instance of the word surfaces with the desinential vowel [a]. In a similar manner, the underlying vowels /a/, /i/, and /u/ can be recovered from alternations between [a], [i], [u] and [ə].

Evidence for underlying /E/ is somewhat more abstract. Kaze (1989) argues for positing an underlying phoneme /e/ which is distinct from /i/, based on the alternations shown in (77).

(77) Evidence for desinential /I/ vs. /E/ in Calvello (Kaze 1989: 28, 31):

<table>
<thead>
<tr>
<th>Phrasal form</th>
<th>gloss</th>
<th>phrasal form</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. nɔv[ə] nɔvə</td>
<td>very new [f. pl.]</td>
<td>/nɔve nɔve/</td>
<td></td>
</tr>
<tr>
<td>ii. kwir[i] kanə</td>
<td>those dogs [m.pl]</td>
<td>/kwiri kani/</td>
<td></td>
</tr>
<tr>
<td>b. m[ə]sə</td>
<td>table [m. sg.]</td>
<td>m[i]sə</td>
<td>tables [m. pl]</td>
</tr>
<tr>
<td></td>
<td>/mese/</td>
<td>/mesi/</td>
<td></td>
</tr>
<tr>
<td>c. kavr[ə]nə</td>
<td>‘goat’</td>
<td>kavr[ú]nə</td>
<td>‘goats’</td>
</tr>
<tr>
<td></td>
<td>/kavrone/</td>
<td>/kavroni/</td>
<td></td>
</tr>
</tbody>
</table>

The forms with underlying desinential /e/ have a schwa alternant even under secondary phrasal stress. For example, in (77.a.i), when the feminine plural form of [nɔvə] is doubled, the final vowel of the first word is still schwa, as in the example [nɔvə nɔvə]. This contrasts with the patterning of forms with underlying desinential /i/, repeated in (77.a.ii), in which [i], rather than [ə], appears under the same conditions.

Additional evidence for the distinction between /i/ and /e/ is the patterning of a class of masculine singular and masculine plural nouns, shown in (77.b,c). For example Kaze (1989) analyses nouns such as [mísə] as having an underlying desinential /i/, and an underlying mid vowel in the stem, as in /mes+i/. Metaphony of the stem vowel is triggered by the underlying desinential /i/, which then reduces to
schwa. In contrast, the derivation for the form [mésɔ] is as follows: [mésɔ] has an
underlyingly desinential mid vowel, as in /mes+e/; metaphony does not occur, but
vowel reduction does. In summary, the patterning displayed by masculine singular
and plural nouns (77.b,c) can be explained by assuming an underlying distinction
between /e/ and /i/ (Kaze 1989); I adopt this analysis.

The examples in (76) and (77) so far provide evidence for four desinential
vowels, realized as [i,ɔ,a,u] under secondary stress, and as [ə] in unstressed position.
In the following section, I discuss whether there is evidence for a distinction between
desinential /U/ and /O/.

2.9.2.1. Masculine singular desinences

Kaze (1989) argues for an underlying nominal desinence /U/ which triggers
metaphony in Calvello. Problematically, there is little evidence for an underlying
U/O distinction in Calvello, as we see below.

2.9.2.1.1. The status of the /U/ vs. /O/ distinction in Calvello

As shown in (78), in most Calvello masculine nouns and adjectives,
metaphonized stem vowels surface in both the singular and the plural. Calvello has
Neapolitan metaphony, in which raising of the lower-mid stem vowels [ɛ,ɔ] creates

(78) Examples of masculine nouns that always have raised (diphthongized) tonic
vowels (Kaze 1989: 26):

| a. | [vɛndɔ] | ‘wind, sg. or pl.’ |
| b. | [lɛttɔ] | ‘bed, sg. or pl.’ |
| c. | [kɛrtɔ] | ‘body, sg. or pl.’ |
| d. | [yɛntɔ] | ‘day, sg. or pl.’ |
| e. | /vɛndU/ | ‘wind, m.s.’ |
| f. | /vɛntl/ | ‘wind, m.pl.’ |

Kaze argues that the singular and plural nouns in (78) have the underlying desinences
/U/ (m.s.) and /I/ (m.pl.), as illustrated in (78.e,f). In Kaze’s analysis, raising
triggered by /U/ and /I/ causes diphthongization of the lower mid stem vowels in the
examples in (78).
Kaze’s evidence for a high /U/ desinence in the nominal forms is based on the forms in (79).

(79) Evidence for desinential [u] in the adjectival system:

a. sánd[ɔ] ‘saint’ (m.sg.)  
b. sánd[u] pyétrò ‘Saint Peter’  
c. kwîr[ɔ] ‘that/those (m.)’  
d. kwîr[u] kàñò ‘that dog’

Kaze (1989:28) argues that desinential [u] can be recovered in masculine singular adjectival forms, as shown by the alternations between [ɔ] and [u] in (79). By extension, Kaze assumes that there is also a nominal desinence [u] (adjectival and nominal desinences usually draw from the same set). However, the data in (79) illustrate a peculiarity of Calvello, namely that while surface desinential [u] can be recovered in adjectives (and also in proclitics preceding the noun), the nominal desinence(s) can never be recovered. This is because nouns never occur in a position where their desinences would be stressed. Furthermore, the same observation can be made of verbal desinences. With the exception of the second person imperative forms discussed in (75)—and these forms end with front vowel desinences—verbal desinences never occur in stressed position.

The above-defined peculiarity of Calvello warrants a separate explanation for nouns and verbs vs. adjectives, definite articles, etc. Accordingly, I analyse adjectives, definite articles, etc. in §2.9.2.1.2, and discuss nouns separately in §2.9.2.1.3.

2.9.2.1.2. The analysis of adjectives, definite articles and other prenominal words

While metaphony triggered by the vowel that is sometimes phonetically realized as [u] is quite regular in adjectives, definite articles, and other prenominal words (henceforth ‘prenominals’)—as shown by the examples in (76)—there is little evidence for a distinction between desinential /U/ and /O/ in Calvello. For example, Gioscio (1985: 54) notes that the neuter category in Calvello is of very limited distribution (‘è poco diffuso nel dialetto’). As shown in (80), the masculine singular
and the mass neuter definite article are identical, except that in the neuter, the article ‘lu’ triggers syntactic doubling—creating a geminate [pp] in (80.a)—while in the masculine singular, the article ‘lu’ does not trigger doubling, as shown in (80.b).

(80) The mass neuter in Calvello Gioscio (1985: 58):

<table>
<thead>
<tr>
<th>Neuter:</th>
<th>Masculine Singular:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. lu [pp]anɔ</td>
<td>bread</td>
</tr>
<tr>
<td>b. lu panɔ</td>
<td>a piece of bread, loaf of bread</td>
</tr>
<tr>
<td>c. lu [ff]yerrɔ</td>
<td>iron, the substance</td>
</tr>
<tr>
<td>d. lu fyerrɔ</td>
<td>iron tools, implements, etc.</td>
</tr>
</tbody>
</table>

If it is indeed the case that the masculine singular and the mass neuter are identical in Calvello, then there is no basis for positing a desinential /U/ vs. /O/ distinction in Calvello. Both the masculine singular and the mass neuter employ the desinence that is realized as [u ~ o]. However, this desinence represents an underlying non-high phoneme, /O/, as it is the only vowel in the back vowel range.

In summary, there is no evidence for an underlying /U/ vs. /O/ distinction in prenominals in Calvello. However, metaphony triggered by the vowel that surfaces as [u] is apparently regular in Calvello adjectives. I analyse the patterning of Calvello adjectives as an instance of morphologized metaphony. (See §2.10.2.3 for further discussion of morphologized metaphony.) Under this analysis, the feature [high] is no longer a property of the masculine singular and the masculine plural adjectival desinences, but is instead a property of the morphological classes of masculine singular and the masculine plural adjectives.

If the feature [high] is a property of morphological classes in the adjectives, one might expect that reanalyses of morphological classes of adjectives might occur due to analogy. Gioscio provides evidence that this is the case, as shown in (81):
(81) Analogical reanalysis of Calvello adjectives (Gioscio 1985: 60):

a. Invariant adjectives:

Masculine, feminine, singular, plural:

\[ \text{[krúrə]} \text{ raw (m.s., pl., f.s., pl.)} \]

b. Variable adjectives:

Masculine singular, plural

Feminine singular, plural

\[ \text{[sólə]} \text{ only (s, pl)} \]

\[ \text{[súlə]} \text{ only (s, pl)} \]

c. A third class:

i. Masculine singular

Feminine singular, plural

Masculine plural

\[ \text{[vë̆c̆cə]} \text{ old [vë̆c̆cə]} \text{ old [vyë̆c̆cə]} \text{ old} \]

ii. Masculine, feminine singular

Masculine & feminine plural

\[ \text{[vë̆c̆cə]} \text{ old [vyë̆c̆cə]} \text{ old} \]

iii. Masculine, feminine, singular, plural

\[ \text{[vë̆c̆cə]} \text{ old} \]

(81.a) illustrates the class of invariant adjectives, which have only one form no matter what the number or gender. (81.b) illustrates the class of variable adjectives; these adjectives have one form for the feminine singular and plural, and another form for the masculine singular and plural. (81.a, b) include the most common patterns, patterns which are like those of the nouns discussed below. (81.c), on the other hand, illustrates a third, smaller class of adjectives which freely occur in three types of patterns (Gioscio 1985: 60). As shown in (81.c.i), this class of adjectives can have a non-metaphonized form for the masculine singular and the feminine singular and plural, while having a metaphonized form only for masculine plurals. (81.c.ii) illustrates that the same adjectives can be reanalysed so that the non-metaphonized

\[ [̃c] \text{ denotes a voiceless palatal stop.} \]
form denotes singulars of both genders, while the metaphonized form denotes plurals of both genders. Gioscio (1985: 60) attributes the patterning in (81.c.ii) to analogy with the patterning of variable adjectives in (81.b), although the analogy is not direct. Finally, (81.c.iii) illustrates that the adjectives in question can even be reanalysed as invariant adjectives, as in (81.a), in which case the unmetaphonized form is used for all numbers and genders (Gioscio 1985: 60). The examples in (81.c) provide evidence for the operation of the morphological process of analogical reformation. Evidence for the operation of this process is also evidence that metaphony in Calvello adjectives is morphologized. I adopt this analysis here.

The patterning of Calvello adjectives might also be viewed as a counterexample to the claims made in this chapter, since it is the case that a phonetic [u] that does not contrast with a phonetic [o] triggers metaphony in the adjectives. However, the morphologization account presented here, namely that metaphony triggered by phonetic [-u] in the adjectives is morphologized metaphony, is an equally viable alternative. In addition, there is one further reason to reject the phonetic account: The phonetic account, in a nutshell, is that phonetically high [u] triggers raising. This account, however is too concrete to explain the facts of Calvello. In Calvello adjectives, for example, the stem vowel of masculine singular and plural forms is metaphonized when the final desinence appears as [u], but also when the final desinence appears as [ə]. To account for this variation, the phonetic account might posit that phonetically high [u] triggers metaphony, and then reduces to [ə]. This account, however, is identical to the abstract metaphony account that I develop for Calvello nouns and verbs in the following section, with one difference: the possible phonetic account discussed here is unfalsifiable, positing a high vowel whenever a metaphonized stem vowel occurs. In contrast, in the abstract metaphony account that I develop in the following sections, I posit a phonologically high desinence only on the basis of alternations between, say, desinential [i~o] and non-alternating desinential [ə]. Crucially, however, I do not posit contrasts on the basis of
whether or not a stem vowel is metaphonized, as the possible phonetic account would. In summary, then, a phonetic account of metaphonized stem vowels in Calvello masculine singular and plural adjectives would be tautological, or at the very least could make no predictions about the patterning of masculine singular and plural adjectives in Calvello. The morphologization account, on the other hand, makes predictions about the patterning of masculine singular and plural adjectives, namely predictions that morphological forces such as analogy could occur. As discussed above, there is evidence from analogical reformation that metaphony in Calvello nouns is morphologized.

For further discussion of the distinction I make here between a) positing contrasts on the basis of alternations in the triggers, and b) positing contrasts on the basis of alternations in the targets, see chapter 5, §5.5.2.

2.9.2.1.3. Nouns and verbs

As discussed earlier, Calvello nominal and verbal desinences never occur in stressed position, and are therefore always realized as schwa [ə]. However, nouns and verbs also display consistent alternations between metaphonized and non-metaphonized stem vowels, as shown by the examples in (82). A checkmark (✓) by an example indicates that the example contains a stem vowel that has been analysed as a metaphonized vowel on the basis of being diphthongized. However, words with a checkmark do not necessarily undergo metaphony, as explained shortly.

(82) Calvello desinences and metaphony (from Kaze 1989: 21-2):

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓a.</td>
<td>v[jé]nté</td>
<td>'wind, m.s.'</td>
<td>✓b.</td>
<td>v[jé]nté</td>
<td>'wind, m.pl.'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>p[ą]řé</td>
<td>'foot, m.s.'</td>
<td>✓d.</td>
<td>p[ą]řé</td>
<td>'feet, m.pl.'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>n[ąv]o</td>
<td>'new, f.s.'</td>
<td>f.</td>
<td>n[ąv]o</td>
<td>'new, f.pl.'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g.</td>
<td>p[ę]ńžo</td>
<td>'I think'</td>
<td>✓h.</td>
<td>p[ę]ńžo</td>
<td>'you s. think'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i.</td>
<td>p[ę]ńžo</td>
<td>'he thinks'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(82.a-f) illustrate nominal desinences. As shown in (82.a,b), some masculine nouns have diphthongized stem vowels such as [jé] in both the singular and the plural.
However as shown in (82.c,d), other masculine nouns have unmetaphonized vowels such as [ê] in the singular, and metaphonized vowels such as [jé] in the plural. The feminine singular and plural nouns in (82.e,f), on the other hand lack metaphonized stem vowels.

Examples (82.g-i) illustrate the regular patterning found in the verbs. The first singular indicative (82.g) and the third singular indicative (82.i) do not have metaphonized stem vowels, while their second singular indicative counterpart (82.h) does have a metaphonized stem vowel.

I explain the metaphonic alternations in (82) in (83). First, I assume that phonologically high desinences trigger metaphony in the cases highlighted by a checkmark (√) in (83). Note that these cases do not include (83.a,b).

As discussed earlier, there is little evidence for a desinential /U/ vs. /O/ distinction in Calvello, but substantially more evidence for a desinential /E/ vs. /I/ distinction, namely the alternations discussed in (76) and (77). In other words, there is evidence for a non-high vs. high distinction in Calvello, but little evidence for such a distinction within the back vowel region. I hypothesize that in Calvello, desinences have been reanalysed in accordance with this evidence, as shown in (83). Curly brackets {} indicate intermediate representations in (83). The desinences in (83.c,g) are bolded to highlight the fact that they differ in form from the historically reconstructed desinence *u (m.s.) and *o (1s indicative).

(83) Reanalysis of Calvello desinences:

```
a.  v[yé]nt{E}  ‘wind, m.s.’  b.  v[yé]nt{I}  ‘wind, m.pl.’
c.  p[é]r{E}     ‘foot, m.s.’  √d.  p[yé]r{I}  ‘feet, m. pl.’
g.  p[é]n{E}     ‘I think’ √h.  p[yé]n̥{I}  ‘you s. think’
i.  p[é]n{E}     ‘he thinks’
```

Under the reanalysis in (83), metaphony in Calvello is associated with the high desinence /I/, while lack of metaphony is associated with the non-high desinences /A/
and /E/. The underlying value of these desinences can be recovered via alternations between desinential [i~ə], [a~ə], and [e~ə], as discussed in §2.9.2.

In masculine singular words which always have metaphonized stem vowels (83.a,b), there is no evidence from alternations that would lead to positing a process of metaphony. Hence, I analyse the stem vowel [jé] in (83.a,b) as underlying vowel, rather than a metaphonized vowel. Under this analysis, the height of the desinential vowel in such masculine nouns is irrelevant. However, based on (83.c,d), I claim that the masculine singular desinence is /E/ while the masculine plural desinence is /I/.

In (83.c,d,e,f), on the other hand, desinential /A/, /E/ and /I/ can be posited on the basis of surface alternations in the nominal and adjectival desinences. See §2.9.2 for further details.

In (83.e-i), there are no surface alternations providing evidence for the height of the desinences. However, based on the evidence for /I/ and /E/ in the types of examples illustrated in (83.c,d), desinential /I/ and /E/ can be posited for (83.e-i) as well. Under this analysis, the desinences in (83.c,g) deserve special mention, as they differ from the desinences one would posit on the basis of comparative evidence. In (83.c,g), the analogous desinences are back vowels in other metaphonizing Italian dialects. For example, the desinence /I,E/ in (83.c) corresponds to /U/ in Servigliano, while /E/ in (83.g) corresponds to /O/ in Servigliano. Other than these two cases, the analysis of Calvello is identical to that of Servigliano.

2.9.3. *Raising and contrastive inventories in Calvello*

Summarizing the above discussion, the desinential vowel inventory of Calvello is /I,E,A,(O)/, where (/O/) is a moribund desinental back vowel realized as [u] in certain prenominal paradigms. Given the desinential inventory /I,E,A,(O)/, metaphony in Calvello should be asymmetrical, i.e. triggered only by /I/. Confirming this prediction, Calvello has a regular process of metaphony triggered by /I/, a vowel that surfaces as [ə~i]. On the other hand, as discussed earlier, prenominal forms
(such as adjectives and determiners) provide evidence for a desinential vowel that is realized as [u], but these same forms do not provide evidence for a distinction between /U/ and /O/. I have analysed these prenominal forms as examples of morphologized metaphony.

Example (84) summarizes the correlation between the desinential vowel inventory and raising of Calvello.

(84) Correlation between desinential vowel inventory and raising in Calvello:

<table>
<thead>
<tr>
<th>Desinential vowels</th>
<th>Desinential triggers of raising</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>E</td>
<td>(O)</td>
</tr>
<tr>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

The Calvello example demonstrates that asymmetrical metaphony triggered by /I/ occurs in those dialects which have a mid-high contrast only in the front vowel desinences. The Calvello example also illustrates that dialects with surface single-vowel ([ɔ]) desinential inventories and metaphony have underlying desinential inventories which contain phonologically high vowels. In such dialects, the correlation between mid-high contrasts and the possibility of metaphony is obscured by reduction.

2.10. Apparent counterexamples (inventories with fewer than four desinential vowels and metaphony)

As discussed in §2.7, many Italian dialects represent surface counterexamples to my claims concerning contrastively-defined inventories. The dialects in question apparently have fewer than four desinential vowels—e.g. surface 3-vowel inventories such as [i,a,u] and [e,a,o], and surface single-vowel desinential inventories consisting of [ɔ]. Such inventories should have no phonologically high vowels, since they have no contrast between mid and high vowels. However, many of the Italian dialects with desinential inventories of fewer than four vowels also have metaphony.
I discuss the apparent counterexamples in the following section, arguing the following: 1) the relevant Italian desinential inventories of fewer than 5 vowels derive from underlying /I,E,A,O,U/ inventories; 2) the underlying /I,E,A,O,U/ inventories become surface [i,a,u], [e,a,o] or [ɔ] as a result of vowel reduction; 3) the dialects in question display synchronic evidence for vowel reduction outside of the desinential inventory; 4) the desinences which do trigger metaphony in such dialects correspond to phonetically and phonologically high vowel desinences in other dialects of Italian, while those desinences which do not trigger metaphony correspond to phonetically and phonologically non-high vowel desinences in other dialects of Italian. On the basis of these arguments, I conclude that the Italian dialects do not represent counterexamples to the claim that a phonologically distinctive high vowel is required for high metaphony; instead, these dialects as well show that metaphony is triggered by those vowels which are predicted to be phonologically high in MCS, but later reduce.

In §2.10.1, I discuss the Neapolitan dialect, which has metaphony apparently triggered by the non-high final vowels /e,o/. I argue for the possibility of an analysis in which the underlying desinential inventory /I,E,A,O,U/ is reduced to three vowels via the process of reduction. In §2.10.2, I argue that this is the correct analysis for dialects such as Neapolitan.

2.10.1. Napoli (Neapolitan)

2.10.1.1. Final vowels

The Campanian dialect spoken in Napoli (henceforth Neapolitan) has three surface final vowels, [ä, ü, ö], whose phonetic realizations are summarized in (85).
Modified Contrastive Specification

(85) Surface final vowels (Bichelli 1973: 30-38):

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ä</td>
<td>semi-silent (semimuto), pronunciation between [a] and [e]</td>
</tr>
<tr>
<td>è</td>
<td>semi-silent (semimuto)</td>
</tr>
<tr>
<td>ö</td>
<td>semi-silent; pronunciation between [o] and [e]</td>
</tr>
</tbody>
</table>

The above descriptions show that the final vowels in the Neapolitan dialect are reduced and articulated with varying pronunciations. For the remainder of this discussion, I use the symbols [e] for [è] and [o] for [ö].

Metaphony occurs in several classes of words which have desinential [e] or [o]. I show in §2.10.1.2 that the [-e] or [-o] desinences which trigger metaphony derive from phonologically high /I/ and /U/, while those that do not trigger metaphony derive from underlying /E,A,O/. More generally, I argue that the surface final vowel inventory in (85) derives from an underlying five-vowel /I,E,A,O,U/ inventory.

2.10.1.2. Tonic vowels and metaphony

Neapolitan has seven tonic vowels whose phonetic realizations are described in (86).

(86) Tonic vowels (Bichelli 1973: 30-43):

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>pronounced with its ‘natural’ sound in tonic position [i.e. like the standard Italian pronunciation]</td>
</tr>
<tr>
<td>e</td>
<td>close</td>
</tr>
<tr>
<td>ε</td>
<td>open</td>
</tr>
<tr>
<td>i</td>
<td>pronounced with its ‘natural’ sound in tonic position [i.e. like the standard Italian pronunciation]</td>
</tr>
<tr>
<td>o</td>
<td>open</td>
</tr>
<tr>
<td>ø</td>
<td>approaching the sound of [u] (p. 38)</td>
</tr>
<tr>
<td>u</td>
<td>pronounced with its ‘natural’ sound in tonic position [i.e. like the standard Italian pronunciation]</td>
</tr>
</tbody>
</table>

The vowels in (86) have values close to the IPA values, except for [ø], which is very close.

Example (87) provides a summary of the correlations between desinences and raised tonic (main-stress) vowels in Neapolitan.
Tonic vowels and metaphony (Bichelli 1973: 47):

<table>
<thead>
<tr>
<th>Underlying tonic vowel</th>
<th>when followed by some [-o] and [-e] desinences (examples provided below)</th>
<th>when followed by any other desinence (some [-o], [-e] and all [-a])</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>e</td>
<td>je</td>
<td>e</td>
</tr>
<tr>
<td>e</td>
<td>i</td>
<td>e</td>
</tr>
<tr>
<td>je</td>
<td>je</td>
<td>je</td>
</tr>
<tr>
<td>i</td>
<td>i</td>
<td>i</td>
</tr>
<tr>
<td>ɔ</td>
<td>wo</td>
<td>ɔ</td>
</tr>
<tr>
<td>o</td>
<td>u</td>
<td>o</td>
</tr>
<tr>
<td>wo</td>
<td>wo</td>
<td>wo</td>
</tr>
<tr>
<td>u</td>
<td>u</td>
<td>u</td>
</tr>
</tbody>
</table>

As summarized in (87), the tonic lower mid vowels [ɛ, ɔ] diphthongize to [jɛ, wɔ] when they metaphonize, and the higher mid vowels raise from [ɛ, ɔ] to [i, ɯ] when they metaphonize. Metaphony is triggered by some final [-o] desinences and by some final [-e] desinences, but not by all. This is illustrated further in the following section.

2.10.1.3. Metaphonizing and non-metaphonizing desinences

In this section, I discuss the correlation between morphological categories and metaphony, phrasing this correlation as one between desinences and metaphony. (I address a separate question, whether metaphony in dialects such as Neapolitan is morphological or phonological, in §2.10.2.1).

2.10.1.3.1. Desinences which do not trigger metaphony

Desinences which do not trigger metaphony are shown in (88) and (89):

(88) Lack of metaphony before final [-e] (/ɛ/) and final [-a] (/ɑ/) in the nouns (Bichelli 1973: 46):

<table>
<thead>
<tr>
<th>f.s. [-a]</th>
<th>f.p. [-e]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. prɛreca</td>
<td>b. prɛreche</td>
</tr>
<tr>
<td>c. cɔzzeca</td>
<td>d. cɔzzche</td>
</tr>
<tr>
<td>‘sermon’</td>
<td>‘sermons’</td>
</tr>
<tr>
<td>‘mussel’</td>
<td>‘mussels’</td>
</tr>
</tbody>
</table>
The feminine singular desinence [-a] and the feminine plural desinence [-e] do not trigger metaphony, as shown by the presence of non-metaphonized lower-mid vowels in (88).

(89) shows another [a] desinence which does not trigger metaphony, and two types of [e] desinences, one of which triggers metaphony while the other does not. (I later argue that the [o] and [e] desinences which trigger metaphony derive from underlying /U/ and /I/ while the [o] and [e] desinences which do not trigger metaphony derive from underlying /O/ and /E/.)

(89) Metaphony before final [-e] (/I/) and [-o] (/U/) (Bichelli 1973: 45-6):

A.  
- f.s. [-a] /A/
- 1s indic. [-o] /O/

B.  
- m.s. [-o] /U/
- 2s indic. [-e] /I/

a. scignet[é]lla ‘little monkey (f.)’  
b. scignet[jé]lo ‘little monkey (m.)’

c. sp[é]rzar ‘lost (f.)’  
d. sp[jé]rzo ‘lost (m.)’

e. io p[é]rdo ‘I lose’  
f. tu p[jé]rde ‘you lose’

g. io c[ó]cio ‘I cook’  
h. tu c[wó]ce ‘you cook’

The first singular indicative desinence [-o] does not trigger metaphony, as shown by the presence of non-metaphonized lower-mid vowels in (89.e,g). In this respect, 1s indicative [-o] patterns like the low vowel feminine singular desinence [-a], illustrated in (89.a,c).

2.10.1.3.2. Desinences which trigger metaphony

The masculine singular desinence [-o], unlike the first singular indicative desinence [-o], triggers metaphony (in the form of diphthongization) of lower mid vowels, as one can ascertain by comparing the related forms of (89.a) with a non-diphthongized lower mid stem vowel and (89.b) with a diphthongized lower mid stem vowel, as well as (89.c) vs. (89.d). Similarly, the 2s indicative desinence [-e] triggers metaphony, as can be ascertained by comparing the related forms of (89.e) vs. (89.f) and (89.g) vs. (89.h).
2.10.1.3.3. The masculine singular vs. mass-neuter distinction

In §2.10.1.3.1 and §2.10.1.3.2, I provided potential evidence for an underlying U/O distinction by showing that the masculine singular correlates with metaphony while the 1st singular indicative desinence correlates with lack of metaphony. In this section, I provide additional evidence for an U/O contrast within the nominal/adjectival system, as signalled by the distinction between metaphonizing masculine singular vs. non-metaphonizing mass-neuter desinences.

The strongest evidence for a masculine singular vs. mass-neuter distinction in Neapolitan come from the pronominal forms illustrated in (90).

(90) Demonstrative pronouns (Bichelli 1973: 143, 144) (evidence for final /O/); (/chEst/- ‘this one’; /chEss/- ‘codesto’; /chEll/- ‘that one’; /At/- ‘the other one’; /stess/- ‘the same one’): 47

<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m</td>
<td>f</td>
</tr>
<tr>
<td>/U/</td>
<td>/chEst/</td>
<td>chísto</td>
</tr>
<tr>
<td>/A/</td>
<td>/chEss/</td>
<td>chísso</td>
</tr>
<tr>
<td>/I/</td>
<td>/chEll/</td>
<td>chillo</td>
</tr>
<tr>
<td>/E/</td>
<td>/At/</td>
<td>áto</td>
</tr>
<tr>
<td>/O/</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in (90), masculine singular forms differ from mass neuter forms in having a raised vs. an unraised stem vowel. In other words, the masculine singular desinence correlates with metaphony, while the mass-neuter does not.

The mass-neuter category in nouns and adjectives in Neapolitan is not very robust, and accordingly, the evidence for mass-neuter vs. masculine singular categories is scarce. The evidence is shown in (91) and discussed below. The mass nouns in (91.a) occur only in the singular form, while those in (91.b) occur only in the plural.

---

47 The demonstrative pronouns do not have separate forms before consonant-initial words; I assume that this is because demonstrative pronouns are typically phrase-final, and therefore not in a position to show the variation discussed in (68).
(91) Evidence for neuter (mass) nouns with underlying final /-O/ (Fierro 1989: 75):

a. ‘a fáme  
   ‘a pr[o]le  
   ‘o senápe  
   ‘o m[é]le  
   ‘a s[é]te  
   ‘o p[é]pe  
   ‘o s[e]go  
   ‘o brio  
   ‘o f[é]le  
   ‘o sán go  
   ‘o senno  
   ll’áere  
   ‘o bário  
   ‘o cálcio  
   ‘o mercúrio  
   ‘o f[é]rro\textsuperscript{48}  

b. ll’anal e  
   ‘e f[e]rie  
   ‘e b[é]tte  
   ‘e br[ó]nte  
   ‘e cal[é]rne  
   ‘e dint[ó]rne  
   ll’es[e]quie  
   ‘e lari\textsuperscript{49}  
   ‘e man[é]tte  
   ‘e n[é]zze  
   ‘e post[e]ri\textsuperscript{50}  
   ‘e spinaci  
   ‘e sp[é]zie  
   ‘e ten[e]bre  
   ‘e viv[e]re

\textsuperscript{48} Altamura (1961) notes that ‘fjérro’ can occur in the plural, but with a
derivationally opaque meaning: ‘fjérro’ in the singular means \textit{iron, anchor},
and in the plural, means \textit{chain, handcuffs}.

\textsuperscript{49} The surface front vowel desinence in Napoli varies freely between [i] and [e],
while the back vowel desinence varies freely between [u] and [o]. However,
this variation does not correlate with any morphological category (Altamura
1961: 20-21, Fierro 1989). As this example illustrates, the spelling system
sometimes inconsistently uses ‘i’ in place of ‘e.’

\textsuperscript{50} See footnote 48.
The singular nouns in (91.a) end either with [-o] or [-e]; significantly, the nouns with [-o] endings may contain unmetaphonized tonic mid vowels—either [é] or [ê]—rather than the metaphonized counterparts, [í] and [jé], eg. s[é]go tallow, f[ê]le bile, and pr[ó]le offspring. The plurals in (91.b) generally end in [-e], which is the plural counterpart to [-o] and [-a] noun desinences in Standard Italian. Significantly, unlike the masculine plurals in (89), which end in metaphonizing [-e], the [-e] desinence in the mass nouns in (91.b) is non-metaphonizing, as shown by the failure to raise in forms such as f[ê]rie and b[ó]tte. I draw two conclusions from this discussion. One, the Neapolitan dialect has a category of mass-neuter nouns which is essentially moribund, as discussed below example (91), and two, this category fails to trigger metaphony. This contrasts with the masculine singular ending [o] (cf. (90)) which consistently triggers metaphony.

Based on the above discussion, I revise and summarize the system of nominal desinences as follows:

(92) Nominal/adjectival endings (revised) (Bichelli 1973: 75-6):

<table>
<thead>
<tr>
<th>Metaphonizing</th>
<th>Non-metaphonizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>m.s. [-o]</td>
<td>‘o níño</td>
</tr>
<tr>
<td></td>
<td>child (ms)</td>
</tr>
<tr>
<td>m.pl. [-e]</td>
<td>‘e marchíse</td>
</tr>
<tr>
<td></td>
<td>marquis</td>
</tr>
<tr>
<td>n.s. [-o]</td>
<td>‘o butírro</td>
</tr>
<tr>
<td></td>
<td>butter</td>
</tr>
</tbody>
</table>

As shown in (92), the metaphonizing nominal/adjectival desinences correspond to the masculine singular and masculine plural categories; other nominal/adjectival desinences are non-metaphonizing.

2.10.1.3.4. Effects of metaphony on higher-mid vowels

To complete the discussion of Neapolitan metaphony, I describe the effects of metaphony on the higher mid vowels /E, O/ and on the vowels /I, U, A/.

A.  
- f.s. [-a] /A/ or f.s. [-e] /E/;
- 1 sg. indic. [-o] /O/;

B.  
- m.s. [-o] /U/ or m.pl. [-e] /I/;
- 2s indic. [-e] /I/;

Example (93) illustrates the effect of metaphony on higher mid stem vowels: the desinential vowels including m.s. [-o], m.pl. [-e], and 2s indicative [-e] trigger metaphony, while the desinential vowels f.s. [-a], f.pl. [-e], and 1s indicative [-o] do not trigger metaphony. Metaphony raises the higher-mid vowels [e, o] to [i, u].

(94) Metaphony—[á], [í], [ú], [jé] and [wó] remain unchanged (Bichelli 1973: 45-6):

Example (94) illustrates that the tonic vowels [á, í, ú] and underlying diphthongs [jé] and [wó] (column A) remain unchanged in a metaphonic context (column B).

2.10.1.3.5. Summary of Neapolitan metaphony

In summary, Neapolitan metaphony is triggered by desinential [-e] and [-o] when [-e] is the m.pl. desinence or the 2s indicative desinence and when [-o] is the
m.s. desinence. However, metaphony is not triggered by the desinences [-e] and [-o] when [-e] is the f.pl. desinence and when [-o] is the mass-neuter desinence or the 1s indicative desinence. In this respect non-metaphonizing [-e] and [-o] pattern like the low vowel desinence f.s. [-a], which likewise does not trigger metaphony.

I analyse the patterning presented above as follows:

(95) The relationship between surface and underlying desinences (based on Bichelli 1973: 75-6):

<table>
<thead>
<tr>
<th>Surface desinence</th>
<th>Underlying desinence</th>
<th>Other dialects</th>
<th>Metaphonizing?</th>
</tr>
</thead>
<tbody>
<tr>
<td>m. pl. [-e]</td>
<td>/-I/</td>
<td>[-i]</td>
<td>yes</td>
</tr>
<tr>
<td>2s indicative [-e]</td>
<td>/-I/</td>
<td>[-i]</td>
<td>yes</td>
</tr>
<tr>
<td>f.pl. [-e]</td>
<td>/-E/</td>
<td>[-e]</td>
<td>no</td>
</tr>
<tr>
<td>m.s. [-o]</td>
<td>/-U/</td>
<td>[-u]</td>
<td>yes</td>
</tr>
<tr>
<td>n.s. [-o]</td>
<td>/-O/</td>
<td>[-o]</td>
<td>no</td>
</tr>
<tr>
<td>1s indicative [-o]</td>
<td>/-O/</td>
<td>[-o]</td>
<td>no</td>
</tr>
<tr>
<td>f.s. [-a]</td>
<td>/-A/</td>
<td>[-a]</td>
<td>no</td>
</tr>
</tbody>
</table>

I hypothesize that metaphonizing [-e] and [-o] derive from underlyingly phonologically high vowels, while non-metaphonizing [-e] and [-o] derive from underlyingly non-high vowels. Under this hypothesis, underlying /I,E/ must reduce to surface [-e], and underlying /U,O/ must reduce to surface [-o]. To support the hypothesis that reduction occurs in Neapolitan, I demonstrate in the following section that reduction occurs in every unstressed vowel in the Neapolitan dialect, and by extension, also in final desinences, which are unstressed.

2.10.1.4. Atonic vowels and vowel reduction

In atonic position, the seven underlying vowels of Neapolitan reduce to [ ē a u ], a process which the Italian literature refers to as ‘apophony’ (Bichelli 1973: 50). (Recall from (85) that [ē] is a semi-silent (semimuto) vowel which essentially sounds like schwa.)

51 Roiate (Orlandi 1989), a Roman dialect, has the endings shown in this column, and has metaphony triggered by final [-i] and [-u].
Atonic (unstressed) vowels and apophony (reduction) (Bichelli 1973: 50):

<table>
<thead>
<tr>
<th></th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>ε</td>
<td>ε</td>
</tr>
<tr>
<td>e</td>
<td>ĝ</td>
</tr>
<tr>
<td>je</td>
<td>je</td>
</tr>
<tr>
<td>i</td>
<td>i</td>
</tr>
<tr>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>wo</td>
<td>wo</td>
</tr>
<tr>
<td>u</td>
<td>u</td>
</tr>
</tbody>
</table>

As summarized in (96), [a] in tonic position (i.e. main word stress position) remains [a] in atonic position; on the other hand, all the front vowels, including [ε, e, je, i], reduce to [ĝ] in atonic or non-main-word-stress position, while all the back rounded vowels, including [o, wo, u], reduce to [u] in atonic position. The patterning summarized in (96) is illustrated in (97) - (99).

(97) [i], [e], [je] and [ε] become [ĝ] (schwa) in atonic position (Bichelli 1973: 48):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>p[i]zza</td>
<td>pizza</td>
</tr>
<tr>
<td>p[ê]zzélla</td>
<td>small pizza</td>
</tr>
<tr>
<td>r[ê]zza</td>
<td>net</td>
</tr>
<tr>
<td>r[ê]zzetélla</td>
<td>small net</td>
</tr>
<tr>
<td>sup[ê]rbo</td>
<td>arrogant</td>
</tr>
<tr>
<td>sup[ê]rbjóne</td>
<td>very arrogant</td>
</tr>
<tr>
<td>arg[jé]nto</td>
<td>silver</td>
</tr>
<tr>
<td>arg[ê]ntaria</td>
<td>silverware</td>
</tr>
</tbody>
</table>

Example (97) illustrates that all front vowels and diphthongs become [ĝ] in atonic position.

(98) [u], [o], [wo], [wo] and [o] become [u] in atonic position (Bichelli 1973: 49):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>p[ú]rpo</td>
<td>octopus (ms)</td>
</tr>
<tr>
<td>p[u]rpéssa</td>
<td>octopus (fs)</td>
</tr>
<tr>
<td>p[ó]rpa</td>
<td>pulp (fs)</td>
</tr>
<tr>
<td>p[u]rpúso</td>
<td>pulpy (fs)</td>
</tr>
<tr>
<td>str[ã]leco</td>
<td>astrologist (ms)</td>
</tr>
<tr>
<td>str[u]lechéssa</td>
<td>astrologist (fs)</td>
</tr>
<tr>
<td>[wó]rco</td>
<td>orc, troll (ms)</td>
</tr>
<tr>
<td>[u]rchéssa</td>
<td>orc, troll (fs)</td>
</tr>
</tbody>
</table>

Example (98) shows that any back vowel or diphthong becomes [u] in atonic position.

(99) [a] in tonic and atonic position (Bichelli 1973: 48):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>c[á]sa</td>
<td>house</td>
</tr>
<tr>
<td>c[a]sarélla</td>
<td>nice little house</td>
</tr>
</tbody>
</table>

Example (99) illustrates that [a] remains unchanged in atonic position.
Examples (96) - (99) illustrate that vowel reduction is a regular, synchronic process in Neapolitan.

2.10.1.5. **Summary of Neapolitan**

The Neapolitan data discussed above exemplify the following patterns:

(100) Neapolitan vowels (summary):

a. Stem vowels

| i. no metaphony | i | e | je | e | a | o | wo | u |
| ii. metaphony | i | je | a | wo | o | u |
| iii. atonic position (non-final) | ë | a | u |

b. Desinential vowels:

Surface

| e | a | o |

Non-metaphonized mid vowels in stems (100.a.i) either raise or diphthongize as a result of metaphony (100.a.ii). However, the vowels in (100.a.i,ii) only occur in stressed position; in unstressed position, all vowels are reduced to the set [e,a,u] (100.a.iii). Surface desinential vowels (100.b) undergo no alternations; only [e,a,o] can appear in surface forms.

2.10.1.6. *The implications of vowel reduction for an analysis of metaphony*

From the above discussion, I conclude that it is possible that the Neapolitan surface desinential inventory [e,a,o] could derive from an underlying /I,E,A,O,U/ inventory, in that surface desinential [e,a,o] could be the result of vowel reduction. (This is essentially the same solution advocated by Calabrese in his analysis of metaphony in Salentino, where the desinential inventory reduces to [i,a,u] (1984-85:6-10)). If vowel reduction of desinences exists in Neapolitan, this necessitate a more abstract analysis of metaphony in which some surface non-high vowels—namely those deriving from underlying high vowels—trigger metaphony.
2.10.2. The status of metaphony in dialects with non-transparent metaphonic alternations

Because the final desinences in dialects such as Neapolitan show no synchronic evidence for vowel reduction, two radically different types of analyses for the metaphonic alternations have been proposed in the literature. One proposal—the one that I have been arguing for—is that desinential [e,a,o] in Neapolitan derives from underlying /I,E,A,O,U/, and that underlying /I,U/ trigger metaphony, just as in the more transparent case of Servigliano. This type of proposal is exemplified by Calabrese’s (1984-85) analysis of Salento. (Aside from having a different surface desinential inventory, namely [i,a,u], Salento patterns like the Neapolitan example discussed above.) I will term this proposal the ‘phonological’ proposal.

An alternative proposal for dialects such as Neapolitan and Salento is that metaphony has been morphologized, so that the feature [high] is a morpheme-level feature in those morphemes which have metaphony in their stems. This type of analysis is discussed but not defended by Maiden (1991), who holds a less extreme position. I term this proposal the ‘morphologization’ proposal.

The above proposals differ in one essential respect. The morphologization proposal predicts that metaphony will in general correlate with particular morphological categories. However, the phonological proposal does not make this prediction; on the contrary, the phonological proposal predicts that there could be, for example, several masculine singular desinences, only one of which triggers metaphony; metaphony would be exclusively a property of desinences.

In §2.10.2.1, I argue for the phonological proposal, showing that metaphony correlates with desinences, not with morphological classes. In §2.10.2.2-§2.10.2.3, I present an analysis which derives the essential differences between transparent and abstract metaphonizing dialects.
2.10.2.1. Against the morphologization account of metaphony

In this section, I argue that in transparent and abstract metaphonizing dialects alike, metaphony is triggered by select desinences. In transparent metaphonizing dialects, as discussed in §2.5-§2.8, the desinences which trigger metaphony are phonologically high, i.e. phonologically high because they contrast with mid vowel desinences. However, in abstract metaphonizing dialects, the correlation between metaphony and desinences is less clear. The basic observation is that metaphony occurs in the same morphological categories which display metaphony in transparent metaphonizing dialects. This is illustrated in table (103), which summarizes the system of nominal desinences for Servigliano (S), Calvello (C) and Neapolitan (N). An asterisk after a desinence indicates that metaphony is associated with forms having that desinence. The singular or plural counterpart of each desinence is shown on the same line in either the singular or plural rows. For example, the masculine singular desinence [-u] in Servigliano has the plural counterpart [-i]. The term ‘n/a’ indicates that the relevant category does not exist. Finally, the desinences shown in (103) are surface forms (in Calvello, those forms which appear under secondary stress).

(103) Metaphony and final nominal desinences in several Italian dialects (Camilli 1929: 226; Bichelli 1973: 45, Fierro 1989: 72-75)

<table>
<thead>
<tr>
<th></th>
<th>masculine</th>
<th>feminine</th>
<th>neuter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td>singular</td>
<td>ū</td>
<td>e</td>
<td>ū</td>
</tr>
<tr>
<td>plural</td>
<td>i*</td>
<td>i*</td>
<td>e*</td>
</tr>
</tbody>
</table>

52 This metaphonizing desinence is attested in plural words such as the following, from Bichelli (1973: 45).

(i) pezz[č]nt[e] ‘beggar, m./f. sg.’ pezz[ǰe]nt[e] ‘beggars, m./f.pl.’
Table (103) illustrates several arguments against the morphologization hypothesis. First, metaphony never occurs anywhere that could not be analysed as before a high desinence. Second, each dialect has largely the same number and type of desinences. For example, all of the dialects have the same number and type of masculine singular and plural desinences. This uniformity of the desinential inventory argues for a uniform treatment of all desinential inventories, such that, if metaphony accounts for the patterning of desinences and stems in Servigliano, it also accounts for the patterning in Calvello and Neapolitan. Third, as shown in (103), particularly for the masculine singular desinences, there is no one-to-one association between metaphony and morphological category in Servigliano, Calvello, and Neapolitan. In these dialects, metaphony correlates with particular desinences, rather than with morphological categories. Further examples of the latter observation are listed in examples (104) - (106). The examples in (104) illustrate non-metaphonizing masculine suffixes in Lucanian (a dialect group to which Calvello belongs).

Salzano (1980: 189) lists the above form as being either masculine or feminine in the Neapolitan dialect. The singular desinence is non-metaphonizing [e], while the plural is metaphonizing [e].

Other examples of a metaphonizing feminine plural [-e] desinence include the following from Fierro (1989: 73):

(ii) a. ‘a sérpa ‘the serpent’ ‘e sjérpe ‘the serpents’
   b. ‘a secchia ‘the bucket’ ‘e sicchie ‘the buckets’

Note that the plurals in (ii) have metaphonized stem vowels, indicating that the final desinence is metaphonizing. As noted by Camilli (1929: 226), the same pattern—i.e. f.s. [-a] and f.pl. [-i]—is attested in Servigliano, but is an archaic pattern.
(104) Masculine suffixes in Lucanian (Calvello) (Mennona 1977a: 93):

<table>
<thead>
<tr>
<th></th>
<th>m.s.</th>
<th>m. pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>culórë</td>
<td>culúrë, colour, colours</td>
</tr>
<tr>
<td>b.</td>
<td>súrgë</td>
<td>mouse, mice</td>
</tr>
<tr>
<td>c.</td>
<td>púlíčë</td>
<td>louse, lice</td>
</tr>
<tr>
<td>d.</td>
<td>vótë</td>
<td>vote, votes</td>
</tr>
<tr>
<td>e.</td>
<td>cŵórë</td>
<td>heart, hearts</td>
</tr>
<tr>
<td>f.</td>
<td>wόmminë</td>
<td>man, men</td>
</tr>
<tr>
<td>g.</td>
<td>vóvë</td>
<td>steer, steers</td>
</tr>
<tr>
<td>h.</td>
<td>p[é]rë</td>
<td>foot, feet (m.s., pl)</td>
</tr>
<tr>
<td>i.</td>
<td>v[š]skë</td>
<td>forest, forests (m.s., pl)</td>
</tr>
<tr>
<td>j.</td>
<td>- ōrë</td>
<td>augmentative suffix</td>
</tr>
<tr>
<td>k.</td>
<td>- ōnë</td>
<td>augmentative suffix</td>
</tr>
</tbody>
</table>

Examples (104.a-i) illustrate masculine singular words that have no metaphony in the singular, but metaphony in the plural. Recall from §2.4.9.2.1.3 that most Calvello nouns have metaphony in both the masculine singular and plural. Examples (104.j,k) illustrate that lack of metaphony is regularly associated with particular suffixes, namely the masculine singular suffixes [-órë] and [-ónë]. Taken together, the examples in (104) illustrate that masculine gender is not a sufficient condition for metaphony to occur.


<table>
<thead>
<tr>
<th></th>
<th>m.s.</th>
<th>m. pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>sérpe</td>
<td>sjérpe, serpent, serpents</td>
</tr>
<tr>
<td>b.</td>
<td>pëše</td>
<td>fish, fish (pl.)</td>
</tr>
<tr>
<td>c.</td>
<td>pístë</td>
<td>bridge, bridges</td>
</tr>
<tr>
<td>d.</td>
<td>cásóne</td>
<td>big house, big houses</td>
</tr>
<tr>
<td>cf. e.</td>
<td>cása, casóna, casóne</td>
<td>house, big house, big houses (f.s, f.s., f.pl.)</td>
</tr>
</tbody>
</table>

(105.a-c) illustrate masculine suffixes which are non-metaphonic in the singular but metaphonic in the plural. Recall from §2.10.1.3.2 that in Neapolitan, most masculine singular words have metaphonized stem vowels. Example (105.d) illustrates the masculine singular suffix [-one], which is cognate the the Calvello suffix [-ónë]. As in Calvello, words with this suffix do not have metaphony. Instead, as shown in
(105.e) the suffix [-óne] patterns like the non-high feminine singular suffix [-óna]. The examples in (105) illustrate that masculine gender is not a sufficient condition for metathony to occur in Neapolitan.

Finally, (106) lists non-metaphonizing masculine suffixes in Servigliano.

(106) [-M] masculine suffixes in Servigliano (Camilli 1929: 226, 255, 258)

a. fórtë
   fender, bumper
b. malefattore
   troublemaker, thief
c. patrú{nE}  patrú{nI}
   patron, patrons
d. bottó{nE}  buttú{nI}
   button, buttons
e. bottóne  bottóni
   button, buttons

(106.a) illustrates a masculine word that has an unmetaphonized stem vowel [5]. Recall from §2.8 that Servigliano masculine singular nouns generally have metathony. Example (106.b) illustrates the patterning of the suffix [-ore], which is cognate to the Calvello suffix [-orë]. As in Calvello, words with this suffix in Servigliano do not have metathony. Examples (106.c-e) illustrate the patterning of the suffix [-one] which is cognate to Calvello [-ónë] and Neapolitan [-óne]. In Servigiliano, these words are also subject to a process of syncope which deletes the final syllable of the word; hence, the final syllables in (104.c,d) are in the curly brackets {} reserved for intermediate representations. As shown in (104.c,d), masculine singular words with [-óne] do not have metathonized mid vowels. This can be seen by comparing the singulars with the metathonized plurals in (104.c,d). Finally, (104.e) illustrates a peculiarity of Servigliano, namely that when apocope does not occur, neither masculine singular nor masculine plural words ending in [-one] or [-oni] are subject to metathony (Camilli 1929: 224). The existence of such forms may indicate influence from standard Italian.

As shown in (103) - (106), then, metathony correlates with subsets of morphological classes, and these subsets in turn correlate with particular desinences. In particular, masculine singular words that have the suffixes [-OrE] or [-OnE] do not have metathony. I argue, then, that metathony is a property of desinences—such as
the /E/ of [-OrE] and [-OnE]—rather than a property of morphological classes, in the transparent and abstract metaphonizing dialects discussed in this chapter.\footnote{This is not to say that morphologized metaphony does not exist (cases of morphologized metaphony are discussed in Kaze 1989, and Maiden 1990); however, Calvello, and Neapolitan do not constitute examples of morphologized metaphony; instead, they are examples of abstract metaphony. Discussion of the morphologized metaphony follows in §2.10.2.3.}

2.10.2.2. An analysis of abstract metaphonizing dialects

Given the conclusion that metaphony is a property of desinences rather than a property of morphological classes, the difference between transparent and abstract metaphonizing dialects can be analysed as follows. In (104), the first vowel of each example represents the target tonic stem vowel, while the second vowel represents the trigger desinence. Dotted lines indicate spreading. Finally, (104.c) employs the grid notation from Halle and Vergnaud (1987).

(107) Transparent and abstract metaphonizing dialects:

a. transparent:

\[
\begin{array}{c|c}
V & V \\
\hline
[\text{high}] & [\text{high}]
\end{array}
\]

c. reduction:

\[
\begin{array}{c|c}
\text{Line 0} & \text{Line 1} \\
V & * \\
[\text{high}] & [\text{high}]
\end{array}
\]

Transparent metaphonizing dialects Servigliano have the type of rule illustrated in (107.a) (cf. Kaze 1989:33), in which the feature [high] of the trigger simply spreads to the target vowel, resulting in a multiply-linked structure. As shown in (107.b), abstract metaphonizing dialects such as Neapolitan and Calvello undergo spreading of [high] as well; in addition, however, the feature [high] delinks from the trigger as a
result of reduction in unstressed vowel position. The process of reduction is illustrated in (107.c): reduction delinks the feature [high] from unstressed vowels. The resulting vowels are realized in a dialect-particular manner: in Neapolitan, vowels with the reduced representation are realized as phonetically mid, while in Salentino, vowels with the reduced representation are realized as phonetically high. (For further discussion of the realization of reduced and underspecified vowels, see chapter 5).

In summary, the above analysis of abstract metaphonizing dialects captures the observation that metaphony is a property of desinences—i.e. that there are phonologically high desinences—in both abstract and transparent dialects. The difference between these types of dialects is essentially that [high] is not neutralized in unstressed positions in abstract metaphonizing dialects.

2.10.2.3. The difference between abstract metaphony, morphologized metaphony, and historical metaphony

The previous discussion raises several questions about how to characterize the various types of metaphony, including abstract, morphologized, and historical. I briefly discuss the differences here, showing how they may be captured representationally.
(108) Phonology, morphology, history:

a. Transparent metaphonizing dialects (e.g. Servigliano):

\[
\begin{array}{c}
V \\
\text{desinential inventory: /I,E,A,O,U/} \\
\text{[high]}
\end{array}
\]

b. Abstract metaphonizing dialects (e.g. Neapolitan, Calvello):

\[
\begin{array}{c}
V \\
\text{desinential inventory: /I,E,A,O,U/} \\
\text{[high]}
\end{array}
\]


\[
\begin{array}{c}
V \ (V) \\
\text{desinential inventory /E,A,O/ or fewer} \\
\text{[high]}
\end{array}
\]

d. Historic relics of metaphony (e.g. pronominal ‘isti’ and certain verbal desinences in Asturian-Leonese):

\[
\begin{array}{c}
V \\
\text{desinential inventory /E,A,O/ or fewer} \\
\text{[high]}
\end{array}
\]

As shown in (108.a, b), in the cases of both transparent and abstract metaphony, the feature [high] is a property of particular desinences or triggers. However, in the abstract metaphony case (108.b), [high] is delinked from desinences. Cases such as (108.a,b) are the type to which predictions the discussed in this chapter extend (i.e. the prediction that there can be no metaphony unless a phonologically high trigger—contrastively defined—exists).

Example (108.c) illustrates morphologized metaphony; in this example, the feature [high] is a property of particular morphological classes. Additionally, the desinential triggers of metaphony no longer exist. Kaze (1989) gives as an example of morphologized metaphony the dialect of Bolognese. In Bolognese, only one class of masculine nouns utilizes metaphony to signal the difference between singular and
plural. The class in question has no desinences, and metaphony is signalled by changes in the stem vowels alone. For example, masculine singular [næj]ger ‘black’ is in the plural [nɪːj]ger (Kaze 1989: 92). Kaze (1989: 106) proposes that such alternations can be captured by assuming that the masculine plural morpheme is an autosegmental feature [high]. Metaphony associates autosegmental [high] with the stem vowel of masculine plurals, essentially resulting in the representation shown in (108.b). Crucially, in the example of morphologized metaphony, the claims made in this chapter do not apply because the morpheme in question (the masculine plural) consists of a feature, rather than a phoneme.

Finally, example (108.d) illustrates the case of historical, residual metaphony—examples of which were discussed in §2.5.3.2 and §2.6. In this example, the feature [high] is a property of isolated lexical items; representations such as (108.c) are lexically listed because they are idiosyncratic.

2.10.3. Summary

In §2.10, I have argued for a reinterpretation of certain types of data that might be viewed as counterexamples to my claim that metaphony only occurs when there is a mid/high contrast in the desinential inventory. I discussed in particular the cases of abstract metaphonizing dialects, in which both metaphony and reduction occur. I argued that in both abstract and transparent metaphonizing dialects, metaphony is triggered by phonologically high desinences, and that this essential observation is obscured when reduction neutralizes the contrast between phonologically high and mid vowels in the desinential inventory. I concluded that abstract metaphonizing dialects do not present a counterexample to the claims in this chapter.
2.11. Conclusion—the relationship between raising and inventories

The data presented in this chapter argue that phonological representations are determined by contrast rather than being phonetically driven. I reiterate these points below.

2.11.1. For Modified Contrastive Specification

I have shown in this chapter that a metaphony rule which spreads the feature [high] only has the possibility of occurring in dialects/languages in which a mid/high contrast exists; it cannot exist if this contrast is not found, even in the presence of a phonetically high vowel. MCS predicts that only in the latter situation does a phonologically high trigger for metaphony exist. The data exemplifying this claim are summarized in (109).

(109) Predictions made by contrastiveness:

<table>
<thead>
<tr>
<th>Final vowel inventory</th>
<th>Possible Triggers</th>
<th>Languages/dialects</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>U</td>
<td>I, U</td>
</tr>
<tr>
<td>E</td>
<td>O</td>
<td>Servigliano, Neapolitan, Salentino (Italian)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pasiego, Lena (Spanish)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>O</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Calvello (Italian)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>O</td>
<td>φ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standard Spanish, Cabranes</td>
</tr>
</tbody>
</table>

As shown in (109), languages and dialects which have a (surface or more abstract) mid/high contrast in both the front and back vowel regions of the vowel space may (and in this case do) have a rule of metaphony wherein both /I/ and /U/ are triggers.
The Italian dialects, such as Servigliano, best display this correlation. Also shown in (109) are the consequences of having a mid/high contrast only in either the front or the back vowel region. In Pasiego and Lena, a phonologically high vowel can only occur in the back vowel region, whereas in Calvello, a phonologically high vowel can only occur in the front vowel region. The asymmetrical 4-vowel inventories of Pasiego, Lena, and Calvello show that high triggers can only occur in the region where a mid-high contrast exists. Finally, Standard Spanish, and Cabranes (robust) exemplify 3-vowel inventories, in which there are so few contrasts that a high trigger, and raising, are not possible.

2.11.2. Against completely phonetically-driven representations

I have also shown in this chapter that the phonological representations of vowels cannot be completely phonetically driven—i.e. phonetically high vowels are not always phonologically high, and phonetically non-high vowels are sometimes phonologically high. The evidence against completely phonetically-driven representations was that vowels that are phonologically high can spread the feature [high] even when they are phonetically non-high. In the example given, from the Neapolitan dialect, there were phonetically non-high vowels, [e] and [o], which spread the feature [high], contrasting with other phonetically non-high vowels, [e] and [o], which did not trigger metaphony.

Other examples discussed later in chapter 4 and shown in (110) illustrate the converse, namely that vowels that are phonologically non-high cannot spread the feature [high] even when they are phonetically high:

---

54 A famous case of this postulate is Yawelmani /U:/, which always surfaces as a phonetically mid vowel, either [o:] or [o]. See Kenstowicz (1994: 107-114) for a recent discussion of abstract representations in Yawelmani.
Dialects with three desinential vowels:

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Desinential vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Gallego</td>
<td>i-ε, u-ø</td>
</tr>
<tr>
<td>b. Asturian (Western)</td>
<td>j-ε, u-ø, a</td>
</tr>
<tr>
<td>c. Leonese</td>
<td>j/ε, u/ø</td>
</tr>
</tbody>
</table>

As shown in Gallego (110.a) and in Western Asturian (110.b), non-high, non-low desinences vary anywhere within the non-low height range, ranging from [i] to [e] for the front vowel and from [u] to [ø] for the back vowel. These dialects have the phonological desinential inventory /E,A,O/, according to the assumptions in §2.2.2. However, these dialects do not have a rule of metaphony. The lack of metaphony could be due to two causes—either because these dialects simply lack the rule, or because these dialects have a phonological inventory which precludes the existence of metaphony, i.e. an /E,A,O/ inventory with non phonologically high vowels. The significant generalization appears to be that no dialect of Spanish with a three-vowel desinential inventory has metaphony. This is particularly striking in the case of Leonese, which has phonetically high desinences, and which belongs to the grouping that historically has metaphony.

In summary, I have shown in this chapter that it is contrast, in conjunction with a contrastive hierarchy of [low] before [high] which determines vowel representations. The phonetic realization of vowels is only an approximate clue for discovering phonological representations within a vowel system.

I have also shown that a model that incorporates the notion of contrast is able to make testable predictions about the relationship between inventories and processes. In general, such a model predicts that languages with smaller inventories will display
fewer processes, and languages with asymmetric inventories can have asymmetric processes. The above predictions imply that it is possible to delimit the range of processes that can occur in a given language by independent means, namely by examining the inventories rather than by knowing the rules. See chapter 5, §5.5.2 for further development of this concept.

While a great deal of this chapter was devoted to the effects of metaphony, the rule of metaphony itself never enjoyed a formal account. I turn to the task of formalizing the rule of metaphony in chapter 3. Doing so provides additional support for the claims in this chapter, since these claims rely on the assumption that metaphony is a spreading process. However, formalizing the rule of metaphony also provides evidence for one of the themes of this thesis, namely that mid vowels (/E/ and /O/) have no height features underlyingly. I discuss both of the above themes—formalizing the rule of metaphony and providing evidence for the ‘mid vowel hypothesis’—in the following chapter.
Map A

1. Galicia
2. Western Asturias
3. Central Asturias
4. North-Central Asturias (Cabo de Peñas)
5. Santander
6. Leonese
7. Cantilien
8. Aragonese
9. Catalan
10. Portugal
11. Andalusian

Metaphonizing areas: 3, 4, 5

Approximate dialect boundary:

Map B
Map C

Map C: Montañese (Santander)

1. Pesués
2. Tudanca
3. Cabezón
4. Torrelavega
5. Santander
6. Selaya
7. Vega de Pas
8. San Pedro del Romeral

(6, 7, 8 - Pasiego)

After Penny (1969, 1978)
Map D

Final Desinences (Savi 1983)

5 i e a o u
4 i e a o /a
3 i e a u
2 a e o
1 a (e,i); (e>o,u)

Regions
Primary dialectal boundary:
Secondary dialectal boundary

Metaphony of higher and lower mid vowels triggered by [-l], [-u]
(Maiden 1991, map 2)

After Maiden (1991), Merlo (1933), Savi (1981, 1983)
3.1. Introduction

This chapter addresses several issues arising out of the framework of Modified Contrastive Specification, namely the minimal specification and markedness of height features. A consequence of minimal specification for height is the prediction that mid vowels have no height features underlyingly. I argue for this claim in the following manner: first, I formalize the rule of metaphony discussed in chapter 2, arguing that the rule spreads the feature [high] to a vowel that is unspecified for vowel height. This argument also shows that phonologically high vowels, and not phonologically mid vowels, are specified for a height feature, namely [high]. Second, I provide further evidence for the claim that mid vowels have no height features by presenting alternative reanalyses of phonological phenomena which have been viewed as evidence that mid vowels have height features.

Formalizing the rule of metaphony presents a problem in that there are two different analyses in the literature which appear, at first, to be equally valid for Pasiego. Metaphony has been analysed as a spreading rule (cf. Hualde 1989, Kaze 1991, McCarthy 1984, Vago 1988) and as a delinking rule (Goad 1992; see also Vago 1988, Wilson 1988 for discussion). While formally both accounts are observationally adequate, a choice must be made between these radically different solutions in order to address the issue of markedness.

In this chapter, I bring a new type of argument to bear on the question of whether metaphony is better analysed as spreading or delinking. Focussing on Pasiego, I present evidence for head-dependent asymmetries (Drescher and van der Hulst 1993)—i.e. evidence that head positions are characterized by greater phonological complexity, while dependent positions are characterized by lesser complexity. I then argue that delinking results in less complexity in phonological representations, while spreading results in greater complexity. I demonstrate that the
vowels which are targeted by metaphony occur in head position, while the vowels that trigger metaphony a) occur in dependent position, and b) are more complex than the target head vowels. Given these observations, I analyse metaphony as a process whose function is to redress an illicit head-dependent asymmetry, one in which the dependent (trigger) vowel has more complexity than the head (target) vowel. Since head positions in Pasiego are characterized by greater complexity, and since there is no evidence for processes that reduce the degree of complexity of heads in Pasiego, the latter observations lead to the conclusion that metaphony in Pasiego is best analysed as a spreading process.

The analysis of metaphony as a spreading process presupposes that mid vowels have no underlying height features. The implication, then, is that in Pasiego—which has the spreading process—mid vowels must have no underlying height features. I explore the consequences of the latter statement in §3.3. In particular, I re-examine analyses which have argued that mid vowels require height features. I show that it is possible to reanalyse these cases under the assumption that mid vowels have no underlying height features. This implies that the latter statement may have universal validity.

This chapter proceeds as follows: In §3.2, I present and defend a formal analysis of metaphony in Pasiego, and then show that my analysis of metaphony leads to the conclusion that the mid vowels /E, O/ underlyingly lack height features while /A, I, U/ have height features underlyingly. In §3.3, I discuss several types of phenomena—including vowel coalescence, diphthongization, sonority/syllabification, and mid harmony—which have been used to support the claim that /E/ and /O/ have height features. I offer reanalyses of these cases within a framework that assumes that mid vowels have no height features.

This chapter sets the stage for chapter 4, in which I present evidence from patterns of phonetic variation for the claim that mid vowels have no height features.
Mid vowels have no height features

Chapter 4, in turn, leads directly into the development of a model which accounts for the patterns of phonetic variation in chapter 5.

3.2. **Evidence from Pasiego that /E/ and /O/ have no height features**

In this section, I discuss phonological evidence from metaphony in Pasiego that the vowels /E/ and /O/ have no underlying height features. I focus on Pasiego instead of drawing on the wide variety of dialects discussed in chapter 2 because of the detailed phonetic data available in Penny’s (1969) account of Pasiego. In §3.2.1, I present criteria by which the spreading and delinking analyses can be evaluated, focussing largely on the type of asymmetries that exist between dependents and heads (Drescher and van der Hulst 1993). In §3.2.2, I demonstrate that Spanish displays asymmetries in the complexity of its representations. In §3.2.3, I evaluate spreading and delinking accounts of metaphony on the basis of the asymmetries in complexity.

3.2.1. **Complexity**

I make several assumptions concerning complexity, which I draw from Donegan (1978), Drescher and van der Hulst (1993; henceforth DH), Harris (1990), Rice (1992), and Rice and Avery (1993; henceforth RA), and Stampe (1979), among others.¹ These authors have argued that an important feature of phonological representations is complexity. I review and develop some of these concepts below.

3.2.1.1. **Segmental complexity**

Complexity at the segmental level is determined by the number and types of contrasts in a given inventory (RA). The overall complexity of segmental representations increases as the number of contrasts in a given inventory increase

Mid vowels have no height features

Representations are more complex when dependents (features or nodes) and branches are added to already existing nodes (DH, RA). The assumption that segments are more complex when they have more dependents is illustrated in (1), which focuses on vowel height.

(1) Complexity and contrasts (a 5-vowel system):

```
/I,U/ /E,O/ /A/  
| high | high | low |
```

The vowel system in (1) contains high, mid and low vowels. As argued in chapter 2, the vowels /I,U/ in (1) require the feature [high] in order to express the contrast between /E,O/ and /I,U/. On the other hand, the vowels /E,O/ in (1) do not require the presence of a height feature, as the contrast between mid and high vowels is expressed by the presence of the feature [high] on the high vowels vs. the absence of a height feature on the mid vowels /E,O/. The vowels /I,U/ in (1) are more complex than the vowels /E,O/, since the former have one more dependent than the latter. The vowel /A/ is also more complex than /E,O/ since it has one more dependent than /E,O/.

3.2.1.2. Syntagmatic complexity

Another type of complexity relevant for this chapter is syntagmatic complexity, defined here as the relative complexity of heads versus dependents. For the purposes of this chapter, heads are equivalent to prosodically-defined heads of feet (eg. heavy rhymes in quantity-sensitive systems) and heads of words (eg. strong feet).

DH argue that phonological heads and dependents are characterized by asymmetrical relationships of complexity, i.e. by Head-Dependent Asymmetries.
Mid vowels have no height features. They argue that in general, heads can support more complexity than dependents.

I introduce two types of HDAs below, relating these HDAs to the complexity of vowel representations. For the following discussion, I adopt the prosodic hierarchy assumed in DH (1993), which includes the prosodic word ($\omega$), the foot (f), the rhyme (r), the mora (m), and the skeletal position (x).

The first type of HDA relevant for this chapter is the HDA at the rhyme level, shown in (2); vertical lines represent heads, while slanting lines represent dependents in this and subsequent representations in this chapter.

\begin{align*}
\text{foot} & \quad f \\
\text{rhyme} & \quad r \quad r \\
\text{mora} & \quad m \quad m \\
\text{segment} & \quad x
\end{align*}

In terms of syntagmatic complexity, the head (strong) rhyme branch in (2) can contain more complex segments than the dependent rhyme branch. The dependent rhyme cannot have more complex segmental structure than the head rhyme has.

An example of the effects of an HDA at the rhyme level is vowel reduction: typically, in unstressed syllables (i.e. metrical dependent positions), fewer vocalic contrasts are allowed (i.e. a lesser degree of complexity is allowed), while in stressed syllables (i.e. in metrical head positions), more vocalic contrasts are allowed (i.e. a greater degree of complexity is allowed). Thus head position in general allows vowel representations which are more complex, while dependent position only allows vowel representations which are less complex. I provide evidence for this type of HDA in §3.2.2.3 - §3.2.2.6, arguing that Spanish dialects have static vowel distribution patterns which are reduction-like.
Another type of HDA is that at the foot level. DH cite as a typical example languages in which main stress is sensitive to quantity, but secondary stress is not.

(3) HDAs at the foot level:

```
word       ω
          |   |
foot       f   f
           \   \  
rhyme      r   r   r   r
           \   \  
morae      m   m
```

As illustrated in (3), the head (here rightmost) foot is quantity-sensitive, i.e. can ‘see’ non-local structure at the level of the mora. However, the dependent foot is not quantity-sensitive, i.e. cannot ‘see’ structure at the level of the mora, and cannot house such structure.

As in DH, I argue in §3.2.2.3 that Spanish has a variant of the type of HDA shown in (3), in that the head foot in Spanish is sensitive to lexical accent while dependent feet do not have this property.

3.2.1.3. Paradigmatic complexity

In the above discussion, I focussed on aspects of syntagmatic complexity, discussing relationships that hold between heads and dependents at segmental and supersegmental levels. In this section, on the other hand, I introduce the concept of paradigmatic complexity, which I derive from Natural Phonology (Donegan 1978, Stampe 1979) and American structuralism\(^2\) (cf. especially Twaddell 1935). Paradigmatic complexity encompasses 1) the number and types of contrasts possible within a given position, and 2) rules affecting the number and types of contrasts possible within a given position. The former concept, drawn partly from Twaddell (1935: 73-4), derives from the observation that within different positions (for

---

\(^2\) See Anderson (1985: 278) for this term.
example, within onsets, within codas, within strong or weak syllables) the contrastive inventory of segments may differ. Unlike Twaddell, I do not conclude from this observation that different positions always contain separate phonemic inventories; instead, I recognize that some elements or features of a given phoneme can undergo neutralization in a given position, while remaining distinct in other positions. In other words, I assume that relationships such as neutralization link the various sub-representations of a phoneme into a more abstract entity (cf. discussion in Anderson 1985: 296, Bloomfield 1933, Chao 1934, Trager 1934, and Trubetskoï 1939/69).³

Given that within Modified Contrastive Specification (MCS) contrasts are inventory-driven, the observation that the inventory of segments may differ within different positions is equivalent to saying that the number and types of contrasts within a given position may vary. Hence, one aspect of paradigmatic complexity is that some positions allow fewer contrasts or less complexity, and vice versa.

The second aspect of paradigmatic complexity includes rules which have an effect on the number and types of contrasts possible within a given position. Such rules may be described as the ‘strengthening’ and ‘weakening’ rules of Natural Phonology (Donegan 1978, Donegan and Stampe 1979, Stampe 1979). Based on the discussion in Donegan (1978) and Stampe (1979) of rules which qualify as strengthening and weakening, I define strengthening and weakening as follows. Strengthening is the general name for processes which increase the complexity of representations by increasing or making more salient the number or types of contrasts in a given position. An example of a strengthening rule is spreading, which adds structure to representations unspecified for that structure. Weakening is the general name for processes which decrease complexity by decreasing or neutralizing the

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³ The relationship that links various sub-representations of a phoneme into a more abstract entity can also be viewed as licencing rather than as neutralization vs. non-neutralization. For development of licencing accounts, cf. Itô (1986, 1989), Itô, Mester and Padgett (1993) and Steriade (1993).
number of contrasts in a given position. An example of a weakening rule is delinking, or reduction, which deletes structure from representations, thereby making them less complex.

The environments for strengthening and weakening include prosodically-defined positions; other environments are possible but not discussed here. For example, strengthening occurs in head metrical positions, while weakening often occurs in dependent metrical positions. Because strengthening and weakening have prosodically-defined environments, they can be thought of as processes which increase or decrease paradigmatic complexity, or the complexity of representations within a given prosodically-defined position.

3.2.2. Spanish stress and vowel distribution

In this section, I introduce certain facts about Spanish stress which argue for the presence of HDAs at the foot and rhyme level in Spanish. First, I provide an analysis of Spanish stress. Second, I show that this analysis of stress provides a basis for identifying which metrical positions represent heads and which dependents in Spanish. Third, I present static vowel distribution facts which provide evidence for the heads and dependents posited on the basis of the stress facts. The ultimate purpose of this section is to establish that HDAs are an integral part of Spanish phonology, and to argue that phonological rules such as metaphony are sensitive to heads.

3.2.2.1. Stress

In this section, I describe the main patterns of Spanish stress. These are common to all Spanish dialects, including Pasiego. I focus on the basic pattern of penultimate stress because this is the pattern which co-occurs with the type of metaphony illustrated in (1). However, I discuss the two other common patterns—antepenultimate and final stress—in order to show that they are inapplicable for the data discussed in this chapter.
Spanish main word stress falls on one of the final three syllables of the word. This characteristic is known as the ‘three-syllable window’ of Spanish stress (cf. Harris 1983, among others). The three-syllable window is illustrated in (4).

(4) Spanish main word stress:

a. Penultimate stress: sabána ‘savannah’
b. Antepenultimate stress: sábana ‘sheet’
c. Final stress: Panamá ‘Panama’

Penultimate stress (4.a) is considered to be the basic pattern (Harris 1991: 452), while antepenultimate stress (4.b) and final stress (4.c) are related to the basic pattern in the manner discussed below.

The stress patterns in (4) are derived via the algorithm from Halle, Harris and Vergnaud (1991) presented in (5), which uses the bracketed grid notation of Halle and Vergnaud (1987).

(5) Main word stress (Halle, Harris, and Vergnaud 1991: esp. p. 145):

a. Mark a word-final V extrametrical (notation: <V>).
b. Accent (that is, mark with * on line 1) the rightmost (metrical) syllable
c. Construct binary left-headed feet from right to left on line 0; mark the heads (stresses) on line 1.
d. Assign main stress to the rightmost foot by constructing an unbounded right-headed constituent on line 1; mark the head on line 2.
e. Conflate lines 1 and 2.

As shown in (5.a), HHV analyse the final vowel of penultimately- and antepenultimately-stressed words as extrametrical. Extrametricality is illustrated in (6) by means of angle- brackets.
Mid vowels have no height features

(6) Extrametricality (5.a):

a. sában<a> ‘bedsheet’
b. sabán<a> ‘savannah’
c. Panamá ‘Panama’

Antepenultimately stressed words (6.a) and penultimately stressed words (6.b) have extrametrical syllables. However, as shown in (6.c), words with final stress have no extrametrical syllable. Extrametricality is largely predictable—if a noun has a desinence, the desinence will be extrametrical. Similarly, if a noun has no desinence and it ends with a vowel, the noun will be stressed on the final syllable (Harris 1983); finally, if a noun has no desinence and ends with a consonant, it normally is stressed on the final syllable (Harris 1983: 118). However, final consonants in some noun stems are marked as extrametrical, presenting apparent exceptions in the form of antepenultimately-stressed nouns that have no desinences and that end with consonants (Harris 1983: 118).

The application or non-application of rule (5.b) derives the difference between penultimate/final stress and antepenultimate stress, as shown in (7).

(7) Rule (5.b) (HHV 1991: 145):

a. Penultimate stress:       b. Antepenultimate stress:

<p>| | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>line 1</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>line 0</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Rule (5.b) applies in the case of penultimately stressed words and words with final stress (recall that finally-stressed words lack extrametrical syllables): in (7.a), application of rule (5.b) places a line 1 asterisk on the penult/ultima, ensuring that the penult/ultima receives main word stress by later rules. In (7.b), however, rule (5.b) fails to apply because antepenultimately-stressed words are lexically marked as non-undergoers of this rule (HHV 1991: 145); the result is antepenultimate main stress by the balance of the rules in (5), discussed below.
Rule (5.c) derives main stress placement for antepenultimately-stressed words as shown in (8.b).

(8) Rules (5.c) and (5.d):

<table>
<thead>
<tr>
<th>Line</th>
<th>Penultimate Stress</th>
<th>Antepenultimate Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>1</td>
<td>*</td>
<td>&lt;*&gt;</td>
</tr>
<tr>
<td>2</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

For antepenultimately stressed words, as shown in (8.b), application of (5.c) creates a binary trochee on the first two syllables. Rule (5.d) then applies, ensuring that the rightmost head (i.e. the antepenult in (8.b)) receives main word stress.

For penultimately stressed words, as shown in (8.a), rule (5.c) cannot apply because rule (5.b) has bled the environment for its application by placing an asterisk on line 1. Instead, in (8.a), rule (5.c) creates two unary trochees on line 0, marking the heads of these trochees on line 1. Finally, rule (5.d) applies, resulting in main word stress on the penult in (8.a).

HHV’s stress algorithm also includes a rule—(5.e)—which conflates lines 1 and 2, as illustrated in (9).

(9) Rule (5.e) (Conflation):

<table>
<thead>
<tr>
<th>Line</th>
<th>Penultimate Stress</th>
<th>Antepenultimate Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>1, 2</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Conflation eliminates all secondary heads on line one, and all foot structure except for the main word stress foot on line zero.

I assume HHV’s analysis of stress for the remainder of this thesis. For the purposes of this chapter, however, mainly the structure of the penultimately-stressed
words is relevant for the following reasons. I abstract away from finally-stressed nouns in this chapter because the process of metaphony discussed here is triggered by desinences. As discussed above, finally-stressed nouns do not have desinences. I also abstract away from antepenultimately-stressed words (6.e) because they are somewhat atypical. First, antepenultimately-stressed words are lexical exceptions to main word stress (Harris 1991: 453). Second, antepenultimately-stressed words also have other atypical properties: 82 of the 90 antepenultimately-stressed words listed in Penny (1969) have the vowels [i,a,u] in the penult, while the remainder, 8/90, have mid vowels; four words of the 8/90 group have the disharmonic mid vowels [e] or [ə]—disharmonic vowels are vowels which do not conform to the rule of metaphony (see chapter 5, §5.4.2.2 for details). These data indicate that a) the full range of vowels ([i,e,a,o,u]) cannot generally exist in the penults of antepenultimately-stressed words; and b) when the mid vowels do occur in the penults of antepenultimately-stressed words, they can be disharmonic. Because antepenultimately-stressed words are atypical and because they are also uncommon in Pasiego—the 90 antepenultimately-stressed words come from a database of over 6000 words, making up 1.5% of the database—I abstract away from them in this chapter.

In summary, while Spanish has three patterns of main stress placement, only the basic pattern of penultimate stress is discussed in this chapter. I outline the relationship among stress, heads, and dependents in the following sections.

3.2.2.2. **Defining metrical heads and dependents**

Given the above remarks on metrical structure, I define the metrical heads and dependents of a penultimately-stressed word as shown in (10).

---

4 In earlier work, Harris has argued that antepenultimately-stressed words have a special prosodic constituent whose properties derive antepenultimate stress (Harris 1983; Harris 1987: 74).
Mid vowels have no height features

The metrical analysis in (10) illustrates two types of heads in Spanish metrical phonology. The head, labelled ‘h’, has an asterisk on line 1. The dependents illustrated in (10), labelled ‘d’, have an asterisk on line 0. Dependents labelled ‘d1’ precede main word stress (i.e. ‘h’). The dependent labelled ‘d2’ is extrametrical in (10), but it may also be viewed as a dependent, under the assumption that extrametrical final syllables are ultimately appended to the prosodic word (see Harris (1983) for this type of analysis of Spanish desinences). For the remainder of this thesis, then, I assume that syllables labelled as extrametrical are dependents. In summary, it is important to note that the desinences, which always occur in final syllables, are dependents in Spanish phonology, while stem vowels may be either heads or dependents.

Using this analysis of stress, in the following sections I demonstrate that Spanish phonology is characterized by Head-Dependent Asymmetries (HDAs) at the foot level and at the rhyme level.

3.2.2.3. Evidence for HDAs at the foot level

The main stress syllable (h) in Spanish patterns differently from dependent syllables (d₁), providing evidence for HDAs at the foot level. Main stress is sensitive to lexical marking for accent, and can support more complex structure than dependent syllables. I discuss each of these properties in turn.

As demonstrated in (5), partially repeated below, main stress in Spanish is sensitive to lexical marking for accent.
Mid vowels have no height features

(5) Illustration of (4):

```
  *     (*)  <(*)
a.  sa  ba  na  penultimate stress
    *     (*)
    *     (*)
  b.  pa  na  ma  final stress
    *     (*)  <(*)
  c.  sa  ba  na  antepenultimate stress
```

Recall from §3.2.2.1 that penultimate stress (5.a) has a predictable variant, namely final stress (5.b). On the other hand, there is no way to predict the difference between antepenultimate stress (5.c) and penultimate/final stress (5.a,b). In order to capture the difference between antepenultimate stress and penultimate/final stress one of these two patterns must be lexically marked. As discussed in §3.2.2.1, it is generally assumed that penultimate/final stress is the rule-derived pattern, while antepenultimate stress is a lexically marked pattern. The observation that antepenultimate stress is lexically marked provides evidence that the main stress foot is sensitive to lexical marking for stress. In comparison, as argued in §3.2.2.4, Spanish has a type of postlexical, alternating stress which incorporates dependent syllables into feet (cf. Roca 1988 and Harris 1991). Comparing main stress to this alternating stress, there is no evidence that the latter is sensitive to lexical marking; by every indication, secondary stress is uniformly trochaic.

Other evidence that the main stress syllable has special properties which dependent syllables lack comes from a series of regular alternations between diphthongs and monophthongs, illustrated in (11). The segments that alternate are referred to as ‘radical changing diphthongs’ in the literature (the word ‘radical’ refers to stem vowels).
Mid vowels have no height features

(11) Spanish alternating diphthongs:

<table>
<thead>
<tr>
<th>Monophthongs</th>
<th>Diphthongs</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. h[e]lár⁵* to freeze’</td>
<td>h[jé]lo ‘I freeze s.t.’</td>
</tr>
<tr>
<td>b. [o]lér ‘to smell’</td>
<td>h[wé]lo ‘I smell s.t.’</td>
</tr>
<tr>
<td>c. p[e]gár ‘to fasten s.t.’</td>
<td>p[é]go ‘I fasten s.t.’</td>
</tr>
<tr>
<td>d. p[o]nér ‘to put’</td>
<td>p[ó]ngo ‘I put’</td>
</tr>
</tbody>
</table>

Examples (11.a,b) illustrate the patterning of radical changing diphthongs; radical changing diphthongs surface as monophthongs in non-main-word-stress position, and as falling diphthongs in main-word-stress position. The forms in (11.c,d) illustrate non-alternating phonemes for comparison. Under the assumption that diphthongs are more complex than monophthongs (cf. §3.2.1), the patterning of radical changing diphthongs provides additional evidence that heads in Spanish support more complexity than dependents: radical changing diphthongs are allowed only in head position. This is expected if the adjacent syllables are dependents, and only heads can have diphthongs. It is expected because of syntagmatic complexity, i.e. the property that heads are generally more complex than dependents.

Example (11) also illustrates that in the three-syllable window, a syllable adjacent to the stressed syllable cannot have a heavy nucleus. Further evidence for this property of main stress is provided in (12).

---

5 For discussion of how stress is derived in this form, see §3.3.2.1.

6 Spanish also has words such as m[je]dóso ‘fearful’, in which a radical changing diphthong surfaces in an unstressed antepenult. This type of example is strange because a light penult is stressed in preference to a heavy antepenult, and as discussed in Harris (1983: 87-90), the latter type of stress pattern is not generally possible. However, examples such as m[je]dóso are unexceptional: Harris (1983, 1987), Halle, Harris and Vergnaud (1991) and others analyse such examples as the result of the cyclic assignment of main-word stress. In examples such as mjedóso, it is argued that main stress applied to the stem /mjEd/ of mjedóso during an earlier cyclic pass, and that a radical alternating diphthong is allowed in this position because of the existence of main stress during an earlier pass of the derivation.
Mid vowels have no height features


<table>
<thead>
<tr>
<th>Impossible:</th>
<th>Possible:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. *at[á]pamba</td>
<td>atap[ám]ba</td>
</tr>
<tr>
<td>b. *at[á]payba</td>
<td>atap[áy]ba</td>
</tr>
<tr>
<td>c. *at[á]pjába</td>
<td>atap[já]ba</td>
</tr>
<tr>
<td>d. *nawfr[á]go</td>
<td>n[áw]frago</td>
</tr>
<tr>
<td>e. *farmacewt[f]co</td>
<td>farmac[éw]tico</td>
</tr>
</tbody>
</table>

The words in (12) illustrate speaker judgements for words, real or nonsense, in which either the antepenultimate or penultimate syllable is heavy, while the remaining syllables are light. The impossible patterns in (12) incorrectly stress a light syllable instead of a heavy syllable to the right of the light syllable; the possible patterns in (12) correctly stress the rightmost heavy syllable. The examples in (12.b-e) provide evidence that a syllable adjacent to the stressed syllable cannot have a heavy nucleus. Example (12.a) indicates that the latter statement might be extended to include heavy rhymes. In other words, it might be possible to posit quantity sensitivity of the main stress foot in Spanish. However, the current literature argues against this position, as discussed below.

Harris (1983) uses the evidence in (12) to argue for quantity sensitivity in Spanish. Against this position, however, others (cf. Roca 1990) have argued that quantity sensitivity must be only a tendency in Spanish, rather than a categorial characteristic. For example, Roca (1990:152-5) cites many loanwords such as ‘Cólchester,’ and ‘Wáshington’ in which the rightmost heavy syllable within the 3-syllable window is not stressed. (Significantly, however, none of Roca’s exceptions to quantity sensitivity involve heavy nuclei; all of his examples—eg. Cólchester—involve heavy rhymes.) Other current analyses of Spanish stress, such as Halle,

---

7 This type of pattern is actually allowed by cyclic derivation. See footnote 6.
Harris and Vergnaud (1991), implicitly adopt Roca’s (1990) position by positing an end rule for main stress—an end rule that is purely determined by position, and not by qualitative factors such as quantity sensitivity.

From the above discussion and from the examples in (12), then, the relevant generalization is that in the three-syllable window, a syllable adjacent to the stressed syllable cannot have a heavy nucleus. Main stress is thus sensitive to the presence of heavy nuclei. On the other hand, as discussed below in §3.2.2.4, there is no evidence that the assignment of postsecondary, alternating stress is skewed by the presence of heavy nuclei. This difference between main stress or head syllables and dependent syllables again reduces to the property of syntagmatic complexity. The head is sensitive to a property of segments while the dependents are not sensitive to this property.

In summary, main word stress in Spanish has special properties: only main stress is sensitive to lexical accent and to the presence of heavy nuclei; in addition, segmentally complex radical changing diphthongs can only occur in main stress syllables, being simplified in dependent syllables. On the other hand, as discussed below in §3.2.2.4, there is no parallel evidence to show that non-main-stress syllables

---

8 If this generalization is categorial—and it seems to be—then some instances of antepenultimate stress may be predictable, namely examples such as ‘farmac[éw]tico pharmaceutical’ in which the antepenult contains a heavy nucleus. However, examples such as ‘sábana’ sheet show that lexical marking of accent is still needed, as the accent on sábana is unpredictable.

9 Note that even if main stress is sensitive to the presence of heavy nuclei, main stress is still derived by an end rule in Spanish. To illustrate, suppose that a regular rule assigns a line 1 asterisk to syllables containing heavy nuclei. The rules deriving main stress in Spanish will put a line 2 asterisk above the rightmost line 1 asterisk. The stress rules will also conspire so that the line 1 asterisk that is predictable from a heavy nucleus will also be the rightmost line 1 asterisk. In other words, there are never two or three adjacent heavy nuclei in the three syllable window; the maximum number of heavy nuclei in the three syllable window is one. Finally, abstracting away from the quantity-sensitivity-like cases discussed here, any other instance of main stress is demonstrably derived via an end-rule.
can support as much complexity as main stress syllables, nor are non-main-stress syllables sensitive to lexical accent or the presence of heavy nuclei.

3.2.2.4. Secondary stress

Although I have already discussed the main characteristics of postlexical, alternating stress in the previous section, I consolidate the observations here.

Based on data such as that in (13), Harris (1991) argues that Spanish alternating stress is essentially trochaic. The forms in (13) show the syllabification and metrification of a phrase.

(13) Metrification of intertonic strings (Harris 1991: 466):

a. ‘quejándome por Constancia Valenzuela’
   *complaining to me for Constance Valenzuela*

b. Main stress assignment: que(ján)doseme por Cons(tán)cja Valen(zwé)<la>

c. Secondary stress assignment: que(ján)dosème [pòr Cons](tán)

d. Secondary stress assignment: (tán)cja [Vàlen](zwé)<la>

e. Final form: que(ján)dosème [pòr Cons](tán)cja [Vàlen](zwé)<la>

Parentheses in (13) indicate main word stress feet, while square brackets [ ] indicate alternating stress feet. (13.a) gives the data with a gloss. (13.b) illustrates the effects of main stress assignment. Main stress assignment foots the syllables [ján], [tán] and [zwé], leaving two unfooted spans of syllables between main word stresses: One span occurs between the main stress feet ‘ján’ and ‘tán’, and the second occurs between the main stress feet ‘tán’ and ‘zwé.’

As illustrated in (13.c), alternating stress proceeds from right to left, beginning to the left of the syllable ‘tán’ and ending with the main stress syllable ‘ján,’ incorporating as much unfooted material as possible into trochees. Because alternating stress feet are minimally binary in Spanish, the syllable [do] of [quejando] cannot be metrified in (13.c).
As illustrated in (13.d), alternating stress also incorporates the syllables between ‘tán’ and ‘zwé’ into phrasal trochees. The maximally metrified result is shown in (13.e): notably, syllables which cannot be incorporated into alternating stress trochees remain unfooted. This illustrates that alternating stress is strictly trochaic.

Example (13) also illustrates that, unlike main stress, alternating stress is not attracted to heavy nuclei; for example, the syllable ‘cja’ of ‘Constancja’ remains unfooted even though it contains a heavy nucleus.

Comparing main and alternating stress, we see that main stress may be unary, i.e. a foot can contain either one syllable as in (5.a) or two syllables as in (5.e). On the other hand, alternating stress must be binary, as shown in (13). In addition, main stress is attracted to heavy nuclei (cf. (12), while alternating stress is not. As well, main stress is sensitive to lexical accent, while alternating stress is not. Finally, main stress syllables can support the complex radical alternating diphthongs, (11), while no other syllable can. The difference in patterning between main and secondary stress provides evidence for an HDA at the foot level in that the main stress syllable can support more complex structure than dependent syllables.

3.2.2.5. Evidence for HDAs at the rhyme level

Evidence for HDAs at the rhyme level in Spanish derives from the static patterning illustrated in (14).
Mid vowels have no height features

(14) HDAs and vowel distribution in the Spanish word (d=dependent, h-head):

<table>
<thead>
<tr>
<th>Line 1</th>
<th>*</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 0</td>
<td>*</td>
<td>(*)</td>
</tr>
<tr>
<td>$d_1$</td>
<td>h</td>
<td>$d_2$</td>
</tr>
<tr>
<td>i</td>
<td>i</td>
<td>(i)</td>
</tr>
<tr>
<td>e</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>je</td>
<td></td>
<td>je</td>
</tr>
<tr>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>we</td>
<td></td>
<td>we</td>
</tr>
<tr>
<td>u</td>
<td>u</td>
<td>(u)</td>
</tr>
</tbody>
</table>

As shown in (14), a smaller set of vowels occurs in initial position ($d_1$) than in main stress position (h). While the vowels [i,e,a,o,u] occur in initial position, the radical changing diphthongs [je] and [we] occur additionally in main stress position (Penny 1991: 47). In final unstressed syllables ($d_2$), the number of vowels which can occur is an even smaller set—only the vowels [e,a,o] occur in Standard Spanish, with isolated examples of unstressed [i] and [u] (Penny 1991: 49); in Pasiego only the vowels /ɔ,a,o,u/ occur in final position (Penny 1969)).

Example (14) illustrates that the number—and hence the segmental complexity—of vowels that can appear in a given metrical position varies with the strength of that position. Referring back to §3.2.2.5, this vowel distribution provides evidence for an HDA—or syntagmatic complexity asymmetry—at the rhyme level in Spanish: h position allows more segmentally complex vowels than $d$ position does. Example (14) also provides evidence for paradigmatic complexity in that the number and types of contrasts (i.e. the degree of complexity) decreases such that $h>d_1>d_2$ (where ‘$>$‘ denotes ‘supports more complexity than.’).

3.2.2.6. Conclusion: HDAs in Spanish and implications for rule types

Decreased complexity—or a reduction in the number of contrasts—is the rule in dependent position. On the other hand, increased complexity is the rule in head
Mid vowels have no height features

position, as illustrated by the ability to retain contrasts in main word stress position. These facts together provide evidence that HDAs are important for the phonology of Spanish.

Having demonstrated the existence of HDAs in Spanish (and by extension in Spanish dialects), I draw the following conclusions concerning the types of rules that are predicted to occur. Given the assumption that certain positions can be characterized as inherently containing either more or less complex segments—dependent positions should favour delinking or weakening processes, i.e. processes which create less complexity. This is because the static vowel distribution patterns in (12) illustrate that dependent positions allow fewer contrasts than head positions. Strong positions, on the other hand, should favour spreading or strengthening processes, i.e. processes which create greater complexity; at the very least, strong positions should disfavour delinking or weakening, since there is no evidence in Spanish for reduced complexity in strong position. On the contrary, the static vowel distributional patterns illustrated in (12) and the monophthongization process illustrated in (13) demonstrate that the greatest degree of segmental complexity is allowed in head position in Spanish.

In the following section, I evaluate two alternative analyses of Pasiego metaphony in light of these predictions concerning paradigmatic complexity, arguing that only one analysis—spreading—is compatible with the greater degree of complexity supported in metrically strong positions versus the lesser degree of complexity supported in weak positions in Pasiego.

3.2.3. Two phonological analyses of metaphony

3.2.3.1. Pasiego metaphony

Recall from chapter 2 that in the literature on Pasiego, it is argued that raising is triggered by final /U/ and also by tonic [ú] and [í]. I review these two types of raising below.
Mid vowels have no height features

Raising triggered by final /U/ targets underlying mid vowels under main word stress, as illustrated in (15).

(15) Pasiego raising (Penny 1969):

<table>
<thead>
<tr>
<th>Non-raised</th>
<th>Raised (only the mid vowels raise)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. afilit[é]ros</td>
<td>afilit[í]ru ‘needle-cases, needle-case’</td>
</tr>
<tr>
<td>b. g[ó]rdo</td>
<td>g[ú]rdu ‘fat (neuter), fat (masculine)’</td>
</tr>
<tr>
<td>c. ab[jé]rtos</td>
<td>ab[jí]rtu ‘open (pl), open (sg.)’</td>
</tr>
<tr>
<td>d. k[wé]rpos</td>
<td>k[wí]rpu ‘bodies, body’</td>
</tr>
</tbody>
</table>

The workings of raising triggered by /-U/ can be seen by comparing the two forms in (15.b), which are representative of the forms shown in (15.a-d). The word g[ó]rdo ends with the underlying mid vowel /-O/, which does not trigger raising. As a result, in g[ó]rdo, the underlying quality of the mid vowel in square brackets remains unchanged. On the other hand, in the form g[ú]rdu, the underlying mid vowel /O/ has raised to [ú]; raising is triggered by the final high vowel /U/ ([u]).

Raising triggered by the tonic vowels [í] and [ú] targets mid vowels which precede main word stress vowels, as illustrated in (16).

(16) Pasiego raising triggered by tonic vowels (Penny 1969: 52-53; 121):

<table>
<thead>
<tr>
<th>Non-raised forms</th>
<th>Raised forms:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. r[e]ger.os</td>
<td>r[i]gir.u ‘marsh, marshes’</td>
</tr>
<tr>
<td>b. k[o]θ.ér</td>
<td>k[u]θ.in.a ‘cooking (n.), to cook’</td>
</tr>
<tr>
<td>c. k[o]θ.ér</td>
<td>k[u]θ.in.u ‘large type of pot, to cook’</td>
</tr>
<tr>
<td>d. g[o]lós.os</td>
<td>g[u]lús.u ‘nosy, inquisitive’</td>
</tr>
</tbody>
</table>

For example, the tonic vowel in (16.b), k[u]θ.in.a, triggers raising of the pretonic vowel, whose underlying value (/O/) can be deduced from the related word k[ó]θ.ér.

The forms [kuθína] and [kuθínu] in particular show that it is the presence of the derivational vowel [í] rather than an inflectional (word-final) vowel [u] that causes the first vowel of the stem [kUθ]-—underlying /kOθ/-—to surface as high. This is because in morphological terms, the forms in (16.b,c) contain a root /kOθ/-, a
Mid vowels have no height features
derivational affix /-In/, and an inflectional affix, either /-A/ or /-U/ (Penny 1969: 106). In the form [kuñína]—underlyingly /kOðInA/—the only possible high trigger is the high vowel /I/ which receives main word stress. This observation provides evidence that raising can be triggered by high main word stress vowels alone, regardless of the height of the final vowel.¹⁰

In summary, raising in Pasiego has the following characteristics:

(17) Pasiego metaphony:

<table>
<thead>
<tr>
<th>Triggers</th>
<th>Final /U/ [u:]</th>
<th>tonic [i], [ú] from underlying /I,U,E,O/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Targets</td>
<td>tonic /E, O/</td>
<td>pretonic /E,O/</td>
</tr>
<tr>
<td>Neutral segments</td>
<td>/A/</td>
<td>/A/</td>
</tr>
</tbody>
</table>

Raising is triggered by vowels which are phonologically high, either because they are underlyingly high or because they have become high as a result of raising in the phonology. The triggers occur in final position, and in main word stress position. A high /U/ in final position triggers raising in the tonic mid vowels /E,O/; high tonic [i] and [ú] trigger raising in pretonic mid vowels. The vowel /A/ is neutral to raising; /I/ and /U/ are unaffected by raising because they are already high.

3.2.3.2. A delinking analysis

In this section, I argue that a delinking analysis of raising is functionally inconsistent with the facts of complexity in Spanish which were discussed in §3.2.2. I discuss Goad’s (1993) delinking analysis of Pasiego height harmony in particular.¹¹

¹⁰ Hualde (1989) and Penny (1969) cite as additional evidence (that raising can be triggered by high main word stress vowels alone) the observation that all the vowels in a derivational stem must agree in height, so that a form like *k[o]ñína* is not possible. However I demonstrate in chapter 5, §5.4.2.2 that while the latter statement holds of much of the Pasiego vocabulary, forms such as koñína in fact exist. In effect, then, Hualde and Penny’s observation requires further analysis which I undertake in chapter 5.

¹¹ McCarthy’s (1984) analysis of Pasiego height harmony might also be considered as an example of a delinking analysis; however, McCarthy’s
Goad (1993) analyses raising in Pasiego and high harmony in general as a delinking or weakening process. In Goad’s feature geometry (cf. also Clements 1989a), high vowels are characterized by a bare Vo node; mid vowels additionally have the node [open], and low vowels additionally have the node [low] (18.a).

(18) A delinking analysis of raising (based on Goad 1993: 179)

a. Underlying vowels: 

<table>
<thead>
<tr>
<th>High</th>
<th>Mid</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>e</td>
<td>a</td>
</tr>
</tbody>
</table>

b. Raised mid vowels:

<table>
<thead>
<tr>
<th>High</th>
<th>Mid</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>e</td>
<td>i</td>
</tr>
</tbody>
</table>

Extending the claims concerning complexity in §3.2.1 to Goad’s geometry, the high vowels in (18) would be the least complex, the mid vowels would be more complex, and the low vowels would be the most complex.

As shown in (18.b), raising delinks [open] from the mid vowels, resulting in derived high vowels (i.e. vowels with a bare Vo node); low vowels are outside the class of targets for this rule (Goad 1993: 183).

In example (19), I illustrate how the delinking analysis of metaphony would appear in the context of complexity (irrelevant structure has been omitted in (19)).

---

analysis is more appropriately considered a feature-changing analysis: in McCarthy’s analysis, both [+high] and [-high] are delinked from pretonic vowels in words which undergo raising; afterwards, however, the value for [+high] present on the tonic vowel spreads to the pretonic vowels (which have no specification for [+high] as a result of delinking). See chapter 5, §2.3.2.2 for further discussion of McCarthy’s analysis.
A delinking analysis of metaphony (analysis of [gúrdu] ‘fat m.s. ’):

\[
\begin{array}{c}
\text{line 1} & * \\
\text{line 0} & (* ) \prec * > \\
& V_0 \quad V_0 \\
gor & du \\
\downarrow \\
& [\text{open}]
\end{array}
\]

The hypothetical extension of Goad’s analysis shown in (19) delinks [open] from the underlying mid vowel [o] just in case the trigger (the desinence [u]) is high. In terms of paradigmatic complexity, the rule in (19) makes a head (the main word stress vowel) less complex just in case a non-head (the ultimate vowel) is non-complex.\textsuperscript{12}

The rule in (19) is counterintuitive in the context of the complexity facts of Spanish, outlined in §3.2.2. First, the delinking account decreases the complexity of heads, going against the (exceptionless) tendency to maintain complexity in heads in Spanish. Second, the rule in (19) levels a Head-Dependent Asymmetry, creating a symmetrical representation where an asymmetrical one previously existed. The structure existing before the rule applies would have been more well-formed than the structure created as a result of the rule of raising. I argue for rejecting the delinking analysis of raising shown in (19) on the grounds that it is not consistent with the facts of paradigmatic complexity, as illustrated through vocalic distribution patterns (cf. (11)) in Spanish.

3.2.3.3. *A spreading analysis*

On the other hand, the spreading analysis of raising presented in (20) is functionally consistent with complexity in Spanish. In a generic spreading analysis, the raising rule spreads the feature [high] to underspecified mid vowel targets. The

\textsuperscript{12} Goad provides no functional explanation for her analysis of Pasiego high harmony (1993: 176-184). Instead, Goad’s discussion of high harmony focusses on showing that high harmony can be accomplished via delinking, given her geometry.
vowel representations that result are illustrated in (20), in which the mid vowels /E,O/ neutralize to [i,u].

(20)  Representations for vowels after raising occurs:

\[
\begin{array}{ccc}
/L,U/ & /E,O/ & /A/ \\
[i,u] & [i,u] & [a] \\
\end{array}
\]

\[
\begin{array}{ccc}
\bullet & \bullet & \bullet \\
/PL & /PL & /PL \\
\text{Ap} & \text{Ap} & \text{Ap} \\
\text{[high]} & \text{[high]} & \text{[low]} \\
\end{array}
\]

A spreading rule in the context of complexity is illustrated in (21).

(21)  Raising as a spreading process:

\[
\begin{array}{ccc}
\text{line 1} & * & \text{line 0} \\
\text{(*)} & <*> & \text{Ap} \\
\text{Ap} & \text{Ap} & \text{[high]} \\
\end{array}
\]

In (21), a high vowel in dependent (final) position spreads [high] to a vowel in head (main word stress) position. (Recall from §3.2.2.6 that final extrametrical vowels are dependents.)

The rule in (21) is consistent with the complexity facts in Spanish for several reasons. First, the spreading rule in (21) increases the segmental complexity of the main stress vowel by spreading the feature [high] to it. Second, spreading occurs just in case an ill-formed HDA exists in the first place, i.e. just in case the final dependent syllable is more complex than the preceding main stress head syllable. The spreading rule in (21) creates a main stress head (h2) which is at least as complex as the dependent (d3), resulting in a well-formed structure in terms of complexity. In no other situation does the ill-formed contour arise.
The merits of the spreading analysis over the delinking analysis are clear. Only the spreading analysis is consistent with HDAs in Spanish, or the tendency towards greater complexity/strengthening in head position. I conclude that a spreading analysis of raising in Pasiego is superior to a delinking account.

3.2.3.4. Implications of the spreading analysis

In the previous sections, I presented evidence in favour of the analysis of raising as a spreading process. This analysis, in turn, has a bearing on whether the vowels /E,O/ are empty of height features or not. The spreading or strengthening analysis requires the latter assumption, while the delinking or weakening analysis requires that /E,O/ be more complex than /I,U/—i.e. that /E,O/ have height features (as in Goad’s representations in (15)). Given that the spreading analysis is the most plausible analysis for Pasiego, the assumption that /E,O/ are empty of height features follows.

3.2.3.5. Conclusions

In the above sections, I have demonstrated that complexity theory is a useful tool for choosing between superficially equally plausible phonological analyses—in this case, between spreading and delinking accounts of raising. In the case of Pasiego, only a spreading analysis of raising is compatible with the demonstrated presence of HDAs in Spanish. In addition, complexity theory provides fine-grained predictions concerning the locus of obligatory and optional raising in Pasiego words.

Determining that raising is the most plausible analysis of Pasiego metaphony also provides us with a strong argument that the vowels /E/ and /O/ are underlingly underspecified for height features. This is because, if raising is to be understood as strengthening, then mid vowels must have no height features—i.e. they must be less complex—in order to trigger strengthening—i.e. a process which increases complexity.
The conclusion that mid vowels have no underlying height features raises several questions which require further attention. In particular, many analyses in the phonological literature have analysed mid vowels as having underlying height features. In the following section, I show that such cases can be reanalysed with the assumption that mid vowels have no underlying height features. If the following proposals hold true, then a strong conclusion can be drawn, namely that mid vowels universally have no underlying height features. I explore the consequences of this conclusion at the end of this chapter.

3.3. Potential counterexamples

In this section, I discuss data which have been analysed as requiring height features on mid vowels. I provide alternative analyses for these potential counterexamples, demonstrating that the latter may be analysed consistently with the assumption that /E/ and /O/ have no underlying height features.

One potential type of counterexample that I postpone until chapter 5, §5.2.4.3 is that of mid harmony in Bantu languages (most recently discussed in Goad 1993, Steriade 1993).

3.3.1. Sonority

In recent work within the feature-geometry framework, sonority is defined as a structural property, such that either an increasing or a decreasing amount of structure correlates with increasing sonority (cf. Avery and Rice 1993, Clements 1989a, 1990, Dogil 1988, Goad 1993, Harris 1990, Rice and Avery 1991, Rice 1992). For vowels, Clements (1989a, 1990) and Goad (1993) argue that sonority correlates with increasing structure under the Aperture node. The underlying assumption of these analyses is the following sonority hierarchy for vowels, where ‘>’ is to be read as ‘are more sonorous than’:
Mid vowels have no height features

(22) The sonority hierarchy for vowels:\(^{13}\)

open (i.e. low) vowels > mid vowels > close (i.e. high) vowels

If sonority is correlated with structure, then the hierarchy in (22) is problematic for my analysis in which mid vowels have no structure. This is because according to the assumption that sonority correlates with increased structure under the aperture node, mid vowels should have more structure than high vowels and less structure than low vowels. I present the evidence for the vocalic sonority hierarchy in §3.3.1.1. In §3.3.1.2, I present the type of evidence that is typically used to argue for vocalic sonority. In §3.3.1.3, I introduce the distinction between structural and inherent sonority. In §3.3.1.4, I present a hybrid account of the patterning in §3.3.2, in which sonority is both structural and inherent. This hybrid account assumes that mid vowels have no height features.

3.3.1.1. Evidence for the sonority hierarchy in vowels

As in consonants, the sonority hierarchy for vowels is based on evidence from syllabification, specifically on the assumptions that a) the syllabic nucleus is more sonorous than any other segment in the syllable, b) segments closer to the nucleus are more sonorous than segments farther away from the nucleus (cf. the Sonority Sequencing Principle, Clements (1990)), and c) sonority in vowels correlates with aperture (Clements 1989a). For example, Selkirk (1984) based on Harris (1983) argues for the sonority hierarchy of low vowels > mid vowels > high vowels in Spanish. I present the Spanish example below, augmenting Selkirk’s (1984) and Harris’ (1983) discussion with observations from García de Diego (1946) (Selkirk 1984 discusses the same observations as García de Diego 1946, but in less detail).

\(^{13}\) This sonority hierarchy is from Jespersen, as reported in Malmberg (1963), cited in Hooper (1974).
Example (23) outlines patterns of syllabification and resyllabification of vowels in hiatus in Spanish words. When syllabification or resyllabification apply to two vowels in hiatus, typically one vowel becomes the nucleus, while another vowel is (re)syllabified as a glide.


a. Initial syllabification:
   i. Vowel-Glide: aʝ iʝ oʝ aɰ eɰ oɰ
      Examples: [hɑi there is], áɰto car, péɲe comb, óɰgo I hear, Eɰrópa Europe, bɒɥ type of fish
   ii. Glide-Vowel: ja je jo ɰa ɰe ɰo
      Examples: djáblɔ devil, bjɛn well, pjoɟo lourse, cuɬɬ which, cuɛva cave, cuoɬa quota
   iii. Either: uɬ or uɬ (lexically specified)
         ju or iɬ (lexically specified)
      Examples: múɬ very, cuɬda s/he cares (for), cuɬdəd city, viɬda widow

b. Resyllabification:

First, a few preliminary comments: In Spanish, sequences of identical vowels are prohibited, as noted in Selkirk (1984: 129) and in numerous other references. Second, sequences of non-high vowels (eg [ae], [eo], etc.) are not initially syllabified within the same syllable in careful or cultivated speech. However in Vulgar Castilian, such sequences can undergo resyllabification into a single syllable, as summarized in (23.b.i)). For example, in Vulgar Castilian, the sequence [eá] in [t[eá]tro] ‘theatre’ becomes [já] in the resyllabified [t[já]tro] (García de Diego 1946).
The process illustrated in (54.b.i) changes a sequence of unstressed plus stressed syllable into a single syllable, in case the vowels involved are non-high.

As shown in (23), within a syllable, the vowels [i,u] always become glides, while [e,a,o] remain vowels (23.a.i-ii). This observation shows that [i,u] pattern as a class separately from the class [a,e,o]. Additional evidence that [i,u] pattern as a class is that when both high vowels occur in the same syllable, the choice of nucleus is lexically conditioned, i.e. either [i] or [u] can become the nucleus (23.a.iii).

As shown in (23.b), the mid and low vowels divide into two classes with respect to resyllabification processes: the mid vowels become high glides, while the low vowel remains as the vocalic nucleus.

In terms of which type of vowel is preferred as the syllabic nucleus, (23) shows that low vowels are preferred to mid vowels (23.c), while mid and low vowels are preferred to high vowels (23.a). A common conclusion drawn from these observations is Selkirk’s (1984) conclusion that the sonority hierarchy for vowels is low > mid > high, where low vowels are more sonorous than mid vowels, and mid vowels are in turn more sonorous than high vowels.

3.3.1.2. *Is sonority the factor that determines vocalic syllabification?*

One question that must be immediately addressed before reanalysing the above data is whether the property responsible for the syllabification of vowels is indeed sonority. I argue here that sonority is indeed the property to which syllabification of vowels is sensitive.

Recall that in chapter 2, §2.2.1, I assumed that within the class of vowels, the relevant classes of features are place features and height features. I assume that this dichotomy of features can also be translated into other terms: following Anderson and Ewen (1987), den Dikken and van der Hulst (1989), Donegan (1978), van der Hulst (1989), Schane (1984), and Stampe (1979), I assume a basic dichotomy
between tonality features and sonority features, identifying tonality features with place features, and height features with sonority features. Rephrasing the above question, then, are place/tonality features or height/sonority features or a combination of both responsible for the syllabification facts outlined in (23)? I provide a preliminary answer to this question below.

I first assume that syllabification is sensitive to the properties of underlying vowel representations, and that underlying representations are specified only to the extent needed to capture contrasts (cf. chapter 2, §2.2.2). I also assume that the resyllabification process discussed in (23.c) also refers to specified vowel representations. These assumptions have significant consequences for the question of whether or not syllabification is sensitive to height/sonority or to place/tonality. Recall from chapter 2, §2.2.2 that within a five-vowel system, /I,E,A,O,U/, the necessary underlying features are the height features [high] and [low], and the place features [coronal] and [labial]. Because [coronal] and [labial] are the only relevant place features, and because neither feature defines the class of mid vowels, I argue that place features are not relevant for syllabification. By default, then, syllabification refers to vowel height or sonority.

3.3.1.3. Is sonority structural or inherent?

Given the assumption that syllabification refers to sonority, the logical next step is to ask whether syllabification refers to structural sonority (as proposed by Clements 1990, Dogil 1988, Harris 1990, Rice and Avery 1991, Rice 1992) or inherent sonority (as proposed in the phonetic literature (e.g. Catford (1988: 174), where inherent loudness is equivalent to inherent sonority). Applying the spirit of these proposals to the structure of the Aperture node proposed in chapter 2, §2.2.1, I rephrase the above assumptions as follows:
(24) The aperture node and sonority:

```
Aperture
  / \  
[low]  [high]
```

Structural sonority as defined in the above references would essentially correlate with the complexity of representations. In example (24), structural sonority would correlate with the presence/absence of the Aperture node, and the presence/absence of aperture features. (Recall that I have argued that both aperture features do not appear at the same time in a given representation; therefore the number of aperture features under the aperture node is not at issue.) Inherent sonority, on the other hand, would correlate with an inherent acoustical property or properties of the features [low] and [high], and the feature [low] would have more of this property than the feature [high].

For example, as discussed earlier, Catford (1988: 174)—an example of the phonetics literature—equates loudness with sonority: "The vowel [a], for instance, has greater inherent sonority than [i]: for the same initiator velocity (same stress) [a] sounds louder than [i], and again, a strongly stressed [i] may sound no louder than a rather weakly stressed [a]."

3.3.1.4. An alternative analysis of sonority

I propose that sonority is computed from both intrinsic content and from structure. The presence of the structural node ‘Aperture’ on vowels makes vowels more sonorous than consonants, deriving the basic C/V dichotomy (cf. Clements 1990). However, I propose that within the class of vowels, sonority is an intrinsic property—i.e. features under the aperture node have intrinsic sonority content. The type of analysis this proposal requires is illustrated below.

(25) Analysis of the sonority hierarchy and preferred nuclei:

```
[low] = preferred nucleus
[ø] = neutral status with respect to syllabification
[high] = dispreferred nucleus
```
Mid vowels have no height features

As shown in (25), I assume that the feature [low] is intrinsically more sonorous than the feature [high]. A similar proposal in the phonological literature is van der Hulst’s (1993) ‘VC’ theory, in which [low] is a ‘V’-feature, i.e. a feature with maximum sonority, while [high] is a ‘C’-feature, i.e. a feature of minimum sonority. A vowel with the feature [low] constitutes a preferred nucleus because it is more sonorous; a vowel with the feature [high] constitutes a dispreferred nucleus because it is less sonorous. However, a vowel with no aperture features (i.e. a mid vowel) is neither dispreferred nor preferred, because it has no inherent sonority content. Instead, a vowel with no aperture features simply has the structural sonority content provided by the presence of the Aperture node. While the presence of an Aperture node identifies a mid vowel as a potential nucleus, it does not label a mid vowel as a preferred or dispreferred nucleus. These assumptions derive the syllabification of Spanish vowels in hiatus (cf. (23)) as follows (where ‘N’ equals the nucleus; ‘rising’ equals increase in height, and decrease in sonority, ‘falling’ equals decrease in height and increase in sonority).

(26) Analysis of syllabification of vowel sequences within one syllable:

a. Maximally rising/falling diphthongs [ai, iə]:

\[
N \quad a \quad i \quad N
\]

[low,Ø] [high,cor] [high,cor] [low,Ø]

b. Minimally rising/falling diphthongs [æː, ɛː, ɛi, ɛɛ]:

\[
N \quad e \quad i \quad a \quad e
\]

[Ø, cor] [high, cor] [low, Ø] [Ø, cor]

c. Level diphthongs [iu, u]:

\[
N \quad j \quad u \quad N
\]

[high, cor] [high,cor] [high,cor] [high, cor]
As shown in (26.a), the low vowel /A/ will be the preferred nucleus if the other alternative for nucleic status is the high vowel /I/ because /A/ is intrinsically more sonorous. In (26.b), the vowel /E/ will be the preferred nucleus if the other alternative for nucleic status is the high vowel /I/, since /I/ is a dispreferred nucleus, while /E/ is neutral in status. The low vowel /A/ in (26.b), on the other hand, will be preferred over /E/ for nucleic status, since /A/ is a preferred nucleus, while /E/ is neutral in status. Finally, as shown in (26.c), if the two vowels being syllabified have the same preferred, dispreferred, or neutral status, then either can be the nucleus (depending on other factors relevant to the language in question; for example, in Spanish (23.b) the choice of the nucleus in this instance is lexically specified).

In conclusion, the sonority hierarchy low>mid>high can be derived from the fact that /E/ and /O/ have NO status with respect to intrinsic sonority, whereas /A/ and /I/ do have some status with respect to sonority. The mid vowels pattern as a separate class with respect to sonority precisely because they do not have height/sonority features.

3.3.1.5. Summary

In summary, I have proposed that the patterns of syllabification of vowel sequences are derivative of sonority, and that sonority is of two types, namely structural and intrinsic. In vowels, structural sonority is computed from the presence of the Aperture node; this defines the class of vowels as opposed to the class of consonants. On the other hand, vowels also have intrinsic sonority: vowels with the feature [low] are intrinsically more sonorous than vowels with the feature [high]. Vowels with no features under the aperture node do not have intrinsic sonority, but they do have structural sonority. The sonority properties of vowels, as defined above, derive vocalic syllabification patterns, without assuming that mid vowels have underlying height features.
3.3.2. Vowel coalescence

In addition to vocalic syllabification patterns, other vocalic processes such as coalescence have been analysed as requiring height features on mid vowels. Vowel coalescence results when two vowels combine across morpheme boundaries, in the process often deleting the mora of one of the input vowels (cf. the analysis of Spanish ‘sinalepha’ or vowel deletion in Kenstowicz 1994: 46). Many vowel coalescence accounts assume the full specification of height features for mid vowels (as in Chomsky and Halle 1968; Kaye, Lowenstamm and Vergnaud 1985: 309).

3.3.2.1. Sanskrit

An example of vowel coalescence from Sanskrit is provided in (27) for illustration.


a. Sanskrit vowel system: [i,u,a]
b. Vowel combination across word boundaries:
   i. Diphthongs ([v] is the counterpart of [w] in Sanskrit):
      u#i → vi
      i#u → yu
      i#a → ya
      u#āi → vāi
   ii. Coalescence:
      a#i → e:
      a#u → o:

In Sanskrit, the combination of two vowels at a word boundary creates either diphthongs (or glide-vowel sequences) (27.b.i), or—the crucial case—monophthongs (27.b.ii). In the monophthong examples, the quality of the derived vowel is different from that of either vowel. A common analysis (cf. Anderson and Ewen 1987,
Mid vowels have no height features

Donegan 1978, Kaye, Lowenstamm and Vergnaud 1985, and Schane 1984) is that the vowels that coalesce contribute all of their features to the resulting vowel. Anderson and Ewen (1987), Donegan (1978), and Schane (1984) assume that the features involved are a combination of height and tonality (i.e. place) features. Kaye, Lowenstamm and Vergnaud (1985) additionally assume that height features are contributed by the combining vowels. Kaye, Lowenstamm and Vergnaud (1985: 309) essentially argue that when [a] and [i] coalesce, the element |A| contributes the feature [-high] to the representation of the element |I|, which is [-round, -back, +high, -ATR, -low]. The element |I| then loses its feature [+high]. The resulting representation is a surface [ɛ], which is [-round, -back, -high, -ATR, -low]. This type of analysis, where both vowels contribute height features to a fully-specified mid vowel, is illustrated within a monovalent feature framework in (28).

(28) Possible analysis of vowel coalescence:

\[
\begin{array}{c}
[a] & [i] & [e] \\
\cdot & \cdot & \cdot \\
[low] & [high] & [low, high]
\end{array}
\]

The type of analysis in (28) makes several assumptions which are problematic for my approach. First, the analysis in (28) requires that both [e] and [i] have height features in Sanskrit. The assumption that [e] has height features is problematic for reasons discussed earlier. The assumption that phonetic [i] is a phonologically high vowel in Sanskrit is problematic because the Sanskrit vowel system is [i,a,u]—a three-vowel system which I argue to be phonologically /E,A,O/, with no phonologically high vowels.

In (29) I present a reanalysis of vowel coalescence which eliminates both of the above potential problems:
(29) Coalescence of features (abstracting away from length):

\[
\begin{array}{ccc}
/A/ & /E/ & [\dot{E}] \\
[a] & [i] & b. [e] \\
\bullet & \bullet & \bullet \\
\mid & \mid & \mid \\
[low] & [coronal] & [low] [coronal] \\
\end{array}
\]

(29.a) illustrates the underlying representation of the relevant vowels in Sanskrit. The combination of [a + u] receives a parallel analysis. The features which combine are [low] from /A/ and [coronal] from /E/. As in chapter 2, I assume that the low central vowel [a] has no underlying place features.\(^{14}\) I follow Hume (1992) in assuming that front vowels such as /E/ ([i]) are [coronal].\(^{15}\)

(29.b) gives the results of coalescence. After coalescence the resulting vowel has the features [low, coronal]—thus, [e] is the realization of a low front vowel in Sanskrit (more on this in §3.3.2.3). This analysis reflects Schane’s intuition that such monophthongizations”… represent fusions of aperture and tonality.” (1984: 135) (in more familiar terms, fusions of height and place features).

A potential problem with the above analysis is that, in comparison to the vowel /E/ ([e]), which I assume to underlingly have no features whatsoever, the coalesced vowel [e] in (29) has a very specified representation. However, this observation is a problem only under the view that phonetic [e] always has the same

---

\(^{14}\) This is in contrast to the low vowels /ÎE/ and /ÎÔ/, which are distinguished from /A/ by the addition of a place feature, respectively [coronal] for /ÎE/ and [labial] for /ÎÔ/.

\(^{15}\) In subsequent chapters, I will assume, following Rose (1993) and Walker (1993), that front vowels are *underlyingly* coronal only when they contrast with central vowels of the same height. However, I argue in chapter 5 that front vowels may also receive the feature [coronal] by means of a phonetic process of enhancement. I assume that coalescence in Sanskrit is a late rule, since coalescence only applies between words. By the time coalescence applies, I assume that front vowels have already undergone enhancement, and therefore have the feature [coronal] at the point at which coalescence applies.
Mid vowels have no height features. As discussed in chapter 2, a particular phonetic instantiation may originate from varying phonological representations, depending on the contrasts present in the language in question (for example, in chapter 2, the case most discussed was [i], which was phonologically high in some inventories, but phonologically ‘mid’ in other inventories). In Sanskrit, [e] represents a derived low vowel, not a phonologically mid vowel.

I suggest that the degree of specification of [e] in Sanskrit proposed in (29) is a good result. In particular, the markedness of the representation of Sanskrit [e] fits well with the observation that [e] only occurs in derived, post-lexical contexts in Sanskrit: In examples such as Sanskrit fusion where a+i→e, the representation of [e] is not like that of any underlying vowel; instead it is non structure-preserving. This is a desirable result because non-structure-preserving outputs generally correlate with post-lexical processes (as argued in Kiparsky 1985), and in this respect, Sanskrit conforms to the generalization.

To conclude, the analysis in (29) assumes that [i] in a three-vowel system has no underlying height features, and in fact, represents underlying /E/. In addition, the phonetic mid vowel [e] need not be regarded as a combination of the aperture features [high] and [low], as in other analyses; instead, in the above analysis, [e] is the product of combining [low] and [coronal], i.e. it is a low front vowel. I discuss the latter conclusion in more detail in §3.3.3, as it relates to the following discussion of Ewe coalescence.

3.3.2.2. Ewe coalescence

Another potential type of coalescence problem is raised by Schane’s analysis of Ewe coalescence. Schane’s (1984) analysis of Ewe coalescence requires that [e] have height features:

(30) Ewe coalescence:

a. Example: a # e → e
b. Schane’s analysis: a # ai → aai
As shown in (30.a), the coalescence of [a] and [e] in Ewe creates [ɛ]. In Schane’s analysis (30.b), [a] and [e] both have a scalar [low] particle represented by the aperture feature lal in Schane’s particle phonology—i.e. both vowels have height features. Fusing the features of [a] and [e] results in a vowel that is midway between [a] and [e], namely [ɛ]. The problem with Schane’s analysis is that [e] again has an underlying height feature (i.e. the particle lal). (Unlike lil and lul, lal is pure height.)

However, there is an alternative solution which does not require that Ewe [e] have underlying height features. This is outlined in (31).

(31) Ewe vowels:

a. phonetic:  
b. maximally specified representations:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>[high, coronal]</th>
<th>[high, labial]</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>u</td>
<td>[Ø, coronal]</td>
<td>[Ø, labial]</td>
</tr>
<tr>
<td>e</td>
<td>o</td>
<td>[low, coronal]</td>
<td>[low, labial]</td>
</tr>
</tbody>
</table>

In the underlying Ewe vowel system (31.a), [ɛ] has been analysed as the low front counterpart of [a], while [ɔ] is the low, back counterpart of [a] (Clements 1989a, Odden 1991, Rice and Avery 1993). (31.b) gives the representations.

As shown in (31.c), the combination of the features [low] from /a/ and [coronal] from /e/ results in the vowel [low, coronal], or [ɛ], in the type of 7-vowel inventory shown in (31). Crucially, the vowel [e] in (31.b) instantiates a vowel with no height features, while [ɛ] in Ewe instantiates a low vowel.

3.3.2.3. Coalescence and inventories

The main point which the above analyses of coalescence highlight is that the difference between Sanskrit and Ewe coalescence derives from the nature of their
underlying inventories. In Sanskrit, the coalescence of [i] and [a] creates [e]\(^\text{16}\); however, in Ewe, the coalescence of [i] and [a] crucially could not create [e]—this is essentially because Ewe has two mid vowel heights: in Ewe, the representation [low, coronal] can only be interpreted as [è], since [è] contrasts with [e]. On the other hand, in Sanskrit, the representation [low, coronal] can only be interpreted as a non-structure-preserving output because the representation [low, coronal] does not exist underlyingly; Sanskrit has no [e/è] distinction, and so the representation [low, coronal] can be interpreted as [e]. (One could also imagine [low, coronal] being interpreted as [e] in some other Sanskrit-like language, so long as the output is phonetically low and not phonetically high.)

The main difference, then, between Ewe and Sanskrit is that the output is structure-preserving in Ewe, but non-structure-preserving in Sanskrit. Because of the latter property, the same process—combination of [low] and [coronal]—has different phonetic outputs in Ewe and in Sanskrit.

3.3.2.4. Summary

In summary, vowel coalescence facts are amenable to alternative analyses in which a) underlying /E/ has no height features, and b) [e] and [è] result from the combination of [coronal] and [low], the output being dependent on the underlying inventory of the language in question. The facts of vowel coalescence do not require the assumption that mid vowels such as /E/—i.e. Sanskrit [i] and Ewe [e]—have height features at any point in their derivation.

\(^{16}\) Sanskrit coalesced vowels are always long; the length of these coalesced vowels may in turn influence their phonetic realization such that, for example \{è::\} is realized as [è:].
3.3.3. *Diphthongization*

Another phenomenon which apparently requires mid vowels to have underlying height features is diphthongization—a process, synchronic or historical, by which long mid vowels diphthongize to [ej] and [ow]. Using [e: → ej] as an example, one might argue that diphthongization sequentializes the height component of the original long vowel. (32) assumes that mid vowels are specified as both [high] and [low].

(32) Possible analysis of diphthongization:

a. Underlying long vowel: b. Diphthong:

\[
\begin{array}{cc}
[e:] & [ej] \\
X & X \\
\downarrow & \downarrow \\
\text{Ap} & \text{Ap} \\
[\text{low}] [\text{high}] & [\text{low}] [\text{high}]
\end{array}
\]

(32.a) illustrates a long mid vowel with fully specified height features; (32.b) illustrates a diphthong, which has been created by splitting the long vowel into two separate segments, namely a mid vowel segment followed by a high vowel segment. If correct, the above analysis would present a counterexample to the claim that mid vowels have no underlying height features.

An alternative analysis advocated in Natural Phonology and Particle Phonology by Donegan (1978), Schane (1984) and Stampe (1979) among others is illustrated in (33).

(33) Diphthongization (Schane 1984: 134-5):

\[
\begin{array}{cc}
a. \text{Process:} & b. \text{Schane’s formalism} \\
e: \rightarrow ej & ai i \rightarrow ai i \\
o: \rightarrow ow & au u \rightarrow au u
\end{array}
\]
Mid vowels have no height features

As shown in (33.b), diphthongization can alternatively be analysed as the sequentialization of height and place features (respectively ‘sonority’ and ‘colour’ in Stampe 1979: 248f, cited in Donegan 1978: 106). In this type of analysis, height features associate to the first element of the diphthong, while place features associate to the second element of the diphthong. The analysis I propose below is in the spirit of the Particle Phonology and Natural Phonology proposals:

(34) Reanalysis of diphthongization:

a. long vowel
b. diphthong:

\[
\begin{align*}
[a:] & \quad [\varepsilon \ j] \\
N & \quad N & \quad \text{Coda} \\
X & \quad X & \quad X & \quad \text{x-tier} \\
\circ & \quad \circ & \quad \circ & \quad \text{root node} \\
\text{Pl} & \quad \text{Ap} & \quad \text{Ap} & \quad \text{Pl} & \quad \text{Pl} & \quad \text{Ap} & \quad \text{subsegmental constituency} \\
& \quad [\text{coronal}] & \quad [\text{coronal}] \\
\end{align*}
\]

(34) illustrates the diphthongization of \([\varepsilon :]\) to \([\varepsilon \ j]\). (34.a) shows the representation of a long vowel before diphthongization. (34.b) shows the representation of the diphthongized vowel, created when a long vowel splits into two segments. As shown in (34), I assume that diphthongization essentially results when the second segment is interpreted as a more consonant-like segment by virtue of no longer heading the syllable containing it.\textsuperscript{17} In addition, I assume that the glide loses its Aperture node, as the presence/absence of the Aperture node, together with syllabic position, distinguishes glides and vowels.

\textsuperscript{17} This follows the common assumption that vowels and glides derive from the same segment, which is interpreted as a vowel or glide according to syllabic position (c.f. Kenstowicz 1994: 37, Levin 1985).
The first segment in (34.b) will be interpreted as a [coronal] vowel with no aperture features, namely as the vowel [e] in this example. The second vowel will be interpreted as a [coronal] glide, namely [j], because it occurs in non-head position. It is in this sense that place features (i.e. ‘tonality’ or ‘colour’) and aperture features (i.e. ‘sonority’) are sequentialized. The main advantage of this analysis is that it does not require that vowels lose height features, as does the analysis in (32)). The main difference between the analysis in (32) and my alternative analysis in (34) is that in the latter, sequentialization alone accounts for the facts of diphthongization. Unlike the analysis in (32), there is no need to adjust height features to get the actual phonetic output. (34) captures the intuition that [e] and [j] form a class—they are both [coronal]; in contrast, (32) assumes that [e] and [j] do not form a class—[e] is mid and [j] is high, and as a consequence, requires adjustment rules to get the phonetic output.\(^{18}\)

Finally, the most salient feature of the analysis in (34) is the assumption that the vowels /E/ and /O/ require no height features. I conclude from this analysis that diphthongization does not necessarily present evidence for height features for mid vowels.

### 3.3.4. Conclusion

If the above reanalyses are correct, then it is possible to say that mid vowels universally have no underlying height features. This conclusion in turn has several consequences which I briefly outline below. First, the feature geometry of the aperture node would be affected, since the latter would be greatly simplified if no height features were required to capture the class of mid vowels. For example, there

\(^{18}\) In the case of glides such as [ea], on the other hand, I assume the operation of a further requirement that [coronal] be limited to the head position of a vowel nucleus.
would be no need for Goad’s feature [open] or Clements’ scalar feature [open n]; the features [low] and [high] would suffice to capture vowel height contrasts.

Second, if mid vowels universally have no underlying height features, there are important consequences for the theory of Contrastive Specification: for example, it is possible to answer the question of whether underspecified representations—such as an empty Aperture node—are distinct or only partly distinct\(^{19}\) from more fully specified representations—such as an Aperture node with a terminal height feature; i.e. whether or not representations such as an empty Aperture node are to be exhaustively interpreted. Support for the hypothesis that mid vowels universally have no underlying height features implies that an empty Aperture node is distinct from a more fully specified Aperture node, since a representation such as [coronal,Ø] (i.e. a vowel with no height features, or a mid front vowel) is a distinct phoneme from [coronal,high] (i.e. a high front vowel) in this approach. There are several advantages to adopting the claim that a height class can be represented by an exhaustively-interpreted empty Aperture node. One is that exhaustive interpretation captures negatively-defined classes without the need for diacritics. For a diacritic approach, see Anderson and Ewen (1987), who make reference to positively-defined classes such as [F], and also to negatively-defined classes by means of the notation [~F] (not-F). Under exhaustive interpretation, negatively-defined classes are defined as [F] versus the node X that dominates [F]. Exhaustive interpretation can then be viewed as an improvement because it refers to something that exists (i.e. a node or its dependent) rather than to something that does not exist (i.e. ~F). Second, and most importantly, exhaustive interpretation of the Aperture node makes the strong prediction that vowels with no height features (i.e. mid vowels) are always inert with respect to height: they cannot spread height features or block spreading of height features; they can be targets for spreading or insertion of height features; if they are

\(^{19}\) The terms distinct/non-distinct are employed by Yip (1989).
derived from high vowels, it is via delinking; and they are neutral to constraints that refer to height (e.g. sonority). In summary, exhaustive interpretation of a bare Aperture node makes strong predictions about the patterning of mid vowels, and about the number of possible height contrasts.

3.4. Summary and conclusions

In this chapter, I argued for the spreading analysis of metaphony illustrated in (18):

(18) Raising as a spreading process:

\[
\begin{array}{c}
\text{line 2} & \ast \\
\text{line 1} & (\ast ) \\
\text{line 0} & (\ast \ast ) \\
\text{Ap} & \text{Ap} \\
\end{array}
\]

As shown in (18), a correlate of this analysis was the assumption that mid vowels have no underlying height features. I demonstrated in the remainder of this chapter that it is possible to make the claim that mid vowels have no underlying height features universal. Combining the claims argued for in this chapter with those of chapter 2, I conclude that vowels thus have the contrastively-determined representations shown in (35):

(35) Mid vowels:

a. 3-vowel inventory:

<table>
<thead>
<tr>
<th></th>
<th>/E/</th>
<th>/A/</th>
<th>/O/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place:</td>
<td>[coronal]</td>
<td>[ø]</td>
<td>[labial]</td>
</tr>
<tr>
<td>Height:</td>
<td>[ø]</td>
<td>[low]</td>
<td>[ø]</td>
</tr>
</tbody>
</table>
b. 5-vowel inventory:

<table>
<thead>
<tr>
<th></th>
<th>/I/</th>
<th>/E/</th>
<th>/A/</th>
<th>/O/</th>
<th>/U/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place</td>
<td>[coronal]</td>
<td>[coronal]</td>
<td>[ø]</td>
<td>[labial]</td>
<td>[labial]</td>
</tr>
<tr>
<td>Height</td>
<td>[high]</td>
<td>[ø]</td>
<td>[low]</td>
<td>[ø]</td>
<td>[high]</td>
</tr>
</tbody>
</table>

The term ‘mid vowels’ denotes the representations /E,O/; they are the non-low vowels in 3-vowel inventories (35.a), and the non-low, non-high vowels in 5-vowel inventories (35.b).

Armed with the above conclusions, I discuss in chapter 4 the patterning of mid vowels in Pasiego. I show that while mid vowels are phonetically variable in Pasiego, they vary in a predictable manner. This observation sets the foundation for chapter 5, in which I outline a model of phonetic interpretation.

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20 In contrast to /E/, the vowel [ø] would have no features whatsoever. See chapter 5 for further discussion.
4.1. Introduction

In chapter 3, I demonstrated that the mid vowels /E,O/ are phonologically underspecified for height features. While the underlying representations are minimally specified, the phonetic representations of [e,o] contain much more information. In order to address the problem of how and when non-underlying information is added, I present data and observations connected with the phonetic patterning of /E,O/ in this chapter. I demonstrate that the phonetic realization of /E,O/ is rule-governed or predictable from paradigmatic and syntagmatic context. First, I show that /E,O/ are phonetically variable for height. I then argue that this phonetic variation for height of /E,O/ is governed by the paradigmatic context, or by the presence/absence of other height contrasts in the inventory. Second, I demonstrate that /E,O/ are phonetically variable for place of articulation (i.e. they vary between front/back segments and central or centralized segments). I argue that this phonetic variation for place is predictable from paradigmatic context, in that different phonetic realizations of /E,O/ exist in weak metrical position. This chapter, then, lays the groundwork for chapter 5, in which I develop a model of phonetic interpretation based on the observation that phonetic variation is constrained.

This chapter proceeds as follows: In §4.2, I outline a phonological model which correlates phonetic variation and underspecification; this model will be refined in the following chapter. In §4.3, I discuss patterns of phonetic realization of height in Iberian Spanish dialects and Catalan dialects. In §4.4 I introduce the patterns of phonetic variation for place of /E/ and /O/ in Pasiego, showing that the phonetic variation for place of /E,O/ is sensitive to metrical (i.e. syntagmatic) context. I present conclusions in §4.5.
4.2. The variability in phonetic realization argument

In this section, I argue that variability in phonetic realization is a consequence of underspecification. This argument is not new. For example, in the phonetics literature, it is often argued that coarticulation is a function of a segment’s inherent lack of specification for articulatory or acoustic targets (Keating 1988: 278). Thus, a given consonant may in one context be realized with its inherent place of articulation (i.e. without coarticulation), while in another context (for example, in anticipation of a following rounded vowel) it might also be realized with a rounded coarticulation. Such a segment is considered to be ‘neutral’ or underspecified with respect to rounding (Keating 1988: 278).

As another example, in the literature involving the phonetics-phonology interface (cf. Cohn 1993, Keating 1988, and references therein), it is argued that phonological representations are at least partly underspecified, and that this underspecification translates into phonetic underspecification for articulatory or acoustic targets. For example, Cohn (1993) argues that segments may be inherently underspecified for a given phonological feature F, and that in the phonetics, phonological underspecification translates into phonetic underspecification. Segments which are underspecified for a given phonetic target may receive "...a transitional amount of the feature F [or -F] from the phonetic context" (Cohn 1993: 50), i.e. from adjacent segments which are specified for F. Thus in Cohn’s model, gradience in phonetic realization is a characteristic of underspecified segments.

As in the above sources, I adopt the assumption that underspecification correlates with phonetic variability. However, unlike the above sources, I adopt a more overtly phonological perspective, focussing on the categorial—as opposed to gradient—aspect of phonetic variation. In particular, I show that phonetic variation is constrained by the presence of phonemic contrasts.
I draw from sources such as Anderson and Ewen (1987), Avery and Rice (1989), Cohn (1993), den Dikken and van der Hulst (1989), van der Hulst (1989), Rice (1993a,b), Dresher, Piggott and Rice (1994), Steriade (1993), Trubetskoii (1939/69) and Wu (1994). I refer to the type of model proposed in the above sources as it applies to vowels as the ‘phonological vowel space model’ for reasons discussed below.

In the phonological vowel space model, there is a correlation between the representations in a given inventory and the phonetic realization of these representations. For example, the more vowels in a given inventory, the more phonetically specified or invariant are the vowels in that inventory; conversely, the fewer the vowels in a given inventory, the greater the phonetic variability of the vowels within that inventory: Phrased differently, vowels are viewed as taking up a larger ‘space’ in less ‘crowded’ inventories, while taking up a smaller space in inventories with fewer vowels.¹ This is illustrated in (1):

(1) Vowel space:

a. 5-vowel inventory 
   I
   E
   A

b. 7-vowel inventory
   I
   E
   O
   Ò

(1) shows the predicted patterning for height of vowels in 5- and 7-vowel inventories. Of particular note is that /E,O/ are predicted to have a greater range of phonetic realization for height in 5-vowel inventories than in 7-vowel inventories. This patterning is seen as a direct consequence of the lack of lower-mid vowels in 5-vowel inventories, versus the presence of lower-mid vowels in 7-vowel inventories.

¹ For a phonetic model with somewhat related assumptions, compare with the Principle of Phonetic Dispersion in the following references: Crothers (1978), Disner (1984), Lass (1984), Liljencrants and Lindblom (1972); Lindblom (1975); Maddieson (1977), and Terbeek (1977).
A subset of the phonological vowel space references discussed above—including Avery and Rice (1989), Cohn (1993), Rice (1993a,b), Dresher, Piggott and Rice (1994), Steriade (1993), Trubetskoi (1939/69) and Wu (1994)—consider the phonetic patterning of vowels illustrated in (1) to be a consequence of the number and types of contrasts present in a given inventory. (The other vowel space models do not necessarily base their representations entirely on the criterion of contrastiveness.) For example, in (1), /E/ is considered to have a wider range of realization in a 5-vowel inventory than in a 7-vowel inventory because it does not contrast with the lower-mid vowel (/È) in the 5-vowel inventory; in the 5-vowel inventory, /E/ is free to take up the space which is otherwise allotted to /È/ in a 7-vowel inventory. The degree of variation in the phonetic realization of a given representation is thus a direct consequence of the number and type of contrasts present in an inventory in the contrastively-based vowel space models. Contrasts take up ‘space,’ leaving less space for underspecified representations such as /E/.

I adopt and provide evidence for a contrastively-based vowel space model in the following section.

4.3. Height variation in three-vowel systems vs. five-vowel systems

In this section, I present two types of data from variation for height in Iberian peninsular dialects of Spanish and Catalan. The data in §4.3.1 demonstrate that /E/ and /O/ potentially have a greater range of phonetic realization in 3-vowel systems than in 5-vowel systems. The data in §4.3.2 demonstrate that /E,O/ are more variable for height than /I,A,U/ in five-vowel systems.
4.3.1. /E/ and /O/ are more phonetically variable in inventories with fewer contrasts

In this section, I discuss the patterning of /E/ and /O/ in Iberian Spanish dialects. First, however, I introduce several assumptions which will help in interpreting the data.

4.3.1.1. Representations

The dialects discussed in this section differ with respect to vowel reduction and their final vowel inventory. Some dialects (e.g. Central and Eastern Asturian, Central Aragonese, Castillian) have 5 or more vowels in all metrical positions and in the final inventory. Other dialects (e.g. Mirandese, Eastern Aragonese, Montañense, Western Asturian/Leonese, and Gallego) have 5 or more vowels in tonic position, while in atonic position and/or in the desinential vowel inventory, they have fewer vowels. I assume that the dialects with fewer vowels in atonic position than in tonic position have a process of reduction which applies to vowels in atonic position, but not to desinential vowels.\(^3\)

Recalling chapter 2, dialects with 5-vowel inventories have the phonological representations abbreviated as /I,E,A,O,U/, while dialects with 7-vowel inventories have the representations abbreviated as /I,E,È,A,Ò,O,U/. In dialects with reduction to five vowels, the reduced vowels have the representations /I,E,A,O,U/; in dialects with reduction to three vowels, the reduced vowels have the representations /E,A,O/ (cf.

---

2 I have included under the rubric of ‘Iberian Spanish dialects’ the dialect of Mirandese, which is spoken along the Spain-Portugal border, and which is also considered a dialect of Portuguese; also included is Gallego, which is often considered to be a separate Iberian language; the other dialects listed are considered to be dialects of Spanish.

3 While there is evidence from alternations for reduction in atonic position, there is no evidence from alternations for reduction in the desinential inventory of these dialects.
chapter 5, §5.4 for discussion of the relationship between /I,E,A,O,U/ and reduced /E,A,O/).

Finally, desinential 3-vowel inventories have the representations /E,A,O/, desinential 4-vowel inventories have the representations /E,A,O,U/ or /I,E,A,O/, and desinential 5-vowel inventories have the representations /I,E,A,O,U/.

4.3.1.2. Variation for height and place

I assume a basic distinction between variation for height and variation for place in this chapter. For discussion of the distinction between height and place features in vowels, refer to chapter 2, §2.2.1. Anticipating later discussion somewhat, I interpret vowel symbols as follows:

(2) Variation for height:

a. high [i] vs. mid [e]
b. close high [iː] vs. high [i]
b. close mid [ɔ] vs. mid [ə]

Variation for height is illustrated in (2). Essentially, any representation which can be characterized as ‘high’, ‘mid’, ‘low’, ‘higher’, ‘lower’, ‘close’, or ‘open’ shows variation for height. On the other hand, I assume that any other type of variation is variation for place:

(3) Variation for place:

a. [i] vs. centralized [i]
b. [e] vs. centralized [ə]
c. [a] vs. lax or centralized [æ]
d. [o] vs. centralized [ɔ]
e. [u] vs. centralized [u]

As shown in (3), variation for place typically involves centralization, or movement away from the periphery of the vowel space. In contrast, variation for height involves raising or lowering. For further discussion of the two phonetic dimensions assumed here, refer to Lass (1984).
4.3.1.3. Height variation in Iberian Spanish dialects

Examples (4) - (8) illustrates the patterning of vowels in many Iberian Spanish dialects. The data for each dialect is divided into vowels occurring in a) tonic or main-word-stress position and b) atonic position, (meaning non-main-word-stress and non-final).

(4) Height variability in dialects without reduction in atonic position:

\[
\begin{array}{ccc}
\text{Dialect} & \text{Tonic position} & \text{Atonic position} \\
\text{Castilian; Central} & \text{i} & \text{u} \\
\text{Aragonese, Central,} & \text{e} & \text{o} \\
\text{Eastern, and Western} & \text{a} & \text{a} \\
\text{Asturian, Montañese} & \text{i} & \text{u} \\
\text{(Tudanca, Pasiego)} & \text{e} & \text{o} \\
\end{array}
\]

As shown in (4), in dialects without reduction the realization of vowels in atonic position is essentially identical to that of vowels in tonic position. For example, in Castilian, atonic vowels are considered to be much less variable than unstressed vowels in other languages (cf. García de Diego 1946, Navarro Tomás 1926, Zamora Vicente 1960). In Central Aragonese, atonic vowels are generally pronounced like those of Castilian, i.e. with little variation (Badía Margarit 1950: 82-3). This pattern apparently holds for the remaining dialects in (4) as well; in the Montañese dialects, there is little if any variation for height in atonic position (however, there is variation for place, which is discussed in §4.4).

The patterning of atonic vowels in the dialects in (4) contrasts with the patterning of atonic vowels in dialects with reduction, illustrated in (5):

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4 See §4.3.2, example (10) for discussion of Andaluzian Spanish and of 5-vowel dialects of Catalan, which display more variability for height than do the dialects illustrated in (4).

5 In one specific context, atonic mid vowels in the dialect in question (Bielsa) tend to close before nasals; and /E/ also tends to close before [§] (Badía Margarit 1950:83).
Height variability in dialects with reduction in atonic position:

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Tonic position</th>
<th>Atonic position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallego</td>
<td>i e e a</td>
<td>i e a</td>
</tr>
<tr>
<td>Mirandese</td>
<td>i (j)e e a</td>
<td>i e a</td>
</tr>
<tr>
<td>Aragonese (Eastern)</td>
<td>i e a</td>
<td>i-e o-u</td>
</tr>
<tr>
<td>Western Asturias</td>
<td>i e a</td>
<td>(i) a/e u/o/ a/e</td>
</tr>
</tbody>
</table>

The dialects with reduction in atonic position fall into two types, namely dialects with 7-vowel inventories (5.a,b) and dialects with 5-vowel inventories (5.c,d). In the former, reduction neutralizes the contrast between lower-mid and higher-mid vowels—for example, in Gallego and in Mirandese, the lower mid vowels /e, o/ neutralize with the higher mid vowels /e, o/ (Veiga Arias 1979: 73, Leite de Vasconcellos 1900: 173-200). The reduced vowel in 7-vowel dialects is always realized as a higher-mid vowel (i.e. as /e, o/). The explanation for this invariance is provided in chapter 5, §5.2.3.

On the other hand, in 5-vowel dialects with reduction, the reduced, non-low vowel varies freely within the non-low height range. For example, in Eastern Aragonese (5.c), the non-low atonic vowel /E/ varies between high [i] and mid [e], while non-low, back, atonic /O/ varies between high [u] and mid [o] (Mott 1990: 31).

---

6 Mott (1990:31) also provides examples where /E/ is additionally realized as [a]. Such examples are parallel to free variation phenomena in Pasiego: In Pasiego, the vowel /E/ takes on any height specification in initial position preceding /n/ or /s/, as argued by McCarthy (1984) and Spencer (1986). In the Eastern Aragonese example as well, /E/ freely varies for height when it occurs in initial position, followed by /n/ or /s/. See the discussion in chapter 5, §5.4.2 of Pasiego.
In Western Asturian (5.d) (García Arias 1988:45), the reduced vowel inventory is essentially [E,A,O].  (However, atonic [i] and [u] occur in post-tonic position—i.e. in between the main stress vowel and the final desinence—in some words and for this reason, they occur in parentheses in (5.d)).  As shown in (5.d), Western Asturian vowels vary for both height and place; the non-low front vowel varies between open high [i] and mid [e] for height, and between front [i, e] and central [ɔ, ɔ] for place; the non-low back vowel varies between open high [u] and mid [o] for height.

In summary, the reduced vowels in the dialects in (5.c,d) generally display greater variation for height.  On the other hand, this is not the case of the reduced vowels in the dialects of (5.a,b).  I explain the less variable patterning of the latter dialects in chapter 5, §5.2.3.  For the purposes of this discussion, however, it is the difference in patterning between dialects with reduction (5.c,d) and dialects without reduction (4) which is significant.  Mid vowels in the former, especially in atonic position, are much more variable for height than mid vowels in the latter.

Similar patterns of variation for height are revealed by an examination of the desinential inventories of Iberian Spanish dialects, summarized in (6) - (8).  (As in Standard Spanish, the desinences /I/ and /U/ are marginal.)

(6)  Lack of height variability in dialects with 5 desinential vowels:

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Desinential vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Asturian (Central, Eastern)</td>
<td>ɪ ɔ ɜ ʊ a</td>
</tr>
<tr>
<td>b. Castilian</td>
<td>ɪ ɔ ɜ ʊ a</td>
</tr>
<tr>
<td>c. Aragonese (Central)</td>
<td>i e o a</td>
</tr>
</tbody>
</table>

Example (6) illustrates dialects with five desinential vowels (including the marginal ones).  In these dialects, the desinences do not vary for height. In Central and Eastern
Asturias (6.a) and Castilian (6.b), the desinential vowels vary in quality (i.e. they vary for place), but do not differ in number, from the tonic vowels (García Arias 1988:45; Atlás lingüístico de la península ibérica (ALPI)). The quality of the desinential vowels can be characterized by variation for place. Desinences are ‘placeless’ or ‘colourless’ in the sense that they lack many place features whereas tonic vowels have place features (see Chapter 5, §5.3 for further discussion). I use the term place-impoverished to denote this concept in this chapter. In Central Aragonese (6.c), final vowel variation is not recorded in the source consulted (Mott 1990), but variation similar to that of Central and Eastern Asturian and Castilian is recorded in the ALPI. In summary, the type of variation in dialects with five desinential vowels may be described as variation for place rather than for height.

On the other hand, variability for height and place occurs in dialects with fewer than five desinential vowels, as illustrated in (7) and (8).

(7) Height variability in dialects with 4 desinential vowels:

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Desinential vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Montañese</td>
<td>ɪ̃/ɔ̃, ɿ̃</td>
</tr>
<tr>
<td>Tudanca</td>
<td>ʊ̃, ɔ̃</td>
</tr>
<tr>
<td>b. Montañese</td>
<td>ɪ̃/ɔ̃, ɿ̃</td>
</tr>
<tr>
<td>Pasiego</td>
<td>ʊ̃, ɔ̃</td>
</tr>
</tbody>
</table>

7 Unlike Pasiego final [ɿ], Tudanca final [a] is not palatal.
8 In Pasiego, the proclitics [mo] and [to] can also be realized as [mi] and [ti] (Penny 1969).
9 Penny reports that /A/ is usually realized as [ɿ] word-finally, but that when the preceding syllable is a stressed [ɪ] in verb forms, then final /A/ is realized as [ɔ]: I assume that the latter variant results from a phonetic process of interpolation (Cohn 1993) which causes the target vowel [ɿ] to be realized as slightly higher [ɔ] because the preceding vowel is [ɪ]. For discussion of interpolation, and for the distinction between interpolation and enhancement, the process introduced in this chapter, see Wu (1994).
The Montañese dialects of Santander shown in (7) have four desinential vowels. In both the Tudanca and Pasiego dialects, the non-low front vowel varies for height between high [i], close [e] and mid [ə], as well as varying for place between front [i] and central [ə]. In contrast, the mid back vowel displays somewhat less variation for height; the mid back vowel in Tudanca is realized as [o] (7.a) (Penny 1978; this is also the case in Pasiego, but more often the mid back vowel of Pasiego is realized as the higher variant [u]; c.f. Penny 1969: 51). In summary, the non-low front vowel varies between mid and high, while the mid back vowel is normally realized as a close mid vowel or as an open high vowel in Montañese dialects.

Finally, as shown in (8), in dialects with three desinential vowels, the non-low desinences potentially vary greatly for height:

(8) Height variability in dialects with 3 desinential vowels:

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Desinential vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Gallego</td>
<td>i-ë</td>
</tr>
<tr>
<td></td>
<td>a-ë</td>
</tr>
<tr>
<td></td>
<td>u-ø</td>
</tr>
<tr>
<td>b. Asturian (Western)</td>
<td>i-ë</td>
</tr>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td></td>
<td>u-ø</td>
</tr>
<tr>
<td>c. Leonese</td>
<td>i/ë</td>
</tr>
<tr>
<td></td>
<td>a/ë</td>
</tr>
<tr>
<td></td>
<td>u/o</td>
</tr>
<tr>
<td>d. Mirandese</td>
<td>ë/ö/å</td>
</tr>
<tr>
<td></td>
<td>a</td>
</tr>
</tbody>
</table>

This is the case in Gallego (8.a) and in Western Asturian (8.b), where the non-low vowels vary anywhere within the non-low height range: In Gallego, the non-low vowels have a number of realizations, ranging from high [i] to close mid [ë] in the desinential inventory.

---

10 Penny (1969) lists two phonemes for the Pasiego front vowel, namely /I/ and /E/, which have the realizations [i/ã,ə]. Penny’s reasons for positing two separate phonemes are certain historic residue which leads him to believe in the existence of an underlying /I/. I argue in chapter 2, §2.5.3.2 that Pasiego has only one front vowel phoneme, /E/ in the desinential inventory.
case of the non-low front vowel (/E/) and from high [u] to close mid [o] in the case of the non-low back vowel (/O/) (Fernández Gonzales 1981: 44). In Western Asturias, the final vowels /E/ and /O/ "...display a large field of dispersion, which ranges from close realizations of the type [close high] [i] to open [ones] of the type [open mid] [e], and also from [close high] [u] to [open mid] [o]; [the large field of dispersion is] motivated by local and particular habits, phonic environment, etc." (García Arias 1988:45).

In Leonese (8.c) and Mirandese (8.d), some of the non-low desinences display a narrower range of variation for height than do the non-low desinences of Gallego and Western Asturian. In Leonese desinential /E/ "...almost always varies between a very close e and an open i." (Rodríguez-Castellano 1954: 106); final /O/ "...tends to close greatly, to the extreme of becoming an open u or a doubly-close o." (Rodríguez-Castellano 1954: 111). In Mirandese, the non-low back vowel is invariant, but the non-low front vowel varies for height between close mid [ɔ], mid [œ] and open mid [a] (Leite de Vasconcellos 1900: 178). The patterning of invariant vowels such as Mirandese [u] and of less variant vowels such as Leonese [u/ø] is discussed in chapter 5, §5.2.3; essentially, I argue that while such vowels are potentially variable, other language-particular processes intervene to limit the variability of these vowels. On the other hand, the other non-low front vowels discussed above display a relatively wide range of variation for height.

The variation for height in Iberian Spanish dialects is summarized in (9), where the size of the enclosing square illustrates the vowel space occupied by the phoneme in question. Table (9) is organized according to the number of vowels in a given position. The term ‘3-vowel’ refers to atonic position in (5.c,d) and final desinences in (8). The term ‘4-vowel’ refers to the desinential inventories in (7). The term ‘5-vowel’ refers to the inventories illustrated in (4) and (6).
Phonetic variation of /E/ and /O/

As summarized in (9), in 3-vowel positions (9.a), /E/ and /O/ tend to vary greatly for height, potentially occupying the entire non-low range; in asymmetrical 4-vowel positions (9.b), the mid vowel that has no high counterpart varies more greatly than the mid vowel with a high counterpart—this is especially evident from the patterning of (more variable) /E/ vs. (less variable) /O/ in Montañese dialects; finally, in 5-vowel positions (9.c), the mid vowels /E/ and /O/ vary little for height.

Examples (9.b,c) also illustrate that /I,U,A/ tend to not vary greatly for height. (However, as in the Gallego and Leonese examples (4.a,c), the vowel /A/, for example, may vary for place between [a] and lax or centralized [ê].) Example (9) graphically illustrates that /I,U,A/ are less variable for height than /E,O/.

The above observations demonstrate that the height of /E/ and /O/ is constrained only by the presence of phonologically high vowels and that /E/ and /O/ are more variable for height than /I,U,A/. Conclusions drawn from this cross-dialectal data are presented in §4.3.3. First, however, I present below another phonetic argument from within-dialect data which demonstrates that /E,O/ are more variable for height than /I,U,A/.

4.3.2. /E,O/ are more variable than /I,A,U/ 

In Spanish and Catalan dialects which have a five or seven vowel inventory, /E,O/ display more variation for height than /I,U,A/. The data illustrating this observation come from Andaluzian, a sub-dialect of Castilian, (10.a), and from a
range of Catalan dialects (10.b,c). Table (10) focusses on variation for height among the non-low vowels; (the low vowel /A/ varies for place; this variation is included for completeness in several footnotes).

(10) Mid vowels vs. peripheral vowels in 5-vowel systems

<table>
<thead>
<tr>
<th>Dialect(s)</th>
<th>Tonic position</th>
<th>Phonological inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Andaluzian</td>
<td>i/i</td>
<td>u/u</td>
</tr>
<tr>
<td></td>
<td>e/e/e/e</td>
<td>[high,labial]</td>
</tr>
<tr>
<td></td>
<td>o/o/o/o/o/o/o</td>
<td>[Ø,labial]</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>[low,Ø]</td>
</tr>
<tr>
<td>b. Catalan</td>
<td>i/e/e/e</td>
<td>u/u</td>
</tr>
<tr>
<td></td>
<td>e/e/e/e</td>
<td>[high,labial]</td>
</tr>
<tr>
<td></td>
<td>o/o/o/o/o/o/o</td>
<td>[Ø,labial]</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>[low,Ø]</td>
</tr>
<tr>
<td>c. Catalan</td>
<td>i/e/e/e</td>
<td>u/u</td>
</tr>
<tr>
<td></td>
<td>e/e/e/e</td>
<td>[high,labial]</td>
</tr>
<tr>
<td></td>
<td>o/o/o/o/o/o/o</td>
<td>[Ø,labial]</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>[low,Ø]</td>
</tr>
</tbody>
</table>

The data from Andaluzian (10.a) and from those Catalan dialects which have five tonic vowels (10.b)\(^{13}\) show that /E,O/ vary more for height than do /I,U,A/. In Andaluzian (10.a), the tonic mid vowels range from close mid [e, o] to very open mid [e, o], depending on whether or not a particular vowel harmony process takes place;\(^{14}\) however, the tonic vowels /I,U,A/ are described as much less variant and much less

---

\(^{11}\) /A/ also varies for place in Andaluzian, becoming more palatal (a) in plural words.

\(^{12}\) /U/ also varies for place, sometimes being realized as centralized [u].

\(^{13}\) The Catalan dialects with only 5 tonic vowels include Rossellonese, and dialects in some intermediate zones between the Catalan and Castilian areas (Recasens I Vives 1991: 59)

\(^{14}\) In Andaluzian, vowels in plural words generally lax to [i, e, a, o, u], while vowels in singular words close to [i, e, a, o, u]. The process responsible for these alternations has been analysed as laxing. Laxing is assumed to be triggered by various consonants, but especially by the plural desinence /-s/. /-s/ lenites to [h] or to [Ø] in various contexts, especially in word-final position, and it is assumed that this lenition process is what triggers laxing. See Alonzo et al. (1950), Rodríguez-Castellano and Palacio (1948) for data, and Zubizarreta (1979) for an analysis within a generative framework.
affected by the same harmony rule (Alonzo et al. 1950: 213-16); in particular, /I/ is realized as high [i] or open high [j], while /U/ is realized as high [u] or as open high [u].

In the Catalan dialects which have five tonic vowels (10.b), the realization of the mid vowels /E/ and /O/ ranges from higher mid [e] to lower mid [E], and from close mid [o] to open mid [O]; in comparison, the tonic vowels /I,U/ vary little for height: /I/ is realized as open high [i], and /U/ is realized as high [u] or close high [u]. /A/ does not vary at all for height, but varies greatly in the place dimension.\textsuperscript{15}

In contrast, in the Catalan dialects which have seven tonic vowels (10.c), the realization of the higher mid front vowel /E/ is variable, but more circumscribed than its realization in 5-vowel dialects of Catalan: phonetic realizations of /E/ cannot include lower-mid [E] variants, and phonetic realizations of the lower mid front vowel /È/ cannot include higher-mid [e] variants. /E/ ranges from very close mid [e] to mid [e], while /È/ ranges from close lower mid [æ] to open lower mid [É]. Parallel observations can be made for the mid back vowels.

The Catalan and Andaluzian data show that /E,O/ display a greater range of variability for height when there are only two vowel heights in the front or back region (10.a,b) than when there are three vowel heights in the front or back region (10.c). Taken together, the Catalan and Andaluzian data show that /E,O/ potentially vary for height, whereas /I,A,U/ do not, and that the range of height realizations for /E,O/ is constrained only by other height contrasts within the same vowel region. (Recall from example (4) that in many dialects of Spanish, /E,O/ do not vary for height. This pattern of lack of variation is explained in chapter 5, §5.2.3.

\textsuperscript{15} Across Catalan dialects, /A/ shows wide variation for place, ranging from (ε)/æ/,æ,æ/ within the low range.
4.3.3. Conclusions

The data presented in §4.3.1 and §4.3.2 demonstrate that /E,O/ pattern differently from /I,A,U/ with respect to phonetic realization. While /I,A,U/ do not vary greatly for height, /E,O/ appear to be free to do so. In addition, the potential range of realizations for height of /E,O/ is constrained only by the number of height contrasts in the relevant (front/back) domain.

Recall from chapter 2 that I proposed the following representations for aperture in 2-, 3-, and 4-height inventories:

(11) The aperture node and height contrasts:

a. 2-height inventories: /E/ /A/  
    Ap Ap  
    [low]

b. 3-height inventories: /I/ /E/ /A/  
    [high] [low]

c. 4-height inventories: /I/ /E/ /È/ /A/  
    [high] [low] [low]

As illustrated in (11), /E/ has no height features in any of the above inventories, while /I/, /È/ and /A/ do have height features. (In addition, /È/ and /A/ differ by place; /È/ is [coronal] or front, while /A/ is central; see chapter 5 for further discussion.) Given these representations, and based on the assumptions discussed in §4.2, the vowels /È/, /Ò/ and /A/ are restricted to the low range, while /I/ and /U/ are restricted to the high range. On the other hand, the vowels /E/ and /O/, without height features, can vary within a negatively-defined range. Thus the representations directly derive the
difference in patterning. Vowels which are specified for height are constrained to a narrow range; vowels which are unspecified for height constitute a negatively-defined class (eg. non-high, non-low). Because they are negatively-defined, they display greater variation for height within the limits defined by the other vowels in the inventory.

I demonstrated in this section that the type of variation predicted by the contrastively-defined vowel space model is well attested in Iberian Peninsular dialects and languages: In 2-height inventories, /E/ and /O/ can vary anywhere within the non-low range, as illustrated by a comparison of the patterning in examples (4) - (8). On the other hand, in 3-height inventories, /E/ and /O/ are constrained to vary within the non-low, non-high range, as illustrated by the examples in (4) - (8), and in (10,a,b). Finally, as illustrated in (10), /E/ and /O/ are constrained to vary within the higher mid vowel range when there is a lower-mid vowel contrast within the system.

In summary, the phonetic evidence from the patterns of phonetic realization of /E,O/ is consistent with the hypothesis that /E, O/ have no height features underlyingly. The difference in patterning between /E, O/ and /I,A,U/ essentially derives from lack of specification for height of /E,O/ versus the specification for height of /I,A,U/.

4.4. Evidence for underspecification from variability of /E/ and /O/ in Pasiego

Recall from §4.1 that the main goal of this chapter is to show that the phonetic realization of vowels is predictable or rule-driven. To accomplish this goal, I argued in the preceding section that the phonetic realization of mid vowels is circumscribed by the number and types of contrasts in a given inventory. In this section, I provide evidence from Pasiego for a different manner of patterning in the phonetic realization of mid vowels. I argue that the phonetic realization of /E/ and /O/ for place is
context-sensitive. Some examples of context-sensitive phonetic patterning were also provided in §4.3; I discuss these examples as a means of introducing the topic.

4.4.1. Context-sensitivity; some introductory examples

Recall that in dialects of Spanish with reduction (5), mid vowels have two patterns of phonetic realization. They are characterized by a more restricted vowel space in main stress or tonic position and a less restricted vowel space in non-main-stress or atonic position. This example shows that the realization for height of mid vowels is predictable from metrical contexts such as main- vs. non-main stress position.

Yet another type of patterned variation from the examples in §4.3 is variation for place, which is exhibited by dialects which have five vowels in all positions (cf. (1), (34)). In such dialects, the vowels in tonic and atonic position are realized as [i,e,a,o,u] (1), while the vowels in final desinences are realized as [i, ø, ø, ø, ø] (34). I assumed in §4.3.1.2 that such variation was variation for place, i.e. that the set of vowels [i,e,a,o,u] have some place feature or features that the set of vowels [i, ø, ø, ø, ø] lack. See chapter 5, §5.3.2 for further justification. In these examples, then, variable phonetic realization for place is also context-sensitive, in that a special type of reduction in the number of place features occurs only in word-final position.

The above examples illustrate that phonetic realization for height and also phonetic realization for place are context-sensitive or predictable.

4.4.2. Pasiego place variation; preliminary considerations

In the following sections, I further develop the idea that phonetic variation for place is predictable. I discuss in particular the patterns of variation for place of Pasiego mid vowels. The place variation in Pasiego consists of variation between [e] and [ɛ], as well as variation between [o] and [ɔ]. I discuss why I consider the
variation between [o] and [o] to be variation for place rather than variation for height below.

The assumption that the variation between [e] and [e] is variation for place is consistent with previous assumptions made in §4.3.1.2. However, in §4.3.1.2, I assumed that in general, variation such as that between [o] and [o] is variation for height, rather than place. In contradiction to this assumption, I argue here that variation between [o] and [o] in Pasiego is variation for place. I argue that this is the case for several reasons. First, the variation between [o] and [o] occurs in the same environments as the variation between [e] and [e]. This argues for a parallel treatment of both phenomena. Second, the variation between [o] and [o] occurs in word-final position (i.e. [o] occurs in word-final position in Pasiego). In word-final position, place-impoverished variants are the rule in Iberian Spanish dialects—for example, in the ALPI, word-final place-impoverished variants are ubiquitous. The area in which Pasiego is spoken is no exception—in this area, as in the rest of Spain, the place-impoverished variant [o], a centralized, back rounded mid vowel, occurs as the word-final variant of /O/. Given the above considerations, I henceforth assume that in Pasiego, variation between [o] and [o], and also variation between [e] and [e] is variation for place (see chapter 5, §5.3 for further discussion). In the following sections, I focus on the patterns of place variation for mid vowels in Pasiego.

4.4.3. Place variation in Pasiego

Variation for place in Pasiego occurs in both word-final and word-medial positions. Word-finally, the place-impoverished variants [e, o] occur as the realization of the desinences /E/ and /O/. (Word-finally after a voiceless stop, the desinences /E/ and /O/ are also realized as voiceless; an example of devoicing is shown in (12.e)).
Phonetic variation of /E/ and /O/  

(12) The word-final realization of /E/ and /O/ (Penny 1969: 51):

/E/
- a. gránd[õ] ‘large’
- b. réd[õ] ‘net’
- c. gránd[õ]s ‘large pl.’
- d. tárd[õ]s ‘afternoons’

/O/
- e. ést[u], ést[ø] ‘this, neuter singular’
- f. gwén[u], gwén[ø] ‘good, neuter singular’
- g. dixjénd[ø] ‘saying (present participle)’

As shown in (12), the word-final realization of /E/ varies between a greatly raised, close schwa [õ] and a somewhat raised, close schwa [õ], while the word-final realization of /O/ varies between a lowered [u] and a raised [ø] ([u] is the most common variant (Penny 1969: 51)). Example (13) illustrates the place of these phonetic realizations in the vowel triangle.

(13) Pasiego partial phonetic inventory:

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Lowered high</th>
<th>Extremely raised mid</th>
<th>Raised mid</th>
<th>Mid</th>
</tr>
</thead>
<tbody>
<tr>
<td>[õ]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ø]</td>
<td></td>
<td></td>
<td></td>
<td>[ø]</td>
<td></td>
</tr>
<tr>
<td>[u]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[ø]</td>
</tr>
</tbody>
</table>

Example (13) illustrates various phonetic degrees of height between the mid and high. [ø] varies between a mid vowel and an extremely raised, somewhat fronted mid vowel that nears English [u] in its pronunciation. (I use [ø] to represent this phone for the remainder of this thesis.) [u] is a lowered high vowel, essentially identical in height to [ø]. Finally, [ø] is a raised mid vowel.

Place-impoverished variants also occur in word-medial position, although this has not been discussed in the literature on Pasiego. I describe the location of the place-impoverished variants in word-medial position in the remaining sections, arguing that the locations are predictable.
4.4.3.1. **Loci of place-impoverished variants**

The place-impoverished variants [ə] and [o] can occur in the following pretonic environments: 1) in the verbal prefixes /rE- / and /dEs- / (only [ə] occurs in this environment); 2) in stem vowels when the latter are not stressed (both [ə] and [o] occur in this environment), and 3) in the penult of antepenultimtely-stressed words (both [ə] and [o] occur in this environment). I provide examples of each environment in the following sections.

4.4.3.2. **Verbal prefixes**

The verbal prefixes /dEs- / and /rE- / can be realized with the vowel [ə], as shown in (14).

(14) Verbal prefixes:

<table>
<thead>
<tr>
<th>Phonetic form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>d[ə]zmër</td>
<td>to peel (eg. bark from a branch)</td>
</tr>
<tr>
<td>b[ə]spusjón</td>
<td>eagerness to work</td>
</tr>
<tr>
<td>c[ə]strikaš</td>
<td>to stretch (oneself)</td>
</tr>
<tr>
<td>d[rə]fágú</td>
<td>underskirt, slip</td>
</tr>
<tr>
<td>e[rə]linčár</td>
<td>to whinny or neigh</td>
</tr>
<tr>
<td>f[rə]linču</td>
<td>pasture weed, about 30-40 cm. high</td>
</tr>
<tr>
<td>g[rə]mangu</td>
<td>daring (adj.)</td>
</tr>
<tr>
<td>h[rə]mőlo</td>
<td>embers</td>
</tr>
<tr>
<td>i[rə]mweļo</td>
<td>embers (alternate form)</td>
</tr>
<tr>
<td>j[rə]spaldu</td>
<td>headrest</td>
</tr>
<tr>
<td>k[rə]spixoñ</td>
<td>animal that hops around happily(^{16})</td>
</tr>
<tr>
<td>l[rə]subáð</td>
<td>to clean by scrubbing(^{17})</td>
</tr>
<tr>
<td>m[rə]swišu</td>
<td>happy</td>
</tr>
<tr>
<td>n[rə]šimu</td>
<td>bunch (of grapes)</td>
</tr>
<tr>
<td>o[rə]bultuśu</td>
<td>rebellious</td>
</tr>
<tr>
<td>p[rə]kitiku</td>
<td>rickety</td>
</tr>
<tr>
<td>q[rə]piluxoñ</td>
<td>to reap badly, leaving uncut tufts of hay(^{18})</td>
</tr>
</tbody>
</table>

\(^{16}\) Cf. [respixár] to jump for joy (said of an animal).
\(^{17}\) Another verb, [sobár], has the same meaning.
\(^{18}\) Cf. [dexár ḙœpiluxoñās / piluxoñās]; [piluxoñās] bunched up wool on the underside of an ewe.
Phonetic variation of /E/ and /O/ (14.a-c) provide examples of [ə] in the prefix /dEs-/ while (14.d-q) provide examples of [ə] in the prefix /rE-/. The examples in (14.b,c) have undergone deletion of their initial /d/, a phenomenon which frequently occurs in Pasiego words (Penny 1969: 56). In this type of d-deletion example, /dEs-/ can surface as [əs-], [es-] or [is-].

The examples in (14) demonstrate that the appearance of [ə] is not related to the height of the stem vowel, and hence, not explained by the generalizations about raising discussed in §3.2.3 of chapter 3. For example, [ə] occurs in (14.e), which has a low stressed vowel, and also in (14.f), which has a high stressed vowel. Thus, the appearance of [ə] is not related to the height of the stressed vowel.

Example (15) illustrates furthermore that [ə] varies freely with [e] (15.a-f) or [i] (15.g-j) in the verbal prefixes.

(15) Free variation between [e] and [ə]:

<table>
<thead>
<tr>
<th>Phonetic form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a  r[ə]mōə</td>
<td>embers</td>
</tr>
<tr>
<td>b  r[e]mōə</td>
<td>embers</td>
</tr>
<tr>
<td>c  r[ə]mweə</td>
<td>embers (alternate form)</td>
</tr>
<tr>
<td>d  r[e]mweə</td>
<td>embers (alternate form)</td>
</tr>
<tr>
<td>e  r[ə]spaldu</td>
<td>headrest</td>
</tr>
<tr>
<td>f  r[e]spáda</td>
<td>back (of a lean-to)</td>
</tr>
<tr>
<td>g  r[ə]bustu</td>
<td>robust</td>
</tr>
<tr>
<td>h  r[i]bústu</td>
<td>robust</td>
</tr>
<tr>
<td>i  r[ə]bultu</td>
<td>rebellious</td>
</tr>
<tr>
<td>j  r[i]bultu</td>
<td>rebellious</td>
</tr>
</tbody>
</table>

As shown in (15.a,b), for example, [ə] alternates with [e] in words with non-high stressed vowels. On the other hand, in (15.g,h), [ə] alternates with [i] in words with high stressed vowels. These examples show that although the regular variants—i.e. [e] in words with high main stress vowels and [i] in words with non-high main stress vowels—may occur in verbal prefixes, [ə] can freely vary with these regular variants.

### 4.4.3.3. Stems

The examples in (16) illustrate that [ə] and [o] can occur in the pretonic syllables of stems which are not stressed.
(16) Stems

<table>
<thead>
<tr>
<th>Phonetic form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a  /ərɪl</td>
<td>uncultivated ground</td>
</tr>
<tr>
<td>b  /pərdiθ</td>
<td>partridge</td>
</tr>
<tr>
<td>c  /pərin</td>
<td>puppy</td>
</tr>
<tr>
<td>d  /ljəbrin</td>
<td>baby rabbit</td>
</tr>
<tr>
<td>e  /səruxu</td>
<td>branch that has dried on the</td>
</tr>
<tr>
<td></td>
<td>tree</td>
</tr>
<tr>
<td>f  /aθəfrán</td>
<td>saffron</td>
</tr>
<tr>
<td>g  /bəb(u)</td>
<td>drink</td>
</tr>
<tr>
<td>h  /bəraku</td>
<td>boar</td>
</tr>
<tr>
<td>i  /bəri(d)a</td>
<td>shriek, scream</td>
</tr>
<tr>
<td>j  /kləaron</td>
<td>chalk</td>
</tr>
<tr>
<td>k  /pərúcəu</td>
<td>puppy</td>
</tr>
<tr>
<td>l  /rəbústu</td>
<td>robust</td>
</tr>
<tr>
<td>m  /rəgústu</td>
<td>robust (alternate form)</td>
</tr>
<tr>
<td>n  /ljəbruku</td>
<td>baby rabbit</td>
</tr>
<tr>
<td>o  /mjədúsu</td>
<td>fearful</td>
</tr>
<tr>
<td>p  /sɛgləmɛntə</td>
<td>surely</td>
</tr>
<tr>
<td>q  /antrəkasa</td>
<td>hope-chest</td>
</tr>
<tr>
<td>r  /bərgwənθusu</td>
<td>shameful</td>
</tr>
<tr>
<td>s  /puŋətəθu</td>
<td>a punch, blow</td>
</tr>
<tr>
<td>t  /brəmeru</td>
<td>said of a practical joker</td>
</tr>
<tr>
<td>u  /mayʊrəsɡu</td>
<td>adj. describing person of</td>
</tr>
<tr>
<td></td>
<td>great age</td>
</tr>
<tr>
<td>v  /mayʊrəlɡu</td>
<td>adj. describing person of</td>
</tr>
<tr>
<td></td>
<td>great age</td>
</tr>
<tr>
<td>w  /alʊmbiyər</td>
<td>to stoke</td>
</tr>
</tbody>
</table>

For example, in (16.c), [ə] occurs in the initial syllable of the stem that is underlyingly /pEʳ-/ . Example (16.c) consists of the stem /pEʳ-/ and the diminutive suffix [ɨn]. Evidence that the vowel of the stem is underlyingly /pEʳ-/ comes from comparable forms such as [pərəs] dogs. Recall from chapter 3, §3.2.3 that a vowel which is realized as [e] before the final non-high desinence [o] derives from underlying /E/.

Example (16.nn), on the other hand, illustrates that [ʊ] also occurs in stem vowels in pretonic position, instantiating the phoneme /O/.
The pairs of words in (17) further illustrate that in stems, [ə] and [o] vary freely with their regular counterparts [e~i] and [o].

(17) Free variation between [ə~i~e], [o~o] in stems:

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a θ[ə]r̥i̯l</td>
<td>uncultivated ground</td>
</tr>
<tr>
<td>θ[i]r̥i̯l</td>
<td>uncultivated ground</td>
</tr>
<tr>
<td>b pu:ñ[e]t̥á̯u</td>
<td>punch, blow</td>
</tr>
<tr>
<td>pu:ñ[ə]t̥á̯u</td>
<td>punch, blow</td>
</tr>
<tr>
<td>c b[ə]rgw[e]nθú:su</td>
<td>shameful</td>
</tr>
<tr>
<td>b[e]rgwenθa</td>
<td>shame</td>
</tr>
<tr>
<td>d may[o]r̥al</td>
<td>gloss not provided in the source</td>
</tr>
<tr>
<td>may[o]ralgu</td>
<td>adj. describing a person of great age</td>
</tr>
</tbody>
</table>

As shown in (17.a) [ə] can occur instead of the regular raised variant [i] in stems. On the other hand, example (17.b) shows that [ə] can occur instead of the regular non-raised variant [e] in stems. Finally, example (17.d) shows that [o] can occur instead of the regular non-raised variant [o] in stems.

In summary, the above examples illustrate that in stems, as in the verbal prefixes, /E/ can be realized by [ə], rather than by the regular variants [i,e]. On the other hand, the phoneme /O/ can be realized as [o], rather than by the regular variant [o].

4.4.3.4. Penults of antepenultimately-stressed words

Some final examples of word-medial [ə] and [o] are shown in (18), which lists the antepenultimately-stressed words which contain these variants.

(18) Antepenults:

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a treb[ə]də</td>
<td>tripod</td>
</tr>
<tr>
<td>b θesp[ə]də</td>
<td>sod</td>
</tr>
<tr>
<td>c bjesp[o]ra</td>
<td>vespers</td>
</tr>
</tbody>
</table>

As shown in (18), [ə] and [o] can occur in the penults of antepenultimately stressed words instantiating the phonemes /E/ and /O/.
4.4.3.5. Summary

In the above sections, I presented a comprehensive list of examples of [ə] and [o] occurring in non-final position. I also pointed out that [ə] and [o] regularly realize final /E/, /O/ in §4.4.2. The above observations illustrate several important points. First, [ə] and [o] never occur in main-stress position, but do appear in pretonic and final position. Recalling the analysis of stress in chapter 3, §3.2.2, [ə] and [o] then occur exclusively in weak metrical position. On the other hand, the regular variants of /E, O/, namely non-raised [e,o] or raised [i,u] have a less restricted distribution than [ə] and [o], occurring in both weak and strong metrical positions. I conclude from these observations that the phonetic realizations of /E,O/ occur in well-defined metrical contexts. This conclusion in turn has important consequences for the phonetic interpretation of underspecified vowels. First, it demonstrates that there are patterns to the phonetic realization of /E/ and /O/. The patterning is recapitulated in (34).

(34) Vowels in metrically strong and weak position in Pasiego:

a. vowels in metrically strong position  
   /E, O/ are predictably interpreted as [e,o] in strong metrical position (34.a), and they are optionally also interpreted as [ə, o] in metrically weak position (34.b). In other words, the phonemes /E/ and /O/ have several phonetic realizations such as [e,ə] and [o, o], but the realization of these phonemes is not random.

   Given that limited phonetic variation of the type illustrated by the Pasiego data is predictable, it is possible to develop a rule of phonetic interpretation to
describe this variation, and to make predictions about the phonetic realization of phonemes based on the rule of phonetic interpretation. I discuss the implications of patterned phonetic variability in the following section.

4.5. Conclusions

In this chapter, I have discussed two types of predictable phonetic patterning. In §4.3, I discussed phonetic variation for height displayed by /E, O/; I demonstrated that this variation is constrained by the number and types of contrasts in a given vowel inventory, in that it is more likely to occur in underspecified vowels such as /E, O/ than in vowels such as /I, U, A/ which are specified for height. In §4.4, on the other hand, I demonstrated that Pasiego /E, O/ pattern for place in a metrically predictable manner.

In summary, I draw the following conclusions, which will be instrumental to the development of the model of phonetic interpretation which follows in chapter 5.

(35) Patterns of phonetic variability:

1. Phonetic variability displays non-random patterning.
2. Phonetic patterning is predictable from several factors, including:
   a. the number and types of contrasts in a given inventory or position (i.e. paradigmatic patterning);
   b. context such as metrical structure (i.e. syntagmatic patterning)
3. Phonetic variability is an inherent characteristic of underspecified segments; the more phonologically specified the segment, the less phonetically variable it is likely to be.

As summarized in (35), phonetic realization appears to be governed by the paradigmatic and syntagmatic context, i.e. by the type of inventory in which a given phoneme occurs, and by the environment (e.g. stressed or unstressed position) in which a given phoneme occurs. For example, an underspecified phoneme such as /E/ is quite variable in its phonetic realization for height (as discussed in §4.3); however, the degree of variability for height is constrained by the presence or absence of other
height contrasts. Finally, as exemplified in §4.4, the phonetic instantiation for place of /E/ is also predictable from the metrical context in which /E/ occurs. In the following chapter, I use the above observations to develop rules which unambiguously derive phonetic output from underspecified representations.
5.1 Introduction: Interpreting empty vowels

In chapters 2 - 4, I argued that phonetically high vowels may be phonologically unmarked for height. For example, we saw in Gallego and Western Asturian (Chapter 4, §4.3.1.3) that a vowel that is phonologically unmarked for height—i.e. a non-low vowel in a three-vowel inventory—can nevertheless surface as the phonetically high vowel [i]. It can, on the other hand, surface as the phonetically mid vowel [e], as in Standard Spanish. One consequence of this is that the phonological representation of a given vowel does not completely determine its phonetic representation. There is a gap between underspecified phonological representations and maximally specified phonetic representations which must be bridged. In this chapter, I explore the interface between the phonological representation and the phonetic representation, integrating the data introduced in chapters 2 and 4, and showing how the syntagmatic and paradigmatic variation discussed in those chapters can be derived within the model of phonetic enhancement (Avery and Rice 1989, Rice 1993a,b, Stevens, Keyser, and Kawasaki 1986, Stevens and Keyser 1989, Wu 1994).

This chapter proceeds as follows: In §5.2, I introduce the model of phonetic enhancement, and use the case studies from height variation discussed in chapter 4 to illustrate the characteristics of enhancement. In §5.3, I expand the model to account for enhancement for place as well as enhancement for height. In §5.4, I discuss the implications of the observations that a) reduction creates less specified representations, and that b) reduction feeds enhancement. I also analyse the variation for place and height of Pasiego /E/ in this section. In §5.5, I discuss a further characteristic of enhancement, namely that it creates permanently underspecified representations, and conclude.
5.2  A model of phonetic enhancement

In this section, I develop a model of phonetic enhancement, based on examples of enhancement for height features. I introduce and discuss the process of enhancement in §5.2.1. In §5.2.2, I outline the workings of enhancement for height in vowels. In §5.2.3, I show how the process of enhancement for height derives the variation for height in Spanish and Catalan dialects discussed in chapter 4. In §5.2.4, I discuss the relationship between phonetic enhancement and the phonology, again using examples from height variation. §5.2.5 summarizes the model of phonetic enhancement as developed in §5.2.

5.2.1.  Phonetic enhancement within Minimal Contrastive Specification

The model of phonetic enhancement developed here derives from Stevens, Keyser and Kawasaki (1986) and Stevens and Keyser (1989).

Stevens and Keyser (1989; henceforth SK) distinguish between a group of features which are more basic (SK's primary' and 'secondary' features, which operate in the phonology) and a set of enhancement features. Functionally, enhancement features serve to increase either the perceptual salience of the more basic features, or the perceptual salience of a contrast.

I adopt a reworking of Stevens and Keyser's model, developed in Avery and Rice (1989) and Rice (1993a, b). This adaptation assumes monovalent features and Modified Contrastive Specification (cf. chapter 2). I briefly review Rice's (1993a) model of enhancement by way of introduction. In Rice's model, enhancement is a phonetic process which inserts certain non-contrastive features in phonetically underspecified representations. Non-contrastive features are features which are not present underlyingly for a given class. For example, [coronal] is the unmarked feature for place of articulation, [nasal] is the unmarked feature for sonorants (Avery and
Rice 1989, Rice and Avery 1993), and [high] is the unmarked feature for vowel height.

One option for dealing with an underspecified node is to enhance. For example, given an underspecified Aperture node, one may enhance by adding the unmarked feature [high]. However, another option is to do nothing—i.e. to leave the Aperture node underspecified—and to interpret the aperture node itself. To use a parallel example, Rice exemplifies the process of enhancement with cross-linguistic data from coronal-velar alternations, arguing that in some languages, a single underlying representation can be phonetically realized as either a coronal or a velar. The velar is similar, if not identical in pronunciation to a dorsal segment, but patterns differently from a dorsal. For example, the velar can vary between [t/k] while the dorsal cannot vary, remaining [k]. The underlying representation for the variable velar segment [t/k] is a bare place node, as shown in (1.a).

(1) MCS model of Enhancement (Rice 1993a):

<table>
<thead>
<tr>
<th>a. Underlying coronal/velar</th>
<th>b. surface coronal</th>
<th>c. surface velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root [t/k]</td>
<td>Root [t]</td>
<td>Root [k]</td>
</tr>
<tr>
<td></td>
<td>Place</td>
<td>Place</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Place</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coronal</td>
</tr>
</tbody>
</table>

Under certain conditions, this segment may be enhanced by the addition of the feature [coronal], resulting in a surface coronal [t] (1.b). If enhancement fails to take place, however, the representation in question is phonetically interpreted as a neutral segment, which Rice argues to be a velar [k] (1.c). Note that (1.a) and (1.c) are identical; however, (1.c) illustrates the interpretation of a bare place node, while (1.a) gives the underlying representation.
5.2.2. *Extension of Rice’s model to enhancement of vowels*

I propose to extend Rice’s model of phonetic enhancement to vowels in the following manner; see Wu (1994) for a similar proposal. Example (2) illustrates the process of enhancement as it operates on the underspecified vowel representation of /E/. As in previous chapters, I assume in (2) that [coronal] is already present on the vowel /E/. I modify this assumption in §5.3.2.

(2) **Enhancement of vowels /E/:**

<table>
<thead>
<tr>
<th>a. no enhancement</th>
<th>b. enhancement with [high]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[e]</td>
<td>[i]</td>
</tr>
<tr>
<td>Root</td>
<td>Root</td>
</tr>
<tr>
<td></td>
<td>\</td>
</tr>
<tr>
<td>Place Aperture</td>
<td>Place Aperture</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in (2.a), and as argued in chapter 3, the vowel /E/ is unspecified for height features. (2) shows how /E/ can be enhanced by the feature [high] in the phonetic component. The enhancement feature is bolded in (2.b). If enhancement takes place, as in (2.b), a surface [i] will result. If enhancement does not take place, the resulting vowel will have the underspecified representation in (2.a), and will be interpreted as the non-high, non-low, coronal (i.e. front) vowel [e]. (In §5.4.3, I discuss why surface [e], which still has no height features in (2), is nevertheless interpreted as a mid vowel.)

In summary, the process of enhancement inserts the feature [high] (or alternatively, as discussed with respect to example (10), the feature [low]) on vowels

---

1 An important qualification is that enhancement of /E/ by [high] can only occur in three-vowel inventories; see §5.2.4.5 for further discussion.
which are unspecified for height. Whether enhancement applies or not is a source of phonetic variation for height that derives from phonologically underspecified representations.

5.2.3. **Height variation in Spanish and Catalan dialects**

To further illustrate how enhancement works, in this section I analyse data on height variation in the Spanish and Catalan dialects discussed in chapter 4 and show how enhancement accounts for this variation. I review the data from chapter 4 in §5.2.3.1, and then present an analysis based on enhancement in §5.2.3.2.

5.2.3.1 **Review of data on height variation**

Recall from chapter 4 that the potential degree of variation for height is a function of the number of height contrasts in a given inventory. This generalization is repeated in (3) in schematic form.

(3) Height variability in Iberian Spanish and Catalan dialects:

a. 3-vowel  b. 4-vowel  c. 5-vowel  d. 7-vowel

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>O</td>
<td>E</td>
<td>O</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
<td>A</td>
<td>È</td>
</tr>
<tr>
<td>Ò</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In 3-vowel inventories (3.a), the non-low vowels potentially vary a great deal for height. Evidence for this observation came from Spanish dialects with 3 desinential vowels, repeated in (4).
Height variability in dialects with 3 desinential vowels:

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Underlying representations</th>
<th>Desinential vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Asturian (Western)</td>
<td>/E/ /O/ /A/</td>
<td>i-ë u-ò a</td>
</tr>
<tr>
<td>b. Gallego</td>
<td>/E/ /O/ /A/</td>
<td>i-ë u-ò a</td>
</tr>
<tr>
<td>c. Leonese</td>
<td>/E/ /O/ /A/</td>
<td>i/e u/ò a</td>
</tr>
</tbody>
</table>

As illustrated in (4.a) (Western Asturian), in dialects with three desinential vowels, the non-low vowels /E/ and /O/ potentially vary anywhere within the non-low vowel range. However, as shown in (4.b,c) (Gallego and Leonese) the vowels of a particular inventory do not necessarily vary as greatly as the Western Asturian vowels. That /E/, for example, varies little in one language or dialect, but more in the next, is due to two factors. One factor is enhancement, which produces categorial variation. For example, enhancement of /E/ for [high] or its lack results in either [i] (enhancement) or [e] (no enhancement). The other factor appears to be language-particular variation, which produces gradient variation within a category, such that, for example, the vowel that results from lack of enhancement for [high] of /E/ is realized as a raised [e], or the vowel that results from enhancement for [high] of /E/ is a raised [i].

Returning to (4), the general point is that the non-low vowels in 3-vowel inventories can vary for height.

In asymmetrical 4-vowel inventories (3.b), the front/back vowel which has no high counterpart varies more greatly for height than the front/back vowel which has a high counterpart. Evidence for this observation came from Spanish dialects with 4 desinential vowels, repeated in (5). Some details from chapter 4 in (5) and in subsequent examples in this section have been omitted here.
As shown in (5), Spanish dialects with 4 desinential vowels have only one front vowel, /E/, with no phonologically high counterpart; they also have two back vowels, including a high vowel /U/ and a non-high, non-low vowel, /O/. The non-high, non-low vowel /E/ is more variable for height than the non-high, non-low vowel, /O/. /E/ can be instantiated as a vowel ranging from mid to high in height. However, /O/ generally remains in the non-high range in this 4-vowel inventory. (Recall from chapter 4 that the variant [u] of /O/ in Pasiego is relatively uncommon.)

In symmetrical five-vowel inventories (3,c), on the other hand, there is relatively little variation for height. Recall that in dialects with 5 desinential vowels, there is no variability for height at all. Central Aragonese in (6) is an example of this observation.

(6) Lack of height variability in dialects with 5 desinential vowels:

<table>
<thead>
<tr>
<th>Dialect</th>
<th>Desinential vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aragonese (Central)</td>
<td>i u e o a</td>
</tr>
</tbody>
</table>

The lack of variability for height shown by Central Aragonese in (6) is due the language-particular factor discussed with respect to (4), namely that the empty vowel is realized as [e], rather than as raised [ɛ] or lowered [ɛ].

In addition, Central Aragonese does not enhance empty Aperture nodes with the feature [low].
potential range of variation of /E,O/ in 5-vowel inventories are the stem vowel inventories reviewed in (7). (7) includes the inventories of Andaluzian (a sub-dialect of Castilian) and Catalan dialects which have 5 vowels (see chapter 4, §4.3.2 for details).

(7) Mid vowels vs. peripheral vowels in 5-and 7-vowel systems

<table>
<thead>
<tr>
<th>Dialect(s)</th>
<th>Underlying Representations</th>
<th>Tonic position</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Andaluzian (Castilian)</td>
<td>/I/ /U/ /E/ /O/ /A/</td>
<td>i[1][2] u[u]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e/e/e/e/e</td>
</tr>
<tr>
<td>b. Catalan (dialects with five tonic vowels)</td>
<td>/I/ /U/ /E/ /O/ /A/</td>
<td>j</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e/e/e/e/e</td>
</tr>
</tbody>
</table>

As shown in (7), the vowels /E/ and /O/ display less variation for height compared to their counterparts in, for example, 3-vowel inventories (4). More specifically, these vowels do not vary into the high range. However, they do vary into the low range, as shown by the [e] and [o] variants in (7).

Finally, as summarized in (3.d), in dialects with seven vowel inventories, the vowels /E/ and /O/ display a more restricted range of variation for height than their counterparts in 5-vowel inventories. This observation is illustrated by the Catalan dialects summarized in (8).

(8) Height variation in Catalan dialects with seven tonic vowels:

<table>
<thead>
<tr>
<th>Underlying Representations</th>
<th>Tonic position</th>
</tr>
</thead>
<tbody>
<tr>
<td>/I/ /U/</td>
<td>j</td>
</tr>
<tr>
<td>/E/ /O/</td>
<td>e/e/e/e/e/e/e</td>
</tr>
<tr>
<td>/A/</td>
<td>a</td>
</tr>
</tbody>
</table>

As shown in (8), the vowels /E/ and /O/ are still variable for height. However, in addition to not varying within the high range, they do not vary within the low range either. /E/ and /O/ in Catalan only vary within the non-high, non-low range.
In summary, the above data demonstrates that the height of /E/ and /O/ is negatively constrained only by the presence of phonologically high and/or phonologically low vowels in the same front or back domain. The data in this section also demonstrates that in general, /E/ and /O/ are more variable for height than /I,U,A/.

5.2.3.2 Analysis of height variation in Spanish and Catalan dialects

In this section, I present an account based on enhancement for the height variation reviewed in §5.2.3.1. I begin by reviewing the underspecified representations of the vowels in 3-, 4-, 5- and 7-vowel inventories in (9). I then show how enhancement derives height variation from these representations.

Example (9) illustrates the representations for height of 3-, 4-, 5- and 7-vowel inventories. Only relevant structure—i.e. the aperture node—is shown.

(9) The aperture node and height contrasts:

a. 3-vowel /E/ /A/ /O/  
   |  |
   [low]

b. 4-vowel /E/ /A/ /O/ /U/  
   |  |  |  |
   [low] [low] [high]

c. 5-v /I/ /E/ /A/ /O/ /U/  
   |  |  |  |  |
   [high] [low] [high]

d. 7-v /I/ /E/ /È/ /A/ /Ò/ /O/ /U/  
   |  |  |  |  |  |  |
   [high] [low] [low] [low] [low] [high]
The vowels /E,O/ are unspecified for height in all the dialects in (9). The vowels /I,U/, which occur in the inventories shown in (9.b,c,d) are specified for [high]. The vowel /A/ is specified for [low] in all dialects. And finally, the vowels /È, Ò/, which occur in the inventory shown in (9.d), are also specified for [low].

In order to derive the variation discussed in §5.2.3.1, the process of enhancement applies to the representations in (9). The workings of enhancement are illustrated in (10). The enhancement features used for 3-vowel inventories are shown in (10.a), those for 4-vowel inventories in (10.b), those for 5-vowel inventories in (10.c) and those for 7-vowel inventories in (10.d). Enhancement features are bolded. The first line in each inventory gives the abbreviated phonemic representations introduced in chapter 2. The second line recapitulates the phonetic instantiations of each phoneme discussed in §5.2.3.1. The remaining lines show the representations that result from enhancement or its lack.
(10) Enhancement for height:

a. 3-v /E/ /E/ /E/ /A/ /O/ /O/ /O/
   [i, i e e a o o o u, u, u]
   | | | | | | |
   [high] [low] [low] [low] [low] [high]

b. 5-v /I/ /E/ /E/ /A/ /O/ /O/ /U/
   [i, i e, e e, e, e a o o o o u, u, u]
   | | | | | | |
   [high] [low] [low] [low] [low] [high]

c. 4-v /E/ /E/ /E/ /A/ /O/ /O/ /U/
   [i, i ø, ø, ø a o u]
   | | | | | | |
   [high] [low] [low] [low] [low] [high]

d. 7-v /I/ /E/ /È/ /A/ /Ò/ /O/ /U/
   [i e, e, e e, e, e a a, ø, ø o, o, o u, u]
   | | | | | | |
   [high] [low] [low] [low] [low] [high]

As shown in example (10.a), the features [high] and [low] can be used for enhancement purposes in 3-vowel inventories; for example insertion of [high] gives [i, i], insertion of [low] gives [e]. (10.b) illustrates that in 5-vowel inventories, only the feature [low] can be used for enhancement; for example, insertion of [low] gives [e, e, e]. (10.c) illustrates that 4-vowel inventories are hybrids of 3- and 5-vowel inventories. In the region where no phonologically high vowels exist, the non-low vowel can be enhanced by [high], as in 3-vowel inventories. However, in the region where there is a phonologically high vowel, the non-low vowel cannot be enhanced.

3 The mid front vowels [e, e], etc. are distinguished from the mid central vowels [ø, ø], etc. in that the former have the place feature [coronal]. See §5.3.2 for further details.
by [high], as in 5-vowel inventories. (10.d) illustrates that in 7-vowel inventories, no features are used for enhancement purposes, i.e. enhancement for height does not take place.

There is a good fit between the attested phonetic instantiations summarized in (10) and the enhanced or unenhanced representations in (10)—i.e. none of the phonetic instantiations in §5.2.3.1 are left unaccounted for. Example (10) thus graphically illustrates that the range of phonetic variation of a given phoneme can be derived via the addition or failure to add enhancement features. It also illustrates that the degree of underspecification of a given phoneme correlates with the degree of phonetic variation for height. Thus, the vowels /I,È,A,Ô,U/, which are specified for height features, are relatively less variable for height than /E,O/ which are unspecified for height features.

Example (10) also illustrates a generalization as to when or which features can be used for enhancement purposes, namely that enhancement features and contrastive features are in complementary distribution. I formalize this generalization in §5.2.4.5.

5.2.4. The place of enhancement in the phonology

In §5.2.1 through §5.2.3, I have focussed on developing the rule of enhancement as it applies to enhancement for height in vowels. In this section, I use examples from height variation to illustrate the place of enhancement with respect to the phonology. I review and adopt a current proposal (from Cohn 1993) that describes the relationship between the phonetics and the phonology in §5.2.4.1. In §5.2.4.2, I clarify the relationship between contrastive features and enhancement features. In the remainder of §5.2.4, I illustrate with several case studies how enhancement relates to the phonology.
5.2.4.1 The phonetics-phonology interface (outline)

I adopt here a modified model of the phonetics-phonology interface, adapted from Cohn (1993). Example (11) illustrates non-universal or language-specific processes.

(11) Current view of the relationship between phonetics and phonology (modified from Cohn 1993: 44)

<table>
<thead>
<tr>
<th>phonological rules</th>
<th>spreading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>delinking</td>
</tr>
<tr>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>language-specific</td>
<td>enhancement</td>
</tr>
<tr>
<td>phonetic rules</td>
<td></td>
</tr>
</tbody>
</table>

As shown in (11), enhancement can be viewed as a language-specific phonetic implementation rule that operates after phonological rules have applied. (However, the process of enhancement is also universal in the sense that the set of features that can be used for enhancement purposes is universal.) The ordering of enhancement after phonological rules implies that features introduced by enhancement play no role in the phonology, serving only to strengthen already existing contrasts.\(^4\) I investigate this prediction in the following section. On the other hand, since enhancement is located within the domain of language-specific rules, one might expect it to be sensitive to language-specific requirements. I investigate this prediction in §5.2.4.3.

5.2.4.2 Spreading in Pasiego vs. enhancement in Tudanca

In this section, I compare and contrast the phonological process of spreading with the phonetic process of enhancement in order to show that enhancement is purely a phonetic process. I illustrate the differences between enhancement and

\(^4\) A separate interesting issue is whether enhancement feeds into language change. For some discussion of this issue, see §5.4.2.
spreading with examples from Pasiego and Tudanca below. Pasiego and Tudanca are closely related dialects of the Montañese dialect grouping, spoken in the province of Santander in NW Spain (see maps in the appendix to chapter 2).

In Pasiego, the vowel /E/ can be realized as high as a result of a spreading process that is operative in the phonology; see chapter 3 for details. Spreading of [high] is illustrated in (12), where extraneous structure is omitted.

(12) Spreading (raising):

\[
\begin{array}{ll}
\text{a. Spreading} & \text{b. No spreading} \\
[ab[ji]rtu]'open (sg.)' & [ab[je]rtos]'open (pl.)' \\
\end{array}
\]

\[
\begin{array}{ll}
* & * \\
(*) & (*) \\
\end{array}
\]

\[
\begin{array}{lll}
a & bjir & tu \\
\bullet & \bullet & \bullet \\
\mid & \mid & \mid \\
\text{PL} & \text{AP} & \text{PL} & \text{AP} & \text{PL} & \text{AP} \\
\text{n} & \text{k} & \text{n} & \text{n} & \text{n} & \text{n} \\
\text{[coronal [ high ]} & \text{[coronal]}
\end{array}
\]

By means of the spreading process illustrated in (12), the empty vowel representation [Ø,coronal] (i.e. a front vowel with no height features) becomes [high,coronal] in the phonology (12.a). (12.b) shows for comparison that when spreading does not take place, the underlying representation of /E/ remains [Ø,coronal].

In contrast to Pasiego, Tudanca has an enhancement process which creates the same phonetic output, [i], as Pasiego spreading. (Tudanca has a raising process similar to Pasiego's; however, this raising rule is not the focus of the current discussion.) In Tudanca, the inventory of desinence vowels is /E,A,O,U/ (Penny 1978: 26-7). Given this inventory, Tudanca's front vowel desinence /E/ can potentially be enhanced by the height feature [high], as argued in §5.2.3.2.

---

5 Penny posits 5 phonemes in word-final position, viz. /i/, /e/, /a/, /o/, /u/. He notes, however, that /i/ and /e/ are neutralized in word-final position, and that
The desinence /E/ in Tudanca is variably realized as a phonetically high front vowel [i], or as a mid vowel. (Not relevant for the present discussion is that the mid vowel in Tudanca is raised central [ɛ], or central [œ], rather than [e]. See §5.3.2 for discussion of how variation between front [e] and central [œ, ɛ] is derived via the addition or lack of addition of the feature [coronal].) The mid ([œ, ɛ]) and high ([i]) phonetic instantiations of desinential /E/ in Tudanca can be viewed as the result of enhancement for height or its lack, as illustrated in (13).

(13) Enhancement in Tudanca

a. Underlying /E/, unenhanced [œ, ɛ] (phonetically and phonologically mid)

b. Enhanced /E/ — [i] (phonetically high)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pl</td>
<td>Ap</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>[coronal]</td>
<td>[high]</td>
</tr>
</tbody>
</table>

As shown in (13.a), when /E/ is unenhanced for height, it is realized as [œ] or [ɛ]. However, as shown in (13.b), when /E/ is enhanced by the addition of the feature [high], which is non-contrastive for Tudanca desinences, the phonetic instantiation [i] is the result. (/E/ is also enhanced for [coronal] in (13.b). I discuss this process in §5.3.5.1.)

While spreading and enhancement may both create a surface [i], as illustrated in (12) and in (13), the sources (i.e. the processes involved) are different, and the associated patterning may differ. The feature [high] is contributed to the representation of /E/ at different levels; [high] is contributed in the phonology via spreading, and [high] is contributed in the phonetic component via enhancement. The distinction between desinental /i/ and /e/ is hardly productive (Penny 1978: 27). Because the distinction between desinental /i/ and /e/ is hardly productive, I argue, that Tudanca has four final vowels, represented as /E,A,O,U/, and that the final desinence /i/ is historical residue. See chapter 2, §2.5.2 for a parallel argument from Pasiego.
high vowel which results from spreading in the phonology could conceivably trigger processes involving [high] as well. On the other hand, the representation that results from the phonetic process of enhancement, as in Tudanca, should be phonologically inert.

5.2.4.3  Enhancement and complexity in mid harmony languages

In this section, I show that enhancement is sensitive to language-particular constraints, including complexity requirements. This evidence motivates placement of enhancement within the language-specific component in (11). In particular, I discuss the process of mid harmony. See Goad (1993) and Steriade (1993) for discussion.

Mid harmony is a process whereby the mid vowels [o] and [e] appear to spread their height features to high vowels. As such, mid harmony presents a potential counterexample to my arguments in chapter 3 that /E/ and /O/ have no height features. I reanalyse examples of mid harmony from Goad (1993) and Steriade (1993) in this section, arguing for the alternative account in which /E/ ([e]) and /O/ ([o]) have no height features. I argue in particular that mid harmony languages have a process not of mid harmony, but of enhancement for [high], and that enhancement for [high] is sensitive to complexity contours in mid harmony languages.

Mid harmony occurs in the Bantu languages of Yaka, Lamba, and Chichewa. In Yaka (Goad 1993: 169-174) and in Lamba (Steriade 1993), the process known as mid harmony operates as in (14). Mid harmony in Chichewa operates in a similar manner, with one qualification that is discussed in (18).

(14)  Mid harmony in Yaka and Lamba:

<table>
<thead>
<tr>
<th>Stem vowels:</th>
<th>Suffix vowels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>No mid harmony</td>
<td>i, u, a</td>
</tr>
<tr>
<td>Mid harmony</td>
<td>o,e</td>
</tr>
</tbody>
</table>
As shown in (14), if the stem vowel is [i], [u] or [a], then the suffix vowel is realized as [i] in certain suffixes. If, however, the stem vowel is [e] or [o], then the suffix vowel is realized as [e]. In both Yaka and Lamba, mid vowels do not appear in suffixes except through the application of mid harmony (Goad 1993: 193; Steriade 1993). For illustration, the process of mid harmony in Yaka is shown in (15):

(15) Yaka mid harmony (Goad 1993: 169, citing Goldsmith 1985: 262-263):

<table>
<thead>
<tr>
<th>Infinitive</th>
<th>Past</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ku-kun-a</td>
<td>k[u]n-[i]n[i]</td>
<td>'to plant'</td>
</tr>
<tr>
<td>b. ku-tal-a</td>
<td>t[a]d-[i]d[i] *t[a]d-[e][e]</td>
<td>'to look at'</td>
</tr>
<tr>
<td>c. ku-toond-a</td>
<td>t[oo]nd-[e][e]</td>
<td>'to love'</td>
</tr>
<tr>
<td>d. ku-beet-ik-a</td>
<td>b[ee]t-ek-[e][e]</td>
<td>'to hit with a stick'</td>
</tr>
<tr>
<td>e. ku-kond-id-ik-a</td>
<td>k[o]nd-el-ek-[e][e]</td>
<td>'to bend something'</td>
</tr>
</tbody>
</table>

Example (15) illustrates the effects of mid harmony on the past tense 'final' suffix [-ili]. When the vowel of the stem contains [u] (e.g. [kun] in (15.a)) or [a] (e.g. [tad] in (15.b)), then the suffix [-ili] contains a phonetically high vowel, [i]. However, when the stem vowel contains the vowels [o] or [e] (as in [toond], [beet], etc. in (15.c-e)), then the suffix [-ili], and all intervening target suffixes, contain a phonetically mid vowel [e]. Finally, as shown in (15.d-e), mid harmony is a morphologically-conditioned rule. Specifically, mid harmony only occurs if the suffix [-ili] is present, and cannot occur in the infinitival forms in (15.d-e).

What is unique about the process illustrated in (15) is that the mid vowels appear to be spreading a feature which they share to the exclusion of [u,a]; however, the only feature which the mid vowels could possibly share is a height feature because they do not share place features (cf. chapter 2, §2.2.1-§2.2.2).

---

6 As noted in Goad (1993: 193), suffixal /l/ becomes [n] when the root contains a nasal, and /l/ becomes [d] before [i]. Goad's source is Goldsmith (1985), whose original source is van den Eynde (1968).
Goad (1993) analyses mid harmony as a rule spreading the height features of [o,e] to the suffix vowel. Recall from chapter 3, §3.2.3.2 that in Goad's geometry, high vowels are characterized by the feature [vocalic], mid vowels by the feature [open] under vocalic, and low vowels by the feature [low] under [open]. Goad accomplishes mid harmony by spreading the feature [open] (16.a):

(16) Goad's analysis of mid harmony (Goad 1993: 172):

a. Mid harmony: Spread [open]

b. o i → e

| voc | voc |

[open] |

| [open] |

| low |

As shown in (16.b), the feature [open] spreads from a stem mid vowel to a target suffix vowel; Goad assumes that the target vowel is high [i] (i.e. characterized by the feature [vocalic]), and that it becomes mid [e] after spreading takes place.

(16.b) also illustrates that not all [open] nodes can spread; in particular, if the feature [open] dominates [low]—i.e. if the stem vowel is [a]—then [open] cannot spread; this is because we wish to avoid low harmony, which Yaka and Lamba do not have. In order to deal with this problem, Goad requires the condition in (16.c), namely that if [open] dominates the feature [low], then [open] cannot spread. Goad notes that condition (16.c) is somewhat problematic, but that it has precedents in the literature (Goad 1993: 172-3).7

7 Steriade's (1993) account of mid harmony in Lamba is similar to Goad's analysis: Steriade proposes a new phonological feature, [non-peripheral], which is a property shared by mid vowels and high central vowels to the exclusion of high and low vowels. In Steriade's account, mid vowels spread the feature [non-peripheral] in cases of mid harmony. Steriade's account
I propose an alternative account of mid harmony that does not require that /E/ and /O/ have height features and that additionally does not require condition (16.c). My proposal assumes that complexity contours and head-dependent asymmetries such as the ones discussed earlier in chapter 3, §3.2.1 are operative in Yaka and Lamba. I assume that stem vowels are heads and that affix vowels are dependents (cf. Dresher and van der Hulst 1993 for discussion of this type of correlation). I further assume that mid harmony—enhancement for [high]—only occurs when well-formed contours result, and is blocked if ill-formed contours would result. The analysis precedes as follows (only aperture structure is shown).

I assume that the inventory of stem vowels in mid harmony languages is /I,E,A,O,U/; however, the affix inventory is /E,A,O/, because only three affix vowels exist in the languages in question (Goldsmith 1985). My analysis is illustrated in (17):

Reanalysis of mid harmony:

\[
\begin{array}{cccc}
\text{a. stem} & \text{suffix} & \text{b. stem} & \text{suffix} & \text{c. stem} & \text{suffix} \\
U & E & A & E & O, & E \\
\cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\
\hline
\text{Ap} & \text{Ap} & \text{Ap} & \text{Ap} & \text{Ap} & \text{Ap} \\
\text{[high]} & \text{[high]} & \text{[low]} & \text{[high]} \\
\end{array}
\]

d. condition: the dependent cannot be more complex than the head

The enhancement feature [high] is bolded in (17). As shown in (17.a), /E/ is realized as [i] or [e], depending on whether or not the enhancement feature [high] is added to

\[
\text{\underline{differs from Goad's only in the respect that Steriade does not require a condition to prevent [a] from spreading its features. This is because in Steriade's account, low vowels are not a subset of non-high vowels, while in Goad's account, this is the case. On other grounds, however, Steriade's account is problematic. In particular, Steriade (1993) posits an otherwise unmotivated new feature [non-peripheral], a feature which includes mid and central vowels. However, mid and central vowels do not form a phonological class, and so there is no phonological evidence for positing a new feature in this instance.}}
\]
the phonetic representation of /E/. /O/ would be realized as [u] or [o] in a parallel fashion. When the stem vowels are [i,u,a] (17.a,b), nothing prevents insertion of [high] on the suffix vowels. However, when the stem vowels are [e,o] (17.c), then insertion of [high] on the suffix vowels will create an ill-formed complexity contour, in which the stem /E/ or /O/ is less complex than the suffix, [i]. In (17.c), then, the insertion of [high] is blocked by condition (17.d), and the suffix vowels are realized as [e,o] instead of as [i,u].

In summary, then, in suffixes, [high] is available for enhancement purposes. Enhancement by [high] in the suffixes is blocked by complexity requirements in (17.c) but is not blocked in (17.a,b). In other words, Yaka and Lamba do not have a mid harmony rule. Instead, they have an enhancement process that is sensitive to complexity requirements.

As in Yaka and Lamba, a better analysis involving enhancement is also available for the case of Chichewa mid harmony. In Chichewa, mid harmony operates as described earlier in (17)); additionally, however, low-vowel suffixes in Chichewa block mid harmony in subsequent suffixes. The relevant patterning is summarized below.

(18) Chichewa mid harmony (Goad 1993):

<table>
<thead>
<tr>
<th>Stem</th>
<th>Suffix</th>
<th>Suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. no mid harmony</td>
<td>i,u,a</td>
<td>i</td>
</tr>
<tr>
<td>b. mid harmony</td>
<td>e,o</td>
<td>e</td>
</tr>
<tr>
<td>c. blocking of mid harmony</td>
<td>e,o</td>
<td>a   i</td>
</tr>
</tbody>
</table>

The operation of mid harmony illustrated in (18.a,b) is identical to Yaka and Lamba. However, as shown in (18.c), if the vowel [a] intervenes in a suffix between the stem vowels [e,o] and the target suffix vowel [i], then 'mid harmony' is blocked.
The Chichewa patterning in (18.a,b) is amenable to the same analysis as the one in (17), with an additional assumption, namely that scansion for complexity is strictly local, such that [high] is inserted if the immediately preceding vowel is complex enough (19.e). Example (19) illustrates how enhancement works in Chichewa.

(19) Chichewa complexity:

<table>
<thead>
<tr>
<th>Stem (head)</th>
<th>Suffix (dependent)</th>
<th>Suffix (dependent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. /I/ [i]</td>
<td>/E/ [i] enhance with [high]</td>
<td></td>
</tr>
<tr>
<td>b. /A/ [a]</td>
<td>/E/ [i] enhance with [high]</td>
<td></td>
</tr>
<tr>
<td>c. /E/ [e]</td>
<td>/E/ [e] enhance blocked</td>
<td></td>
</tr>
<tr>
<td>d. /E/ [e]</td>
<td>/A/ [a]</td>
<td>/E/ [i] enhance with [high]</td>
</tr>
<tr>
<td>e. Condition: For ( V_1(C)0 V_2 ), ( V_2 ) cannot be more complex than ( V_1 ).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(19.a-c) are identical to the Yaka and Lamba cases; in (19.a,b), enhancement applies; however, in (19.c), enhancement is blocked by complexity, as enhancing the suffix would make the latter more complex than the stem vowel. In (19.d), on the other hand, the presence of an /A/ in a suffix intervening between the stem vowel /E/ and the final suffix /E/ effectively prevents blocking of enhancement. (19.d) is thus equivalent to (19.b), in that the vowel immediately preceding the target high suffix vowel in both (19.b,c) is the relevant vowel for scanning for syntagmatic complexity requirements. In other respects, Chichewa mid harmony is identical to the Yaka and Lamba cases.

In Chichewa, then, mid harmony operates as in the Yaka and Lamba cases analysed in (17). In addition, however, Chichewa harmony refers to the immediately preceding segment, so that (17.b) applies in the cases illustrated in both (19.c) and (19.d).

In summary, the effects of the complexity requirements in Yaka, Lamba and Chichewa are seen only in the blocking of enhancement of vowels. Enhancement via
the addition of [high] to the representation /E/ does not take place when it would create an ill-formed complexity contour. This analysis replaces the 'mid harmony' analysis.

The examples of Yaka, Lamba, and Chichewa enhancement illustrate that enhancement is sensitive to language-particular requirements such as complexity contours. The examples in §5.2.3.1 and §5.2.3.2 then illustrate that enhancement operates in the phonetic component after the phonology, and that enhancement is sensitive to language-particular constraints. I now discuss some theoretical issues raised by the examples discussed above.

5.2.4.4  Contrastive features and enhancement features

One of the implications of the model of enhancement as outlined above is that the same set of features potentially operates in both the phonology and in the phonetics. For example, in §5.2.3.2, we saw that the feature [high] could be used either as a contrastive feature in the phonology of languages with 4- or 5-vowel inventories, or as an enhancement feature in the phonology of languages with 3- or fewer vowels. Given that the same set of features potentially operate in both the phonology and in the phonetics, the question arises as to whether there are principles guiding when and how features can be used. In chapter 2, I argued that the principle of contrastiveness determines which features will be used in the phonology. Similarly, in this section I discuss and formulate a principle that determines when features will occur in the phonetic component, i.e. for enhancement purposes. I specify the relationship between contrastive and enhancement features.

5.2.4.4.1.  The role of contrastive features

As argued in chapter 2, contrastive features appear in underlying representations in order to mark phonemic contrasts. I argued in chapter 2 that the model of Modified Contrastive Specification (MCS) predicted which features would

8 These examples also provide support for the hypothesis, presented in chapter 3, that mid vowels have no height features.
appear in the underlying representations of given inventories. In particular, I argued for the following characteristics 1) a monotonic algorithm for adding contrasts to vowel inventories, and 2) contrast-driven addition of features to inventories and representations. I review these properties in (20), which illustrates the contrastive determination of vowel height.

(20)  MCS:

a. Contrastive determination of vowel height:

i. low vs. unmarked (non-low) vowels, marked by the presence of [low]

ii. high vs. unmarked (mid) vowels, marked by the presence of [high]

b. 2-height inventory:

d. 3-height inventory:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>/I/</td>
<td>[high]</td>
<td></td>
</tr>
<tr>
<td>/E/</td>
<td>[ø]</td>
<td></td>
</tr>
<tr>
<td>/A/</td>
<td>[low]</td>
<td></td>
</tr>
</tbody>
</table>

The monotonic algorithm for height contrasts is shown in (20.a). As argued in chapter 2, the contrast between low vs. non-low vowels is marked first via the addition of [low]; then, within the non-low region, the contrast between high vs. non-high vowels is marked via the addition of [high]. As illustrated in (20.b), in a two height inventory, low vowels are marked as [low], while the remaining height is unmarked; the feature [low] is therefore contrastive in this inventory—and in all other inventories, under the assumption that there are minimally two vowel heights in any inventory (cf. Disner 1984, Maddieson 1984, Trubetskoi 1939/1969). On the other hand, in a three height system, the feature [high] is needed to mark the mid vs. high contrast. As illustrated in (20.d), [high] is contrastive in 3-height inventories.

In summary, contrastive features are those features which are forced to appear in underlying representations in order to mark the presence of particular phonemic contrasts. As discussed above, some features—such as [low]—may be universally contrastive, i.e. every language must have at least a low vs. non-low contrast.
However, some features—such as [high]—are contrastive only in given inventories, i.e. only in inventories with at least three height contrasts.

5.2.4.4.2. The role of enhancement features

In opposition to contrastive features, enhancement features are those features which function solely to enhance or make more salient already existing contrasts (Rice 1993b; Stevens, Keyser and Kawasaki 1986 and Stevens and Keyser 1989). Enhancement features are not underlyingly present, and are inserted in the phonetic component (Avery and Rice 1989, Rice 1993a,b). An example of a feature that can function as an enhancement feature is the feature [high] in inventories with fewer than three vowel heights. As discussed in §5.2.3.2, this feature can enhance the representation of the non-high vowel /E/ in 2-height inventories, creating a phonetically high vowel [i] that is phonemically non-high.

The definition of the role of enhancement features implies that enhancement features are drawn from the reduced set of features which are not used to mark contrasts. In the following section, I discuss this aspect of the relationship between contrastive and enhancement features.

5.2.4.5 The Contrastiveness Exclusivity Principle

As discussed in §5.2.4.4, I assume that contrastive and enhancement features are drawn from the same universal set of features. However, I argue in this section that contrastive and enhancement features are in complementary distribution.

I propose, following Rice (1993b: 123-4, cf. also Avery and Rice 1989, Rice and Avery 1993), that features which are contrastive in a given sub-inventory are not available for enhancement in the same sub-inventory. For example, in vowel inventories with mid/high contrasts at a given height, [high] cannot function as an enhancement feature at the same height.9

9 Similarly, in consonant sub-inventories with contrasts within the coronal region, [coronal] cannot be an enhancement feature because it is required as a contrastive feature (Rice 1993b: 124).
This proposal concerning the complementarity of contrastive and enhancement features can be formulated as follows:

(21) **Contrastiveness Exclusivity Principle (CEP):** Features which are contrastive cannot also be enhancement features within their class.

The CEP assumes a complementary relationship between contrastive and enhancement features, namely that contrastive features are picked first, and that enhancement features are drawn from whatever features are left over. The CEP as formulated in (21) is also relativized to domains, i.e. classes of vowels. I discuss evidence that the CEP is relativized to apply within vowel classes below. In §5.4, I argue that the CEP is also relativized to apply within other paradigmatic domains such as the metrical positions that were defined in Chapter 3.

I provide evidence for the formulation of the CEP below. In order to illustrate the issues at hand, I first provide derivations which do not assume the CEP in (22).

(22) **Use of height as an enhancement feature:**

a. No contrasts within non-low vowels:

   \[ /E/ \]

b. non-high/high contrast within non-back vowels:

   \[ /E/ \quad /I/ \]

i. **Underlying representation:**

   Aperture Aperture Aperture
   | \[\text{Aperture} \rightarrow [\text{high}]\]

ii. **Enhancement rule:**

   Aperture \rightarrow [high]

   Enhancement rule:

   Aperture \rightarrow [high]

iii. **Outcome of enhancement:**

   Aperture Aperture Aperture
   | | \[\text{Aperture} \rightarrow [\text{high}]\]
   | \[\text{Aperture} \rightarrow [\text{high}]\]
   | \[\text{Aperture} \rightarrow [\text{high}]\]
(22) illustrates two inventories, one with no contrasts within the non-low vowel region (22.a), and one with a mid vs. high contrast in the non-low vowel region (22.b). (22) gives the structure of the aperture node only. As shown in (22.i), only /I/ in the type (22.b) inventory requires the feature [high] underlyingly.

(22.ii) illustrates the enhancement rule which operates in the phonetic component; this rule inserts the feature [high] if the aperture node is empty. For this derivation only, I assume that this rule can operate unconditionally.

(22.iii) illustrates the effects that unconditional enhancement (22.ii) would have in each inventory type. In the type (22.a) inventory, the sole non-low vowel would be realized as phonetically high. In the type (22.b) inventory, both of the non-low vowels would be realized as phonetically high, the vowel /I/ because it underlyingly has the feature [high], and the vowel /E/ because it receives this feature through enhancement. The situation illustrated in (22.b) represents absolute neutralization for height.

While there is no a priori reason to rule out absolute neutralization, I argue that it is dispreferred on both theoretical and empirical grounds. On theoretical grounds, the definition of an enhancement feature—i.e. a feature which make contrasts more salient—precludes the insertion of, for instance, high on vowels in inventories where mid and high vowels contrast. This is because [high] would essentially be used to 'de-enhance' in such a case. The use of an enhancement feature to de-enhance is dispreferred because it runs counter to the phonetic function of enhancement.

However, there is a more compelling data-based argument in favour of the CEP, namely that languages do not appear to employ the option of using features both for contrastive and enhancement purposes within the same vowel class. Recall from §5.2.3.2 that /E/ and /O/ in 3-, 4-, 5-, and 7-vowel inventories display patterns of variation for height. Recall as well that I argued in §5.2.3.2 that this variation for
height could be derived via enhancement, as shown in (23). (23) summarizes the use of height features for enhancement purposes in 3-, 5-, and 7-vowel inventories. As before, enhancement features are bolded.

(23) Enhancement features:

<table>
<thead>
<tr>
<th></th>
<th>3-vowel</th>
<th>5-vowel</th>
<th>7-vowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
</tbody>
</table>

As shown in (23.a), both [high] and [low] can be used for enhancement purposes within the front or back vowel ranges in 3-vowel inventories. However, as shown in (23.b), in 5-vowel inventories, the feature [high] is contrastive, and it is not used for enhancement purposes within the front or back vowel classes. On the other hand, as shown in (23.c), in 7-vowel inventories, the feature [low] is also used contrastively within the front and back vowel ranges, and so it is not used for enhancement purposes.

As shown in (23), the relevant generalization appears to be that features which are contrastive within the front or back vowel region cannot be used for enhancement purposes within that region, providing evidence for (21). The patterning in (23) also demonstrates that any generalization concerning the complementarity of contrastiveness and enhancement must be relativized to particular regions of the vowel space (i.e. to the front or the back region). If this were not so, we would not expect to see [low] being used for enhancement purposes at all. This is because, as discussed in §5.2.3, [low] is contrastive in all inventories. However, the relevant generalization appears to be that [low] is not contrastive for every place of articulation in all inventories. The feature [low] can be used for enhancement where it is not used contrastively within a given place of articulation, providing evidence that the CEP is relativized to paradigmatic domains.
In summary, I adopt the above arguments and assume that the CEP is a valid principle guiding the choice of contrastive and enhancement features. Further evidence from Pasiego for the CEP is provided in §5.4.2.

5.2.5. Summary

In §5.2, I have employed case studies and general discussion to illustrate the main characteristics of the model of phonetic enhancement. I review what has been established so far. First, in §5.2.3, I showed that patterned variation for height can be derived via the application or lack of application of enhancement for a height feature. I then went on in §5.2.4 to define the role of enhancement with respect to the phonology. I used case studies to show that enhancement is a phonetic process that operates after the phonology, and that enhancement is sensitive to language-particular constraints such as complexity. These case studies established that enhancement is a language-particular phonetic rule that operates after the phonology. From the latter ordering, I argued that contrastive features are primary, and that enhancement features are not active in the phonology. This led to the CEP, which is a formalization of the complementary distribution of contrastive and enhancement features.

5.3 Enhancement for place

In §5.2, I developed the model of enhancement through discussing examples of enhancement by height. Vowels have not only height features, but also place features, and so in this section, I turn to an examination of the patterns of variation caused by enhancement for place. The examples from enhancement for place are more involved than the ones of enhancement for height, partly because there are more place features than height features. Accordingly, I begin in §5.3.1 through §5.3.4 by discussing a more detailed model of the feature geometry of the place node. In §5.3.5,
I resume the analysis of variation between Pasiego \([e,ə]\) and \([o, o]\) which I began in chapter 4.

5.3.1. **Feature geometry**

The vowel geometry assumed in this chapter is illustrated in (24). As discussed in chapter 2, this model of feature geometry generally follows Clements (1985) and Sagey (1986). Nodes intermediate between the root node and the Aperture and Place nodes are not shown in (24). Modifications to the place node are discussed below.

\[
\text{(24)} \quad \text{Vowel feature geometry}
\]

Following Clements (1989a,b), Goad (1991), Odden (1991), van der Hulst (1989) and others, I assume that vowels have a place node and an aperture node. Following Clements (1991), I assume that the features [coronal], [labial], and [dorsal] are dominated by the place node, while height features are dominated by the Aperture node. I also assume the place feature [peripheral], which dominates [dorsal] and [labial] (for discussion, see Avery and Rice 1989, Rice 1994, Rice and Avery 1991, 1993). I adopt the height features [high] and [low], rather than Clements' feature [open n], for reasons discussed in chapters 2 and 3.

Not shown in (24)—because I am unsure of where to place it—is the place feature [RTR] discussed in Clements (1989b, 1991). Following Clements (1989b), I assume that the terms 'radical', 'pharyngeal', and 'RTR' are essentially equivalent and use the feature [RTR] here. Further discussion of [RTR] follows in §5.3.3.1.
The geometry in (24) also encodes a) the monotonic algorithm by which contrastive features are added to inventories, and b) the features which will be used for enhancement purposes if not used contrastively. I discuss the workings of this geometry briefly, providing more detailed discussion and references in following sections.

In (24), the structure between the Root node and the nodes that it dominates is irrelevant, and nothing besides dominance is meant by the direction of the lines in this case. However, below the aperture and Place nodes, a vertical line indicates the features which are first used for contrasts in a given inventory, while a slanted line indicates the features which are either used for contrastive purposes, if the contrasts exist, or for enhancement purposes.

Under the aperture node—as discussed in chapter 2—the contrast defined by the presence of the feature [low] is primary; if there are more than two height contrasts, then the feature [high] is also used as a contrastive feature; if there are fewer than two height contrasts, the feature [high] might be used as an enhancement feature for vowels with underlyingly empty aperture nodes; however, [high] could not be used contrastively.

Similarly, under the place node, as discussed in greater detail with references in §5.3.2, the feature [peripheral] defines the primary contrast between back and non-back vowels.\textsuperscript{10} If there is a three-way place distinction, then [coronal] will also be a contrastive feature; however, if there is only a back vs. non-back distinction, then [coronal] might be used as an enhancement feature for vowels with underlyingly empty place nodes. Finally, under the peripheral node, as argued in Rice (1994), the features [dorsal] and [labial] are only used as enhancement features. Further discussion and exemplification follows below.

\textsuperscript{10} In previous chapters, I used the feature [labial] to distinguish between front and back vowels. See §5.3.2.1 for further discussion of the relationship between [peripheral] and [labial].
5.3.2. *Place contrasts*

I assume that the primary place contrast is between back vs. non-back vowels. Evidence for this assumption is that a) only the features [coronal] and [peripheral] are needed to capture the number of place contrasts found in languages (Rice 1994), and b) [coronal] is normally absent from underlying representations (Rose 1993, Walker 1993). I discuss each of these points in turn.

5.3.2.1 *A two-feature theory of vowel place*

Rice (1994) argues that only two features are needed in order to generate the number of vowel place contrasts attested in languages. Rice observes that languages have a maximum of four distinctive places of articulation: in addition to front unrounded and front rounded vowels, languages can only have a single central vowel place and a single back vowel place; the rounding of the central or back vowels is phonologically irrelevant.

To capture four places of articulation, only two place features are necessary; adding any more place features results in overgeneration in the number of possible place contrasts, as illustrated in (25).

---

A similar assumption that only two features are needed in order to capture place contrasts is found in Dependency Phonology (cf. Anderson and Ewen 1987, van der Hulst 1989) and Particle Phonology (Schane 1984). However, the Dependency Phonology features are not analogous to my own, since Dependency Phonology features (elements) can combine place and height (tonality and sonority).
(25) Combinations of place features (Rice 1994):

a. Combinations of [peripheral] and [coronal]:

<table>
<thead>
<tr>
<th></th>
<th>Coronal</th>
<th>Coronal + Peripheral</th>
<th>No place features</th>
<th>Peripheral</th>
</tr>
</thead>
<tbody>
<tr>
<td>(front unrounded)</td>
<td>(front rounded)</td>
<td>(central)</td>
<td>(back)</td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>ü</td>
<td>Ė, u *</td>
<td>u, u</td>
<td></td>
</tr>
</tbody>
</table>

b. Combinations of [labial], [coronal], and [dorsal]:

<table>
<thead>
<tr>
<th></th>
<th>Coronal</th>
<th>Coronal + Labial</th>
<th>No place features</th>
<th>Labial</th>
<th>Dorsal</th>
<th>Labial + Dorsal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(front unrounded)</td>
<td>(front rounded)</td>
<td>(central unrounded)</td>
<td>(central rounded)</td>
<td>(back unrounded)</td>
<td>(back rounded)</td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>ü</td>
<td>Ė</td>
<td>o</td>
<td>u</td>
<td>u</td>
<td></td>
</tr>
</tbody>
</table>

Example (25) contrasts Rice's coronal/peripheral theory (25.a) with the assumption that there are three phonologically-active place features for vowels ((25.b), as argued in Clements (1991), Hume (1992), and Clements and Hume (forthcoming). As illustrated in (25), the three-place-feature theory overgenerates six phonemic places of articulation, while the two-place-feature theory generates the attested four phonemic places of articulation. Adopting this argument, I assume the two-place theory articulated in (25.a).

5.3.2.2 The coronality of front vowels

As discussed above, I also adopt arguments in Rose (1993) and Walker (1993) that [coronal] does not appear in the underlying representations of front vowels unless forced by contrasts between front unrounded and central vowels of the same height.\textsuperscript{12} I discuss their arguments in more detail at this point. Rose and Walker\textsuperscript{12} Dependency phonology essentially assumes that back vowels have a place feature in the unmarked case and that front vowels also have a place feature in the unmarked case. I do not make the latter assumption. Instead, I assume that back vowels are [peripheral] in the unmarked case, while front vowels have no place features in the unmarked case. Front vowels are \textit{non}-peripheral, rather than [coronal].
first assume a primary place division between back and non-back vowels. They then focus on generalizations concerning front and central vowels. Rose and Walker distinguish between symmetrical inventories, in which there is a contrast between front and central vowels at every height, and asymmetrical inventories, in which a contrast between front and central vowels is lacking at a given height. They argue that in the asymmetrical inventories, front vowels which do not contrast with central vowels at the same height pattern as if they were central or placeless—even when they are phonetically front. On the other hand, in the symmetrical inventories, front vowels which contrast with central vowels at the same height pattern as if they were phonologically front, or [coronal], while their central counterparts are placeless. Rose and Walker argue for the analysis summarized in (26).

(26) Place specification of [e]:

a. [e] does not contrast with a central vowel at the same height:
   
   [e] /Ø,Ø/

b. [e] contrasts with a central vowel at the same height:
   
   [e] /Ø, coronal/
   [ə] /Ø,Ø/

As shown in (26), front vowels in symmetrical inventories are always specified for [coronal], whereas front vowels in asymmetrical inventories are unspecified for [coronal]. As evidence for this hypothesis, Rose and Walker cite the patterning of phonetically front vowels with respect to vowel sandhi (Rose 1993), and vowel harmony (Rose 1993, Walker 1993), among other processes. With respect to vowel sandhi, Rose (1993) argues that vowels such as [e] in (26.a) tend to assimilate to the place of back vowels in vowel sandhi processes (Rose 1993). On the other hand, vowels such as [e] in (26.b) pattern identically to back vowels with respect to assimilation processes. Such vowels do not assimilate; instead their central
counterparts assimilate. With respect to vowel harmony, vowels such as [e] in (26.a) are neutral to front harmony processes, while vowels such as [e] in (26.b) participate in front harmony processes (Rose 1993, Walter, 1993). Rose and Walker attribute the different patterning of vowels such as [e] in (26.a,b) directly to the specification or lack of specification for the feature [coronal] in the phonology. I adopt the above arguments here. To recapitulate, then, [coronal] only appears in underlying representations when front vowels contrast with central vowels at the same height. Given this assumption, it follows that the split between [peripheral] vs. non-peripheral vowels—rather than the split between [coronal] and non-coronal vowels—is primary.

Given the above arguments, the surface realizations of non-back vowels can be derived as in (27). (27) summarizes the possible enhancements of non-back vowels in triangular inventories, i.e. inventories for which there are no phonological contrasts between front and central vowels.

(27) Front vowels and their enhancements:

<table>
<thead>
<tr>
<th></th>
<th>Coronal</th>
<th>Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>i</td>
<td>j</td>
</tr>
<tr>
<td></td>
<td>e</td>
<td>ə</td>
</tr>
<tr>
<td>low</td>
<td>e</td>
<td>a</td>
</tr>
</tbody>
</table>

As shown in (27), I use the symbols [i,e,ɛ] for vowels which have been enhanced by the feature [coronal]. On the other hand, the unenhanced vowels [j, ə, a] represent the central or non-coronal counterparts of the [coronal] vowels. ([j] is equivalent to the symbol [Ê] used in (25)).

5.3.2.3 Summary

In summary, the minimal set of contrastive features for vowel place generally includes [peripheral]. It follows from the CEP that [peripheral] is not generally used
for enhancement purposes. On the other hand, the set of enhancement features for place includes [coronal], [dorsal] and [labial]. As discussed above, [coronal] enhances non-peripheral vowels in triangular inventories. In the following section, I clarify how [dorsal] and [labial] enhance [peripheral] vowels.

5.3.3. *The relationship between [peripheral], [dorsal], and [labial]*

While the feature [peripheral] is always present and contrastive in vowel inventories, the features [dorsal] and [labial] are not used contrastively, as argued by Rice (1994), cf. (25) above. Instead, [dorsal] and [labial] are enhancement features. Since [dorsal] and [labial] are never contrastive, they cannot participate in phonological rules; see Rice (1994) for arguments that processes which have been analysed as referring to [labial] and [dorsal] can be reanalysed as referring to [peripheral]. I adopt Rice's arguments here.

Given the above assumptions, the possible surface realizations of back vowels can be derived as in (28).

(28) Back vowels and their enhancements:

<table>
<thead>
<tr>
<th>Peripheral</th>
<th>Peripheral</th>
<th>Peripheral</th>
<th>Peripheral</th>
</tr>
</thead>
<tbody>
<tr>
<td>labial</td>
<td>dorsal</td>
<td>labial, dorsal</td>
<td></td>
</tr>
<tr>
<td>u</td>
<td>ü</td>
<td>u</td>
<td></td>
</tr>
<tr>
<td>ä</td>
<td>ø</td>
<td>y</td>
<td>o</td>
</tr>
<tr>
<td>Â</td>
<td>ç</td>
<td>Â</td>
<td>ò</td>
</tr>
</tbody>
</table>

The symbols in (28) are derived from Lass (1984: 104). The symbols [u], [ø] and [ò] are [peripheral] or back vowels that have been enhanced by both [labial] and [dorsal]. [u] is a high back rounded vowel, [ø] is a mid back rounded vowel, and [ò] is a low

13 A major exception is the enhancement of the [low] vowel /A/, which is realized, for example, as front [a] (e.g. word-finally in some Spanish dialects; refer to the ALPI for details), as central [a] (the default case for Spanish dialects), or as back [a] (in Vulgar Castilian (Zamora Vicente 1960)). It appears that /A/ can be realized as a vowel of any place, so long as it is [low] and so long as /A/ does not contrast with another [low] vowel. In this respect, /A/ patterns analogously to the front/back vowels, which can be realized as [low] if there is no contrasting [low] phoneme within the same front/back region.
back rounded vowel. The symbols [u, y, A] represent vowels which are enhanced only for [dorsal]. The symbol [u] represents a high back unrounded vowel, [y] represents a mid back unrounded vowel, and [A] represents a low back unrounded vowel. The symbols [u], [A], and [g] represent vowels which are unenhanced for [dorsal] but enhanced for [labial]. Following Clements (1991: 79), I assume that vowels which have the feature [dorsal] are more prototypically back. Thus, vowels which are not enhanced by the feature [dorsal] are somewhat less back than their [dorsal] counterparts. For this reason, I use [u] [o], and [g], which are Lass's symbols for 'centralized back' vowels. The symbol [u] represents a centralized, high back rounded vowel, [o] represents a centralized, mid back rounded vowel, and [g] represents a centralized, low back rounded vowel, all unenhanced by [dorsal]. Finally, [u, y, A] represent unenhanced [peripheral] vowels. The symbol [u] represents a high [peripheral] vowel which is unenhanced for [labial] or [dorsal], [y] represents its mid counterpart, and [A], the low, unrounded centralized counterpart.

In summary, [labial] and [dorsal] are enhancement features for back vowels. Enhancement by [labial] produces a rounded vowel, enhancement by [dorsal] produces a more back vowel within the peripheral region, and lack of enhancement by [dorsal] produces a more centralized vowel within the peripheral region. In contrast to the features [labial] and [dorsal], [peripheral] is generally a contrastive feature, marking the contrast between back and non-back vowels.

5.3.3.1 [RTR]

Clements (1989b, 1991) posits a place feature which I designate here as [RTR] (Retracted Tongue Root).\textsuperscript{14} [RTR] is somewhat enigmatic because it defines a different type of dimension than the place features [coronal] and [dorsal]. The latter features can be thought of as subclassifying a horizontal dimension. However, [RTR] \textsuperscript{14}This feature has also been referred to as [pharyngeal] and [radical].
appears to subclassify the vertical or height dimension, unlike any other place feature. (See, for example, Odden (1991), who argues that [high] and [ATR] cooccur.) This observation is illustrated in (29), which summarizes Clements' arguments about the role of [RTR].

(29) Low vowels are [radical] (i.e. [RTR]) (Clements 1991:79):

<table>
<thead>
<tr>
<th></th>
<th>æ</th>
<th>a</th>
<th>a</th>
<th>lax vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>coronal</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>dorsal</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>radical</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

As shown in (29), Clements (1991), following Herzallah (1990), argues that [RTR] always cooccurs with low vowels. However, Clements (1989b) also argues that [RTR] occurs in the representation of lax vowels (i.e. in languages with a tense/lax distinction). In this respect, then, [RTR] patterns something like the feature [labial]: [labial] normally cooccurs with back vowels; however, [labial] can cooccur with both back and non-back vowels. In other words, [RTR] and [labial] cross-classify the height and place dimensions respectively. I assume for the purposes of this thesis that [RTR] is a place feature, in order to account for variation between [a] and [ə] in Spanish dialects. However, further research into the nature of this feature is required.

In triangular inventories such as /I,E,A,O,U/ which do not have tense/lax distinctions I assume that [RTR] is always an enhancement feature, and that [RTR] can enhance the representation of the low vowel /A/.

5.3.4. **Summary of place features**

In the above sections I have developed a model that specifies which place features are used for contrastive purposes and which for enhancement purposes. I summarize these observations in (30), showing specifically how they apply in triangular 3-5 vowel inventories.
(30) Enhancement and contrastive place features in 3-5 vowel inventories.

a. Contrastive place features: [peripheral]

b. Enhancement place features:
   i. [peripheral] $\rightarrow$ [labial], [dorsal]
   ii. Place $\rightarrow$ [coronal]
   iii. [low] $\rightarrow$ [RTR]

As shown in (30.a), the set of contrastive place features in triangular inventories includes only [peripheral]. As shown in (30.b.i), the [peripheral] or back contrast can be further enhanced by [labial], [dorsal], or both of these features. As shown in (30.b.ii), a bare Place node (i.e. the class of non-back vowels) can be enhanced by the feature [coronal]. Finally, as shown in (30.b.iii), the Aperture feature [low] can also be enhanced by the feature [RTR].

5.3.5. Variation for place in Pasiego

With the above background on place distinctions and place enhancements, I present an analysis of the phenomenon of variation between [e/ë˚] and [o/o] in Pasiego in this section. Recall that in chapter 4, I provided evidence for the following observations: a) the variation between [e/ë˚] and between [o/o] in Pasiego is context-dependent or patterned; and b) the variation between [e/ë˚] and between [o/o] is predictable from metrical position. I incorporate these observations in my analysis of variation in Pasiego below.

5.3.5.1 Deriving the variation between [e-ë˚] and [o-o] in Pasiego

The representations [ë˚] and [o] are close, more central, and less carefully articulated variants of [e] and [o] (Penny 1969). Given this description, I assume that
[5] is equivalent to the symbol [ə] used in (27), while [ɔ] is equivalent to the symbol [ø] used in (28), i.e. a centralized or less back round vowel.

To explain the variation between [e-œ] and [o-ɔ], I propose that empty /E/ and /O/ optionally undergo enhancement in Pasiego in given metrical positions. The workings of enhancement in Pasiego are illustrated in (31).

(31) Context-sensitive enhancement:

a. Metrically strong position (obligatory enhancement):

b. Metrically weak position (optional enhancement):

As discussed in §5.3, the enhancement features which are relevant for back and non-back vowels are [dorsal], [labial], and [coronal]. In Pasiego, /E/ and /O/ are

---

15 As discussed earlier with respect to (4), I categorize [ə, œ, ø], for example, as instantiations of one unit. The unit is defined as a vowel unspecified for height and place, a vowel which can potentially be instantiated as [ə, œ, ø, e, ɛ, e], etc. Phonetic variation within this unit that is not due to enhancement is language-particular.

16 Note that enhancement for [labial] is obligatory in Pasiego, as shown by the representations in (31.b).
obligatorily enhanced in strong metrical position (31.a), but only optionally enhanced in metrically weak position (31.b). As before, enhancement features are bolded. Enhancement by [coronal] for /E/ and by [dorsal, labial] for /O/ results in front [e] and back [o]. However, when enhancement for [coronal, dorsal] fails to take place, as in the unenhanced examples in (31.b), the somewhat higher, more central and less carefully articulated vowels, [ã] and [o], result in metrically weak position.

Example (31) highlights the main characteristics of enhancement: First, enhancement is a phonetic process that more fully specifies underspecified vowels. Second, limited, patterned phonetic variation—such as that between [e/ã] and [o/ø]—can be captured by the addition or lack of addition of an enhancement feature in the phonetic component. Third, as shown in example (31)—and as argued in chapter 4—the operation of enhancement is also sensitive to context (e.g. strong vs. weak metrical position).

5.3.6. The significance of enhancement

Enhancement as described above is essentially a particular type of redundancy rule known as an R-rule (Steriade 1987). I review the concepts of R-rules and D-rules to highlight this point and to underline its importance.

R-rules introduce a non-underlying feature value [αF] within a given segmental class for which only one value of [F] occurs (Steriade 1987: 341). A familiar example of an R-rule from the literature is voicing within sonorants: sonorants are generally phonetically voiced in the unmarked case; this fact in the underspecification literature is taken to mean that the value [+voice] is predictable within sonorants. In the underspecification literature, the assumption that [+voice] is predictable for sonorants also entails that [+voice] is absent from the underlying representations of sonorants. To account for the phonetic voicing of sonorants, an R-rule introducing [+voice] applies later in a given derivation. (But see Rice (1993a),
Rice and Avery (1993), Steriade (1993) for a different analysis in which no R-value is invoked.)

D-rules, on the other hand introduce a feature value \([\alpha F]\) within a class of segments for which both values of [F] occur contrastively (cf. Steriade 1987: 341). For example, both [+voice] and [-voice] can occur in the underlying representations of obstruents in languages which have voicing contrasts among obstruents. Features such as \([\pm\text{voice}]\) in such languages are referred to as D-features.

Treatment of D-features varies in the literature. In Contrastive Underspecification models, D-features such as [+voice] and [-voice] must be present in the underlying representations of obstruents (cf. Archangeli 1988); in Radical Underspecification models, D-features are introduced by D-rules in the phonology (D-rules are defined shortly), and so underlying representations do not have D-features. D-rules are rules of the form \([\ ] \rightarrow [\alpha F]\), where something that is underspecified receives a feature by rule (Steriade 1987: 341-2). Steriade (1993) describes the latter type of rules as 'context-free redundancy rules' because of the lack of a structural description on the right-hand side of the rule.

I assume that D-rules and D-features do not exist for the following reasons. First, I assume privative features, following Anderson and Ewen (1987), Avery and Rice (1989), Clements (1988), den Dikken and van der Hulst (1988), Ewen and van der Hulst (1987), Goldsmith (1987, 1990), van der Hulst (1989), van der Hulst and Smith (1989), Mester and Itô (1989), Selkirk (1991), Steriade (1987, 1993). This assumption eliminates the need for D-features. The assumption of monovalency is based on arguments that only single values are ever referred to in the phonology. To illustrate, a type of example frequently cited as evidence against D-features is voicing in obstruents. Abstracting away from the problem of voicing of sonorants, Mester and Itô (1989: 278-9) argue that assuming privative voicing (i.e. [voice]) for the analysis of Lyman's Law in native Japanese vocabulary captures several observed
asymmetries between the patterning of the binary features [+voice] and [-voice]. [+voice] participates in the OCP effect of Lyman's Law, blocking insertion of [+voice] by rule if there is a [+voice] obstruent in the relevant environment. On the other hand, [-voice] is inert with respect to Lyman's Law, and crucially does not block it. Mester and Itô argue that the patterning of [-voice] can be better captured by assuming that [-voice] does not exist, i.e. that [voice] is a privative feature. They also argue briefly that [-voice] is universally absent from representations. More extensive arguments for the privativity of [voice] are provided in Lombardi (1991).

Second, within the Modified Contrastive Specification literature it is argued that other d-features (i.e. other than [-voice]) are in general absent from underlying representations. For example, Avery and Rice (1989) argue that while the feature [coronal] can be present and active in some inventories, its absence is never referred to. In summary, based on evidence that some feature values (generally minus values) are always phonologically inert, neither triggering nor blocking processes, I assume that D-rules and D-values do not exist.

In contrast to D-rules and D-values, in models such as MCS which assume underspecified representations, R-rules are essential for bridging the gap between underspecified phonological representations and more fully specified phonetic representations. I explain this point further in the following paragraphs.

Steriade (1993) classifies R-rules as context-dependent redundancy rules, essentially because they have the shape 'F —> G', or because they have a structural description on the right-hand side of the rule. Such rules are perhaps more accurately referred to as 'specification rules' because they add to already existing structure (Steriade 1993). I use the latter term for the remainder of this discussion.

In Steriade (1993) there is a double sense in which specification rules are context-dependent. Specification rules can refer to paradigmatic contexts, e.g. to the presence of segment structure. In addition, specification rules can also refer to
syntagmatic contexts, e.g. to specific metrical positions within a word, to syllabic constituents, etc. I argue that specification rules—here identified as enhancement rules—refer to both types of context. Furthermore, because context constrains the operation of specification rules, the interpretation of underspecified representations is highly constrained.

I illustrate this point by returning to the Pasiego case summarized in (31), discussing the variation between [e,ə]. In Pasiego, the paradigmatic context (i.e. knowledge of the inventory of Pasiego) tells us that /E/ can only be enhanced by the place feature [coronal]. To illustrate this point, I abstract away from features acquired via spreading, and also from enhancement for height. If /E/ does not acquire features via spreading in the phonology, it leaves the phonology as a segment that has no specification for place or height features. Since /E/ still has a place and an aperture node, a maximum of two types of features (i.e. place and height) are potentially available for specification of /E/. However, the paradigmatic context narrows these choices. First, as discussed in §5.3.2-§5.3.3, only [coronal] is available for enhancement of an unspecified place node in a 5-vowel inventory such as Pasiego's. In contrast, if the place node is already specified as [peripheral], (i.e. in the case of a back vowel), then the place node can be only be enhanced by the features [labial] and [dorsal]. In the case of /E/, then, enhancement by [coronal] is the only possibility for the unspecified place node, if it contrasts with /O/. As for the aperture node, as discussed in §5.2.4, only the feature [high] is potentially available for enhancement for height. However, Pasiego has a five-vowel inventory, and as argued in §5.2.4, [high] cannot be used as an enhancement feature in such inventories. The paradigmatic context tells us that /E/ in Pasiego can only be enhanced or not be enhanced by the place feature [coronal]. In Pasiego, then, and in any language with the same inventory, /E/ can only be instantiated as mid front [e] (the vowel enhanced for place) or mid central [ə] (the vowel that is unenhanced for place).
Given syntagmatic context, the range of choices for Pasiego narrows even more. In metrically strong positions, /E/ must be enhanced to [e]—there is no choice in metrically strong position. On the other hand, in metrically weak position, /E/ also has the option of being unenhanced, i.e. realized as [ə]. Pasiego, then, has obligatory enhancement for [coronal] in strong metrical position and a choice of whether or not to enhance for [coronal] in weak metrical position. The narrow range of choices available for interpretation of /E/ is made more significant because—given the assumptions argued for in chapter 3—/E/ has a completely underspecified underlying representation. It follows, then, that more completely specified vowels have fewer options for phonetic enhancement. In summary, then, the interpretation of underspecified representations is highly constrained.

5.3.7. Summary

In §5.2 and §5.3, I have proposed and developed a model of phonetic enhancement for place and height features in 3- and 5-vowel inventories. I have also demonstrated that enhancement provides an unambiguous way of phonetically specifying phonologically underspecified representations.

5.4 Interpreting reduced vowels

Phonological rules not only add featural content (as with the spreading of [high], discussed earlier in this chapter), but also delete feature content, as in the case of delinking. In this section, I address the problem of how representations which are made less specified via delinking become phonetically specified through the phonetic process of enhancement. I show that reduction is intrinsically ordered before enhancement in §5.4.1.1. This observation then leads to the possibility that reduction might feed enhancement. I explore the implications of this feeding order in §5.4.1.2 and §5.4.1.3, discussing the examples of Eastern Aragonese-style reduction and
Catalan-style reduction. I then reexamine the problem of the phonetic instantiation of vowels in Pasiego in §5.4.2. I show that the optionality of raising and of enhancement in metrically weak position in Pasiego receives a unified explanation, namely enhancement for [high].

5.4.1. Enhancement vs. reduction

In this section, I use the example of the surface representation [ə] to clarify the relationship between reduction and enhancement. In the literature, [ə] is often analysed as a reduced vowel that may potentially derive from multiple phonological sources via delinking of features from underlying vowels (some examples follow below). However, instead of being derived by delinking of features, I have argued in previous sections that [ə] can also derive from underlying /E/ via the failure to add [coronal] to the phonetic representation. Given just the sound [ə], then, other criteria are needed in order to determine its phonological source(s), i.e. whether reduction or enhancement take place.

Reduction and enhancement differ in the following ways: First, reduction potentially neutralizes contrasts; on the other hand, enhancement has no effect on the number and types of contrasts in a given inventory: instead, enhancement makes contrasts more salient, and lack of enhancement fails to do so. To illustrate, I discuss the phonetic instantiation of [ə] in Catalan and in Standard Spanish. In the examples below, [ə] results from reduction in Catalan and from lack of enhancement in Standard Spanish final vowels. (32) illustrates the process of reduction in Catalan.

(32) Reduction—Catalán (Mascaró 1978):
a. Tonic inventory:  
   i u τ u  
   e o  
   ə a ̃ ə

   Catalan vowel reduction decreases the seven phonemes in tonic position (32.a) to three in atonic position (32.b). In particular, the vowels [e, ə, a] reduce to [ə] in
Catalan. [i] also reduces to [ɪ], and [u,o,ɔ] reduce to [ɔ]. The workings of reduction are partially analysed in (33).

(33) Catalan reduction (height only):\(^{17}\)

```
[ε]     [ɛ]     [a]     [ɔ]
/E/     /Ê/     /A/     [E]
Aperture Aperture Aperture Aperture
     \|     \|     \|     
[low]  [low]  
```

Example (33) focusses on the part of reduction which neutralizes the height of the non-high non-back vowels phonetically realized as [ε,ɛ,a]. (See §5.4.1.1.2 for more detailed discussion of how reduction in Catalan works). As shown in (33), /Ê/ and /A/ are underlyingly low, while /E/ has no height features. Reduction delinks [low] from /Ê/ and /A/. The resulting reduced vowel is non-high, and non-low, i.e. unspecified for height features. This vowel is not enhanced phonetically, and is realized as [ɔ].

In contrast to the Catalan example, however, [ɔ] in Standard Spanish derives from a different source, namely from an underlyingly unspecified vowel which fails to undergo enhancement. As shown in (34), [ɔ] is the phonetic instantiation of unstressed /E/ in word-final position (i.e. the desinence /-E/) in Standard Spanish.

(34) Standard Spanish desinences (unenhanced):

```
Non-desinential vowels:   Desinential vowels:\(^{18}\)

i     u     i     ü
e     o     ɔ     o
a     æ
```

As discussed in chapter 4, Standard Spanish desinences are generally 'colourless':

Navarro Tomás states that in Standard Spanish, the desinences are realized as

---

\(^{17}\) The vowels [e,ɛ] also lose the feature [coronal] when they are fully reduced.

\(^{18}\) The desinences [i] and [u] are marginal, occurring in only a select few words. See Harris (1991) for details.
[i, ə, ɛ, o, ʊ]. These vowels are described as 'transitory' sounds which require less articulatory effort; they tend to easily resolve into other, more stable sounds (Navarro Tomás 1929: 57-61; Monroy Casas 1980: 54-55). Drawing on the discussion in §5.3.2, I assume that the desinences of Standard Spanish have the representations shown in (35.b). (35) also includes the surface representations of non-desinential vowels in (35.a) for comparison.

(35) Standard Spanish final vowels:

a. Non-desinential vowels:  
   i [coronal, high]  
   e [coronal, 0]  
   a [RTR, low]  
   o [peripheral, dorsal, labial, 0]  
   u [peripheral, dorsal, labial, high]

b. Desinential vowels:  
   i [Ø, high]  
   ə [Ø, 0]  
   ɛ [Ø, low]  
   ω [peripheral, Ø, labial, Ø]  
   ʊ [peripheral, Ø, labial, high]

A comparison of the non-final vowels and the final vowels in (35) shows that the final vowels lack a place feature (i.e. [coronal], [RTR], or [dorsal]), while their non-final counterparts possess this feature (the relevant feature/s is/are bolded in (35.a)). Of relevance for this discussion in (34) is that desinential /E/ lacks the enhancement feature [coronal] and is therefore realized as [ə], a mid central vowel. Crucially, however, the desinence [ə] in Standard Spanish still contrasts in height with the high desinence [i]. This example illustrates that enhancement or its lack has no effect on the number and type of contrasts in a given inventory.

In Standard Spanish, then, [ə] results when enhancement fails to apply; crucially, however, the number of contrasts remains unchanged. On the other hand, [œ] is the result of a reduction in the number of underlying contrasts and the failure of

---

19 The final variants [i, ə, o, ʊ] are also carefully distinguished from the open sounds [i], [ɛ], [o] and [u] (Navarro Tomás 1929: 57-61).
enhancement in Catalan. Under the assumption that the ability to affect contrasts is a hallmark of phonological processes, reduction is a phonological process, while enhancement is not. Under the assumption that phonological processes occur before phonetic ones, this means that reduction is intrinsically ordered before enhancement. This latter observation in turn raises the possibility that reduction can feed enhancement. In the following section, I show that reduction can feed the process of enhancement, using several case studies discussed in chapter 4. I show that this feeding order derives some major differences in the phonetic patterning of vowels.

5.4.1.1 The problem of reduction

At first glance, reduction processes seem to present several problems for the claims made in this thesis, in that delinking creates representations which are less specified. However, I show in this section that reduction can feed enhancement, resulting in different surface patterns from the same reduction process. To illustrate the problem and its solution, I discuss and contrast the reduction patterns in Catalan with those of Eastern Aragonese, both of which are summarized in (36).

(36) Two reduction patterns:

<table>
<thead>
<tr>
<th>Language</th>
<th>Tonic Position</th>
<th>Atonic Position</th>
<th>Final Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Catalan</td>
<td>i e o a</td>
<td>i</td>
<td>y</td>
</tr>
<tr>
<td>(Eastern or Common)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Aragonese</td>
<td>i e o</td>
<td>i-e o-u</td>
<td>(i) (u)</td>
</tr>
<tr>
<td>(Eastern)</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

In Catalan (36.a), [i] reduces to a centralized front vowel [j], [e,ε,a] reduce to [ə], and [u,o,ɔ] reduce to the centralized back rounded vowel [υ].20 What is important for the

---

following discussion is that the vowels [i] and [u] are less variable than the vowel [ə], and that [ə] has a wide range of instantiations (Cerdá Massó 1972). This pattern of reduced vowels differs from that of the reduced vowels in Eastern Aragonese.

In Eastern Aragonese (36.b), [i,e] reduce to a vowel that varies between [i] and [e], while [u, o] reduce to a vowel that varies between [u] and [o]. The vowel [a] remains unreduced.

The problem illustrated in (36) is that in both Catalan and Eastern Aragonese, reduction results in a three-vowel subsystem; however, the three-vowel subsystem of Catalan does not pattern like the three-vowel subsystem of Eastern Aragonese. In particular, the non-low vowels in Catalan are relatively invariant, while the non-low vowels of Eastern Aragonese are greatly variant for height. These observations appear to contradict several of the claims made previously. In chapter 2, I claimed that three-vowel inventories generally have the underlying representations /E,A,O/, and in §5.2.3.2 of this chapter, I claimed that true /E,A,O/ inventories should pattern like the Eastern Aragonese example and unlike the Catalan example.

The key to resolving this apparent contradiction is to distinguish between underlying three-vowel inventories /E,A,O/ and derived three-vowel inventories which are created by reduction. I hypothesize that the Eastern Aragonese pattern of reduction creates a derived 3-vowel inventory {E,A,O} which is essentially identical to the underlying /E,A,O/ inventory. On the other hand, the Catalan pattern of reduction creates a derived 3-vowel inventory which has no counterpart in the /E,A,O/ inventory, [ɪ, ə, u]. I compare the representations of underlying 3-vowel inventories with the representations created by the Eastern Aragonese reduction rules below in order to argue for this hypothesis.

5.4.1.1.1. Eastern Aragonese reduction

In an underlying /E,A,O/ inventory, contrastively-determined vowels have the (by now familiar) representations shown in (37).
In chapter 4, and in §5.2.3.2 of this chapter I demonstrated that in inventories such as (37), the non-low vowels, which are unspecified for height, could potentially vary a great deal for height.

Reduction in Eastern Aragonese creates reduced representations which pattern exactly like the /E,A,O/ inventory in (37), as illustrated in (38).

(38) Eastern Aragonese reduction:

a. Underlying inventory:      b. reduced inventory:

\[
\begin{array}{cc}
[\text{high}, \emptyset] & [\text{high, per}] \\
[\emptyset, \emptyset] & [\emptyset, \text{per}] \\
[\text{low}, \emptyset] & [\text{low, } \emptyset]
\end{array}
\]

In Eastern Aragonese, the reduced three-vowel system is created by a rule delinking [high] from underlying representations. The resulting representations—with neutralized mid and high vowels—are illustrated in (38.b). The representations in (38.b) are identical to those in (37), although from different sources. The reduced vowels of Eastern Aragonese also pattern like the vowels in the three-vowel inventory illustrated in (37). In particular, they can undergo enhancement. This observation is illustrated in (5).

(39) Reduction feeds enhancement:

a. Reduced inventory, [\emptyset, \emptyset] unenhanced  [\emptyset, \text{per}]  [\text{low, } \emptyset]

b. Reduced inventory, [\emptyset, \text{cor}] enhanced for place  [\emptyset, \text{per, dors, lab}]  [e]  [o]  [\text{low, } \emptyset, \text{RTR}]

c. Reduced inventory, [\text{high, cor}] enhanced for place and height  [\text{high, per, dors, lab}]  [i]  [u]  [\text{low, RTR}]  [a]
(39.a) illustrates a reduced unenhanced \{E,A,O\} inventory. (39.b) illustrates a reduced \{E,A,O\} inventory that has been enhanced for place only, giving \[e,a,o\]. The enhancement features are bolded in (39). (39.c) illustrates a reduced \{E,A,O\} inventory that has been enhanced for place and height, giving \[i,a,u\]. Example (39) shows that when reduction feeds enhancement, reduced \{E,A,O\} inventories pattern like underlying /E,A,O/ inventories. In particular, the representations E and O can vary for height within the front and back vowel range, being instantiated as \[i,a,u\] or \[e,a,o\], just like underlying /E,A,O/ inventories.\(^{21}\)

In summary, the Eastern Aragonese examples show that reduction can create an inventory which has the same representations as an underlying /E,A,O/ inventory. However, there is no a priori reason why reduction must operate as it does in Eastern Aragonese. Reduction in Eastern Aragonese only delinks height features. Since vowels also have place features, it is possible that reduction could neutralize place contrasts as well, creating a derived inventory which is dissimilar to the /E,A,O/ inventory. I show in §5.4.1.1.2 that this is the case in Catalan.

### 5.4.1.1.2. Catalan reduction

The process of reduction in Catalan is much more complex than the Eastern Aragonese case. In previous sections, I discussed a common analysis of reduction in Catalan which assumes that Catalan reduction is 2-stage. See (36) for details. However, Mascaró (1978) argues for an intermediate stage of reduction, giving three stages. I describe these three stages of reduction in terms of the metrical positions in which Catalan vowels occur in (40). An additional stage shown in (40.c) is commented on shortly.

---

\(^{21}\) Example (39) is an apparent violation of the Contrastiveness Exclusivity Principle (§5.2.4.5) in that the feature [high], which is contrastive for 5-vowel inventories such as that of Aragonese, is also being used for enhancement purposes. I resolve this apparent problem in §5.4.1.2.
Reduction in Catalan:

a. Main stress  
b. Abstract  
c. Unstressed  
d. Unstressed, Secondary Stress  
      Balearic Islands  
      Common Catalan

\[
i \quad u \quad i \quad u \quad i \quad u \quad \tilde{u} \\
e \quad o \quad e \quad o \quad \tilde{e} \quad \tilde{e} \quad a
\]

(40.a) summarizes the inventory of vowels found in main stress position in Common Catalan. (40.b) illustrates the phonetic implementation of vowels which occur under abstract secondary stress in Catalan, as argued by Mascaró (1978). A morphological peculiarity of Catalan is that [a] never occurs under secondary stress in Catalan, at least in none of the crucial examples cited by Mascaró (1978) as evidence for secondary stress; [a] only occurs under main stress, or as [\v] in unstressed position. (40.c) illustrates the phonetic implementation of unstressed vowels in many dialects of Catalan spoken on the Balearic islands (Badia i Margarit 1988: 43). I include this step because it is intermediate between (40.b) and (40.d), the Common Catalan pattern. Finally, (40.d) illustrates the phonetic implementation of unstressed vowels in Common Catalan.

I hypothesize that the surface realizations in (40) are not actually derived from one process of reduction, but rather from a complex combination of reduction and enhancement. My analysis is illustrated in (41). The enhancement features are bolded. Delinked features are crossed out.
(41) Catalan reduction:

a. Underlying inventory:

<table>
<thead>
<tr>
<th>phonetic</th>
<th>underlying</th>
<th>phonetic realization</th>
</tr>
</thead>
<tbody>
<tr>
<td>[hi,hØ]</td>
<td>[hi,per]</td>
<td>see (41.b-e)</td>
</tr>
<tr>
<td>[Ø,Ø]</td>
<td>[Ø,per]</td>
<td></td>
</tr>
<tr>
<td>[lo,cor]</td>
<td>[lo,Ø]</td>
<td>[lo,per]</td>
</tr>
</tbody>
</table>

b. Main stress vowels; enhance with [coronal], [labial], [dorsal]:

<table>
<thead>
<tr>
<th>phonetic</th>
<th>underlying</th>
<th>phonetic realization</th>
</tr>
</thead>
<tbody>
<tr>
<td>[hi,cor]</td>
<td>[hi,per,lab,dors]</td>
<td>i u</td>
</tr>
<tr>
<td>[Ø,cor]</td>
<td>[Ø,per,lab,dors]</td>
<td>e o</td>
</tr>
<tr>
<td>[lo,cor]</td>
<td>[lo,Ø]</td>
<td>[lo,per,lab,dors]</td>
</tr>
</tbody>
</table>

c. Abstract secondary stress vowels; delink [low], enhance with [coronal], [labial], [dorsal]:

<table>
<thead>
<tr>
<th>phonetic</th>
<th>underlying</th>
<th>phonetic realization</th>
</tr>
</thead>
<tbody>
<tr>
<td>[hi,cor]</td>
<td>[hi,per,lab,dors]</td>
<td>i u</td>
</tr>
<tr>
<td>[Ø,cor]</td>
<td>[Ø,per,lab,dors]</td>
<td>e o</td>
</tr>
<tr>
<td>[lo,cor]</td>
<td>[lo,cor]</td>
<td>[lo,per,lab,dors]</td>
</tr>
</tbody>
</table>

d. Unstressed vowels in Balearic island dialects; delink [low]; delink [coronal]; no [coronal] enhancement; enhance with [labial], [dorsal]:

<table>
<thead>
<tr>
<th>phonetic</th>
<th>underlying</th>
<th>phonetic realization</th>
</tr>
</thead>
<tbody>
<tr>
<td>[hi,Ø]</td>
<td>[hi,per,lab,dors]</td>
<td>i u</td>
</tr>
<tr>
<td>[Ø,Ø]</td>
<td>[Ø,per,lab,dors]</td>
<td>e o</td>
</tr>
<tr>
<td>[lo,cor]</td>
<td>[lo,Ø]</td>
<td>[lo,per,lab,dors]</td>
</tr>
</tbody>
</table>

e. Unstressed vowels in Common Catalan; delink [low], [high]; delink [coronal]; [high] enhancement for back vowels; no [coronal], [dorsal] enhancement:

<table>
<thead>
<tr>
<th>phonetic</th>
<th>underlying</th>
<th>phonetic realization</th>
</tr>
</thead>
<tbody>
<tr>
<td>[hi,hi,Ø]</td>
<td>[hi,hi,per,lab]</td>
<td>i u</td>
</tr>
<tr>
<td>[Ø,Ø]</td>
<td>[hi,per,lab]</td>
<td>e o</td>
</tr>
<tr>
<td>[lo,cor]</td>
<td>[lo,Ø]</td>
<td>[lo,hi,per,lab]</td>
</tr>
</tbody>
</table>

The underlying inventory of Catalan is illustrated in (41.a). Recall from chapter 2 that the vowels [ɛ] and [ɔ] in 7-vowel inventories are low vowels, distinguished from [a] via the underlying place features [coronal] and [peripheral]. (41.b) illustrates the fully enhanced inventory which occurs under main stress; vowels are enhanced by the features [coronal] and [labial]. (41.c) illustrates two phenomena. One process is reduction, which delinks the feature [low]. The other process is enhancement by [dorsal], [coronal] and [labial], which is identical to the process shown in (41.b). As shown in (41.c), the combination of reduction and enhancement produces the secondary-stress representations shown in (40.b), namely [i,e,o,u]. The derivation in
(41.c) also implies that if underlying /A/ occurs in this position, it is both reduced to [ə] and then enhanced to [e]. However, I have not been able to verify or falsify this prediction.\footnote{The evidence that would verify this prediction would be if underlying /A/ is realized as [e] in the abstract secondary stress environment defined in Mascaró (1978).}

Example (41.d) illustrates the phonetic implementation of unstressed vowels in the Balearic Island dialects. In order to produce the phonetic forms, first reduction applies to delink [low]; in addition, reduction delinks [coronal] from the underlying representation of /È/; then enhancement by [labial] and [dorsal] applies. Finally, as shown in (41.e), unstressed vowels in Common Catalan are further simplified so that there is no distinction between mid and high back vowels; this is accomplished by reducing back vowels and then enhancing them for [high].

While the derivations in (41) seem complicated, a common thread unites the various permutations. Recall from Chapter 3,§3.2.2 that in Spanish, metrical positions differ in the amount of complexity they can support; in particular, main stress position supports more complex structure than secondary stress position, and the latter supports more complex structure than unstressed position. I argue that the same type of complexity facts also hold in Catalan. An analysis of Catalan based on complexity is illustrated in (42).

(42) Complexity in Catalan:

<table>
<thead>
<tr>
<th></th>
<th>Main stress</th>
<th>Secondary stress</th>
<th>Unstressed, Balearic</th>
<th>Unstressed, Common Catalan</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>[high]</td>
<td>[high]</td>
<td>[high]</td>
<td>[high]</td>
</tr>
<tr>
<td>b.</td>
<td>[peripheral]</td>
<td>[peripheral]</td>
<td>[peripheral]</td>
<td>[peripheral]</td>
</tr>
<tr>
<td>c.</td>
<td>[coronal]</td>
<td>[coronal]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>[low]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in (42) both reduction and enhancement conspire to meet complexity requirements. The features [high] and [peripheral] are supported in any metrical
position in Catalan (42.a,b). (However, Belearic island dialects do not have a process of enhancement for [high] of the back vowels). The feature [coronal] occurs only under some degree of stress (either main or secondary) as shown in (42.c). Finally, the feature [low] is supported only in main stress position (42.d).

An examination of the representations in (41) shows that eliminating the features [low], and then [coronal] serves the function of eliminating most of the complexity in Catalan representations. This is why [low] and [coronal] only appear under a main or secondary stress, where complexity is allowed. In Catalan, then, complexity requirements are met through a combination of a) reduction or delinking of features in the phonology, and b) failing to add features (i.e. failure to enhance) in the phonetic component under complexity conditions.

5.4.1.1.3. Summary

In summary, then, Catalan and Eastern Aragonese have different types of complexity requirements, which result in dissimilar, reduced three-vowel subsystems. In addition, Catalan and Eastern Aragonese diverge in the manner in which they enhance reduced vowels. The differences between Catalan and Eastern Aragonese are illustrated in (43), which compares the features which are allowed in main and unstressed position in Catalan and in Eastern Aragonese.
(43) Comparison of complexity in two languages:

a. Complexity in Catalan:

<table>
<thead>
<tr>
<th>Main stress</th>
<th>Secondary stress</th>
<th>Unstressed, Balearic</th>
<th>Unstressed, Common Catalan</th>
</tr>
</thead>
<tbody>
<tr>
<td>[high]</td>
<td>[high]</td>
<td>[high]</td>
<td>[high]</td>
</tr>
<tr>
<td>[peripheral]</td>
<td>[peripheral]</td>
<td>[peripheral]</td>
<td>[peripheral]</td>
</tr>
<tr>
<td>[coronal]</td>
<td>[coronal]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[low]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Complexity in Eastern Aragonese:

<table>
<thead>
<tr>
<th>Main stress</th>
<th>Unstressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>[high]</td>
<td></td>
</tr>
<tr>
<td>[low]</td>
<td>[low]</td>
</tr>
<tr>
<td>[coronal]</td>
<td>[coronal]</td>
</tr>
<tr>
<td>[peripheral]</td>
<td>[peripheral]</td>
</tr>
</tbody>
</table>

As shown in (43), Catalan and Eastern Aragonese both support more complexity in main stress position than elsewhere. However, Catalan and Eastern Aragonese have radically different means for reducing complexity, means which are partially predictable from the types of inventories which each language has. For example, Catalan delinks [low] as the most effective way of simplifying complex representations. However, Eastern Aragonese does not have the complex low vowels [ɛ, ɔ] that Catalan has, and therefore delinking [high], rather than [low], seems the logical place to start.

The net result of the interaction of reduction and enhancement is to create derived non-low vowels with different phonetic patterning. In the Catalan example, the non-low vowels are relatively invariant; however in the Eastern Aragonese example, the non-low vowels vary for height. From the above examples, then, we see that the interpretation of underspecified reduced vowels is predictable from two types of rules, reduction and enhancement.
5.4.1.2 Interpreting reduced and unreduced vowels in the same domain

The Eastern Aragonese example of reduction raises a potential problem for the Contrastiveness Exclusivity Principle (21) which requires further comment. I illustrate this problem in (44), which reviews the analysis of Eastern Aragonese reduction presented in 4.1.2.1.

(44) Interpretation of vowels within the same domain

<table>
<thead>
<tr>
<th></th>
<th>tonic vowels</th>
<th>atonic vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Aragonese (Eastern)</td>
<td>i e u o a - i-e o-u</td>
</tr>
<tr>
<td>b.</td>
<td>[high,Ø] [Ø,Ø] [low,Ø]</td>
<td>[high, per] [Ø,per] [low,Ø]</td>
</tr>
</tbody>
</table>

As illustrated in (44), in Eastern Aragonese, the vowel /E/ is realized as [e] when the number of vowels in a given position is five, and as [i-e] when the number of vowels in a given position is three. In §5.2.4, I argued that the variation between [i-e] was derived via enhancement or lack of enhancement for [high].

At first glance, the enhancement of /E/ by [high] appears to violate the CEP, which is repeated below for convenience.

(21) Contrastiveness Exclusivity Principle (CEP): Features which are contrastive cannot also be enhancement features within their class.

As worded in (21), the CEP predicts that use of [high] for enhancement in Eastern Aragonese should be ruled out. This is because Eastern Aragonese has a 5-vowel /I,E,A,O,U/ inventory, and the feature [high] is contrastive in this inventory. The answer to this apparent problem is that the feature [high] is predictable in weak metrical positions in Eastern Aragonese, and therefore the CEP can be relativized to another paradigmatic domain, that of metrical position. I explain this line of reasoning in more detail below.
Recall from chapter 3 that metrical positions define a type of paradigmatic domain, i.e. a domain in which a particular type of inventory typically occurs. As illustrated in (45), reduction in Eastern Aragonese predictably delinks [high] from vowel representations in weak metrical position.

\[(45)\] Reduction in Eastern Aragonese

\[
\begin{array}{ccc}
* & * & * \\
I & E & A \\
\text{Aperture} & \text{Aperture} & \text{Aperture} \\
\text{\textbackslash} & | & \text{[low]} \\
\text{[high]} & \\
\end{array}
\]

The rule of reduction in (45) provides causes the feature [high] to be predictably non-contrastive in weak metrical position. If the CEP is relativized to domains such as metrical position as well, then, enhancement by [high] in Eastern Aragonese does not contradict the CEP.

Given this definition, the CEP can be revised as in (46) to reflect the fact that it is relativized to various paradigmatic domains.

\[(46)\] Contrastiveness Exclusivity Principle (CEP) revised: Features which are contrastive cannot also be enhancement features within a given paradigmatic domain.

The revised CEP in (46) incorporates the idea that enhancement features are essentially predictable features. It also incorporates the idea that phonetic enhancement is sensitive to various levels of paradigmatic context. The paradigmatic contexts to which the CEP are relativized include those in (47). See Steriade (1993) and Dresher and van der Hulst (1993) for further discussion of such paradigmatic contexts.
(47) Paradigmatic contexts:

a. Aperture
   | Inventory or class
   | [high]

b. line 0
   * Inventory within a given metrical position
   V
   | Ap
   | [high]

c. Dependent
   * Inventory within a more broadly-defined paradigmatic domain
   V
   | Ap
   | [high]

As shown in (47.a), the CEP can be viewed as applying within the paradigmatic domain of a given inventory in general or a vowel class in particular, such that, for example, a bare Aperture node is enhanced by the feature [high]. In other words, the feature [high] is predictable in the inventory or class shown in (47.a). (47.b) illustrates that the CEP can be relativized to a more broadly defined paradigmatic domain within which [high] is predictable, namely metrically weak position. (47.b) also graphically illustrates the similarity to the paradigmatic domain in (47.a); these two examples differ only in the amount of structure to which the CEP refers. Finally, (47.c) illustrates a hypothetical example, namely the relativization of the CEP to a more broadly-defined domain within which [high] is predictable. The dotted line in (47.c) indicates an undetermined amount of intermediate structure. Some examples of languages which refer to this type of domain include the 'mid-harmony' languages discussed in §5.2.4.3. Recall that in 'mid-harmony' languages, [high] is predictable in suffixes, but unpredictable in stems. I assume, following Dresher and van der Hulst
(1993), that stems are heads while suffixes are dependents. However, the level at which these heads and dependents are defined must be some higher level of morphological or syntactic constituency. Defining this level is not really the issue here; the important point is that in 'mid-harmony' languages, [high] is predictable in a very broadly defined domain, which can be described as involving a lot of vertical structure for context.

In summary, I assume that the CEP can be relativized to any paradigmatic domain; features can only be used for enhancement purposes in paradigmatic contexts within which they are predictable, i.e. within which they are not used contrastively.

5.4.2. Pasiego pretonic raising revisited

The discussion in §5.4.1.2 provides the background for an analysis of raising of /E,O/ in pretonic syllables in Pasiego, a topic introduced in chapter 2, §2.5.4. I present this analysis below.

5.4.2.1 A reanalysis of pretonic raising

As discussed in chapter 3, §3.2.3.4, I make a distinction between two types of raising in Pasiego. The type of raising referred to as metaphony in chapters 2 and 3 is triggered by desinences and targets main stress vowels. I refer to this process as tonic raising. On the other hand, the type of raising discussed in this chapter is described in the literature as being triggered by main stress vowels and targetting pre-main-stress vowels. I refer to this process as pretonic raising. I argue below that tonic raising is obligatory while pretonic raising is optional. I then argue that pretonic raising should be reanalysed as optional enhancement for [high], i.e. as a phonetic process rather than a phonological process.

5.4.2.1.1 Obligatory tonic raising

There are literally thousands of examples illustrating that tonic raising is obligatory. An example of this process is shown in (48) for illustration.
(48) Example of raising in head position:

a. /gOrd+U/ [gúrdu]'fat, m.s.'

b. Raising:

\[
\begin{array}{c}
\text{line 2} & * \\
\text{line 1} & (*) \\
\text{line 0} & (*) \\
\end{array}
\]

\[
\begin{array}{c}
\text{h} & \text{d} \\
\text{gOr} & \text{dU} \\
\end{array}
\]

[high]

As shown in (48), raising occurs when a dependent vowel (d) has more complex structure than a head vowel (h). Raising causes underlying /O/ in /gOrdU/ to be realized as [u].

There are approximately 14 exceptions to tonic raising, which fall into two classes. The first class of exceptions consist of diphthongs in head position which incompletely raise to [je] and [we] (with a very close mid vowel) rather than to [ji] (with a slightly lowered high vowel) and [wi] (with a high vowel) (Penny 1969: 63).

(49) Disharmonic forms in which the tonic vowel does not undergo harmony:

<table>
<thead>
<tr>
<th>Phonetic forms from Penny (1969)</th>
<th>Glosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>a [yé]rnu</td>
<td>son-in-law</td>
</tr>
<tr>
<td>b [jé]lu</td>
<td>sky</td>
</tr>
<tr>
<td>c [wé]ku</td>
<td>wooden shoe</td>
</tr>
<tr>
<td>d g[wé]rtu</td>
<td>vegetable garden</td>
</tr>
<tr>
<td>e ru[je]gu</td>
<td>weed-infested</td>
</tr>
<tr>
<td>f de[je]gu</td>
<td>pimply</td>
</tr>
<tr>
<td>g lamos[je]gu</td>
<td>swampy</td>
</tr>
</tbody>
</table>

As shown in (49), the tonic diphthongs /je/ and /we/ sometimes undergo only partial raising. However, because the difference between the less-raised variants and the more-raised variants is slight (i.e. because a very close mid vowel is phonetically
similar to a lowered high vowel), I analyse examples such as (48) as raised—i.e. unexceptional—diphthongs. In essence, then, I do not think that Penny's (1969) distinction between 'raised' and 'incompletely raised' diphthongs is phonologically significant.

The remaining examples of failure to raise in head position are shown in (50):

(50) Failure to raise in head position:

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>éin word used for calling pigs</td>
</tr>
<tr>
<td>b</td>
<td>móstru a very large person</td>
</tr>
<tr>
<td>c</td>
<td>óču eye</td>
</tr>
<tr>
<td>d</td>
<td>ispíxu de médja líña pane, eyeglass</td>
</tr>
<tr>
<td>e</td>
<td>mónstru monster</td>
</tr>
<tr>
<td>f</td>
<td>graθjósu gracious</td>
</tr>
<tr>
<td>g</td>
<td>nóčə night</td>
</tr>
</tbody>
</table>

The above forms are simply exceptions to the rule of metaphony. I suggest that these exceptions are the result of influence from Standard Spanish: Penny indicates that "In the speech of the Pasiegos who still use the old dialect, metaphony can be heard in any word ending with [-u:], even in the terms of most recent borrowing." (1969: 61; my translation and italics). The exceptions in (50) constitute only 0.075% of the words in the Pasiego dictionary to which metaphony can apply. This means that there are essentially no exceptions to raising in main stress position.

5.4.2.1.2. Exceptions to pretonic raising

On the other hand, there are many exceptions to pretonic raising. These exceptions account for approximately 2.4% of the words in the Pasiego dictionary, and fall into the classes outlined below.

23 The calculations are the following: The entire database consists of 6024 words; in approximately 80 percent of these words, the conditions for metaphony are met (this is an optimistic estimate).
Verbal prefixes: Many of the exceptions to raising involve a specific group of prefixes, namely the verbal prefixes /rE-/ /dEs-/ /trEs-/ /En-/. These prefixes can be realized as the vowel [i], [e ~ ə] or [a], regardless of the height of the tonic vowel.

Word-initially before nasals, and word-initially before 's + stop' clusters: The sole vowel that occurs in this environment displays free variation for height, being realized as [i], [e], or [a] regardless of the height of the tonic vowel. This phenomenon has been previously discussed in McCarthy (1984) and Spencer (1986).

The penults of antepenultimately-stressed words: These stem vowels display another type of pattern, namely invariance. The penults of antepenultimately-stressed words have a phonetic inventory of three vowels, namely [i], [a], [u]. Note that the vowels [e] and [o] are absent.

Unstressed stem vowels: Pretonic, unstressed stem vowels display several patterns which are exceptions to the rule of pretonic raising: 1) underlying pretonic mid vowels can be realized as either mid or high before stressed high vowels; in other words, raising before stressed high vowels is optional; 2) unstressed stem mid vowels can optionally raise to high, even when the stressed vowel is non-high; in other words, raising occurs where pretonic raising does not predict it to occur; and 3) underlying high vowels can lower to mid before non-high stressed vowels (there are fewer examples of this type of pattern than of the first two patterns).

This outline of the exceptional patterning of Pasiego pretonic vowels illustrates that positing a phonological rule of pretonic raising fails to account for the full range of phonetic realization of unstressed pretonic vowels. In the following sections, I present a reanalysis of Pasiego pretonic vowels that accounts for their total range of patterning. In each section, I discuss the relevant vowel inventory, and how that inventory is phonetically realized.

Number of words with metaphony (approximately 80%): 6024*0.8 = 4819.2
Percentage of words with disharmonic pretonic vowels: [117/4819]*100=2.4
Percentage of words with disharmonic tonic vowels: (7/4819)*100=0.15
5.4.2.1.3. Evidence for a reduced inventory in the prefixes

As outlined above, the verbal prefixes make up a class consisting of /rE-/,
/dEs-/ /trEs-/, and /En-/. These prefixes are essentially the only prefixes in Pasiego,
as nominal prefixes in Pasiego are moribund (Penny 1969: 103). Based on the latter
observation and on comparative evidence from related Spanish dialects, I assume that
the verbal prefixes also form a special class equivalent to level 2 or word-level
prefixes. I assume that the verbal prefixes occur in the environment shown in (51),
attaching to a prosodic word. 'ω' denotes the edge of a prosodic word.

(51) Paradigmatic context of verbal prefixes:

a. ω[ re ω[ spondér ] ]

b. ω[ /E/ ω[ ] ]

The environment in (51.a) qualifies as a paradigmatic context in which only
the vowel /E/ occurs, as shown in (51.b). It is in this paradigmatic context—i.e where
only one vowel occurs, or where there are no height contrasts—that variation for
height is attested, as shown below.

5.4.2.1.3.1. The prefixes /dEs-/ and /rE-/ 

The phonetic realization of the prefixes /dEs-/ and /rE-/ has the following
characteristics: a) in these prefixes the distribution of high variants of /E/ cannot be
predicted by the phonological rule of pretonic raising discussed earlier; and b) that the
patterning of these prefixes can, on the other hand, be explained by the interaction

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24 Penny (1969: 142) also includes /sO-/ and /A-/ in the inventory of verbal
prefixes. /sO-/ is only attested in two verbs (ibid.), and I do not include this
prefix as part of the verbal prefix inventory because it is so uncommon. I also
exclude the prefix /A-/ because this prefix consistently adds no meaning to the
verb it is added to (Penny 1969: 140). On these grounds, I argue that /A-/ is a
moribund prefix that has been reanalysed as part of the verb to which it attaches.
between the number of phonemes in a given inventory and their phonetic realization, i.e. via the interaction of phonetic enhancement and the CEP.

Examples (52)-(53) show the phonetic realization of the prefixes /dEs-/ and /rE-. The prefixes are highlighted by means of square brackets.

(52) The vowel in the prefix /dEs-/:  

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>[dis]kubrír</td>
</tr>
<tr>
<td>b</td>
<td>[dis]nugásø</td>
</tr>
<tr>
<td>c</td>
<td>[des]akupár</td>
</tr>
<tr>
<td>d</td>
<td>[des]agurío</td>
</tr>
<tr>
<td>e</td>
<td>[døs]miðír</td>
</tr>
</tbody>
</table>

The regular patterning of /dEs-/ as described in Penny (1969) and Hualde (1989) is as follows: First, as shown in (52.a), if the main-stress vowel is high, the vowel of the prefix /dEs-/ also raises to high. Second, as shown in (52.c), if the main stress vowel is non-high, the vowel of the prefix /dEs-/ is realized as [e].

However, a comparison of all the examples in (52) illustrates that, against Penny's and Hualde's analysis, the height of /E/ is independent of the height of the main stress vowel. (52.a,b) illustrate that underlying /E/ can be realized as [i] whether the stressed vowel is low or high. (52.c,d) illustrate that /E/ can be realized as [e] whether the stressed vowel is low or high. Finally, (52.e) illustrates that /E/ can be realized as non-high [ɑ] even when the stressed vowel is high. The examples in (52) illustrate that the phonetic realization of /E/ in the prefix /dEs-/ cannot be explained by the application or non-application of raising. Instead, (52) illustrates that the vowel /E/ in /dEs-/ can be realized anywhere within the non-low range, regardless of the height of the tonic vowel.

The prefix /rE-/ illustrates the same phenomenon, as shown in (53).
The vowel in the prefix /rE-/:  

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a [ri]bwíltu</td>
<td>turned over</td>
</tr>
<tr>
<td>b [ri]bosiyar</td>
<td>to gust</td>
</tr>
<tr>
<td>c [re]spóndér</td>
<td>respond</td>
</tr>
<tr>
<td>d [re]struíða</td>
<td>type of fight among animals</td>
</tr>
<tr>
<td>e [re]swíñu</td>
<td>happy</td>
</tr>
<tr>
<td>f [rə]spíxón</td>
<td>a frisky animal</td>
</tr>
</tbody>
</table>

The regular patterning of /rE-/ as described in Penny (1969) and Hualde (1989) is as follows: First, as shown in (53.a), if the main-stress vowel is high, the vowel of the prefix /rE-/ also raises to high. Second, as shown in (53.c), if the main stress vowel is non-high, the vowel of the prefix /rE-/ is realized as [e]. However, a comparison of all the examples in (53) illustrates that the height of the vowel of the prefix /rE-/ is independent of the height of the main stress vowel: examples (53.a,b) illustrate that underlying /E/ can be realized as [i], regardless of the height of the main stress vowel. (53.c,d) illustrate that underlying /E/ can be realized as [e], regardless of the height of the main stress vowel. (53.e,f) illustrate that underlying /E/ can be realized as [o] regardless of the height of the main stress vowel. The examples in (53) thus show that the vowel /E/ in /rE-/ can be realized anywhere within the non-low range.

The phonetic patterning of /E/ in the prefixes /rE-/ and /dEs-/ cannot be derived from pretonic raising, since non-high variants occur in a raising context, and high variants occur in a non-raising context. Instead, the patterning of /E/ in the prefixes /rE-/ and /dEs-/ must be derived from the operation of enhancement. My enhancement analysis for the verbal prefixes is illustrated in (54). (I unify the analysis of enhancement by [high] developed here, and the analysis of enhancement by [coronal] developed in §5.3.5.)
(54) Enhancement of /E/ in the verbal prefixes:
   a. Inventory in the verbal prefix paradigmatic domain: /E/
   b. Enhancement of /E/ by [coronal] [e] [respondér, restrúlíða]
   c. Lack of enhancement of /E/ by [coronal] [ɔ] [ræswíðu, ræspíxón]
   d. Enhancement of /E/ by [coronal, high] [i] [ribwíltu, ribosíyár]

(54.a) lists the inventory /E/ which occurs in the verbal prefix paradigmatic domain illustrated in (51.a). (54.b) illustrates enhancement by [coronal] alone, which results in the prefix [re]. (54.c) illustrates lack of enhancement, which results in the prefix [rɔ]. (54.d) illustrates enhancement by [coronal] and [high], which results in the prefix [ri]. As shown in (54) the variation of the prefix /rE-/, and by extension of /dEs-/, is predictable from enhancement. The pretonic raising rule, on the other hand, makes incorrect predictions about forms such as [ræswíðu, ribosíyár], in which the height of the prefix /rE-/ is independent of the height of the main stress vowel.

According to the CEP, it should also be possible to enhance the vowel /E/ occurring in the verbal prefix domain with the feature [low], which is non-contrastive in this type of single-vowel inventory. There are no attested examples to confirm or disconfirm this prediction for the prefixes /dEs-/ and /rE-/. However, the prefixes /trEs-/ and /En-/ display this type of pattern, as shown below.

5.4.2.1.3.2.1. The prefix /trEs-/

Example (55) illustrates the phonetic realization of the prefix /trEs-/

(55) Variation for height of /trEs-/

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>[tras]nočár</td>
</tr>
<tr>
<td>b.</td>
<td>[tres]nočár</td>
</tr>
<tr>
<td>c.</td>
<td>[tras]lapár</td>
</tr>
<tr>
<td>d.</td>
<td>[tres]lapár</td>
</tr>
<tr>
<td>e.</td>
<td>[tras]plantár</td>
</tr>
<tr>
<td>f.</td>
<td>[tres]plantár</td>
</tr>
<tr>
<td>g.</td>
<td>[tris]kilár</td>
</tr>
</tbody>
</table>

The prefix /trEs-/ varies anywhere from low [a] to mid [e] to high [i]. The vowel /E/ in /trEs-/ varies for height in the manner expected if /E/ is analysed as being enhanced for height features, i.e. [high] or [low], and by the place feature [coronal]:
As shown in (56), enhancement by [high, coronal] gives the [i] variant, and enhancement by [coronal] alone gives the [e] variant. Enhancement by [low] alone results in the [a] variant of /E/.

5.4.2.1.3.2.2. The prefix /En-/ and word-initially before nasals

Example (57) shows the variation for height of /E/ in an environment which includes that of the prefix /En-. This environment can be described as 'word-initially before a nasal.' See McCarthy (1984) and Spencer (1986) for discussion of variation in this environment.

(57) Word-initial /E/ preceding a nasal:

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>[a]mfõru nickname</td>
</tr>
<tr>
<td>b</td>
<td>[i]mfõru nickname</td>
</tr>
<tr>
<td>c</td>
<td>[a]nántaos before</td>
</tr>
<tr>
<td>d</td>
<td>[e]nántaos before</td>
</tr>
<tr>
<td>e</td>
<td>[a]ngwédã 1-2 year-old she-goat</td>
</tr>
<tr>
<td>f</td>
<td>[e]ngwédã 1-2 year-old she-goat</td>
</tr>
</tbody>
</table>

As shown in (57), underlying /E/ can be realized as [a], [e], or [i] word-initially before a nasal. McCarthy (1984), Penny (1969) and Spencer (1986) argue that any vowel that appears word-initially before a nasal displays free variation. I argue, on the other hand, that word-initially before a nasal, only one vowel occurs phonologically in Pasiego. Recall from the discussion in §5.4.1 that an inventory with only one vowel has no underlying features. Given this assumption, it is not surprising that this
vowel, designated as /E/, can be instantiated as a vowel of any height; this vowel exists in a position where there are no height contrasts, and so it is free to vary for height. The variation of /E/ in the environment shown in (57) is a consequence of enhancement for [high, coronal], giving [i]; for [coronal] alone, giving [e]; and for [low], giving the vowel [a]. (See (56) for representations.)

5.4.2.1.3.2.3. Word-initially before an s+stop cluster

Another example of free variation is shown in (58), where /E/ varies as [i,e,a] in initial position before /s/ plus stop clusters. (This type of variation is also discussed in McCarthy (1984), Penny (1969), and Spencer (1986).)

(58) Examples of variation within a single lexeme containing the initial grouping /Es+stop/:

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>[a]skwéla school</td>
</tr>
<tr>
<td>b</td>
<td>[e]skwéla school</td>
</tr>
<tr>
<td>c</td>
<td>[i]skwéla school</td>
</tr>
<tr>
<td>d</td>
<td>[a]skučár to listen to</td>
</tr>
<tr>
<td>e</td>
<td>[i]skučár to listen to</td>
</tr>
<tr>
<td>f</td>
<td>[a]skondér to hide</td>
</tr>
<tr>
<td>g</td>
<td>[e]skondér to hide</td>
</tr>
<tr>
<td>h</td>
<td>[a]skína edge, corner</td>
</tr>
<tr>
<td>i</td>
<td>[a]skjár to ski</td>
</tr>
<tr>
<td>j</td>
<td>[a]skuťina rasp, plane</td>
</tr>
<tr>
<td>k</td>
<td>[a]spardér to scatter</td>
</tr>
<tr>
<td>l</td>
<td>[a]stíya cut firewood</td>
</tr>
<tr>
<td>m</td>
<td>[a]stónťas then</td>
</tr>
<tr>
<td>n</td>
<td>[a]strinkár to insist</td>
</tr>
<tr>
<td>o</td>
<td>[e]stár to be</td>
</tr>
<tr>
<td>p</td>
<td>[i]stár to be</td>
</tr>
</tbody>
</table>

As an example of this variation, (58.a-c) illustrate that /E/ can be realized as, [a], [e], or [i] in the same lexeme, /EskwEla/ school.

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25 A related question is why this vowel /E/, if the only vowel in a given position, cannot be enhanced for the feature [peripheral]. An answer to this question would perhaps also answer the question of why epenthetic vowels generally draw from the non-back vowel set.
The vowel before word-initial /s/ plus stop clusters in Spanish is analysed as an epenthetic vowel (Harris 1983). Given the epenthesis analysis, it is not surprising that the featureless vowel /E/ is the vowel that appears in this position (cf. Archangeli 1984, Itô 1989).

The data in (57) and (58) illustrate that 'word-initially before a certain consonant' is an important paradigmatic environment in Pasiego. In this environment, only /E/ can appear. In my analysis, this vowel varies all across the height range because it does not contrast with any other vowel in word-initial position.

5.4.2.1.3.2.4. Evidence for a restricted inventory in the penult of antepenultimately-stressed words.

In this section and following, I turn to the patterning of stem vowels. One aspect of the patterning of stem vowels, that of the penults of antepenultimately-stressed words, can be readily explained by the interaction between inventories and phonetic enhancement. (On the other hand, the patterning of pretonic stem vowels, minus the cases already discussed above, requires further discussion which I undertake in §5.4.2.2.)

Examples (59) - (61) list all the antepenultimately-stressed words in Penny's (1969) dictionary. (59) shows antepenultimately-stressed words ending with the phonologically high desinence /U/ ([u]).
(59) The penults of antepenultimately-stressed words ending with [-u]:

a. [-u] desinence, [i] in the penult:

- simpát[i]ku: nice
- pláit[i]ku: the second level of reader (book) in school
- sát[i]mu: seventh
- pólp[i]tu: lip of a jar
- ábr[i]gu: the south wind
- antigw[i]mu: very old
- frját[i]ku: very sensitive to cold
- řiřját[i]ku: very sensitive to cold

b. [-u] desinence, [a] in the penult:

- sáb[a]du: Saturday
- kánt[a]ru: pitcher, jug
- ká[r]bu: small boat, scarab
- plát[a]nu: plantain
- tá[b]a[nu]: horsefly
- řáb[a]nu: radish
- řág[a]nu: cranberry
- řář[a]ru: tartamudo
- tář[a]nu: grain stalk
- bál[a]gu: lightness
- kwé[b]a[nu]: basket, hamper
- řelámp[a]gu: esparagus
- lá[t]a[gu]: wooden neckband to hang a cowbell from
- islá[p]a[gu]: esparagus
- múrjá[p]a[gu]: bat (animal)
- múrjá[p]a[gu]: bat (animal)
- gwéř[a]nu: orphans
- gwéř[a]nu: orphan
- nán[a]gu: lución (type of reptile)
- páx[a]ru: bird
- deská[p]a[lu]: scandal
- eská[p]a[lu]: scandal
- pá[p]a[du]: fingertip (the side with the fingerprint)
- pá[p]a[du]: eyelid

The above words ending with the desinence [-u] have either [i] or [a] in the penult. Given the limited surface inventory in the penult, and especially given the absence of mid [e,o], one might wish to posit a process of raising triggered by desinential [-u] and targetting the penult. However, against this hypothesis, as shown in (60) antepenultimately-stressed words ending with the non-high desinences [o, ř, a] pattern identically to the words in (59). In particular, the words in (60) contain non-mid [i,a,u] in the penult, just as in (59).
(60) The penult of antepenultimately-stressed words ending with non-high [o, ø, a]:

a. [-ø] desinence, [i] in the penult:
   pênd[i]ø appendicitis
   pâpâ[i]rø kestrel

b. [-ø] desinence, [u] in the penult:
   mjér[k]uʊs Wednesday

c. [-a] desinence, [i] in the penult:
   sêt[i]ma seventh plamâ[t]i[k]a stories, tales
   řáb[i]la kite (falcon) astwě[r]d[i]ɡa strips of cowhide
   lârg[i]ma tear úl[t]i[m]as used for making
   lâst[i]ka type of sweater nót[i]ka sandals
   nwět[i]ka bird similar to a last (pl.)

   b. [a] desinence, [a] in the penult:
   sáb[a]na sheet kânt[a]ra 16-litre liquid
   kâsk[a]ra bark řísō [a] kâsk[a]ra measure
   jēna
   agâ[a]ras gallnut aθúk[a]ra laugh impetuously
   kwě[b]a[n]a cradle čát[a]ra and noisily
   kâm[a]ra opening for sugar
   waterchannel in a rubber shoes
   pâmp[a]na barn-owl
   fäng (pl.)

   d. [-a] desinence, [u] in the penult:
   andîb[u]la mandible mandîb[u]la 16-litre liquid
   biták[u]la tavern brînk[u]a measure
   bî[b]u[ra]a viper dûlθ[u]ra laugh impetuously
   gâng[u]las adenitis gând[u]las and noisily
   ár̥g[u]ma clay
   clavicle

   e. [-a] desinence, [u] in the penult:
   andîb[u]la mandible
   biták[u]la tavern
   bî[b]u[ra]a viper
   gâng[u]las adenitis
   ár̥g[u]ma clay
   said if one does not know if it is the truth

   f. [-o] desinence, [i] in the penult:
   pólp[i]tòp pulpit es liθ[i]tò to publish by
   ídr[j]tò large, imported
   grâns ponér en éd[i]tòs posting in the
   said if one does not church or town hall
   know if it is the truth

   okál[i]tò eucaliptus
g. [-o] desinence, [a] in the penult:

<table>
<thead>
<tr>
<th>Word</th>
<th>Example</th>
<th>Spanish Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>istóm[a]go</td>
<td>stomach</td>
<td>stomach</td>
</tr>
<tr>
<td>ṭrapapáx[a]ros</td>
<td>kestrel</td>
<td>kestrel</td>
</tr>
<tr>
<td>ũáiθ el pár[a]mo</td>
<td>unidentified plant</td>
<td>a stomach ailment</td>
</tr>
<tr>
<td>másk[a]ros</td>
<td>crackling</td>
<td>crackling</td>
</tr>
<tr>
<td>čát[a]ros</td>
<td>rubber boots</td>
<td>rubare boots</td>
</tr>
<tr>
<td>kwér[a]gos</td>
<td>rivulets in melting snow</td>
<td></td>
</tr>
<tr>
<td>bwét[a]gos</td>
<td>lungs</td>
<td>lungs</td>
</tr>
</tbody>
</table>

A comparison of (59) and (60), then, illustrates that the phonetic realization of the penults of antepenultimately-stressed words is independent of the height of the final desinence, i.e. no rule of raising applies. Instead, it is simply the case, as observed by Hualde (1989: 797; 802, ft. 16) that the presence of [e] and [o] in the penult of antepenultimately-stressed words is extremely rare in Pasiego, and also in Spanish (outside of learned or scientific vocabulary).

The latter observation, together with the evidence in (59) and (60), argue that the inventory of vowels in the penult of antepenultimately-stressed words is a reduced inventory including only /E,A,O/. I argue that in this inventory, surface [i,u] in the penults are derived via obligatory enhancement for [high] of /E,O/.

Finally, in Pasiego, only 8 out of 90 antepenultimately-stressed words contain mid vowels in the penult. These words are listed in (61) and discussed below.
The penult of antepenultimately-stressed words containing [e, ə, o] in the final syllable:

a. [-o] desinence, [o] in the penult:
   tórd[o]lo  nightingale

b. [-ə] desinence, [ə] in the penult:
   tréb[ə]də  tripod
   0ésp[ə]də  sod

c. [-a] desinence, [o] in the penult:
   bjésp[o]ra  vespers

d. [-o] desinence, [e] in the penult:
   xén[e]ro  species
   óm[e]do  humid

e. [-u] desinence, [e] in the penult:
   pálp[e]du  eyelid
   pálp[e]gu  eyelid

Examples (61.a,b) can be explained by a spreading rule which makes the penult into a copy of the final vowel (see Maiden (1988) for discussion of this type of phenomenon, known as 'total harmony', in Italian dialects). The remaining examples, four out of a total of 90 antepenultimately-stressed words, can be analysed as exceptions to the phonetic process of enhancement for [high]. Assuming that only /E,A,O/ occur in the penults of antepenultimately-stressed words, the forms in (61.c-e) can be derived via the failure of enhancement for [high] of /E,O/.

In summary, then, the patterning of the penults of antepenultimately-stressed words can be explained by assuming an /E,A,O/ inventory and a rule of enhancement for [high] which creates a surface inventory of [i,a,u] in the penults of antepenultimately-stressed words.

5.4.2.2 The patterning of unstressed stem vowels

In the previous sections, I have argued that in certain paradigmatic positions in Pasiego, the inventory of segments is impoverished, and that as a result, we see either a) great phonetic variation for height, with /E/ being realized as [i,e,a] through
optional enhancement for [high] or for [low], or b) no variation for height, with /E,O/ being realized as [i,u] respectively through obligatory enhancement for [high].

In the following sections, I complete the analysis of Pasiego, turning to the remaining problem of unstressed stem vowels. First I show that, unlike vowels in the paradigmatic positions discussed earlier, remaining unstressed stem vowels draw from a full set of five vowel phonemes. Second, I describe the phonetic realization of Pasiego unstressed stem vowels, focussing on the type of exceptional phonetic behaviour introduced in §5.4.2.1.2. Thirdly, I provide an account of the relationship between the underlying inventory and the phonetic realization of unstressed stem vowels.

5.4.2.2.1. The inventory of unstressed stem vowels

With the exception of the presence of radical-changing diphthongs in main-stress position (see chapter 3, §3.2.2.3), the inventory of unstressed stem vowels is identical to that of stressed stem vowels. To illustrate, as discussed in chapter 2 §2.5.1, stressed stem vowels draw from the set /I,E,A,O,U/:

(62) Pasiego, stem vowels (Penny 1969):

\[
\begin{array}{ll}
\text{Non-raised} & \text{Raised (only the mid vowels raise)} \\
\hline
\text{a.} /I/ & \text{luz m[i]yo\text{\textsuperscript{s}}} & \text{il m[i]yu} & \text{‘mine (pl.), mine (sg.)’} \\
\text{b.} /E/ & \text{afilit[e]ros} & \text{afilit[i]ru} & \text{‘needle-cases, needle-case’} \\
\text{c.} /A/ & \text{br[\ddot{a}]\text{\text{\textsuperscript{\textdagger}}}}\text{los} & \text{br[\ddot{a}]\text{\text{\textsuperscript{\textdagger}}}u} & \text{‘arms, arm’} \\
\text{d.} /O/ & \text{g[\ddot{o}]rdo} & \text{g[\ddot{u}]rd\text{\text{\textsuperscript{\textdagger}}}u} & \text{‘fat (neuter), fat (masculine)’} \\
\text{e.} /U/ & \text{bj[u]\text{\text{\textsuperscript{\textdagger}}}da} & \text{bj[u]\text{\text{\textsuperscript{\textdagger}}}u} & \text{‘widow, widower’} \\
\end{array}
\]

(62) provides evidence for a five-vowel inventory in Pasiego stems. A comparison of (62.a,b) or (62.d,e) shows that there is an underlying distinction between mid and high vowels. Crucially, only the underlying mid vowels in (62.a,c)—but not the underlying high vowels—alternate as a result of the rule of raising which is triggered by the high desinence [-u].
Unstressed stem vowels also draw from the same set of vowels, namely /I,E,A,O,U/, as shown in (63).

(63) Unstressed stem vowels in Pasiego:

a. /I/ an[i]yár to put a nose ring in a pig's nose
b. /E/ amf[e]stár to infest
c. /A/ ag[a]fár to take (i.e. when speaking of an impregnated cow)
d. /O/ ab[o]rtár to abort
e. /U/ ab[u]yár to roar (said of a bull)

(63) illustrates that in the environment where pretonic raising (as described by Penny 1969 and Hualde 1989) is not expected to apply, namely before non-high main-stress vowels, the phonetic inventory of segments is [i,e,a,o,u]. In many instances, there is no evidence that phonetic [i] can be realized as [e], or that phonetic [e] can be realized as [i], and similarly with the back vowels. These observations provide evidence that Pasiego has a phonemic distinction between mid and high vowels in pretonic position.

However, Pasiego unstressed stem vowels also pattern in a manner that is inconsistent with the latter conclusion. To illustrate, if Pasiego had an underlying /I,E,A,O,U/ stem inventory, and a phonological process of high harmony, we would expect the following to occur:

(64) Assuming an /I,E,A,O,U/ inventory:

<table>
<thead>
<tr>
<th>Rules:</th>
<th>Pretonic (unstressed stem) vowels</th>
<th>tonic (main stress stem) vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>high harmony applies</td>
<td>[i] [a] [u]</td>
<td>[í], [ú]</td>
</tr>
<tr>
<td>high harmony does not apply</td>
<td>[i] [e] [a] [o] [u]</td>
<td>[á] [é] [ó]</td>
</tr>
</tbody>
</table>

As shown in (64), if the stressed vowel were high, then the pretonic vowels would be either high or low, but crucially not mid. On the other hand, if the stressed vowel were non-high, then the pretonic vowels would be high, mid or low. The neutralization that would occur when the stressed vowel was high would be due to a
phonological rule that would spread the feature [high] from the high stressed vowels to the pretonic mid vowels, raising the latter to high as well. The patterning in (64) is that assumed by, for example, Penny (1969) and Hualde (1989).

However, the actual patterning of Pasiego pretonic mid vowels does not conform to the expectations summarized in (64). To show this, in §5.4.2.2.2 I demonstrate that pretonic raising is not across-the-board, thus providing evidence against the assumption that Pasiego has a phonological rule of pretonic raising. In §5.4.2.2.3 - §5.4.2.2.4, I then provide evidence that the phonemes /E,O/ can vary freely between phonetic mid and high vowels, while /I,U/ can lower to mid [e,o] in pretonic position. I analyse this exceptional patterning in §5.4.2.2.5 and §5.4.2.2.6.

5.4.2.2.2. Disharmonic vowels

Example (65) provides evidence against the phonological rule of pretonic raising posited in (64). (65) lists words in which the pretonic mid vowel, either /E/ or /O/, fails to raise to high in a raising environment, i.e. when the stressed vowel is high. The relevant disharmonic vowels are enclosed in square brackets.

(65) Pretonic mid vowels may fail to undergo harmony:

a. Pretonic [e] where raised [i] is expected:
   i. Before high tonic [i]:
      \[\theta[e]n\mathring{\text{i}}\text{r} \quad \text{to sift} \]
      \[\tilde{\text{r}}[e]y\text{\text{í}}\text{r} \quad \text{to laugh} \]
      \[t\text{r}[e]b\text{jisu} \quad \text{mischievous} \]
      \[t[r][e]nt\text{ñino} \quad \text{30 month old colt} \]
      \[\tilde{\text{r}}[e]sp\text{\text{í}gu} \quad \text{cabbage flower, lettuce flower, etc.} \]
      \[\tilde{\text{r}}[e]\text{y}\text{í}\text{\text{s}o} \quad \text{to smile} \]
      \[\text{\text{o}l3} \quad \text{a d [e]\text{s}p\text{í}ta} \quad \text{pot for separating cream} \]
      \[\text{pínta de kab\text{\text{é}th}a p[e]\text{\text{r}\text{d}í}\text{da} \quad \text{headless nail} \]
      \[k[r][e]\text{\text{i}du} \quad \text{believed (past participle)} \]
      \[p[e]\text{\text{n}sa\text{t}íbu} \quad \text{thoughtful} \]
      \[s\text{um}[e]\text{\text{x}í}\text{\text{du}} \quad \text{submerged} \]
      \[t[j][e]\text{\text{f}r\text{d}íla} \quad \text{clay, argil} \]
      \[t[j][e]\text{\text{f}r\text{d}í\text{o}} \quad \text{clay, argil} \]
      \[\text{aŋx}[e]\text{l\text{í}tu} \quad \text{small angel} \]
ar[e]niðo      gravelly soil mixture
b[e]nadíxa        wild animal
[e]čadíxu        overrun by furze and ferns
[e]čáiða        exaggeration
imb[e]níða        adj. describing spring pastures
kub[e]rtíru      basket, hamper
pr[e]kabiú      astute
puč[e]ráto      puckering up one's face (as before crying)
lob[e]ríða      wolf pack
m[e]rkadíru      small basket
p[e]dr[e]títa      small stone
alb[e]rgadíru      perch

ii. Before high tonic [ú]:
   m[e]nútò      minute
   ³[e]radúra      enclosed garden space
   b[œ]rgw[œ]nústu      shameful
   að[e]stríadúras      bits of hay left after haying
   að[e]stríyadúras      bits of hay left after haying

b. Pretonic [o] where raised [u] is expected:
   i. Before high tonic [í]:
      x[o]stíyu      bib fastened with buttons or string
                      (traditional clothing)
      g[o]ríto      special paper liners for a baked good
      t[o]rd[o]líla    nightingale
      k[o]gaíðu      very small lean-to
      k[o]rk[o]mó      worm-eaten
      m[o]tíðo      recently drawn milk
      a[o]ratíbu      thrifty
   ii. Before high tonic [ú]:
      k[o]rtúra      shortness
      [o]rága      borer that attacks corn
      [o]skúra      darkness
      [o]túbrə      October
      [o]lyüko      leaflet
      m[o]ldúra      grinding (n.)
      r[o]nkúxu      testicles
      kalθ[o]ðuída      sheep with lots of wool on its rump
      k[o]ðidúra      cooking (n.)
      m[o]rálíku      stack of hay 1 m. high
      kam[o]skadúra      sill or embrasure
      esk[o]pljadúra      shroud
The above examples illustrate that raising in pretonic syllables is not as categorical as the raising analysis in (64) assumes. Disharmonic [e] and [o] occur before high tonic [í] and [ú] alike, contra the raising analysis in (64).

5.4.2.2.3. Free variation between [e~i] and [o~u] of mid /E,O/

Also not explained by the pretonic raising analysis in (64) is the evidence from Pasiego for free variation for height. Example (66) lists Pasiego stems which display free variation between [i], [e], [ə] and even [a]. The variable vowel is highlighted by square brackets in each example. Dots indicate morpheme boundaries in the first example of each lexeme in order to indicate the stems.

(66) Free variation for height between [i], [e], [ə] and [a]:

(66.1) Before high tonic [í]:

a. m[e][e]θ.in.a  medicine
    m[i]ll[i]θìña  "

b. p[ə]ăr.in  puppy, cub
    c.f.   p[ɛ]r.os    dogs
           p[e]r.áç.u
           p[i]r.úθ.u  disrespectful diminutive of 'dog'

    c. θ[e]r.íl  uncultivated ground
        θ[ə]ríl  "
        θ[i]ríl  "

d. θ[e]r.m.ír  to grind
    θ[i]nísə  to work alot

e. r[ə]θ.ím.u  root
    r[i]θìmu  "

f. r[ə]k.it.ik.u  rickety
    r[i]kitiku  "

g. r[e]spig.u  lettuce, cabbage flower, etc.
    r[i]spig.á.sə  to seed a vegetable

h. r[e]nd.i.u  to be panting as a result of having worked hard
    r[i]ndìu  "

  i. s[e]nt.ír  hear
     s[i]ntfr  "

  j. s[e]r.ína  small type of chestnut
     s[i]r.inas  small and good species of chestnut

  k. [i]sp[e]ñadìru  cliffy mountain
Phonetic Enhancement

274

d[e]sp[i]ñadíru

(66.2) Before high tonic [ú]:

a. p[i]r.uθ.u
   c.f. p[œ]r.ín
   p[ɛ]r.os
   p[e]r.áč.u
b. θ[e]s.úr.a
   θ[i]súra

(66.3) Before non-high tonic [é]:

a. l[e]g.at.érm.a
   l[i]gatérm.a
   l[a]gatérm.a
b. ṭ[e]sk.éθ.a
   ṭ[i]skjeθa

c. s[e]tjémbr.ə
   s[i]tjémbrə

(66.4) Before non-high tonic [á]:

a. p[e]dr.ik.ář
   p[i]drikár
b. mel[e]ndr.án
   m[a]ll[a]ndrán
   mel[i]ndrán
c. in.θ[e]ment.ář
   inθ[i]mentár

d. l[é]n
   l[i]n.ásk.u
e. mend[e]ng.jář
   mend[i]ng.ánto
f. p[e]r.[o]x.ář
   p[i]r[u]xář

g. ř[e]sp.ix.ář
   ř[i]spixář
h. t[i]l.ář
   t[e]lář
i. t[e]r[e]ll.áň.a
   t[i]r[i]láňa
(66.5) Before non-high tonic [ó]:

a. m[e]g.ó].o crumb
   m[i]gólo "
b. p[e]sa.rós.o penitent
   p[i]saróso "
c. ŋ[ə]sp.ix.ón frisky animal
   c.f. ŋ[e]sp.ix.ár to frisk, jump with joy
       ŋ[i]spixár "

As shown in (66.1) and (66.2), the vowel /E/ can be realized as [i], [e], [ə] or [a] before a high tonic vowel. Similarly, as shown in (66.3) - (66.5) the vowel /E/ can also be realized as [i], [e], [ə] or [a] before a non-high tonic vowel. The above examples illustrate that the presence of either [i] or [e] is not predictable from a rule of raising. This type of example instead illustrates that /E/ can vary freely between a mid and a high vowel, regardless of the height of the tonic vowel.

Example (67) lists lexemes which display free variation between [u] and [o].

(67) Variation between [u] and [o]:

(67.1) Before high tonic [í]:

a. k[o]rk.[o]m.i.ů worm-eaten
   k[u]rk.[u]m.i.a primrose (?) (gloss uncertain to Penny)
b. l[o]mb.į.y.ů a one-meter pile of hay
   l[u]mb.į.y.a "

(67.2) Before high tonic [ú]:

a. k[o]θ.id.úr.ů cooking
   k[u]θidúra "
b. m[o]ld.úr.ů grinding (noun)
   m[u]ldúra the bits of grain and rock that are left in the mill after grinding
c. ŋ[o]nk.úx.ů testicles
   ŋ[u]nkúxu "

(67.3) Before non-high tonic [é]:

a. [de] ŋ[o]d.êt.ə covered with a scarf
   ŋ[u]dėtə forehead
b. k[ō]nt.in.ér.a said of a very fertile cow
c.f. k[ū]ntinárja

(67.4) Before non-high tonic [á]:

a. is.kar.[o]nč.ár
deshell
iskar[u]nčár
" 

b. a.f[u]rt.un.á.u
lucky (m.s.)
a[f]ørtuná:
lucky (f.s.)

" 

c. g[o]m.it.ár
vomit
g[ú]mitár
"

d. p[e]r.[o]x.ál
wild peartree
p[i]r[u]xál
"

e. p[o]rt.ál
a bin for firewood, etc.
p[u]rt.ál
"

f. a.f[l].ár
to hill a plant for the third time
af[l]árr

to tuck up

g. ře.s[o]b.ár
shake vigorously
ře.s[u]bár
"

h. s[o]l.án.u
south-facing site, slope
s[u]lánù
the east wind

i. tras.t[o]rn.jáu
overturned
tras[t]urjáár
to overturn

j. t[o]x.ár.a
hole left after cutting a branch off of a tree
t[u]xára
"

k. [Ó].l.a
pot
[u].l.ár
to dent

l. [o]mbr.ál
shoulder
[o]mbrál
"

m. [o]k.ál.it.o
eucalyptus
[u]kálito
"

n. [o]rak.án
hurricane
[u]rakán
"

o. agarl[o]pjár
to brush with a long plane, leveller
agarl[u]pjára
"
(67.5) Before non-high tonic [ó]:

a. n[u]s.ótr.os  
   c.f.  n[ó]:s  
   we  
   us

b. [u]mad.ór  
   c.f.  [ó]med.o  
   person in charge of humidifying bees  
   humid

The words in (67.1) and (67.2) illustrate that the phoneme /O/ varies between [u] and [o] before high tonic vowels. Similarly, (67.3) - (67.5) illustrate that /O/ varies between [u] and [o] before non-high tonic vowels as well. These examples illustrate that the height of pretonic, unstressed /O/ is not predictable from a rule of raising. Instead, /O/ varies freely for height, regardless of the height of the main-stress or tonic vowel.

Examples such as (67.4.k) and (67.5.a) are also interesting. In these examples, the highlighted vowel is [ó] when stressed, but [u] when unstressed, a phenomenon reminiscent of reduction, as also observed by Penny (1969: 71). This type of reduction is characterized by mid vowels raising to high when in unstressed position. In this respect, Pasiego displays some evidence of patterning like languages such as Catalan (and also Polish, c.f. Kenstowicz 1994: 74-78), in which unstressed vowels are also raised to high.

Finally, the words listed in (68) illustrate variation for height of unstressed vowels into the low range. The vowels in square brackets in (68) can be realized as vowels of any height, even as [a]. In general, the second variant listed for each lexeme is etymologically correct.

(68) Further variation of unstressed pretonic vowels:

(68.1) Variation before high tonic [í]:

a. θ[a]k.at.řθ  
   θ[e]k.at.řθ  
   cicatrice
(68.2) Variation before high tonic [ú]:

a. [a]sk.úr.a  dark
[o]skūra

(68.3) Variation before non-high tonic [é]:

a. ko.m[a]dr.éx.a  weasel
kom[o]drēxa
b. tr[a]č.wé.a  tack
tr[ičwēla]

(68.4) Variation before non-high tonic [á]:

a. a.gur.[a]k.ár  to hollow out a tree
agur[e]kár
b. a.pis.[a]d.ombr.á.u  sad
apis[i]dumbráu

c. θ[a]rb.el.án  plant used for a sieve
θ[e]rbelán
d. a.l[a]targ.á.u  drunk
al[e]targáu
e. a.d[a].lant.á.u  late
ad[e]lantáu
f. ard.[a]ň.ár  to milk
ard[o]ňár

(68.5) Variation before non-high tonic [ó]:

a. agw[a]ň.ón  a bad horse, a lewd person
agw[e]ňón

As shown above, variation between [e~a] is most common ((68.1), (68.4.d,e), (68.4.a,c), and (68.5)), but variation between [o~a] ((68.2), (68.3.a), (68.4.f)) and even between [i~a] ((68.3.e), (68.4.b)) is also attested. These examples show that vowels in unstressed position might actually be vowels of indeterminate quality, similar to schwa but transcribed as [a]. However, the examples in (68) also illustrate that variation for height is commonly attested when pretonic vowels are unstressed.
5.4.2.2.4. Variation of high vowels as [e], [o]

In the previous sections, I discussed the patterning of the unstressed non-high, non-low stem vowels /E, O/. In contrast, in this section, I discuss the patterning of the unstressed, phonologically high vowels /I/ and /U/ in stems, providing some limited evidence that these vowels can also vary for height when in metrically weak position.

Penny lists some derivational suffixes which have underlyingly high vowels, suffixes including [-iθ], [-ig], and [-ik] (Penny 1969: 104-111). Importantly, the latter suffixes also surface phonetically as [-eθ], [-eg] and [-ek], and even as [-aθ], [-ag], and [-ak] in some cases. (Penny does not make note of this phenomenon. However, Penny discusses lowering of high vowels in the context of a stressed non-high vowel elsewhere. This will be discussed in §5.5.4.3.) For illustration, example (69) shows the suffix which Penny analyses as /-Iθ/, with an underlying high vowel and the consonant /θ/.

(69) Variation for height of high vowels in unstressed position:

<table>
<thead>
<tr>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. bóθ</td>
<td>a shout</td>
</tr>
<tr>
<td>b. boθ[eθ]ár</td>
<td>to yawn</td>
</tr>
<tr>
<td>c. buθ[iθ]jár</td>
<td>to yawn</td>
</tr>
<tr>
<td>d. boθ[aθ]jár</td>
<td>to yawn</td>
</tr>
</tbody>
</table>

(69.a) gives the stem /bOθ/ when it occurs without the suffix /Iθ/. (69.b-d) illustrate the stem /bOθ/ with the suffix /Iθ/, and also illustrate that /Iθ/ surfaces as [eθ], [iθ] and [aθ] in the same environment, i.e. before a stressed low vowel [á]. (69.c,d) show the same lexeme, with variation between [i] and [a] in the suffix /Iθ/.

If suffixes such as /Iθ/ are correctly analysed as having phonologically high vowels (and in the vast majority of cases, such suffixes have invariantly high vowels) then examples such as (69) illustrate that phonologically high vowels can also be realized as mid and even low vowels.
There is also some limited evidence that originally high /I, U/ can lower to [e, o] before non-high stressed vowels. However, because the evidence is not extensive, accounts of Pasiego pretonic vowels have treated this phenomenon very differently: for example, McCarthy (1984), based on limited evidence for total height harmony, posits an across-the-board feature-changing rule which turns [+high] atonic vowels into [-high] vowels in case the main stress vowel is [-high], and vice versa. However, Vago (1988: 353) argues, based on the same evidence, that lowering of high vowels before stressed non-high vowels is an aberration, while raising of atonic mid vowels before stressed high vowels is the rule. In between these two positions, Penny analyses the nature of pretonic vowel patterning as follows:

It can be observed that a system of only three atonic [unstressed] vowels is being produced: [e] and [i] are becoming allophones of the same vowel, realized as [e] or [i] according to the [height of the] tonic [main-stress] vowel, while the same occurs with [o] and [u]. In order that this change be complete, we would hope to encounter /i/ and /u/ realized as [e] and [o] respectively when the tonic vowel is [á], [é] or [ó]. In effect, we see that this change is coming into effect in a (still limited) series of words: tregera 'trigüera' [graminaceous plant], egácos, diminutive of 'higos' [figs], lexéros, plural of 'ligero' [light]; kokaráca 'cucaracha' [cockroach], oxána 'gusana' [type of worm], orakán [hurricane], moradál 'muladar' [dunghill], ontáta 'untaza' [grease, fat], kócar 'cuchara' [spoon], apesadombráu [sad]. (Penny 1969: 53, my translation

Penny's citation provides some evidence for total height harmony in pretonic vowels: While some of Penny's examples constitute weak evidence, being based solely on a comparison of Standard Spanish with Pasiego forms (for example, Pasiego [kokaráca] versus Standard Spanish <cucaracha>), other examples display a type of variation that more convincingly argues for total harmony: for example, the initial vowel of the word [légéros] light, (adj., pl.) is underlyingly high, as shown by the presence of the high vowel in a non-raising environment in the related adverbial form in the

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26 Several of the Pasiego words in this citation—including [orakán] and [apesadombráu]—were not provided with Standard Spanish glosses.
phrase [a lo lixéro] rapidly, said of dancing. The presence of the mid vowel [e] in the initial syllable of the word [légéros] light, (adj., pl.), then, argues that underlying /l/ lowers to [e] when followed by a non-high stressed vowel. This in turn provides some evidence for total height harmony.

However, the evidence that high vowels can vary for height in pretonic position is less clear-cut than the evidence showing that the non-high vowels /E/ and /O/ can vary for height. The evidence that high vowels can vary for height in pretonic position consists of a handful of suffixes such as the one shown in (69) and the cases of total harmony. In contrast, the evidence that the vowels /E,O/ can vary for height in pretonic position comes from a wide range of sources, including verbal prefixes, word-initial epenthetic vowels, and unstressed stem vowels. In general, phonologically high vowels normally remain high, while phonologically non-high, non-low vowels show a greater tendency to vary for height. I include these observations in my reanalysis of pretonic raising below.

5.4.2.2.5. A comparison of Pasiego unstressed stem vowels with other patterns

The patterning of Pasiego unstressed stem vowels discussed in the preceding sections is summarized in (70).

(70) Pasiego unstressed stem vowels:

<table>
<thead>
<tr>
<th>/I/</th>
<th>/E/</th>
<th>/A/</th>
<th>/O/</th>
<th>/U/</th>
</tr>
</thead>
<tbody>
<tr>
<td>[i~(e)]</td>
<td>[i~e]</td>
<td>[a]</td>
<td>[u~o]</td>
<td>[u~(o)]</td>
</tr>
</tbody>
</table>

Unstressed /E,O/ are optionally realized as either high or mid. Unstressed /I,U/ are usually realized as [i] and [u] but are sometimes also realized as [e,o].

A comparison of (70) and (71) illustrates that the attested patterning of Pasiego unstressed mid vowels is unlike the patterning that one would predict on the basis of the assumption that Pasiego has a 5-vowel /I,E,A,O,U/ inventory of unstressed stem vowels, an assumption for which some evidence was provided in
(63). Example (71) illustrates the standard raising analysis of Pasiego pretonic vowels, which assumes a 5-vowel /I,E,A,O,U/ inventory and a rule that spreads [high] from high main-stress vowels to preceding mid vowels.

(71) Assuming an /I,E,A,O,U/ inventory:

<table>
<thead>
<tr>
<th>Rules:</th>
<th>Pretonic (unstressed stem) vowels</th>
<th>tonic (main stress stem) vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. high harmony applies</td>
<td>[i] [a] [u]</td>
<td>[í], [ú]</td>
</tr>
<tr>
<td>b. high harmony does not apply</td>
<td>[i] [e] [a] [o] [u]</td>
<td>[á] [é] [ó]</td>
</tr>
</tbody>
</table>

As shown in (71.a), the application of high harmony would result in pretonic [i,a,u], while, as shown in (71.b), the lack of application of high harmony would result in pretonic [i,e,a,o,u]. However, as shown in (70), Pasiego does not conform to the patterning predicted in (71), as alternative patterns also occur.

Let us alternatively suppose that Pasiego is like Eastern Aragonese (§5.4.1.1.1), having reduction in pretonic vowels. Under this assumption, the patterning of Pasiego might be derived as in (72). An assumption made in (72) in order to model as closely as possible the attested patterning of Pasiego pretonic vowels is that in Pasiego—unlike Eastern Aragonese but like Bantu 'mid-harmony' languages—enhancement for [high] is subject to complexity requirements, such that it preferably applies when the main stress vowel is high. (Like Eastern Aragonese, however, enhancement before high stressed vowels would be optional, such that it need not occur before main-stress high vowels.)

(72) Assuming a reduced /E,A,O/ inventory in pretonic position:

<table>
<thead>
<tr>
<th>Rules:</th>
<th>Pretonic (unstressed stem) vowels (reduced /E,A,O/ inventory)</th>
<th>tonic (main stress stem) vowels (full /I,E,A,O,U/ inventory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. optional [high] enhancement</td>
<td>[i<del>e] [a] [o</del>u]</td>
<td>[í], [ú]</td>
</tr>
<tr>
<td>b. lack of enhancement for [high]</td>
<td>[e] [a] [o]</td>
<td>[é], [á], [ó]</td>
</tr>
</tbody>
</table>
As shown in (72), reduction would occur in pretonic position, and then enhancement would optionally apply before high stressed vowels, resulting in the realizations [i~e] for /E/ and [u~o] for /O/. Before non-high stressed vowels, on the other hand, enhancement for [high] would fail to occur.

A comparison of (70) (Pasiego), (71) (the standard raising analysis of Pasiego) and (72) (an Eastern Aragonese type of pattern) illustrates that Pasiego patterns neither like the standard raising analysis would predict nor like the Eastern Aragonese type of pattern. Instead, the attested Pasiego patterning is intermediate: in Pasiego, unstressed pretonic /E,O/ are variable for height, while /I,U/ are generally invariant in unstressed position. In this respect, the patterning of Pasiego vowels provides evidence for an underlying mid/high distinction in unstressed position. On the other hand, /I,U/ sometimes pattern like /E,O/ in that the former are realized in a variable manner in unstressed position.

By all indications, then, the patterning of Pasiego unstressed stem vowels is transitional between a language with a full /I,E,A,O,U/ inventory in unstressed stem vowels, and one with a reduced inventory of /E,A,O/ in unstressed stem vowels. Given the latter observation we may conclude that the contrast between mid and high vowels in Pasiego is becoming moribund. This conclusion in turn helps to explain some otherwise puzzling aspects of the patterning of pretonic vowels in Pasiego, as discussed below.

In (73) I reiterate the phonetic realizations of Pasiego pretonic stem vowels provided in (71), adding derivations for the surface phonetic forms.

(73) Derivation of Pasiego unstressed stem vowels:

<table>
<thead>
<tr>
<th></th>
<th>/I/</th>
<th>/E/</th>
<th>/O/</th>
<th>/U/</th>
<th>Rules:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td>[i~e]</td>
<td></td>
<td>[u~o]</td>
<td>• optional enhancement for [high]</td>
</tr>
<tr>
<td>b.</td>
<td>[i ~(e)]</td>
<td></td>
<td>[u ~(o)]</td>
<td></td>
<td>• sporadic instances of reduction (delinking of [high] from high vowels)</td>
</tr>
</tbody>
</table>
As summarized in (73.a), in Pasiego, underlying /E,O/ are realized variably in pretonic position. I derive this difference by means of optional enhancement for [high] in (73.a). On the other hand, as summarized in (73.b), /I,U/ are normally realized as [i,u], but are sometimes realized as mid. I derive this patterning from the sporadic operation of reduction, or delinking of [high] from high vowels.

According to the Contrastiveness Exclusivity Principle, enhancement for [high] in (73.a) should not occur because Pasiego has evidence for a mid/high contrast in unstressed position. However, under the assumption that the mid/high contrast is moribund, it is not surprising that Pasiego has optional enhancement for [high] in unstressed position. Nor is it surprising that Pasiego displays some instances of reduction of /I,U/ to [e,o] in unstressed position.

5.4.2.2.6. Conclusion: Pasiego unstressed stem vowels

The optional rule of enhancement for [high] in Pasiego pretonic vowels discussed above can be viewed as a change in progress. I draw on the phonological literature in explaining this change in progress as follows. In the literature, there is a long-standing interest in phonologization, particularly with the means by which foreign sounds become incorporated into the phonology of a borrowing language. For example, it is argued that phonologization starts with the incorporation of new elements into the phonetic component, and that these elements ultimately work their way into the phonological component. See Davis 1994, Haugen 1950, Holden 1976, Hyman 1970, Itô and Mester 1993, Kaye and Nikiel 1979, Paradis 1993, Paradis and LaCharité 1994, Paradis and Lebel 1994, Prunet 1990, Silverman 1992, Singh 1987,

27 Alternatively, this rule could be viewed as a variable rule, that is, as an optional rule that is associated with a certain frequency of usage (cf. Chambers and Trudgill 1980: 155-161 for further discussion of variable rules).
Yip 1993) for further discussion. Based on this literature, I argue that 'dephonologization', i.e. neutralization of a mid/high contrast, might also infiltrate into the phonology of a language by becoming first a phonetic, then a phonological process.

In Pasiego, neutralization of the mid/high contrast could have been introduced into the phonetic component via enhancement for [high] of /E,O/ before stressed high vowels. This would have created a situation analogous to that of the present day, in which the reduced inventory [i,a,u] generally appears before stressed high vowels, while the non-neutralized inventory [i,e,a,o,u] appears before stressed non-high vowels. (Recall that there are exceptions to both of the latter generalizations deriving from a) failure to enhance for [high] and b) sporadic reduction.) In addition to being introduced at the phonetic level, the change towards neutralizing unstressed mid and high vowels could also have begun to affect the phonology of Pasiego, such that neutralization via delinking of [high] from /I,U/ could sometimes occur. The logical end development of these trends in Pasiego would be to find only [i,a,u] before stressed high vowels, and only [e,a,o] before stressed non-high vowels. As discussed earlier, Pasiego has not yet reached this point.

In this account, then, Pasiego has a phonetic process which results in neutralization (i.e. enhancement for [high], affecting unstressed vowels before high stressed vowels) but is only beginning to develop a phonological process of which results in neutralization of the mid/high contrast (i.e. delinking of [high], affecting unstressed vowels before non-high stressed vowels). This view of the relationship between enhancement for [high] and neutralization in Pasiego captures the essentially moribund nature of the contrast between mid and high vowels in pretonic position.

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28 Related discussion is also found in Kiparsky (1985), in which Kiparsky argues that rules may apply at different levels of the grammar, i.e. lexically, postlexically, and phonetically.
In summary, then, Pasiego is a counterexample to the Contrastiveness Exclusivity Principle in that enhancement for [high] takes place even though Pasiego has a mid/high contrast in pretonic position. However, the patterning of pretonic vowels in Pasiego is more indicative of a change in progress from an underlying mid/high contrast to a lack of one. This counterexample, then, does not present a strong case for abandoning the CEP. Instead, it presents an interesting type of intermediate case in which neutralization of the mid/high contrast is being phonologized.  

5.4.3. Reduction and enhancement

In the preceding sections, I have outlined the relationship between phonological processes which result in a lesser degree of specification, and the phonetic process of enhancement. I have shown that reduction and neutralization are phonological processes which are ordered before enhancement by virtue of being phonological. This ordering results in several interesting phenomenon, as shown in (74). Column A of (74) lists phonological rules that are ordered before Enhancement (Column B). Column C describes the effects of interaction between the phonological rules in Column A and enhancement in Column B.

(74) Permutations of reduction and enhancement:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonological</td>
<td>Phonetic component</td>
<td>Surface phenomena</td>
</tr>
<tr>
<td>component</td>
<td>(Enhancement)</td>
<td></td>
</tr>
<tr>
<td>a. Reduction:</td>
<td>Add X</td>
<td>Reduce X and ~X to X</td>
</tr>
<tr>
<td>delink X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Reduction:</td>
<td>Fail to add X</td>
<td>Reduce X and ~X to ~X</td>
</tr>
<tr>
<td>delink X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Lack of reduction</td>
<td>No enhancement</td>
<td>X and ~X remain distinct</td>
</tr>
</tbody>
</table>

For related discussion, see Maiden (1991), who observes that pretonic raising in Italian dialects is part of a continuum from a) maximal contrasts in pretonic position to b) pretonic raising to c) reduction to d) deletion and minimal contrasts in pretonic position.
As shown in (74), the combination of reduction and enhancement (74.a) has the effect of reducing X and ~X to the value X, e.g. reducing mid and high vowels to [hi]. The combination of reduction and lack of enhancement for X (74.b) has the effect of reducing X and ~X to ~X, i.e. reducing mid and high vowels to mid. Both (74.a,b) are attested in Eastern Aragonese (§5.4.1.1.1).

As shown in (74.c), I argued in this chapter that lack of reduction—i.e. failure to delink a feature—precludes the operation of enhancement for that feature. Catalan (§5.4.1.1.2) exemplified, for example, that [low] cannot be used for enhancement purposes when [low] is used contrastively within the front or back vowel regions.

Finally, I presented a case that was intermediate between Eastern Aragonese (reduction and enhancement) and Catalan (lack of reduction and lack of enhancement), namely Pasiego. In Pasiego, reduction is a variable rule with low frequency (§5.2.2.6). Because the contrast between mid and high vowels in pretonic position is essentially moribund in Pasiego, the requirements of the CEP may be viewed as 'softened', and the result is that enhancement for [high] occurs.

5.5. Constraining the phonetics-phonology interface

In order to conclude this chapter, I address several questions raised in chapter 2, namely, a) whether the path from phonemic representations to phonetic representations is constrained, and b) whether the path from phonetic representations to phonemic representations is constrained. Addressing these questions serves to summarize this chapter and draw out important implications of the work presented here.

5.5.1. The path from phonemic representations to phonetic representations

Recall from §5.1 that in the model of Modified Contrastive Specification, the phonological representation of a given vowel does not completely determine its phonetic representation. In addressing this gap between underspecified phonological
representations and specified phonetic representations, I outlined the means by which underspecified phonological representations become more fully specified. In doing so, I provided derivations in which enhancement failed to apply, resulting in a vowel that was still underspecified (as in Pasiego [e], for example, which is unspecified for height features; see chapter 3 for arguments that [e] is both phonologically and phonetically unspecified for height features). I also gave derivations in which enhancement did apply, but still failed to provide a given vowel with the maximum number of features possible within a given class. In other words, in many of the derivations in §5.1-§5.4, I argued that enhancement or its lack resulted in less than fully specified representations. I have, in fact, argued for maximal, rather than full, specification in the phonetic component. I discuss the consequences of this argument below. I discuss in particular a case which was raised in §5.2.3 where I noted that the representation [Ø, coronal]—i.e. a vowel that is unspecified for aperture features but specified for the place feature [coronal]—is interpreted as [e], even though the representation [Ø, coronal] is still underspecified for height features.

Example (75) illustrates that the representation [Ø,coronal]—and by extension, other permanently underspecified representations—is/are unambiguous within a universal context. It is possible to phonetically interpret this representation, even though it is permanently underspecified. Column A of (75) summarizes the possible combinations of surface features outlined in §5.2 and §5.3. Column B illustrates the phonetic interpretation of the representations in column A. Column C illustrates the possible phonological source(s) of each phonetic representation. Finally, the surface representations shown in (75) are maximally specified; any segments that are not fully specified in (75) are also permanently underspecified.
Surface instantiations of underlying vowels:

<table>
<thead>
<tr>
<th></th>
<th>A. Surface features</th>
<th>B. Phonetic Representation</th>
<th>C. Phonological Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>coronal, high</td>
<td>[i]</td>
<td>/I/, /E/</td>
</tr>
<tr>
<td>b</td>
<td>ø, high</td>
<td>[i]</td>
<td>/I/, /E/</td>
</tr>
<tr>
<td>c</td>
<td>coronal, ø</td>
<td>[e]</td>
<td>/E/</td>
</tr>
<tr>
<td>d</td>
<td>ø,ø</td>
<td>[ɔ]</td>
<td>/E/</td>
</tr>
<tr>
<td>e</td>
<td>coronal, low</td>
<td>[æ]</td>
<td>/E/, /Ê/</td>
</tr>
<tr>
<td>f</td>
<td>ø, low</td>
<td>[ə]</td>
<td>/A/</td>
</tr>
<tr>
<td>g</td>
<td>RTR, low</td>
<td>[a]</td>
<td>/A/</td>
</tr>
<tr>
<td>h</td>
<td>per, high</td>
<td>[u]</td>
<td>/U/, /Ô/</td>
</tr>
<tr>
<td>i</td>
<td>per, labial, high</td>
<td>[u]</td>
<td>/U/, /Ô/</td>
</tr>
<tr>
<td>j</td>
<td>per, labial, dorsal, high</td>
<td>[u]</td>
<td>/U/, /Ô/</td>
</tr>
<tr>
<td>k</td>
<td>per, ø</td>
<td>[ʌ]</td>
<td>/O/</td>
</tr>
<tr>
<td>l</td>
<td>per, labial, ø</td>
<td>[ɔ]</td>
<td>/O/</td>
</tr>
<tr>
<td>m</td>
<td>per, labial, dorsal, ø</td>
<td>[ɔ]</td>
<td>/O/</td>
</tr>
<tr>
<td>n</td>
<td>per, labial, dorsal, low</td>
<td>[œ]</td>
<td>/O/, /Ô/</td>
</tr>
</tbody>
</table>

An important point is that table (75) essentially divides the entire range of variation of the phonetic vowel space into discrete, non-overlapping spaces. This property entails that there is only one phonetic interpretation for the maximally specified representation [Ø, coronal], namely [e], and that there is no ambiguity between the representations in Column A and those in Column B. For the purposes of interpretation, then, the representations in (75) are specified enough.

The discrete, non-overlapping spaces defined by the phonetic representations in Column B are theoretically subdividable into more fine-grained areas. For example, the maximally specified representation [ø, coronal] can be instantiated as [e, e, ñ], etc. I suggested earlier with respect to example (51) that such subdivision is
essentially language-particular, such that a given language or dialect may habitually use [ɛ] to instantiate [ø, coronal].

5.5.2. The path from phonetic representations to phonemic representations

A separate question raised by (75) is whether the phonetic representations of a given inventory can be unambiguously related to underspecified representations. For example, if a language has the vowel [ə], can this vowel be related to an underspecified representation? One option—overtly employed in the Radical Underspecification literature (c.f. for example Abaglo and Archangeli 1989, Archangeli 1984, 1988, Archangeli and Pulleyblank 1989, 1994) but also employed in the Contrastive Specification literature (c.f. Clements 1988, Mester and Itô 1989, Steriade 1987)—is to correlate phonetic and phonological representations with the help of rules. For example, knowing from rules that [ə] is phonologically inert, Radical Underspecification—and Contrastive Specification, for that matter—posits an underlying phoneme that has no place or height features, namely [Ø,Ø]. However, a more interesting question is whether [ə] can be related to a phonological representation without recourse to evidence from rules. I believe that this is possible. To illustrate, I discuss the example of [ə] in more detail. The example of [ə] is particularly challenging because [ə] can potentially be related to any phoneme through reduction.

Suppose that the inventory of vowels that can occur in a given paradigmatic domain includes either [i,e,ɛ,a,o,u], under one scenario, or [ə,a,o,u], under another scenario.

However, there is also another possibility, namely that the finer-grained distinctions are predictable from the phonetic context, such that, for example, a higher [ɛ] occurs in the vicinity of a phonetically high vowel. I suggest that such predictable finer-grained distinctions are derived by the process of phonetic interpolation (Cohn 1993), which fills in some of the phonetic detail of permanently underspecified segments. See Cohn (1993) for details.
Note that I assume that the phonetic instantiations [i,e,ɔ,a,o,u] all *contrast* with one another. The inventory [i,e,ɔ,a,o,u] is not just a blind listing of the phonetic instantiations found in a given paradigmatic context. First, a certain amount of phonetic detail is omitted, such that one writes [i] rather than [i, i, i], etc. Second, I assume that it has already been determined that, for example, [i] and [e] are not in a relationship of free variation, i.e. [i,e] do not randomly instantiate the 'same' vowel. More on the definition of the 'same' vowel below.

If the inventory in a given domain is [i,e,ɔ,a,o,u], then there is evidence for a contrast between a mid [e] and central [ɔ] at the same height; therefore [ɔ] does not instantiate a reduced vowel, and given the inventory it occurs in, [ɔ] can only be a vowel with no height or place features. If, on the other hand, the phonetic inventory is [ɔ,a,o,u], then the underlying inventory is either a symmetrical one, such as /I,E,A,O,U/, or an asymmetrical one, such as /E,A,O,U/. In other words, given the surface inventory [ɔ,a,o,u], it can be determined that [ɔ] is not low and not back, or conversely, that [ɔ] must be either phonologically unmarked for features or high, and either central or [coronal] underlyingly. In other words, it is possible to greatly narrow the range of choices for relating [ɔ] to a given phoneme, a) by assuming that the phonetic instantiations in a given paradigmatic domain all contrast with one another, and b) by determining the inventory of phonetic instantiations in a given paradigmatic domain.

In order to further narrow the range of choices for the phonemic status of [ɔ], one must have recourse to rules. This involves determining that [ɔ] in one position context is an allophone of [i] in another position, i.e. through raising. I assume that proving the latter establishes that [ɔ] is underlyingly high. (More on the latter assumption below.)

Determining that [ɔ] in one paradigmatic context is related to [i] in another paradigmatic context requires identifying [ɔ] and [i] as the 'same' vowel. In order to
do the latter, it is necessary to know the morphological structure of the language in question. For example, it is necessary to know that [ɔ] in a given stem is realized as [i] in the same vowel of the same stem in another paradigmatic context.

The above line of reasoning shows that it is possible to determine the phonemic representation of /Ø/ — [i] without recourse to rules. In order to know that [ɔ] is underlyingly high /I/, it is necessary to establish a syntagmatic relationship between [ɔ] and [i] by observing that the latter instantiate the 'same' vowel in different paradigmatic domains. Crucially, however, one does not have to observe that [ɔ] (from high /I/) triggers raising in some target in order to know that [ɔ] is phonologically high.

One final point needs to be clarified: In this chapter, I have argued that the relationship between [ɔ] and [i]—when the latter instantiate the same vowel—can be viewed in two different ways. If [i] varies with [ɔ] in a given paradigmatic context, then [i] and [ɔ] do not contrast. Instead, the variation is derived by enhancing the phoneme /E/ for [high]. If, on the other hand, [i] stands in a syntagmatic relationship with [ɔ], such that the same vowel is instantiated as [i] in one paradigmatic context, but as [ɔ] in another paradigmatic context, then the variation is derived via a rule of reduction, i.e. delinking of [high]. In summary, establishing syntagmatic and paradigmatic relationships among phonetic instantiations of the same vowel determines the phonemic content of that vowel, without recourse to rules.

In this chapter, I have developed a model which constrains the relationship between language-particular phonemic representations and universal phonetic representations. I have also shown that the path from phonetic representations to phonemic ones is similarly constrained. In the process, I have demonstrated that phonemicization need not refer to rules. Instead, phonemicization can refer solely to syntagmatic and paradigmatic relationships among the phonetic instantiations of
given vowels. Determining whether given phonetic instantiations represent the same vowel additionally requires knowledge of the morphology of a language.
6.1 Conclusion

In this final chapter, I take the opportunity to reiterate the main themes of my thesis and to summarize my view of the relationship between the phonetics and the phonology. In the process I highlight my contributions to phonological theory.

6.1.1 Organically-derived characteristics

I have argued for the model of the relationship between the phonetics and the phonology shown in (1). This model is modified from Cohn (1993: 44); the modification is bolded. Example (1) illustrates the components of the language-specific module, while Cohn's language-universal module has been omitted, as it was not discussed.

(1) Current view of the relationship between phonetics and phonology:

<table>
<thead>
<tr>
<th>phonological rules</th>
<th>spreading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>delinking</td>
</tr>
<tr>
<td></td>
<td>constraints</td>
</tr>
</tbody>
</table>

language-specific phonetic rules → enhancement

As shown in (1), I have assumed a derivational model in which the phonological component precedes the phonetic component. I have argued for contrastively-defined underspecification in the phonological component, and for phonetic enhancement in the phonetic component. While the ideas of Modified Contrastive Specification and phonetic enhancement do not originate with me (cf. Avery and Rice 1989, Rice 1993a,b, Rice and Avery 1991, 1993, Rose 1993, Walker 1993, Wu 1994), I have provided extensive evidence to develop and support these ideas.
A main theme of my thesis is that many of the characteristics of the language-specific module illustrated in (1) are derived organically, i.e. from the phonological inventory of a given language. For example, in chapter 2, I argued that the possible set of phonological rules in a given language is delimited by the phonological inventory of that language, such that an inventory with no contrastively-determined mid vs. high contrast cannot have rules referring to the feature [high]. I have also argued that phonetic rules such as enhancement derive their language-specific nature from the phonological inventory as well, in that the use of features as phonological precludes their use for phonetic enhancement. Enhancement is thus language-particular to the extent that it uses features which are 'left-over' from the contrastively-determined phonological inventory.

This thesis has been couched in a traditional derivational approach that assumes a phonological component, followed by a phonetic component. However I believe that the phenomena discussed here are not merely products of the derivational approach (as argued, for example, by Steriade 1993 with respect to 'trivial' underspecification), but are theory-independent phenomena which require explanation in non-derivational approaches as well. To illustrate, in chapter two, I demonstrate that the presence of the feature [high] was forced by the existence of a mid-high contrast. This evidence for a contrastively-based feature hierarchy in turn has important consequences for recent work in constraint-based approaches such as Optimality Theory (OT; c.f. Itô, Mester, and Padgett 1993 for an Optimality Theoretical account involving features). OT assumes a fixed feature hierarchy (c.f. for example Itô, Mester and Padgett 1993: 9 example (18)), but constraints are in principle unordered, except on a language-particular basis (Prince and Smolensky 1993). Given that constraints can be ordered in any manner, one would expect to find no correlation between contrasts and the presence or absence of a feature. To illustrate, I show part of Itô, Mester and Padgett's (1993) derivation for nasals
underspecified for [voice] in (2). While this example deals with redundant voicing on nasals, it serves to illustrate any feature-geometric head-dependent relationship. I assume some basic knowledge of OT here, dealing only with specifics of the table.

(2) Underspecification of nasal for [voice] (from Itô, Mester, and Padgett 1993: 15):

<table>
<thead>
<tr>
<th></th>
<th>Candidate:</th>
<th>License Feature</th>
<th>R-condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>[nasal]</td>
<td><img src="nasal" alt="License Feature" /> → [voice]</td>
<td>*</td>
</tr>
<tr>
<td>b.</td>
<td><img src="voice" alt="nasal" /></td>
<td><img src="nasal" alt="License Feature" /> → [voice]</td>
<td>*!</td>
</tr>
</tbody>
</table>

The candidate in (2.a) represents a nasal underspecified for voice. Candidate (2.b) represents a nasal specified for [voice]. The constraints deriving the optimal output include 'License Feature', a constraint that all features in a feature-geometric relationship be licenced (IMP 1993: 9), and an R-condition that nasals should dominate the feature [voice], or a condition that a dependent be dominated by a certain head. The ordering of License Feature before the R-condition results in the optimal candidate (2.a), in which a head has no dependent. (2.a) trivially fulfills License Feature, as there are no features to licence under the [nasal] node. (2.b), on the other hand, does not pass License Feature because there is no licencing relationship between [nasal] and [voice]. (2.a) fails to fulfill the R-condition, while (2.b) meets the R-condition. However, because (2.a) meets the higher-ranked constraint, License Feature, (2.a) is the optimal candidate. Notice that a reordering of the constraints, such that the R-condition ranks higher than License Feature, produces (2.b) as the optimal candidate. Hence, given the possibility of constraint reordering, OT can make no claims about when a head (such as [nasal]) has a dependent (such as [voice]). OT therefore predicts none of the asymmetries in inventory patterning which constitute evidence for MCS.
This thesis then contributes to phonological theory in providing a new body of evidence supporting Modified Contrastive Specification, and hence contrastively-derived underspecification. This evidence for underspecification contributes to the dialectic between full specification and maximal underspecification approaches, which may in turn lead to a new Hegelian synthesis in our understanding of (under)specification.

6.1.2 Complexity

Another theme developed in this thesis is complexity, derived from (Anderson and Ewen 1987, Donegan 1978, Dresher and van der Hulst 1993, Harris 1990, van der Hulst 1989, Kaye, Lowenstamm and Vergnaud 1985, 1990, Rice 1992, Rice and Avery 1993, Stampe 1979, and Twaddell 1935). In particular, I argued that generalizations concerning the paradigmatic complexity of given positions—for example concerning the number and types of phonemes present in a given position—provide a functional criterion for deciding between phonological analyses. In other words, deciding between, for example, apparently equivalent spreading or delinking analyses of neutralization between mid and high vowels can be accomplished on a language-particular basis once one has determined language-particular complexity requirements, as evinced by static patterns of vowel distribution. Thus, not only the set of phonological rules, but also the nature of phonological rules, is largely determined by either the overall inventory of a given language or the sub-inventories which are relativized to particular paradigmatic domains.

6.1.3 Contrastively-defined domains

A major theme of this thesis involved determining the domains within which features are contrastive. In chapter 2, I argued for a hierarchy of domains within which height features are contrastive in a given inventory. I also introduced the
concept that inventories (and hence contrasts) could be relativized to morphological—or more generally, paradigmatic—domains, i.e. stem and desinential domains. I review these two concepts—contrasts within inventories, and inventories within paradigmatic domains—below.

6.1.3.1 Contrasts within inventories

Chapter 2 and parts of chapter 5 dealt with defining the domains within which contrasts are determined in a given inventory. In chapter 2, I discussed vocalic features under the Aperture node, arguing that the height contrast between low and non-low is primary, and that the feature [high] is only used when forced to appear in inventories. In chapter 5, I argued that the feature [high] could be used as an enhancement feature when non-contrastive.

In chapter 5, I focussed on vocalic place features, adopting arguments that a) only the features [coronal] and [peripheral] are needed to capture the number of place contrasts found in languages (Rice 1994), and b) that [coronal] is absent from underlying representations unless forced to appear in order to mark contrasts (Rose 1993, Walker 1993). I adopted arguments from Rice (1994) that the features [labial] and [dorsal] are enhancement features. Finally, following Avery and Rice (1989), Rice (1994), Rice and Avery (1993), Rose (1993), and Walker (1993), I assumed that when [coronal] is non-contrastive within a given inventory, it is absent from underlying representations.

The above arguments give a fairly comprehensive picture of the structure of vowels, and hence, of the range of possible contrasts and domains of contrasts of vowels. I present a formalization of this view in (4), which employs the feature-geometric framework of MCS. Vertical lines denote features which are always used contrastively while non-vertical lines denote features which appear in underlying representations only when the appropriate contrasts exist. Features which may be
used for enhancement purposes, subject to the CEP, are enclosed in parentheses. I abstract away from the issue of what dominates the Place and Aperture node in (4) by using dotted lines to indicate that omitted intermediate structure. Finally, as noted in chapter 5, §5.3.3.1, [RTR] appears under the [low] node because it enhances [low]; however, it is unclear whether it is appropriate to put [RTR] under the Aperture node since [RTR] is a place feature.

(4) Vocalic features and contrastively-determined domains:

\[
\begin{array}{c}
\text{Place} \\
| \text{Aperture} \\
/\text{[peripheral]} ([\text{coronal}]) \quad | \quad \text{[low]} \quad ([\text{high}]) \quad | \quad ? \\
|/\text{[dorsal]} \quad ([\text{labial}]) \\
\end{array}
\]

The geometry in (4) generates a minimum of 1 vowel\(^1\)—the null vowel with no place or aperture features—and a maximum of 12 vowels, with the height contrasts high/mid/low and the place contrasts front rounded/front unrounded/central/back. (But see Goad 1993 for arguments that [ATR] can further subdivide the height domain to produce five vowel heights; c.f. also Kaye, Lowenstamm and Vergnaud 1985 and van der Hulst 1989, 1993 for further discussion) The geometry in (4) also makes strong predictions concerning which features are universally contrastive, and which are contrastive on a language-particular basis. I have provided evidence for the status of [low] versus [high] in chapter 2. I have also provided evidence based on the Contrastiveness Exclusivity Principle (CEP) in chapter 5 which argues that [coronal], [high], [dorsal], and [labial] have a different status from [peripheral], the former often optionally appearing as enhancement features in Iberian Spanish and Italian dialects. In summary, I have

\(^1\) Independent factors may force languages to have more than one underlying vowel. For example, nuclei may require a minimum amount of complexity, forcing a [low] versus non-low contrast within an inventory.
shown that both phonological and phonetic evidence can be used to determine the status of features as contrastive or non-contrastive within a given inventory.

### 6.1.3.2 Paradigmatic domains

Finally, as discussed earlier, I have not only assumed that contrasts are defined within inventories, I have also relativized the concept of inventory to domains, particularly to paradigmatic domains. I have argued that useful generalizations can be derived by broadening the definition of paradigmatic domains to include any vertical structure. I review some of these arguments below.

In chapters 4 and 5, I argued for paradigmatic domains that were defined in terms of vertical prosodic structure. For example, I argued that a) metrical positions such as strong and weak metrical position, and b) prosodic positions such as the right or left edge of a prosodic word could be considered as separate domains containing their own inventories. For example, the domain of verbal prefixes in Pasiego—which can be defined in terms of prosodic structure—has a separate inventory which is much smaller than the inventory occurring in stems. I argued that different phonetic patterning correlated with these separate domains.

I also argued for essentially morphological domains in this thesis. In chapter 2, I argued for a distinction between desinential and stem inventories in Spanish dialects, and in chapter 5, I argued for a distinction between stems and affixes in 'mid-harmony' languages such as Lamba. I showed that relativizing domains in this manner enables one to a) predict when a language can have a rule of height harmony (as in Spanish dialects), and b) predict asymmetries in phonetic variation for height within different domains (as in 'mid harmony' languages).

I left open an important question, namely what constitutes the possible set of paradigmatic domains. I add a few comments at this point to define this question further.
One potential solution to the question of what constitutes the possible set of paradigmatic domains is to limit the possible set by assuming that all examples of paradigmatic domains reduce to a common type. This appears to be possible in some instances; for example, in Pasiego, it is possible to analyse the morphological domain of verbal prefixes as a prosodic domain because the verbal prefixes also have in common a unique prosodic structure.

However, it is unclear whether reduction of morphological domains to prosodic domains is possible in all instances. For example, it is unclear whether the distinction between the stem domain and the affix domain in 'mid harmony' languages such as Lamba can also be reduced to some prosodic domain. In other words, reduction of morphological domains to prosodic domains is probably not a valid option.

I assume that, as argued in Dresher and van der Hulst (1993) and Steriade (1993), what is needed instead is a unified theory of prominent and non-prominent positions—in my terms, a unified theory of two types of paradigmatic domains, prominent and non-prominent. Dresher and van der Hulst develop such a theory in their 1993 paper, which posits a distinction between heads and dependents that "...cuts across segmental and supersegmental levels, and indeed perhaps across phonology and syntax." (1993: 1). Halle and Vergnaud (1987), and Anderson and Ewen (1987) also number among the people who also "...assume that constituency and heads are fundamental linguistic concepts." (Dresher and van der Hulst 1993: 1).^2

Lieber (1992) provides support for the idea that the distinction between heads and dependents cross-cuts more than just the phonology. Recall from chapter 2 that Dresher and van der Hulst (1993) argue that dependents tend to have more

---

impoverished representations than heads. In the same vein, Lieber (1992), argues that inflectional affixes have a relatively impoverished set of morphological features (i.e. 'Categorial Signatures' in Lieber's terms), while stems, bound bases, and derivational affixes have more fully specified sets of morphological features (Lieber 1992: 112). Many of the features of inflectional affixes are predictable from percolation conventions, i.e. inflectional affixes acquire many of their features from the Categorial Signatures of other affixes, stems, etc. In other words, it appears that inflectional affixes may be thought of as dependents, while stems, bound bases, and derivational affixes are heads.

Returning to the question of the possible set of paradigmatic domains, recall that I have argued in this thesis that many of the characteristics of the phonology of a given language are organically derived, that is derived from the irreducible elements of the phonological inventory. In keeping with this theme, and in keeping with the literature on heads and dependents in phonology, I assume that the potential set of paradigmatic domains is not unlimited. Instead, the potential set of paradigmatic domains derives from the irreducible set of elements listed in the lexicon, elements which can be defined as 'heads' and 'dependents'. However, the universal set of heads and dependents remains to be delineated.

6.1.4 Conclusion

In this thesis I have employed and developed the concepts of a) a fixed, contrastive feature hierarchy, especially for vowel height, b) phonetic enhancement, especially for height, within paradigmatic domains, and c) complexity theory. I have synthesized a model of the phonology-phonetics interface which addresses the gap between phonologically underspecified representations and maximally specified phonetic representations. I have argued that there is an unambiguous path from underspecified phonemic representations to maximally specified phonetic
representations. I have also shown that it is possible to derive a phonemic analysis by observing syntagmatic and paradigmatic patterns, instead of by observing the effects of rules. Finally, I have shown that the phonetic instantiation of vowels in Spanish dialects is patterned, and that the patterns derive organically from the contrasts and complexity requirements of the dialect in question.
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