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THE PHONOLOGY OF ITALIAN

MARTIN KRÄMER

The Phonology of Italian

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Any flaws in the analysis, omission of relevant works, misrepresentation of cited works or language data, uninterpretable sentences, and inappropriate comments are the author's responsibility.

NOTATION CONVENTIONS

Since this book deals with sounds and sound patterns, notation conventions are an important issue to be settled beforehand. Surface representations are given using the symbols and conventions of the International Phonetic Alphabet as displayed in the chart on the following page.

The long consonants of Italian will be indicated either by repetition of the respective IPA symbol for the sound in question or by the presence of the IPA length mark after the symbol for the segment. The choice is a matter of convenience in the respective context, and is not intended to reflect an analysis or theoretical position. Neither should transcribed double consonants or double affricates be interpreted as consisting of two closures and two release phases. Surface representations will be given in square brackets [ ] except for candidates (i.e. potential surface forms) in OT tableaux, which are listed without brackets, and abstract forms, either assumed underlying or input, are given in forward slashes //. Round brackets indicate foot edges ( ). Sections 4 and 5 of Chapter 7 deal with prosodic structure in relation to syntactic structure. In these sections, angled brackets ⟨ ⟩ indicate syntactic phrase boundaries, and curly brackets { } phonological phrase boundaries as well as boundaries of higher prosodic units. Orthographic forms of words are given in *italics* in the text, except for Latin words, which are given in CAPITALS.

The International Phonetic Alphabet is reproduced on p. x by kind permission of the International Phonetic Association (Department of Theoretical and Applied Linguistics, School of English, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece).

THE INTERNATIONAL PHONETIC ALPHABET (REVISED TO 2005)

CONSONANTS (PULMONIC)

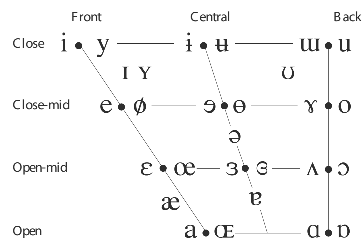
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks		Voiced implosives		Ejectives	
ʘ	Bilabial	ɓ	Bilabial	ʼ	Examples:
ǀ	Dental	ɗ	Dental/alveolar	pʼ	Bilabial
ǃ	(Post)alveolar	ʄ	Palatal	tʼ	Dental/alveolar
ǂ	Palatoalveolar	ɠ	Velar	kʼ	Velar
ǁ	Alveolar lateral	ʛ	Uvular	sʼ	Alveolar fricative

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

OTHER SYMBOLS

ʍ	Voiceless labial-velar fricative	ɕ ʑ	Alveolo-palatal fricatives
w	Voiced labial-velar approximant	ɺ	Voiced alveolar lateral flap
ɥ	Voiced labial-palatal approximant	ɧ	Simultaneous ʃ and x
ʜ	Voiceless epiglottal fricative		
ʢ	Voiced epiglottal fricative		Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary. k͡p t͜s
ʡ	Epiglottal plosive		

SUPRASEGMENTALS

- ˈ Primary stress
- ˌ Secondary stress
- ˌfoʊnəˈtɪʃən
- ː Long eː
- ˑ Half-long eˑ
- ˘ Extra-short ĕ
- | Minor (foot) group
- ‖ Major (intonation) group
- . Syllable break ɹi.ækt
- ‿ Linking (absence of a break)

DIACRITICS Diacritics may be placed above a symbol with a descender, e.g. ŋ̊

̥ Voiceless	n̥ d̥	̤ Breathy voiced	b̤ a̤	̪ Dental	t̪ d̪
̬ Voiced	s̬ t̬	̰ Creaky voiced	b̰ a̰	̺ Apical	t̺ d̺
ʰ Aspirated	tʰ dʰ	̼ Linguolabial	t̼ d̼	̻ Laminal	t̻ d̻
̹ More rounded	ɔ̹	ʷ Labialized	tʷ dʷ	̃ Nasalized	ẽ
̜ Less rounded	ɔ̜	ʲ Palatalized	tʲ dʲ	ⁿ Nasal release	dⁿ
̟ Advanced	u̟	ˠ Velarized	tˠ dˠ	ˡ Lateral release	dˡ
̠ Retracted	e̠	ˤ Pharyngealized	tˤ dˤ	̚ No audible release	d̚
̈ Centralized	ë	̴ Velarized or pharyngealized	ɫ		
̽ Mid-centralized	e̽	̝ Raised	e̝ (ɹ̝ = voiced alveolar fricative)		
̩ Syllabic	n̩	̞ Lowered	e̞ (β̞ = voiced bilabial approximant)		
̯ Non-syllabic	e̯	̘ Advanced Tongue Root	e̘		
˞ Rhoticity	ɚ a˞	̙ Retracted Tongue Root	e̙		

TONES AND WORD ACCENTS

LEVEL			CONTOUR		
e̋ or ˥	Extra high		ě or ˩˥	Rising	
é ˦	High		ê ˥˩	Falling	
ē ˧	Mid		e᷄ ˦˥	High rising	
è ˨	Low		e᷅ ˩˨	Low rising	
ȅ ˩	Extra low		e᷈ ˧˦˧	Rising-falling	
ꜜ	Downstep		↗	Global rise	
ꜛ	Upstep		↘	Global fall	

ABBREVIATIONS

*	indicates (a) a constraint violation in OT tableaux, (b) an ungrammatical form, (c) a reconstructed form (only relevant in Chapter 3)
AP	adjectival phrase
C	consonant
cand	candidate (potential surface representation)
CG	clitic group
CON	the set of constraints on surface representations and on mappings between representations
Cor	coronal place of articulation/place feature
CP	complement phrase
dim	diminutive
DiPI	*Dizionario di Pronuncia Italiana* ‘Dictionary of Italian Pronunciation’
Dors	dorsal place of articulation/place feature
DP	determiner phrase
EVAL	the Evaluation function, i.e. the component assumed in OT which chooses the optimal output form from the candidate pool provided by GEN
F	segmental feature/prosodic foot
fem	feminine gender
FocP	focus phrase
Ft	prosodic foot
GEN	the Generator function, i.e. the component assumed in OT which generates output candidates
h	head (e.g. of a foot)
H	heavy syllable
impf	imperfective
inf	infinitive
IP	inflectional phrase
IPh	intonational phrase
L	light syllable
Lab	labial place of articulation/place feature
Lar	laryngeal node/feature
LO	Lexicon Optimization

LPM-OT	Lexical Phonology and Morphology Optimality Theory
masc	masculine gender
NP	noun phrase
OCP	Obligatory Contour Principle
OT	Optimality Theory
PCat	prosodic category
pl	plural
PP	prepositional phrase
PPh	phonological phrase
PWd	prosodic word
RAT	Revised Articulator Theory
sg	singular
SPE	*The Sound Pattern of English* (Chomsky and Halle 1968)
SR	surface representation
SWP	Stress-to-Weight Principle
TopP	topic phrase
U	utterance
UR	underlying representation
V	vowel
VP	verb phrase
WbyP	Weight-by-Position
WSP	Weight-to-Stress Principle
XP	syntactic projection
μ	mora (prosodic weight unit)
σ	syllable

1

INTRODUCTION

The Phonology of Italian offers an overview of the main characteristics of Italian sound patterns under consideration of regional variation and an analysis couched in the framework of Optimality Theory.

With regard to this goal immediately two questions arise. 1. What is Italian? 2. Why is there a need for such a book? The first question might be raised by readers who are aware of the complex linguistic situation of Italy and the Italian language—or languages, one might say. Section 1.1 will be dedicated to a clarification of this situation. The second question could be expected from anyone familiar with the literature on Italian phonology. Italian is by no means an understudied language. It has received a lot of attention in the linguistic literature, both in the descriptive literature and in the theoretically oriented literature that seeks to further our understanding not only of Italian as a linguistic system but of language in general. Thus, one might wonder what the intended contribution of this book is supposed to be. I will give a more detailed answer to this in section 1.2. Section 1.3 will give an overview of the book, while section 1.4 provides guidance on orthography.

1.1 APPROACHING ITALIAN

Italian is spoken today by approximately 60 million people on the Italian peninsula, in Switzerland and in substantial communities in Croatia, France, Germany, Canada, the United States as well as South America. The Italian territory is far from being linguistically homogeneous. Apart from the 'new' languages brought to Italy by more recent immigrants from northern Africa and the Near East, there are several traditional enclaves of minority languages, such as Greek in the south, Albanian in the centre-south, and some Romance varieties which are regarded as distinct languages in the north, such as Friulian.

Notwithstanding the existence of the Accademia della Crusca in Florence, which is the Italian equivalent of a national language academy, and its dictionary project, there are several publishing houses that regularly publish dictionaries and claim authority on 'correct' pronunciation. Notwithstanding, the various dictionaries show a surprising agreement with respect to pronunciation guidelines, even regarding those aspects which are not covered by orthography, most prominent of which are the voicing or voicelessness of *s* and tenseness/laxness of mid vowels (with the notable exception of the *DiPI*, Canepári 1999). The reality is that hardly anybody conforms to this prescribed norm.

The Romance spoken on the Italian peninsula displays remarkable regional as well as sociolinguistic variation in all areas of grammar, sound inventory, and the lexicon, and is divided into a plethora of dialects. As mentioned in the first paragraph, some forms of Romance spoken on the peninsula are generally regarded as separate languages, such as Friulian or Ladin.

Italians make a clear-cut distinction between *dialetto* and *italiano*, and most speakers can be said to be bilingual in the sense that they have some competence in both a dialect and Italian. An estimated 50 per cent of the population learn Italian as their second language when they enter the education system. The spoken standard, or Italiano, is also subject to considerable geographic variation, as can be expected because of the high degree of dialectal diversity. Along sociolinguistic parameters such as education, economic background, and occasion of use, there is a continuum of varieties ranging from local dialects to heavily locally coloured Italian, from weak regional accents to standard/prescriptive Italian. Hence the standard as promoted in prescriptive works such as the Zingarelli remains a quite abstract construct, spoken at best by a minute minority of the population.

Since the unification of Italy in the nineteenth century, however, Italian has gained ground at the cost of the dialects. The number of families using some form of the standard at home has been steadily increasing. Today, over 90 per cent of Italians use some form of the standard in some contexts. The majority of speakers, even those who are not bilingual and don't have any active command of a dialect, use a regionally 'coloured' version of Italian (see also the discussion in Bertinetto and Loporcaro 2005 and references cited there). Mioni (1993: 104) captures the essence of the prevailing attitude towards a rigid pronunciation norm: 'se l'italiano è ormai di ≪tutti≫, ciascuno ha un certo ragionevole diritto ad avere un suo italiano' ('if the Italian language now is the language for everybody, everyone has a certain reasonable right to have his own Italian').

In this context it is instructive to look at two phenomena that will play a prominent role in this book, syntactic consonant doubling and intervocalic *s*-voicing. Gemination of consonants is much more salient the further south one travels on the Italian peninsula, with raddoppiamento sintattico—the lengthening of consonants at word junctures (as in *va*[bb]*ene* 'OK'; lit. '(it) goes well')—characteristically found in the centre, while northern varieties have no surface geminates at all. Intervocalic *s*-voicing is found in most morphophonological contexts in northern Italian, while Tuscan displays this phenomenon only in certain morphologically derived environments and many southern varieties have no voiced coronal fricative at all, except in voiced consonant clusters, i.e. as a result of assimilation to an adjacent consonant. Similar geographic distributional restrictions hold for other phonological patterns such as lenition in the form of voicing or spirantization, or for de-affrication. Thus, even though one could regard raddoppiamento sintattico as a feature of the standard language, northern speakers often pronounce only those geminate consonants that are indicated as such by the orthography, and do not display raddoppiamento sintattico when they speak Italian. Thus, one could say that raddoppiamento sintattico and intervocalic *s*-voicing are geographically almost mutually exclusive. Nevertheless, both phenomena should be discussed in a book on Italian phonology.

To give justice to a language which is spoken by such a large community and which is accordingly as regionally splintered in its phonology, it is necessary to examine regional variation in what is referred to as Italiano (as opposed to dialetto). As a consequence of the regional variation, the formal analyses which will be developed in the following chapters, taken together, are not intended to represent the linguistic competence of one individual speaker, but are intended as a 'meta-Italian' grammar, which covers a wide range of phenomena to be found in the linguistic space that can be regarded as Italian.

1.2 A RATIONALE

Starting with Bembo's (1525) insightful *Prose della volgar lingua*, grammars of Italian or works dealing with Italian phonology have been produced abundantly. However, most of these are descriptive or prescriptive works directed towards learners of the language, or rather outdated structuralist approaches (e.g. Dørum 1998) or generative accounts, based on the *SPE* framework. Saltarelli (1970) is the most prominent example of the latter. The issues it concentrates on are still essential in the contemporary discussion, and it provides brilliant analyses reflecting the state of generative phonology in the late 1960s. The shortcomings of this outstanding contribution are its very economical use of language data and the high degree of abstractness in the proposed analyses.

Aspects of Italian phonology, though, have informed and advanced generative phonological theorizing considerably. Nespor and Vogel's (1986) theory of prosodic phonology relies heavily on Italian, with its analyses of raddoppiamento sintattico, intervocalic *s*-voicing, vowel deletion, phrase-final lengthening, and the metric structure of Dante's *Divina Commedia*. Itô's (1988) seminal work on the coda condition compares Italian and Japanese. Davis's (1990) argument for the onset as a constituent of the syllable investigates this aspect of Italian phonotactics. Kaye et al. (1990) and Kaye (1992) develop central ideas in government phonology by considering Italian syllable onsets and vowel length among data from other languages.

Aspects of the prosodic phonology of Italian have been reanalysed within OT more recently by Peperkamp (1995; 1997), Van Oostendorp (1999), and Krämer (2001a; 2003b; 2005; forthcoming). Kenstowicz (1996a) drew on Northern Italian intervocalic *s*-voicing among other data to motivate his OT notion of uniform exponence, while Bertinetto (1999) and Loporcaro (1999) analyse intervocalic *s*-voicing within Natural Phonology and argue for strength scales. Krämer (2003b) argues for abstract underlying representations within OT on the grounds of virtual geminates in Veneto Italian. An enlightening OT analysis of Italian main stress was presented by D'Imperio and Rosenthall (1999). Borrelli (2002) and Saltarelli (2004) consider regional differences in raddoppiamento sintattico within OT, while Passino (2005) gives an account of backwards gemination (onset-driven consonant doubling) in CV theory. Van der Veer (2006) discusses mobile diphthongs in OT. There is an ongoing discussion on the analysis of metaphony as found in various forms in many varieties of Italian (Calabrese 1984; Maiden 1991; Frigeni 2003; Walker 2005). This list could easily be extended—it shows that many aspects of Italian phonology are in the focus of current research in phonology. However, the reader who is interested in the bigger picture has to rely on descriptive chapters in reference grammars or pronunciation guides, and must cull discussions on various aspects of Italian phonology from working papers, conference proceedings, journal articles, monographs, and dissertations. Thus, while Italian phonology is very well studied, our understanding of the phonology of Italian as a system is still very poor. One aim of this book is to put the pieces of this puzzle together.

In the following chapters I will not, however, exhaustively discuss the various accounts given of the manifold issues in Italian phonology, but will rather attempt to give a unified picture of the language. Apart from referring to previous analyses, and in many places adopting them, I will develop an account of the main aspects of the phonology of Italian in Optimality Theory.

Optimality Theory is a framework that is extremely well designed to analyse processes and variation. It does not provide a theory of representations. In this book, the segmental phonology is analysed in a version of the Parallel Structures Model (Morén 2003; 2006). The analyses of prosodic structure will use the concept of the syllable as well as moraic theory and the prosodic hierarchy as assumed in the framework of prosodic phonology (Nespor and Vogel 1986).

As indicated in the previous section, the phenomena of intervocalic *s*-voicing and raddoppiamento sintattico reveal the fundamental problem of a project on the phonology of Italian. The study of variation has to be an integral part of an account of the phonology of a language of wider communication. I have already referred to geographic and social variation. We can, however, discover further dimensions of variation in addition to regional and social differences and this book will hopefully contribute to a further understanding of these additional dimensions.

Many languages display slightly different phonological patterns across the major lexical classes, such as verbs and nouns (e.g. the stress patterns of English are generally assumed to be different in these two classes). An example from Italian that will be discussed in some detail below is the application of velar palatalization, which applies at morpheme boundaries without exception in 2nd conjugation verbs and is never found in 1st conjugation verbs. Most nouns and adjectives do not display velar palatalization at the morpheme boundary; a handful, however, do so.

A second type of internal variation is what is generally referred to as free variation. The most obvious example of this type from Italian is stress placement. For most words, speakers of Italian know exactly which syllable is stressed. Quite a few words show vacillation in this respect, however, such as *amaca* 'hammock', which can be stressed on the penultimate (second-to-last) or antepenultimate (third-to-last) syllable by the same speakers.

A third type of intra-grammatical variation is found in ambiguous patterns for which speakers might find diverse analyses. An example is the idiosyncratic application of velar palatalization in nouns. While the numerical facts could guide a speaker to assume that palatalization is not productive in nouns and adjectives, and that the few which show the alternation have to be recorded as exceptions, it is still possible that speakers, for some reason, analyse this pattern as productive and mark all the non-alternating forms as exceptions. We cannot decide on this question by looking at existing vocabulary. In Chapter 4 I will present the results of a nonce word test which show that speakers actually diverge on this point. This kind of variation does not manifest itself when speakers use known vocabulary: it is crypto-variation, an abstract variation at the level of grammatical analysis.

Usually it is simply regarded as a bad sign if a theory provides more than one analysis for one surface pattern, and the linguist attempts to streamline the theory to eradicate this apparent lack of economy. The discovery of this type of variation, however, shows that this aspiration to theoretical economy does not always help the linguist in her/his quest for the ultimate truth, since it does not bring the theory closer to the psychological reality. The investigation of these latter three types of variation has come more and more into focus over the past few years. I regard the study of these types of variation—along with investigation of the earlier mentioned types—as important avenues on our way to a better understanding of language, and will spend some time in this book on their exploration.

The Italian data, the backbone and raison d'être of this book, come from various sources. A lot of very good descriptions (and analyses) of phonological patterns in Italian can be found in the literature, which come from observation of speech behaviour of native speakers, introspection by native-speaker authors, psycholinguistic experimentation in the form of perception and production experiments, or lexical decision tasks. Apart from these sources I will report on my own fieldwork with informants from the north and the centre-south of Italy (with speakers from a range of places of which the province of Sondrio, Lombardy, marks the extreme north and Rome the most southern), which comprises simple observation of speech patterns in natural conversations, elicitation in conversation or via reading tasks, grammaticality judgements, and nonce word tests. Furthermore, I have made use of the internet search engine google™ to see frequencies of use of competing forms, in case the relevant information was encoded in the orthography. To a minor degree I consulted dictionaries, mainly 'il *DiPI*' (Canepàri 1999) and the online edition of Garzanti Linguistica. All data taken from dictionaries or the literature were double-checked with native speakers whenever this was possible.

1.3 AN OVERVIEW OF THIS BOOK

Chapter 2 gives a comprehensive but concise introduction to the theoretical framework to be employed in the remainder of the book, OT (Prince and Smolensky 1993; McCarthy 2004; McCarthy and Prince 1995; 1999), and the theory of segmental features to be used in the analysis of the segment inventory and segmental phonology, PSM (the Parallel Structures Model: Morén 2003; 2006). Readers familiar with the OT paradigm and with the PSM can skip this chapter and move directly to the chapters they are interested in. On the other hand, readers who are neither familiar with these theories nor interested in the theoretical arguments and analyses can also skip this chapter and stop reading around halfway in each of the following chapters, skipping the analysis sections in these as well.

Beyond Chapter 2 the chapters need not be read in the order they are presented in. While Chapter 3 gives the diachronic background, it is not necessary to have this to understand the discussion of the synchronic phonology presented in the following chapters. Chapter 3 can also be read after the following chapters, since the reader then has a fuller understanding of the synchronic processes and patterns that are mentioned only in passing in Chapter 3. The order of Chapters 4 to 7 reflects the levels of phonological organization, building up from the level of the segment, through syllable structure, to foot structure and the organization of the phonological word, and moving beyond this to the phrasal level.

The third chapter provides the historical linguistic background of Italian by pointing to its roots in Latin and the major developments from Roman times to the present day. The chapter starts with a sketch of the phonological system of Latin to provide a starting point for the phonological processes to be discussed later. In this discussion of Latin I will first look briefly at the consonant inventory, then vowels and diphthongs, then moving up to syllable structure and finishing with the regularities of word stress assignment in Latin. The overview of Latin is followed by a discussion of the major changes that led to current Italian, first presenting changes affecting consonants, then changes involving vowels, processes altering syllable structure, and, finally, the reorganization of the stress system. It will become evident here that processes affecting one subsystem often have an impact on other subsystems. For example, the reorganization of the vowel length system, replacing contrastive vowel length by predictable vowel length, is interconnected with the reorganization of the stress system in which we see a move from a quantity-sensitive right edge-oriented system to largely unpredictable lexical stress.

The third part of Chapter 3 sheds a more theory-oriented light on the changes introduced in the second part of this chapter, illustrating the three major paths of historical change, neogrammarian sound change, lexical diffusion, and rule inversion and analysing them from the perspective of OT, mainly as innovation by constraint reranking, but also by reanalysis of (ambiguous) surface patterns (also resulting in constraint reranking).

In Chapter 4 the sound inventory of modern Italian and segmental processes are dealt with, starting with a large inventory of surface-apparent segments which is then reduced to the inventory of contrastive segments. The overarching goal of this chapter is to argue for a system of contrastive or otherwise phonologically active features and their organization, moving from consonants to vowels and diphthongs. The discussion of phonological processes affecting consonants concentrates on alternation-inducing palatalization. Nasal place assimilation will be dealt with in the subsequent chapter on syllable structure; and the northern Italian phenomenon of intervocalic *s*-voicing is discussed in Chapter 7, dealing with prosodic phonology. The investigation of palatalization contributes to three issues. First, the pattern allows conclusions on the analysis of place features on consonants and, partially, on vowels. Second, velar palatalization in Italian is restricted to lexical classes. It is exceptionally productive in 2nd conjugation verbs, causes no alternations in 1st conjugation verbs, and is lexically idiosyncratic in nouns and adjectives. A further type of variation, which I term ‘crypto-variation’, will be identified among speakers' individual analyses of the pattern in nouns as lexically blocked in many nouns for some speakers or lexically triggered in some nouns for other speakers, as indicated already in the previous section. The OT analysis provides an account of variation between lexical classes by lexically indexed constraints, while inter-speaker variation is accounted for as different constraint rankings.

On the borderline between consonants and vowels we find the two glides, [j] and [w]. The discussion of vowel-glide alternations gives arguments for the independent status of glides as contrastive segments.

The processes affecting vowels discussed in Chapter 4 are neutralization of the tenseness contrast in mid vowels in unstressed syllables, and metaphony—the raising of stressed vowels in the presence of a following (word-final) high vowel. Unstressed vowel reduction and metaphony will help to further our understanding of the distinctions made in vowel height.

The chapter concludes with an overview of the feature system established on the bases of contrastive function and phonological activity. In this chapter we consider (albeit to a minor extent) a problem caused by phonotactic restrictions. The most economical feature system on the basis of contrast has to be rejected, because some generalizations on phonotactic distribution cannot be made for lack of distinctions among some segment classes.

Chapter 5 gives an overall picture of the restrictions on syllable structure, decomposing the syllable into its traditional constituents, onset and rhyme, nucleus and coda. We will see that Italian has quite strict requirements as regards the size of the syllable and of its component parts, as well as combinations of segments inside these. There are no combinatorial restrictions in the coda, since codas can have maximally one consonant. The choice of this, however, is determined to a high extent by the following segment. Thus, we will extrapolate restrictions holding between syllables as well. Given the strictly enforced restriction of rhyme size, delimiting rhymes to maximally two moras, one might wonder whether the coda is a relevant category in Italian at all. In the analysis, phonotactic restrictions are captured by reference to feature alignment rather than through constraints directly referring to the sonority hierarchy. Thus, both effects attributed to sonority sequencing and those that pose problems for a sonority-driven approach can be handled.

The next chapter investigates stress placement at the word level. A characteristic feature of Italian is the unpredictability of word stress in nouns and adjectives. Stress placement in verbs is more systematic, but still the pattern is obscured by a large number of lexically stressed morphemes. As it will turn out, stress placement in nouns and adjectives is not entirely unpredictable: for example, the second-last syllable in a word generally attracts stress when heavy, even though not all penultimate heavy syllables are stressed. This can be deduced from the results of a nonce-word test. The same test reveals that speakers are generally undecided when it comes to placing stress in words consisting of three light syllables: stress is as likely to fall on the penult as on the antepenult. Even though the stress grammar is subordinate to the realization of lexical stress, in the case of competing lexical stresses on combining morphemes a right edge orientation can be observed. A further conclusion of this chapter is that the stress foot is a strictly bimoraic trochee in Italian. Finally, the chapter discusses optimal word size and the status of clitics as being integrated into the prosodic word or not. The very systematic variation in stress placement observed in unknown words (and in a handful of established lexical items) is accounted for as an effect of unranked constraints, which are freely ranked with regard to each other every time they become relevant to determine an output form.

The final chapter is dedicated to systematic patterns beyond the word level, and discusses the prosodic phonology phenomena of intervocalic *s*-voicing, raddoppiamento sintattico, vowel deletion, phrase-final lengthening, and phrasal stress placement. While the argument for the prosodic word once derived from the pattern of intervocalic *s*-voicing turns out to stand on shaky ground in the light of more recent developments in phonological theorizing—especially the introduction of Base-Output correspondence or levels of evaluation—the discussion of the other phenomena, in particular syntactic consonant doubling, is to a high degree determined by principles already observed as operative in earlier chapters, such as the requirement on stress feet to be optimally bimoraic. Another argument in this chapter, in line with more recent developments, is that syntactic structure has less influence on prosodic organization than was often thought to be the case in the 1980s and early 1990s. Furthermore, where syntactic and prosodic constraints stand in conflict, Italian provides an excellent example of the observation that sometimes prosodic requirements are superordinate to some syntactic restrictions, but cannot enforce dramatic disturbances in syntactic organization. The conclusion (albeit not a novel one) is that at least some syntactic constraints are ranked in a hierarchy together with and in relation to prosodic constraints.

1.4 ORTHOGRAPHY

Dealing as it does with the phonological system of Italian, this book is not about pronunciation (and is by no means to be understood as a guideline to 'correct' pronunciation), nor is it intended for readers who are interested in Italian spelling conventions or writing systems in general. Nevertheless, I think it is instructive to have a brief look at sign-sound correlations in Italian orthography, for two reasons. The first is that an orthography which is (relatively) faithful to the phonology and phonetics, as the Italian one is, can give us some pre-theoretical insight into these latter modules of language. Moreover, writing systems tend to preserve historical artefacts, and can thus shed light on the history of a sound system. The other reason is purely practical. Examples will often be given in their orthographic form, and it might be helpful for the non-Italian reader to know how to interpret these.

Most letters representing consonants have approximately the value they have in the IPA, such as *p, t, f, v, l, n*. There are, however, several di- and trigraphs representing a single segment each. A few letters represent more than one segment, and some segments are represented by more than one letter or letter combination. The letter *h* occurs in some forms but never has a phonetic value. Apart from some idiosyncratic occurrences (see below), it is used systematically as a diacritic. For example, because of the peculiar way in which palatals are represented in the spelling, the segment [k] corresponds to *c* before the vowels *u, o, a*, and is represented by the digraph *ch* before *i* and *e*.

I will consider the different cases in turn, first discussing consonants, then vowels, and finally the marking of word stress in the orthography. We start with *h*, followed by the discussion of letters representing several distinct segments, then segments represented by two or three letters, i.e. di- and trigraphs, and then segments represented by more than one letter (combinations).

The segment [h] was already unstable in Classical Latin (Allen 1970; see Chapter 3 below) and is completely absent from Modern Italian. The letter has also been discarded in most words that contained it in Latin, such as *onore* 'honour', Latin HONOR. There are silent remnants, though, in some forms, such as loanwords (e.g. *hotel* 'hotel') and some words directly inherited from Latin, as in *ho* '(I) have', orthographically distinguishing the verb form from the disjunction *o* 'or'. All other forms of this verb lack an *h*, as the infinitive *avere* (from Latin HABERE). As Mioni (1993) notes, until the 1950s there was still a tendency to put an accent on the vowel of one of the forms rather than writing the *h*, which is common practice (for example) with the verb form *è* '(s/he) is' and the conjunction *e* 'or'.[1]

While in most cases it is very clear which phonetic value corresponds to a letter or letter combination, the letters *s* and *z* correspond to two segments each, and in neither case is it clear from the environment which phonetic value the respective letter has in a given word. *s* can represent [s] or [z]. The choice is in most cases determined by the environment. At the beginning of a word, the letter always represents the voiceless fricative, unless it is followed by a voiced consonant, as in *sbagliare* 'to be wrong', *smettere* 'to stop (e.g. doing something)'. Generally, the letter is to be interpreted as voiced when followed by a voiced consonant, as in *cosmo* 'cosmos, universe'. When it is preceded word-internally by a sonorant consonant, i.e. the letters *r, l, n*, it represents the voiceless fricative. Surrounded by vowels word-internally it stands for the voiced fricative in northern varieties, for a voiceless fricative in the south, and is unpredictable in Tuscany.[2]

The letter *z* stands for either [ts] or [dz], and there is no general rule as to where we find which. In northern varieties, however, word-initial *z* is usually [dz].

The phonetic realization of the letters *c* and *g* depends on the following vowel. Before *a, o, u* they are realized as [k] and [g], respectively, but as [tʃ] and [dʒ] before *i* and *e*.

In such cases where one of these two consonants is followed by *i* and this in turn is followed by another vowel, the *i* does not correspond to a segment, but is used as a diacritic to indicate the presence of an affricate rather than a plain stop, as already indicated earlier. There are more examples for digraphs. The sequence *sc* corresponds to [sk] when followed by *a, o, u* but to [ʃ] when followed by *i, e*. To represent a [ʃ]

[1] It would definitely be an advantage for students acquiring the Italian writing system if these instances of the letter *h* were removed from the system.

[2] Regionally/dialectally, post-sonorant *s* is often rendered as a voiceless affricate, therefore overlapping with the forms that contain a *z* preceded by a sonorant. Thus, *penso* is *pe*[nts]*o* rather than *pe*[ns]*o* '(I) think'.

followed by a back vowel (*a, o, u*) the letter *i* is added to *sc*, as with *c* and *g* representing an affricate, e.g. *sciogliere* 'to melt'. The latter word also illustrates the trigraph *gli* representing [ʎ].

The sequence *gn* represents [ɲ] as in *gnocchi, ragno* 'spider'. Thus, palatal segments and palatoalveolar affricates are represented by di- or trigraphs.

Finally, there are two digraphs with the same phonetic value, e.g. *qualità* 'quality' vs. *cuoco* 'cook'. Both *qu* and *cu* followed by another vowel represent [kw]. This dichotomy of representation reflects which of these were already present in Latin and which are Italian innovations. Also, this leads us to the peculiarities of the orthographic representation of glides and vowels.

Vowels usually have the same phonetic value as indicated by the respective letter as an IPA symbol, except in two cases. When followed by another vowel, *i* is used as a diacritic to indicate palatality of *c, g* rather than representing a vowel, and *i, u* also represent high glides when followed by a vowel, which are only written with *j, y*, or *w*, respectively in recent loans. The laxness or tenseness of stressed mid vowels is not reflected in the orthography, even though it is not predictable. There is a marginal cue to tenseness/laxness in vowels that are marked with an accent.

An accent marks stress. However, stress is not indicated except if a word is stressed on the final vowel, as in *città* 'city', *virtù*, 'value', *così* 'like this, this way', *paltò* 'overcoat', *bebè* 'baby', *perché* 'why, because'. On mid vowels, the choice of accent indicates the tenseness/laxness of front mid vowels in the most conservative prescriptive Tuscan orthoepic rendition. Compare *perché* with *caffè* 'coffee'. The acute accent is used to indicate tenseness and the grave accent laxness. This does not hold for high vowels, which are always tense, nor for the low vowel, which does not distinguish between tense and lax either. High and low vowels are marked with the grave accent. The lexical distribution of mid lax and mid tense is subject to regional variation; thus the 'rule' on the correspondence of tenseness and laxness with a specific accent only holds for some speakers. For example, speakers from northern Italy realize *perché* with a lax mid vowel in the final syllable, while the orthography indicates a tense one. Most Italians just use one accent for all cases anyway.

In conclusion, even though the Italian orthography is quite straightforward and phonologically oriented, there are several complex sound-sign correspondence relations. The orthography indicates some phonological alternations, such as those in palatalization processes. On the other hand it is phonemic in that it does not, for example, indicate the voicing of the anterior coronal fricative or whether an orthographic high vowel has to be interpreted as a glide or as a vowel. Tenseness and laxness, a distinction which is contrastive among mid vowels, is not encoded, except for stressed final position. Stress is only indicated marginally (figuratively and literally). As we will see in Chapter 6, a more extensive indication of stress would be useful to the (foreign) learner. However, recommendations for an optimization of Italian orthography are outside the scope of this book.

2

THEORETICAL BACKGROUND

Most of the analyses which will be proposed or discussed in this book are framed in Optimality Theory (Prince and Smolensky 1993; McCarthy and Prince 1993a; McCarthy 2004). The analyses of segmental phonology make use of a version of the Parallel Structures Model (Morén 2003; 2006). In this chapter I give a short introduction to the two theories; both will be used in tandem in Chapter 4. The analyses of phonological structure beyond the segment will be based on a basic notion of syllable structure, moraic theory, and the prosodic hierarchy as proposed in Prosodic Phonology (Kahn 1980; Nespor and Vogel 1986). The basics of the former two will be taken for granted here. The latter, the prosodic hierarchy, will be introduced in Chapter 7 in the appropriate context.

Even though Optimality Theory can at present be said to be the most widely used theory in generative phonology, it cannot be taken for granted that the reader is familiar with it. The Parallel Structures Model has so far received less attention in the literature: it is a relatively new theory, and various competing theories of segmental representation are available. Readers with some acquaintance with these theories are invited to skip the following paragraphs and move directly to the next chapter (or the one they are most interested in).

2.1 OPTIMALITY THEORY

Production as well as parsing (interpretation) of linguistic expressions is seen in Optimality Theory (as in most generative linguistic theories) as the mapping of two representations. In production, an input—an abstract mental linguistic representation—is taken as the starting point. The Generator (GEN), generates an infinite set of possible linguistic surface or output representations. Another function, the Evaluator (EVAL), chooses one optimal match, i.e. candidate, from this set of forms. These forms are also abstract linguistic (in our case, phonological) representations, which are the input to phonetic interpretation.

The function EVAL contains a set of universal constraints on linguistic representations. This set can be divided into two main classes or families of constraints, Markedness constraints and Faithfulness constraints. Markedness constraints are statements concerning the well-formedness of surface candidates. Examples of such universal markedness constraints are ONSET, which states that every syllable starts in a consonant, and *CODA, which states that syllables do not end in consonants. Obviously, neither of these statements can be regarded as a linguistic universal in the

Chomskyan sense, since neither of these constraints holds true (is satisfied) in all the languages of the world: many languages show vowel-initial syllables, and there are plenty of languages that show consonant-final syllables. Italian, for example, allows the violation of both constraints. This points to another property of OT constraints besides universality, that is, violability. Constraints can be violated by linguistic representations. If a language tolerates the violation of a constraint by a surface form this can only happen in order to satisfy a more important constraint. Thus, constraints have two more central properties. They stand in conflict with other constraints and they are of differential importance, i.e. ranked in a hierarchy of constraints. Constraint conflicts are resolved on a language-specific basis by constraint ranking. The candidate which displays the least severe violations of constraints as they are ordered on the constraint hierarchy is chosen as the optimal output for a given input. Since constraint rankings are language-specific, different languages choose different output candidates for the same input. Thus, the central idea of OT is that languages vary systematically in the dominance hierarchies of universal violable constraints, which is reflected in the Richness of the Base Hypothesis (Prince and Smolensky 1993). Any grammar, i.e. constraint ranking, of a specific language should produce only forms that are well-formed in that language, regardless of which input is mapped to an output form. The language-specific differences in constraint rankings explain the typological variation we find among languages.

The constraints which are in potential conflict with the two aforementioned Markedness constraints are two constraints of the family of faithfulness constraints. DEP-IO (Dependency Input-Output) states that all segments in the surface representation have a correspondent segment in the input representation, i.e. there should be no insertion. Any output candidate that has additional segments compared to the input violates this constraint. MAX-IO (Maximization Input-Output) states that every segment present in the input has a corresponding segment in the output. Any surface candidate that has any of the segments missing that are found in the input form violates this constraint. Thus, OT constraints are of these two types: statements on the well-formedness of linguistic surface structures and requirements on faithful mapping between input and output.

With the constraints introduced above I illustrate the property of conflict and the notion of constraint ranking. Suppose we have a word such as *ancora* [ˈaŋkora] ‘anchor’. If we look at the syllabification of the word, [.ˈaŋ.ko.ra.], we see that the first syllable starts in a vowel, [a]. It does not have a consonantal onset, which counts as a violation of the Markedness constraint ONSET. Furthermore, this first syllable ends in a consonant, [ŋ], in violation of the Markedness constraint *CODA. To avoid violation of ONSET, a grammar could add a consonant to the left of the vowel or delete the vowel, getting rid of the offending syllable. GEN provides these options in the form of candidates. The violation of *CODA could likewise be avoided by deletion of the nasal or by insertion of a vowel to the right of the nasal.

Since in Italian neither of these options is exploited, the faithfulness constraints that are violated by the addition of segments (DEP-IO) or by the omission of segments (MAX-IO) have to be more important than our two Markedness constraints. We can illustrate the evaluation process, as is common practice in OT, with a tableau (1). In the tableau, the input is given in the top cell in the leftmost column. Below this we find a list of selected relevant candidates from the infinite set of candidates. In the top row, to the right of the input, we have the constraints given in order of decreasing importance from left to right. Constraints that are crucially ranked with respect to each other are separated by a continuous line, while constraints for which we have no ranking argument are separated by an interrupted line. Asterisks in the columns below constraints indicate violations of the constraint in the respective column by the candidate in the respective row. Exclamation marks indicate fatal violations, i.e. the point in the comparison of candidates at which a candidate is excluded. The pointing finger indicates the winning candidate, i.e. the one chosen as the optimal output by this ranking.

(1) Constraint conflict and candidate evaluation[1]

	/aNkora/	Max-IO	Dep-IO	Onset	*Coda
☞ a.	.aŋ.ko.ra.			*	*
b.	.ʔaŋ.ko.ra.		*!		*
c.	.a.ŋe.ko.ra.		*!	*	
d.	.ʔa.ŋe.ko.ra.		*!*		
e.	.ko.ra.	*!*			
f.	.a.ko.ra.	*!			
g.	.ʔa.ko.ra.	*!	*		
h.	.ŋe.ko.ra.	*!	*		

OT is characterized as a 'parallelist' theory as opposed to derivational theories. The notion of parallelism here refers to the parallel generation as well as the parallel evaluation of output candidates, i.e. candidates (a–h), and an infinite set of suboptimal candidates omitted from this tableau are compared in one fell swoop. In a derivational theory a form is derived from an input by successive application of rules to the original representation, which introduce changes to this representation, with successive derived representations being ever more distinct from the original or input representation.

Multiple violations of lower ranked constraints cannot cancel out a candidate's good performance on higher ranked constraints, that is, constraint domination is strict, in Standard OT. Comparison of candidates (a) and (d) in tableau (2) illustrates this. Though candidate (a) has many violations of constraint D, which is satisfied by candidate (d), the latter candidate is excluded in favour of candidate (a) for a single violation of a higher-ranked constraint (B). Strict domination does not mean, however, that lower-ranked constraints have no impact on the choice of candidate. If two candidates outperform

[1] Lexicon Optimization (e.g. Prince and Smolensky 1993; Inkelas 1994; Beckman and Ringen 2004) predicts the input /aŋkora/ with a nasal specified for place even though this information is predictable, while most non-OT approaches prefer an underspecified /aNkora/. The alleged predictions of LO as well as its very existence have recently been challenged, though (Krämer 2006a; Nevins and Vaux 2007).

all other candidates on highly ranked constraints, but tie on the highest constraint they violate (as candidates (a) and (b) do), a lower-ranked constraint has to decide between the two. This is schematically indicated in tableau (2).

(2) Strictness of domination and the role of lower-ranked constraints

	/input/	ConstraintA	ConB	ConC	ConD
☞ a.	candidate 1			*	****
b.	candidate 2			*	*****!
c.	candidate 3			**!	
d.	candidate 4		*!		
e.	candidate 5	!*			

Weighted constraints, i.e. the option that multiple violations of generally lower-ranked constraints can have an impact on candidate selection, were explored in a predecessor to OT, Harmonic Phonology (Legendre et al. 1990), and have recently been discussed anew in the context of OT grammars (Legendre et al. 2006; Smolensky and Legendre 2006; Coetzee and Pater forthcoming).

Another way in which multiple violations of lower-ranked constraints can accumulate to exclude candidates that have optimal performance on higher-ranked constraints is local constraint conjunction. Two or more constraints are combined into a 'new' constraint, which is violated whenever a representation violates both constraints simultaneously. Local Conjunction has been invoked for a range of purposes. Several authors have analysed a variety of derived environment effects with locally conjoined constraints. Another application is the decomposition of complex constraints.

Take for example the coda condition (Itô 1988). Japanese and Italian (and many other languages) do not display coda consonants with a feature for place of articulation. Any labial or dorsal specifications in coda consonants are shared with the following consonant in onset position. To take our example *ancora* 'anchor' again, the dorsal place of articulation of the nasal in the coda of the first syllable is generally held to result from neutralization and assimilation to the following consonant. A constraint that forbids autonomous specification of place features in coda consonants could be a primitive constraint to this effect or a combination of two simple constraints, as *Coda and *Place. The former is familiar already and the latter is a markedness constraint violated by a segment with its own specification for place features. A consonant in coda position violates *Coda, and if it has a place feature it also violates *Place. Both violations together, incurred by the same segment, result in a violation of the conjoined constraint *Coda&*Place. With such a constraint in the grammar, all markedness constraints against specific features can be ranked below faithfulness to allow for the extent of contrast observed in syllable onsets, while the local conjunction militates against any contrastive specification of place features in coda consonants.

These two issues, the strictness of domination and Local Conjunction, bring us to another important issue. In the past decade, OT has experienced many proposals for additions to the theory and changes to the basic mechanisms of the theory (Positional Faithfulness, Transderivational Correspondence, Weighted Constraints, Local Conjunction, Turbid Representations, Targeted Constraints, Virtual Phonology, Stratal OT, Sympathy Theory, Comparative Markedness, Coloured Containment, Candidate Chains Theory, to name but a few 'extended versions' and 'plug-ins' related to OT). Such proposals serve to achieve many ends, the most salient of which is a principled account of phonological opacity. In this book, however, there will be no need for most of these extensions and modifications. I will keep the formal analyses in this book at a theoretically basic level for two reasons. The first is that we can insightfully analyse the major characteristics of Italian phonology at this level. The second might be regarded as a flaw of this book, in that I simply do not include some issues I regard as marginal in this context.

Let me illustrate one of these issues, structure preservation. We can use our example word *ancora* again. The dorsal nasal in this and other words in Italian is generally assumed not to be contrastive. In Italian, dorsal nasals emerge only as the result of assimilation to a following dorsal consonant, and are thus completely predictable in their appearance.

It has been a widely assumed practice to stipulate some constraint on the lexicon of a language to the exclusion of non-contrastive segments/structures from underlying representations. OT does not admit constraints on underlying forms. OT markedness constraints exclusively refer to surface forms, and faithfulness constraints refer to the match between forms of separate representations, such as input and output. Thus, they serve the evaluation of output forms. In this sense OT is surface-oriented. To formalize the observation that a certain segment is not contrastive in a language, OT has to reflect this in the ranking of constraints on surface structures.

Thus, exclusion of the dorsal nasal is achieved by ranking the markedness constraint against dorsal nasals above faithfulness, in this case above constraints from the IO-IDENTITY(Feature) family which preserve the faithful mapping of the feature content of input segments to the surface.

This works straightforwardly if a segment has to be excluded that does not occur under any circumstances in a language, for example, the laryngeal fricative [h] in Italian. If a hypothetical input (or a loanword, from English for example) contains this segment it will never surface. If the segment never surfaces and never has any (even indirect) impact on neighbouring segments, a learner will not be able to store it in underlying representations, because there will never be any reason to do so, and the segment is excluded from the Italian lexicon without recourse to assumptions concerning the lexicon itself.

Any ranking of *[dorsal, nasal] above faithfulness, however, would also ban the dorsal nasal from emerging as the result of a regular phonological process.

Krämer (2006c) proposes that Comparative Markedness (McCarthy 2003a) handles this problem. To oversimplify matters slightly, in Comparative Markedness theory, every Markedness constraint comes in two versions. One type is violated by the emergence of structure X if that structure has already been present in the input, labelled 'Old Markedness' ($^{*}X_{\mathrm{Old}}$). The other type is violated by any marked structures that are not present in the input, labelled 'New Markedness' ($*X_{New}$). The former militates against marked structures that are 'contrastive', while the latter militates against derived marked structures, such as the derived/predictable dorsal nasal in Italian. Thus, the former, $*$[dorsal, nasal]$_{Old}$, outranks faithfulness in Italian, while the latter, $*$[dorsal, nasal]$_{New}$, is ranked relatively low. In the discussion of the Italian sound inventory we will touch on this issue in passing.

Another wide field for the introduction of new theoretical machinery in OT is the phenomenon of phonological opacity. As it turns out, all instances of phonological opacity or derived environment effects that will be discussed in the chapters of this book can be analysed without technical solutions designed exclusively to this end.

The additional theoretical tools I will make use of in this book are Positional Faithfulness (Beckmann 1997a; 1997b; 2004), Transderivational Correspondence (Benua 2000; Kenstowicz 1996a; Burzio 2004), and constraint indexation (Pater 2000; 2005; forthcoming).

Positional Faithfulness was designed to account for the asymmetric behaviour of phonological structure in different positions. McCarthy and Prince (1995) observed that languages in general tend to have larger segment inventories in morphological stems than in affixes or other functional elements. In many phonological patterns, such as assimilation or harmony patterns, the trigger can systematically be found in a privileged position, such as the morphological stem/root and the targets in morphologically weak position, i.e. in affixes or clitics. To capture these observations they proposed differential faithfulness constraints. One type of faithfulness relates to phonological structure in morphologically privileged position, i.e. in roots or stems, morphemes belonging to the lexical classes Noun, Verb, Adjective/Adverb. The other type of faithfulness could be seen as not differentiating which kind of morpheme a phonological structure is associated with, or as referring to functional elements. The latter was in fact McCarthy and Prince's proposal. With this differentiation they introduced a meta-ranking that has root or stem faithfulness universally dominating affix faithfulness.

In addition to asymmetries conditioned by morphological class differentiation, Italian (as well as other languages) displays a larger vowel inventory in stressed syllables than in unstressed syllables and a larger set of consonants in onsets than in codas. The stress-induced asymmetry is also accompanied by synchronic alternations between lax and tense vowels and diphthongs and monophthongs, respectively, manifested when stress shifts due to affixation operations.

Beckmann (1997a) proposes a range of positional faithfulness constraints specifically referring to prominent positions such as the first syllable in a root, stressed syllables, and the onset. The 'opposite' approach explains positional neutralization effects via positional Markedness constraints, i.e. Markedness constraints against the realization of certain features in weak positions, such as unstressed syllables (see e.g. Crosswhite 2000; 2001; 2004).

Transderivational Correspondence postulates correspondence relations between morphologically related forms, such as a word or stem and a derived or inflected form containing this 'base'. This theory explains paradigm effects, such as the overapplication as well as underapplication of phonological processes in forms in paradigms.

To take an example from Italian again, diphthongization of mid vowels historically happened only in stressed syllables (as in the Modern Italian pair *nuovo* - *novità* 'new - news'). Some verbs have extended the diphthong across entire paradigms to forms in which the diphthong is not stressed (as in *muovo* - *muoviamo* '(I) move - (we) move'). Synchronically, it is debatable whether this process is active: historically such an extension can be explained as the effect of Base-Output Faithfulness constraints (transderivational correspondence) operating on these verb classes at some point in the history of Italian after the introduction of these diphthongs (see section 4.2.3 for more detail).

Many phonological processes are restricted to lexical or morphosyntactic classes, i.e. sometimes verbs behave in a different way phonologically from nouns, or sometimes a phonological process is unexpectedly blocked in a random set of morphemes. Lexically indexed constraints are constraints that are connected to a particular lexical item or class of lexical items, and are only activated at a position in the hierarchy that would make an impact when the correspondingly marked lexical items are evaluated. For all other forms the constraint is not active at this position in the hierarchy, but at a lower one. If the lexically indexed constraint is a faithfulness constraint, the effect is the exceptional blocking of a phonological process in some items and its regular application in all others. If the lexically indexed constraint is a Markedness constraint, we find a phonological process only applying to a selected set of lexical items, i.e. those carrying the respective lexical index. In this way lexical class behaviour and exceptionality can be handled and distinguished in a straightforward fashion.

OT is a theory of constraint interaction. These constraints pose restrictions on linguistic representations. The theory does not endorse a particular theory of representations, neither for prosodic nor for segmental structures.

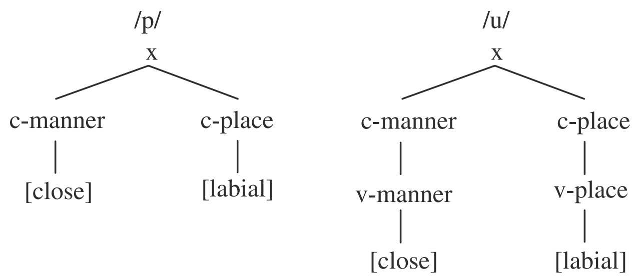
2.2 THE PARALLEL STRUCTURES MODEL OF SEGMENTAL REPRESENTATIONS

The 1980s and early 1990s saw the emergence of feature theories out of Autosegmental Phonology (e.g. Goldsmith 1976a,b): examples include Feature Geometry (Clements 1985; Clements and Hume 1995), Element Theory (Kaye et al. 1985; Harris and Lindsay 1995), Articulator Theory (Halle 1995; Halle et al. 2000), and Aperture Theory (Steriade 1993). New theories of segmental representation also emerged outside Autosegmental Phonology, with Articulatory Phonology (Browman and Goldstein 1992) being the most prominent. This interest in representations declined in the 1990s with the rise of Optimality Theory (Prince and Smolensky 1993). In this book I will use a version of the Parallel Structures Model (Morén 2003; 2006) that unites aspects of most previous models.

An important characteristic of Morén's theory is that the feature tree with all its contents is not universal. In Articulator Theory and Feature Geometry, for instance, the set of features is the same for all languages and (as I understand it) the same phonetic entities[2] receive a uniform feature specification in all languages. In the PSM, the organizational or hierarchical properties of the feature tree are universal, while the use of a particular feature is a language-specific choice, determined by several principles. The same holds for the expansion of the tree. Whether or not a specific mother node is present in a language depends on its segment inventory and the phonological processes displayed by the language. Thus, the model reduces universality in segmental representations almost to the function of recursion.

Vowels and consonants are parallel in that they potentially have the same class nodes and use the same terminal features—an assumption taken from feature geometry as proposed in Clements (1991) and Clements and Hume (1995). This is indicated in (3).

(3) Basic feature geometry in PSM



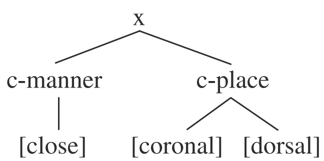
The intermediate v-manner and v-place nodes do not necessarily have to be present in a language. If a language has no phonological processes affecting vowels across consonants (such as vowel harmony), structural economy prescribes omission of the node. One of these intermediate nodes, however, should be present to distinguish vowels from consonants. Otherwise, an interpretation of a segment as either vocalic or consonantal could be achieved by virtue of its position in prosodic structure. It seems that in the latter case a prosodic theory relying solely on moraic representation at this level is not powerful enough to encode the difference, since consonants might be moraic and vowels could end up as mora-less under certain circumstances. Thus, a more elaborate model of syllable structure has to be employed, one which makes reference to constituents such as onset, rhyme, and nucleus. Likewise, an approach similar to CV Theory or Element Theory, which label positions as C(onsonant) and V(owel) or O(nset) and N(ucleus), respectively, can be adopted to resolve the indeterminacy in the system of contrastive features.

Coming back to the language-specific interpretation of feature trees, a structure as given in (4) can be interpreted phonetically as a click, [ǂ], in one language and as an affricate, [t͡ʃ], in another. This, however, does not imply that all clicks in all languages using clicks and all affricates in all languages displaying affricates have to

[2] 'Sameness' here refers to a relatively unsharp identity, i.e. not a phonetician's idea of sameness. For example, the high vowels in German and English are phonetically different, but are regarded as defined by the same phonological features in these theories rather than e.g. /u/ being [labial, dorsal, +back, +high, −low, +ATR] in one and [dorsal, +high, −low] in the other.

be analysed in this way. An affricate might, likewise, be a segment specified for two conflicting c-manner features, i.e. [open] and [close], or have instead a vocalic place feature in addition to its consonantal place feature. Thus the economy introduced in the feature theory also has to be paid for with a much more elaborate and language-specific phonetics module than is necessary in other models of segmental representation.

(4) Phonetically ambiguous phonological structure

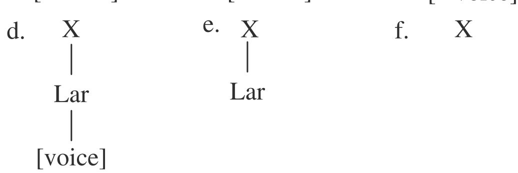


Apart from defining which features exist and how they are organized into higher constituents (class nodes), an issue of fierce debate was (and still is) the nature of features as unary, binary, or even ternary. While some scholars regard binarity as the zero hypothesis and assume privativity where they have arguments for this (e.g. Clements and Hume 1995), as for [nasal] and the articulator-based place features, others take a more holistic stance and assume privativity as a matter of principle (as in Element Theory and the Parallel Structures Model). Inkelas (1994) moves in the opposite direction, claiming that there is evidence for underlying three-way distinctions based on binary features, with a negative, a positive, or no value.

But is there actually a significant difference? For example, in a fleshed-out autosegmental theory with unary features and class nodes, a three-way distinction can be modelled just as with binary features and underspecification (5).[3]

(5) Parallels between bi-/ternary and unary features

a. [+voice] b. [−voice] c. [voice]



Such a theory therefore needs further constraints on representations, demanding the presence of a terminal feature in case of the presence of a class node, an obligatory requirement for all class nodes to be always present, or a ban on empty class nodes, etc.

The situation is similarly non-discriminatory when we look at the use of faithfulness to mediate feature contrast and neutralization in Optimality Theory. As outlined already in the founding papers on OT, the framework is supposed to be compatible with whatever turns out to be the most adequate theory of representations. As outlined in Krämer (2006a), Dep(F) and Max(F) constraints are particularly suitable for unary

[3] Thanks to Dave Odden for discussion of such issues.

features, while IDENT(F) constraints are defined in reference to feature values and thus seem most useful to deal with binary/ternary (or *n*-ary) features.

There is, though, an additional subtle difference here. While with the MAX/DEP(F) constraints a feature receives an autonomous status independent of the segment it is linked to, the IDENT(F) constraints regard any feature as an attribute to the segment it is tied to, at least in the way the constraints are interpreted in most of the literature. While a MAX(F) constraint is violated if a segment together with its features is not mapped to the surface, because the respective feature is missing, an IDENT(F) constraint is vacuously satisfied in the same situation, because the identity check presupposes the mapping of the relevant segment from one representation (e.g. the input) to another (e.g. the output) (see also Lombardi 1998; Walker 1998; Blaho 2008).

(6) Feature autonomy and attributivity via faithfulness

	/x[labial]/	MAX[labial]	DEP[labial]	IDENT[labial]
a. *faithful*	x[labial]			
b. *F changed*	x	*		*
c. *segment deleted*	Ø	*		

The tableau in (6) combines Identity constraints with unary features. The most reasonable interpretation in such circumstances is to assume violation in case of deletion or addition of the relevant feature, and, as in (6), vacuous satisfaction by candidates that have deleted the carrier segment. Thus, this combination of representational means and constraint theory turns unary features into binary ones (although so far without the third choice championed by Inkelas) (7).

(7) Constraint theory obviates the choice among binary valued and unary

	/x/	MAX[labial]	DEP[labial]	IDENT[labial]
a. *faithful*	x			
b. *F changed*	x[labial]		*	*
c. *segment deleted*	Ø			

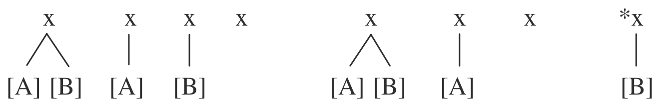
As may be deduced from the introductory remarks above, the PSM endorses unary features. I will adopt this practice in this book. However, I will not subscribe to all particulars of the PSM. For instance, we will see in the discussion of metaphony that unary features can be used creatively to formalize scalar or chain shift effects. That is, a segment can have several aperture (manner) features of the same type to encode a distinction in a certain dimension of contrast.

Furthermore, in the PSM, for every terminal feature used in the analysis of a language there must be a 'primitive' segment that has only this feature specified and no other feature; accordingly, for every combination of terminal features specified in a segment, there must be other segments each of which is specified for only one of these features.

This restriction has to do with learnability. The underlying assumption is that a learner incrementally builds up structures. Thus, first segments are detected which contrast by the presence and absence of feature x. Then segments are detected which contrast by the presence/absence of feature y. If the learner then detects yet another contrasting segment, this can be specified for both features, x and y. A consequence of this is the prediction that inventories are always symmetric in the sense that, if a language has a segment specified as [A,B], then it also has a segment specified as [A] and one specified as [B], as indicated in (8a). Instead it seems reasonable that inventories can equally well be built in the way depicted in (8b). See Blaho (2008) for a more detailed discussion.[4]

(8) Features and inventories

a. Symmetry   b. 'Asymmetry'



As my motivation of the feature system for Italian in Chapter 4 will rely heavily on phonological processes, we will see later on that we need redundant feature specifications to some degree, which also leads to the theory-internally undesirable situation that there is not always a primitive segment for each feature.

The contrastive inventory does not have to exhaust all combinatorial options presented by a given set of features. In principle, this leads to an explanation of non-structure-preserving phonological processes. It is generally accepted that phonological processes usually only affect contrastive features. There is, for example, no language with a phonological assimilation process which does not also use the assimilating feature contrastively. Thus, emergent contrasts or non-contrastive segments which are the result of phonological processes can be regarded as feature combinations not lexically exploited by the system for some reason.

Another argument against the principle that for each feature there is a segment comes from phonotactic restrictions. We will see in Chapter 5 that in order to make some of the generalizations on the distribution of segments inside syllables, we need to make reference to at least some redundant features.

As far as the phonological inventory is concerned, therefore, I will propose a system in Chapters 4 and 5 that is based on phonological activity in the broad sense that a feature is only specified if it is contrastive or is needed in some phonological process or phonotactic restriction.

4 As Blaho notes, the system in (8b) is problematic in OT, since a markedness constraint that bans a segment containing [B] also bans the complex segment containing [B], i.e. [A, B]. In this work I will ignore this problem and refer the reader to Blaho's proposal for a reformulation of constraints.

3

A VERY BRIEF HISTORY OF ITALIAN PHONOLOGY

As all Romance languages, Italian is a daughter language of Latin. In this chapter I give a sketch of the origins of Italian, concentrating on the main changes to the phonological system that characterize the change from Classical Latin to Modern Italian. Nevertheless, I start with a short sketch of the emergence of fifteenth-century Florentine as the source variety for Modern Italian.

The history of Italian and its rise to the status of the language of Italy starts with the adoption of some form of the *lingua volgare* (or, rather, spoken language) by Florentine merchants in their written business affairs, and the use of the spoken language of Tuscany and in particular Florence by fourteenth-century writers such as Dante Alighieri, Petrarca, and Boccaccio. If we follow Marazzini's (2004) careful argumentation, we can assume that, as in other language communities, the language of the educated differed substantially from that used by the less educated or illiterate. As Marazzini (p. 39) points out, classical writers had already noted a diffusion of the language along geographic and sociolinguistic parameters during the era of the Roman empire. The success of Tuscan as opposed to other regional varieties is due to the economic dominance of Florentine merchants and the cultural hegemony of the region's writers at that time. Marazzini reports that merchants in other parts of the peninsula seemed to have been studying Florentine to some extent during this time. It took, however, until the seventeenth century for the modern Italian orthography to emerge. Before that, the place where a book was published determined to a considerable extent which variety was used.

Probably because of the educational background of those who first codified Italian, an orthography was adopted that to a large extent followed the phonemic principles which characterize Classical Latin orthography. The educational and linguistic gap between the educated classes, i.e. those people who determined the (written) standard, and the majority of the population unsurprisingly led to a certain tension, long before the unification of Italy as a nation state in 1861, in discussions concerning the adoption of a variety as the standard or national language. Today we are left with a seeming contradiction. Even though Italian orthography is by and large phonemic, the language has only a written and no spoken norm. This written norm is based on the local variety spoken by educated Florentines.

The spoken language deviated from the Classical Latin norm long before this deviation was codified in writing. A revealing document is the *Appendix Probi*, which is from around the seventh century AD. This is basically a long list of 'errors', deviations in production from the Latin norm, compiled by a teacher of the time. As Marazzini notes, dating of the deviating realizations reported in this list is a matter of discussion.

In (1) below I reproduce a few items from the *Appendix Probi* as selected by Marazzini (2004: 42), which illustrate very nicely the beginning of the transformation from Latin to Italian. The list always gives the correct form first and then the 'erroneous' form. Marazzini added the Italian form for comparison; I have added the English glosses.

(1) Examples from the *Appendix Probi*

List item	*Italian*	*Gloss*
a. speculum non speclum	specchio	'mirror'
b. vetulus non veclus	vecchio	'old'
c. columna non colomna	colonna	'column'
d. auris non oricla	orecchia	'ear, auricle'

This short list illustrates the syncopation of internal unstressed syllables (examples a and b), the change of /t/ to /k/ before /l/ (b), the lowering of short lax high vowels to tense mid vowels (c), and the smoothing of the Latin diphthongs to mid vowels (d). These processes, among others, will be discussed in more detail in the following.

Even though it would be worthwhile to sketch the development of Italian in smaller steps, and to take a closer look at so-called 'vulgar Latin' and post-medieval/Renaissance Italian as well, I will restrict myself to a sketch of Classical Latin in the next section. This is followed by an overview of the main changes that can be identified distinguishing Italian from Latin. The final section will review these in a theoretical generative light, and give a formalization of the main mechanisms of change that have been identified in the literature.

3.1 LATIN AS A STARTING POINT

If we want to chart the development from Latin to Italian, we encounter a range of problems. The first problem is to define and accurately describe the variety of Latin we wish to take as our starting point. Despite a huge amount of literature written in and on Latin from the Classical period through to the emergence of Florentine Italian, it is not always entirely clear what the phonetic correspondence of letters and letter combinations was. Moreover, Latin must already have split into at least some dialects in a relatively early phase of the Roman empire. Even though Latin was still used in Italy as the written language until the fourteenth or fifteenth century, the spoken language must have deviated considerably from this written norm.

It is likely that the majority of the inhabitants of the Italian peninsula during the time of the Roman empire never spoke Latin in the way it is described in the grammars. Closely related to this matter is another substantial question. Where do the differences between Latin and Italian actually come from? Are these differences all innovations or do they come from external sources, i.e. the influence of other languages?

Before the Roman expansion, the Italian peninsula was inhabited by an impressive variety of ethnically and linguistically multifarious groups, comprising Celts in the north, Venetans, Etruscans, and various (non-Latin) Italic groups, as well as Greek settlements in the centre and south. Etruscan, for example, which was spoken roughly speaking in the area of Tuscany, was a Finno-Ugric language (Alinei 2003). After the breakdown of the Roman empire the peninsula was visited by various other groups who seized power locally and temporarily, and who could have put a linguistic stamp on the developing Italian language(s) (Gothic, Arabic, French, German, etc.). However, these adstrate languages do not seem to have had any noteworthy influence, apart from the occasional loanword. On the other side, the role of the pre-Roman substrate languages is a much more controversial issue. As Lepschy and Lepschy (1986) note, the present-day dialect isoglosses run roughly along the boundaries of the territories as divided up by pre-Romans. Remnants of substrate languages can be found on the lexical level, i.e. in geographic differences in the vocabulary; but on the phonological level such a substrate influence is extremely difficult to prove (Maiden 1995).

When I refer to 'Latin' in what follows, I mean Classical Latin, the language spoken by educated Romans in the first century BC, as reconstructed from written texts and descriptions by grammarians (see Vincent 1988a for a discussion of the problem of defining Latin). I will therefore ignore any sociolinguistic or geographic differences that already existed in the classical period. This is methodologically justified, as is the neglect of substrate influence, since we are looking at systematic differences between Latin and Italian. Since the major part of the Italian lexicon is of Latin origin, for any systematic difference that is detected it should be possible to describe this and formalize this regardless of its origin as an innovation, a substrate influence, or an adstrate influence.

Latin contrastive consonants show a voicing distinction among stops but not among fricatives, as shown in (2). Four places of articulation are distinguished among the stop consonants: labial, coronal, dorsal and labio-dorsal. The latter are the two dorsal stops with a labial glide in the release phase (i.e. /k^w/ and /g^w/). The appropriate analysis of such labio-dorsals in Modern Italian, as complex segments or complex syllable onsets, will be subject of discussion in Chapter 4.

(2) Latin contrastive consonants (Vincent 1988a: 29)

Labial	Alveolar/dental	Velar	Labio-velar	Glottal
p b	t d	k g	k^w g^w	
f	s			h
m	n			
	l			
	r			

The dorsal (velar) nasal is present in Latin but is omitted from (2), since its status as contrastive or allophonic is a matter of discussion. Latin orthography represents the dorsal nasal as a G before N and as N before G, as in REGNUM 'rule, authority, realm' or LINGUA 'language, tongue', respectively. The orthographic conventions suggest that the nasal is an allophone of underlying /g/ before a nasal and of /n/ before a dorsal consonant—i.e. the dorsal stop is nasalized by a following nasal and a nasal assimilates its place of articulation to a following stop.

In addition, Latin had the two glides [j] and [w], which were represented orthographically by the letters used for the high vowels, as in *I*ANUARUM 'January', CI*U*ITATEM 'city', respectively. Given the generally phonemic character of Latin orthography, the surface glides are thus phonologically regarded as high vowels whose realization as glides is fully predictable.

The Latin system of contrastive vowels as found in stressed syllables is usually described as displaying a threefold height distinction, and a backness contrast with front unrounded vowels and back rounded vowels. There is one low vowel. All vowels are distinctively long or short. Among the non-low vowels the length distinction correlates with a tense/lax opposition. All non-low long vowels are tense (or Advanced Tongue Root, ATR) and all non-low short vowels are lax (or Retracted Tongue Root, RTR). That length is the basic contrast with tenseness as an enhancing feature can be seen from the stress patterns. Long vowels attract stress in penultimate position. Latin has three diphthongs, which are all of falling sonority.

(3) a. Latin vowels

iː	ɪ				ʊ	uː
	eː	ɛ		ɔ	oː	
		aː	a			

b. Latin diphthongs

ai (orthographic AE)
au
oi (orthographic OE)
(Vincent 1988a: 29)

Latin syllable structure was quite permissive (in comparison to Modern Italian), allowing almost any kind of consonant in the syllable coda except /h/ and voiced stops. Voiced stops were only present in the coda if followed by another voiced stop. Syllables could be superheavy. A coda consonant could be preceded by a long vowel (4a) or diphthong (4b). On the other hand, the coda could consist of two consonants (4c). Word-initial syllable onsets could consist of at most three consonants, an obstruent plus a sonorant, which could be preceded by /s/ (4d).

(4) Latin syllables

a. LŪCTUM 'mourning' b. CLAUSTRUM 'bolt, bar, prison, cloister'
c. FARCTUS 'stuffed' d. STRATA 'street'

Word stress was completely predictable. Main stress fell on the antepenultimate syllable except when the penult was heavy, containing either a long vowel or diphthong or being closed by a consonantal coda.

(5) Latin stress

a. ÁSINUS 'donkey' b. RŌMǺNĪ 'Romans'
AGRÍCOLA 'farmer' DETRIMÉNTUM 'defeat, damage'

3.2 MAJOR DEVELOPMENTS ON THE WAY FROM LATIN TO ITALIAN

In this section I will discuss the most prominent and most systematic changes from Latin to Italian, looking at the consonants first and then turning to the vowel system.

However, when looking at these changes it is advisable to connect changes from different areas of phonology to achieve a better understanding. Furthermore, the history of Italian is a remarkable example of the emergence and subsequent abandonment of phonological processes. Thus, every generalization made below has to be treated with caution, since the majority of the processes that shape the transition from Latin to Italian became inactive later on, mostly testified through the existence of forms that seemingly did not undergo the process in question.

The explanation for these exceptions which is usually given in the literature is the application of a later process that created the potential input for an earlier process which was no longer active, or borrowing of new words either from Latin or neighbouring dialects.

An example of the creation of the context of application of a rule that is no longer active is the interaction of first palatalization and post-consonantal weakening of laterals (as will be discussed in more detail below) or the creation of a context for palatalization by diphthongization of mid lax vowels. A word like Italian *tiepido* [ˈtjɛːpido] 'lukewarm' contains a sequence of a coronal stop and a palatal glide due to the breaking of the stressed mid vowel in Latin TEPIDUM, which is a sequence that actually should have undergone palatalization to the anterior affricate [ts] to *[ˈtsɛːpido]. The explanation of the under-application here is the historical sequencing of the two processes. At the time breaking occurred, this type of palatalization had already ceased to be an active process.

The hypothesis of borrowing from Latin is supported by the existence of 'doublets', forms that underwent some sound change which today exist in tandem with a form with a related meaning that did not undergo the same change, for example, *cosa* 'thing' and *causa* 'cause'. Both forms stem from Latin CAUS(S)A; the former underwent diphthong smoothing and the latter did not. Historical linguists therefore suspect that the latter was reintroduced as a loanword from Latin after the Latin diphthongs in the vocabulary in daily use had turned into monophthongs.

The hypothesis of borrowing from neighbouring varieties can be illustrated with the following example. While Latin had only voiceless fricatives, standard Italian has a marginal voicing contrast in intervocalic position, as evidenced by the forms *ca*[s]*a* 'house' and *chie*[z]*a* 'church'. The explanation for this innovative contrast given by Maiden (1995), and others before him, is that the words with the voiced fricative were imported into the standard language or into Tuscan/Florentine as borrowings from northern Italian, which has a systematic pattern of voicing of intervocalic /s/ (see chapter 7.2).

3.2.1 Changes in the consonantal system

The changes affecting the consonant inventory mostly led to an expansion of the inventory of contrastive segments. A new series of palatal consonants and the voiced labial fricative [v] were introduced. On the other hand, the glides and the laryngeal fricative were lost. According to Allen (1970), already in the Classical phase, orthographic H was only realized correctly by very educated people. While the laryngeal fricative just vanished, the two glides turned into the aforementioned new segments. Glides, however, did not entirely disappear; and new glides emerged from several sources. Such new segments were also formed from other sources (as will be discussed shortly). The length contrast in consonants was extended, i.e. the set of lexical items that contain geminate consonants expanded. Below I will sketch the developments with the most dramatic impact. For more detailed descriptions see e.g. Tekavčić (1980) or Maiden (1995).

In the first wave of palatalization all consonants except the labials that were followed by the palatal glide [j] turned into palatals. Morpheme-internally we can speak of fusion of the two segments in question since the glide disappears.

(6) First palatalization

FILIA	figlia	[fiʎʎa]	'daughter'
PALEA	paglia	[paʎʎa]	'straw'
BALNEU	bagno	[baɲɲo]	'bath'
UITIU	vezzo	[vettso]	'habit'
MEDIU	mezzo	[meddzo]	'half'
ERICIU	riccio	[ɾittʃo]	'hedgehog'
FAGEU	faggio	[faddʒo]	'beech'
FASCIARE	fasciare	[faʃʃaːɾe]	'(to) bandage'
REVERSIARE	rovesciare	[roveʃʃaːɾe]	'(to) reverse'

A few palatal consonants emerged as reactions to tightened conditions on coda consonants without any palatal vowel or glide present in the Latin form.

(7) Parasitic onset licensing of features in coda position by fusion[1]

LAXARE	lasciare	[laʃʃaːɾe]	'(to) let' (X = [ks])
LIGNA	legna	[leɲɲa]	'wood' (GN = [ŋn])

The second palatalization turns all instances of /k/ and /g/ followed by a front vowel (i.e. /i/ or /e/) into the affricates illustrated already in (6). If the voiceless stop is preceded by /s/ the palatal fricative emerges rather than the affricate (8c).

(8) 2nd palatalization

a. CIRCULUS	*circolo*	[tʃiɾkolo]	'circle'
b. GENTE	gente	[dʒɛnte]	'people'
c. PISCE	pesce	[peʃʃe]	'fish'

Both palatalization processes also resulted in large scale alternations in inflectional paradigms. For 2nd and 3rd conjugation verbs, palatalization of stem-final /k/ and /g/

[1] In the analysis of velar palatalization in chapter 4.2.1 I propose that the palatal series is characterized by the presence of the place feature that identifies dorsal consonants and the coronal place feature, which explains also why a combination of a dorsal with a coronal results in a palatal, as in these examples. On the other hand, coda stops did not usually merge in this way with the following consonant. It seems they debuccalized and the remaining segment position, devoid of feature contents, got filled by spreading from the following consonant. Otherwise we would expect *[ɔttʃo] in Italian (as in Spanish *ocho* [ɔtʃo] 'eight') from Latin OCTO rather than the actual form [ɔtto] 'eight', see below.

before all affixes starting in a front vowel or a palatal glide is obligatory (9a), thus causing differing realizations of the root-final consonant in different inflected forms, while 1st conjugation verbs never show palatalization, as shown in (9b) (for more details, chapter 4.2.1). The nominal inflectional paradigm still contains a few nouns that show the alternation in number inflection.

(9) Morphophonological consequences of palatalization

a. giun[dʒ]ere	giun[g]o	'(to) join - (I) join'
b. pa[g]are	pa[g]i	'(to) pay - (you.sg) pay'

Instances of the two glides that were not in the neighbourhood of a consonant got strengthened, /j/ to [dʒ] and /w/ to [v]).

(10) Glide fortition

a. PEIUS	peggio	[ˈpeddʒo]	'worse'
IANUARIUM	gennaio	[dʒenˈnaːjo]	'January'
b. CIUILEM	civile	[tʃiˈviːle]	'civil'
UINUM	vino	[ˈviːno]	'wine'

According to Tekavčić the palatal glide was long in intervocalic position in Latin. This explains why all former intervocalic palatal glides resulted in geminate affricates.

The new segment [v] also emerged through another process than strengthening of Latin U [w], the lenition of obstruents. Intervocalic Latin /B/ lenited to [v] as in HABERE *avere* '(to) have'. /B/ before glide, however, lengthened (see below), and long labial consonants did not spirantize to [v]. Thus we get the paradigmatic alternation, as in *avere* - *abbiamo* '(to) have - (we) have'. While Latin /B/ seems to have been quite vulnerable to this lenition process, other stops resist. There are sporadic instances of voicing of intervocalic stops and even some cases of voicing combined with spirantization of /P/. However, the majority of words containing stops resisted this voicing process in Italian (11d).

(11) Intervocalic lenition

a. FABULA(M)	fa[v]ola	'(fairy) tale'
b. RIPA(M)	ri[v]a	'shore'
EPISCOPU(M)	[v]esko[v]o	'bishop'
c. STRATA(M)	stra[d]a	'street'
SCUTELLA(M)	sco[d]ella	'bowl'
ACU(M)	a[g]o	'needle'
LOCU(M)	luo[g]o	'place'
ECCLESIA(M)	chie[z]a	'church'
d. STRATU(M)	stra[t]o	'stratum'
FOCU(M)	fuo[k]o	'fire'
NASU(M)	na[s]o	'nose'

Intervocalic lenition of stops is one of the features that is generally used to draw the major line between the Romance languages, the La Spezia-Rimini line (isogloss), which separates Western from Eastern Romance. Remarkably, the major division in the language family runs right through the Italian territory (which further shows the inadequacy of the term 'dialects of Italian' used in reference to the varieties spoken on the Italian peninsula). Thus, northern Italian dialects generally display intervocalic lenition and are therefore regarded as Western Romance, while central and southern dialects don't have this feature and are regarded as Eastern Romance.[2] Generally, Western Romance, including the northern Italian dialects, is also uniform in the loss of the length distinction in consonants.

Tekavčić (1980) mentions a Pompeian rendition of TRIDICUM for TRITICUM 'grain' as one of the first emergences of intervocalic lenition. This is puzzling (also for Tekavčić, as he points out), since, first, this area does not fall within the zone in which we generally find lenition, second, it is quite early, and, third, the C does not lenite to G. The latter might find an explanation if we understand the D as an orthographic reflex of intervocalic tapping, as in American English. English intervocalic tapping targets intervocalic coronals only, i.e. /t/ and /d/, and leaves labials and dorsals intact. Thus, the intervocalic /t/, orthographically represented with a D here, could have been a tap, [ɾ]. If this speculation has anything to do with reality this instance of intervocalic weakening is qualitatively different from Western Romance lenition.

The existence of these sporadic and lexicalized cases of intervocalic voicing also casts doubt on the argument generally given for the existence of the voiced coronal fricative [z] in some words, i.e. that these, only sometimes ecclesiastic, terms were imported to Tuscany by northern Italian clerics (see above), since the lexical items that underwent lenition come from all sorts of semantic fields (as the list above shows). A further suspicious coincidence is the complete absence of reports on borrowings with shortened geminate consonants from the north (which might just be owed to my ignorance). This, however, might be explained chronologically (i.e. words with innovatively voiced intervocalic consonants might have been imported before northern varieties abandoned the length distinction in consonants).

New geminates developed from three sources. A considerable number emerged as a consequence of tighter restrictions on coda consonants. While Latin allowed almost any consonant in coda position, Italian has word-final consonants only in more recent borrowings. Word-internal coda consonants are subject to strict conditions. They can be sonorant consonants, *s* or the initial part of a geminate. Latin word-internal coda consonants generally merged with the following consonant, as in PACTUM *patto* 'pact'.

Another route for new geminates to enter the lexicon was through strengthening before glides. Consonants preceding the glide [w] geminated if they weren't preceded by another consonant. For example, the nasal preceding the labial glide in Latin IANUARIUM changed to a long nasal and the labial glide disappeared, *gennaio* 'January'. Labials preceding the palatal glide also lengthened and were immune to palatalization, as in CAVEA *gabbia* 'cage', SIMIA *scimmia* 'monkey'.

The third way in which new geminates emerged is actually pre-glide strengthening as well. However, it is connected with several other changes, most importantly the

[2] The Tuscan dialect feature 'gorgia toscana' is a special case of lenition with its debuccalization of /k/ to [h], as in [ahasa] *a casa* 'at home'.

weakening of post-consonantal laterals to a palatal glide. Thus, a form like OCULU(M) turns into Italian [ɔkkjo] *occhio* 'eye'. We cannot say for sure if the consonants preceding Latin L word-internally were subject to lengthening before the lateral softened or after. Since at a certain point in history the palatal glide caused palatalization of preceding consonants (1st palatalization) and since sequences of a dorsal stop and a lateral don't palatalize when the lateral turns into a glide (cf. CLAVIS *chiave* [kjaːve] 'key') one has to assume that palatalization ceased to be an active process at least morpheme-internally when L softening set in. The same conclusion has to be drawn regarding the emergence of glides as the effect of diphthongization (see below), since these stop-glide sequences, as in [tjɛpido] *tiepido* 'lukewarm' are immune to palatalization too. Compare *[ts(j)ɛpido] 'lukewarm' with *spazio* [spaːtsjo] *[spaːtjo] 'space' from Latin SPATIU(M).

As the above sketch shows, the matter of 'timing' or, less sloppily, chronological ordering of changes becomes relevant when we look at the emergence of new contrasts. I will come back to this issue in the final section of this chapter.

3.2.2 Changes in the vowel system

While Latin had a length distinction with tenseness connected to long vowels and laxness connected to short vowels, Modern Italian has no contrastive length distinction and has lost the lax high vowels. The length distinction, enhanced by a tense/lax difference among mid vowels, was thus reinterpreted as a tense/lax contrast, though not in a direct way, as can be seen from the lax high vowels. The lax high vowels changed to tense mid vowels. Thus, rather than merging with the tense high vowels, keeping their height intact, or with the lax mid vowels, conserving the RTR feature, they merge with the tense mid vowels. In this way, tenseness and length are uncoupled. Tenseness is no additional cue for the length contrast anymore.

Diphthongization of lax mid vowels in open syllables created a set of diphthongs that was not present in Latin, diphthongs with rising sonority (e.g., Latin NOUUM, Italian *nuovo* 'new'). There are a few exceptions to this pattern, i.e. stressed lax mid vowels that did not break into diphthongs, as in [ˈbɛne] *[ˈbjɛne] 'well'. To explain such exceptions Lausberg (1965) connects this diphthongization to metaphony (see chapter 4.2.3), which creates high vowels from tense mid and rising diphthongs from lax mid vowels in the presence of a following high vowel (e.g., the -U in Latin NOUUM). Maiden, however, refutes this claim, because this approach does not explain the emergence of diphthongs in some forms which never had a final high vowel, such as *ruota* 'wheel' (from ROTA).

While we see the emergence of a new set of diphthongs here, the original Latin diphthongs were smoothed to mid vowels. Latin OE turned into tense /e/, the other two diphthongs turned into lax mid vowels, AE to /ɛ/ and AU to /ɔ/. Such diphthongs were subsequently reintroduced, however, with the large scale borrowing of loanwords (mostly from Latin) containing these diphthongs (see the comments on doublets such as *cosa* vs. *causa* above) and via other changes (e.g., the change of final /s/ to /i/, as in VOS *voi* 'you.pl'). Since Latin diphthongs count as prosodically heavy, equivalent to long vowels, we get a mismatch in the otherwise consistent length-tenseness correlation in the change affecting the two low-high diphthongs as well, since this process introduced long lax vowels. Vincent (1988a) points out that this cannot have caused the collapse of the contrastive length system since this only affects a handful of lexical items.

The diphthongization of the lax mid vowels and the smoothing of diphthongs with falling sonority in tandem come close to what is generally labelled a chain-shift in phonology. One set of contrastive segments fills the position left vacant by another set that has changed.[3] This opacifies the diphthongization process, since the language now has minimal pairs (12a), a set of tense mid vowels that breaks into a diphthong under stress (the former lax mid vowels, 12b) and one set of plain vowels that is faithful (the former diphthongs, 12c). Faithfulness is not complete here, though, since in Italian lax vowels are tense when unstressed. The latter set aren't always faithful when stress shifts. Here we see another change at work. Unstressed mid vowels raise to high (12d). By smoothing, the former Latin diphthong ending in the back high vowel/glide fills the gap left by the now diphthongized lax mid back vowels. The Latin diphthong ending in a front high vowel/glide, however, (i.e., AE /ai/), meets the same fate as the front lax mid vowels - it turns into a rising diphthong. Thus, it might have been smoothed to a lax mid vowel in an intermediate stage.

(12) Reorganization of mid vowels and diphthongs

a. ˈkwɔːko (COQUUS)	'chef'	ˈpɔːko (PAUCUM)	'not much'
b. ˈnwɔːvo (NOUUM)		noviˈta	'new/news'
c. ˈgɔːdo	'(I) enjoy'	goˈdeːre (GAUDERE)	'enjoy-inf.'
d. ˈɔːdo	'(I) hear'	uˈdiːɾe (AUDIRE)	'hear-inf.'
e. ˈkjɛːdeɾe (QUAERERE)	'ask-inf.'	kjeˈdjaːmo	'(we) ask'

As a side effect we see the overgeneralization of the diphthong also to unstressed position in some morphemes (e.g., (12e)). That is, for example in verbal paradigms, the originally lax mid vowel is not only realized as a diphthong in forms in which it is stressed, but also in forms that realize stress on a different vowel.

A further set of (non-alternating) rising diphthongs comes from the weakening of the lateral consonant in complex onsets, already mentioned above, as in *pioggia* 'rain' PLUUIA. Given the lack of alternations in forms like *pieno* 'full' (PLENUM), *fieno* 'hay' (FAENUM, FENUM) and so on, the historical origin of these diphthongs as stemming either from lateral weakening or mid vowel breaking is no longer retrievable for speakers of Italian. Thus, it is reasonable to assume that subsequent generations reanalysed the diphthongization of mid lax vowels in stressed syllables as monophthongization of (some of) the diphthongs found in stressed position into tense mid vowels in unstressed position, a development generally referred to as rule inversion (Vennemann 1972).

The diphthongization of lax mid vowels, in metaphony contexts as well as in stressed syllable strengthening, poses a challenge to an analysis for several reasons, as will be discussed in more detail in chapter 4.2.3.

[3] Another chain shift can be observed in the behaviour of intervocalic stops in many dialects. The voiced stops turn into fricatives (thus occupying a vacant area since Latin had no voiced fricatives) and the voiceless stops are voiced. In northern Italian dialects, intervocalic voiceless stops are voiced and all long consonants are shortened, thus we end up with a voiced/voiceless distinction in intervocalic position nevertheless, only the lexical items carrying the respective specification have changed.

A factor that must have struck a heavier blow to the length system was the reorganization of syllable structure. While Latin had superheavy syllables containing a long vowel or diphthong plus a tautosyllabic consonant and didn't lengthen short lax vowels when stressed, later varieties introduced a size restriction on stressed syllables of maximally and minimally two moras (units of prosodic weight). This led to the shortening of some geminate consonants (e.g., Latin CAUSSA became CAUSA, losing the geminate, and subsequently [kɔːsa], smoothing the diphthong) and to the shortening of some long tense vowels in closed syllables as well as the lengthening of stressed lax vowels.

The breakdown of the length contrast was probably also favoured by the failure of the Latin orthography to indicate length. We see the same with regard to tenseness in contemporary Italian. Tenseness is not indicated in Italian orthography and we find a lot of regional variation as to which words have mid vowels that are tense and which words have lax mid vowels.

Apart from these major reorganizations that affected stressed as well as unstressed vowels to some extent (as the merger of lax high with tense mid vowels), unstressed vowels were subject to some minor changes as well. Lax mid vowels were banned from unstressed syllables probably already very early on. If the (short) lax vowels are realized as tense and still short when unstressed, this definitely also undermines the maintenance of a length contrast. Beyond that we find sporadic raising of mid vowels in unstressed syllables, as in the example *odo - udire* '(I) hear - (to) hear' in (12). Before labial consonants, unstressed front vowels show a tendency to turn into labial (and therefore back) vowels, as in *ubriaco* 'drunk' from Latin EBRIACUM. On the other hand, Latin final unstressed U lowered to /o/ (see *ubriaco*).

(13) Vowel changes from Latin to Italian

iː	→	i
ɪ, eː	→	e
ɛ	→	jɛ. / ɛ
aː, a	→	a
ɔ	→	wɔ. / ɔ
oː, ʊ	→	o
uː	→	u
ai	→	jɛ
au		ɔ
oi	→	e
		au
		ai

3.2.3 Changes in prosodic organization

Italian syllable structure is subject to much stricter restrictions than are found in Latin. The changes affecting syllable structure were already mentioned in passing in the discussion of consonantal changes and the loss of the length distinction.

The most characteristic change in phonotactic restrictions is probably the change of post-consonantal /l/ into the glide /j/. This change can be seen as a tightening of sonority sequencing constraints on syllable onsets. The rise in sonority from the first member of an onset (an obstruent) to the second member is steeper if the second member is a glide than if it is a lateral.

This process, however, once it had applied throughout the lexicon, ran out of business, since the change did not cause any morphophonological alternations. With the introduction of new words containing pre-vocalic consonant-lateral sequences a (new) contrast between consonant-glide and consonant-lateral syllable onsets emerged, as in *classe* 'class', *flauto* 'flute', and, more recently, *clacson* 'horn (of a car)', *flirtare* '(to) flirt'.

A lowered tolerance to marked consonants in coda position led to the extension of the geminates and to a new set of palatals, as well as to deletion of consonants (e.g., word-finally). Present-day Italian has developed a looser restriction on codas than it had in earlier centuries, as evidenced by the increasing number of new loans with final consonants from languages such as English, as, e.g., *film* 'film'. Original Latin word-final consonants, however, were lost or vocalized already very early in the history of Romance.

Moreover, the enforcement of syllable size restrictions to maximally two positions in the rhyme and minimally two positions in the rhyme of stressed penultimate syllables (see chapters 5 and 6 for more discussion), contributed to the loss of the vowel length distinction (see the remarks above).

While Latin had predictable stress on the antepenult with the penultima attracting stress when heavy, i.e. when it contained a long vowel, diphthong or a consonantal coda, Italian stress is not predictable (for more discussion of this issue see below, chapter 6). The introduction of lexical stress emerged (most probably) as a side effect of the loss of the length distinction and the syncope of some unstressed syllables. Thus, once the phonological reason (i.e. distinctive vowel length) for penultimate stress in a word with an open penultimate syllable was lost speakers most probably interpreted stress in this position as lexically marked, rather than induced by the Weight-to-Stress Principle (Prince 1983), according to which heavy syllables attract stress.[4] Consider in this regard words with light syllables only, as ASINU(M) 'donkey' and ASȲLU(M) 'refuge', which have developed into Modern Italian [ˈaˑsino] and [aˈziːlo], respectively. If the contrastive length was replaced by predictable length(ening) of stressed vowels, the reason for the penultimate stress in ASYLU(M) was not recoverable anymore. Thus, for a learner, stress randomly fell on the penultima or the antepenultima, with the

[4] Weight sensitivity restricted to the penultimate syllable, though, is most likely to be a side effect of foot size restrictions and edge orientation. See chapter 6 for a discussion.

vowel in each syllable being long because of the stress and not the syllable receiving stress because of its position in the word or the length of the vowel in its nucleus, respectively.

A telling example, as far as the emergence of lexical stress is concerned, is the word *città* 'city', since this word has final stress, which Latin did not have, and derives directly from a Latin ancestor, unlike some other words with final stress such as *casinò* 'casino' which was recently imported from French including the final stress. (The latter should not be confused with *casino* [kaˈsiːno] 'club; brothel; mess'.) Latin CIUITATE had a lexically long and accordingly stressed vowel in the penultima. On its way to Modern Italian the second and the last syllable got lost, while the stress remained on the vowel it was originally placed on by application of the Latin stress placement rules. The prosodic position contributed by the second syllable was retained in the form of lengthening of the following consonant. Thus, here only the vowel of the second syllable was deleted, not the consonant. This brings U into coda position of the first syllable, which corresponds to [w] in non-nucleic position in Classical Latin. As we have seen above, Latin labial glides changed into the labial voiced fricative [v]. Latin coda consonants that were not sonorants, however, assimilated to the following consonant word-internally. This results in the geminate we find in Modern Italian *città*. We can assume that, in Latin, CIUITATE had two trochaic feet, with secondary stress on the first syllable. All unstressed syllables got lost in this word. Since word-final consonants deleted as well, there was no room for the prosodic weight of the final syllable to be retained. Moreover, final long vowels are not allowed in Italian, thus the stressed vowel got shortened.

(14) From Latin predictable stress to Modern Italian lexical stress

Latin input	CIUITATEM /kiwitaːtem/	'city'
Latin parsing	(ˌkiwi)(ˈtaːtem)	
Palatalization	(ˌtʃiwi)(ˈtaːtem)	
Weak syllable deletion	(ˌtʃiw)(ˈtaːt)	
'/w/ → [v]'	(ˌtʃiv)(ˈtaːt)	
Coda licensing	(ˌtʃit)(ˈtaː)	
Final V shortening	(ˌtʃit)(ˈta)	città 'city'

Contemporary speakers of Italian certainly don't derive *città* from underlying /kiuitaːte/ but rather from /tʃitˈta/, since in Modern Italian neither syncope, nor apocope, nor strengthening of labial glides, nor word-final coda deletion, nor velar palatalization are fully productive processes.[5]

[5] Maiden (1995) gives a reconstructed Proto-Romance *tʃiˈitate implying that the labial high vowel/glide got completely lost before the second high front vowel was syncopated. If stress moved to the antepenultima, as in this reconstruction, before all syllable deletion one wonders though how it migrated back to the vowel stressed in the Latin form.

3.3 EXPLAINING HISTORICAL CHANGE

Even though Italian is, compared to the other Romance languages, relatively conservative with respect to Latin we have seen that the phonology underwent considerable restructuring in the course of time. In the following I will concentrate on a more formal approach to rule innovation, the emergence of new contrasts, the gradual introduction of a new phonological process and, finally, rule inversion. Another, related, issue I will touch is the scope of phonological rules and the change in scope they undergo over time.

3.3.1 Neogrammarian sound change

The theoretical analyses that follow are based on Hayes and Steriade's (2004) assumption that language change originates in language acquisition. In language acquisition all children/learners make errors in the analysis of the sound patterns they are exposed to, some of which are retained into adulthood and spread through the speech community. If we combine this with the OT-internal theory of acquisition which currently enjoys most currency, the constraint demotion algorithm (Tesar and Smolensky 2000), and the assumption that the initial state of grammar is one in which all markedness constraints outrank all faithfulness constraints, we find an immediate explanation for the emergence of innovative phonological patterns, such as palatalization or intervocalic lenition, etc. In the course of acquisition markedness constraints are demoted to places in the constraint hierarchy below faithfulness constraints. The task of the language learner is thus to establish the language-specific constraint ranking by successive downward movement of constraints along the strata of the hierarchy. Child errors (or, rather, many child errors) are assumed to emerge when a child has not demoted a certain constraint (yet). A markedness constraint can remain in a high position in the hierarchy even though it should be placed in a stratum further down the ranking. Usually the learner realizes this at some point by comparing her own surface forms with those of the ambient speakers and demotes the constraint to the position it should be in. If the misanalysis persists the child's grammar remains distinct from that of the previous generation. Thus, such failure to demote a markedness constraint explains sudden innovations. For example the complete loss of /h/ on the way from Latin to Italian (and all other Romance languages), as in *onore* 'honour' from Latin HONOREM, can be explained by simple failure to demote the markedness constraint that bans /h/ from surfacing faithfully, e.g., *[Laryngeal]. In violation of the lower ranked faithfulness constraint MAX-IO all instances of /h/ a learner hears from older speakers are left out of surface forms by this learner to satisfy undominated *[Laryngeal].

(15) Learners' failure to demote markedness initiates change

a. Initial state in language acquisition: MARKEDNESS $\gg$ FAITHFULNESS
b. Latin: MAX-IO $\gg$ *Laryngeal
c. Italian: *Laryngeal $\gg$ MAX-IO

Likewise, phonological processes such as palatalization or lenition are understood in OT as responses to markedness constraints. The failure to demote markedness constraints explains the emergence of categorical processes like these that apply without exception. Lexical abruptness, i.e. application to all lexical items containing a marked structure, is the hallmark of neogrammarian sound change.

Another feature of neogrammarian sound change is phonetic gradience (see Bermúdez-Otero 2007 for a brilliant exposition of neogrammarian sound change and lexical diffusion, and for references). The smoothing of Latin diphthongs can easily be imagined as having been implemented in a phonetically gradient way. Rather than changing in a single step from, e.g., /ai/ (Latin orthographic AE) to [ɛ] this and the other diphthongs might have changed gradiently by various degrees of centralization, with initially freely varying realizations such as [ai], [aɪ], [æe], and [ɛː].

3.3.2 Contrast innovation and fading-out of phonological processes

We can connect the emergence of new phonological processes with the emergence of new contrast now: While initially speakers might have linked the blocking of palatalization to sequences of dorsals and coronals followed by the palatal glide derived from underlying sequences of these stops followed by /l/, later generations, which are actually never exposed to any sequence of the latter type, i.e. C + [l], establish a simpler grammar that has to analyse the palatal consonants as well as the sequences of dorsal or coronal stops plus palatal glide as underlying. The highly opaque grammar is simplified towards more transparency. This at the same time opens the door for new words containing previously offending stop plus lateral sequences, as in *flauto* 'flute', to be adopted faithfully.

But let us take a step back and look at what an OT grammar does to static patterns. While palatalization caused alternations in morphological paradigms, as in *amico - amici* [amiko - amitʃi] 'friend - friends', it also created many non-alternating affricates. As noted in chapter 2, the Richness of the Base Hypothesis demands that systematic gaps that cannot be regarded as accidental gaps in the lexicon, but are rather systematic, have to be explained via a restrictive constraint ranking which excludes any hypothetical input that would fill such a gap, i.e. such generalizations have to be captured by a synchronic grammar. Lexicon Optimization (Prince and Smolensky 1993; Inkelas 1994; Beckman and Ringen 2004) reverses the usual evaluation procedure by evaluating all potential inputs that converge on the same output in a given grammar to choose the optimal underlying representation among these. For non-alternating forms in a palatalization grammar this means, according to Inkelas (1994) and Beckman and Ringen (2004), that they are stored lexically as maximally faithful. In comparison to the input candidate (16b) that takes a free ride on the alternations observed in other forms, the input candidate that is maximally identical to the output satisfies faithfulness (16a).

(16) Lexicon Optimization

	PAL	*DORS,COR	FAITH
☞ a. /rittʃo/ - ɾittʃo ɾittʃi		*	
b. /rikjo/ - ɾittʃo ɾittʃi		*	*!

Thus, the morpheme-internal sequences of dorsals and glides have been eliminated from the surface as well as from the lexicon. The breaking of mid vowels and the glide formation from post-consonantal laterals introduce new sequences that provide exactly the input condition for palatalization. At this point palatalization already has to have retreated to being a process that applies at morpheme boundaries only, that is, in morphologically derived environments, or learners block the palatalization process in phonologically derived environments. Lexicon Optimization has come under attack recently. See Krämer (2006a) as well as Nevins and Vaux (2007) for discussion. Thus, it is as plausible that at some stage in history non-alternating palatals still took a free ride (Zwicky 1970, McCarthy 2005a) on the alternating forms.

There are various approaches in OT to deal with derived environment effects and opacity. I don't want to enter this discussion here and represent the blocking of palatalization to derived consonant-glide sequences by local conjunction for convenience. If an underlying lateral or front mid vowel turns into a palatal glide on the surface this violates one faithfulness constraint, say IDENT(lateral) in the case of the input /l/. Turning this input lateral into an affricate to satisfy the markedness constraint on palatalization (shorthand PAL here) violates two Identity constraints since the segment does not only turn from a lateral into a stop/affricate but also from a sonorant into an obstruent. The latter faithfulness constraint is indicated here as IDENT(sonorant). Violation of one of these constraints is trivial, but if a segment violates both constraints this is fatal, since it adds up to a violation of the local conjunction of the two faithfulness constraints. Tableau (17) illustrates this. The tableau also illustrates that the variety that became Italian must have had an opaque interaction of the two processes or palatalization must have been inactive morpheme-internally already. Taking out the constraint conjunction results in the selection of candidate (c), which palatalizes the original C+ lateral sequence, as we find in contemporary Venetan [tʃɛza] *chiesa* 'church'.

(17) Glide formation from post-consonantal laterals and opacity

	IDENT(lat) & IDENT(son)	*ClV	PAL	IDENT (lateral)	IDENT (sonorant)	IDENT (place)
a. /okklo/ - okklo		*!				
☞ b. /okklo/ - okkjo			*	*		
c. /okklo/ - ottʃo	*!			*	*	
d. /rikjo/ - ɾikkjo			*!			
☞ e. /rikjo/ - ɾittʃo						*

At the surface a learner now encounters seemingly unpredictable consonant-glide sequences as well as posterior affricates, i.e. a contrast between forms such as *s*[kj]*avo* 'slave' and [tʃ]*ena* 'dinner'. This learner is still confronted with alternations between posterior affricates and dorsal stops at morpheme boundaries. For such a learner there is no reason to assume that palatalization is active morpheme-internally. Thus, the non-alternating forms, such as (17d, e), are stored as palatals in underlying representations and the opaque grammar is abandoned in favour of one that limits active palatalization to morphologically derived environments. Again, rather than introducing Stratal OT or some other extension I will represent this with a faithfulness constraint that is placed in the stratum above the palatalization-inducing markedness constraint.

(18) CONTIGUITY (F): 'Don't change the neighbourhood relations inside correspondent strings.' */XYZ/ - [XWZ]

Contiguity constraints are violated by changes to segments embedded between two other segments in the input.[6]

(19) Emergent contrast

	*ClV	CONT(F)	PAL	IDENT(F)
☞ a. /rittʃo/ - ɾittʃo				
b. /rittʃo/ - ɾikkjo		*!	*	*
☞ c. /okkjo/ - okkjo			*	
d. /okkjo/ - ottʃo		*!		*

Since strings of morphemes are regarded as unordered in the input, the stem-final obstruent in a derived or inflected form, such as plural /amik -i/ 'friend—masculine.plural' is not guarded by CONTIGUITY, since it is not embedded between two segments in the input. In this way, high ranking of this constraint explains the blocking of a process inside morphemes and its application at morpheme boundaries, i.e. non-derived environment blocking.

With the introduction of loanwords with consonant-lateral sequences the markedness constraint that caused all post-consonantal laterals to disappear is demoted below faithfulness. With the introduction of new verbs that don't show palatalization in morphologically derived environments and new nouns with the same lack of application of palatalization, the PAL constraint has to be moved even further down the hierarchy (for a detailed account of this in Modern Italian see chapter 4.2.1).

This example shows the historical movement of constraints, or as Bermúdez-Otero (2006) terms it, the life cycle of constraint rankings. A markedness constraint is left at the top of the hierarchy at some point and then gradually moves down over time.

[6] In the original proposal by McCarthy and Prince (1995), Contiguity constraints were regarded as violated by the insertion of a segment inside a string that is a contiguous string in the input or the deletion of a segment from inside a contiguous string. Krämer (2005) extended this to the level of segmental features. A feature embedded between two other features should not be changed. See as well the discussion in chapters 4, 5, and 7.

Bermúdez-Otero formalizes his insights into language change in Stratal OT (Bermúdez-Otero, to appear; or LPM-OT, Kiparsky 2000, to appear,). Stratal OT adopts the idea of stratification of the grammar into levels from Lexical Phonology (Kiparsky 1982). Parallel evaluation is done in three steps: at the stem level, at the word level, and at the phrase level. On each level CON consists of the same constraints, but they can be ranked in different ways on the different levels. Linguistic representations are successively evaluated in each level before we arrive at a surface representation. A markedness constraint can initially be ranked on top only at the final level, the phrase level, and then over time successively make it to the top stratum as well, first on the word level and then on the stem level. The development we have seen here, though, is a different one in that a process first applies unrestricted and successively the domain of application becomes more and more restricted.

The development of the scope of innovative phonological processes can be seen when looking at palatalization. The process that turned the dorsal stops into posterior affricates when situated before the palatal glide seems to have swept over the Italian lexicon in one big bang, causing whole-scale shift and morphophonological alternations before it lost force. These morphophonological alternations are still on the retreat today, as can be seen by comparison of different lexical classes, i.e. the different conjugation classes of verbs and the plural forms of masculine nouns (see chapter 4.2.1).

3.3.3 Classical lexical diffusion

The potentially reverse development can be observed in the slow rise of a new phonological process: As discussed above, the presence of voiced intervocalic coronal fricatives in some words in standard Italian is generally attributed to borrowing from northern varieties. The same can be claimed for the few voiced intervocalic stops found in standard Italian that were voiceless in Latin.

An alternative explanation for the rise of new voiced intervocalic obstruents invokes lexical diffusion (Wang 1969; again, see Bermúdez-Otero 2007 for an insightful discussion). A markedness restriction can have an impact on otherwise contrastive segments even if not generally active in a language. Sticking to the example of intervocalic voiced obstruents we can say that in intervocalic position the unmarked laryngeal configuration for an obstruent is voiced, even though in general the unmarked value for these segments is voiceless. Kiparsky (1988; 1995) draws on underspecification to explain the gradual shift from one value to another. A learner/speaker, when confronted with low frequency words, might not always store the value for voicing in an intervocalic consonant and thus rely on the grammar to make the choice for him/her.

In OT the difference between the general markedness of voiced obstruents and the relative markedness of intervocalic voiceless obstruents is expressed through the formulation of constraints. Thus, CON contains the two markedness constraints listed below, but not the reverse restrictions that treat voiced obstruents as unmarked and intervocalic voiceless obstruents as unmarked.

(20) Markedness constraints on voicing

a. VOP (Voiced Obstruent Prohibition): 'Obstruents are voiceless.'
b. *VC̥V: 'Obstruents between vowels are voiced.'
c. Default ranking (specific ≫ general): *VC̥V ≫ VOP

Standard Italian has some faithfulness constraint outranking these two markedness constraints to the effect that word-internally voiced [z] can occur under certain conditions, but not at word edges. The discussion on intervocalic *s*-voicing to follow in chapter 7 shows that even in standard Italian *s*-voicing applies at some morpheme boundaries.[7] Thus, we can make use of the same kind of faithfulness constraint involved in the morphological differentiation of a process looked at before, CONTIGUITY.

(21) Faithful word-internal contrast

	CONT	*VsV	*z
a. /kjɛza/ - kjɛsa	*!	*	
☞ b. /kjɛza/ - kjɛza			*
☞ c. /kasa/ - kasa		*	
d. /kasa/ - kaza	*!		*
☞ e. /zumo/ - sumo			
f. /zumo/ - zumo			*!

Whether the contrast-favouring ranking was achieved by borrowing or accidentally came into being by limitation of the process to prefix-final /s/ at the stem boundary is not relevant here (and difficult to answer, anyway), since I just intend to illustrate the potential effect of a lowly ranked markedness constraint to the rise of lexical diffusion. Whenever a speaker is not certain about the value of an intervocalic obstruent the constraints introduced in the grammar in (21) interact to give her/him the voiced segment as the unmarked.

(22) Emergence of the Unmarked

/koS?akko/	CONT	*VsV	*z
a. kosakko		*!	
☞ b. kozakko			*

In this way, voiced segments sneak into the lexicon over time. The same analysis can be extended to other unexpected voiced intervocalic segments, i.e. segments that were voiceless in Latin.

An ad hoc search in Italian dictionaries from 1938 (Palazzi 1939), the 1990s, and the first decade of this century (Palazzi et al. 1992; Zingarelli 1993; Garzanti's online dictionary, copyrighted in 2005) reveals an interesting confirmation of this predicted

[7] For a more detailed discussion of the synchronic pattern and its analysis in OT see chapter 7.2.

tendency. Of 28 items with an intervocalic coronal fricative that were looked up two had changed within 50–60 years towards voicing. *Cosacco* 'cossack' is given by Palazzi (1939) as containing a voiceless /s/, as is *fuso* 'spindle'. In the 1973 edition of the Zingarelli, *cosacco* is given with a voiced fricative and *fuso* with a voiceless sibilant. In the later dictionaries (among them Palazzi et al. 1992; Zingarelli 1993), *cosacco* is listed with a voiced fricative and *fuso* with two licit renditions.[8] None of the checked items listed with a voiced intervocalic fricative by Palazzi is listed with a voiceless fricative in the newer dictionaries. This might be regarded as an accident caused by the low number of items looked up. On the other hand this finding indicates that the theory of lexical diffusion just outlined is on the right track.

Canepàri (DiPI 1999) criticizes contemporary dictionaries for giving forms which are not in use anymore even by the most trained professional speakers from Tuscany or Florence.[9] Accordingly he gives almost all forms that have an intervocalic voiceless coronal fricative in the other dictionaries with a voiced fricative as the preferred form ("la piú consigliabile" 'the most advisable') and an 'outdated' form with the voiceless fricative ("la piú consigliata un tempo" 'the most advisable some time ago'). Those forms that are recommended with a voiced fricative by the other dictionaries have no alternative formerly recommended or non-recommended rendition. This leaves Canepàri's recommended pronunciation of Italian with an imbalanced contrast (if it is a contrast at all) leaning towards the other side: only very few forms, such as *presidente* 'president', or *preservativo* 'preservative, condom' are recommended with a voiceless fricative. These are those forms which, according to my experience, educated speakers from northern Italy, for whom intervocalic *s*-voicing can be regarded as operative, produce with a voiceless fricative. It is not quite clear if these speakers treat these words as loanwords or as morphologically complex (see 7.2 for more discussion).

The two varieties, the northern variety with active intervocalic *s*-voicing and the central variety with an intervocalic contrast, show an interesting quantitative asymmetry. Given that, hypothetically, both northern and central varieties could influence each other alike, it has to be observed that the number of words containing intervocalic voiceless /s/ is evanescent in northern Italian, while the number of words with a

[8] The orthographically equivalent participle of the verb *fondere* '(to) melt, fuse', *fuso* 'melted', is listed with a voiced fricative in all dictionaries. One might consider lexical attraction to play a role here in the change of the noun *fuso* from exclusively voiceless to variably voiced. The argument is more difficult to establish in the case of *cosacco*, though. Also, other such participles, such as *roso* from *rodere* 'to gnaw' have a voiceless fricative.

[9] Referring to the dictionary by Migliorini, Tagliavini, and Fiorelli, published in 1969, Canepàri (p. 3) writes (...) "[R]ispecchia una scelta ortoepica esclusivamente ≪ tradizionale ≫, troppo incentrata sul toscanismo, anzi sul fiorentinismo, che gli stessi professionisti della voce toscani e fiorentini non seguono più, o solo parzialmente, considerandolo ormai un tratto piuttosto regionale. Ci riferiamo in particolare, ma non solo, a quella ≪ scomoda ≫ peculiarità dell'≪ s ≫ intervocalica semplice (sonora o non-sonora a seconda delle parole), con ≪ caso ≫ /ˈkazo/, ma ≪ casa ≫ /ˈkasa/, ≪ chiesa ≫ /ˈkjɛza/, ma ≪ chiesi ≫ /ˈkjɛsi/, etc."

(It [the dictionary]) respects an exclusively ≪ traditional ≫ orthoepic choice, too centred on tuscanism, in fact on florentinism, which the same Tuscan and Florentine professional vocalists don't follow anymore or only partially follow, and who consider it a rather regional feature. We are particularly, but not exclusively, referring to this inconvenient peculiarity of short intervocalic ≪ s ≫ (voiced or voiceless depending on the word in question), with ≪ caso ≫ /ˈkazo/ 'case', but ≪ casa ≫ /ˈkasa/ 'house', ≪ chiesa ≫ /ˈkjɛza/ 'church', but ≪ chiesi ≫/ˈkjɛsi/ '(they) asked', etc." (My translation, M.K.)

voiced fricative in the central variety is much larger (and, very probably, increasing). That is, it is very difficult for lexically voiceless intervocalic /s/ to enter the northern Italian lexicon, while the central Italian lexicon is much more permeable for new forms with intervocalic /z/. The analysis given above predicts this. In the northern variety, a contrastively voiceless fricative in intervocalic position has to be produced against the pressure exerted by a highly ranked markedness constraint, *VC̥V (or, more specifically, *VsV), while in the central variety the innovative voiced intervocalic fricatives emerge in satisfaction of the same markedness constraint, even though it is a relatively unimportant constraint in this variety.

Of course, an assessment of the real linguistic situation requires extensive fieldwork with speakers of Florentine and Tuscan Italian rather than consultation of prescriptive dictionaries. If the observation stands further scrutiny that the number of forms containing a voiced intervocalic coronal fricative is on the rise this gives further evidence supporting the theory of lexical diffusion as outlined above.

3.3.4 Rule inversion

The breaking of lax mid vowels into rising diphthongs illustrates rule inversion, as illustrated by the change from Latin NOUUM to Italian [ˈnwɔːvo] ‘new’. In unstressed position the diphthong alternates with a plain vowel, [noviˈta] ‘news’. A phonological rule applies and in interaction with other phonological rules becomes difficult or impossible to learn. While we know from the historical data that it was originally the lax mid vowels that surfaced as rising diphthongs in stressed syllables, learners are faced with different options for the analysis of the pattern they are confronted with. For a learner of Modern Italian it is not clear whether s/he is exposed to underlying mid vowels that break into a diphthong when stressed or whether these segments/nuclei are underlyingly diphthongs which turn into simple vowels when unstressed. Given the related neutralization pattern in Italian that turns lax mid vowels into tense mid vowels when they are unstressed it is more likely that the diphthong/tense vowel alternation is analysed as an asymmetry of the same kind, i.e. a marked structure is allowed in stressed position and banned from unstressed position.

A speaker/learner who is confronted with the choices in (12) also faces the problem of apparent lexical idiosyncrasy. Since the original Latin vowels and especially the Latin diphthongs don’t surface in the pattern a learner has no access to the historical chain of events and can conclude, in parallel with the tense/lax alternation, that some diphthongs can be neutralized to monophthongs in unstressed position, but other diphthongs don’t alternate even though they have the same surface form in stressed syllables as the alternating ones. A more detailed account of such lexical idiosyncrasies will be given in chapter 4.

3.3.5 Summary

In the preceding paragraphs of this section I have illustrated different ways in which the phonological system of the language has changed on the way to contemporary Italian. First, the sudden emergence and complete and categorical application of new phonological processes (such as the sweeping elimination of post-consonantal /l/), the emergence of new contrast through the interaction of subsequently introduced phonological processes (i.e. post-consonantal /l/ weakening created the context of application of 1^{st} palatalization but the process was blocked in these forms), the abandonment of processes and introduction of new contrasts via the introduction of new words (as, e.g., *flotta* 'fleet' vs. older *fiore* 'flower'), the introduction of a phonological process and its recession in the face of excessive opacification of the grammar in combination with other processes and the slow establishment of a contrast through a subversive markedness condition (the slowly increasing number of intervocalic /z/ in central Italian).

As we have seen, OT provides mechanisms for the explanation of these modes of change. The detailed elaboration of these, i.e. a detailed account of the history of Italian phonology, though, is beyond the modest scope of a book chapter on the history of Italian phonology.

4

SEGMENTAL PHONOLOGY

In this chapter we will have a look at the Italian sound system and segmental processes. Questions to be discussed are the following. There is some disagreement on which and how many contrastive segments the system actually has. Glides, for example, are by many phonologists regarded as high vowels affiliated to a syllabic position reserved for consonants. Hence, we will look at alternations that give support to an analysis of glides as contrastive segments independent of the high vowels. Furthermore, if inventories of contrastive segments are regarded as systems built up in an economic fashion from a minimal set of contrastive features, the Italian system shows a few gaps or asymmetries in the system, which is a matter that has to be solved via either a creative approach to feature economy or an abstract analysis of the inventory which derives some segments from combinations of other segments at the underlying level of representation. For example, most of the consonants have a short/long opposition, but some consonants occur as long only. Since, seen from whatever perspective, long consonants are considered as the marked member of a short/long pair, one might want to decompose these long-only consonants into two more basic component parts which are merged in surface structures in a non-structure-preserving way.

Finally, an issue that will take considerable space here (and which also touches on the previous discussion) is which phonological features best represent the Italian system. To determine this, we will look not only at which segments are contrastive and which contrasts or lack thereof cause imbalances to the system, but also at phonological alternations.

As hinted at above, in order to determine if glides deserve a treatment as individual segments of their own kind at a deeper level, the examination of vowel-glide alternations is vital. That is, can all glides alternate with vowels under the right conditions, or do some resist alternation in an unpredictable way? In this case such unpredictable behaviour is regarded as evidence for the conclusion that Italian has two types of surface glide. One group derives from underlying high vowels, the other from underlying glides. Another matter of dispute that will be solved by examining alternations is whether affricates should be regarded as stops, fricatives, or a third species of obstruents. To this end I will propose an analysis of the processes of velar palatalization and of fricativization (as it was termed in Saltarelli 1970 for example) which puts all affricates and stops into one group, the members of which are distinguished via place of articulation.

The Italian vowel system is relatively uncontroversial (especially so as we do not focus on dialectal inventories here). However, the status of the lax/tense distinction of mid vowels is relatively unstable across varieties of the standard. Vocalic place features will to some extent be chosen on the basis of vowel behaviour in interaction with consonants in the palatalization processes already mentioned above. The most appropriate set of features to encode vowel height, though, will be determined by looking beyond processes we find in the standard varieties. We will have a closer look at the phenomenon of metaphony as it is found in many dialects.

4.1 THE SOUND INVENTORY

In this first section on segmental phonology I will give an overview of the sounds we find in Italian, and propose a preliminary distinction between the surface inventory and an abstract or 'contrastive' inventory. Segments will to a limited extent be decomposed into smaller parts—contrastive features. The primary purpose, though, is to take stock of the inventory.

As to the status of contrastiveness, I regard a feature as necessary to distinguish between two or more segments if its occurrence or absence on a (set of) segment(s) cannot be predicted by the environment synchronically. Thus, the concept of minimal pairs, i.e. words with distinct meanings that differ only in one aspect of articulation of one segment, is of subordinate relevance. For this reason the reader will also rarely find lists of minimal or near-minimal pairs. For example, if for the words containing a particular sound, e.g. [ɲ], we do not find matches that are identical to these in all aspects but for the sound in question being substituted by another, this should not lead us to the conclusion that the palatal nasal is not contrastive in Italian. Since neither its place nor its manner of articulation can be predicted synchronically in the words that contain this sound by means of its environment, it has to contain this information to separate it from all other consonants.

4.1.1 Consonants

Three consonant charts are given below, overlapping to a large degree. The first and most extensive one shows all the surface consonants of Italian (1). We see that phonetically there are seven manners of articulation to be distinguished and seven places of articulation. However, not all series display all places of articulation. The stops and the fricatives, for example, only show up at three places of articulation each. This usually leads phonologists to regard e.g. the labial stops and the labio-dental fricatives as phonologically encoding the same place of articulation. Strikingly, though this is quite common, the affricates lack all places of articulation bar alveolar and post-alveolar, i.e. there are no /pɸ, t̪θ, kx/. On the other hand, one could say they fill a gap with respect to places of articulation of stops. We will come back to this shortly.

The next observation to be made is that all stops and affricates display a voiceless and a voiced cognate. In Italian, the voiced stops show vocal fold vibration and the voiceless series is unaspirated. There are also no laryngeals, i.e. no glottal stop and glottal fricative. The voiced/voiceless distinction is contrastive, i.e. there are no contextually triggered processes that could be held responsible for the voiced or voiceless realization of any stop or affricate. This is slightly different in regional varieties which show intervocalic (incomplete) voicing of the voiceless series. Thus, based on these observations we can say that Italian employs the contrastive feature [voice] as opposed to [spread glottis] or [constricted glottis]. The voicing contrast in the alveolar affricate is slightly marginal. First of all, we do not find many words starting with an alveolar affricate; second, the number of voiceless word-initial alveolar affricates is considerably less than half of these words. Moreover, northern speakers tend to realize all initial alveolar affricates as voiced. Word-internally, however, the contrast is more stable. The only fricative that displays a stable voicing contrast is the labial (or labio-dental) pair. The voiced post-alveolar fricative is given in brackets since it occurs in a few loanwords only (mostly of French origin, such as *garage*).[1] The alveolar fricative does not contrast in voicing in northern Italian. The voiced fricative occurs in the vicinity of voiced stops and in word-internal intervocalic position. Elsewhere we find the voiceless form. In southern Italy, the alveolar fricative is voiceless in intervocalic position as well, while in the centre of the peninsula it shows some marginal contrast in intervocalic position. We will come back to this in more detail in the section on intervocalic *s*-voicing in the prosodic phonology part (Chapter 7.2). In summary, while the stops and affricates have a full voicing distinction, this dimension of contrast is defective in fricatives.

(1) Surface consonant chart

	Labial	Labio-dental	Dental	Alveolar	Post-alveolar	Palatal	Velar
Stop	p, b		t̪, d̪				k, g
Affricate				ts, dz	tʃ, dʒ		
Fricative		f, v		s, z	ʃ,(ʒ)		
Nasal	m	ɱ	n̪	n		ɲ	ŋ
Lateral			l̪	l		ʎ	
Rhotic				ɾ, r			
Glide	w					j	

The next row below the three groups of consonants discussed so far contains nasals. There appear to be quite a lot of nasals in Italian. However, half of them are not contrastive. When nasals are found in pre-consonantal position they completely assimilate in place of articulation to the following segment. This leads to surface labio-dental nasals (as in *trionfo* [t̪ɾiˈoɱfo] ‘triumph’), dentals (as in *dente* [ˈd̪ɛn̪t̪e] ‘tooth’), and velar nasals (as in *angùria* [aŋˈguːɾja] ‘watermelon’). These three never occur word-initially, and since their occurrence is completely predictable they are not contrastive. (This assimilation process will come more into the focus of discussion later on again, in the discussion of syllable structure, especially the coda condition in Chapter 5.) Thus, we can happily remove them from a chart that is supposed to show only the contrastive segments of Italian.

The same holds for the dental lateral. While the alveolar lateral occurs abundantly, the palatal lateral is extremely rare word-initially. (I personally know two words with

[1] The post-alveolar fricatives are also popular dialectal substitutes for the two post-alveolar affricates.

an initial palatal lateral, *gli* 'definite masculine plural determiner' and *glie-* 'object clitic', while all the items listed in the *DiPI* (Canepàri 1999) are personal names or loans or both.) Word-internally, however, the two laterals contrast in pairs such as *paglia* [ˈpaʎːa] 'straw' vs. *palla* [ˈpalːa] 'ball'. This shows once again that word-internal or morpheme-internal position is a much safer place for contrast in Italian than the word-initial position.

This minimal pair also shows us something else which relates to length, a dimension of distinction not mentioned so far. All the segments bar the three allophonic nasals occur as long, and most of them as short as well. Except in some contexts at word boundaries, length is contrastive, i.e. unpredictable from context (see section 7.3 for predictable consonant length). However, contrastively long consonants occur, again, only word-internally. Word-initially, all consonants can only be short (except in the contexts to be discussed in section 7.3). The consonants [ts, dz, ʃ, ɲ, ʎ] are short (like all the other consonants) word-initially, but are always long word-internally. In word-initial position they are realized as long whenever preceded by a vowel. The voiced alveolar fricative [z], on the other hand, does not occur in long form. This is not particularly surprising, since the geminate voiceless alveolar fricative is not subject to the assimilatory voicing processes mentioned above, and since [z] is a positional allophone of the alveolar fricative.

Length also explains the two rhotics in the penultimate row of the table. The rhotic is usually realized as a tap when short and as a trill when long (though Bertinetto and Loporcaro (2005) register a double contact of the tongue tip at the roof of the mouth in post-pausal and pre-consonantal position).

Finally, the chart in (1) lists two glides at the bottom. I have given [w] as labial here, though the more appropriate description of its place of articulation is labio-dorsal or labio-velar, as indicated by the choice of IPA symbol. These two glides are probably the most controversial segments in Italian. Vincent (1988b) does not list them in his inventory of contrastive consonants (2), thus following the line that high glides are phonologically identical to high vowels. High vowels are phonetically realized as glides when they are brought into a prosodic position that requires consonantal qualities, such as syllable onset or as the weak part of a diphthong. However, Bertinetto and Loporcaro (2005) take a different stand and include glides in their inventory of contrastive consonants (3).

(2) Italian consonant phonemes (Vincent 1988b: 280)

	Labial	Labio-dental	Dental	Alveolar	Palato-alveolar	Palatal	Velar
Stop	p, b		t, d				k, g
Affricate				ts, dz	tʃ, dʒ		
Fricative		f, v		s, (z)	ʃ		
Nasal	m			n		ɲ	
Lateral				l		ʎ	
Rhotic				r			

(3) Italian contrastive consonants (Bertinetto and Loporcaro 2005: 132)

	Labial	Labio-dental	Dental	Alveolar	Post-alveolar	Palatal	Velar	Labial-velar
Plosive	p, b		t, d				k, g	
Affricate			ts, dz		tʃ, dʒ			
Nasal	m			n		ɲ		
Trill				r				
Fricative		f, v	s, z		ʃ (ʒ)			
Approximant						j		w
Lateral approximant				l		ʎ		

Apart from the absence of glides in Vincent's inventory the two charts differ in two respects. First, Vincent describes the anterior affricate as alveolar, while it is dental for Bertinetto and Loporcaro. The other difference concerns the voicing contrast in the lingual fricatives. The voiced post-alveolar fricative is absent in Vincent's chart, probably on account of its alien status. Furthermore, Vincent lists the voiced alveolar fricative in brackets, indicating that it is contrastive only regionally. We find a contrast between /s/ and /z/ in intervocalic position in Tuscan Italian.

The charts in (1)–(3) could have been even more extensive. First, Calabrese (2005) notes that velar stops are realized slightly fronted before front vowels, which he transcribes with a superscript *y* as [k^y]. Calabrese (2005) gives a phonological rule to this effect, i.e. acknowledging the allophonic status of the slightly fronted dorsals. I regard this distributional variant as phonetic, and will not discuss it further. Nor did we consider combinations of obstruents and sonorants. In words such as *chiesa* [ˈkjeːza] 'church', we have at least three choices to analyse the initial sequence of the dorsal stop and the glide: as a simple onset followed by a glide-initial diphthong in the nucleus, as a complex onset of two segments, or as a simple onset containing a palatalized labial stop (the latter seems to be Calabrese's 1993 favoured solution). The latter choice would increase the size of the Italian consonant inventory considerably, since we would have to assume a plain, a palatalized and a labialized (with the glide [w]) series of most consonants. The solution favoured below is the one as a complex onset.

Comparing chart (1) with charts (2) and (3), we can conclude that Italian displays a range of non-structure-preserving phonological processes, which explains the reduction from the first surface inventory to the contrastive inventory. Mioni (1993) puts the labio-dental nasal, the velar nasal, the voiced alveolar fricative, and the voiced post-alveolar fricative, as well as the two approximants (glides), into square brackets, noting that they have purely allophonic status. Accepting the allophonic status of some of the segments, one might wonder if the system is not further reducible. A further point of attack for reduction is the dimension of place of articulation. As Mioni (1993: 109) observes, there is no distinctive opposition between labials and labio-dentals, neither between dentals and alveolars nor between post-alveolars and palatals. Thus, the seven places of articulation differentiated in the phonetics can be collapsed into five that are used for the purpose of contrast.

We will see, for instance, in the discussion of velar palatalization that some palatal fricatives are derived from phonotactically ill-formed combinations of segments arising through palatalization. For example, a sequence /sk/ shows a surface alternation realizing as [sk] and [ʃ] depending on context. Before /i/ we find underlying /k/ emerge as /tʃ/ at some morpheme boundaries. Thus, for the input /sk/ one could assume an intermediate representation //stʃ// which is generally unattested on the surface in Italian even intervocalically (which is, as we have seen already, the position with the widest range of contrasts). Surface [ʃ] could then be the result of merging the manner feature of /s/ and the place feature of /tʃ/. If this procedure is generalized one might remove /ʃ/ from the inventory as well, assuming that all surface post-alveolar fricatives are derived from an illegal consonant cluster, such as /stʃ/, with the non-alternating instances of /ʃ/ taking a free ride on the alternating ones.

Generalizing this further, the status of the other naturally long segments is up for discussion. The segments which are always long morpheme-internally and lengthen in intervocalic context at morpheme boundaries are susceptible to a poly-segmental analysis as well under this line of thought. Take for example the palatal nasal. It is quite rare word-initially, occurring in the forms in (4a). Note that I have also given the determiners for the first of these forms. In (4b) we see a form with the same gender as the first form in (4a) starting with a non-palatal. Such forms take a different determiner. We find the same determiner allomorphy with all the inherently long consonants. Thus, one can analyse the palatal nasal as an underlying sequence of a velar/dorsal stop and an alveolar/coronal nasal (very much as indicated in the orthography) or a nasal plus a palatal glide, which fuse in the surface form in response to phonotactic conditions (such as the coda condition and onset well-formedness conditions, which will be discussed in Chapter 5).

(4) Palatal nasals

a. gnomo	[ˈɲɔːmo]	/gnɔmo/	‘gnome’
	[uno ɲˈɲɔːmo] [lo ɲˈɲɔːmo]		‘a/the gnome’
gnostico	[ˈɲɔstiko]	/gnɔstiko/	‘gnostic’
vergogna	[veɾˈgoɲɲa]	/vergogna/	‘shame; shyness; embarrassment’
b. nonno	[ˈnɔnno]		‘grandpa’
	[un ˈnɔnno] [il ˈnɔnno]		‘a/the grandpa’

A polysegmental analysis of the inherently long palatals directly reflects their historical genesis (see Chapter 3). In Latin, these were short coronals followed by a front glide. The glide first induced lengthening and then merged with the resulting long consonant into the palatal segments we find today. It is unlikely, though, that the palatals are analysed according to their historical development by modern speakers, since the phonological processes that lead to their emergence are no longer active in the synchronic phonology, as illustrated by words such as *Italia* [iˈtaːlja] ‘Italy’. The sequence of the lateral followed by the palatal glide in *Italia* should not surface as such, but should instead be turned into a long palatal lateral. Moreover, from the perspective of Optimality Theory, the idea of reducing a surface inventory to a more abstract and reduced one seems somewhat out of place. Since in OT a surface inventory is determined by the ranking of markedness constraints with respect to faithfulness constraints and there are no restrictions on the lexicon, any non-alternating surface segment that is not predictable from its environment (e.g. the [ʃː] in [faʃːa] *fascia* 'band, bandage') should be stored as such (see the literature on Lexicon Optimization, e.g. Prince and Smolensky 1993; Inkelas 1994; but also Krämer 2006a; 2006c; Nevins and Vaux 2007 for a diverging point of view).

This discussion remains very sketchy at this point. We will return to this issue in the discussion of phonological opacity in connection with palatalization (4.2.1).

As just noted, Mioni (1993) reduces the number of places of articulation to five, looking at contrastive properties of the different places of articulation. On the basis of phonological alternations to be discussed in the following chapters, I propose that we can represent the Italian consonant inventory as given in (5). The striking difference between (5) and (2)/(3) is that affricates do not constitute a separate class of manner of articulation. Instead, affrication is seen as an enhancement strategy to encode differences in place of articulation among stops. Secondly, I will entertain the option that all surface palatal (or post-alveolar) fricatives are derived from illicit segment clusters. Finally, as will be shown in section 4.2.2 on glides, I follow Bertinetto and Loporcaro (2005) as well as Muljačić (1969) and van der Veer (2006) in analysing the two glides (or, to be more precise, some occurrences of them) as phonologically distinct from high vowels. In this analysis, underlying high vowels alternate with surface glides contextually, but underlying glides are not subject to the reverse alternation in the relevant context.

(5) Italian consonants reorganized

	Labial	Dental	Alveolar	Palatal	Velar
stop	p, b	t, d	ts, dz	tʃ, dʒ	k, g
fricative	f, v		s, (z)	(ʃ)	
nasal	m		n	ɲ	
lateral			l	ʎ	
rhotic			ɾ		
glide	w			j	

On the following pages we will turn our attention to the vowel inventory, starting with monophthongs and then taking a preliminary look at diphthongs and triphthongs. The latter will play a further role in the discussion of syllable structure.

4.1.2 Vowels

In stressed syllables, Italian has a seven-vowel system. Three vowels are front and unrounded, three vowels are back and rounded. The low vowel is neither front nor back: phonetically it is a central to front vowel, but since it does not participate in any phonological process in which front vowels are involved (such as velar palatalization), it is often regarded as phonologically back. Apart from backness and (predictable) roundness the system distinguishes four degrees of height. Usually, (see e.g. Calabrese 1987; 1998) such a four-way system is distinguished by the use of two height features, [±high] and [±low], with the mid vowels being negatively specified for both features, and a feature on tongue root position, [±ATR] (Advanced Tongue Root), which distinguishes tense [+ATR] from lax [−ATR] vowels. The two high vowels are always tense and the low vowel is lax, while the mid vowels distinguish between tense and lax or mid-closed and mid-open, respectively.

(6) Italian simple vowels

i						u
	e				o	
		ɛ		ɔ		
			a			

The tense/lax distinction among mid vowels is subject to regional variation. First of all, individual lexical items' membership of the lax and tense class varies across regions. What is a tense mid vowel in the north is often a lax mid vowel in the centre or south or the other way round, as with *dopo* 'later', for example, which has a stressed lax vowel in the north and a tense one in Tuscany. Bertinetto and Loporcaro (2005) note that in Milanese the two front mid vowels are in complementary distribution, with the lax one in closed and the tense one in open stressed syllables. This neutralization, however, cannot be generalized over the whole north. Furthermore, the tense/lax distinction is neutralized in unstressed syllables in which mid vowels are always tense, which leads to alternations under stress shift. This leaves us with a five-vowel inventory in unstressed position. In unstressed final position, the inventory is further reduced by the absence of the back high vowel [u].

All seven vowels occur as long and short, depending on their position in the prosodic structure. It is even arguable that speakers distinguish three degrees of length. The length of a vowel, however, is completely predictable by its position. Word-final vowels, stressed or unstressed, are never long (except for stressed final vowels in some northern varieties). Most descriptions maintain that, in general, stressed vowels in open syllables are long. This generalization, however, has to be restricted by several factors. First, according to the measurements presented by D'Imperio and Rosenthall (1999), full length is only achieved in penultimate position. Even if clitics are added to a word with penultimate stress, vowel length is reduced. Furthermore, absolute vowel length is subject to the overall length of a word in terms of number of syllables, i.e. the longer a word the shorter its vowels in general. Pre-antepenultimate stressed vowels are slightly lengthened in open syllables, but considerably and systematically less so than those in stressed penultimate position. Thus, we find long vowels in penultimate stressed open syllables, semi-long vowels in stressed pre-penultimate open syllables, and short vowels everywhere else.

Leaving aside the neutralization of length in unstressed and final position, one could draw two conclusions from these observations: either vowel length is contrastive and underlyingly long vowels attract stress (which could contribute also to an understanding of the intricacies of Italian stress placement) or, alternatively, length is never contrastive but rather a positional by-product of stress. The latter position turns out as more attractive, since under the first hypothesis we would expect short vowels as well in penultimate stressed open syllables, which are not attested. These issues will be taken up again in more detail in the chapters on syllable structure and on word stress (Chapters 5 and 6).

Apart from the plain vowels, Italian shows an intriguing variety of diphthongs and triphthongs. Bertinetto and Loporcaro, as well as Mioni, in their respective overview articles, deal with diphthongs right after vowels, suggesting through the organization of their articles that diphthongs are an additional class of segments, like affricates among consonants, for example. A closer look at the less problematic diphthongs demonstrates that they actually are combinations of segments and that any restrictions on the inventory of diphthongs are not restrictions on the inventory of (contrastive) segments, but rather restrictions on the combinatorial options within higher units of organization than the segment.

For example, the diphthongs with falling sonority behave phonotactically very much like long vowels. Italian syllables do not have long vowels if they are closed by a consonant. As emphasized above, long vowels are restricted to stressed open syllables. There are also no syllables closed by a consonant (sonorant, coronal fricative, or first part of a geminate) that contain a diphthong that ends in a high glide. The situation is different for diphthongs that start in a glide. Potential analyses of this asymmetry could explore the option to expand the consonant system by palatalized and labialized consonants, as mentioned earlier. Below I will argue for an analysis of the glides in rising diphthongs as part of a complex syllable onset. Thus, the issue of diphthongs has an impact on our understanding of the segment inventory—even though diphthongs are not mono-segments and the discussion of the diphthong inventory is actually a matter of phonotactics. We take a preliminary look at the issue here and then return to it, first when dealing with vowel-glide alternations and later when the restrictions on Italian syllable structure are in focus.

Before doing so, however, it is necessary to reflect briefly on what a diphthong actually is. A diphthong consists of two vowels of different quality. An important condition on diphthongs is that they belong to the same syllable (see Marotta 1987 for a discussion of the hiatus/diphthong distinction in Italian and various definitions of the notion 'diphthong'). Italian displays quite a lot of words containing adjacent vowels, which we regard as in hiatus position if they are not in the same syllable. A form like *poesía* [po.e.ˈziː.a] 'poetry' contains two pairs of adjacent vowels. Since it has four syllables, each of the four vowels of the word constitutes a nucleus on its own. Thus, we have two hiatuses rather than two diphthongs.

There are near-minimal pairs of diphthong/hiatus occurrences, as given in (7).

(7) Diphthong/hiatus near-minimal pairs

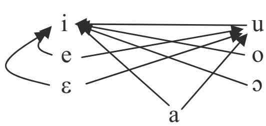
a. [ba.ˈuː.le]	baule 'car boot'	b. [ˈpaˑw.za]	pausa 'pause, break'
[pa.ˈuː.ɾa]	paura 'fear'	[ˈkaˑw.za]	causa 'cause'
[a.ˈiː.da]	'Aida'	[ˈlaˑj.ko]	laico 'secular'

A potential analysis could hold underlying syllable structure responsible for this distinction. However, since syllable structure is in general predictable via well-formedness conditions on phonotactic combinations, most phonologists reject the idea of contrastive syllabification (though see e.g. Golston 2007 for a renegade stance). Contrastive stress is less controversial, actually largely agreed to be unavoidable for a great many languages, including Italian (as we will see in Chapter 6 on word stress). Thus, the connection of lexical stress to one of two adjacent vowels determines the fate of the sequence as a surface diphthong or as heterosyllabic, i.e. a hiatus. If the first vowel is lexically stressed and the two vowel qualities allow for integration of both vowels in one nucleus, we will get a surface diphthong; if the second vowel is lexically stressed we are very likely to have a surface hiatus (if the first vowel cannot be turned into a glide). A third conceivable alternative could take this as the evidence for the distinctive status of glides. The forms in (7a) have an underlying high vowel, while the forms in (7b) have an underlying glide. Under this analysis, all forms in (7) receive default penultimate stress.

First, there is a quite restricted set of falling or closing diphthongs. These are falling in the sense that sonority decreases from the first to the second part of the diphthong, and they are closing in that the second part is a high or close vowel and the first part is in most cases lower/more open. Thus the articulatory movement goes from a relatively open mouth to a more closed mouth position. The second part of a falling diphthong is always a semivowel or glide, i.e. *j* or *w*. There is a tradition of transcribing the glides at the beginning of words and in falling diphthongs as vowels with a diacritic, as in [i̯], and those in rising diphthongs as glides, i.e. [j]. I will ignore this tradition here, since the criterion to determine this difference (once we accept that there is a phonological difference between the two, i.e. derived glides (or 'semi-vowels'?) and lexical glides (or 'semi-consonants'?)) should be phonological. I have so far not found a reliable phonological criterion to differentiate the weak parts of diphthongs from one another as either glides or vowels.

(8) Falling diphthongs

a.



b.

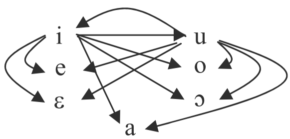
	i	u
i	*ij	*iw
e	ej	ew
ɛ	ɛj	ɛw
a	aj	aw
ɔ	ɔj	*ɔw
o	oj	*ow
u	uj	*uw

As the diagram in (8) shows, a falling diphthong can only change from mid or low to high or from back to front. A further restriction bans two round vowels together.

Falling diphthongs, however, are only the smaller of the two sets of diphthongs in Italian. Rising or opening diphthongs are much more diverse, as the chart in (9) indicates. The first part of a rising diphthong is always a semivowel or glide, i.e. *j* or *w*. As with the falling diphthongs each high vowel cannot combine with its corresponding glide. Apart from that, there don't seem to be any restrictions on combinations.

(9) Rising diphthongs

a.



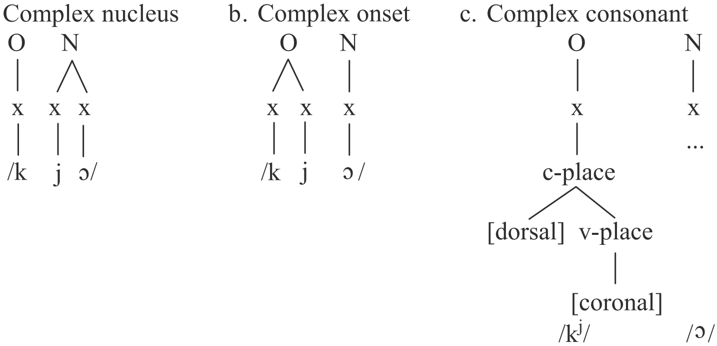
b.

	i	e	ɛ	a	ɔ	o	u
j		je	jɛ	ja	jɔ	jo	ju
w	wi	we	wɛ	wa	wɔ	wo	

Mioni (1993) lists these combinations of vowels as diphthongs. Calabrese (1993) analyses the first part of diphthongs and triphthongs starting in the palatal glide as part of the preceding consonants, i.e. he assumes that Italian has an additional series of palatal consonants. He does not make explicit what kind of analysis he envisages for the consonants followed by the labial glide, but they might be a series of consonants with a secondary place feature too, [labial] in this case. With a stricter definition of what a diphthong actually is, a third option emerges: to be a diphthong both parts have to be part of the nucleus. In a quantity-sensitive stress system (which Italian is, according to some, but see Chapter 6 on stress) we expect both parts of the diphthong to be moraic, i.e. contribute to weight. If this is not the case, we can say that they are not diphthongs, and that the initial glide is part of the syllable onset. There it might be the articulatory reflex of a secondary place of articulation (as envisaged by Calabrese; see also Ní Chiosáin 1991 for an analysis of palatalized consonants in Irish along such lines) or a segment in its own right. (10) gives the three options.

(10) Potential representations for rising diphthongs (*chiocciola* 'snail')

a. Complex nucleus b. Complex onset c. Complex consonant



An argument against an analysis as diphthongs comes from syllable phonotactics. As noted above, the falling diphthongs are never found in closed syllables, while the rising diphthongs can be found in syllables closed by a consonant, as in *[pájn.ta] vs. [pján.ta] *pianta* 'plant'. In this respect, the falling diphthongs behave like long vowels and the rising diphthongs behave like short vowels. (These issues will be discussed in more detail in Chapter 5.) I take this as an indication that the Italian syllable nucleus or rhyme has a maximum size restriction which is exceeded by a diphthong plus a consonant. Consequently, the first part of rising diphthongs, the glide, has to be in onset position; thus the two parts are not in the same syllable constituent, and we can exclude these structures from our diphthong inventory. The debate is still open, however, if we are dealing with complex onsets or two additional series of contrastive consonants here. An argument against the analysis just opted for is the absence of the two homorganic rising diphthongs *[ji] and *[wu] from the inventory.

There are some rare cases of triphthongs consisting of one of the rising diphthongs (using the terms 'diphthong' and 'triphthong' in a purely descriptive way now) preceded by a glide. That is, they emerge in derived environments, as in *seguiamo* [segwjáːmo] /segu-jamo/ 'we follow'. Morpheme-internal triphthongs are extremely rare. Bertinetto and Loporcaro (2005) give *acquiescenza* [ˌakːwjeˈʃentsa] 'acquiescence' as an example. Another one is *quieto* [kwjɛto] 'quiet'.

Surprisingly (at least from the position just developed), consonant plus glide combinations do not precede the falling diphthongs, as in *[kwajko], with extremely rare exceptions, such as *quei* [kwej] 'those' and a few derived forms involving mobile diphthongs, such as *vuoi* [vwoj] 'you want' (from *volere*). This could either be a lexical gap due to the way in which these complex consonants historically developed or the effect of a ban on the combination of complex onsets or complex segments (assumed in the analysis avoiding rising diphthongs) with falling diphthongs. Generally, we expect co-occurrence conditions on or within syllable constituents, but not across tauto-syllabic constituents.

While the fact that the post-consonantal initial glides can be combined with any vowel speaks against an analysis of the falling diphthongs as one prosodic unit, the observations on triphthongs cast doubt on the alternative analysis. In this chapter, however, we are concerned with inventories rather than combinatorial restrictions. Unlike a consonant with a secondary (vocalic) place feature (as was considered above as a potential alternative to rising diphthongs), a diphthong still consists of two segments and the matter is one of constraints on prosodic constituents, such as nuclei and rhymes. Accordingly, I will return to these issues in section 4.2.2 on vowel-glide alternations and in Chapter 5 on syllables.

As we have seen, there are a few open questions with regard to the segment inventory of Italian. First of all, we have not yet established a system of features that would sensibly distinguish (at least) the contrastive segments from another. I will develop such a system with the help of arguments from segmental alternations. Secondly, the nature of quite a number of segments—the inherently long segments and the glides—as derived or lexical is not yet clear, and nor is the status as complex segments or adjacent segments of tauto-syllabic consonant plus glide sequences. We will address most of the open issues in the following chapters on phonological processes involving segmental alternations. After these I will address the issue of the inventory of features and of contrastive segments again in a summarizing section.

4.2 SEGMENTAL ALTERNATIONS

I will use phonological activity as the main criterion, along with contrastive function, to establish a feature system for Italian. In this section I will first discuss palatalization. This discussion serves on the one hand to establish the place features active in Italian. On the other hand the analysis provided shows how lexically restricted phonological processes can be explained with the help of indexed constraints, which obviates any need for separate grammars for separate parts of the lexicon. Moreover a nonce-word experiment will show the divergent reactions of native speakers to ambiguous patterns. It shows that speakers confronted with the same surface patterns can draw different conclusions as to the grammatical analysis of such patterns.

Section 4.2.2 discusses vowel-glide alternations. We will see that only some instances of the two glides alternate with vowels. The conclusion to be drawn is that vowels can alternate with glides in certain environments but glides cannot be realized as vowels. This has two repercussions on the analysis of the Italian sound inventory. First, not all glides can be analysed as surface realizations of high vowels. Second, the asymmetric behaviour of the two segment types yields to an analysis that treats high vowels as more complex than glides with respect to the number of features they bear.

Section 4.2.3 deals with vowel alternations, the neutralization of the tense/lax distinction in unstressed mid vowels, and vowel raising in metaphony. These patterns will help to establish the features that encode the height contrast in vowels.

4.2.1 Palatalization

In this section we address two distinct assimilatory processes which can both be categorized as palatalization in the broad sense. Both processes create affricates, one from coronal (or, phonetically speaking, dental) stops, the other from dorsal (or velar) stops. Saltarelli (1970) deals with the process that turns dental stops into alveolar affricates under the label 'affrication', while he reserves 'palatalization' or more precisely, 'velar palatalization' for the change of velar stops into post-alveolar affricates. In each case it has been questioned whether the process is still active synchronically due to a high number of exceptions. To answer this question I have conducted a nonce-word test following the basic methodology of the wug test (Gleason 1958) with several native speakers. After introducing the processes in more detail I will report the results of the wug test. It turned out that for roughly half the speakers velar palatalization is an active phonological process, while it appears to be an historic fossil for the other half. However, since alternations can only be observed in derived environments, and since participation in the process might depend on the individual root or stem, the affix carrying the trigger, the lexical class of roots/stems, or the grammatical class of the affixes involved, an analysis is also conceivable that places the process in a certain area of the grammar. In the terminology of Lexical Phonology, the lexical/post-lexical distinction or the organization of grammar into distinct levels could be relevant to determine the locus of application and explain exceptions. A further very important question to be discussed is how these processes are analysed at the level of representations. Which feature spreads? How are targets defined? What is the difference between the target and the result? After the representations are discussed I will turn to an OT analysis of the attested variation in the process, i.e. between different lexical items and between individual speakers. A final issue that warrants our attention is the phonological opacity attested in some cases, i.e. the absence of the trigger of the process in the surface form due to other phonological or phonotactic restrictions.

4.2.1.1 Alveolar affrication and velar palatalization

Alveolar affrication turns a dental stop, e.g. /t/, into an alveolar affricate, i.e. [ts], before a front high vocoid, i.e. /i/ or /j/. Morpheme-internally this kind of process is not active at all in Modern Standard Italian, since we find /t/ in the triggering environment. i.e. preceding /j/ or /i/, as in *tiepido* [ˈtjɛpido] 'lukewarm'.

At morpheme junctures, we find many cases with alternations of exactly this kind, as illustrated in (11).

(11) Affrication of /t(t)/ before high vowel/glide[2]

profe[t]a	profe[ˈtsiː]a	'prophet/prophecy'
astu[t]o	astu[tstsj]a	'clever/cleverness'
corre[tt]o	corre[tsˈtsjoː]ne	'correct/correction'
Mar[t]e	mar[ˈtsjaː]no	'Mars/Martian'
par[t]e	par[ˈtsjaː]le	'part/partial'

The process is limited to a handful of derivational affixes. Thornton (1995) discusses those exemplified in (11). One could at this stage conclude that certain affixes trigger the alternation and others do not. This is not necessarily consistently the case: there are affixes that never trigger this alternation, and in other cases emergence of the alternation does not depend only on the affix but also on the base, i.e. the same affix does not cause affrication in all bases that provide a suitable target condition. Usually, it is new formations in particular which do not show the alternation, as shown by the examples in (12b).

(12) Blocking of affrication

a. apatìa	*apa[ˈtsiː]a	'apathy'	(and all other *x*-pathies)
b. travol[ˈtjaː]no		name	(from Travolta)

The non-productivity of affixation of /-ja/ and the absence of the process in novel forms with the still productive affixes has prompted Thornton (1995) to reject any analysis that deems the process synchronically active, and instead posit allomorphs for the affected bases. The affix /-ja/, however, provides data that tell us something about the limits of the process (when the affix still was productive). If the target /t/ is preceded by /s/ the process is suspended, as in *modestia* 'modesty'.

Furthermore, we find forms with the alternation, but no trigger in the surface representation.

[2] Most data on affrication are taken from Thornton (1995).

(13) Affrication without a trigger

ignoran[te]	ignoranza [iɲɲoˈrantsa]	†ignoranzia	'ignorant/ignorance'
for[t]e	forza/(raf)forzare		'strong/strength/strengthen'
al[t]o	al[ts]are		'high/raise'

Historically these forms can be explained, since in Latin they had the triggering segment (still present in the now extinct form marked by † in (13)), but it got lost on the way to Modern Italian. The question emerging here is of course whether we should analyse these forms as synchronically opaque or lexicalized. The former alternative assumes the trigger in the input, causing the alternation and being subsequently deleted, or, in a non-derivational fashion, the trigger merges with the target, resulting in affrication. We then have to explain in addition why there is merger in these forms but not in the forms in (11). Since these affixes are not productive in present-day Italian, it is most plausible to assume that synchronically pairs like *alto* 'high' / *alzare* 'to raise' are not derivationally related.

While the process has been analysed as a synchronically active phonological or morphological rule by various linguists, Thornton (1995) argues, on the basis of the lack of application in new formations, that there is no synchronic phonological rule of affrication, and that the cases in which we see alternations have to be analysed in terms of allomorphs. She also criticizes approaches that make use of diacritic features for loans that undergo the process, such as [+ Greek]. The problem, she points out, is that these overgenerate, since not all loans from a language behave uniformly. Another criticism is that for most borrowed forms the ordinary speaker of Italian is quite unlikely to have any knowledge about which source language a loan comes from, or even about whether it is a loan at all, given the phonetic and phonotactic integration of loans into the language.

The only affix that consistently triggers affrication of /(t)t/ is the nominalizing affix /-jóne/, which only attaches to past participles. Even here it is not always clear what exactly the base of affixation is. Take for example *traduzione* 'translation'. The past participle is *tradotto*. Since the noun has a *u* where the participle has an *o* and there is no generally observed process of raising, the noun has to be lexical rather than derived.

Below, in the section developing an OT account (4.2.1.3), I will suggest another possibility for the less idiosyncratic forms drawing on indexed constraints.

Now we turn our attention to velar palatalization, a widespread process or family of processes in Romance languages which is most often analysed from a historical perspective (see e.g. the enlightening contribution by Calabrese 1993). Palatalization showing synchronic alternations can be observed in distinct incarnations in the inflectional morphology in different lexical categories in present-day Standard Italian.

Velar palatalization applies in some Italian nouns in the masculine plural. Velar or dorsal stops are realized as palatal affricates before the high front vowel /i/ in the plural, as in (14a). (14a) also shows that the other front vowel, /e/, as in the feminine plural, does not trigger the alternations. Nouns with a palatal affricate in the singular never show an alternation, as illustrated in (14b). It has to be learned item by item whether palatalization applies to a velar stop, since some nouns do not show the alternation in the plural, as shown in (14c). A small number of nouns vacillate, i.e. they can be realized with or without palatalization, as in (14d) (Celata and Bertinetto 2005).[3]

(14) Velar palatalization: idiosyncratic/optional in nouns

a. aˈmiːko, aˈmiːtʃi, aˈmiːke	‘friend/pl./fem.pl.’
b. ˈbɾontʃo, ˈbɾontʃi	‘sad face/pl.’
c. ˈkwɔːko, ˈkwɔːki	‘cook$_N$/pl.’
d. ˈmaniko, ˈmanitʃi/ˈmaniki	‘door handle/pl.’

Despite its optionality, the process can be generalized to apply only to intervocalic dorsal stops. If the dorsal stop at the end of a nominal stem is preceded by another consonant, which can be any of the set /s, ɾ, l, N/, the process never applies.

In 2nd conjugation verbs, the process applies without any exception before inflectional affixes starting in /i/ and /e/, as shown in (15a–c). Third conjugation verbs fall into two groups, like nouns. Many such verbs display palatalization, some do not, as shown in (15a′–c′). Those verbs that block palatalization are very often derived from adjectives, as in (15c′). The stem extension *-isk-*, which surfaces in the singular forms and in the 3rd person plural, alternates regularly depending on the following vowel, while its host, the morphological root, does not necessarily do this.

(15) Velar palatalization in 2nd and 3rd conjugation verbs[4]

a. diˈɾidʒeɾe, diˈɾiːgo, diˈɾiːdʒi, diˈɾiːdʒe	‘direct$_V$ inf./1/2/3sg’
ˈvintʃeɾe, ˈviŋko, ˈvintʃi, ˈvintʃe	‘win$_V$ inf./1/2/3sg’
b. ˈkwɔːtʃeɾe, ˈkwɔːtʃo, ˈkwɔːtʃi, ˈkwɔːtʃe	‘cook$_V$ inf./1/2/3sg’
c. *tokeɾe, toko, toki, toke	unattested
**tochere, toco, tochi, toche*	
a′. fudʒˈdʒiːɾe, ˈfuggo, ˈfudʒdʒi, ˈfudʒdʒe	‘escape$_V$ inf./1/2/3sg’
b′. kuˈtʃiːɾe, ˈkuːtʃo, ˈkuːtʃi, ˈkuːtʃe	‘sew$_V$ inf./1/2/3sg’
b″. aˈdʒiːɾe, aˈdʒisko, aˈdʒiʃʃi, aˈdʒiʃʃe	‘act$_V$ inf./1/2/3sg’
c′. arikˈkiːɾe, arikˈkisko, arikˈkiʃʃi	‘enrich$_V$ inf./1/2sg’

There is an odd observation to be made here, which is probably connected to paradigm levelling. While 2nd conjugation verbs with a voiced dorsal (long or short) stem-finally are very common, and always alternate between affricate and plain dorsal stop, verb stems ending in the voiceless dorsal stop are much rarer. Most stems that orthographically end in a *c* in this class are always realized with the affricate. This data situation needs further investigation.

Another unsolved (and, as far as I am aware, so far unaddressed) puzzle is posed by the behaviour of palatal laterals in comparison to [ldʒ] sequences. There is a contrast between seemingly derived palatal laterals which alternate with the segment sequence [lg] and verbs which have the same sequence in non-palatalizing contexts but alternate

[3] Celata and Bertinetto (2005) note that each of the few vacillating nouns actually has a preferred plural form. Below I will report the results of an internet search for the competing plural forms. The result was that the frequency of the dispreferred form for each stem is negligible (see (20)).

[4] Unless indicated otherwise, verbs in the examples are present indicative active forms.

with [ldʒ] in the palatalizing context, as illustrated in (16a,b). Palatal laterals which do not alternate are not attested, unlike non-alternating posterior affricates (16c). Lateral plus posterior affricate sequences display the same gap.[5]

(16) /lg/ sequences and palatalization

a. to[ʎ]ere	to[lg]o	to[ʎ]i	'take away (inf) / 1sg/ 2sg'
b. vo[ldʒ]ere	vo[lg]o	vo[ldʒ]i	'turn (inf) / 1sg/ 2sg'
c. *po[ʎ]ere	*po[ʎ]o	*po[ʎ]i	unattested
*po[ldʒ]ere	*po[ldʒ]o	*po[ldʒ]i	unattested

Since the process is usually explained as assimilation to the following front vowel, the 1st person singular, which has a back vowel, is the form which shows us the underlying form. Since the two types of verb behave differently in palatalization contexts, however, they are expected to have distinct underlying representations. A possible explanation would be that underlyingly the two verbs indeed have a sequence of two consonants, but in opposite order, as indicated in the spelling (compare *togliere* with *volgere*). This would require the postulation of a metathesis process that swaps the two underlying segments in the 1st person form of *togliere*. A potential reason for such a change is the phonotactics which allows syllable-final laterals but not stops. However, metathesis is generally not a process observed in contemporary Italian. Unlike voiceless palatals, there is no verb that retains the palatal lateral in all environments.

The data in (17) illustrate the exceptionless lack of application of the process in 1st conjugation verbs.

(17) 1st conjugation verbs never show velar palatalization

a. leˈgaːre, ˈleːgi, ˈleːga, ˈleːgo	'tie$_V$ inf./1/2/3sg'
b. kominˈtʃaːre, koˈmintʃo, koˈmintʃi, koˈmintʃa	'begin$_V$ inf./1/2/3sg'
c. *gruˈkaːre, ˈgruːko, ˈgruːtʃi, ˈgruːka	unattested

We have seen that with inflectional affixes containing a potential trigger, the process is restricted to the high front vowel as a trigger in nouns, while in verbs both /i/ and /e/ cause palatalization in preceding dorsals with a morpheme boundary in between target and trigger.

Stem-final coronals do not alternate with affricates in the same environment, as in *ripetere* - [riˈpeːto] - [riˈpeːti] - [ripeˈtjaːmo] 'to repeat - I repeat - you repeat - we repeat'.

Moreover, the process idiosyncratically applies in nouns, always applies in 2nd and 3rd conjugation verbs (with the exception of those 3rd conjugation verbs that are derived from adjectives), and never applies in 1st conjugation verbs.

Dressler (1985) gives a detailed overview of the situation regarding derivational affixes, as do Celata and Bertinetto (2005). The examples in (18a) are chosen for not undergoing palatalization in masculine plural formation. Thus, we can see that many derivational affixes cause palatalization in roots that block the process in inflected forms. However, there are some exceptions in this group, i.e. roots which neither undergo palatalization in inflection nor with otherwise triggering derivational suffixes,

[5] This does not imply that sequences of a lateral and a posterior affricate followed by a back vowel are ungrammatical in Italian in general. Words such as *calcio* [ˈkaltʃo] 'kick' are not unusual.

as shown in (18b). The forms in (18c) exemplify derivational suffixes that trigger palatalization in roots which undergo palatalization in inflection as well, and the blocking of the process in roots which do not undergo it in inflection either. The data in (18d) give affixes that never cause palatalization. Dressler notes that affixes starting with an /e/ do not cause palatalization. Celata and Bertinetto give -*ense*, -*ente*, and -*enza* as derivational suffixes causing palatalization, (18e).

(18) Velar palatalization with derivational affixes

a.	pedagogo	pedagoghi	pedagogia	'pedagogue(s)/pedagogy'
	opaco	opachi	opacità	'opaque (sg/pl)/opacity'
	analogo	analoghi	analogismo	'analogue (sg/pl)/analogism'
	pedagogo	pedagoghi	pedagogismo	'educationism'
	–	–	pedagogista	'educationist'
			pedagogico	'pedagogic'
b.	fuoco	fuochi	fuochista	'fire (sg/pl)/pyrotechnist'
	antico	antichi	antichità	'antique (sg/pl)/antiquity'
c.	cattolico	cattolici	cattolicesimo	'catholic (sg/pl)/catholicism'
	sporco	sporchi	sporchissimo	'dirt (sg/pl)/very dirty'
	greco	greci	grecizzare	'Greek (sg/pl)/make Greek'
	turco	turchi	turchizzare	'Turkish (sg/pl)/make Turkish'
d.	gioco		giochino	'game/dim.'
	greco		grecheggiare	'Greek/to use Greek expressions'
e.	Costa Rica		costaricense	'Costa Rican'
	cresco	cresce	crescenza	'I grow/you grow/growth'

A further interesting aspect of the pattern is the homogenization of strident and palatal clusters. As is most clearly exemplified with the 3rd conjugation stem extension -*isk*-, but also with /sk/ clusters in roots in palatalization environments, sequences of [stʃ] are illegal in Italian. The same holds for sequences of palatal (or coronal) affricate plus palatal glide, [tʃj]. In the first person plural of 2nd and 3rd conjugation verbs, the glide which is present with other verbs and which is the source of palatalization does not surface. In these forms the affricate is not turned into a fricative.

(19) Cluster reduction and palatalization

a. finire	fini[sk]o	fini[ʃʃ]i	fini[ʃʃ]e	'to finish/1sg/2sg/3sg'
b. cre[ʃʃ]ere	cre[sk]o	cre[ʃʃ]i	cre[ʃˈʃaː]mo	'to grow/1sg/2sg/1pl'
c. vin[tʃ]ere	vin[k]o	vin[tʃ]i	vin[ˈtʃaː]mo	'to win/1sg/2sg/1pl'
d. perdere	perdo	perdi	per[ˈdjaː]mo	'to lose/1sg/2sg/1pl'

The first case, /skj/ becoming [ʃʃ], is an OCP effect. The output of the heteromorphemic /kj/ sequence would be the palatal affricate, which gives us potential [stʃ]. Two adjacent strident segments are not tolerated and the unacceptable configuration is avoided by merging the two, which changes the stop into a continuant.

The second pattern is slightly more difficult to explain. In this context it is interesting to note that the two affricates do not occur before any other consonant in Italian, while the other obstruents occur before most sonorants, except nasals. However, the glide must have some quality that is offensive in this context, or the affricate and the glide together must create an unacceptable configuration. I regard this as evidence that the affricates are characterized by two place features, [coronal] and [dorsal]. If we assume further that the glide has the feature [coronal] and that a single syllable constituent, like an onset or a coda, cannot support more than two place features, these two assumptions together explain the observed loss of the glide. I will return to both claims later.

Here, we have tapped into the interaction of palatalization with restrictions on syllables. Dressler (1985) observes another relation to prosodic structure. In a nonce-word test with students, he found that those dorsals immediately preceded by a stressed vowel are less susceptible to palatalization than those which are separated from the stressed vowel by one syllable. That is, words with antepenultimate stress are more likely to show palatalization than words with penultimate stress.

In this context, it is useful to have a look at the vacillating stems, which sometimes palatalize and sometimes do not. Each of these stems has a preferred form, with the other occuring more rarely (Celata and Bertinetto 2005). In order to find out how rare the dispreferred form actually is, I carried out an internet search with the search engine Google (www.google.it). Googling each plural and knowing if it was predominantly palatalized or not is possible, since palatalization or blocking thereof can be inferred from the written form via the respective absence or presence of the letter *h* between the *c* or *g* and the following *i*. In this survey, I searched internet documents (web pages) which the search engine identified as written in Italian and located in Italy. The experiment was carried out on 21 August 2007. The respective occurrences of the different orthographic variants of plurals of vacillating nouns are given in table (20).

(20) Occurrences of vacillating nouns in the Italian web[6]

Item	Hits	%	Item	Hits	%
fármaci	2,220,000	99.97	**mónaci**	982,000	98.86
farmachi	548	0.03	monachi	11,300	1.14
total	2,220,548		total	993,300	
chirúrghi	1,900,000	97.98	**mánici**	225,000	99.76
chirurgi	39,100	2.02	manichi	546	0.24
TOTAL	1,939,100		total	225,546	
sarcófagi	65,400	80.54	**stómaci**	49,400	98.16
sarcofaghi	15,800	19.46	stomachi	925	1.84
TOTAL	81,200		total	50,325	

6 In two previous runs in which I accessed all pages identified by the search engine as written in Italian (*pagine in italiano*, 7 and 9 Apr. 2006), I found a reverse correlation of vacillation with frequency. In the plurals with the lowest frequency (e.g. *stomac*(*h*)*i*) the hits for the dispreferred form approached 20%. I suspect that this has to do with the presence of web documents written by non-natives (like me). This factor was minimized by searching only sites in Italian in the Italian web.

The extreme tendency towards one form in all items (the bold-faced forms in 20) raises the question whether the few occurrences of the other form are not to be regarded as typos—i.e. whether they are irrelevant for our purposes. To get an impression of the relevance of vacillation for a given item, I entered plural forms of stems in the search engine which are not supposed to vacillate. Any occurrence of unexpected blocking or unexpected application in these has to be regarded as an orthographic error, commonly referred to as a typo. As the comparison of tables (20) and (21) shows, there is no significant difference between the so-called vacillating stems and non-vacillating forms (except for *sarcofago*).

(21) Frequencies of non-vacillating forms in the Italian web

Item	Hits	%
amici	3,140,000	99.68
*amichi	9,970	0.32
TOTAL	3,149,970	
*amice	12,700	0.6
amiche	2,120,000	99.4
TOTAL	2,132,700	
greci	2,060,000	96.27
grechi	79,800	3.73
TOTAL	2,139,800	

Only one of the words tested for vacillation has stress on the penultimate syllable. All other words are stressed on the antepenultimate syllable. Interestingly, only the form with penultimate stress (*chirurgo*) shows a preference for non-application of palatalization, while the bigger distance between the alternating segment and the stress correlates with preference for palatalization. A possible explanation for this could reside in foot structure. Italian has trochaic feet, so if these feet are also bisyllabic, integration of the target segment into a foot perhaps protects it from alternation. However, this generalization is based on one form only, and later in Chapter 6 on word stress we will consider evidence that the final syllable in words with penultimate stress is not included in the foot. Therefore, I will ignore this aspect of the pattern in the analysis to come.

We can conclude from this experiment that vacillation in most forms is irrelevant. There are no balanced vacillating forms.

Another aspect of the pattern in nouns and adjectives is the idiosyncratic application and blocking of the process, which we return to now. Looking at the behaviour of nouns (and adjectives) in general, one can reach one of three conclusions.

A. The process is synchronically active, and the nouns that do not show it have to be regarded as lexical exceptions.
B. The process is synchronically inactive, and the nouns displaying the alternation have to be listed as exceptions.
C. The speaker cannot make a decision on synchronic activity of the process, and all plural forms of stems ending in a dorsal have to be learned and stored.

To make a choice between these options I followed Dressler's example and carried out a nonce-word test.[7] If a speaker applies palatalization (more or less consistently) to novel forms we conclude that the process is synchronically active: the speaker cannot 'know' the plural forms of nonce-words, since there is no way that s/he can have heard them from another speaker before. Thus, the forms with blocking have to be the marked exceptions. If a speaker never or hardly ever palatalizes the final consonant in the plural of a nonce-word, we can safely conclude that the process is not active synchronically and that the items with the alternation are the marked exceptions. If speakers palatalize some forms but not others and we do not find any systematic conditions in the phonological environment that could be made responsible, we have to conclude that speakers are undecided as to the status of the process, that it is optional, and that all plural forms of nouns have to be learned, as concluded by Celata and Bertinetto (2005).

In conclusion, speakers face the same dilemma as linguists in such a case, and some speakers choose option A while others choose option B. This result conflicts with the conclusions drawn from a lexical decision task by Celata and Bertinetto (2005), who maintain that all plural forms of nouns ending in velars are lexically stored while nouns ending in non-velars are produced compositionally.

In the nonce-word test I presented speakers with a list of nonexistent words. These words had to comply with Italian phonotactics, to be not too similar to any existing words and to be easily readable, because they were intended for presentation in written form in the singular. All words were presented to a native speaker and judged by her. Furthermore they were all checked for nonexistence in a dictionary and run through an internet search engine. Only words with zero hits in the dictionary and the internet were included. The items of interest were masculine nouns, indicated by their ending in the letter *o*, and had a stem ending in the letter *c* or a double *c* preceded by all five Italian orthographic vowels. The list also contained filler words.[8] These did not contain a root-final dorsal, or they were feminine, or both. The relevant test words are given in italics in (22).

[7] The reason why I do not just report Dressler's findings is that he only gives his results in a very brief form and does not break them down by speaker or other potentially relevant variables. See below.

[8] The test posed a double challenge for the subjects, since it is also not clear where Italian places default stress. The data generated in this test were also used to shed light on this issue: see also Ch. 6 on word stress and Krämer (forthcoming a). A short version of the results of the palatalization study is also presented in Krämer (forthcoming b).

(22) Nonce-word list including fillers

1 *frunaco*	2 brombulo	3 *frampeco*
4 *plantico*	5 chiatteno	6 sbancito
7 *gico*	8 *cincuco*	9 *praco*
10 flempile	11 *tapirco*	12 chiateppo
13 svappa	14 *nalico*	15 fiesova
16 *smeco*	17 *cruvacco*	18 grotulfo
19 *giompicco*	20 rocapado	21 *plontico*
22 frudalo	23 *ancico*	24 picutopa
25 *gionsicco*	26 *conchico*	

In the test, speakers had to read each word from a list (they did not get an auditory stimulus) and then use it in a plural context, always using the same carrier sentence. For the latter task they did not get a visual input either, since orthography would have told them what to do (depending on whether they encounter e.g. *smeci* or *smechi*). This corresponds largely to Gleason's (1958) wug test procedure (with the difference that his subjects were also given a picture with each nonce-word). Eleven adult subjects were tested, of whom three had to be excluded later for several reasons.[9] Subjects were recruited from Lombardy, Piedmont, Rome, Tuscany, Umbria, and the Veneto; several subjects were from Lombardy, two from Veneto, and two from Rome/Lazio. Since no significant areal effects were shown, I do not give a breakdown according to region below.

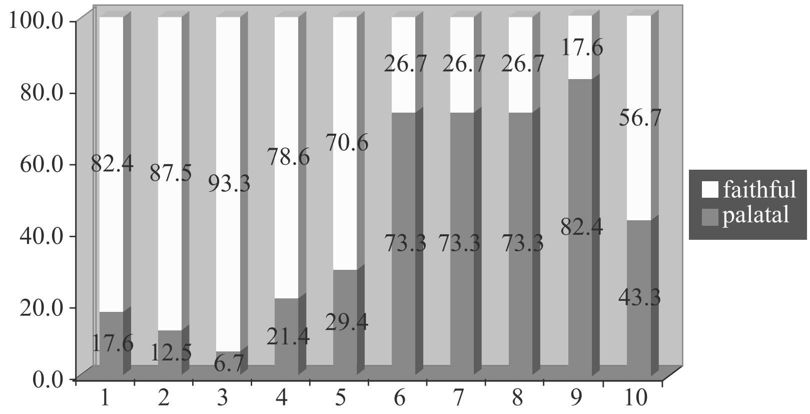
(23) *Carrier sentence*:

Ieri ho visto due _____.
Yesterday have-1sg see-past.part two _____.
Yesterday, I have seen two _____.

The chart in (24) displays the percentage of masculine plural forms of stems ending in *c* produced by each speaker with palatalization (e.g. [pratʃi]) and without (e.g. [praki]). Each bar represents a speaker, except for the last bar, which shows respective percentages of all realizations of all plural forms by all speakers together. Looking at the average, one gets the impression that the process is applied or suppressed randomly, i.e. that palatalization happens at chance level. Thus, the premature conclusion here would be that the grammar is non-deterministic with respect to palatalization. However, a look at the individuals (bars 1–9) reveals that each speaker has a preference.

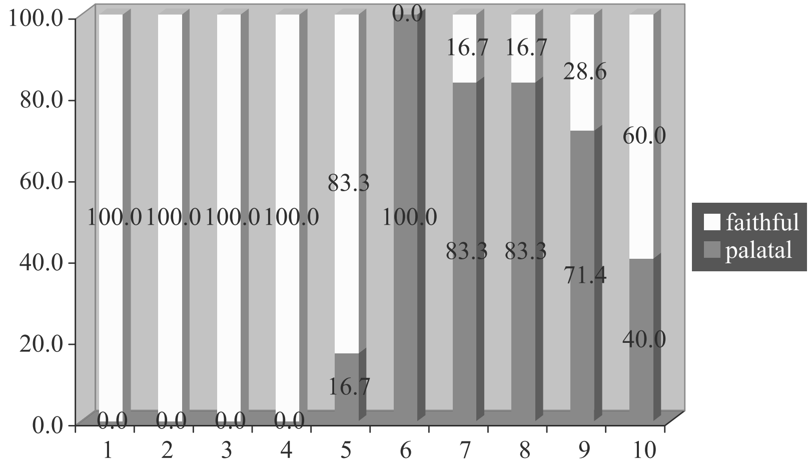
[9] One subject did not understand the task properly and did not produce the desired plural forms. The other two were aware of the problem (productivity of palatalization) and started a discussion of the topic.

(24) Results by speaker



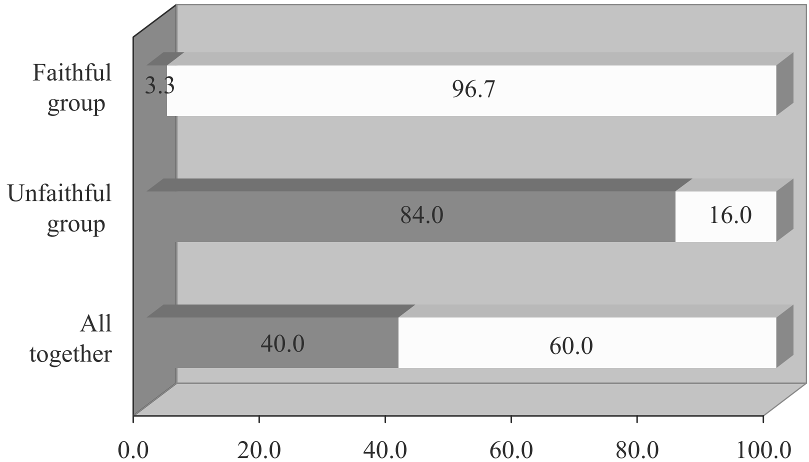
However, the phonological make-up of the test words might also be significant. For example, geminates could prove to be resistant, or a coronal vowel preceding the target consonant could constitute a factor that favours palatalization. Indeed, it turns out that one of the subjects (represented in bar 6) who favours palatalization never palatalizes geminates, and that the latter factor, a preceding coronal vowel (especially [i]), prompts even subjects who consistently do not palatalize to apply the process (speakers represented by bars 1–5). In the next chart the words with geminates and with an *i* preceding stem-final *c* are removed, and we get an even clearer picture of the subjects' preferences (25). Bar 10 represents the whole group again.

(25) Neutral words only



The chart in (26) divides the subjects into two groups according to their preference in palatalization matters.

(26) Non-problematic words only, by group



A further factor that could have played a role here is stress. As mentioned already, Dressler (1985) diagnoses a connection between stress placement and palatalization. Dressler conducted a very similar nonce-word test, but provided the written stimuli with stress marks. He records 85 per cent (nouns) and 95 per cent palatalization rates in words with antepenultimate stress, but only 55/57 per cent palatalized forms in words with penultimate stress. However, this is all he reports, and he does not break down his results by candidate as was done here. My subjects, however, placed stress on the penultimate syllable in the majority of the relevant test words, and I could not find any significant correlation between stress and palatalization. The speakers' reactions to geminates and forms ending in the sequence *ico* is interesting for a more detailed analysis of palatalization and the role of morphological decomposition. (Italian has a derivational suffix /-iko/, which undergoes palatalization in plural formation and which might have had an influence on performance here.) What is important for our current concern is that no speaker has a non-deterministic grammar, i.e. we do not find free variation. Instead, each speaker opts for one strategy and sticks to it. The results are overwhelmingly clear in this respect, which obviates the need for any further statistical test of significance.

A further question that is relevant in the context of Italian velar palatalization is to explain the systematic absence of exceptions in the verbal paradigms in the face of a mixed paradigm, that of nouns, which allows exceptions. Different grammatical behaviour in (lexical) subcomponents of a single language have been accounted for in a variety of ways, including idiosyncratic lexical marking or pre-specification of features, co-phonologies or morpheme-specific rankings (Inkelas 1999; Anttila 2002a) and lexical indexation of lexical items that triggers the activity of lexically indexed constraints (Pater 2000; forthcoming). I analyse the Italian patterns here with lexically indexed constraints and Base-Output faithfulness constraints (Benua 2000; Burzio 2000; 2004). Speakers who treat palatalization in nouns as the exception have a grammar that generally blocks palatalization, and a lexically indexed markedness constraint triggers exceptional application. Speakers who have palatalization generalized block the process in individual items by a lexically indexed faithfulness constraint. The general blocking and complete lack of exceptions in 1st conjugation verbs is due to high-ranking paradigm uniformity constraints as proposed by Burzio.

Before detailing this analysis I discuss the representational side of the pattern, i.e. which kinds of feature can be reasonably used in an analysis, and what all this tells us about the contrastive features of Standard Italian.

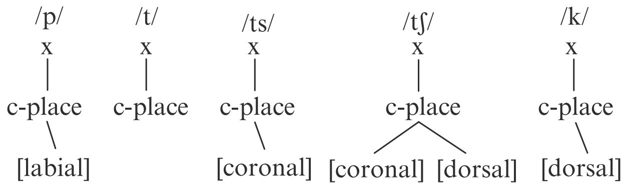
4.2.1.2 Place features

The feature assumed to be spreading to or switching value in the target in palatalization has given rise to a lot of debate in the literature, and has accordingly been changed several times. Saltarelli (1970) uses the SPE feature [+sharp] to formalize velar palatalization as well as affrication, acknowledging thus the relation between the two processes. Calabrese (2005) formalizes both affrication and velar palatalization as the promotion of the feature [coronal] to primary articulator status, following an approach proposed by Clements (1991). However, in Calabrese's approach the promotion of [coronal] is the indirect consequence of the spreading of the feature [−back], which produces a configuration of vocalic features in the consonant that leads to the application of a rule which changes the values of the features [anterior] and [distributed]. As can be seen from this summary, full specification together with segregation of consonantal and vocalic features leads here to an extremely complex derivation. The most widely accepted view on palatalization is that the involved vowels are specified for the feature [coronal] and this spreads to the neighbouring consonant (e.g. Clements 1976; 1991; Hume 1992; Lahiri and Evers 1991; Broselow and Niyondagara 1991; Halle 2005).

In the following, I will maintain this basic idea that the feature [coronal] is at the heart of retraction plus affrication of the dental stop as well as advancement plus affrication of the velar stop. However, since I subscribe to a more abstract view of segmental representation I use Morén's (2006) analysis of palatalization in Serbian as the matrix for my account of palatalization in Italian. Both palatalization processes in Italian are spreading of [coronal] from a vowel to the preceding stop.

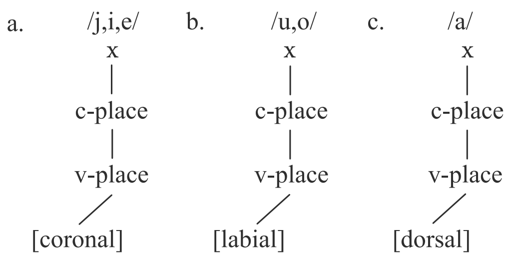
Since /t/ alternates with [ts] and /k, g/ with [tʃ, dʒ] when followed by a front vocoid, it seems most economical for both alternations to be triggered by the same feature, which has to be present in all the triggering segments if the alternation is conceived as a spreading operation. If the spreading feature is a place feature rather than a manner feature, the affricates can be analysed as additional stops rather than as an additional class of obstruents next to stops and fricatives (i.e. via a feature [strident] or [sharp], for example). The idea that in many languages with affricates (but not all) affrication is a phonetic enhancement strategy to distinguish additional places of articulation amongst stops has been argued for at length in e.g. Kehrein (2002). Thus, we can specify consonantal place features as in (27), using the major place features as proposed in the literature on feature geometry and combining them as introduced in the Parallel Structures Model.

(27) Places of articulation (preliminary)

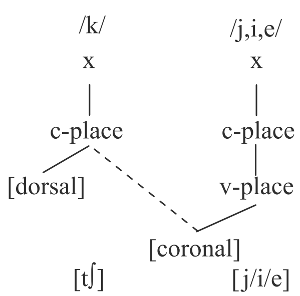


All 2nd conjugation verbs show palatalization of dorsal stops at the morpheme boundary before inflectional affixes beginning with an /i/ or /e/. In this class the process has to be regarded as automatic. As we have seen, in some instances the front glide /j/ also causes palatalization (which is morphologically or lexically governed).

(28) Representation of vocalic place features



(29) Spreading of [coronal] (preliminary version)



Basically the same rule turns /t/ into [ts]. However, as discussed above, according to Thornton it is questionable whether coronal affrication is synchronically active in any way. Thus, we also do not need to discuss the environmental restrictions, such as the blocking when the sequence is preceded by an /s/ etc.

It has to be captured in some way, though, that only [dorsal] stops are appropriate targets for the rule. The same holds for the ambiguous behaviour of /e/ and /j/ as triggers or neutral in dorsal palatalization. The whole range of different types of idiosyncratic behaviour is in need of analysis. One way of dealing with all this would be to assume that the only part of the Italian lexicon/grammar in which the process is active are the (non-productive) verbs of the 2nd conjugation. In all other cases alternations are due to lexically stored allomorphs. As we have seen above in the discussion of the results of the nonce-word test, this is too simplistic a solution.

With a representational analysis of the basic process at hand we can now tackle the opaque aspect of the phenomenon, the merging of clusters (30) and disappearance of the trigger (30b,c).

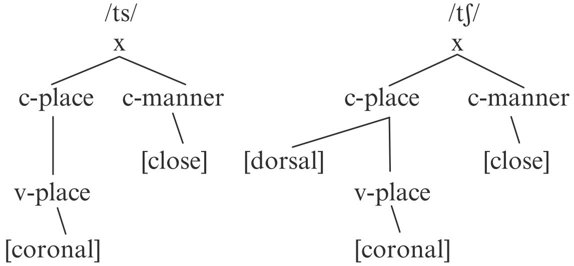
(30) Cluster simplification and destopping

a. /sk-i/ → //stʃi// → [ʃʃi] [krésko, kréʃʃi] 'I grow, you grow'
b. /k-j/ → //tʃj// → [tʃ] [dí:ko, ditʃá:mo] 'I say, we say'
c. /sk-j/ → //stʃj// → [ʃʃ] [krésko, kreʃʃá:mo] 'I grow, we grow'

Since I do not intend to introduce more features than necessary, an early observation on syllable structure is instructive here. According to our analysis so far the derived segment contains two place features. With respect to syllable structure, we observe that neither the palatal fricative nor the affricate combines with any sonorant within onsets, while the stops with only one place feature are abundant in complex onsets or combinations with following glides.

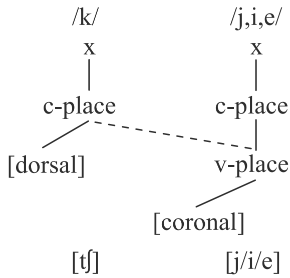
Thus, the conclusion is justified that the glide has a v-place node (filled with [coronal]), and that it is this v-place node which defines it as more sonorous than all other consonants and therefore as combinable with them in an onset. Since the affricates are not combinable with anything in an onset, they must be in the rare situation of being so low and at the same time high in sonority that no other consonant can precede them in an onset or follow them in an onset. Low sonority can be an effect of a terminal consonantal place feature or a c-manner feature, especially when specified as [close]. Since the anterior affricate does not have a consonantal place feature, the latter must be the reason for low sonority in the case of our affricates. High sonority, on the other hand, can only be contributed by the filled v-place node. Thus, in Italian, an affricate has to be specified as indicated in (31).

(31) Representations for Italian affricates



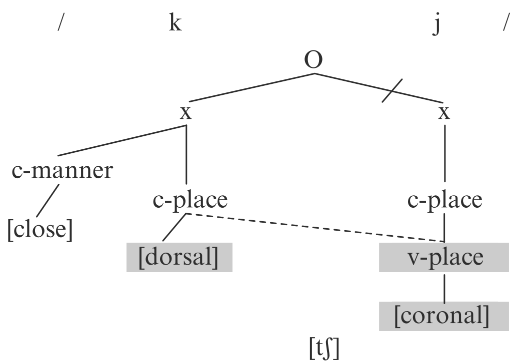
In order for an underlying dorsal stop to turn into an affricate the glide and the front vowels do not only spread their terminal place feature, they spread the whole v-place node.

(32) Spreading of [coronal] (version 2)



Under these circumstances, there is no longer any room in the onset for a glide. It has to delete or merge with the other segment in the constituent. Syllabification of the derived affricate in the preceding syllable, as a coda, violates the coda condition and is therefore no repair option either.

(33) Syllable constituent OCP violation with following glide



(33) shows how the glide seals its own fate. The spreading of its very own place feature [coronal] causes an excess of place features, since the target segment now needs to be long, and shares in the syllable constituent with the glide. Thus, again we can conceive of the process as a merger of the two segments driven by the desire to spread [coronal] to dorsals, and the conflict of the potentially resulting structure with restrictions on syllable constituents. The analysis of the disappearance of the coronal glide partially answers one of the questions on the status of consonant+glide sequences with respect to syllable structure, which arose earlier in the discussion of falling diphthongs (4.2.2). If this analysis is correct, the glide has to be in onset position together with the stop rather than being part of the following nucleus—at least in morphologically derived environments.

All this does not explain the reaction observed when there is a preceding /s/. The alveolar fricative is frequently found in Italian codas, but never followed by an affricate or palatal fricative. Moreover, since we do not specify redundant features, such as [+strident], the two adjacent segments only have one thing in common that would explain the observed creation of a palatal fricative from /s/ plus //tʃ// (or the blocking of affrication of /t/ by preceding /s/ or the absence of [sts] clusters from the language). The place feature [coronal] is present in both segments. If two adjacent segments specified for [coronal] are not allowed, the solutions are a merger of the c-place node with loss of one instance of [coronal] or deletion of one segment. The repair is obviously a merger with delinking of one of the conflicting c-manner nodes, i.e. c-manner:[close] in the second segment.

(34) Syllable constituent place-OCP violation with preceding coronal fricative

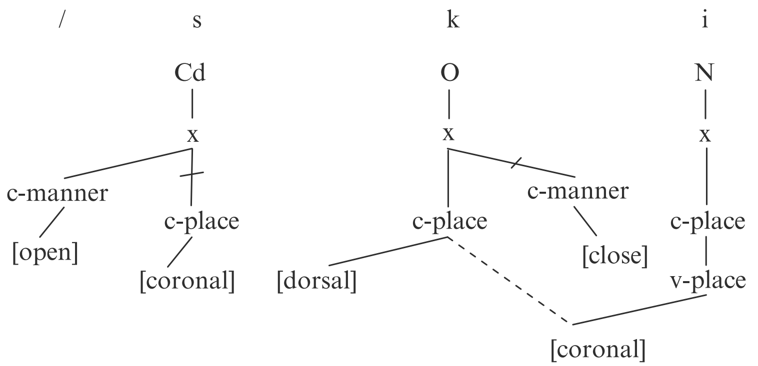
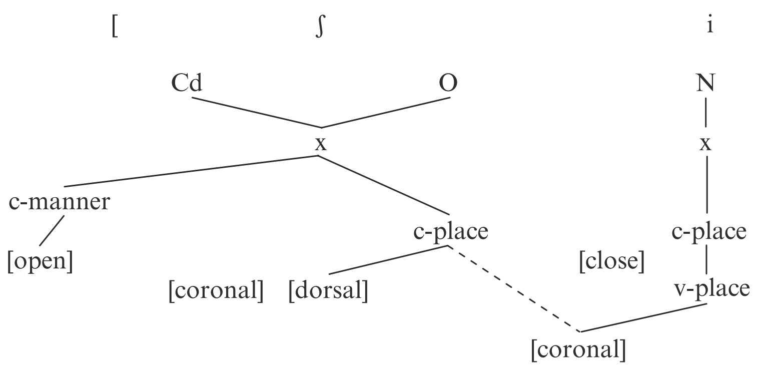


Diagram (35) shows the merged structure. I have left the disposed features in the diagram to make the analysis more transparent. It can be seen that the emergent long palatal fricative is composed of the first segment's manner feature and the second segment's place features.

(35) Solution to syllable constituent place-OCP violation



For the destopping the manner features are crucial. To restrict the palatalization targets to stops, these segments need a class feature, c-manner:[close]. In order to lose this feature in the merger with /s/ the latter needs a manner feature as well, c-manner:[open].

The analysis developed so far has quite a derivational flavour. Readers familiar with autosegmental phonology could feel tempted to interpret the analysis as the serial application of rules or repair strategies in response to violations of structural constraints.

It remains to be shown in the next section how these outputs emerge as the least offensive solution from a competition of imperfect candidates.

The next section will also deal with restriction of palatalization to lexical classes and item-wise lexicalization within the nominal class. The different behaviour and accordingly different grammars of individual speakers in the face of the same surface patterns will also be addressed in a formal way.

So far, we have expanded our inventory of the contrastive segmental features in Italian, and of allowed and prohibited structures in the segmental domain, as well discovering a restriction on syllable constituent structure. We have a basic inventory of three place features which can be underspecified in a segment or combined to give us at least five places of articulation. Even though the glide in the morphologically derived structures considered above was represented as an autonomous segment, the question is still open as to whether the consonant plus glide sequences should be analysed as one or two segments.

4.2.1.3 Constraint-based analysis of palatalization

Before I delve into the details of an OT analysis of velar palatalization, it is advisable to take stock of what is left on our list of things that have to be accounted for.

First of all, velar palatalization is found in morphologically derived environments only. Morpheme-internally we find configurations of adjacent segments which we would not expect if this were a process that applies unconditionally, as in *chiedere* [ˈ**kj**edere] 'to ask', which is a 2nd conjugation verb. Verbs of this class show velar palatalization of input velar stops with following front glides or front vowels without exception at the stem-suffix juncture.

We found at the outset that the process applies always when the conditions are met in 2nd conjugation verbs, never in 1st conjugation verbs, and only to some random lexical items in the nominal class. As for derivational affixes, the situation was slightly chaotic: some derivational affixes always trigger the process, while others only do so with selected nouns. The nouns that block palatalization with these affixes are not necessarily the same nouns as those that block palatalization with inflectional affixes.

As regards the vacillating nouns which are said to allow for both alternation and blocking, an internet search revealed that vacillation is de facto inexistent, since the use of the allegedly less-used form for each word under scrutiny was at the same level of frequency as we found for typos with non-vacillating nouns. Thus, in this context, vacillation does not need to be accounted for, since there is no free variation.[10]

The nonce-word test showed that speakers interpret the surface pattern in two different ways. For one group the process is active: plurals of new forms are palatalized almost without exception. The other group never palatalizes in the plural of a new word. Thus, it is plausible to assume that speakers belonging to the first group have all plurals which do not palatalize stored as exceptions or marked with a diacritic that

[10] The situation is demonstrably different with words that have vacillating stress placement, e.g. for which the same form can be produced with penultimate or antepenultimate stress. These show free variation, as will be discussed in Ch. 6.

prevents application, while the situation is the reverse for speakers belonging to the other group. For these, every palatalizing noun has to have a stored allomorph or a diacritic mark that triggers exceptional application.

Let us first have a look at the constraints and ranking necessary to account for the pattern in 2nd conjugation verbs. A constraint triggering spreading has to outrank the relevant faithfulness constraint that blocks spreading. I will use a short-hand label here, PAL, for the constraint that favours candidates in which a dorsal segment has an additional link to the feature v-place:[coronal] in the following vocoid.

(36) Active palatalization

PAL ≫ IO-IDENT[place]

The choice of the candidate showing palatalization over a faithful one is shown in (37).

(37) Palatalization

	/dirig -i/	PAL	IO-IDENT
☞ a.	diɾidʒi		*
b.	diɾigi	*!	

Since the process applies only in morphologically derived environments, there must be some additional faithfulness constraint blocking palatalization inside morphemes. Krämer (2003b; 2005) has argued for an analysis of derived environment effects invoking CONTIGUITY constraints (McCarthy and Prince 1995). A contiguity constraint is violated only if a segment embedded between two other segments in input and output is unfaithful. While McCarthy and Prince's definition of Contiguity punishes string-internal deletion and insertion (38), Krämer extends this to string-internal changes in segmental features.

(38) Contiguity (McCarthy and Prince 1999: 295)

a. I-CONTIG ('No Skipping')
The portion of S_1 standing in correspondence forms a contiguous string.
Domain ($\Re$) is a single contiguous string in S_1.

b. O-CONTIG ('No Intrusion')
The portion of S_2 standing in correspondence forms a contiguous string.
Domain ($\Re$) is a single contiguous string in S_2.

For the analysis of palatalization it is not necessary to split CONTIGUITY into one constraint against the removal of a string-internal feature and one against the insertion of a feature inside a string; hence I will only refer to (Feature-)CONTIGUITY, rather than I- or O-CONTIGUITY.

(39) F-CONTIGUITY ≫ PAL ≫ IO-IDENT[place]

The tableau in (40) exemplifies blocking of the process morpheme-internally in 2nd conjugation verbs.

(40) Morpheme-internal blocking

/kjed-ere/	CONTIGUITY	PAL	IO-IDENT
a. tʃedeɾe	*!		*
☞ b. kjedeɾe		*	

At a morpheme juncture, the CONTIGUITY constraint is not violated by spreading, as shown in (41).

(41) Exceptionless application at morpheme boundaries

/dirig -i/	CONTIGUITY	PAL	IO-IDENT
☞ a. diɾidʒ#i			*
b. diɾig#i		*!	

In the 1st conjugation class we do not find a single verb stem that shows the alternation. Dorsal stops in the stem surface faithfully in the palatalization environment. I follow Burzio (2000; 2004) in assuming that generalized blocking and the absence of idiosyncratic behaviour is due to high-ranking Base-Output-faithfulness (henceforth BO-faithfulness) that punishes any deviation from a surface base form. The application context is given in 2nd person singular forms, with the affixation of /-i/. Thus, these forms have to be faithful to some other form, the 3rd person singular or the infinitive, which do not show palatalization either (if only because of lack of a trigger). This paradigmatic constraint, then, outranks the palatalization constraint. Since there is regular application in the 2nd conjugation, this faithfulness constraint has to be lexically indexed to 1st conjugation verbs, indicated with a subscript '1' attached to the constraint. The assumption of an additional constraint that is activated only in the evaluation of 1st conjugation verbs saves us from stipulating different rankings for the two verb classes.

Lexical co-indexation of constraints and lexical entries was proposed by Pater (2000; forthcoming). Pater claims that lexicalized blocking of a process is due to the ranking of an indexed constraint above the triggering constraint. This triggering constraint is ranked above general faithfulness. The index on the constraint activates this constraint only when a lexical item is evaluated which is tagged with the same index. In the evaluation of all other inputs, the constraint remains silent. The exceptional application of a phonological process has as its basic ranking a blocking ranking, i.e. faithfulness outranks the markedness constraint that prefers candidates in which the process has applied. This is complemented by the high ranking of a lexically indexed copy of the same markedness constraint, i.e. the constraint triggering application.

(42) Lexical indexation

a. Exceptional blocking
   $\text{FAITH}_X \gg \text{PHONO-CONSTRAINT} \gg \text{FAITH}$
b. Exceptional application
   $\text{PHONO-CONSTRAINT}_X \gg \text{FAITH} \gg \text{PHONO-CONSTRAINT}$

Such indices can be tagged to arbitrary morphemes or, as in the case of 1st conjugation verbs, to groups of morphemes, defined over conjugation class membership or grammatical category or other features defining groups. The same approach to exceptionality will be extended to nouns and adjectives below.[11]

(43) *-are* verbs exceptionless non-application:

BO-IDENT[place]$_1$ $\gg$ PAL $\gg$ IO-IDENT[place]

As tableau (44) shows, the highly ranked BO-faithfulness constraint marks a protest against the otherwise preferred candidate with a palatalized root-final consonant, since this candidate differs from the base.

(44) Potential exceptional palatalization in *-are* paradigm

/leg/ /-i/	BO-IDENT1	PAL	IO-IDENT
a. ledʒi	*!		*
☞ b. legi		*	
base: legare/lega			

With one ranking which contains one lexically indexed constraint, we account for the absence of a paradigm like hypothetical *{*tokeɾe, toko, toki*} as well as for impossible *{*tokaɾe, toko, totʃi*}.

The issue of the behaviour of affix-initial glides and stem-final /sk/ clusters will be taken up after we have discussed the OT grammars needed for nouns and adjectives, which we turn to now.

[11] There are several conceivable alternatives to the indexation approach. One alternative option is to regard exceptional application of palatalization (or any other process) as the effect of allomorphy. The morphemes undergoing the process have two stored forms, e.g. /amik/ and /amitʃ/, which are always present in the input to every form. The constraint hierarchy then chooses the least offensive allomorph depending on the context, as proposed by van de Veer (2006). The non-alternating forms then simply do not have a stored allomorph. Following Burzio (2000), I assume that such an approach is only justified if we see more unpredictability, as in the case of true suppletion, where one allomorph cannot reasonably be derived from the other, which is observed e.g. with irregular verb forms (e.g. *sono, è, fu, fosse* 'be 1sg present indicative, be 3sg present indicative, be 3sg remote past, be 3sg conjunctive imperfective').

The nonce-word test data reported above also show that an allomorph analysis does not represent the competence of a considerable part of speakers. There is no reason for a speaker to assume a stored allomorph for novel words. Hence, such an analysis cannot explain why some speakers regularly apply palatalization to new words.

Another potential analysis makes use of co-phonologies rather than indexed constraints. Individual morphemes are linked to different constraint hierarchies in such an analysis. A problem arises here if palatalizing and non-palatalizing morphemes are mixed in a word. We have seen above that 3rd conjugation verbs may behave in a mixed fashion. For example, the verb *arricchire* 'to enrich' has the non-palatalizing adjective stem *ricco* (pl. *ricchi*) as its base. In many inflected forms the stem extension /-isk-/ is added to the base which palatalizes in the usual environment:

arricchisco '(I) enrich', *arricchisci* '(you) enrich'.

Since constraint hierarchies evaluate whole words (or larger units), a co-phonology approach cannot handle such mixed forms, while the co-indexation analysis has no problems with these.

If we simply proceed with the analysis on the basis of the grammar established for verbs, the most important choice regarding nouns seems to be made already. The default established above is application of palatalization. Thus, nouns that display the alternation can just be fed into the grammar and the correct output will be generated. All the nouns that are immune can be treated in the same fashion as 1st conjugation verbs: they receive a lexical index tied to the activation of a BO-faithfulness constraint with the same index. A further aspect that has to be integrated is the lack of triggering behaviour of /e/. In 2nd conjugation verbs, dorsals preceding an affixal /e/ palatalize, while hardly any affix with intial /e/ added to nominal bases, inflectional or derivational, triggers palatalization. Furthermore, the nonce-word experiment showed that the situation is slightly more complex, with individual speakers making different choices regarding the default or exceptional status of palatalization in nouns and adjectives.

The grammar developed for verbs generates palatalization as the default reaction to heteromorphemic sequences of dorsal consonant plus coronal vocoid. On this basis I now develop a grammar that explains the non-palatalizing female nouns and adjectives. The lack of palatalization in the presence of affixed /-e/ in nominals can be regarded as evidence that there are distinct underlying /e/s, one with the feature [coronal] and one without. I opt against this solution to keep the system small and explain the lack of application in feminine inflection by an indexed constraint.

Palatalization is blocked in feminine forms because these obey BO-faithfulness, just as 1st conjugation verbs do. The plurals of feminine nouns and adjectives have to be faithful to the singular form. This approach follows the line pursued already to capture blocking in verbs, and thus is the preferred choice. The new faithfulness constraint is added to the hierarchy developed for verbs.

(45) Velar palatalization grammar continued

BO-IDENT[place]$_{fem}$, BO-IDENT[place]$_{-are}$ $\gg$ PAL $\gg$ IO-IDENT[place]

The tableau in (46) shows how the BO-faithfulness constraint selects the candidate without palatalization.

(46) Blocking in female forms

/amik/ /-e/	BO-IDENT$_{fem}$	PAL	IO-IDENT
☞ a. amike		*	
b. amitʃe	*!		*
base: amika			

If the same noun is used as a masculine form we get automatic palatalization now as shown by tableau (47).

(47) Palatalization default in nouns

	/amik/ /-i/	BO-IDENT$_{fem}$	PAL	IO-IDENT
	a. amiki		*!	
☞	b. amitʃi			*
	base: amiko			

This grammar generates the wrong output for nouns and adjectives like *cuoco* 'cook'. Pursuing the same argument as before, we can add an indexed BO-faithfulness constraint sensitive to nouns carrying a lexical index. Nouns and adjectives exceptional to palatalization get an arbitrary lexical index that links them to this constraint.

(48) Velar palatalization grammar

BO-ID[place]$_{fem}$, BO-ID[place]$_{1}$ ≫ BO-IDENT[place]$_{Nx}$ ≫ PAL ≫ IO-IDENT[place]

(49) Lexically arbitrary non-application

	/kwok-/$_{x}$ /-i/	BO-IDENT$_{Nx}$	PAL	IO-IDENT
☞	a. kwoki		*	
	b. kwotʃi	*!		*
	base: kwoko			

Participants 6–9 spontaneously palatalize novel masculine words in the plural. This is exactly what is expected if they adhere to this grammar, since new words are of course not lexically indexed. This is illustrated with the evaluation of a nonce-noun in tableau (50).

(50) Participants 6–9

	/frampek/ /-i/	BO-IDENT$_{Nx}$	PAL	IO-IDENT
	a. frampeki		*!	
☞	b. frampetʃi			*
	base: frampeko			

There are several options now for those participants who did not palatalize at all. Their grammar could be radically different already for verbs. In this case they have the 2nd conjugation-specific process triggered by a highly ranked indexed PAL$_{2,3}$

constraint, while the general PAL constraint is below general faithfulness. Thus, no further constraints are necessary for feminine nominals.

(51) Palatalization as exception grammar 1.0

$\text{PAL}_{2,3} \gg$ IO-IDENT[place] $\gg$ PAL

Only the exceptionally palatalizing masculine forms need an index and an indexed constraint.

(52) Palatalization as exception grammar 1.1

$\text{PAL}_{2,3}$, $\text{PAL}_{x\text{-}N(masc.)} \gg$ IO-IDENT[place] $\gg$ PAL

In this case the subjects will not palatalize any novel forms, since for a form to undergo palatalization it has to carry a lexical index that activates the constraint.

The second indexed constraint is quite complex. It is restricted to indexed nouns and adjectives that in addition have to be masculine. Arguably, in Italian only nouns and adjectives carry a feature for gender. On the other hand, masculine is the linguistically unmarked gender in Italian. Thus, reference to masculine should be avoided.

In order to keep the indices simple, I propose a second solution. This group of speakers has essentially the same grammar as developed for those that palatalize new words, with one difference. The BO-faithfulness constraint indexed to nouns is not sensitive to lexically indexed nouns, but to all nouns. Instead, there is an additional indexed PAL constraint in the hierarchy carrying an arbitrary index. Since this constraint is ranked below the BO-faithfulness constraints referring to 1st conjugation verbs and to feminine nouns and adjectives, no idiosyncratic palatalization can emerge in these groups. If a masculine adjective or noun carries the index, however, this makes a difference. This alternative grammar is given in (53).

(53) Velar-palatalization-as-exception grammar

BO-IDENT$[\text{place}]_{fem}$, BO-IDENT$[\text{place}]_{are} \gg \text{PAL}_{\text{y}} \gg$ BO-IDENT$[\text{place}]_{\text{N}}$ $\gg$ PAL $\gg$ IO-IDENT[place]

The three tableaux show this grammar in action. Palatalizing stem /amik/ has a lexical index which activates the copy of the palatalization constraint PAL that outranks the BO-faithfulness constraint that causes blocking in unindexed nouns (54.iii). However, the BO-faithfulness constraint activated by feminine forms is ranked higher than indexed Pal_{y}, and thus palatalization cannot apply to lexically indexed stems when they are used in the feminine form (54.ii and iv). Again the nominal grammar is an add-on to the hierarchy developed for verbs, rather than a co-phonology.

(54) Blocking by paradigm uniformity

i. /amik/$_y$ /-i/	BO-IDENT$_{fem}$	PAL$_y$	BO-IDENT$_N$	PAL	IO-IDENT
a. amiki		*!		*	
☞ b. amitʃi			*		*
base: amiko					

ii. /amik/$_y$ /-e/	BO-IDENT$_{fem}$	PAL$_y$	BO-IDENT$_N$	PAL	IO-IDENT
☞ a. amike		*		*	
b. amitʃe	*!		*		*
base: amika					

iii. /kwɔk/ /-i/	BO-IDENT$_{fem}$	PAL$_y$	BO-IDENT$_N$	PAL	IO-IDENT
☞ a. kwɔki				*	
b. kwɔtʃi			*!		*
base: kwɔko					

iv. /kwɔk/ /-e/	BO-IDENT$_{fem}$	PAL$_y$	BO-IDENT$_N$	PAL	IO-IDENT
☞ a. kwɔke				*	
b. kwɔtʃe	*!		*		*
base: kwɔka					

The grammar looks somewhat baroque, but the number of indexed constraints is necessary to avoid application of idiosyncratic palatalization in feminine forms.

Speakers with this grammar will treat novel words as not bearing an idiosyncratic index, and thus they will follow the pattern exemplified by /kwɔk/. Since they are nouns, the BO-faithfulness constraint indexed to nouns is activated in their evaluation and blocks palatalization. The higher-ranked indexed PAL$_y$ is very unlikely to get activated, since at this stage (the word is new) the speaker has no reason to assume that it has the index that would activate the constraint.

(55) Blocking in novel words

/frampek/ /-i/	BO-IDENT$_{fem}$	PAL$_y$	BO-IDENT$_N$	PAL	IO-IDENT
☞ a. frampeki				*	
b. frampetʃi			*!		*
base: frampeko					

This second grammar (palatalization as exception) relies on indexed markedness to generate palatalization as the exceptional pattern, while the first nominal grammar developed utilized indexed faithfulness to generate underapplication as the exception.

This analysis follows Pater's (forthcoming) proposal to analyse exceptional application as indexed markedness and exceptional blocking as indexed faithfulness.

To summarize, we have established two grammars, differing in the constraints that are lexically indexed (56). The first grammar, (56a), represents the speakers that palatalize nonce- or novel words, and it has an indexed faithfulness constraint that selects the candidate without palatalization when a lexically indexed noun stem is in the input. Accordingly, for these speakers, all nouns that block palatalization carry the lexical index that activates the respective constraint. The second grammar, (56b), represents speakers who do not apply palatalization to novel forms. Palatalization is blocked in all nouns (in parallel with the treatment of feminine forms as well as 1st conjugation verbs) by a high-ranking faithfulness constraint connected via indexation to all nouns. Exceptional application is triggered by a markedness constraint carrying an arbitrary index. This constraint has to rank below the blocking faithfulness constraints indexed to feminine forms and 1st conjugation verbs to exclude idiosyncratic application in these classes. Accordingly, all nouns that do palatalize in the plural carry the index in their lexical representation.

(56) The two grammars

a. Spontaneous palatalization
$\text{BO-I}\textsc{dent}_1$, $\text{BO-I}\textsc{dent}_{fem}$, $\text{BO-I}\textsc{dent}_{Nx} \gg \text{P}\textsc{al} \gg \text{IO-I}\textsc{dent}$

b. Generalized blocking of palatalization
$\text{BO-I}\textsc{dent}_1$, $\text{BO-I}\textsc{dent}_{fem} \gg \text{P}\textsc{al}_{\text{y}} \gg \text{BO-I}\textsc{dent}_N \gg \text{P}\textsc{al} \gg \text{IO-I}\textsc{dent}$

The data generated in the experiment show that this account is on the right track. Anttila's (2002a) proposal of co-phonologies stipulates that co-phonologies arise only in cases where the general grammar has no ranking imposed on the crucial constraints. Thus, we would expect that each Italian noun has either one ranking or the other via lexical co-phonology membership, while novel words are not affiliated to any class or fixed ranking. Coupled with Anttila's (2002a; 2002b) view on how unranked constraints behave, i.e. that they randomly assume a ranking in each evaluation, we expect all our subjects to behave as the group as a whole apparently behaved, i.e. to show free variation. Furthermore, we expect at least some lexical items to show a more or less balanced vacillation, which is not the case. In this hypothetical account the two crucial constraints that are generally unranked are PAL and IO-IDENT. The rest do not play a role, except for BO-faithfulness for feminine forms. For the *amico*-type words PAL outranks faithfulness. For *cuoco*-type words the ranking is reversed. When novel words are pluralized the two constraints can assume any ranking: in 50 per cent of all cases PAL will outrank faithfulness and in 50 per cent of cases faithfulness will outrank PAL. The predicted surface effect is free variation in each speaker. Since this is not the case, the lexical indexation account has to be preferred.

The analysis can be further extended to the affixes listed above and in Dressler (1985) by the introduction of further indexed constraints. Given the chaotic situation with regard to triggering and blocking factors, it seems very unlikely that a simple solution allocating the different affixes to different lexical strata in the sense of Stratal OT (Kiparsky 2000; Bermudez-Otero forthcoming) or Lexical Phonology (see especially Giegerich 1999 for the issue of stratal allocation of affixes), in which different phonological rules reside, will prove feasible. The conclusion that there is no internal structure in the Lexical Phonology of Italian was reached by Vogel as early as (1993), while Scalise (1984) postulated three levels.

While in these cases the ordering of the addition of affixes with respect to the application of phonological rules might be an issue, the behaviour of /sk/ clusters and that of glides is a matter that can be regarded as purely phonologically opaque. A phonological segment causes the application of a rule and then disappears because of the application of another rule.

As mentioned earlier, these patterns can likewise be regarded as the fusion of segments. To account for this aspect of the pattern we have to consider more types of faithfulness constraint. In the representational analysis above the observed effect was explained as fusion or coalescence of two or three segments. So, in the case of an input /sk-i/ the consonants are blended into one, which occupies two prosodic positions. McCarthy and Prince (1999) introduce the faithfulness constraint Uniformity, which bans coalescence. Gemination, on the other hand, violates the faithfulness constraint Integrity. Below I will resort to Lamontagne and Rice's (1995) *MC (No Multiple Correspondence), for the sake of simplicity. Here the situation is this: we have two input segment positions, each segment with different specifications for place and manner features. The output still has the two segment positions, but they share all features. This could be due to spontaneous lengthening of the emergent segment (which, in Italian, is realized as long whenever possible), or there may be a prosodic explanation, in that the resultant single segment still has a mora attached which the original /s/ gets due to Weight-by-Position, as a consonant in a coda (I will discuss the latter issue in more depth in Chapter 5 on syllable structure and Chapter 6 on word stress).

In any case, if we assume that the two segments assimilate to each other or that they coalesce, we need to make sure that the emergent structure inherits the right feature profile. The Identity constraints employed so far do not differentiate the candidates appropriately. Taking the place feature first, if a coronal and a dorsal are merged, the segment originally specified for [coronal] only now has a feature [dorsal] in addition. The dorsal has an additional feature [coronal] anyway because of the spreading from the following vowel. In any configuration, whether [coronal] is present on the candidate segment or not, the segment will incur a violation of Ident[coronal]. The same holds for c-manner. The fricative is specified as [open] and the stop is specified as [close]. The desired output has just a specification of [open]. The Identity constraints on these features will be violated to the same degree by any merged candidate segment, and thus they tie with the desired output, as indicated by the black peperoni in (57). Delinking of the dorsal feature rather than merger of the segments leads to the least severe violation of faithfulness, which makes candidate (e) appear more harmonic than the desired winner, which is indicated by the bomb 💣.

(57) The identity dilemma

/kresk-i/	PAL, OCP	MAX-IO	ID[dor]	ID[op]	ID[cl]	ID (c-manner)
a. kreski	*!					
b. krestri	*!					
c. kretri		*!				
d. kresi		*!			*	
💣 e. kresti			*			
🌶 f. kressi			*	*!	*	*
🌶 g. kretʃtʃi			*	*!	*	*
☹ h. kreʃʃi			*	*!	*	*

The additional effect of MAX-[F] constraints solves the problem. The sub-optimal candidate (e) and undesired (f) violate MAX[dorsal], which the other candidates avoid. Sub-optimal (g), with a long affricate specified for [close], but not for [open], violates MAX[open].

(58) Merger and maximized feature faithfulness

/kresk-i/	PAL, OCP	MAX-IO	MAX[dor]	MAX[op]	MAX[cl]
a. kreski	*!				
b. krestʃi	*!				
c. kretʃi		*!			
d. kresi		*!			*
☠ e. kresti			*!		
f. kressi			*!		*
g. kretʃtʃi				*!	
☺ h. kreʃʃi					*

Even though tableau (58) does not display any Identity constraints, it is not my intention here to argue that Identity constraints have to be replaced by MAX-[F] (and DEP-[F]) constraints. Rather, we need both types of faithfulness to features. This will be taken up again in the discussion of vowel raising.

The ban against the palatal fricative and the coronal glide together in one onset is regarded here as an OCP violation. Closer inspection, however, also reveals that in this case one syllable constituent is filled with three place features, which exceeds the capacity of Italian onsets (see Chapter 5 on syllable structure).

(59) Merger of/skj/

/kresk-jamo/	PAL, OCP	MAX-IO	MAX [dor]	MAX[op]	MAX[cl]	*MC
a. kɾeskjamo	*!					
b. kɾestʃjamo	*!					
c. kɾeʃʃjamo	*!				*	*
d. kɾeʃʃamo		*!				*
☞ e. kɾeʃʃamo					*	**
f. kɾesjamo		*!			*	
g. kɾessjamo			*!		*	*
h. kɾetʃtʃamo				*!		**

The current analysis answers the question whether velar palatalization is productive at least in inflection. The answer is a clear 'it depends on the speaker'. Furthermore, the closer look at palatalization helps us determine the Italian system of place features.

There are still several issues which have not been discussed in detail here. It is unclear yet whether the absence of nouns with palatalization of stem-final consonant clusters, such as fricative plus dorsal consonant or sonorant plus dorsal consonant, is due to an active restriction on the pattern or instead an accidental gap. It is also not clear why some speakers do not palatalize geminates (even among those who palatalize nonce-words) and whether this has anything to do with the just-mentioned ban on palatalization of consonants preceded by a consonantal coda. I leave these issues to further study.

4.2.2 The status of glides: vowel-glide alternations

As indicated above, the two high glides have received different treatments. They can be seen as non-vocalic realizations of high vowels, due to prosodic position, or as underlyingly different from high vowels. The independent contrastive status of glides as opposed to high vowels can be established by examples in which glides and high vowels appear in the same environment. This, however, needs some further qualification on the basis of data that display alternations between glides and high vowels. We can establish a structural difference between the two and judge approximately what this difference actually is in terms of phonological features if we discover asymmetries between the two classes, i.e. high vowels and glides. If we can show that underlying glides can alternate with vowels but vowels cannot alternate with glides, or that glides cannot be realized as vowels but vowels can surface as glides in some positions, we have shown that there is indeed a structural difference. Our conclusion—as to which of the two asymmetries (non-alternating glides or non-alternating vowels) applies—tells us about relative complexity. To turn a glide into a vowel one has either to add vocalic features or to remove consonantal features; likewise, to turn a vowel into a glide one has either to add consonantal features or to remove vocalic features. Delinking, i.e.

removal, of features should be the preferred option. Below I will show that vowels can alternate with glides but glides cannot alternate with vowels. This tells us that this change involves the delinking of features or deletion of structure in the input vowel which a glide lacks. A further distinction could be made between the two high glides. One might actually be vocalic and one consonantal. This has been shown for American English, for example, by Davis and Hammond (1995). Marotta (1988) argues that /j/ is placed in onset position while [w] is either part of a nucleus together with/ɔ/or part of a labialized dorsal stop, i.e. /kʷ/ and /gʷ/. Her analysis results in an imbalanced system of contrast. The language has only one glide, the palatal; the labial rising diphthong is regarded as the only diphthong of this kind (rising) in Italian, and of all the stops only the dorsal stops can be contrastively labialized.

In this chapter I will first go through the different types of alternation, their contexts and instances of blocking of expected alternations (4.2.2.1), and then turn to an analysis, first discussing repercussions for the representation of glides and high vowels and then modelling the observed productive alternations and blocking of these in OT.

4.2.2.1 Separating high vowels and glides

Vowels and glides alternate in several distinct patterns in Italian. All vowel-glide alternations are connected to stress, i.e. depend on whether the segment is stressed or not or on whether stress is in the vicinity or further away. Beyond alternations between high vowels and glides, a pattern that has received considerable attention in the literature is the alternation between mid-low vowels and rising diphthongs of a glide plus a mid-low vowel, the *dittonghi mobili*, 'mobile diphthongs'.

Glides are relatively rare in word-initial position. Most of the words listed in (60) are loanwords. This is connected to a historical development. All Latin labial glides turned into fricatives at some point. However, given the existence of a considerable number of words containing glides, no ban against surface glides can be regarded as synchronically operational any more. The question, though, is whether these glides are lexical.

(60) Word-initial glides

uomo	ˈwɔːmo	'man'
whisky	ˈwiski	'whisky'
iella	ˈjɛlla	'bad luck'
iena	ˈjɛːna	'hyena'
iodio	ˈjɔːdjo	'iodine'
iato	ˈjaːto	'hiatus'
yacht	ˈjɔt	'yacht'
iuta	ˈjuːta	'jute'

There are almost no words starting in a high vowel followed by some other vowel. *DiPI* records variation in *iato* between a glide and a vowel. The only word consistently starting with a high vowel followed by another vowel is the 1st person singular pronoun *io*, which is stressed on the first vowel [ˈiː.o]. This raises the suspicion that all these glides are underlying vowels which turn into glides to provide some consonantal onset, or to avoid an unstressed syllable, or for some other presumably prosodic reason.

Definite article selection of nouns has been used as a diagnostic criterion to determine the prosodic structure of glides. Italian masculine nouns select different articles depending on whether the noun starts in a vowel (taking *l'/gli*) or inherently long consonant or /s+C/ (taking *lo/gli*) on the one side or any other consonant or rising-sonority consonant cluster on the other (taking *il/i*). Feminine nouns take *la* if they start in a consonant, and the determiner lacking the vowel if they start in a vowel (*l'*).

(61) The definite articles

a. il duomo	i duomi	'the dome/s'
il maschio	i maschi	'the male/s'
il ladrone	i ladroni	'the villain/s'
il bar	i bar	'the café/s'
b. l'ottico	gli ottici	'the optometrist/s'
l'asparago	gli asparagi	'the asparagus/es'
c. lo spettacolo	gli spettacoli	'the event/s'
lo straniero	gli stranieri	'the stranger/s'
d. lo zaino [d͡z]	gli zaini	'the backpack/s'
e. il gioco [d͡ʒ]	i giochi	'the game/s'
f. la spada	le spade	'the sword/s'
la torta	le torte	'the cake/s'
l'anatra	le anatre	'the duck/s'

Thus, if the glides are vowels and part of the nucleus we expect the glide-initial words to select *l'/gli*. The situation is a bit more complex than this, as shown in table (62).

(62) Masculine articles and labial glide-initial words

	l'	il	lo	gli	i	Gloss
a. uomo	✓	∗	∗	✓	∗	'man/men'
b. weekend	∗	✓	∗	∗	✓	'weekend'
c. whisky	∗	?	✓	✓	?	'whisky'

For the labial glide, we can conclude on the basis of article selection that in some words it is in the nucleus (62a), in some words it is a consonant in the onset (62b), and, finally, it can also be an underlying geminate (62c) which has no room in the nucleus and exceeds the available space in the onset (see also the discussion on syllable structure in Chapter 5).

On the other hand, the data look suspiciously as if the guiding information for selection here is not phonological in nature but rather orthographic. The item written with an initial vowel receives the article reserved for vowel-initial words, while the one with an initial orthographic consonant selects the article for consonant-initial forms and the one starting in an odd consonant cluster takes the article used with clusters which are special in some sense or geminates (see below, Chapter 5).

Words starting with a palatal glide do not really improve the picture. Words starting with an orthographic vowel can take the article reserved for nouns beginning with a vowel or the one for geminates and /sC/ clusters. Consonant-initial nouns show a tendency towards *lo* selection. The latter might be due to the choice of letter again. The letter *y* is not commonly used in Italian orthography. It is reserved for loanwords.

(63) Masculine articles and palatal glide-initial words

	l'	il	lo	gli	i	Gloss
a. ione	✓	*	✓	✓	*	'ion/s'
iato	✓	*	✓	✓	*	'hiatus'
b. yoghurt	*	*	✓	✓	*	'yoghurt'
yacht	?	*	✓	✓	*	'yacht'
iodio	?	*	✓			'iodine'

While these data so far weakly suggest that the glides are vocalic in nature, if anything, since the article used with consonants is ungrammatical in most cases, the feminine forms show a contradicting tendency. Palatal glides show an overwhelming tendency towards selection of the full form of the feminine article rather than the one with the vowel elided (64a). However, since the feminine article choice does not make a difference between 'ordinary' consonants and consonant cluster on the one side and geminates and /sC/ clusters on the other, this might still be taken as evidence that palatal glides are underlying geminates. Unfortunately, the glides are never realized as long.

In feminine forms, the labial glide is highly variable in article selection. Individual speakers may have personal preferences for a certain article with certain words, but in general they accept either choice (64b).

(64) Feminine article selection

a. la/*l'	iella	'bad luck'	b. la/l'	UEFA	'UEFA'
la/*l'	iena	'hyena'	l'/la	uosa	'gaiter'
la/*l'	juta	'jute'			
la/*l'	Iugoslavia	'Yugoslavia'			

In summary, we have to admit that article selection is not a very good diagnostic. First, there is very likely to be an influence from orthography. Second, the number of words starting in a glide plus vowel is extremely low and they are mostly recognizable loanwords. The only conclusion that can be drawn is that the labial glide is slightly more amenable to treatment as a vowel than the palatal glide. The reason for this might as well be the influence of the high frequency of the very few (two) Italian words starting in a labial glide (*uomo, uovo*).

At the beginning of words we have found no minimal pairs of glide plus vowel and high vowel plus vowel. The situation is more revealing word-internally, as previously observed with other contrasts (4.1). In (65), we see pairs where the occurrence of the glide cannot be predicted from context. The data in (65a) show glides and high vowels in or preceding the stressed position. (65b) shows a distinction between stressed high vowels following a low vowel and forms in which the same sequence is realized as a diphthong, i.e. vowel-glide sequences, while (65a) and (65c) show glide-vowel sequences. In (65c), finally, stress precedes the glide or is realized on its vocoid counterpart. As for (65a), the *DiPI* records variation for most of the examples, except pairs like *piano/Piano* and *qui/cui* as well as words like *piovere* and *fiasco*.

(65) (Near-)minimal pairs

a.	fiala	[ˈfjaː.la]	‘vial’	a′.	viale	[vi.ˈaː.le]	‘avenue’
	diavolo	[ˈdja.vo.lo]	‘devil’		dialogo	[di.ˈa.lo.go]	‘dialogue’
	piano	[ˈpjaː.no]	‘flat’		piano	[pi.ˈaː.no]	‘of Pius’
	qui	[ˈkwi]	‘here’		cui	[ˈkuː.i/ˈkuj]	rel.pron.
	piovere	[ˈpjɔ.ve.ɾe]	‘to rain’		pioniere	[pi.o.ˈnjɛː.ɾe]/	‘pioneer’
	fiasco	[ˈfjas.ko]	‘fiasco’			[pjo.ˈnjɛː.ɾe]	
	fiato	[ˈfjaː.to]	‘breath’		fiat	[ˈfiː.at]	‘FIAT’
b.	baule	[ba.ˈuː.le]	‘boot/trunk’	b′.	pausa	[ˈpaw.za]	‘break’
	paura	[pa.ˈuː.ɾa]	‘fear’		causa	[ˈkaw.za]	‘cause’
					aura	[ˈaw.ɾa]	‘aura’
c.	Italia	[i.ˈtaː.lja]	‘Italy’	c′.	prosodia	[pɾo.zo.ˈdiː.a]	‘prosody’
	invidia	[in.ˈviː.dja]	‘envy’		Maria	[ma.ˈɾiː.a]	

The data in (65) have to be compared with data in which we find predictable alternation between vowels and glides in the course of word length increase and stress shift as an effect of morphological operations. Stressed high vowels predictably turn into glides in morphologically related forms when the stress moves to the right, as shown in (66).

(66) Stressed vowel to unstressed glide (van der Veer 2006)

a.	av[ˈviː.o]	‘start’	b.	av[vja]ménto	‘start’
	cir[ˈkuː.ito]	‘circuit’		cir[kwi]tàle	‘of a circuit’
	in[ˈviː.o]	‘sending’		in[vja]bilità	‘sendability’

Unstressed full vowels that precede stress can alternate with glides when stress is moved further away. For the vocalic reflex to surface, stress does not have to be on the segment, but adjacent.

(67) Pre-tonic vowel to glide (adapted from van der Veer 2006: 75)

a.	b[i.ˈɔ]logo	‘biologist’	b.	b[jo]logía	‘biology’
	cl[i.ˈɛ]nte	‘client’		cl[je]ntéla	‘clientele’
	cons[u.ˈɛː]to	‘usual’		cons[we]túdine	‘habit’

We find a similar alternation when stress ‘hops over’ a high vowel.

(68) Post-stress glide to pre-stress vowel alternation

patria	[ˈpaː.tɾja]	‘native land’
patriota	[pa.tɾi.ˈɔː.ta]	‘patriot’

The data in (69) show a vowel changing from stressed to unstressed to a glide.

(69) Stressed vowel to unstressed vowel to glide

via	[ˈviː.a]	‘away; street’
viale	[vi.ˈaː.le]	‘avenue’
traviamento	[tra.vja.ˈmen.to]	‘distortion/corruption’

Thus we can generalize that immediately pre-stress high vowels change into glides when stress moves further away. If glides were not represented separately from vowels in underlying representations, we would expect no exception to this pattern. Since we find many words which have glides that are not realized as high vowels in the immediate vicinity of stress (70), we have to conclude that glides have an autonomous status with respect to high vowels.

(70) Many glides surface in the ‘wrong’ context and never vocalize

a. [ˈkjɔt͡ʃ.t͡ʃo.la]		*[ki.ˈɔt͡ʃ.t͡ʃo.la]	‘snail’
[ˈkwɔ.t͡ʃe.re]	- [kwo.ˈ t͡ʃjaː.mo]	*[ku.ˈɔ/ku.o . . .]	‘to cook/1pl.’
b. [i.ˈtaː.lja]	- [i.ta.ˈljaː.no]	*[i.ta.li.ˈaː.no]	‘Italy - Italian’
[in.ˈviː.dja]	- [in.vi.ˈdjoːzo]	*[in.vi. di.ˈoːzo]	‘envy - envious’

Another pattern involving alternating glides is contributed by the *dittonghi mobili*, the mobile diphthongs. In this pattern it is sequences of glide plus low-mid vowel in stressed position that alternate with low-mid vowels in unstressed position (71a). The pattern emerged from Latin short mid vowels, which were re-analysed as low-mid vowels which were subject to breaking in stressed position—a pattern observed in many Romance languages, differing in details of the context of application. In Italian, the historical process was limited to open syllables. As the data in (71) show, the pattern has many exceptions in present-day Italian. Especially in those lexical items undergoing breaking, the glide-vowel sequence has been extended throughout the paradigm to vowels in unstressed position as well (71b,d).

(71) Mobile diphthongs, exceptions, and paradigm levelling

a. seˈdeːre	‘to sit down’	b. ˈmwɔvere	‘to move’
ˈsjɛːdo	1sg	ˈmwɔːvo	1sg
ˈsjɛːdi	2sg	ˈmwɔːvi	2sg
ˈsjɛːde	3sg	ˈmwɔːve	3sg
seˈdjaːmo	1pl	mwoˈvjaːmo/moˈvjaːmo	1pl
seˈdeːte	2pl	mwoˈveːte/moˈveːte	2pl
c. esˈplɔdere	‘to explode’	d. ˈkjɛdere	‘to ask’
esˈplɔːdo	1sg	ˈkjɛːdo	1sg
esˈplɔːdi	2sg	ˈkjɛːdi	2sg
esˈplɔːde	3sg	ˈkjɛːde	3sg
esploˈdjaːmo	1pl	kjeˈdjaːmo	1pl
esploˈdeːte	2pl	kjeˈdeːte	2pl

Some glide plus vowel sequences are historically due to the change of the lateral in complex onsets to a palatal glide, as in the verb *piegare* ‘to fold’. In these forms, the emergence of the glide in the whole paradigm is no surprise.

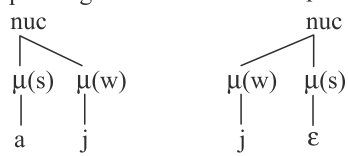
Overapplication and irregularity leads to contrastive presence/absence of the glide, as in the pair given in (72).

(72) The glide is contrastive

noˈtaːre	‘to note’	nwoˈtaːre	‘to swim’
ˈnɔːto	1sg	ˈnwɔːto	1sg
ˈnɔːti	2sg	ˈnwɔːti	2sg
ˈnɔːta	3sg	ˈnwɔːta	3sg
noˈtjaːmo	1pl	nwoˈtjaːmo	1pl

A common approach to the mobile diphthongs is to conclude that they emerged from a drive to give more weight to stressed syllables. This, however, is somewhat surprising, since by any account Italian, as well as Latin, has trochaic feet (see Chapter 6 for more detail), and the rising diphthongs look very much like iambs.

(73) Trochaic diphthong Iambic diphthong



As mentioned at the beginning of section 4.2.2, Marotta (1988) distinguishes the sequences of initial glide plus vowel, claiming that only [wɔ] is a true diphthong (i.e. with both segments in the nucleus), since [w] is only followed by other vowels than the low-mid labial vowel if it is preceded by a dorsal stop. However, van der Veer (2006) shows that this is not borne out, since such allegedly nonexistent sequences do in fact exist, as in *pun*[tw]*alità* ‘punctuality’.

A further crack in this picture is contributed by another restriction on the process. As said before, mobile diphthongs do not emerge in closed syllables. Morphemes in which the vowel is preceded by a consonant cluster that has to be syllabified as an onset to the syllable containing the low-mid vowel (as in *esplodere* ‘to explode’) are very often—if not always—exempt from the process too. While in early Italian such structures were subject to breaking, today they no longer contain glides (as in [ˈprɛːgo] ‘I pray’, which contained a glide four centuries ago; see e.g. Castellani 1980; van der Veer 2006). The obvious conclusion is that representations underwent restructuring, that the emergent glide is associated to the syllable onset rather than the nucleus, and thus should not contribute to prosodic weight. On the other hand, even complex onsets might contribute to the weight of a syllable. Davis et al. (1987) and Davis (1988) argued for a stress attraction effect of complex onsets in 2nd conjugation verbs.

Furthermore, the process is at odds with the synchronic high vowel-to-glide alternation. While in the synchronic process glide formation occurs when stress is absent, the mobile diphthongs emerge under stress.

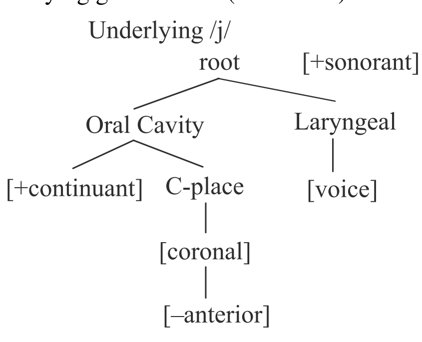
4.2.2.2 Analysis

Before delving into an OT analysis of vowel-glide alternations the representations of glides and high vowels on the one hand and of the mid-low front and back vowels on the other have to be determined. I argue here that front vowels and the palatal glide all have the place feature [coronal], as it has already been used for front vowels and glides to account for palatalization in section 4.2.2. The back high and mid vowels and the labio-velar glide are specified for the place feature [labial]. The latter also explains an asymmetry observed repeatedly in the literature, i.e. the reluctance of the mid-low back vowel to break into a diphthong in the historical emergence of the mobile diphthongs. The discussion of metaphony below will present us with a similar asymmetry: the back vowels are less susceptible to metaphonic raising or diphthongization than the front vowels. Van der Veer (2006) gives a functional phonetic explanation for this asymmetry in connection with the mobile diphthongs. We will see shortly that the asymmetry finds a straightforward explanation in differential markedness of place features, as proposed by de Lacy (2006).

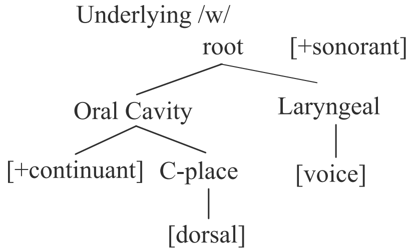
Underlying glides are not particularly new. They have been postulated before (Herman 1994; Hume 1995; Levi 2000; 2004) as well for Italian (Muljačić 1969; Bertinetto and Loporcaro 2005; van der Veer 2006). Diagram (74) shows representations for high glides as conceived in Feature Geometry.

(74) Underlying glides in FG (Levi 2004)[12]

a.



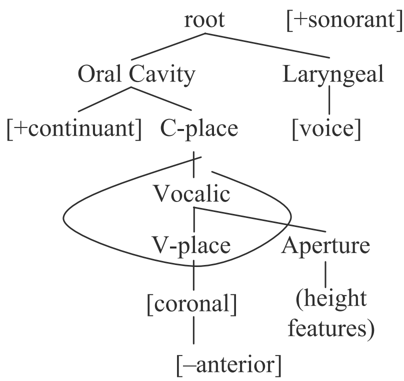
b.



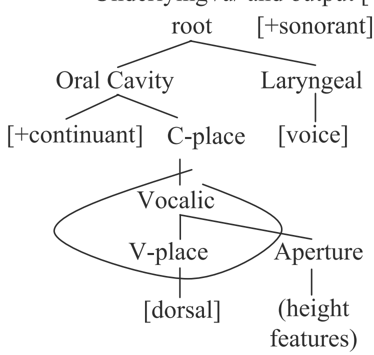
[12] FG = Feature Geometry; RAT = Revised Articulator Theory

A problem for these representational theories, however, is how to turn a high vowel into a glide. The only choice is to cut off the Vocalic node. This cuts off the place feature too.

(75) a. Underlying /i/ and output [j]

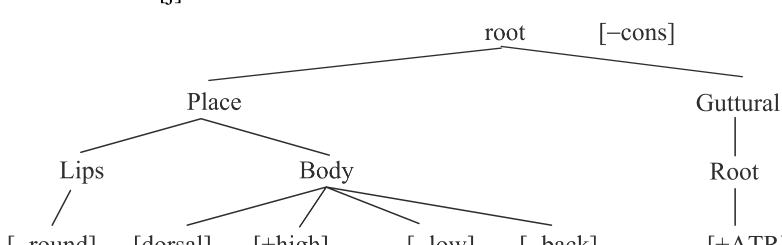


b. Underlying /u/ and output [w]

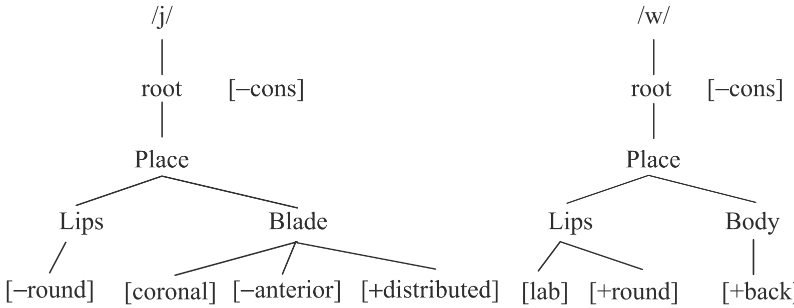


Revised Articulator Theory (Calabrese 1995; Halle et al. 2000) requires a set of feature replacement rules to arrive at the required changes to transform a high vowel into a glide.

(76) /i/ and derived [j] in RAT



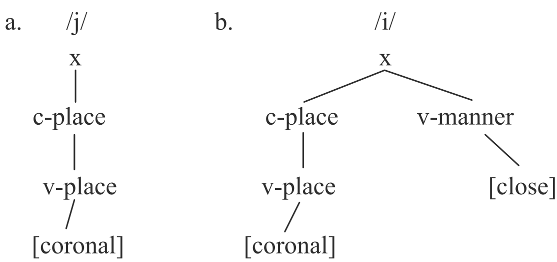
(77) /j/ and /w/ in RAT



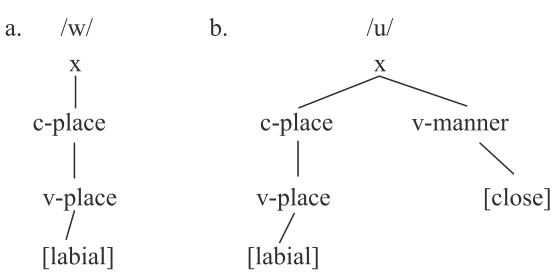
Getting from an input vowel to a surface glide by changing the representation is not a trivial operation here either.

In the approach used here, we can assume high vowels and glides to have the place feature in common, but the vowels have some additional height specification. For the moment we assume this to be [close]. This will be revised later on the basis of the metaphony pattern. A vowel changes into a glide by delinking of the vowel manner node including the subordinate height feature [close].

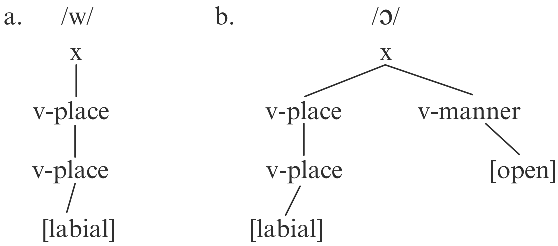
(78) Coronal glide and high vowel



(79) Labial glide and high vowel



(80) Labial glide and low-mid vowel



With an understanding of the representation of glides and non-low vowels we can turn to the conditions in which we find vowel-glide alternations. The productive (though mostly optional) alternation observed is further removal of stress from directly after a high vowel, which then turns into a glide, as in *b*[i.ˈɔ]*logo* - [bjo]*logía* ‘biologist - biology’. As mentioned, the emergence of the vowel is not automatic, as we find glides in the relevant context in words such as [ˈkjɔt͡ʃ]ola - *[ki.ˈɔt͡ʃ]ola ‘snail’ or [ˈkwɔ]co ‘cook’. In the latter cases we have to assume an underlying glide. The grammar does not allow vocalization of underlying glides. As said above, with the assumed representations, this change would amount to the insertion of a v-manner feature. A third option is to have a glide syllabified as a nucleus as it is. Since it is unacceptable in Italian in general to have a consonant of whatever type as the head of a nucleus, a markedness constraint against this syllabification (*C/Nuc) has to be top-ranked in Italian. The forms that do show an alternation improve the output on the number of unstressed (or unfooted) syllables in the word. However, if the underlying vowel would surface as a glide in a stressed syllable we do not get gliding. Thus, the prominent stress position has to be protected against unfaithfulness to the crucial v-manner feature that has to be delinked, while in unstressed syllables the feature is immune to deletion.

These considerations provide us with the relevant constraints that play a role in the analysis. The constraint causing the alternation is Parse-σ, demanding that every syllable is contained in a foot.[13] The faithfulness constraint against insertion of the v-manner feature IO-Dep[v-manner] cannot be ranked. Any formation of a vowel from a glide would cause the candidate to perform worse on Parse-σ than its competitor with the glide. For this reason, we just consider the positional faithfulness constraint on v-manner in stressed syllables. Nor is there anything to say about the ranking of *C/Nuc with respect to faithfulness. The only thing we can tell is that both constraints outrank Parse-σ.

This mini-grammar is seen at work in (81). An underlying glide has no reason to surface as a vowel before a stressed vowel. Faithfulness does not play a role here, since if the glide is realized unfaithfully it is not in the stressed syllable to which the faithfulness constraint refers.

[13] In Ch. 6 I will discuss foot structure in more detail and will also explain why Italian has the footing assumed in the tableaux displayed here. For the moment, all that matters is that the relevant syllable containing the high vowel is not footed. It does not matter for the analysis if the syllable following the stressed syllable is included in the foot or not.

(81) No glide-to-vowel alternation

/bjɔndo/	*C/NUC	IO-IDENT [v-manner]ˈσ	PARSE-σ
a. bi.(ˈɔn).do			**!
☞ b. (ˈbjɔn).do			*
c. bj.(ˈɔn).do	*!		**

Underlying vowels should always reduce to glides if unstressed. However, this either results in phonotactically unacceptable consonant clusters—for example if the /i/ in *disastroso* 'disastrous' got reduced to *[djsasˈtroːzo]—or it would be syllabified as the onset of the stressed syllable, a position in which IO-IDENT[v-manner]ˈσ registers a violation if its manner feature is cut off, as displayed in tableau (82).

(82) Faithful realization of a high unstressed vowel

/biɔlɔg -o/	*C/NUC	IO-IDENT [v-manner]ˈσ	PARSE-σ
☞ a. bi.(ˈɔ.lo).go			**
b. (ˈbjɔ.lo).go		*!	*
bj.(ˈɔ.lo).go	*!		

If the stress is placed sufficiently far away and there is an adjacent vowel (unlike in *disastro*), the high vowel is not protected by IO-IDENT[v-manner]ˈσ, unlike in (82). We observe glide formation (83).

(83) Gliding

/biɔlɔg -ía/	*C/NUC	IO-IDENT [v-manner]ˈσ	PARSE-σ
a. bi.o.lo.(ˈdʒiː).a			****!
☞ b. bjo.lo.(ˈdʒiː).a			***

While we have identified PARSE-σ as the constraint responsible for the vowel-glide alternation, van der Veer (2006) attributes gliding to the Stress-to-Weight principle (SWP), the constraint enforcing bimoraicity in stressed syllables. However, as noted above this would entail the assumption of the glides in the nucleus together with an iambic head-dependent relationship of the two moras in the nucleus. Furthermore, as will be shown in Chapter 6 and section 7.3, the SWP is very unlikely to play any role in Italian phonology at all, despite all claims to the contrary.

As a last remark on this pattern and how it helps determine the contrastive features of Italian glides and vowels, the mid vowels show a tendency to form glides in the same environment (van der Veer 2006), though much less so, while the low vowel shows no tendency to gliding whatsoever. This is surprising on the one hand, since the low vowel is the least acceptable vowel in an unstressed syllable due to its high sonority. On the other hand this is not surprising, since not many languages show an alternation of low vowels with glides.[14] I analyse the low vowel as specified for the place feature [dorsal] without any height feature specification. Thus, there is no v-manner feature to be delinked to turn it into a glide, and there is no possible way in which alteration of the vowel's feature content could result in a structure that improves on PARSE-σ.

While the mobile diphthongs emerged historically as the breaking of low-mid vowels under stress, they have been analysed by Saltarelli (1970) as containing a diphthong in the input. Thus the process is not conceived as one of glide insertion/formation, but rather as glide deletion. Van der Veer goes a different path. Acknowledging that the process is no longer synchronically productive, because of the huge degree of paradigm levelling and the high number of exceptions (i.e. low-mid vowels which do not alternate with diphthongs), he analyses the alternation as a case of allomorphy.

In the following analysis I combine both views in a way, but follow the path of analysing morpheme-specific behaviour as effected by indexed constraints. We thus avoid the assumption of two allomorphs in the input to an evaluation and, correspondingly, in the Italian lexicon.

Onset complexity does not play any significant role in the positioning of stress in Italian. In a nonce-word test with 2nd conjugation verbs, Davis et al. (1987) found an effect of onset complexity in antepenultimate syllables. Rather than assigning a mora to complex onsets, one can explain such effects too as driven by markedness constraints. As the literature on positional faithfulness and positional markedness has shown (Beckman 1997; 1998; 2004; Zoll 1996; and many others), complex structures tend to be licensed in prominent positions, and to get neutralized to less complex structures in non-prominent positions.

The Weight-to-Stress Principle ('Heavy syllables attract stress'), for example, can be seen as just such a licensing condition. A syllable with a branching nucleus or rhyme (by way of vowel length or a coda) is generally marked in comparison to a light syllable with a non-branching nucleus or rhyme. This is expressed by various constraints in OT, such as *CODA. If stressed, however, the heavy syllable is less offensive, and is indeed actually preferred. This preference for heavy syllables in stressed positions cross-linguistically often results in vowel lengthening or some other kind of augmentation of such stressed syllables, and is usually attributed to the Stress-to-Weight Principle ('Stressed syllables are heavy').

[14] For an exception see English. Intrusive *r* in British and Massachusetts English is analysed as glide formation by more and more researchers. See Krämer (2008) for references.

Thus, we can understand the Weight-to-Stress principle either as positional faithfulness or as positional licensing, as expressed in (84b). In the same way, onset complexity can be said to be marked in unstressed syllables and licensed in stressed syllables (84).

(84) Markedness and positional licensing

a. WEIGHT-TO-STRESS: 'Syllables with complex rhymes are stressed.'
b. LICCPLXRHYMEˈσ: Syllable rhymes $>$ 1 segment are preferred in stressed syllables.
c. *COMPLEXONSET: A syllable onset contains maximally one segment.
d. LICCPLXONSˈσ: Syllable onsets $>$ 1 segment are preferred in stressed syllables.

Ranking the licensing constraint on onsets above faithfulness can result in either of two strategies: stress is placed on syllables with complex onsets if they are present in a string, or, if stress cannot be placed on the syllable with a complex onset, the complex constituent is reduced. The latter is the effect we observe in present-day Italian in the alternation between consonant + glide + mid vowel sequences with sequences in which the glide is missing. Tableau (85) shows how such a complex sequence survives if stressed, while tableau (86) illustrates the alternation.

(85) Glide preservation

/nwɔv-o/	LICCPLXONSˈσ	IO-FAITH	*CMPLXONS
☞ a. ˈnwɔːvo			*
b. ˈnɔːvo		*!	

(86) Glide deletion

/nwɔv-iˈta/	LICCPLXONSˈσ	IO-FAITH	*CMPLXONS
a. nwoviˈta	*!		*
☞ b. noviˈta		*	

As we have seen, not all potential structures undergo this alternation. There are many morphemes in which the glide survives also in unstressed syllables. From a historical perspective (which the analysis just introduced obviously lacks), this is due to paradigm levelling. If the glide was indeed inserted to augment a stressed syllable, the presence of the glide was subsequently extended to word forms which lack the crucial context, i.e. stress on the syllable containing the mid-low vowel. Thus, we can assume there to be an indexed faithfulness constraint enforcing uniformity across the paradigm in morphemes which are co-indexed, while all morphemes lacking the index undergo the alternation, as indicated in (87).

(87) Glide deletion and paradigm levelling

	/mwɔv$_X$-ˈjamo/	BO-FAITH$_X$	LICCPLX ONSˈσ	BO-FAITH, IO-FAITH	*CMPLXONS
☞ a.	mwovˈjaːmo		*		*
b.	movˈjaːmo	*!		**	
	Base: ˈmwɔve				
	/nwɔv-iˈta/				
c.	nwoviˈta		*!		*
☞ d.	noviˈta			**	
	Base: ˈnwɔvo				

However, since this process of breaking cannot be regarded as synchronically active, an analysis is preferable which marks as special the forms still undergoing the alternation. To capture this, the constraint that is indexed—and with it the morphemes which show an alternation, such as /nwɔv/, rather than those resisting it—has to be the one causing the alternation, the licensing constraint.

(88) Glide deletion as exception

	/mwɔv-ˈjamo/	LICCPLXONSˈσ$_X$	BO-FAITH, IO-FAITH	*CMPLXONS
☞ a.	mwovˈjaːmo			*
b.	movˈjaːmo		*!	
	Base: ˈmwɔve			
	/nwɔv$_X$-iˈta/			
c.	nwoviˈta	*!		*
☞ d.	noviˈta		**	
	Base: ˈnwɔvo			

Potentially, this analysis allows for all kinds of complex onset to idiosyncratically undergo this alternation. However, we do not find consonant-glide sequences followed by high or low vowels or mid-high vowels (CGa, CGu, respectively, for short) displaying this kind of alternation, neither do sequences of a consonant followed by any other sonorant show this behaviour. However, assignment of indexes to morphemes is arbitrary, done on detection of an exceptional alternation; and since the pattern is a 'frozen artefact' of a former process which targeted low-mid vowels only, the assignment of lexical indices is restricted by historical events rather than spread evenly across all potential targets in the synchronic lexicon.

In section 4.2.2 I have motivated why glides have to be kept distinct from high vowels in their representation. Furthermore, we have seen arguments for the glides to be associated with the onset of the syllable rather than the nucleus. A further argument will be considered in Chapter 5, in which we will discuss (among other things) maximal syllable size. There I will argue that the maximum syllable in Italian contains two moras, and that coda consonants are associated with a mora. Given this, a glide in a stressed closed syllable, as in *pianta* [ˈpjanta] 'plant', cannot be in the nucleus, contrary to van der Veer's (2006) analysis.

The clarification of the status of glides and the analysis of vowel-glide alternations contributes significantly to our understanding of the segmental features of glides and vowels in Italian. The analysis of vowel features developed so far is only partial, however, since we now, after looking at palatalization and vowel-glide alternations, have an idea of which place features vowels have, but we are still in limbo as far as vowel height or v-manner features are concerned. This topic will be taken up in the following section on vowel neutralizations, which involve alternations in vowel height.

4.2.3 Vowel neutralization

Italian shows two distinct patterns of vowel neutralization. In the Standard variety, lax mid vowels cannot occur in unstressed syllables; they are realized as tense. Local varieties/dialects show an apparently very different phenomenon, metaphony (e.g. Calabrese 1987; 1998; Maiden 1991; Savoia and Maiden 1997; Walker 2005). Final unstressed vowels cause preceding vowels to assimilate in height. In most varieties the process affects the vowels up to and including the stressed vowel and does not go beyond this (Maiden 1991). In some instances, however, this assimilation affects all vowels in the word/domain, i.e. we observe vowel harmony (Camilli 1929; Nibert 1998; Walker 2005). Metaphony does not always apply unconditionally. It is often morphologized, i.e. it applies only with certain morphemes, and sometimes the triggering vowel is lost, i.e. we find a form of umlaut (Maiden 1991). Canalis (2007) adds a further (in a sense, reverse) pattern to the typology in which unstressed vowels assimilate to the preceding stressed vowel, which is actually a pattern often discussed in the literature on prominence-controlled vowel harmony (McCarthy 1984; Kaun 1995; Beckman 1997; 1998; 2004; Majors 1998; Walker 2001; Krämer 2003a). However, this latter pattern has not been reported for Italian varieties before. This is a very rough overview of the patterns found in Italian dialects; I will discuss individual cases as well as the typology as a whole in more detail further below to illuminate the matter.[15]

[15] Metaphony in various forms can be found in other Romance varieties as well. The interested reader will find the relevant data and discussion in the pertinent literature. See e.g. Walker (2005) and sources cited there for Spanish cases, or the articles in *Rivista di linguistica* 10(1) (1998) as a starting point.

Metaphony is a dialectal feature[16]—so here we make an exception from the general rule in this work to concentrate on Italian and its regional varieties (where appropriate) to the exclusion of dialects. The exception is warranted, since the patterns under discussion examined in more regional detail will serve to illustrate the typological aspect of the neutralization pattern in the Standard, i.e. set into place, and lead to a better understanding of, the patterns under examination. Moreover, the various degrees of lexicalization and morphologization contribute a further aspect to the phenomenon of lexical exceptions/lexical idiosyncrasy that has already featured prominently in the discussion of palatalization.

In section 4.2.3.1 I will introduce unstressed vowel neutralization and give an overview of the different patterns of metaphony/harmony found in the dialects of Italy. Section 4.2.3.2 discusses theoretical accounts of metaphony with a focus on the representational side, i.e. which segmental features are involved, and will end in a new proposal based on a scalar model of height features. Section 4.2.4.3 discusses the most frequent analysis in OT (Walker 2005) and, after dealing with unstressed vowel neutralization, takes this as a starting point to implement the representations developed in the previous chapter in an OT analysis.

4.2.3.1 Overview

The neutralization of the tense/lax distinction in unstressed mid vowels is illustrated in (89). The affected vowels are underlined.

(89) Unstressed vowel neutralization in Standard Italian

a. ortop<u>e</u>ˈdiːa	'orthopaedics'	b. ˈl<u>ɔ</u>dʒika	'logics'
ortoˈp<u>ɛ</u>diko	'orthopaedist/orthopaedic'	l<u>o</u>dʒikaˈmente	'logically'

The situation is not straightforward, though. Davis (1937) already found that the actual degree of openness depends on the following consonant. Liquids drag the vowel slightly down, such that it is actually closer to a lax than a tense mid vowel. Castellani (1956) identifies even more parameters influencing the exact height of unstressed mid vowels, such as the height of a following stressed vowel. I regard these differences as phonetically conditioned, rather than phonological. The phonologically important generalization to be drawn is that essentially the contrast between tense and lax is neutralized in unstressed position.

From the alternation in (89) we can conclude that the lax mid vowels are the marked set in the system. In the autosegmental tradition, neutralization is usually delinking of a feature. Thus, the lax mid vowels have to have the marked feature value or a privative feature that other vowels are lacking. Nevertheless, they are usually analysed as [–ATR].

In central Veneto (Rizzi 1989; Belloni 1991; Maiden 1991; Marcato and Ursini 1998; Walker 2005) the same neutralization of unstressed mid vowels applies. In addition,

[16] More detail on the geographic distribution of metaphony patterns on the Italian peninsula can be found in Maiden (1991) and Savoia and Maiden (1997).

high post-tonic vowels cause raising of tense mid vowels to high (90a). Lax mid vowels are retained in the same context (90b).

(90) Central Veneto stress targeting raising

a.	b[eː]vo	b[iː]vi	‘drink (1sg/2sg)’
	g[eː]va	g[i]vimo	‘had (3sg/1pl impf.ind.)’
b.	[vɛːtʃo]	[vɛːtʃi]	‘old (m.sg/m.pl)’
	[ˈtɔːko]	[ˈtɔːki]	‘piece (m.sg/m.pl)’

Applying the same logic as above, following the generally held assumptions of autosegmental phonology that assimilation is spreading and that marked feature values spread, we can assume that the spreading feature here must be imminent in the triggering vowel, i.e. [high] or [close].

In a second type of metaphony the lax mid vowels are raised too. Stressed tense mid vowels change to high (91a) and lax mid vowels change to tense mid (91b) in the presence of a following high vowel (data are given as presented in Walker 2005, who refers to Calabrese 1988 and Kaze 1991 as sources).

(91) Southern Umbro chain shift

a.	ˈverde	ˈvirdi	‘green (sg/pl)’
	ˈrossa	ˈrussu	‘red (fem/masc)’
b.	tʃɛ́ka	ˈtʃeku	‘blind (fem/masc)’
	ˈnɔva	ˈnovu	‘new (fem/masc)’

A third type shows diphthongization of the lax mid vowels. The output of diphthongization varies between a tense and lax mid vowel as the second part of the diphthong. These data exemplify another complication that arises in some dialects: the trigger disappears. Though transcribed here as /e, o, i, u/ for the sake of expository transparency the unstressed final vowels in all forms in (92) are realized as a central mid vowel, i.e. schwa. Historically or underlyingly the masculine forms of nouns take /-u/ in the singular and /-i/ in the plural, as seen in the data from other varieties above. Thus, the process is opaque. The trigger of the change is not present in the surface form. In some varieties the triggering vowel has disappeared completely, as in Lugo /spos, spus/ ‘spouse (m.sg/pl)’ (Savoia and Maiden 1997: 21).

(92) Calvello raising and diphthongization

a.	ˈmese	ˈmisi	‘month (sg/pl)’
	kaˈvrone	kaˈvrunu	‘carbon (sg/pl)’
b.	ˈpɛre	ˈpjeri	‘foot (sg/pl)’
	ˈmɔvo	ˈmjovi	‘move (1sg/2sg)’

According to Savoia and Maiden (1997) lax mid vowels either raise to tense mid or diphthongize. Walker (2005), however, gives data from Pugliese showing that tense mid vowels as well as lax mid vowels raise to high.

Low vowels are not immune to raising per se. An example with raising of mid and low vowels (albeit with diphthongization) is given in (93). The low vowel /a/ raises to [ɛ] in the masculine forms, which have an underlyingly high affix vowel (93d). As with the other data above, the feminine forms which (historically) have no triggering affix vowels (/-a/ and /-e/ in singular and plural respectively) show the underlying vowel of the stem. The transcriptions in (93b,c) suggest that there are two types of lax mid vowels showing different raising behaviour. The lax mid vowel in (93b) raises to high while the one in (93c) diphthongizes. The Standard Italian cognate to what appears to be /sɛkk-i/ - [ˈsikkə] here, however, is [ˈsekko], i.e. the vowel belongs to the tense set. Similarly, the Ischia diphthong /au̯/ in (a) corresponds to Italian /o/.

(93) All height metaphony in Ischia (Freund 1933; Savoia and Maiden 1997)

	Fem. sg.	Masc. sg.	
a.	ˈsau̯rdə	ˈsurdə	‘deaf’
b.	ˈsɛkkə	ˈsikkə	‘dry’
c.	-ˈɛddə	-ˈjeddə	(suffix)
	ˈtsɔppə	ˈtswoppə	‘lame’
d.	kajəˈnatə	kajəˈnɛtə	‘sister/brother-in-law’

Maiden (1991: 115f.) claims an implicational hierarchy for the targets of raising. Raising of low vowels implies raising of mid vowels, and raising of lax mid vowels implies raising of tense mid vowels.

(94) Metaphonic chain shift typology (ignoring diphthongization)

{ /ˈe/ - > [ˈi]/__C(CVC)i, u# } Veneto
/ˈɛ/ - > [ˈe]/__C(CVC)i, u#] S.Umbro
/ˈa/ - > [ˈɛ]/__C(CVC)i, u# } Ischia

These hierarchies, however, are not without exception (Maiden 1991: 128f.; Savoia and Maiden 1997: 17). In varieties of Lombardian (Poschiavo and Isolaccia) and a few other areas, only lax mid vowels raise.

A potential analysis could make use of foot structure, assuming that the weak part of a foot encroaches on the strong part to be licensed. However, as will be shown in Chapter 6, there is good reason to assume that the final syllable of a word is not footed if unstressed; furthermore, in words with antepenultimate stress the final vowel can still trigger raising in the stressed vowel, as exemplified by data from Servigliano in (95). Thus, we would have to assume a ternary (trisyllabic) foot. The data in (95) also illustrate complete harmony. The penultimate vowel in all the forms but the infinitive is a copy of the final vowel. Thus, the infinitive shows unstressed position tensing of the initial mid vowel and the underlying high second vowel of the root. The quality of both vowels is determined in all other forms by the final unstressed vowel. Since lowering of underlyingly tense mid vowels is not observed elsewhere, we can assume that the lax quality of the first root vowel in (95b) and (95d) is its underlying specification.

(95) Servigliano complete harmony blocked by stress (Nibert 1998)

a. prediˈka	‘to preach’	b. ˈprɛdoko	‘I preach’
c. ˈprediki	‘you preach’	d. ˈprɛdaka	‘s/he preaches’

In the same variety we find regressive assimilation of the vowels preceding the stress to the stressed vowel (96), i.e. regressive raising. As with metaphony, vowels only raise to assimilate but never lower (the first two vowels in (95a) are not harmonic with the final stressed low vowel). The mid root vowel in the first form in (96a) does not lower to harmonize with the following stressed vowel (which might also be a result of priority of the ban on lax mid vowels in unstressed syllables), but it raises to high in the second form. (96c) shows an intervening low vowel, which neither raises nor blocks the process, as becomes evident from the masculine plural form. Finally, example (96d) shows the interplay between pre-tonic raising and metaphony. In the masculine form the stressed vowel is raised to accommodate the final unstressed high vowel, and the pre-tonic vowels are raised too.

(96) Servigliano stress triggered regressive raising

a. kreˈd-ɛnno	'believing'	kriˈd-i	'to believe'
b. verˈd-o	'very green (m.sg)'	virˈd-u	'very green (m.pl)'
c. bokkaˈl-o	'foolish (m.sg)'	bukkaˈlu	'foolish (m.pl)'
d. stommeˈkos-a	'nauseating (f.sg)'	stummiˈkus-u	'nauseating (m.sg)'

Unlike Servigliano, where pre-stressed, stressed, and post-stressed vowel alternations can be decomposed as different processes, Central Veneto shows an optional extension of the raising of the stressed vowel to the preceding vowels (Walker 2005). The data in (97c) confirm the inability of stressed underlyingly high vowels to trigger leftward raising in Central Veneto. Another difference between the two patterns is the behaviour of low vowels flanked by target and trigger. While in Servigliano the low vowel is transparent, it is opaque in Central Veneto (97b). Raising does not permeate through a medial low vowel.

(97) Central Veneto unbounded raising

a. konˈfondo	kunfunˈdivi	'confuse (1sg/2sg.impf.ind)'
b. po(v)aˈreto	po(v)aˈriti	'poor people (dim.m.sg/pl)'
	*pu(v)aˈriti	
c. moˈvi	ˈmuvi	'move (2pl/2sg)'
*muˈvi		

Piveronese, a variety of Piedmontese, has the reverse pattern. The stressed vowel triggers raising of the vowel to its right. Unstressed high vowels do not trigger raising in the following vowel.

(98) Piveronese progressive stress-triggered harmony (Canalis 2007)

a. ˈmɑska	ˈmɑske	'witch (fem.sg/pl)'
fyˈmela	fyˈmele	'feminine (sg/pl)'
diˈlɔza	diˈlɔze	'jealous (fem.sg/pl)'
b. basˈtimja	basˈtimji	'blasphemy (fem.sg/pl)'
ˈbryta	ˈbryti	'ugly (fem.sg/pl)'
ˈturtura	ˈturturi	'tortoise (fem.sg/pl)'
c. ˈmɑndula	ˈmɑndule	'almond (fem.sg/pl)'

Apart from the height dimension, backness has been observed to be relevant as a conditioning environment as well. Front vowels are more likely to raise than back vowels. The feature that changes when lax mid vowels are raised is [ATR]. Hall et al. (1973/74) observe that ATR vowels in African languages tend to be more fronted, and point to Somali, in which all ATR back vowels have become fronted, retaining their roundness specification. Similarly, Calabrese (2000; 2005) explains the historical emergence of front rounded vowels in Altamura (Loporcaro 1988) by a correlation between frontness and ATR. Thus, backness and ATR do not go together very well.

A final parameter that plays a role in metaphony is the structure of the stressed (i.e. targeted) syllable. In some varieties metaphony applies only to open syllables and is blocked if the stressed syllable ends in a consonant (Maiden 1991; Savoia and Maiden 1997). Krämer (2001b; 2003a) assumes that vocalic features may interact at the moraic level or at the syllabic level. Thus, if a feature spreads from mora to mora a consonantal mora between two vowels can act as a blocker. On the other hand, we have also seen above that low vowels can behave as either opaque or transparent.

In the following section I will first focus on the representational aspect of the main metaphony pattern. Since this results in an analysis of vowel height for Italian, the relation to unstressed syllable reduction will be discussed as well. An OT implementation of the representational analysis of both processes will be given in 4.2.3.3.

4.2.3.2 Representations and derivations of metaphony

To summarize the main changes we find in metaphony: tense mid vowels raise to high; lax mid vowels do not change or raise to tense mid, or they raise to high or diphthongize; finally, the low vowel either does not change at all or raises to lax mid. Since the changes are triggered by high unstressed vowels, it is most plausible to assume that the changes are caused by spreading one or more features from the trigger to the target. Walker (2005) explains this functionally as parasitic licensing of features in a prosodically weak position via spreading to a prosodically strong position. If we look at any of the currently available feature theories, the pattern looks quite problematic, since it is at first sight not clear why for example a mid lax vowel is an improvement on a low vowel. If [+high] spreads why do not all target vowels simply change to [+high]? And why is a change in [ATR] observed?

Kaze (1991) and Zetterstrand (1998) compare the different options available. Kaze (1991) argues that Shane's (1984) Particle Phonology and Goldsmith's (1987) element-style theory fail in analysing metaphony because they lack the feature [+high] which he deems essential in the formalization of the process(es). Zetterstrand (1998) compares Calabrese's (1988; 1998) Articulatory Model (Halle 1995; Halle et al. 2000) analysis with a potential analysis in Goad's (1991; 1993) Dependency and Complementarity Model and Clements' (e.g. 1985) feature geometry in the form of the Incremental Constriction Model (Parkinson 1995), and argues that Calabrese's approach fares best, but in her conclusion points out a few problems with this account as well. However, Nibert (1998) uses the Incremental Constriction Model successfully to account for Servigliano metaphony.

The conclusion Kaze and Zetterstrand share is that the other models have a problem, because they do not have a feature [+high], which they claim is the crucial ingredient to any analysis of Italian metaphony. The Articulatory Model's features for the Italian vowel system are given in (99).

(99) Italian vowel system, height dimension: Articulatory Model

	i,u	e,o	ɛ,ɔ	a
low	−	−	−	+
high	+	−	−	−
ATR	+	+	−	−

The central piece of Calabrese's analysis is indeed a contextual rule changing [−high] to [+high] in the context of following [+high]. This rule applied to input /e,o/ gives us the desired output [i,u]. The question turning up here immediately is, of course, how this analysis can account for a change of /ɛ/ to [e] or /a/ to [ɛ], not to speak of diphthongization. The rule only gives the right results in concert with filters or constraints on surface structure and repair mechanisms invoked to achieve adherence to these constraints. Application of the above rule to an input lax mid vowel /ɛ/ results in a lax high vowel //ɪ// (I use double slashes for convenience here to indicate intermediate abstract forms). This intermediate output violates the system constraint against lax high vowels *[+high, −ATR]. Applying the rule to the low vowel /a/ creates an even uglier creature with the feature specifications [+high, +low, −ATR]. This offends not only the *[+high, −ATR] filter, but also a universal one against simultaneous positive specification of the features [high] and [low] in one segment, *[+high,+low]. To get rid of 'monsters' in output structures, Calabrese's theory has three repair operations: feature deletion, fission, and negation. The latter two are assumed to be at work here.

A structure offending the filter *[+high, −ATR] is repaired by negation. Each of the two features involved receives the opposite value. This changes the lax high vowels that resulted from the application of the height rule to /ɛ/ into tense mid, i.e. [−high,+ATR]. The offending output of the application of our rule to /a/ could be repaired in the same way. This, however, would result in [−high, +low, +ATR], which does not exist in the system either. Instead, it must be assumed that the filter *[+high,+low] has to take precedence over the filter *[+high, −ATR]. Applying negation to the configuration [+high, +low] results in [−high, −low], which, together with /a/'s original [−ATR] specification results in output [ɛ].[17] Fission is regarded as another option to repair

[17] I ignore the issue of backness features here. But note that if /a/ is specified as [+back]—which it surely must be in the Articulatory Model, for it embraces the idea of full specification—the derivation of a lax mid front vowel from /a/ is actually slightly more complicated than indicated above.

the [+high, −ATR] configuration. Under fission the structure is split into two, each passing the filter in its own way, so that we get [+high, +ATR] and [−high, −ATR], resulting in diphthongization. A minor inconvenience here is that the emergent diphthongs usually have a tense mid vowel as their second part, which is not captured by the analysis. If fission is an option for the monster created from a mid lax input vowel, it might as well be an option for a monster emerging from an input low lax vowel. The result, however, would be another illegal structure, since the first part of the diphthong created thus would still offend *[+high, +low] and has to be repaired again via negation or another round of fission, resulting in the diphthong [ɛa] in the first case and in the latter case probably an infinite loop of repairs creating an ever-longer multiphthong.[18]

We have seen that the filters and repair strategies give us quite a few options, i.e. they have to be handled with care. This aspect of the analysis is the point of attack for Nibert (1998), who deems superior an analysis that does not need any repairs. She deals with the three changes displayed in Servigliano and employs Clements' (1989, 1991) and Clements and Hume's (1995) vowel height theory in which vowels of different height are distinguished by different registers of the feature [±open]. In a system that distinguishes four levels of vowel height, as Italian and most of the dialects in question do, a vowel can have up to three instances of the feature. The specification for this feature differs for the same vowel on a language-specific basis, depending on whether the language phonologically groups the tense mid vowels with the high vowels or with the lax mid vowels. For Servigliano, she assumes the following specifications (100).

(100) Italian vowel system, height dimension: incremental constriction

	((i, u	(e, o	ɛ, ɔ))	a)	
[open$_1$]	−	−	−	+	(primary registers)
[open$_2$]	−	+	+		(secondary registers)
[open$_3$]	−	−	+		(tertiary registers)

Unspecified values are inserted via redundancy rules. The reduction of mid lax vowels to mid tense vowels in unstressed position is analysed as a delinking of [+open$_3$] and subsequent insertion of [−open$_3$] via a redundancy rule. Pretonic raising is conceived as spreading of [−open$_2$]. This spreading and subsequent delinking of the original feature would target the low vowel as well and result in an illicit feature combination. To avoid this, Nibert specifies a target condition, [−open$_1$]. Since the low vowel is transparent to the rule in Servigliano, the spreading rule has to apply

[18] One of the less formal objections Calabrese (2005) raises against OT is that it focuses on the elimination of undesired candidates/structures. It should be noted in passing here that any theory has to do so. The difference here just lies in explicitness. While OT attacks the issue by listing and eliminating possible but undesired structures, Calabrese (and all other derivational theories) does so by applying repair strategies or stipulating the right order of application of operations, and by the assumption of constraints on lexical representations or inputs.

before the redundancy rules insert a value for [open$_2$] in the low vowel. Otherwise the low vowel's [+open$_2$] would stand in the way of the spreading operation (which would violate the constraint against line crossing if it went through this feature). Thus, extending Nibert's analysis to Central Veneto, where the low vowel acts as a blocker, we have to switch the order of rule application to capture the difference between the two dialects.

Metaphony, finally, is formalized as the spreading of a [−open] feature with the register (the little index) unspecified in the rule. The trigger has to be specified, though, as word-final [−open$_2$] in order to exclude spreading from mid vowels.

Servigliano displays neither raising of the low vowel nor diphthongization. Accordingly, Nibert's analysis is not intended to derive these alternations. If we want to use her approach as our theory of Italian metaphony, however, it should be possible to modify the analysis to get the Ischia pattern. Since the target condition of the metaphony rule does not exclude the low vowel, we would expect it to apply to a stressed low vowel anyway. The result, however, would be [+open$_1$, +open$_2$, −open$_3$], a vowel that does not exist in the system. ([+open$_2$] is specified according to a redundancy rule, and [−open$_3$] is the result of spreading.) Since the rule is set to structure preservation mode, it cannot apply to form such a structure. To achieve raising of the low vowel to a lax mid vowel under metaphony, the rule would have to apply to /a/ after the redundancy rules have filled in the positive values for the secondary and tertiary height register. Since the first feature to spread is the tertiary one (which explains the raising of lax mid to tense mid vowels), the vowel resulting from spreading to /a/ is not predicted to be a lax mid vowel by any means. Thus, the spreading hierarchy should be primary > tertiary rather than the other way round. Finally, diphthongization needs a completely new mechanism.

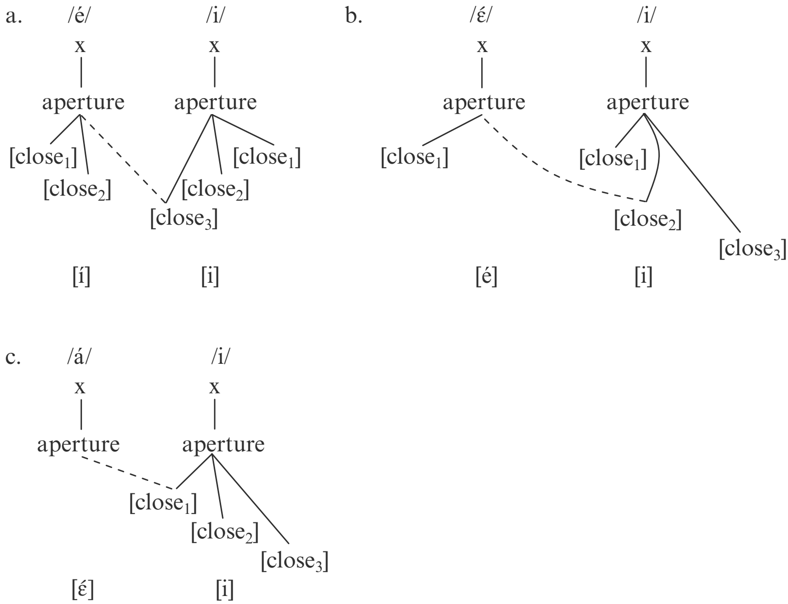
If we take Clements' hierarchy of features as a basis, but turn it around, i.e. assume an incremental feature [close] and assume it to be privative rather than binary, the situation looks more promising. The height dimension of the vowel system now looks as indicated in (101).

(101) Incremental privative vowel height

i, u	e, o	ɛ, ɔ	a	
[close$_1$]	[close$_1$]	[close$_1$]		(primary registers)
[close$_2$]	[close$_2$]			(secondary registers)
[close$_3$]				(tertiary registers)

Taking metaphony first, a mechanism spreading the first possible instance of [close] from unstressed final vowels with a triple specification to any stressed vowel results in a perfect chain shift, as the maximal extension pattern (all height levels are targets) is expected to be −, i.e. every vowel on the height scale moves one step up. The trees in (102) show /e/ raising to [i] (a), /ɛ/ raising to /e/ (b), and /a/ raising to /ɛ/ (c) by spreading from the following vowel.

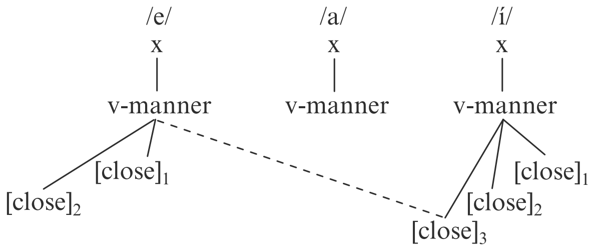
(102) Metaphony as cascaded spreading



The immunity of the low vowel in Servigliano has to be accounted for by an additional constraint on the vowel system. In accordance with Clements and Hume (1995) I assume that vowel place features are unified with consonant place features. Thus, the front vowels are specified as [coronal] (see section 4.2.1 on palatalization), the back vowels /u,o/ as [labial] or underspecified, and the low vowel has the feature [dorsal]. A constraint against the feature [dorsal] combined with a specification of [close], i.e. *[dorsal, close] blocks the emergence of a dorsal slightly raised vowel, such as [æ]. Thus, spreading to /a/ demands delinking of the feature [dorsal]. If this is not allowed, as in Servigliano, spreading is suspended. In such an analysis some varieties can have the mid back vowels specified as [dorsal] as well rather than [labial]. This, together with a constraint against derived additional [close] features, explains that they do not participate in metaphony as targets in these varieties. Immunity of lax mid vowels to metaphony in Central Veneto has to be achieved via constraints on derived structures as well. I will come back to these issues in the OT section on metaphony (4.2.3.3).

To explain pre-tonic harmony, what counts for the height of a vowel is the number of [close] specifications again. Still, metaphony is captured by spreading any one of the three [open] features of a high vowel. Pre-tonic raising is essentially the same process as metaphony, spreading of one [open] feature. In both varieties, Servigliano as well as Central Veneto, /a/ does not take part in the process. Transparency of the low vowel in Servigliano can be accounted for by its underspecification for the spreading feature. The spreading feature cannot dock onto the low vowel, because of the ban against [dorsal, close], and just looks for the next docking site, which is the preceding non-low vowel.

(103) Pre-tonic harmony permeates /a/



While the Servigliano /a/ is just invisible to the spreading feature, the blocking behaviour of the Central Veneto /a/ can be accounted for via a locality restriction on this spreading process. The feature has to link up to the very next v-manner node, not just the next suitable one.

As metaphonic raising is the addition of an aperture feature, the raising of mid vowels now has to be the addition of the same kind of feature, but not via spreading. This looks at first problematic, since the usual way in autosegmental phonology of dealing with neutralization is to formalize it as the delinking of a marked feature. However, if we see neutralization as a reaction to some well-formedness constraint, any strategy should do—deletion of offensive structure or insertion of more structure—as long as the offending configuration changes for the better.

Finally, the Piveronese pattern displayed metaphony-style raising, although the roles of trigger and target are flipped. Piveronese (104) also nicely illustrates another aspect of the Italian-style vowel harmony pattern that turns out to be a problem for any OT analysis: the trigger of the process is usually quite narrowly defined. It is not only that only the high vowels trigger, they also have to be in a specific position to do so. The unstressed high vowel in the form in (104c) is in an optimal position to spread its height feature to the final vowel in the plural form, but it does not do this.

(104) Piveronese progressive stress-triggered harmony (Canalis 2007)

a.	ˈmɑska	ˈmɑske	‘witch (fem.sg/pl)’
	fyˈmela	fyˈmele	‘feminine (sg/pl)’
	dilɔ̀za	dilɔ̀ze	‘jealous (fem.sg/pl)’
b.	basˈtimja	basˈtimji	‘blasphemy (fem.sg/pl)’
	ˈbryta	ˈbryti	‘ugly (fem.sg/pl)’
	ˈturtura	ˈturturi	‘tortoise (fem.sg/pl)’
c.	ˈmɑndula	ˈmɑndule	‘almond (fem.sg/pl)’

So far the modified analysis accounts for all types of raising, and we can describe unstressed syllable neutralization. The metaphonic formation of tense diphthongs from lax mid vowels, though, is still enigmatic.

Since the aim of this book is to illuminate the phonology of Italian, the above proposal of height features has to be related to the process we find in Italian: reduction of lax mid vowels in unstressed syllables to tense mid.

The difference between lax mid and tense mid vowels in the current state of the analysis lies in the absence vs. presence of a second feature [close]. Absence of [close] specifications increases sonority (see section 4.2.3.3 below for a brief discussion of the literature on the relation of sonority and stress). We can say that the fewer [close] specifications a vowel has, the more it attracts stress. Thus, improval on markedness in unstressed syllables is achieved by the insertion of another instance of the feature [close].

A growing majority of Italians, though, do not have a dialect (or minority language) with metaphony as a background first language, or have no dialectal background at all. Under the assumption that every language has its unique set of phonological features drawn from a universal pool of possible features and feature combinations, a learner of Standard Italian could, on the basis of the reduction pattern, deduce the following height system in which the mid lax vowels are characterized by the feature [open]. Loss of this feature by delinking turns them into mid tense vowels.

(105) Standard Italian vowel system

	[open]	[close]	[coronal]	[dorsal]	[labial]
i		✓	✓		
u		✓			✓
e			✓		
o					✓
ɛ	✓		✓		
ɔ	✓				✓
a				✓	

The place feature specifications given in (105) were motivated in part in section 4.2.1 on palatalization. Every front non-low vowel has to have a feature [coronal]. Nothing hinges on the specification of the vowels *u* and *o* as [labial]. They might be underspecified for this feature. However, this designates *o* as a featureless vowel. According to the logic of OT, this should surface as the epenthetic vowel. The existence of vowel epenthesis in Italian is subject to debate. The most plausible candidate for an epenthetic vowel, however, is *e* (see 7.3). If the *e*/zero alternations discussed in 7.3 are seen as deletion, one might accept the system without the feature [labial], which has the advantage that it is built up incrementally: every feature exists as the only specified feature in one vowel (indicated by shading in (105)). Intuitively, one might expect the low vowel to be specified for the feature [open]. However, this additional specification would also raise the expectation to see an alternation in unstressed syllables in some variety that raises *a* to *e* or *o*, which is not attested.

The vowel system based on metaphonic alternations, however, has another advantage. Together with the OT account of metaphony, to be discussed in the next section, it explains a historical curiosity of Standard Italian—the asymmetric vowel inventory in the final unstressed syllable. Recall that the inventory in this position consists of the vowels in (106a), and is derived historically from the system we have seen in some dialectal varieties above, displayed in (106b).

(106) Word-final unstressed vowels

a. Italian			b. Dialectal		
i			i		u
e		o	e		
	a			a	

In the OT analysis, metaphony is a reaction to a licensing constraint on this position, while in an analysis drawing on rules and representations we formalize metaphony as a spreading rule. Usually, there is more than one way to relieve a surface representation from the pressure exerted by a licensing or any kind of markedness constraint. Below we will see that one strategy is to establish a connection with a segment in a strong position. Another strategy to avoid a markedness constraint is to change the segment in the position referred to by the markedness constraint. If high vowels are too marked in final position, the high back vowel can likewise be lowered to *o*.

This is an option for the high back vowel, but not for the high front vowel. The reason why final /i/ has not lowered in Standard Italian as final /u/ has lies in the morphosyntactic information they provide. If final /i/ lowers to *e* the distinction between masculine plural and feminine plural collapses, since /-i/ encodes masculine plural and /-e/ feminine plural. There is no such loss of information involved in the lowering of /-u/ to *o*.

4.2.3.3 Unstressed vowel reduction and metaphony in OT

I will first sketch an analysis of Standard Italian neutralization of the tense/lax distinction in unstressed syllables, and then proceed to Walker's approach to metaphony and weak-trigger harmony.

In her OT approach to metaphony, Walker (2005) relies on the work by Crosswhite (2000; 2001; 2004), in which vowel neutralization is motivated via sonority, i.e. phonetic grounding is important. Crosswhite argues that in languages with reduction of non-high vowels to high or schwa in unstressed syllables, the phonetic motivation behind the process is that unstressed vowels, being in a non-prominent position, also should be of low sonority. The sonority scale divides the vowels into high sonority vowels which are low, mid vowels which are of intermediate sonority, and high vowels and schwa (though technically mid as well), which are of low sonority. Another reduction process reduces the vowel inventory in unstressed position to the three corner vowels *i, u, a*. In Crosswhite's theory this is the most contrastive and least confusable set of vowels and any additional contrast (i.e. mid vowels) is licensed in stressed syllables only. While the sonority-driven reduction is achieved via a universal hierarchy of negative positional markedness constraints banning vowels of high and relatively high sonority from unstressed nuclei/syllables, the corner vowel reduction is formalized via a licensing constraint, a positive markedness constraint restricting the emergence of mid vowels to stressed position. The idea of licensing constraints in OT goes back at least to Zoll (1996). The triggering constraint in Walker's analysis of metaphony is such a licensing constraint in the spirit of Zoll. She grounds this constraint in the same way as Crosswhite does with the constraint set on sonority-driven reduction, she just turns her argument upside down: high vowels are perceptually weak and therefore need additional licensing in a strong position, i.e. a stressed position.

Generally, functional grounding of especially markedness constraints is a very cautious way of drawing some borders around the space of possible constraints. If, however, the same argument can be twisted in any direction, the procedure loses credibility, and one might retreat to a more abstractionist position that holds that language is arbitrary and grammar is only constrained by its own systemic limits. First of all, Prince and Smolensky (1993) argue that the higher a segment is in sonority the better it suits as a syllable nucleus. They turn the sonority scale basically upside down to construct a universally ranked set of constraints guarding the syllable nucleus. This gives low and mid vowels pole position. Then, Crosswhite turns this around again, creating a reverse hierarchy of markedness constraints on vowels in unstressed syllables. According to this constraint hierarchy, the lower a vowel is the less optimal it is in unstressed syllables. Thirdly, Walker claims the markedness of low sonority vowels in unstressed position. So perhaps sonority is not the concept at the core of it at all. The sonority scale has in any case turned out to be difficult to formalize in terms of segmental features, starting with its implementation in *SPE* (Chomsky and Halle 1965), and being still problematic in today's theories of segmental representation. One source of difficulty here might be that the scale is a scale; more than that, it has telescoping tendencies in that some steps on the scale tend to collapse in some languages but not in others, while phonological features are usually binary or unary. Before we go astray in this digression, let us return to the actual issue, unstressed mid vowel reduction.

The sonority scale for vowels is given in (107a). (107b) gives the constraint scale derived by Prince and Smolensky from the sonority scale, and (107c) provides the resultant markedness constraint hierarchy on unstressed position, as proposed by Crosswhite (2001; 2004) and Kenstowicz (1996b).

(107) Sonority scale and markedness hierarchies

a. a > ɛ, ɔ > e, o > ɪ, ʊ > i, u, ə
b. *Nuc/i, u, ə ≫ *Nuc/ɪ, ʊ ≫ *Nuc/e, o ≫ *Nuc/ɛ, ɔ ≫ *Nuc/a
c. *σ̆/a ≫ *σ̆/ɛ, ɔ ≫ *σ̆/e, o

If we interweave the set in (107c) with faithfulness constraints, the resulting grammars give us various kinds of reduction (Crosswhite 2000; 2001; 2004). If we consider MAX-IO as well, as Gouskova (2003) and Graf and Krämer (2006) do, we also get a range of vowel deletion patterns.

Right now, we just want to have a ranking for the Standard Italian pattern of unstressed vowel reduction. First of all, Italian tense mid as well as low vowels do not change height to conform to this markedness scale. Given standard features, such as [±high], [±low] and [±ATR] and IDENTITY constraints for each, the faithfulness constraints would be quite easy to pick and rank on the scale, together with additional markedness constraints against lax high and tense low vowels. However, above I introduced an analysis of height as accumulative [close] specifications. Thus, the situation is slightly different, but not more complex.

As said above, the low vowel is additionally specified as [dorsal]. To block the low vowel from raising I use the constraint against segments that carry [dorsal] combined with any number of [close] features, *[dorsal, close]. IDENT-IO[dorsal] is violated whenever a feature [dorsal] is added to or removed from a segment. The same logic applies to IDENT-IO[close]. Thus one step up or down on the height scale incurs one violation mark, while for two steps up on the scale two violations are registered, because two instances of [close] have been added or removed and so forth.

(108) Italian unstressed vowel reduction in OT

	*[dors, close]	IDENT [dors]	*σ̆/a	*σ̆/ε, ɔ	IDENT [close]	*σ̆/e, o
☞ a. /a/ - a			*			
b. /a/ - æ	*!				*	
c. /a/ - ε		*!			*	
d. /a/ - e		*!			**	*
e. /a/ - i		*!			***	
f. /ε/ - ε				*!		
☞ g. /ε/ - e					*	*
h. /ε/ - i					**!	
i. /ε/ - a		*!	*		*	
☞ j. /e/ - e						*
k. /e/ - i					*!	

At the end of 4.2.3.2 I considered the possibility that speakers of Standard Italian have established a slightly different feature system to encode vowel height. This analysis of unstressed syllable reduction is largely independent of the assumed features. A question that arises in this context is how cross-linguistic tendencies are encoded in universal constraints if the features used to encode the same kind of surface structure can vary from language to language. A straightforward connection between features, constraints, and phonological processes is established if the use of a certain feature (combination) is always accompanied by the same phonological processes, and absence from the system of the feature affected by the process explains absence of the process from the language. This is another aspect in which language-specific features undermine the programmatic goals of OT, i.e. to explain differences between languages via constraint interaction. Potential explanation of phonological patterns through both representations as well as constraint interaction recreates what was dubbed the 'duplication problem' (e.g. Prince and Smolensky 1993), i.e. the same fact is explained twice. The 'duplication problem' originally referred to an overlap of the effects of morpheme structure constraints and phonological rules in derivational theories, such as Lexical Phonology and Morphology.

Having dealt with unstressed syllable ATR neutralization, we can proceed now to the analysis of metaphony, focusing on Walker's account first.

As said above, the central constraint in Walker's analysis is a licensing constraint. The general scheme of positional licensing constraints and the actual constraint triggering metaphony are given in (109).

(109) Positional licensing constraints

a. LICENSE(F, S-Pos):
'Feature [F] is licensed by association to strong position S.'

b. LICENSE($[+\text{high}]_{\text{post-tonic}}$, $\acute{\sigma}$):
'[+high] in a post-tonic syllable must be associated with a stressed syllable.'

Walker adopts the representational model from Calabrese (though not his derivations and repairs theory) together with the assumption that the spreading feature is [+high]. The restriction of the locus of the constraint to 'post-tonic' makes sure that pre-tonic unstressed high vowels will not spread because they do not violate the constraint. For a high vowel in post-tonic position there are basically four strategies to avoid violation of this constraint: the vowel can be unfaithful by disappearing, i.e. not being present in the surface representation, or by changing into [−high]. The vowel can attract the stress or it can spread to the next stressed vowel, changing this one into a high vowel if it is not high already. Walker does not discuss the options of deletion and stress shift, so we will just assume that the constraint against segment deletion, MAX-IO, as well as any constraints determining stress, are ranked higher than the metaphony grammar we are going to unfold here.

In addition to the positional markedness constraint and input-output faithfulness Walker still has to invoke additional constraints, since either of the two remaining choices—changing the offender or changing the stressed vowel—is a violation of faithfulness.

(110) Walker's conundrum

/bev-i/	LICENSE([+high]$_{pt}$, $\acute{\sigma}$)	IO-IDENT[high]
a. ˈbevi	*	
? b. ˈbeve		*
? c. ˈbivi		*

To be able to make a choice between the two candidates (110b) and (110c), she goes back to the original sonority requirements on unstressed vowels as proposed by Crosswhite and introduces a constraint that bans vowels of sonority higher than that of high vowels from unstressed syllables. She conjoins this with the faithfulness constraint on height. The reason for this is not quite obvious at this point, however, since the markedness constraint itself would achieve the desired outcome to oust candidate (110b) with lowering in the unstressed syllable, even if ranked below the two constraints introduced so far, as illustrated in (111).

(111) Walker's conundrum provisionally solved by markedness

/bev-i/	LICENSE([+high]$_{pt}$, $\acute{\sigma}$)	IO-IDENT[high]	$*\breve{\sigma}$/Son≥e,o
a. ˈbevi	*		
b. ˈbeve		*	*!
☞ c. ˈbivi		*	

The reason why Walker has to resort to local conjunction here is that the stressed vowels which do not raise could cause the final vowel to lower. The conjunction is violated whenever a segment that is a derived vowel of higher sonority than *i*, *u* or schwa is found in an unstressed syllable.

(112) Local conjunction: IO-IDENT[high] & $*\breve{\sigma}$/Son≥e,o

I shall return to this shortly. As it stands, the analysis predicts that any vowel in stressed position raises to high when followed by a high vowel, which especially for Central Veneto is not the case. Recall that in Central Veneto only the tense mid vowels raise. A complete raising of low vowels to high would change their feature specification for the feature [low] as well. Therefore IDENT[low] is introduced and ranked at the top of the hierarchy. Raising of lax mid vowels would either create a lax high vowel, which is strictly illegal in Italian including Central Veneto, or the lax mid vowel again would have to sacrifice a second feature specification to raise, changing from [−ATR] to [+ATR]. Accordingly, Walker ranks the markedness constraint against high lax vowels and IDENT[ATR] above the metaphony constraint as well. All this is summarized in tableau (113).

(113) Central Veneto metaphony (Walker 2005)

	*[+hi, -ATR]	IO-IDENT [low]	IO-IDENT [ATR]	IO-IDENT [high] & $\breve{\sigma}$/Son≥e,o	LICENSE ([+high]$_{pt}$, $\acute{\sigma}$)	IO-IDENT [high]	*$\breve{\sigma}$/Son≥e,o
☞ a. /bɛli/ - ˈbɛli					*		
b. /bɛli/ - ˈbɪli	*!					*	*
c. /bɛli/ - ˈbeli			*!		*		
d. /bɛli/ - ˈbili			*!				
e. /bɛli/ - ˈbɛle				*!		*	*
☞ f. /staʒ-i/ - ˈstaʒ-i					*		
g. /staʒ-i/ - ˈstɛʒ-i		*!			*		
h. /staʒ-i/ - ˈsteʒ-i		*!	*		*		
i. /staʒ-i/ - ˈstiʒ-i		*!	*				
k. /staʒ-i/ - ˈstaʒ-e				*!		*	*

The Central Veneto regressive spreading of height beyond the stressed vowel (as in /dolór-i/ → [dulúri] 'pain (m.pl)') is induced by a spreading constraint of the type proposed by Kaun (1995). The constraint demands spreading of [+high] by post-tonic vowels to all vowels in the word, and has to be ranked above faithfulness to the feature [high] and below all the constraints that block raising of the wrong vowels. Recall, however, that in Servigliano high stressed vowels trigger raising in preceding vowels as well, whether or not they are lexically [±high] or derived high vowels. Furthermore, Piveronese shows spreading from stressed vowels only (and only rightward). To incorporate these patterns we have to consider a second spreading constraint, punishing forms in which the tonic syllable does not spread.

(114) The SPREAD family of constraints

a. SPREAD[+hi]: 'The feature [+high] is associated with every vowel in the domain.'

b. SPREAD[+hi]$_{\text{post-tonic}}$: 'The feature [+high] associated with a post-tonic vowel is associated with every vowel in the domain.' (Walker 2005: 954)

c. SPREAD[+hi]$_{\text{tonic}}$: 'The feature [+high] associated with a tonic vowel is associated with every vowel in the domain.'

In Central Veneto we find variability in the application of the extended harmony. It is not clear to me whether the process is variable in individual speakers, across speakers, or is applied and blocked depending on the lexical item. Walker shows how variation can be accounted for by reranking of the SPREAD constraint with respect to IDENT[high]. I will not go into the discussion of which kind of variability we find in

Central Veneto: a more detailed discussion of these types of variation and their formal analysis can be found in the section 4.2.1 on palatalization and Chapter 6 on stress.

Walker's aim, though, is not just an analysis of Central Veneto; she wants to integrate the various patterns of metaphony differing in target conditions. The constraint set developed up to this point, however, describes a typology in which only tense mid vowels raise to high or all vowels raise to high. To account for the raising of mid lax vowels to mid tense she introduces two amendments to the analysis. First, she concludes that in such varieties all height features of post-tonic vowels require licensing in a strong position. Thus, apart from the feature [+high], the $\text{LIC}_{\text{post-tonic}}$ constraint here refers to the features [±ATR] and [−low] as well. Second, target vowels have to be saved from changing more than one feature. To this end, a local conjunction of two faithfulness constraints is introduced. Any vowel that is unfaithful to both features [high] and [ATR] is punished by this conjoined constraint. (115) reproduces Walker's tableau showing the raising of lax mid vowels.

(115) Extended target metaphony

/nɔv-u/	IO-IDENT[high] & IO-IDENT[ATR]	LIC (height)	IO-IDENT [ATR]	IO-IDENT [high]
☞ a. ˈnovu		*	*	
b. ˈnɔvu		**!		
c. ˈ nuvu	*!		*	*

The reformulation of the licensing constraint is slightly problematic. If there are different licensing constraints active in the different varieties, we regard the variants of metaphony as different processes rather than as variations on the same theme. Furthermore, if the constraint now demands the licensing of any height feature, we expect non-high final vowels to cause metaphony as well, resulting, for example, in the lowering of stressed vowels. A final /a/, for example, with its features [−high, −ATR, +low], would not cause changes in the features [high] and [low], but drag down mid tense vowels to mid lax, which does not happen. Changing the specification of [ATR] to the positive value in the licensing constraint still does not exclude mid vowels from triggering raising of low and lax mid and lowering of high vowels to tense mid.

Conjoining the licensing constraint with the markedness constraint violated by high vowels, *[+high], is not a solution either. The desired result of this would be that, since all non-high vowels satisfy this markedness constraint, they would not trigger metaphony, since the local conjunction is satisfied anyway and there is no need to improve on this constraint by violating others. However, for the unfaithful mapping of a mid lax vowel to a tense one (116a) to be considered more harmonic than the faithful mapping (116b) requires a gradual interpretation of the licensing constraint. The local conjunction is violated whenever both constraints are violated, no matter how often.

(116) Licensing via metaphony restricted to high vowels

	IO-Id[hi] & IO-Id[ATR]	IO-Id[lo] & IO-Id[ATR]	*[+hi] & Lic	IO-Id[ATR]	IO-Id[high]	*[+hi]	Lic[+hi, −lo +ATR]
☹ a. /ˈɔ-u/ - ˈo.u			*	*!		*	*
💣 b. /ˈɔ-u/ - ˈɔ.u			*			*	**
c. /ˈɔ-u/ - ˈu.u	*!			*	*	**	
☞ d. /ˈɛ-e/ - ˈɛ.e							*
e. /ˈɛ-e/ - ˈe.e				*!			
f. /ˈɛ-e/ - ˈi.e	*!			*	*	*	
g. /ˈ a-i/ ˈa.i			*			*	***!
h. /ˈ a-i/ ˈi.i		*!				**	
i. /ˈ a-i/ ˈe.i		*!	*			*	*
☞ j. /ˈ a-i/ ˈɛ.i			*			*	**

The task gets easier if we ignore the rules of constraint conjunction and instead stipulate in the definition of the constraint that it applies to high vowels only, just as we have stipulated its position as post-tonic. Furthermore, violations are defined as one violation for each height feature of the high vowel that is not licensed.

(117) Redefined licensing

	Id[hi] & Id[ATR]	Id[lo] & Id[ATR]	$\text{Lic}_{\text{post-tonic(hi)}}$ [+hi, −lo, +ATR]	IO-Id[ATR], [hi], [lo]
☞ a. /ˈɔ-u/ - ˈo.u			*	*
b. /ˈɔ-u/ - ˈɔ.u			**!	
c. /ˈɔ-u/ - ˈu.u	*!			**
☞ d. /ˈɛ-e/ - ˈɛ.e				
e. /ˈɛ-e/ - ˈe.e				*!
f. /ˈɛ-e/ - ˈi.e	*!			**
g. /ˈa-i/ˈa.i			***!	
h. /ˈa-i/ˈi.i		*!		***
i. /ˈa-i/ˈe.i		*!	*	**
☞ j. /ˈa-i/ˈɛ.i			**	*

Varieties which exclude low vowels have IDENT[low] ranked higher than the licensing constraint. Varieties which additionally exclude lax mid vowels from raising have IDENT[ATR] ranked higher than the licensing constraint as well.

Since the exclusion of mid lax and low vowels is achieved via two independent constraints, we now expect to find varieties in which low vowels raise and tense mid vowels raise; but lax mid vowels do not (i.e. only IDENT[ATR] outranks licensing), which is not attested. A way out of this dilemma is provided by de Lacy's theory of markedness and faithfulness scales. In parallel to what he does with consonantal place features, for example, we can assume that faithfulness to the different features of the vowel height dimension is interlinked. There is a faithfulness constraint that is violated if the specification of [low] is altered, another faithfulness constraint which is violated if the specification of [low] or the specification of [ATR] is changed (or both), and a third one which is violated if one of the previous features is changed or the specification for [high] is not identical to the input.

(118) Height faithfulness scale with current features

a. IO-IDENT[$\pm$low]
b. IO-IDENT[$\pm$low] $\vee$ [$\pm$ATR]
c. IO-IDENT[$\pm$low] $\vee$ [$\pm$ATR] $\vee$ [$\pm$high]

This solves the problem of the implicational nature of the raising target hierarchy so well that the Lombardian varieties which raise only lax mid vowels could cause a problem now.

Thus, all this seems to confirm yet again the chainshift nature of the process, and to confirm that the feature theory currently favoured in the literature is ill chosen.

As we have just seen, many aspects of the analysis are still problematic. We can get the typology by imposing locally conjoined constraints only. The reranking of the basic constraints generates a completely different typology from that displayed by the dialects. In the following I will implement the analysis indicated above, relying on a scalar feature [close] in OT.

In the reformulation of height features I kept Clements' height registers. In the new analysis every register corresponds to an index. Another ingredient to the analysis is the restriction that the [close] features from the different registers can only be combined in the way they are in table (101). In the following I will not display any markedness constraints that ban illicit [close] specifications, such as *[close]$_1$, [close]$_3$ etc., but rather assume that these are inviolable restrictions and that the lowest register [close] feature possible spreads.

The next important ingredient is the formulation of identity to this kind of features. In the analysis of unstressed vowel reduction I assumed identity to count violations according to the number of [close] features changed in a segment. To understand the scalar nature of the typology, i.e. that /e/ is most likely to raise, then /ɛ/, then /a/, I decompose IDENTITY[close] into the component constraints referring to the three registers, indexed 1, indexed 2, and indexed 3. These three more specific faithfulness constraints are in a fixed ranking with respect to each other (at least in Italian), with the constraint referring to the lowest register ranked highest, the constraint referring to the highest register ranked lowest, and the constraint on register 2 ranked in between. Tableau (119) shows these constraints in combination with a licensing constraint that triggers spreading of one instance of [close] from the rightmost high vowel.

(119) Faithfulness by register: all vowels raise one step

	LIC[close]	ID[close]$_1$	ID[close]$_2$	ID[close]$_3$	ID[close]
a. /ˈe-u/ - ˈe.u	*!				
☞ b. /ˈe-u/ - ˈi.u				*	*
☞ c. /ˈɔ-u/ - ˈo.u			*		*
d. /ˈɔ-u/ - ˈɔ.u	*!				
e. /ˈɔ-u/ - ˈu.u			*	*!	**
f. /ˈa-i/ ˈa.i	*!				
☞ g. /ˈa-i/ ˈɛ.i		*			*
h. /ˈa-i/ ˈe.i		*	*!		**
i. /ˈa-i/ ˈi.i		*	*!	*	***

Now we have a look at what happens if we demote the licensing constraint step by step. First demotion under IDENT[close]$_1$ gives us the Servigliano pattern in which all mid vowels raise, but low vowels do not.

(120) Servigliano: /a/ does not raise

	ID[close]$_1$	LIC[close]	ID[close]$_2$	ID[close]$_3$	ID[close]
a. /ˈe-u/ - ˈe.u		*!			
☞ b. /ˈe-u/ - ˈi.u				*	*
☞ c. /ˈɔ-u/ - ˈo.u			*		*
d. /ˈɔ-u/ - ˈɔ.u		*!			
e. /ˈɔ-u/ - ˈu.u			*	*!	**
☞ f. /ˈa-i/ ˈa.i		*			
g. /ˈa-i/ ˈɛ.i	*!				*
h. /ˈa-i/ˈe.i	*!		*		**
i. /ˈa-i/ ˈi.i	*!		*	*	***

Demoting the licensing constraint a further step yields the Central Veneto metaphony pattern. Only tense mid vowels raise, as shown in (121).

(121) Central Veneto: only /e,o/ raise

	ID[cls]$_1$	ID[cls]$_2$	LIC[cls]	ID[cls]$_3$	ID[cls]
a. /ˈe-u/ - ˈe.u			*!		
☞ b. /ˈe-u/ - ˈi.u				*	*
c. /ˈɔ-u/ - ˈo.u		*!			*
☞ d. /ˈɔ-u/ - ˈɔ.u			*		
e. /ˈɔ-u/ - ˈu.u		*!		*	**
☞ f. /ˈa-i/ ˈa.i			*		
g. /ˈa-i/ ˈɛ.i	*!				*
h. /ˈa-i/ ˈe.i	*!	*			**
i. /ˈa-i/ ˈi.i	*!	*		*	***

If we demote the licensing constraint one more step, no vowel will raise, i.e. we end up with Standard Italian.

The choice between lowering of the rightmost unstressed high vowel and raising of the stressed vowel prompted Walker to introduce a local conjunction of two constraints. If we assume the whole metaphony grammar in all varieties to be dominated by a simple MAX[close] constraint and MAX-IO(segment) (to avoid deletion) we escape the complex constraint as well. While the IDENTITY[f] constraints in use here are violated by any change to [close] features (i.e. addition or removal) made to a segment, MAX[close] is violated if a feature [close] is present in the input but not in the output. Thus, lowering, i.e. removing [close] features from, a weak vowel to escape violation of the licensing constraint is not possible.

(122) Targeting stress

	MAX-IO(seg)	MAX-IO[cls]	LIC[cls]	IO-IDENT[cls]
a. /ˈe-i/ - ˈe.i			*!	
☞ b. /ˈe-i/ - ˈi.i				*
c. /ˈe-i/ - ˈe.e		*!		*
d. /ˈe-i/ - ˈe	*!			

With the same machinery we explain the lack of change in the final vowel if the stressed vowel is resistant to change. Remember that we have dealt above with the representation of the low vowel /a/, analysing it as void of [close] features and specified for [dorsal]. A markedness constraint (or set of these) bans the combination of [dorsal] with any number of [close] features, limiting the vowel inventory of Italian. In the varieties in which stressed /a/ is immune to spreading, this high-ranking markedness constraint is complemented by high ranking of MAX-IO[dorsal] or IDENT-IO[dorsal]. Together with these constraints the subgrammar in (123), especially the ranking of

Max-IO[cls] above Lic[cls], explains the lack of change in /á. . .i/ configurations in those varieties.

(123) Blocking

	Max(seg)	*dors/cls	Id[dors]	Max[cls]	Lic[cls]	Id[cls]
☞ a. /ˈa-i/ - ˈa.i					*	
b. /ˈa-i/ - ˈɛ.i			*!			*
c. /ˈa-i/ - ˈæ.i		*!				
d. /ˈa-i/ - ˈa.a				***!		*
e. /ˈa-i/ - ˈe	*!					

The position of the faithfulness constraint on [dorsal] in the ranking explains participation or lack thereof of stressed /a/ in the process.

Max-IO[f] constraints also give us a key to the understanding of another aspect of the phenomenon: remnant raising when the triggering context is lost, i.e. stressed vowels raise even though the suspected trigger is a schwa or not there at all, finds a straightforward explanation. Max-IO[f] demands realization of input features in the output independent of the segment they are linked to in the input, unlike Identity constraints, which I assume to be vacuously satisfied in case of deletion of the input segment (see e.g. Krämer 2006a and references there for a discussion of possible interpretations of faithfulness constraints on features). In case a segment is not mapped to the surface, for example to avoid violations of markedness constraints on the position the segment would occur in, or if the segment is neutralized to schwa, i.e. it cannot carry its own features due to markedness requirements on its position in the prosodic structure, Max-IO[f] favours a candidate that has the particular feature realized on a different segment. This is shown in a schematic way in (124).

(124) The selfish feature

i. /Y $X_{[f]}$/	Max-IO[F]	*X[F]	Ident-IO[F]	Max-IO(seg)
a. Y $X_{[f]}$		*!		
b. Y X	*!		*	
c. $Y_{[f]}$ X			**!	
☞ d. $Y_{[f]}$			*	*

ii. /Y $X_{[f]}$/	Max-IO[F]	*X[F]	Max-IO(seg)	Ident-IO[F]
a. Y $X_{[f]}$		*!		
b. Y X	*!			*
☞ c. $Y_{[f]}$ X				**
d. $Y_{[f]}$			*!	*

What appears to be an opaque interaction of phonological processes—the spreading of a feature from a vowel to the preceding vowel with subsequent neutralization or deletion of the source of spreading—can now be understood in a transparent way. A feature threatened by neutralization migrates to a safer position.[19]

A detailed formal account would now have to tease out what a schwa actually is in terms of features, and why it is that we still get stepwise raising in the opaque case as well rather than a wholesale takeover of the stressed segment by the features of the neutralized or deleted segment. I content myself for now with the basic ideas as laid out so far, and leave the more detailed aspects of the analysis of opaque interaction of neutralization and metaphony for future work.

4.2.3.4 Summary

This chapter has given an overview of the typology of vowel neutralization we find in contemporary Italian and its dialects, i.e. tensing of mid vowels in unstressed syllables, metaphony and its extended versions (word-domain height harmony triggered by the rightmost post-tonic high vowel). The former was identified as raising due to position, while the latter process was identified as raising caused by following high vowels. Non-high vowels do not seem to cause lowering anywhere. Dialects vary with regard to the possible targets of metaphonic raising. Maiden (1991) identified an implicational hierarchy with very few exceptions. If low vowels raise, all higher vowels raise as well (except for vowels which are underlyingly high already, of course). If lax mid vowels raise, tense mid vowels raise as well. Targets also differ in the outputs. In many dialects lax mid vowels split into diphthongs under raising conditions.

The theory-centred second and third parts of this chapter discussed first the representational side of the patterns and then Optimality Theoretic approaches. It turned out that the representational (derivational) approaches, as well as the most recent and most embracing OT account, have their shortcomings.

To circumvent the problems with these analyses, I proposed a scalar representation that stacks up to three instances of the height feature [close] on a v-manner node (aperture node). This does not imply that all languages implement these representations. Other languages might make use of the opposing aperture feature [open] or combine

[19] Admittedly, the solution opens the door for criticism that has to be met. For example, we need an explanation of the obvious locality of this kind of process now, i.e. why don't we find patterns in which a word-final feature is realized in the initial syllable, or, if so, only if intervening vowels are affected as well (see also the argument in McCarthy 2007). McCarthy and Prince (1995; 1999) formalize the observation that underlying structures do not map to surface representations in a completely scrambled order by a violable rankable constraint (family), i.e. LINEARITY. Minimal violation of this constraint accounts for the fact that an underlying feature always migrates to a segment surface-adjacent to its original host. However, the free ranking hypothesis (i.e. if not specified otherwise, constraints should be rankable in any order and no ranking should create unattested patterns), together with the current inventory of widely accepted constraints, confronts us with a potential ranking as given in i.

i. MAX[f] $\gg$ FAITH(stress) $\gg$ Markedness: *FINAL(f) $\gg$ FAITH(σ_1) $\gg$ LINEARITY $\gg$ FAITH

Paired with an input that will be parsed into three syllables, with stress on the medial syllable, the offending feature of the final vowel will be transferred to the initial syllable to satisfy MAX(f). This contributes to a substantial problem of OT, the too-many-solutions problem, but see Blumenfeld (2006) for a possible way out.

both, or even use a third one, such as [ATR]. The proposed representations, however, in tandem with the subsequently developed OT constraint set and the emerging possible rankings, explain why we only find raising (as opposed to lowering) as well as the implicational hierarchy of targets. A further aspect of the pattern that is explained with the current model is the apparently opaque raising of stressed vowels in dialects where the triggering vowel is neutralized to schwa.

The aspect of the pattern remaining in obscurity is the diphthongization of target vowels. The most prominent derivational account (Calabrese 1987; 1998) was rejected for meta-theoretical reasons. Calabrese concludes (1998: 58f.) that his OT analysis "fails to account for the dialectal variation observed in the case of metaphony in a systematic and unitary way. Obviously, other more general theoretical considerations independent of the treatment of metaphony discussed here may show that the OT analysis is the most desirable one."[20]

4.3 A FEATURE SET FOR THE ITALIAN SEGMENT INVENTORY

In this section I recapitulate the insights we have gained into Italian segmental phonology and the representation of segments. In the previous discussions I used palatalization to elucidate the contrast system among consonants, especially which features and feature combinations we can assume for place of articulation, and this contributed to a first understanding of place of articulation in vowels and glides. Vowel alternations led to a theory of vowel height. The discussion of glides established these segments as distinct from high vowels. Combining insights into representations from the previous discussions, the alternation of high vowels with glides and the lack of the reverse alternation could be explained as a delinking operation that removes the v-manner node from high vowels when pressed into onset position. In this section I will further anticipate a few representations which will be discussed in more detail in the next chapter, especially the features of the remaining sonorants.

Place of articulation has five distinct configurations composed of three basic features. The two affricates and the other palatals each are the most complex segments of the consonant inventory. This complexity is reflected in regional variation. The affricates are absent from some varieties, usually replaced by the corresponding fricatives. The palatal nasal and the palatal lateral are decomposed into a sequence of coronal nasal and glide or coronal lateral and glide, respectively, by many speakers.

The specification of glides with nothing but a vocalic place feature explains two aspects of Italian phonology. Historically, Latin /w/ developed into /v/. This is conceivable as a conflation of the feature structure of /w/. The intermediate v-place node disappears. Thus, /v/ is specified for c-place:[labial] only. Present-day labial glides

[20] For the sake of fairness it has to be noted here that Calabrese only made a short excursion into the realms of OT and later revised this optimistic position (see esp. Calabrese 2005).

are part of falling diphthongs, the result of historic mid back vowel breaking or recent imports from other languages. Furthermore, we have observed that lexical high vowels can turn into glides when in the appropriate environment, but glides do not turn into vowels even if in a phonotactic environment where they would fit better as vowels. This vowel-to-glide change is arrived at by delinking of the high vowels' manner node. Changing a glide to a high vowel would require that a v-manner node filled with three terminal features is inserted—an operation that seems rather costly. This minimal specification of glides also explains their promiscuity in onsets, viz. that they can combine with almost any consonant except affricates and palatals, i.e. those consonants that are specified with two place features. A similar argument holds for the approximants. While /r/ combines in onsets with all stops with a single place feature, /l/ cannot combine with /t/ and /ʎ/ never occurs in complex onsets. /r/ contributes a single place feature to a complex onset. Such onsets can maximally host two place features and these have to be distinct.

Table (125) summarizes the results of the investigation of segmental contrast and segmental alternations.

(125) Feature specifications for the Italian segment inventory

	c-manner		c-place			v-manner	v-place			sonorant		lar
	cl	op	lab	cor	dor	cl	lab	cor	dor	nas	lateral	voice
p	✓		✓									
b	✓		✓									✓
t	✓											
d	✓											✓
ts	✓							✓				
dz	✓							✓				✓
tʃ	✓				✓			✓				
dʒ	✓				✓			✓				✓
k	✓				✓							
g	✓				✓							✓
f		✓	✓									
v		(✓)	✓									(✓)
s		✓		✓								
(z)		✓		✓								✓
ʃ		✓			✓			✓				
m			✓							✓		
n				✓						✓		
ɲ					✓			✓		✓		

l								✓			✓	
ʎ					✓			✓			✓	
r				✓								
j								✓				
w							✓					
i						✓✓✓		✓				
u						✓✓✓	✓					
e						✓✓		✓				
ɛ						✓						
o						✓✓	✓					
ɔ						✓	✓					
a									✓			

There are, however, a few generalizations that cannot be stated yet. The failure of the anterior affricate /ts/ to combine with any sonorant does not emerge from this feature system. The same holds for the combinatorial restrictions on the voiced labial fricative. These might be regarded as lexical gaps or as an indication that the specification of features needs further refinement. Inherent length of the anterior affricate and all palatal segments bar the posterior affricate cannot be directly derived either. The key to understanding this inherent length could lie in the double specification of the place feature. If we correlate this double specification with length, this would predict the posterior affricate to be inherently long, which is not the case, and the anterior affricate to be inherently short, which is counter to fact as well. Thus, at this point I can only attribute the length facts to the historical origins of these segments as resulting from Latin consonant clusters—a solution which is rather unsatisfactory since we cannot expect any speaker of Modern Italian to have any knowledge of earlier stages of the language.

To arrive at these feature specifications we had a look at three different aspects of the phonology: contrastive behaviour, phonological activity in processes that cause alternations, and co-occurrence restrictions. The latter will be considered further in the following chapter. From the analysis provided so far, we can already see that minimal contrastive specification does not allow us to account for all aspects of the sound patterns that need phonological explanation. Thus, on the one hand we have introduced already a certain degree of redundancy, and on the other hand the system as laid out presents some gaps: there are features which do not have a corresponding segment in the system.

In the following chapter, on syllable structure, we will come back to the features established here to explain phonotactic restrictions in more detail.

5

SYLLABLE STRUCTURE

Italian syllable structure is highly restrictive. The language poses several challenges to an analysis, some of which have been taken up repeatedly in the literature. First, in Italian, as in most languages, onsets are relatively straightforwardly restricted by sonority requirements except for a few aspects, most prominently the occurrence of /s/ word-initially before any other licit onset cluster. A problem with sonority is that it has to be translated into categorical features which define segments by contrastivity and phonological activity. Otherwise it is another piece of redundant information that every segment has to carry along. When we look at the other edge of the Italian syllable, we find one of the few cases that imposes stricter limits on possible syllable-final consonants word-finally than word-medially. We found a similar asymmetry between word-initial position and intervocalic morpheme-internal position. Italian post-vocalic consonants (or codas) in general have been used to make substantial contributions to linguistic theorizing (e.g. the coda condition; Itô 1988). Another intriguing aspect of Italian syllables is a clear size restriction on the rhyme. Notwithstanding the number of segments in a syllable's onset, the rhyme seems to be restricted to maximally two segments, either a diphthong or long vowel or a short vowel plus a consonant (there are a few exceptions, such as *film* 'film', which are recent loanwords). Conditions on syllable size (such as Stress-to-Weight), weight of coda consonants, foot size, contrastive consonant length, and emergent consonant length (as in raddoppiamento sintattico) have been analysed insightfully in moraic theory (Saltarelli 1983; Davis 1990; Repetti 1990; 1991; Sluyters 1990; Jacobs 1994; Morén 2001),[1] and this contribution is no exception to this tradition. Last but not least, the question is still open as to whether the syllable is a category in the grammar or not. As Vogel (1982: 5) put it, '[d]ai tempi dello strutturalismo ad oggi, la sillaba ha fatto un giro di 360 gradi: è stata prima parzialmente accettata come unità fonologica, poi quasi completamente rifiutata ed infine parzialmente accettata di nuovo.'[2] While most literature on Italian phonotactics takes the concept of the syllable for granted nowadays (i.e. the late twentieth and early twenty-first century—e.g. Davis 1990; Loporcaro 1997; Wiltshire and Maranzana 1999), research framed in Government Phonology (Kaye et al. 1990; Scheer 2004) makes only reference to onsets (O), nuclei (N), rhymes (R), but not to syllables, or, more radically, just refers to consonant (C) and vocalic (V) positions.

[1] This list is far from exhaustive. Though Moraic Theory is taken for granted by many contributors, it is not universally accepted in the context of analyses of Italian syllable structure, stress, gemination, etc. See e.g. Nikiema (1992) or Loporcaro (e.g. 1996).

[2] "From the times of structuralism onwards, the syllable has made a 360 degree turn: first accepted as a phonological unit, then nearly completely dismissed, and finally partially accepted again." (My translation.)

5.1 ITALIAN ONSET PHONOTACTICS

Italian has onsets which range from maximally three consonants to zero onsets, i.e. vowel-initial words.

(1) Onset types

a. [ˈstrontso]	stronzo	'turd, bastard'
b. [ˈspɔrko]	sporco	'dirty'
[ˈtroŋko]]	tronco	'trunk'
c. [ˈkɔːro]	coro	'chorus, choir'
d. [ˈɔːro]	oro	'gold'

Dealing with combinatorial properties within syllable onsets, one first notes that in simple onsets almost all segment types can occur. The dorsal nasal [ŋ] and the labio-dental nasal [ɱ] are the only consonantal segments that are not attested at all. Beyond that we can look at lexical frequency. Words with an initial palatal lateral or a palatal nasal are extremely rare. A bit less rare but still below the frequency of all other onsets are initial glides. This is probably due to the historical sources of these sounds on the way from Latin to Modern Italian. The initial (and non-initial) voiced labial fricative [v] is historically a substitution for the labio-velar glide [w] in Latin. Words with an initial labio-velar glide are all relatively recent loans.

(2) Low frequency word-initial onsets

a. [ʎi]	gli	3pl.pronoun
b. [ˈɲɔkko]	gnoccho	'gnocco'
[ˈɲɔstiko / ˈgnɔstiko]	gnostico	'gnostic'
c. [ˈjaːto]	iato	'hiatus'
[jɔt]	yacht	'yacht'
d. [wiˈkɛnd]	week-end	'weekend'
[ˈwiski]	whisky	'whisky'
e. [veˈloːtʃe]	veloce	'fast'
[ˈvalle]	valle	'valley'
[ˈvwɔːto]	vuoto	'empty'
[viˈɔːla / ˈvjɔːla]	viola	'violet'

The only segment of the above that occurs in a complex onset is the labial fricative, which occurs with glides. The same holds for the lateral and the trill as well as for the nasals. They are only followed by glides when in a complex onset. The only other voiced fricative, [z], does not occur word-initially at all.

The tables in (3) indicate the possible binary onsets with a check mark and unattested ones with an asterisk. We see that consonants of the same manner cannot be combined. If we regard nasals as sonorant obstruents, this explains why nasals cannot combine with stops and fricatives. Stops combine only in very rare loans, such as *pterodattilo* 'pterodactyl'. The same holds for fricative and stop combinations, as in *ftalmologia* 'phtalmology'. The labial and the palatal fricative cannot combine. /s/ as the initial segment of a binary cluster is attested with almost any segment. The charts do not reflect this and we will come back to this later. Of the stops, the affricates do not combine with any other segment, as /t/ does not combine with the lateral. In complex onsets an obstruent always precedes a sonorant, bar the nasals.

(3) (Im)possible consonant combinations in word-initial onsets

1/2	Stop	Fricative	Nasal	Lateral	Rhotic	Glide
Stop	*	*	*	✓	✓	✓
Fricative	*	*	*	✓	✓	✓
Nasal	*	*	*	*	*	✓
Lateral	*	*	*	*	*	✓
Rhotic	*	*	*	*	*	*/✓
Glide	*	*	*	*	*	*

1/2	Stop	Fricative	Nasal	Lateral	Rhotic	Glide
Stop	*pt	*tf	*kn	klasse	kɾedo	kwoko
Fricative	(*)ft	*fs	*fn	flauto	fraele	fiasco
Nasal	*nt	*nf	*mn	*ml	*mɾ	nwotʃe/mjɛle
Lateral	*lp	*lf	*lm	*lʎ	*lɾ	lwogo, ljevito
Rhotic	*rp	*rf	*rn	*rl	*ɾɾ	ɾwota/*ɾj
Glide	*jp	*jf	*jn	*jl	*jɾ	*wj

The most widely accepted approach to onset phonotactics relates the restrictions we find on onsets to the sonority scale (4) and the Sonority Sequencing Principle (5). The idea of relative strength of different classes of segments or sonority hierarchy goes back to Saussure (1916), Jespersen (1913), and Hooper (1976).

(4) Davis' (1990) sonority scale

Voiceless stops	Voiced stops	Non-coronal fricatives	Coronal fricatives	n	m	Liquids	Vowels
1	2	3	4	5	6	7	8

(5) The Sonority Sequencing Principle

'Sonority rises towards the syllable peak and then falls.'

When segment classes are ordered on the scale as in (4), one can define the minimum sonority rise allowed in a constituent such as an onset. For Italian, sonority has to rise by at least three steps to exclude onsets consisting of a non-coronal fricative and a nasal, such as *[fn], which is attested in Norwegian, for example, but not in Italian. To exclude combinations of voiceless stops and nasals, such as *[kn], we need to postulate a minimal rise of at least four steps, as Davis (1990) proposes. This would exclude sequences of non-coronal fricative plus liquid as well—i.e. [fɾ...], as in *fratello* 'brother', would be ungrammatical. Accordingly, the restriction would have to be formulated less strictly, which then does not explain the absence of stop + nasal sequences anymore. Anyway, the language allows quite marked structures in some loans, however small their numbers, as in the initial onsets in *pterodattilo* 'pterodactyl', *psicologia* 'psychology', or *pneumatico* 'pneumatic'.

To account for the restrictions on onsets the feature system developed in the previous chapters is not entirely sufficient, as can be inferred already from the segment classes used to describe the restrictions; but we have got quite a bit of mileage out of it already.

Within this system we can attribute the restrictions on onsets to the OCP and to restrictions on the number of features allowed within this constituent. First of all, the Italian onset does not seem to support more than two place features.

(6) Maximum place specification: Onset(place spec ≤ 2)

Thus, any consonant which was analysed as having two place features is now banned from complex onsets, which explains the absence of palatals (which are combinations of [coronal] and [dorsal]). Stops and fricatives each have a c-manner feature. The OCP or a size restriction bans onsets with more than one c-manner specification.

(7) Maximum c-manner specification: Onset(c-manner:[F] ≤ 1)

This rules out stop-stop and stop-fricative/fricative-stop combinations. If all nasals get additionally a redundant specification for c-manner:[close] their low promiscuity is accounted for, since any combination of oral and nasal obstruent exceeds the limit on c-manner specifications in onsets.

The lateral has a v-place:[cor] specification and a manner specification as [lateral]. If we assume that historically the lateral had a c-manner:[close] (which actually makes it look very similar to the affricate /ts/), we can explain the change from lateral to palatal glide in complex onsets. Many Italian words which have cognates with obstruent plus lateral clusters in other Romance or Indo-European languages have a sequence of obstruent plus palatal glide, as illustrated in (8a). Delinking of the lateral's manner features leaves us with a segment specified for v-place:[coronal] only, which is the glide /j/. This restriction, however, can no longer be regarded as active, since Italian happily accommodates initial clusters of stops plus laterals, as shown in (8b). The one combination that is still not found is /t/ plus /l/.

(8) Lateral and glide in complex onsets

a. fiore	[ˈfjoːre]	'flower'	b. flotta	[ˈflɔtta]	'fleet'
pioggia	[ˈpjɔdʒdʒa]	'rain'	placebo	[plaˈtʃɛːbo]	'placebo'
chiave	[ˈkjaːve]	'key'	classe	[ˈklasse]	'class'

The restriction must have been loosened to one strictly checking c-manner specifications only, i.e. the presence of the terminal features [close] and [open] under this node in adjacent segments within the same syllable constituent.

A further observation to be accounted for if we do not use the sonority hierarchy is the sequencing of obstruents and sonorants, with the sonorants always closer to the nucleus than the obstruents.

Any specification of c-manner (the terminal features [open] and [close]) has to stand at the (left) margin of the syllable. While all obstruents are specified for these features, the sonorant consonants are not. Thus, in a sequence, sonorants always have to stand at the right, closer to the nucleus.

There are, however, differences among the sonorants. In general sonorants do not combine well. The only sonorants that combine with others are the two glides. There are no nasal+approximant sequences in onsets. The lack of combinations of nasals and laterals is accounted for by maximum specification of one sonorant manner feature in an onset (parallel to the c-manner restriction). An onset cannot bear both a feature [nasal] and a feature [lateral]. This, however, does not explain the absence of combinations with /r/, since /r/ is specified only for c-place:[coronal] and not for any manner feature. Another redundant class node can help us here. We introduce the class node sonorant, which has the terminal features [nasal] and [lateral]. /r/ has to redundantly carry this node without a terminal feature. The restriction now can be reformulated as one against two sonorant nodes within an onset.

(9) Onset sonorant OCP: *Onset([sonorant][sonorant])

The two glides /j/ and /w/ have to be left void of this node, since they combine with other sonorants. Thus, the idea of maximum underspecification gets another blow from this aspect of onset phonotactics. We need more features to describe and analyse phonotactic restrictions than we need for the contrastive system. We have seen an argument for redundant features already in the discussion of segmental processes (especially velar palatalization).

Apart from the maximum feature specification restrictions on onsets, we have to take care that the segments in onsets emerge in the right order. Above, I said that any c-manner specification has to be kept at the margin. This orders the sequences partially. We can say this for all c-features: they should be positioned as close to the margin as possible, while all v-features should be as close to the nucleus as possible. This statement can be easily formalized as violable Alignment constraints.

(10) Feature ordering

a. CAM: C-features align with the margin.
b. VAN: V-features align with the nucleus.

Now recall that several consonants are specified for v-place features. These consonants are listed with their feature profile in (11). None of the obstruents that has a v-place feature occurs in an onset with another consonant to its right. For most of the consonants listed below this is trivial, since they also have a c-place feature, which makes their features add up to two, and we have already established that a third place feature has no room in an onset. For the anterior affricates and the glides this is not trivial, because they just have one place feature each and could combine with another segment. The right-alignment of v-features in the onset explains the absence of such combinations.

(11) Italian consonants with vocalic features

	c-manner		c-place			v-manner	v-place			sonorant		lar
	cl	op	lab	cor	dor	cl	lab	cor	dor	nasal	lateral	voice
ts	✓							✓				
dz	✓							✓				✓
tʃ	✓				✓			✓				
dʒ	✓				✓			✓				✓
ʃ		✓			✓			✓				
ɲ					✓			✓		✓		
l								✓			✓	
ʎ					✓			✓			✓	
j								✓				
w							✓					

The only problem here is that the lateral actually combines with glides, as in *lievito* 'yeast' and *luogo* 'place'. This suggests that the alveolar lateral does not have a place feature synchronically. Above, the presence of this v-place feature was argued for on the basis of the change from /l/ to /j/ in obstruent plus /l/ onsets. As we have also seen above, this restriction does not hold synchronically. Thus, we could assume that /l/ does not have a place feature. This also explains why there are no clusters of the anterior affricates or any palatal consonants plus /l/. If /l/ lacks a place feature it can combine with a following glide and it is still illegally positioned when preceded by a consonant that has a v-feature, since the v-feature should align with the nucleus.

If we include the restrictions discussed so far into the grammar of Italian, we have to say something about the mostly Greek loanwords shown above in which these restrictions on Italian onsets are violated. As can be seen from a word like *psicologia* 'psychology', the initial cluster causes trouble to native speakers. Italians realize any of the three possible forms listed in (12) and it is only the prescriptive sources (such as Canepàri's *DiPI*) that tell us that the most faithful one is to be preferred.

(12) Variation in highly unusual onset clusters

[psikoloˈdʒiːa]/	'psychology'	[pneuˈmatiko]/	'pneumatic'
[sikoloˈdʒiːa]/		[neuˈmatiko]	
[pissikoloˈdʒiːa]			

Here, therefore, as in many cases of tolerance in loanword phonology, it is the association of faithful reproduction of loanwords with a high level of education and prestige that leads to acceptance of these clusters rather than a relaxation of grammatical restrictions. We can conclude that such forms are learnēd, and accordingly outside the grammar. Itô and Mester (1999), for example, propose a layered structure of the lexicon to account for such observations. In their 'onion' model, the core vocabulary and several strata of loanwords receive distinct rankings of OT constraints. The core vocabulary component has the most restrictive ranking, with more markedness constraints ranked higher than faithfulness. The more marginal lexical items are, the lower-ranked are markedness constraints with respect to faithfulness in their lexical stratum. Following the line adopted in the discussion of palatalization, the irreguar onsets can likewise be captured by indexed faithfulness constraints, rather than assuming distinct rankings. I will not go into this in any detail here. There are a few very interesting studies on loanword phonology in Italian the reader might consult, for example Repetti (2006).

Complex onsets with three consonants always have /s/ as the first member. The coronal fricative can combine with almost any of the complex or simplex onsets discussed above. It cannot combine with itself, neither with the palatals nor with the anterior affricate.

(13) S+ clusters

Siena	'Siena'	sporco	'dirty'
suocera	'mother-in-law'	storto	'crooked'
slalom	'slalom'	scala	'staircase'
snello	'slender'	sdrucciolo	'tri-syllabic verse'
smettere	'to stop'	spremuta	'fresh juice'
sveglio	'awake'	strada	'street'
sfida	'challenge'	scroscio	'roar'
sbagliare	'to go wrong'		

Davis (1990) argues on the basis of determiner selection that the /s/ in S+C onsets as well as the initial member of the irregular onsets discussed above are outside the onset.[3] Masculine nouns with a simple onset or an onset cluster of an obstruent plus sonorant have the definite article *il* (14a), while masculine nouns starting in S+C clusters and stop+stop as well as stop+nasal clusters take the determiner *lo* (14b), as has already been noted in the discussion of initial glides. The same holds in the plural, where the former nouns take *i* while the latter take *gli*. Vowel-initial nouns take *l′*.

Article selection of masculine nouns with different onset types

a.	il furbo	i furbi	'the smart fellow/s'
	il cretino	i cretini	'the idiot/fool/s'
b.	lo stronzo	gli stronzi	'the turd/s'
	lo pterodattilo	gli pterodattili	'the pterodactyl/s'
	lo gnu	gli gnu	'the gnu/wildebeest/s'
c.	l'orfano	gli orfani	'the orphan/s'

Another argument for a status of /s/ as outside the onset in S+C clusters put forward by Davis is their behaviour in raddoppiamento sintattico contexts. While the forms in (14a) undergo lengthening of the initial consonant when preceded by a stressed open syllable (15a), the /s/ in S+C clusters does not geminate (15b).

(14) Raddoppiamento sintattico and complex onsets

a. palˈtɔppuˈliːto	'clean coat'	b. palˈtɔzbaʎˈʎaːto	'wrong coat'
palˈtɔgˈgriːdʒo	'grey coat'		

[3] The same conclusion was reached by Chierchia (1983) for word-level phonology. Though, unlike Davis, Chierchia assumes a later adjunction rule which integrates the 'stray' /s/ into the onset.

A third argument can be drawn from the word- or morpheme-internal syllabification of consonant clusters. While a cluster as in /VtrV/ is always tautosyllabic, all /VsCV/ clusters are heterosyllabic (Chierchia 1986; Morelli 1999). This can be inferred from vowel length in stressed penultimate syllables. While stressed penultimate vowels followed by two consonants are always long if the consonant sequence consists of an obstruent plus sonorant, they are always short if the consonants stand in the reversed order, i.e. sonorant followed by obstruent, or if the vowel is followed by a geminate. A stressed penultimate vowel followed by /s/ plus any other consonant is always short. Thus, we can conclude that intervocalic consonant clusters are syllabified as complex onsets if these do not violate the restrictions on onset well-formedness. If the first consonant in the cluster cannot be parsed into an onset, as in the sequence VrtV, e.g. *orto* 'garden, orchard', it has to be syllabified as the coda of the preceding stressed syllable, causing the preceding vowel to be short. As the first member of an intervocalic consonant cluster /s/ is always syllabified in this way, as in *pesto* 'pesto'. Otherwise we would expect a preceding stressed vowel to be long. The situation is actually slightly more complicated, as discussed for example in Vogel (1982) and, in an interesting overview of phonetic and psycholinguistic experimentation, by Bertinetto (2004). Apparently, a syllabification as [.peː.sto.] is an option. However, below in the discussion of the syllable rhyme we will see that most distributional evidence points to a treatment of /VsCV/ as Vs.CV.

One possible alternative analysis concerns the initial consonant in forms such as those in (14b) as syllabified in an extra syllable with the consonant preceded by a silent nucleus. Thus, they are basically vowel-initial words, which explains their behaviour in article selection. The problem with this analysis is that it also has to explain why initial syllables with a silent nucleus also tolerate coda consonants which are otherwise strictly illegal in Italian, since the language only allows /s/, parts of geminates, liquids, and nasals homorganic with the following onset in word-internal codas, and is even more restrictive on word-final codas (see below). In their OT analysis, Wiltshire and Maranzana (1999) analyse word-initial pre-consonantal /s/ as tolerated in the onset, while it is syllabified in the coda of the preceding syllable in raddoppiamento contexts. I will discuss their analysis in more detail in section 5.4, which presents an OT analysis of syllable structure.

For now we leave the issue of syllable onsets and move on to the rhyme.

5.2 THE RHYME

Vogel (1982) formulated a restriction on Italian stressed syllables that they either contain a long vowel/diphthong or a coda consonant, i.e. stressed syllables have to be heavy. In Chapter 6 we will see that this requirement actually holds only for penultimate stressed syllables. This generalization differs slightly from another observation, which is that the maximal size of a syllable (rhyme) consists of either a long vowel/diphthong or a short vowel and one coda consonant (Basbøll 1974;

Vogel 1992; Chierchia 1982; 1986; Prince 1984; Itô 1988). In moraic theory we can formalize this as a restriction on syllables to bear maximally two moras. Under this view, coda consonants have to be assigned a mora by convention (i.e. Weight-by Position; Hayes 1989; 1995). This idea will be substantiated in the following section (5.2.1) and elaborated in more formal detail in 5.3. Section 5.2.2 takes a closer look at which consonants can occur, and recapitulates the emergence of the Coda Condition (Itô 1988).

5.2.1 The size of the rhyme

A striking feature of Italian is that long vowels only occur in stressed open penultimate syllables.[4] In this context short vowels are excluded. This has led to the conclusion that Italian has no vowel length contrast, and that length is a function of stress and/or foot structure (see Chapter 6). If a stressed penultimate vowel is followed by a sequence of two consonants of falling sonority or by a geminate it is always short, as exemplified in (15b).

(15) Vowel length and coda consonants

a. ˈpeːzo ‘weight’
ˈpeːlo ‘hair’
b. ˈpeʃʃe ‘fish’
ˈpɛtto ‘breast’
ˈpesto ‘pesto’
ˈpeska ‘fishing; peach’
ˈpensa ‘s/he/it thinks’
ˈpɛɾla ‘pearl’

Diphthongs with falling sonority cannot be followed by a consonant cluster of initially falling sonority or a geminate either (16a,b). Diphthongs with rising sonority, however, can be followed by a consonant cluster of initially falling sonority, at least those that historically stem from obstruent+liquid onsets (17c). While the former supports the claim that rhymes cannot exceed the size of two moras, the latter is additional evidence for the conclusion drawn in Chapter 4 that the rising diphthongs are not diphthongs in the strict sense, because the glide is actually parsed in the onset rather than the nucleus.

(16) Diphthongs and codas

a. ˈflawto ‘flute’
ˈlajko ‘lay, secular’
b. *flawʃʃo
*lajsko
*bojndo

[4] See Ch. 6 for a more in-depth discussion of length measurements of stressed vowels, and especially of the difference between penultimate and pre-penultimate stressed vowels.

c. ˈbjondo ‘blond’
ˈkjɔsko ‘kiosk’
ˈkjɔstɾo ‘cloister’
ˈkjɔtʃtʃa ‘broody hen, over-protective mother’
ˈfjanko ‘hip, side’

The fact that long vowels and true diphthongs do not combine with coda consonants does not necessarily imply that there cannot be any complex codas. A glance at intervocalic consonant clusters of more than two segments reveals very few exceptions to the generalization made above.[5] In intervocalic contexts we can assume that the first member(s) of every combination that cannot be a word-initial onset is/are in a coda. If codas can branch (i.e. contain two segments) this adds up with the nucleus to three segments in the rhyme. However, such tri- or poly-consonantal clusters are not attested. Tri-consonantal clusters are all sequenced in a way that maximally one consonant has to be attached to the preceding syllable.

There are a few words that seem to contradict the claim that a syllable cannot have more than two moras, listed in (17).

(17) Oversized rhymes

a. ˈawstɾja	‘Austria’	b. balaˈustɾa/	‘balustrade’
awsˈtɾaːlja	‘Australia’	baˈlawstɾa	
ˈawstɾo	‘South’		

It is noteworthy that most of the few examples are country names. In the only form listed here that is an ordinary noun, the preferred realization breaks up the offending sequence /aus/ into two syllables. Thus, I do not regard these data as counter-evidence to the generalization made on rhyme size.

In Chapter 6 we will encounter arguments that indirectly corroborate this finding. The Italian stress foot is maximally bimoraic as well. It seems a reasonable restriction on syllables that they cannot exceed the size of a foot.[6] Thus, one could consider the rhyme size restriction to be a side-effect of a moraic binarity restriction on stress feet. However, not all heavy syllables are provably in a stress foot, e.g. the first syllable in *Australia* ‘Australia’, or, to give an example of a less marked case, the first syllable in *paltò* ‘overcoat’. If these syllables do not receive main stress they could arguably still be inside a secondary stress foot and subject to the same restrictions as syllables carrying main stress. The existence of secondary stress at the word level in Italian is a matter of debate (see Chapter 6). Despite that, in the examples at hand, secondary stress,

[5] I will not look at word-final consonants here, since they are exceptional, and we will have a look at them when discussing the coda condition. The very few existing complex word-final codas I am aware of, e.g. *film, sport*, are definitely loanwords.

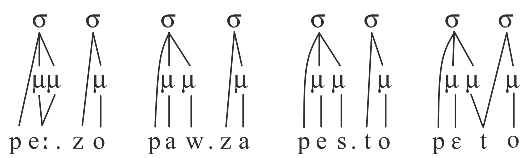
[6] For the sake of clarity I anticipate some of the analysis of foot structure that will be developed in Ch. 6. First, it is necessary to assume that at least all coda consonants in the penultimate syllable are moraic, because they attract stress. Furthermore, the vowel-lengthening patterns suggest that the final syllable of a word is usually not part of a foot (unless it is stressed). The result are foot structures such as the following, [(ˈkaː).za] ‘house’, [(ˈpes).to] ‘pesto’, [(ˈflaw).to] ‘flute’, i.e. feet are binary at the moraic level rather than the syllabic level, e.g. *[(ˈpes.to)].

which is expected if the syllable is footed, would cause a stress clash. Stress clashes are systematically avoided (see Nespor and Vogel 1979; 1989; Chapter 7 below). Accordingly I will posit a constraint limiting the number of moras in a syllable in the OT account below.

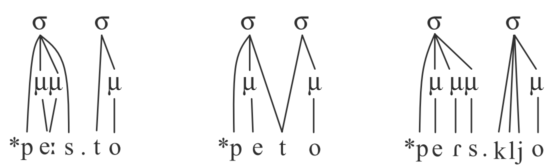
The trees in (18) show the assumed moraic analysis of syllable rhymes. (18a) illustrates legal rhymes while (18b) displays a selection of strictly illegal structures, which have either failed to assign a mora to coda consonants or exceeded the limit on moras per syllable.

(18) Exhaustive and maximally binary moraification

a.



b.



Our next task in the context of rhymes will be to define the rhyme positions in terms of quality. A quite obvious restriction on Italian nuclei is that consonants are strictly rejected in this position. This is not as trivial as one might think, since the admission of consonants in the syllable nucleus is quite common cross-linguistically. In the coda, or, more neutrally speaking, in post-vocalic and pre-pausal as well as pre-consonantal position, we find a subset of the Italian consonant inventory. In the next section we will have a closer look at these.

5.2.2 The coda condition

As shown in the previous section, on the basis of attested combinations of consonants in word-initial position and their behaviour in contexts such as article selection and raddoppiamento sintattico, we can determine which consonants are in coda position word-internally. Italian displays a radical difference in the possibilities for post-vocalic consonants word-internally and word-finally. While simple codas are quite frequent word-internally, the native lexicon at least does not allow word-final consonants. Words ending in consonants are of extremely low frequency and can all be identified as relatively recent loans (19a). A great many words historically ending in consonants or ending in consonants in sister languages, such as Spanish, end in a mid front vowel in Italian (19b). Words ending in a consonant such as those in (19a) do not strike native speakers as particularly exotic. Their existence proves that any vowel epenthesis strategy that might have resulted in the absence of word-final consonants is no longer operative as a general strategy.

(19) Word-final consonants

a.		b. *Italian*	*Spanish*	*gloss*
ˈbaɾ	‘bar’	leˈone	*leon*	‘lion’
ˈbus	‘bus’	ˈfjoɾe	*flor*	‘flower’
bɾiˈɔʃ	‘brioche’	koˈloɾe	*color*	‘colour’
ˈklub	‘club’			
ˈspɾajt	‘Sprite’[7]			
ˈfilm	‘film’			

The difficult question is whether the emergence of final consonants is a ‘lapse’ allowed in the lexical stratum of semi-adapted loanwords only or a general restriction on the Italian lexicon. That Italian speakers do indeed treat loanwords differently has been shown by Repetti (1993; 2006). Recent loanwords, even those looking like a more or less ordinary Italian noun because they end in an *o* or *a*, e.g. *euro* ‘Euro’, are not inflected for plural (**euri*).[8,9] Blocking of inflection is otherwise expected only in forms that have an irregular final vowel, e.g. *analisi* ‘analysis/analyses’ or a stressed final vowel, e.g. *paltò* ‘overcoat/s’.

Thus, under the assumption that for loanwords phonotactic restrictions are relaxed, one can say that in the core stratum of the lexicon word-final consonants are prohibited.[10]

Word-internal codas can be the first part of a geminate (20a), /s/ (20b), a nasal with the same place of articulation as the following consonant (20c), or the liquids, /r/ or /l/, (20d). Again, the statement has exceptions in some loanwords (20e).

(20) Word-internal codas

a.		b.	
ˈpatto	‘pact’	ˈkaspita	‘good gracious!’
ˈfaʃʃa	‘band, bandage’	ˈpasta	‘pasta’
ˈdʒɛmma	‘gem’	ˈkasko	‘helmet’
ˈkaɾɾo	‘cart’		
. . .			

c.		d.	
ampjo	‘ample’	ˈkɔɾpo	‘corpse, body’
tɾiˈoɱfo	‘triumph’	ˈkolpo	‘blow, stroke’
ˈpon̪t̪e	‘bridge’		
ˈʃentsa	‘science’		
ˈlintʃe	‘lynx’		
ˈkaŋkɾo	‘cancer’		

[7] Brand of soft drink.

[8] The currency used in Italy before the introduction of the euro, the lira, underwent regular inflection (*1 lira, 21,500 lire*). The unit below the euro, the cent, even though phonotactically quite exotic (or maybe *because* it violates phonotactic constraints?), was immediately and fully integrated into the language as *centesimo/centesimi*.

[9] In regional varieties, though, such words can undergo regular inflection.

[10] The statement has to be qualified further, since phrase-internally word-final vowels can be elided under specific circumstances: see 7.4.

e. ˈkɔpto / ˈkɔtto ‘Coptic’
at'lante ‘atlas, book of maps’
ˈɛtna / ˈɛnna ‘Etna’
ˈkaktus ‘cactus’

Glides, as the second half of diphthongs, are found in post-vocalic pre-consonantal position as well. However, at present I see no way to figure out whether they are syllabified in the nucleus or in the coda. The only diagnostic test is their free occurrence with following consonants of any place of articulation, which suggests that they are in the nucleus.

Nasal place assimilation, as illustrated in (21c), also applies across morpheme and word boundaries. The final nasal of pre-cliticized indefinite masculine articles usually shares the place of articulation with the first consonant of the following noun. The same holds for the negative prefix /in-/, which acquires the place—and, if followed by a sonorant, also the manner of articulation—of the following consonant.

(21) Nasal place assimilation across morpheme boundaries

a. umˈpo ‘a little’
uŋˈkarro ‘a cart’
b. imposˈsibile ‘impossible’
iŋkreˈdibile ‘unbelievable’
irreˈaːle ‘unreal’
illeˈdʒittimo ‘unlawful’

Itô (1988) formulates the coda condition in (22) to account for the restricted consonant inventory found in codas. She notes immediately (in a footnote) that this constraint is too liberal. The labial and the posterior coronal fricative are not found in coda position other than as part of a geminate, but they are not excluded by the coda condition in this formulation.

(22) The Coda Condition for Italian (Itô 1988:38)

$$\begin{array}{c} {}^*\mathrm{C}]\sigma \\ | \\ \begin{bmatrix} -\text{cont} \\ -\text{son} \end{bmatrix} \end{array}$$

With the feature theory used here we can identify the features banned in codas as c-manner[closed] and the place features [labial] and [dorsal]. The segments not found here are each specified for at least one of these features. All stops are c-manner[closed]. The illegal fricatives /f/, /v/ are specified for place [labial] and /ʃ/ is specified for the two place features [coronal, dorsal]. Thus, the constraint on the coda should refer to these features in a disjunctive way.

(23) Disjunctive coda condition

a. No c-manner[closed] in the coda.
b. No place feature [labial] or [dorsal] in the coda.

Nasal place assimilation to following onset consonants is a pattern to be seen as separate from the coda condition, since this is an extremely widespread phenomenon that also occurs in languages with less severe restrictions on codas.

In the OT section below we will discuss how a constraint system can naturally pick out these features as the marked case in a weak position. Furthermore, we will establish if the pattern is best accounted for by a negative constraint (set) with explicit reference to the coda or a positive licensing constraint that demands association to a prominent prosodic position (the onset) or via general markedness constraints in interaction with positional faithfulness. Furthermore, the difference between word-final and word-internal codas will be accounted for.

5.3 ACROSS SYLLABLE BOUNDARIES

Consonant co-occurrences across syllable boundaries are largely determined in Italian by the coda condition, i.e. there is a limited set of consonants that can occur in the coda which can be followed by almost any other consonant in the following onset. The consonants that cannot follow a coda are the inherently long consonants, or, more accurately, the palatals, since /ts/ or its voiced counterpart occurs after all possible coda consonants except /s/. This can be explained by the syllable size restriction. Since the inherently long consonants need a position in the preceding syllable to realize the underlying mora, there is no room for an extra consonant. It is surprising, though, that /ts/ behaves differently from the other long consonants.

Furthermore, the syllable junction seems to be governed by what Vennemann (1988) labelled the Syllable Contact Law. In terms of sonority, a coda has to be of higher or equal sonority compared to the following onset. While we find syllable junctures such as in *urlo* 'cry, shout, yell, shriek' the reverse junction, i.e. **ulro*, is not found. Also other rising sonority junctions, such as /Vn.rV/ or /Vn.lV/ are extremely rare, if attested at all (other than in personal names such as *Enrico*).

Combinations of /s/ with a following consonant of higher sonority also have a marginal status, confined to loanwords (as in *co*[zm]*o* 'universe', *pri*[zm]*a* 'prism'). If this is not an accidental lexical gap, it is not enforced across morpheme boundaries. Any prefix ending in /s/ can be combined with stems starting in almost any consonant, as long as it fits semantically (though see immediately below).

The coronal fricative does not occur before an affricate. The absence of /VstsV/ sequences cannot be attributed to the anterior affricate's length, following the reasoning above. However, if affricates are stops by nature, as argued in Chapter 4, we would expect sequences of the coronal fricative and the posterior affricate, which is not long by nature. The nonexistence of words like *[kostʃo] might be connected with the following observation.

Fricatives are quite restricted in their co-occurrence. Even though /s/ can occur in a coda, it is rarely found before another fricative other than itself (i.e. a geminate /s/, as in *cassa* ‘box’). The absence of sequences of the coronal fricative plus the posterior fricative can be attributed to the inherent length of the latter. Exceptions to this generalization on fricatives, such as *asfalto* ‘asphalt’ or *fosforo* ‘phosphor’, are very rare, however, and they are all loanwords. At the prefix/stem boundary we find an interesting split in the behaviour of affixes. While forms such as *sfortunato* ‘unlucky’ are absolutely acceptable, something like **s-sciacquato* ‘unrinsed’ is impossible, and expressed periphrastically as *non sciacquato* ‘not rinsed’. The same situation holds with respect to prefixes which span a whole syllable and end in /s/, such as *bis-*. A form like *bissciovinista* ‘extreme chauvinist’ is semantically possible, but would preferably be expressed as *ultra-sciovinista*.

In the current analysis in terms of segmental features, the ban on /s/ plus affricates and the posterior fricative could be understood as a ban on adjacent segments specified for [coronal], as briefly discussed already in section 4.2.2. Sequences such as /sj/, as in *Siena*, are also extremely uncommon and emerge mostly in derived forms (as in *siete* ‘you.pl are’ or *siamo* ‘we.pl are’). The same holds for monomorphemic /sr/ and /sn/ sequences. This supports the analysis of /t/ as lacking the feature [coronal], since it combines with preceding /s/ abundantly in monomorphemic as well as morphologically complex contexts.

(24) summarizes the observations on syllable contacts (somewhat cursorily). The coda consonant is represented in the first column, while the following onset consonant is represented in the first row. In the cells that represent the combination of two identical segments these must indeed be identical, i.e. a geminate to occur in a sequence of coda and onset. The nasal is given as a capital letter to indicate that it has to have the same place of articulation as the following segment, or can be labial or coronal as an onset. The question mark indicates that the status of the occurrence is a bit dubious. The combinations of stop plus stop or affricate are all phonetically geminates. The interesting feature of this table is the slope towards the bottom right corner, indicating rising incompatibility of segments of successively rising sonority with following segments of successively rising sonority. To put it the other way round, the lower a coda consonant is in sonority the less compatible it is with other following onset segments.

(24) Syllable contacts

Onset

Coda	t	ts	tʃ	f	ʃ	s	N	l	r
t	+	+	+						
s	+			?		+			
N	+	+	+	+		+	+		
l	+	+	+	+		+	+	+	
r	+	+	+	+		+	+	+	+

With respect to the coronal OCP, we can conclude that a segment like /n/ in coda position does not have its own place feature anyway, and therefore can combine with anything else if in a coda. The onset (or contrastive) alveolar nasal was analysed above as specified for [coronal]. And so was /s/. This explains the incompatibility of coda /s/ with onset /n/, though not the extremely marginal status of coda /s/ plus any other nasal. Going further down and rightward in the table, to be excluded from combination with preceding /s/ and /n/ the lateral needs a feature [coronal], which it is assumed to have. However, if this is the case, the lateral should not be combinable with a preceding /r/, which is specified for [coronal] as well. Moreover, if the lateral and the tap can be combined in one order, they should also occur in the other order. It seems as if our coronal OCP can explain some aspects of syllable juncture phonotactics but not all. It is unsatisfactory, though, to leave these observations as historical accidents—which, at the end of the day, they might be.

5.4 AN OT ANALYSIS OF ITALIAN SYLLABLE STRUCTURE

I begin with the observation that onsets are not obligatory at the beginning of the word. In other languages (e.g. German) we observe that consonant epenthesis provides a consonantal onset. Usually a glottal stop is inserted to this effect. Basic syllable structure, i.e. the presence or absence of obligatory onsets and whether a language allows codas or not, is analysed by the interaction of four constraints in OT. The markedness constraint ONSET favours syllables that start with a consonant, and the markedness constraint *CODA prohibits syllables that end in a consonant. Interaction of these with two basic faithfulness constraints explains the different preferences we find among languages. MAX-IO is violated by deletion of segments. That is, a post-vocalic consonant violates *CODA, but its deletion to avoid this markedness violation results in violation of MAX-IO. Similarly, insertion of a consonant, to provide an onset and avoid violation of ONSET, is opposed by the faithfulness constraint DEP-IO.

(25) Constraints on basic syllable structure

ONSET: Syllables start with a consonant.
*CODA: Syllables end in a vowel.
MAX-IO: Any segment present in the input is present in the output.
DEP-IO: Any segment present in the output is present in the input.

Since Italian displays neither insertion nor deletion to improve basic syllable structure, the two faithfulness constraints have to rank higher than the two markedness constraints.

(26) Liberal syllable structure

/orto/	MAX-IO	DEP-IO	ONSET	*CODA
☞ a. orto			*	*
b. ʔorto		*!		*
c. ʔoto	*!	*		
d. oto	*!		*	
e. to	*!*			

Nor do we find that metathesis repairs basic syllable structure. In the example at hand, swapping the initial vowel and the tap would result in optimal performance on both markedness constraints. Thus, a faithfulness constraint guarding the linear order of input segments has to be in the top stratum as well.

(27) LINEARITY-IO: The linear order of segments in the input is preserved in the output.

(28) No metathesis

/orto/	LINEARITY-IO	ONSET	*CODA
☞ a. orto		*	*
b. roto	*!		

The native lexicon does not contain any consonant-final forms. McCarthy and Prince (1995; 1999) propose a faithfulness constraint that is violated if a segment inside a string is removed or added, CONTIGUITY. High ranking of this constraint explains the emergence of word-internal and absence of word-final codas. The only evidence we have for the ranking of *CODA with respect to MAX-IO and DEP-IO is the historical emergence of final [e] in content words.

(29) Differential coda ban[11]

/kortil/	MAX-IO	CONTIGUITY	*CODA	DEP-IO
a. kortil			**!	
b. koti	*!*	*		
c. korti	*!		*	
d. kotil	*!	*	*	
e. koretile		*!		**
☞ f. kortile			*	*

[11] This tableau is not intended to indicate that a form such as *cortile* 'courtyard' is stored lexically as the structure given as the input here. The input in this tableau is purely hypothetical, imposed upon the analyst by a fundamental tenet of OT, the Richness of the Base. Any grammar postulated for a given language or phenomenon in a language should exclude systematically unattested forms. The same holds for the other tableaux in this section.

The next fundamental observation is that the syllable nucleus can only be occupied by a vowel. We have acquainted ourselves with Prince and Smolensky's sonority-based hierarchy on syllable positions already in Chapter 4. For the sake of simplicity I do not reformulate this hierarchy in terms of the segmental features introduced in Chapter 4, but instead confine myself to the observation that the division between nuclei and margin positions is defined sharply in Italian.

(30) Only vocalic nuclei[12]

/tr/	*PEAK/ STOP	*PEAK/ CONT	*PEAK/ NAS	*PEAK/ LIQU	MAX	DEP	ONS	*CODA
a. .t.ɾ.	*!			*			*	
b. .tɾ.				*!				
c. .teɾ.						*		*!
☞ d. .tɾe.						*		
e.					**!			

We find maximally binary onsets and simplex codas (we will return to /s/+C(C) onsets shortly). Thus, the markedness constraint against complex onsets is dominated by faithfulness, while the constraint against complex codas resides at a higher stratum than faithfulness.

(31) Complex onsets but no complex codas[13]

/trarlta/	*COMPLEX CODA	LINEARITY	CONTIG	MAX	DEP	*COMPLEX ONSET
a. .tɾaɾl.ta.	*!					*
b. .tva.ta.			**	*!*		*
c. .ta.ta.			***!	***		
d. .taɾl.ta.	*!		*	*		
e. .tɾaɾ.ta.			*	*		
☞ f. tɾa.ɾel.ta.			*		*	
g. tɾal.tɾa.		*!				**

On the other hand, it was established above that an Italian syllable can have maximally two moras, and that any consonant not in an onset automatically receives a mora.

[12] An alternative to deletion or insertion is of course to change one of the segments into a vowel to optimize syllable structure. Without conducting serious experiments on this matter we cannot decide this issue, since Italian does not provide any alternations that would shed light on it.

[13] For this tableau the same disclaimer holds as for the previous tableaux. Which strategy speakers actually applied if confronted with inputs containing illegal structures is not something we can be certain about at present, and there are additional strategies available to optimize the given constraints other than those displayed by the candidates.

With these severe restrictions on Italian rhymes in place, any complex coda is ruled out without recourse to *COMPLEXCODA, which in any case just restates the observation that there are no complex codas.

(32) *COMPLEXCODA decomposed

/trarlta/	WEIGHT-BY-POSITION	$*>(\mu\mu)_\sigma$	*CPLX CD	LIN	CONTIG	MAX	DEP
a. .tra$^{\mu}$ɾ$^{\mu}$l$^{\mu}$.ta$^{\mu}$.		*!	*				
a'. .tra$^{\mu}$ɾ$^{\mu}$l.ta$^{\mu}$.	*!		*				
b. .tra$^{\mu}$.ta$^{\mu}$.						**!	
☞ e. .tra$^{\mu}$ɾ$^{\mu}$.ta$^{\mu}$.						*	
☞ f. tra$^{\mu}$.ɾe$^{\mu}$l$^{\mu}$.ta$^{\mu}$.							*
g. tra$^{\mu}$l$^{\mu}$.tra$^{\mu}$.				*!			

Once we have complex onsets, the grammar has to place limits on the combinatorial possibilities within these. The grammar also has to limit the possible coda consonants. First, above I have given a relatively informal inventory of restrictions on feature combinations and alignment of features either with the margin or with the nucleus, which determine the upper limit to the number of segments in an onset, their sequencing, and which segments may be combined. Thus, the general maximum of two segments in an onset is not a binarity effect, as can be said of the size limit of the rhyme (i.e. 'syllables are maximally binary at the moraic level'), but instead epiphenomenal, as we will see shortly.

The usual approach to onset phonotactics uses the sonority hierarchy, and implements restrictions on segment order and combination in the form of a scale of constraints that determine the minimal sonority distance from one segment to the next. Wiltshire and Maranzana (1999) present such an OT version of Davis' (1990) theory of cluster syllabification. In their analysis, the *s* in *s*+Stop(sonorant) clusters is in the onset. The sonority sequencing principle is taken for granted, and onset phonotactics are analysed as an interweaving of the constraint hierarchy in (33) with faithfulness constraints. The numbers in the constraints refer to steps on the sonority hierarchy displayed in (4).

(33) Onset constraints (Wiltshire and Maranzana 1999)

*EQSON: Onset segments do not have equal sonority. (or *<1DIFSON: Onset segments differ in sonority by no less than 1.) ≫
*<2DIFSON: Onset segments differ in sonority by no less than 2. ≫
*<3DIFSON: Onset segments differ in sonority by no less than 3. ≫
*<4DIFSON: Onset segments differ in sonority by no less than 4.

In their analysis, MAX-IO and DEP-IO are ranked just above *<4DIFSON. This explains why there are no initial geminates and why obstruents do not combine with nasals, but obstruents followed by liquids are legal.

(34) Onset well-formedness as sonority sequencing

	*EqSon	*<2DifSon	*<3DifSon	Max/Dep	*<4DifSon
.tta.	*	*	*		*
.tfa.		*	*		*
.tna.			*		*
.tra.					*

The analysis is also intended to account for /sC(C)/ onsets. According to Wiltshire and Maranzana, /s/ plus obstruent does not violate the highest-ranked constraints on the scale, but only *<4DifSon. However, this analysis overlooks a small detail. The sonority difference demanded in these constraints has to imply rising sonority towards the nucleus. Otherwise onsets such as /rt/ would be legal, since the sonority difference between /r/ and /t/ is bigger than four steps on the scale, no matter what order the segments are in. Coronal fricatives are indeed quite a distance from voiceless stops on the sonority hierarchy used here, with voiceless stops on step one and coronal fricatives on step four. This, however, makes /s/ more sonorous than voiceless obstruents. Thus, the first onset in a form like *sporco* 'dirty' is as bad as an initial geminate in terms of Wiltshire and Maranzana's constraints, and thus could never survive.

(35) Interpretation of *<xDifSon

	*EqSon	*<2DifSon	*<3DifSon	Max/Dep	*<4DifSon	*<5DifSon
.rta.	*	*	*		*	*
.nta.	*	*	*		*	*
.sta.	*	*	*		*	*
.tta.	*	*	*		*	*
.tsa.			*		*	*
.tna.					*	*
.tra.						*

Apart from faithful realization, metathesis, change, and deletion, OT offers a fifth choice in case a segment violates constraints on syllable well-formedness. A segment can be realized, but not syllabified. Recall that in Davis' analysis the word-initial preconsonantal /s/ was not integrated in the constituents of the syllable either. In the original OT model of faithfulness (Prince and Smolensky 1993), faithfulness was a matter of exactly this: the faithfulness constraint Parse took care of all segments being parsed in the next higher prosodic level of organization, while the constraint Fill made sure every syllable constituent contains some lexical material. An unsyllabified segment was considered as having no phonetic realization because it lacked integration in higher prosodic structure, i.e. it was inaudible. Phonologically, though, it was assumed to be present in the surface representation, which was enshrined in the Containment hypothesis. With the advent of Correspondence Theory, the Containment hypothesis was abandoned and deleted material was assumed to be literally absent from the surface representation. PARSE constraints were nevertheless still used to capture the hierarchical relation between syllables and feet, for example. Thus, a syllable has the option of either being part of the next higher prosodic constituent or of being outside, but visible (or audible), in each case. If we consider this option for the relation between segments and syllables as well, we can describe segments as being (audibly) present in a surface representation, but not syllabified.

Tableau (36) illustrates this theory of faithfulness and prosodic parsing. Candidate (a) is the faithful candidate that offends markedness by having an /s/ illegally precede a consonant. Candidates (b, c) represent the repair strategies. Candidate (b) displays plain deletion: a segment present in representation I is absent from corresponding representation O, which violates MAX-IO. Candidate (c) stands for the 'Spanish solution': a vowel is epenthesized to avoid violation of the important markedness constraint. This candidate fails on DEP-IO. Finally, candidate (d) has solved the dilemma by simply not including the /s/, which creates the offence, in the next syllable; it is a prosodic stray segment which nevertheless receives phonetic interpretation.

(36) Underparsing without deletion

/strontso/	PHONO	MAX-IO	DEP-IO	PARSE-seg
a. .stron.tso.	*!			
b. .tron.tso.		*!		
c. .es.tron.tso.			*!	
☞ d. <s>.tron.tso.				*

Such an analysis, as Davis pointed out, explains the non-application of gemination in raddoppiamento sintattico contexts observed with /sC(C)/ clusters, as will be shown in more detail in section 7.3, as well as the choice of determiner typical for this type of word (*lo stronzo* rather than **il stronzo*).

(37) Definite article selection[14]

/il ∨ lo strontso/	PHONOTACTICS	WBP	σ-BIN	MAX-IO	PARSE-seg
a. .il. <s>tron.tso.					*!
b. .ils.tron.tso.		*!			
c. .ils.tron.tso.			*!		
d. .lo<s>.tron.tso.					*!
☞ e. .los.tron.tso.					

[14] This is not intended as an exhaustive analysis of the allomorphy involved in determiner selection. I am aware that this analysis runs into severe difficulties if the two allomorphs of the article are always assumed to be present in the input, since *il* would not be chosen over *lo* in the appropriate environments (e.g. **lo ponte* > *il ponte* due to an additional *CODA violation in the latter). Vice versa, there are contexts in which the current analysis sketch predicts the illegal selection of *il* over *lo/l'*, as with vowel-initial nouns, e.g. *analisi* 'analysis':

Three issues require further clarification in this context. First, why is it only /s/ that can surface without syllabic affiliation? Second, cross-linguistically this only happens at word margins (though one might argue about forms such as *extra*, and not only in Italian). The third matter is whether this analysis can be extended to word-final position in Italian as well. We will first see why it is only /s/ that occurs in this position. This will inform the formal account of the coda condition later on. For the second observation I can currently envisage three explanations. First, there could be a restriction in GEN that does not allow interrupted strings of syllables within the word domain; second, this could be attributed to a universally undominated constraint demanding that syllables be adjacent to other syllables or a pause. The third option could simply be that the observation that extrasyllabic segments occur at word margins only is simply not true; the constraint on syllable contiguity is an ordinary constraint that can be ranked and violated like any other constraint. I will come back to this shortly.

It is a well-known fact that the different places of articulation are subject to different markedness conditions (see e.g. Prince and Smolensky 1993; de Lacy 2006 and references cited there). Labial and dorsal are generally regarded as more marked than coronal. De Lacy proposed the following set of disjunctive constraints to account for this fact without reference to universally fixed rankings (see also the discussion in 4.2.4).

(38) Differential markedness of place of articulation

a. *[dors]
b *[lab] ∨ *[dors]
c. *[lab] ∨ *[dors] ∨ *[cor]

In interaction with a positional faithfulness constraint, such as IdentOnset, these constraints ban all non-coronal consonants that are not associated to an onset.

(39) Restricting place in pre-onset position

/ftra/	Phono	Max	Dep	Ident Ons	*[lab]∨*[dors]	Ident
a. ftra	*!					
b. stra	*!	*		*		
c. ʃtra	*!		*	*		
d. <f>.tra					*!	
☞ e. <s>.tra						*
f. <ʃ>.tra.					*!	*

*[.i.la.na.li.si] could be preferred over [.la.na.li.si] because the latter has an additional violation of Max which counts more than the former's violation of Onset. Thus, either we are still far from an understanding of Italian article selection or it is indeed a quirky offshoot of prescriptivism, and therefore outside the realm of grammatical analysis. See too the remarks on this issue in the context of the behaviour of initial glides in 4.2.3.

This grammar still allows for the coronal nasal and the coronal stop in the unsyllabified pre-onset position. Thus, the features that define these segments have to be excluded via high-ranking markedness as well.

(40) Restricting manner in pre-onset position

	PHONO	*[lab]∨*[dors]	*c-manner [closed]	*[nas]	FAITH	*c-manner [open]
a. nkɾa	*!				?	
b. tkɾa	*!		*		?	
c. skɾa	*!				?	
d. <n>.kɾa				*!	?	
e. <t>.kɾa			*!		?	
☞ f. <s>.kɾa.					?	*

The liquids do not occur in the same way. In Chapter 4 I discussed whether there should be a redundant (non-contrastive) feature [sonorant]. Especially since /r/ was specified as [coronal] only without any manner or other feature, it seems necessary now to assume such a redundant feature. This assumption, together with the appropriate markedness constraint ranked in the position where (40) shows *[nas], excludes all sonorants in one fell swoop. In the discussion of the coda condition below, we will bring further order into the ranking of markedness constraints introduced so far.

With this part of the analysis set, we can return to the question of what happens to word- or morpheme-internal excessive clusters containing CSC(C).

The Contiguity constraint introduced above must be conceived, like most types of faithfulness constraint, as only one member of a whole family of constraints of the same type. McCarthy and Prince (1995; 1999) distinguish I-Contiguity and O-Contiguity, which militate against string-internal insertion and deletion, respectively. Krämer (2005) extends the scheme to string-internal segmental features. Pater (1997) and Krämer and Graf (2006) use CONTIGUITY constraints that refer to syllables as the relevant string domain. A constraint demanding exhaustive parsing of segments into syllables without string-internal gaps in fact deviates substantially from the definition and scope of Contiguity constraints. However, the important aspect of the constraint is that it demands contiguous parsing. In ignorance of a better term I label the constraint σ-CONTIGUITY here.

(41) σ-CONTIGUITY: Every syllable edge is adjacent to another syllable edge or a pause.

(42) No word-internal extra-syllabic consonants[15]

/finstra/	SonSeq	WbP, σ-Bin	σ-Contig	Max-IO	Dep-IO	Parse-seg
a. .fin.stra.	*!					
b. .fins.tra.		*!				
c. .fin.tra.				*!		
d. .fin.<s>.tra.			*!			*
☞ e. .fi.nes.tra.					*	

The analysis allowing word-initial unparsed segments as developed here also allows word-final extrasyllabic consonants (something that has been put forward e.g. for English—see the discussion in Hall 2002). This holds regardless of how codas are analysed later on. Marginal /s/ receives a special status now at both edges of the word. Whether we have to treat words ending in /s/ in the same way as all other final consonants, or whether final /s/ is a side-effect of the emergence of initial /s/, is a question that cannot be answered in this context. However, I will return briefly to this issue after dealing with word-internal codas.

(43) Exclusive word-final coronal fricatives

	*Coda	*[lab]∨*[dors]	*c-manner [closed]	*[nas]	Faith	*c-manner [open]
a. .bus.	*!				?	
b. .bu.<s>					?	*
c. .but.	*!				?	
d. .bu.<t>			*		?	

The conditions on word-internal codas can now be tackled. The same markedness constraints as we used to restrict the initial extra-syllabic position already delimit the segment classes eligible to parsing in a word-internal coda. However, as tableau (44) shows, the current grammar is too restrictive. The candidates marked with ☜ are the attested codas, i.e. geminates (d), the coronal fricative (e), and sonorants (f–e). So far, we only generate the coronal fricative in coda position.

[15] As with previous tableaux, it does not follow from this analysis that words like *finestra* 'window' are underlyingly /finstra/. Within OT, Lexicon Optimization (LO), as argued for in Inkelas (1994) as well as Beckman and Ringen (2004), would generate an underlying representation identical to the input in such cases. For a critique of LO see Krämer (2006a), Nevins and Vaux (2007).

(44) Word-internal codas: I

	IDENT ONS	*[lab]∨*[dors]	*c-manner [closed]	*[son]	IDENT	*c-manner [open]
* a. .ap.ta.		*	*		?	
* b. .af.ta.		*			?	*
* c. .am.ta.		*			?	
☜ d. .at.ta.			*		?	
☜ e. .as.ta.					?	*
☜ f. .an.ta.				*	?	
☜ g. .aɾ.ta.				*	?	
☜ e. .al.ta.				*	?	

The faithfulness constraint that saves morpheme-internal coda consonants from deletion has to be inserted above the markedness constraint against sonorants. It should also be below the markedness constraint against stops. At first sight this seems to exclude not only coronal stops but also any geminate. Geminates, however, are treated as single segments, bearing a mora and affiliated to two prosodic positions in two syllables.

Here the treatment of geminates is important. Geminate consonants have a mora linked to their root node underlyingly. As we have noted already, vowels are not contrastive for length in Italian, while consonants are. Morén (2001) analyses this configuration in OT and moraic theory as follows. Long vowels are banned by the markedness constraint *Vμμ, while the markedness constraint *Cμ opposes long consonants or moraic consonants in general. WEIGHT-BY-POSITION (WBYP) demands that coda consonants bear a mora, and has to outrank *Cμ in Italian. MAXμ safeguards the faithful realization of underlying moras. Since vowels are not contrastive, *Vμμ has to be ranked higher than MAXμ; and since consonants are contrastively long or short, MAXμ dominates *Cμ.

(45) Length contrast in consonants

$\text{pja}^{\mu\mu}\,\text{t}^{\mu}\text{o}$	WBYP	*Vμμ	MAXμ	*Cμ
a. $\text{pja}^{\mu\mu}\,\text{t}^{\mu}\text{o}^{\mu}$		*!		*
b. $\text{pja}^{\mu}\,\text{to}^{\mu}$			*!*	
☞ c. $\text{pja}^{\mu}\,\text{t}^{\mu}\text{o}^{\mu}$			*	*

(46) Potential oversized syllables (cf. (18))

$\text{pja}^{\mu\mu}\,\text{nt}^{\mu}\text{o}$	WBYP	σ-BIN	*Vμμ	MAXμ	*Cμ
a. $\text{pja}^{\mu\mu}\,\text{nt}^{\mu}\text{o}^{\mu}$	*!		*		*
b. $\text{pja}^{\mu\mu}\,\text{n}^{\mu}\text{to}^{\mu}$		*!	*	*	
c. $\text{pja}^{\mu}\text{n}^{\mu}\text{t}^{\mu}\text{o}^{\mu}$		*!		*	**
☞ d. $\text{pja}^{\mu}\text{n}^{\mu}\text{to}^{\mu}$				**	*

Now we can return to the treatment of intervocalic geminates. The high-ranking faithfulness constraints IDENTONS, MAXμ, σ-CONTIGUITY leave no choice but to enforce violation of the markedness constraints on segmental features which otherwise are neutralized.

(47) The realization of geminates

/bok$^{\mu}$a/	IDENT ONS	MAXμ	*[lab]∨ *[dors]	*c-manner [closed]	IDENT	*c-manner [open]
☞ a. .bo$^{\mu}$k̩$^{\mu}$a$^{\mu}$.			**	**		
b. .bo$^{\mu}$k$^{\mu}$.ka$^{\mu}$.			***!	***		
c. .bo$^{\mu}$.ka$^{\mu}$.		*!	**	**		
d. .bo$^{\mu}$s$^{\mu}$.ka$^{\mu}$.			**	**		*!
e. .bo$^{\mu}$s̩$^{\mu}$a$^{\mu}$.	*!*			*	*	*
f. .so$^{\mu}$s̩$^{\mu}$a$^{\mu}$.	*!***				**	**

To account for the emergence of sonorants in word-internal codas, an additional faithfulness constraint exerts its influence. This faithfulness constraint belongs to the CONTIGUITY family of constraints. We have already used CONTIGUITY constraints referring to features in the middle of a string, as opposed to features at the margin of a string (F-CONTIGUITY), in section 4.2.1 in the analysis of velar palatalization in derived environments. This instantiation of F-CONTIGUITY is violated if a segment's manner feature is changed that is situated between two other segments. Since we want to avoid *Vt.pV clusters but explain the emergence of Vn.tV sequences, the constraint has to dominate *[son] and has to be placed below the other two markedness constraints involved. By transitivity of ranking, this brings the three markedness constraints which were unranked so far in a partial order.

(48) Sonorant codas

i. /palko/	IDENT ONS	*[lab]∨ *[dors]	*c-man [closed]	F-CONT manner	*[son]	IDENT
☞ a. .pal.ko.		**	**		*	
b. .pat.ko.		**	***!	*	*	*
c. .pas.ko.		**	**	*!	*	
d. .p.al̩$^{\mu}$o.	*!	**	**	*	*	*

ii. /tporko/	PHONO	IDENT ONS	*[lab]∨ *[dors]	*c-man [closed]	F-CONT manner	*[son]	IDENT
a. .tpoɾ.ko.	*!		**	***		*	
b. .spoɾ.ko.	*!		**	**		*	*
c. <t>.poɾ.ko.			**	***!		*	
☞ d. <s>.poɾ.ko.			**	**		*	*
e. <s>.pot.ko.			**	***!	*		**
f. <s>.pos.ko.			**	**	*!		***

The CONTIGUITY constraint blocking the effect of markedness constraints because of its relatively high ranking has another side-effect. This constraint does not protect consonants at morpheme or word margins, as illustrated by the evaluation of *sporco* ‘dirty’ in (48ii). What holds for initial consonants also holds for final consonants. Any word-final consonant other than /s/ has to be repaired or brought out of this position via vowel epenthesis. As we have seen above, word-final consonants are attested in Italian. The question is whether or not these final consonants are a collateral effect of marginal extra-syllabicity. Since the set of consonants we find at the end of (loan)words is a superset of the initial extra-syllabic consonant set (containing only /s/), an analysis that allows final consonants in loanwords via a high-ranking faithfulness constraint indexed to loanwords is more in tune than final extra-syllabicity.[16] The latter might be an effect of a prosodic alignment constraint mapping the right edge of the (prosodic) word with the right edge of a syllable.

The Coda Condition is not an exclusively Italian phenomenon. Languages that show restrictions on codas display patterns very similar to the Italian pattern, as illustrated by Itô (1988) through the comparison of Italian and Japanese which shows very similar coda restrictions.[17] Prince and Smolensky (1993) formalized the different preferences for segment classes in syllable margins vs. nuclei with universal hierarchies of markedness constraints derived by cross-linguistic generalizations on positional markedness, as mentioned already in previous chapters, which are translated into our feature system here in (49a, b).[18] For the right margin of the syllable, however, the hierarchy has to be partially reversed, as in (49c). For Italian, a further reranking is needed to account for the one fricative in coda position, (49d).

(49) Segmental markedness and syllable position

a. Syllable margin:
*v-manner $\gg$ *v-place $\gg$ *[son] $\gg$ *[nas] $\gg$ *c-manner[open] $\gg$
*c-manner[closed]

b. Syllable core:
*c-manner[closed] $\gg$ *c-manner[open] $\gg$ *[nas] $\gg$ *[son] $\gg$
*v-place $\gg$ *v-manner

c. Right from the core:
*[lab/dors], *c-manner[closed] $\gg$ *c-manner[open] $\gg$ *[nas] $\gg$ *[son]

d. Right from the core (Italian-style):
*[lab/dors], *c-manner[closed] $\gg$ *[nas] $\gg$ *[son] $\gg$ *c-manner[open]

The latter amendment to the ranking options raises the suspicion that Italian /s/ is probably not specified for the feature c-manner[open]. This has repercussions for the

[16] On the other hand, other languages that have been analysed as displaying extra-syllabic consonants (such as Germanic languages) also show different sets of consonants in initial and final position.

[17] English, with its ban on liquids in codas, as evidenced by ‘r-dropping’ and l-vocalization, is the exceptional case in this respect, since the affected varieties of English allow obstruents and nasals in the coda but no sonorants, while most languages with coda restrictions allow only nasals, or nasals as well as other sonorants, but no obstruents.

[18] Given the problematic status of universal constraint rankings, the same can be achieved if the constraints are restated in a stringent fashion, as by de Lacy (2004); see (38) above.

analysis of the inventory. If /s/ is just [coronal], /r/ has to receive a different analysis from the one adopted here. This, however, is a question that has to be answered by future research.

A final aspect of the coda condition is the assimilation of nasals to the following consonant with regard to place of articulation. As mentioned earlier, this is not necessarily strictly connected to the coda condition, since nasal place assimilation also occurs in languages without specific restrictions on codas.

There have been various proposals for the analysis of assimilation patterns in OT. A matter of debate is whether such patterns are triggered externally or internally. The former stance attributes assimilation as a side-effect of independently motivated constraints, while the latter stance postulates assimilation - specific constraints, such as ALIGN-Feature constraints, AGREE(F), or Syntagmatic Identity (S-IDENT(F)).

With the current grammar we can explain the assimilation of potential underlying labial or dorsal nasals to following onset consonants.

(50) Nasal place assimilation

/amkora/	IDENT ONS	*[lab]∨ *[dors]	*c-man [closed]	F-CONT manner	*[son]	IDENT	*[cor]
a. amkoɾa		**!	*		*		
b. ampoɾa	*!	*	*		*	*	
c. ankoɾa		*	*		*	*	*!
☞ d. aŋkoɾa		*	*		*	*	

However, why a coronal nasal is not found in front of a labial or dorsal consonant needs explanation.

(51)

/ankora/	IDENT ONS	*[dors]∨ *[dors]	*c-man [closed]	F-CONT manner	*[son]	IDENT	*[cor]
☞ a. ankoɾa		*	*		*		*
b. antoɾa	*!	*	*		*	*	
c. aŋkoɾa		*	*		*	*!	

A convenient solution is to split up faithfulness to place of articulation in faithfulness related to obstruents and faithfulness in relation to other consonants.

(52) Split faithfulness and nasal place assimilation

/ankora/	IDENT ONS	*[lab]∨ *[dors]	*c-man [closed]	*[son]	IDENTOBSTR [PLC]	*[cor]	IDENT [PLC]
a. ankoɾa		*	*	*		*!	
b. antoɾa	*!	*	*	*	*		*
☞ c. aŋkoɾa		*	*	*			*

The other sonorants do not occur with any place specification other than [coronal] anyway. There is thus no need to explicitly exclude dorsal or labial laterals or taps (owing to the articulatory problems involved in producing such segments). A matter of concern is still why the dorsal nasal only surfaces as the result of assimilation, but not contrastively. This is even more a conundrum since, in local dialects which do not have the final vowels, nasals in word-final position regularly surface as dorsal (e.g. *bambi*[ŋ] instead of *bambi*[n]*o* 'child(.masc.)').

A potential analysis might endorse McCarthy's (2003b) Theory of Comparative Markedness, which seems perfectly designed to account for non-structure-preserving phonological processes, as shown by Krämer (2006c). Such an account could then be extended to the segments that were thought to derive from underlying segment sequences, such as [ʃ]. However, the purpose of this chapter was not to deal with structure preservation, but rather to give an overview and analysis of Italian syllable structure. Accordingly I regard this as a matter for future investigation.

6

WORD STRESS

In this chapter I will focus on word stress. The chapter is organized as follows. I will first introduce the conundrum of Italian word stress placement, which is that the stress system is obscured by lexical stress both in roots and in affixes. We will see that, at least for nouns, a default stress assignment algorithm cannot be determined in every detail. We will further see that for verbs there are ways to determine the default stress algorithm. The determining criteria for verbs are that stress goes on the penultimate syllable unless there is a lexical stress mark in the root or in an affix in a given form. The Italian foot structure will be shown to be maximally a bimoraic trochaic foot. After these preliminaries, I show that with nouns native speakers of Italian have the same problem as the linguistic analyst. It is not possible to determine the default algorithm unambiguously. A nonce-word test shows that speakers make individual decisions on this issue that diverge from one another. An aspect of the system all speakers agree on, though, is that a heavy penult attracts stress. After dealing with main stress I will discuss secondary stress. Even though an analysis of secondary stress in non-compound words has been produced (Vogel and Scalise 1982), the existence of secondary stress itself is disputed. Our conclusion here will be that secondary stress is optional and has a tendency not to be realized. The final issue that will be investigated in this chapter is the domain of stress assignment, and as such the nature of the prosodic word in Italian.

6.1 OVERVIEW

The first observation to be made regarding the location of main stress in the word is that any of the three final syllables can be stressed (1a–c). In some inflected verb forms, we find stress even on the fourth last syllable (1d). In the following overview I will first concentrate on nouns (and adjectives) and then turn to verbs. The reason is that we have to draw slightly diverging conclusions from the data we find for the two respective lexical categories.

(1) Unpredictable word stress

a. tʃit.ˈta	‘city’	b. pa.ˈrɔː.la	‘word’
pal.ˈtɔ	‘coat’	ba.ˈnaː.na	‘banana’
vir.ˈtu	‘virtue’	me.lan.ˈtsaː.na	‘aubergine’
ko.li.ˈbri	‘hummingbird’		

c. sˈtuˑ.pi.do ‘stupid’ d. im.ˈma.dʒi.na.no ‘they imagine’
pen.ˈtaˑ.go.no ‘pentagon’
ˈriˑ.de.re ‘to laugh’

In the examples in (1), stress placement is not governed by syllabic weight, as can be seen from the first two forms in (1a), the third form in (1b), the second form in (1c), and the form in (1d), respectively, where a heavy syllable is shunned in favour of a light syllable; nor is stress placement governed by the sonority of the vowels (see Kenstowicz 1996b for sonority-driven stress placement). Thus, one has to conclude that lexically marked stress overrides any stress placement algorithm. This is supported by minimal pairs, as given in (2).

(2) Minimal pairs

a. ˈmeː.ta ‘aim’ b. ˈaŋ.ko.ra ‘anchor’
me.ˈta ‘half’ aŋ.ˈkoː.ra ‘still, yet’
c. ˈmer.tʃe ‘goods’
mer.ˈtʃe ‘mercy’

On the basis of (2a,b), one might still conclude that the position of stress is governed by syllable weight, with long vowels and coda consonants making a syllable heavy. Such an analysis, however, has already been ruled out on the basis of the examples in (1), and it is further shown to be inadequate by the pair in (2c).

Nevertheless, quantity deserves some discussion in the context of Italian stress. Sluyters (1990) generalizes that if the penult is heavy (i.e. closed by a consonant) and the antepenult is light, the penult is stressed. This, however, is not an exceptionless generalization. There are a few words with this make-up in which the antepenult is stressed (3a), as there are words with two heavy syllables preceding the last syllable with stress on the third last syllable (3b).

(3) Additional data against weight sensitivity

a. ˈpɔ.lit͡sːa ‘(insurance) policy’ b. ˈman.dor.la ‘almond’
ˈa.ris.ta ‘chine of pork’

On the basis of such data, den Os and Kager (1986) and Nespor (1993) conclude that Italian is not quantity-sensitive. On the other hand, Sluyters (1990), D’Imperio and Rosenthall (1999), and Morén (2001) analyse Italian as quantity-sensitive.

A set of data that clearly shows the quantity-insensitivity of at least the final syllable are acronyms. Acronyms are short forms of long names of companies, institutions, etc. This kind of data was also used in Wetzels (2006) in the discussion of Portuguese stress. Italian acronyms are usually bisyllabic and very often end in a closed syllable. Of the very common acronyms listed in (4), not a single one is stressed on the heavy last syllable.

(4) Acronyms

ˈAGIP	'Azienda Generale Italiana Petroli'
ˈANAS	'Azienda Nazionale autonoma delle AutoStrade'
ˈATAC	'Public transport services in Rome'
ˈENEL	'Ente Nazionale per l'Energia eLettrica'
ˈIRAP	'Imposta Regionale sulle Attività Produttive'
ˈOPEC	'Organizzazione dei Paesi Esportatori di Petrolio'

A further datum pointing towards a fairly flexible stress grammar is the existence of vacillating words (Sluyters 1990; Jakobs 1994). The words in (5) can be realized either way. Individual speakers, however, usually choose only one option. Nevertheless, this is not primarily a question of regional variation. As for the place names in (5b), some of the alternate forms are regarded as old-fashioned.

(5) Vacillating nouns

a. ˈaˑ.li.t͡ʃe / a.ˈliː.t͡ʃe	alice	'anchovy'
ˈaˑ.ma.ka / a.ˈmaː.ka	amaca	'hammock'
b. ˈkaˑ.na.da / ka.na.ˈda	Canada	'Canada'
ˈfɛs.ti.val / fes.ti.ˈval	festival	'festival'
ˈbɛi.ɾut / bei.ˈɾut	Beirut	'Beirut'
ˈbɛl.fast / bel.ˈfast	Belfast	'Belfast'
ˈbɛ.li.tʃe / be.ˈliː.tʃe	Belize	'Belize'
c. om.be.ˈliː.ko / om.ˈbe.li.ko / om.ˈbel.li.ko	ombelico	'navel'

A variety of proposals have been put forward to capture lexical stress representationally. In grid theory, lexical stress can be conceived of as the presence of grid marks above the segmental string (for the most recent incarnation see Revithiadou 2007). Idsardi (1992) proposes foot edges, i.e. opening or closing brackets in lexical representations. Similarly, lexical specifications of segmental structure as foot heads or foot tails have been proposed. Finally, in most OT literature lexical stress is some kind of attribute to a segment, as can be inferred from the faithfulness constraints on stress, such as IO-Ident(stress) or IO-Max(stress). The examples in (6) and their further examination could shed some light on this issue. At first inspection there seems to be a link to syllable structure; alternatively, stress is indeed a property of individual segments. In these cases the presence or absence of a lexical stress mark also determines the realization of the segment as a high vowel or a glide.

(6) (Near-)minimal pairs and syllable structure

a. pa.ˈuː.ɾa	'fear'
ˈpaw.za	'break'
b. ˈkwi	'here'
ˈkuj	complementizer

Turning our attention to verbs, we find a similarly confusing picture as far as the criteria for default stress placement are concerned. We find stress in verbs basically on any syllable.

(7) Stress on verbs: a first look

a. awguˈɾɔ 'sʹ/he/it wished'
b. awguˈɾaːɾe 'to wish'
c. ˈawguɾo 'I wish'
d. ˈawguɾano 'they wish'
e. ˈawguɾaʎelo 'Wish it to her/him!'

I will return to stress in verbs in more detail in the next section below. For the moment this example suffices to illustrate that lexical stress is a property of affixes as well, with the consequence that we potentially have competing lexical stress marks in one form, contributed by the stem or root and by one or more suffixes.

Four questions arise in this context: (a) What is the default stress pattern in Italian? (b) What is the foot form? And, since Italian has rich morphology, (c) do all affixes behave uniformly with regard to stress (i.e. there might be a word-level/stem-level distinction with an influence on stress placement in complex forms)? And (d) how do two or more lexically stressed morphemes combine – which stress surfaces? I will discuss the former two questions in the light of the two most recent approaches in OT, D'Imperio and Rosenthall (1999) and Morén (2001), and supplement these analyses where they diverge or where evidence points in a different direction. The last question has been discussed for Greek, Russian, and other lexical stress languages by Revithiadou (1999), Alderete (2001), and others. The typological choices are the following: root stress always takes precedence over affix stress, affix stress always takes precedence over root stress, or the affixes are divided into a recessive and a dominant class, with morphosyntactic heads displaying dominant behaviour. Italian shows an interesting complication here: many affixes seem to trigger default (penultimate) stress, but this supposed default overrides lexical stress on roots. The Richness of the Base Hypothesis leads us to the expectation that there are actually two kinds of penultimate stress-triggering affixes, those with lexical stress on the penultimate and lexically unmarked affixes which trigger stress shift in lexically unmarked roots.

Once the generalization is accepted that Italian has lexically driven (i.e. unpredictable) stress placement, another more abstract issue arises. If stress is stored underlyingly with some lexical items, we are interested in the form it is stored in. To illustrate this, let us draw a parallel with segmental features. There is no dispute over the fact that at least contrastive segmental features are stored with individual lexical items. Whether a word starts in a stop or continuant, a voiced or voiceless stop, a labial, coronal or dorsal segment, etc. is unpredictable. The discussion in this area centres around whether the features are associated with units called segments or prosodic positions, what the nature of these features is, whether they are articulator-based or substance-free, whether privative, binary, or multivalent, etc.

Contrastive stress could be associated to syllable nuclei, since on the surface it is a property of these and not of onsets or codas; but then most researchers reject the idea of underlying syllable structure, since syllabification is not contrastive and, because of its predictability, can be replaced by economic algorithms of syllabification. Stress might be a unary, binary, or scalar feature of vowels or a prominence mark on a metrical grid. On the other hand, we know that stress units are organized into feet. Thus, a foot might be stored, associated to segments. Once the foot is assumed we get more choices than this: we can divide feet into subcomponents. Each foot has two edges. One of these stored with the segmental information might be sufficient to generate lexical stress in the right position. Feet also usually consist of a strong and a weak part, the foot head and the foot tail. These might be the radicals stored in the lexicon. In languages like Russian, Greek, or Japanese we find data that can contribute to a deeper understanding of these issues. These languages display stress-repelling morphemes, pre- and post-stressing morphemes.

6.2 DEFAULT STRESS

6.2.1 Identifying the problem

The majority of non-derived nouns show penultimate stress, as well as the majority of inflected verb forms. If affixation results in additional syllables, we can observe stress shift in both nouns and verbs.

(8)	a. pa.ˈrɔː.la	‘word’	pa.ro.ˈlatʃ.tʃa	‘ugly word/swear word’
	b. sˈkar.pa	‘shoe’	skar.ˈpoː.ne	‘boot’
	c. ˈkan.to	‘song/singing’ / ‘corner’	kan.ˈtatʃ.tʃo / kan.ˈtutʃ.tʃo	‘horrible song/kind of singing’ / ‘small corner/comfy corner’
	d. ˈmak.kina	‘car/machine’	mak.kiˈnet.ta / mak.ki.ˈniː.na	‘little car/machine’
	e. sˈtu.pi.do	‘stupid’	stu.pi.ˈdaː.ta	‘stupid idea/behaviour/story’
	ˈta.vo.lo	‘table’	ta.vo.ˈliː.no	‘little table’
	f. ˈtʃɛr.to	‘certain’	tʃer.ˈtets.tsa	‘certainty’
	g. ˈgrɔs.so	‘fat’	gros.ˈsitʃ.tʃo	‘quite fat’
	h. ˈmak.ki.na		mak.ki.ˈnis.ta	‘engine driver/engineer’
	bi.tʃi.ˈklet.ta	‘bicycle’	bi.tʃi.klet.ˈtis.ta	‘cyclist’
	i. ˈbam.bo	‘stupid (dial.)’	bam.ˈbɔtʃ.tʃo	‘clumsy person’

From the abundance of this type of stress shift, one could conclude that penultimate stress is the default in Italian. That default stress is penultimate is also the conclusion drawn by D’Imperio and Rosenthall (1999). However, quite a few words shift between penultimate and antepenultimate stress in their inflectional paradigm.

(9)	adʒiˈtare	‘to shake, get excited’		
	ˈadʒito	1sg.	adʒiˈtjaːmo	1pl.
	ˈadʒiti	2sg.	adʒiˈtaːte	2pl.
	ˈadʒita	3sg.	ˈadʒitano	3pl.

If default stress were penultimate we would not expect antepenultimate stress in singular forms of *agitare* after having seen the penultimate stress in the infinitive, unless the infinitive suffix for *-are* verbs has a lexical stress mark. In this case the default stress might as well be antepenultimate, since now all affixes attracting stress to the penult can get a lexical stress mark. Yet the antepenultimate stress in the 1st person singular form could be the emergence of lexical stress on the root in the absence of lexical stress on the suffix. This generalization is supported by the pre-antepenultimate stress in the 3rd person plural form. How else could the stress end up so far away from the right edge of the word if not via lexical marking? Under this analysis, a word like *agitare* does not tell us anything about default stress and we are back where we started. Similar circular chains of reason can be employed for the analysis of the forms given initially.

A very approximate way to settle the issue is to look at lexical frequency. The general estimate is that penultimate stress occurs in around 70–80 per cent of all lexical items in Italian, antepenultimate stress in around 20 per cent, and final stress in around 2 per cent. The frequencies cited from Borrelli (2002) in (10) should be the most accurate figures. She scanned 120 consecutive words in a dictionary to get her percentage figures. Pre-antepenultimate stress does not figure here since, as mentioned above, it only occurs in inflected verb forms.

(10) Estimations of stress frequency:

70 per cent of Italian words show penultimate stress.
30 per cent show antepenultimate stress.
(Bertinetto, p.c. to Colombo, 1989; cit. Colombo 1992)

80 per cent penult
18 per cent antepenult
2 per cent final
(Thornton et al. 1997)

76.67 per cent penult
20.83 per cent antepenult
2.5 per cent final
(Borrelli 2002)

Lexical frequency, though, does not directly tell us what the default is. Only if we correlate markedness inversely with frequency can we say that penultimate stress is the least marked option because of its high frequency. This, however, would force us first to discuss the notion of markedness, whether lexical frequency actually has anything to do with it, and if so which correlation can be established.

An evidence-based argument for default penultimate stress can be developed by looking at 2nd conjugation verbs. While 1st and 3rd conjugation verbs all have penultimate stress in the infinitive form, these verbs divide into two groups according to their infinitives. The 2nd conjugation verb in (11a–d) has penultimate stress in the infinitive, while the verb in (11a'–d') has antepenultimate stress.

(11)	a. kaˈdeːɾe	‘to fall’	a’. ˈɾideɾe	‘to laugh’
	b. ˈkaːdo	1sg	b’. ˈɾiːdo	
	ˈkaːdi	2sg	ˈɾiːdi	
	ˈkaːde	3sg	ˈɾiːde	
	c. kaˈdjaːmo	1pl	c’. ɾiˈdjaːmo	
	kaˈdeːte	2pl	ɾiˈdeːte	
	d. ˈkadono	3pl	d’. ˈɾidono	

If one wants to avoid the stipulation of two allomorphs for the infinitive affix in the *-ere* class, i.e. one with lexical stress and one without, which are subcategorized for by different verb roots, this pattern shows us the default stress placement for verbs. If the infinitive suffix *-ere* does not have lexical stress, then the root of ‘laugh’ has a lexical stress mark and verbs like *cadere* ‘to fall’ are assigned stress by rule. That is, default stress is penultimate in verb forms with light syllables. A surprising fact regarding this generalization, especially given the brief discussion of markedness and frequency above, is that only 22 verbs plus forms derived from these by prefixation have the default stress in this class (Davis et al. 1987; Napoli and Vogel 1990). The majority of *-ere* verbs show lexical stress on the root in the infinitive form.

There is a further observation to be made looking at 2nd conjugation verbs. As Davis et al. (1987) note, there are no verbs of this class with stress on the affix (or the theme vowel) whose root ends in more than one consonant or a geminate. That is, a consonant cluster at the end of the root attracts stress to the antepenultimate syllable. All combinations of consonants found in this context are split up into two different syllables according to what we have said above about Italian syllable structure. Thus, in these forms the antepenult can be said to be heavy and stress-attracting. Heavy syllables further away from the right edge, however, do not seem to attract stress, as in [tratteˈneːre] ‘keep back’. Hence, for verbs we can conclude that stress placement is quantity-sensitive at least up to the third-last syllable.

Davis et al. (1987) found a third factor contributing to stress placement in 2nd conjugation verbs. Of the 23 verbs with stress on the infinitive marker, none starts in a consonant cluster, except for two which have an obstruent plus glide. In their nonce-word test, subjects assigned mostly root stress to non-word infinitives starting in a consonant cluster. Thus, the complexity of the onset of the third-last syllable seems to have an impact on stress placement.

This account will be further elaborated in conjunction with the discussion of lexical stress below. These generalizations on the default mechanism detected in verbs, of course, do not necessarily automatically extend to nouns. Italian would not be the only language in which stress placement differs between lexical categories.

Other scholars, however, have not necessarily taken this route of argumentation, neither separating nouns from verbs nor examining the different infinitives, and thus we are left with the range of conflicting opinions sketched above.

Another question on which the literature divides is the nature of the Italian stress foot. There is wide consent that Italian has trochaic feet. The controversial issue is whether the foot is syllable-based or mora-based. First, as discussed in Wetzels (2006), it was long considered impossible to have weight-sensitivity in a language without a length contrast in vowels. However, given the conflicting views on Italian quantity, the optimal foot in Italian could be mora-based or syllable-based. This is also what makes the difference in D'Imperio and Rosenthall's and Morén's analyses, respectively. The bimoraicity of the optimal foot results in penultimate stress for D'Imperio and Rosenthall, while bisyllabicity of the foot causes antepenultimate default stress in Morén's account.

To understand this we must look at stress-induced vowel lengthening in Italian. It was long observed that stressed vowels tend to be longer in Italian (and cross-linguistically) than unstressed ones. However, this holds only for open syllables. Furthermore, as phonetic studies have shown, lengthening of stressed vowels is quantitatively more substantive in penultimate position, with pre-penultimate stressed vowels lengthening slightly less under stress; and the vowel in the final syllable is not longer at all under stress compared to unstressed final vowels. For such studies see D'Imperio and Rosenthall (1999) and the work of Marotta. The former study also shows that vowel lengthening changes with the addition of post-clitics.

It is quite a curious situation if vowel lengthening is different in one prosodically defined position. D'Imperio and Rosenthall's conclusion is that in penultimate position we find phonological lengthening, while in pre-penultimate position we find phonetic lengthening. Phonetic lengthening constitutes a phonetic cue to stress and does not change the prosodic structure. Phonological lengthening, on the other hand, adds a mora to a vowel, thus creating a heavy syllable.[1] Why should this happen in the second-last but not in any other syllable? This indicates that the final syllable is excluded from footing in Italian, and that the stress foot has to be at least bimoraic. In pre-penultimate position no extra mora is necessary, since at least one is supplied by the following second-last syllable.

Thus, we get the following foot structures in syllabic terms. If all syllables are light and stress is on the third-last syllable, the main foot spans over the two non-final syllables (12a). If stress is on the second-last syllable, this syllable constitutes a monosyllabic foot (12b) in which the vowel is lengthened to make it at least bimoraic to conform to a binarity requirement on feet (Prince 1990).

(12) Italian foot structure: first approximation

a. (ˈσσ)σ ?*(ˈσ)σσ
b. σ(ˈσ)σ *σ(ˈσσ)

We still do not know which is preferred—foot binarity at the syllabic or the moraic level.

[1] Van der Veer (2006) makes measurements of diphthongs and obtains similar results. His conclusion, however, is that the length difference between stressed penult and pre-penult is a phonetic compression effect. An increased number of syllables causes across-the-board shortening of segments.

My own measurements of vowel length in three words that were chosen to tell us something about the nature of foot structure in Italian are based on one speaker only, and thus need to be confirmed by additional data. However, the results are suggestive. The three contexts tested were LˈLL, ˈLLL and ˈLHL (L = light, H = heavy) containing the same vowel in stressed position. The northern Italian speaker recorded realized the vowel in the light syllable word in antepenultimate position considerably shorter than the stressed vowel in penultimate position in the LLL context, confirming D'Imperio and Rosenthall's results. However, while D'Imperio and Rosenthall claim there is less lengthening in pre-penultimate position the heavy syllable following the stressed vowel in the ˈLHL word had an impact: the stressed vowel in the ˈLHL word had the same length as the one in penultimate position in the LˈLL word. In conclusion, the heavy penult was not included into the main stress foot. Thus, the stressed vowel had to be lengthened to provide enough morae for the main stress foot. The reason for the lack of footing of the heavy syllable is the moraicity of the coda consonant (see also Chapter 5), which results in a bimoraic unstressed syllable following the stressed vowel in (13.iii). Inclusion of this heavy syllable into the main stress foot would have resulted in a trimoraic and anti-trochaic (LH instead of HL) foot. Thus, we can conclude that bimoraicity is the upper limit for the foot in Italian, as indicated in (14). This confirms Prince's (1990) and Morén's (2001) conclusions on Italian foot size. (13) shows the three types of syllable and stress combination tested, and indicates length of the stressed vowel, along with competing moraic analyses and the example word.

(13) Phonological versus phonetic vowel lengthening (own measurements)

	σ type	*ˈV length*		*Analyses*	*Example*	
i.	LˈLL	0.15 sec.	☞ a.	μ μμ L(ˈLL)	piˈlɔːta	'pilot'
			☞ b.	μ μμ μ L(ˈLː)<L>		
ii.	ˈLLL	0.1 sec.	a.	μμ μμ (ˈLː)LL	ˈpɔˑlipo	'octopus'
			☞ b.	μμ μ (ˈLL) <L>		
iii.	ˈLHL	0.15 sec.	☞ a.	μμ μμ μ (ˈLː) H <L>	ˈpɔːli͡tsːa	'policy'
			b.	μ μμ μ (ˈLH) <L>		

(14) Italian foot structure = $\mu\mu$ = H or LL

$*>\mu\mu/*$(HL), (LH), (HH), (LLL)

$*<\mu\mu/*$(L)

In summary, from Marotta's and D'Imperio and Rosenthall's experiments on vowel length we can tell that Italian has two types of vowel lengthening: phonetic and phonological. The latter provides an extra mora to build a foot on the penultimate lexically light syllable excluding the final syllable from this foot. Thus, the final syllable is extra-metrical if not stressed. If stress is on the third-last light syllable we find no phonological lengthening. In this case a bisyllabic trochaic (i.e. strong-weak) foot is built on the third- and second-last syllables. Furthermore, as evidenced in the little experiment reported above, the Italian foot cannot exceed the size of two moras, which can be told from the emergence of phonological lengthening on the stressed antepenult if the penult is heavy. This confirms Repetti's (1990) and Morén's (2001) conclusion that the restriction on foot size demands bimoraicity rather than bisyllabicity. These data also show that stressed vowel lengthening in Italian is not an effect of the Stress-to-Weight-Principle (Myers 1987; Vennemann 1988; Prince 1990; Riad 1992), which demands stressed syllables to be heavy, but rather emerges due to Foot Binarity (Morén 2001).

As far as the placement of stress goes, we can say that in verbs default stress is penultimate. In nouns, default stress could be either antepenultimate or penultimate. Previous analyses also disagree on whether the system is quantity-sensitive or not. The argument involving 2$^{\text{nd}}$ conjugation verbs above indicated that the system is quantity-sensitive in a three-syllable window at the right edge of the word.

Thornton (1996) argues that hypocoristics or truncations are limited in size to a bisyllabic trochaic foot. Given the above generalizations, Thornton's analysis might be due a minor revision.

Truncations are a widespread phenomenon also in other languages: see among others McCarthy and Prince 1986; Benua 2000 on English; Itô and Mester 1997; Wiese 2001 on German.

The data in (15) illustrate the general pattern. In (15a) with sortal nouns, the cut-off line can align with a morphological boundary, as in *auto* from *auto+mobile* 'car', but does not have to coincide with a morphological boundary, as in *ampli* 'amplifier'. (15b,c,d) illustrate the pattern with proper names. While the truncatum 13 derived from the initial two syllables of the base in (15a), the proper names in (15d) show that with names the final two syllables can also make for a good truncated form.

(15) Truncations (examples given in Italian orthography)

a. ampli	amplificatore	'amplifier'			
bici	bicicletta	'bicycle'			
cine	cinematografo	'movie, cinema'			
auto	automobile	'car'			
biblio	biblioteca	'library'			
dia	diapositiva	'slide'			
b. Ale	Alessio			c. Gianca	Giancarlo
Bea	Beatrice			Patri	Patrizia
Fede	Federica			Salva	Salvatore
Marghe	Margherita				

d.	Tore	Salvatore	Cesca	Francesca
	Tano	Gaetano	Dolfo	Rodolfo
	Tilde	Clotilde	Rita	Margherita

The bisyllabic truncatum does not have to coincide with the foot structure of the base, which is illustrated by examples such as *Ále* from *Aléssio*. Nor does the truncatum have to be bimoraic, as can be seen from the examples that show a heavy closed syllable. Thornton argues that these truncations show a bisyllabic trochaic foot. Above, I argued that the optimal foot in Italian is a bimoraic trochaic foot; and we can assume with D'Imperio and Rosenthall that the optimal prosodic word contains an unfooted syllable at its right edge. Thus, we can extend these insights to truncations. The optimal truncated form consists of a bimoraic trochaic foot plus an unfooted syllable. This is further supported by the length of the stressed vowels in truncated forms. The stressed vowel in *Ale*, for example, is considerably longer than the corresponding vowel in the base.

Thornton gives a compelling argument for treating the creation of a hypocoristic form from the initial part of the base and the creation of a hypocoristic form from the final part of the base as two distinct processes. (The alternative would be to assume that you can cut off material at either edge, but you have to be consistent in a given form, i.e. not delete material from both sides.) Apparently, the right-edge-oriented truncation cannot be derived from any name. All the bases in (15d) have stress on the penult—i.e. in these forms the stress in the truncated form corresponds to the stress in the base. According to Thornton the names listed below, all stressed on the antepenult, do not have a right-edge-oriented truncated form.

(16) Impossible right-edge truncations

Angelo	*Gelo	Cesare	*Sare
Massimo	*Simo	Davide	*Vide
Carmine	*Mine	Stefano	*Fano[2]

Thus, right-edge truncation maps the rightmost foot and the following unfooted syllable from the base to the hypocoristic. In names like those listed in (16), this would result in the production of the first two syllables, as in *Ange* for *Angelo*, instead of **Gelo*, because in the base *Angelo* there is a foot on [an] and the next unfooted syllable is [dʒe]. The word ends in two unfooted syllables. This result of failed right-edge truncation is indistinguishable from left-edge truncation. If we take a word with antepenultimate stress and light syllables only, like *Davide*, the foot structure of the base is /(da.vi).de/ and the truncated form would be identical, because there is only one foot in the word /(da.vi)/ and **Vide* does not correspond to this foot in the base.

Left-edge truncation, though, is not limited by the foot structure of the base. It takes all the material necessary to produce the optimal or minimal form from the left edge. We will come back to this issue in section 6.5 when we discuss the minimal size of the prosodic word in Italian.

[2] According to one of my informants, *Fano* is acceptable as a hypocoristic of *Stefano*.

To conclude, foot type and foot structure in Italian can be said to be a bimoraic trochee. We can also say that, whenever possible, an unfooted syllable is placed at the right edge of the word. The determination of default stress placement in Italian, however, is a problem: we have (at least) two different analyses in the literature and the data are not really conclusive, since any position could have a lexical stress. A lexical class for which we can give an answer are 2nd conjugation verbs, which have default stress on the penult if the antepenult is not heavy. In verbs, this default pattern is obscured by the presence of lexical stress in both roots and affixes. In nouns, the issue cannot be resolved by looking at the existing data, due to the paucity of the inflexional system and the uniform attraction of main stress to derivational affixes. To resolve this puzzle I conducted a wug test with native speakers eliciting stress in nonce-words, which I will report on in the following sections.

6.2.2 Nonce-word test method

Davis et al.'s (1987) conclusions on stress placement are based on a reading task involving infinitives of non-existing 2nd conjugation verbs. Colombo (1992) carried out a nonce-word test to figure out main stress placement, but did not produce conclusive results. Her main focus was on whether analogy plays a role in stress placement. She constructed her nonce-words to be relatively similar to existing words. Her list consists of different word types as regards the presence or absence of heavy syllables and their combination with light syllables. In the presentation of results, however, she does not divide up results according to the syllable types occurring (heavy or not). Thus, her result, that around two thirds of realizations have 'regular stress' (Colombo's terminology for penultimate stress) and around one third have 'irregular stress', does not tell us anything about default stress, for two reasons. First, the similarity with existing words will have had an impact on stress placement (as she rightly concludes); second, we cannot tell if 'irregular stress' was caused by syllable weight.

To work out the default stress assignment criteria, a list of non-existing words was presented to 12 native speakers. The majority of speakers were from northern Italy, with five from Lombardy, two from Padua, two from Rome, one from Tuscany, one from Umbria, and one from Piedmont. Speaker age ranged from 30 to 65.

The non-words conform to Italian phonotactics, i.e. each word is a possible but nonexistent Italian word. In the creation of words I tried to avoid endings that could be analysed as suffixes other than masculine or feminine markers (i.e. as derivational and potentially stress-determining affixes). To make sure that each word was nonexistent, every word was looked up in a dictionary and searched with a search engine in the Italian pages of the worldwide web. Only words with no entry in the dictionary and no hit in the web search were included. Furthermore, the words were presented to a native speaker who was asked to identify words known to her, to give words that are similar, and to judge if the words sounded good and were easy to read (as far as letter combinations and letter-to-sound transfer were concerned). From the word list created initially, 26 items remained.

These items represented the following combinations of light (L) and heavy (H) syllables.

(17) Word types according to syllable weight

LL	HL
LLL	HLL
LLLL	LHL
	HHL

With these items the following stress placement criteria could be detected: primary stress placement in words with light syllables only (i.e. edge alignment) and weight sensitivity.

Words were placed in random order in a list and presented to the subjects. Initially, subjects were asked to read each word aloud and indicate for each word if they knew it or if it reminded them of a word they knew. The second task for the subjects was to produce the plural form of each word using the carrier sentence below.

(18) Non-words presented in random order

1	frunaco	2	brombulo	3	frampeco
4	plantico	5	chiatteno	6	sbancito
7	gico	8	cincuco	9	praco
10	flempile	11	tapirco	12	chiateppo
13	svappa	14	nalico	15	fiesova
16	smeco	17	cruvacco	18	grotulfo
19	giompicco	20	rocapado	21	plontico
22	frudalo	23	ancico	24	picutopa
25	gionsicco	26	conchico		

(19) Carrier sentence for plural form: *Ho visto due* _____.

The list was originally slightly longer. Several items had to be removed, because they were problematic in one or the other way. For instance, the item *lompascia* was realized by one speaker as [lompaʃˈʃiːa] while all other speakers realized it as [lomˈpaʃːa], some with a short, some with a geminate palatal fricative. The word was excluded from the data corpus before analysis because it is not clear to me which factors contributed to these variations in syllabification. The item *tospumo*, originally on the list, was not included either, because speakers could have varied with regard to the syllabification as *tos.pu.mo* or *to.spu.mo*. Thus, it was not clear to which group the word should be assigned in the analysis (HLL or LLL?).

Words ending in the sequence -*ico* were analysed separately. The reason was that this sequence could have been analysed by speakers in analogy with the suffix that forms adjectives. This suffix -*ico* hardly ever carries stress, as in *simpático* 'sympathetic' or *enigmático* 'enigmatic', and this could therefore have resulted in a bias towards the antepenult. Words like *antíco* 'antique' constitute a rare exception to a general pattern.

Furthermore, items 6 and 10, *sbancito* and *flempile*, could be analysed as a participle or an adjective respectively. This type of participle has always stress on the penultimate syllable, while adjectives ending in *-ile* have stress on the antepenultimate syllable, as in *fragile* 'fragile'.

In the analysis, all realizations were counted. If, for example, a subject was not sure as to which form they should use and presented several different forms for the same item, they were all counted. This happened occasionally, but not consistently. Another source of variation was the plural form. For some words some speakers realized stress on one syllable in the singular and on another in the plural. In the analysis, both realizations were counted.

6.2.3 Results

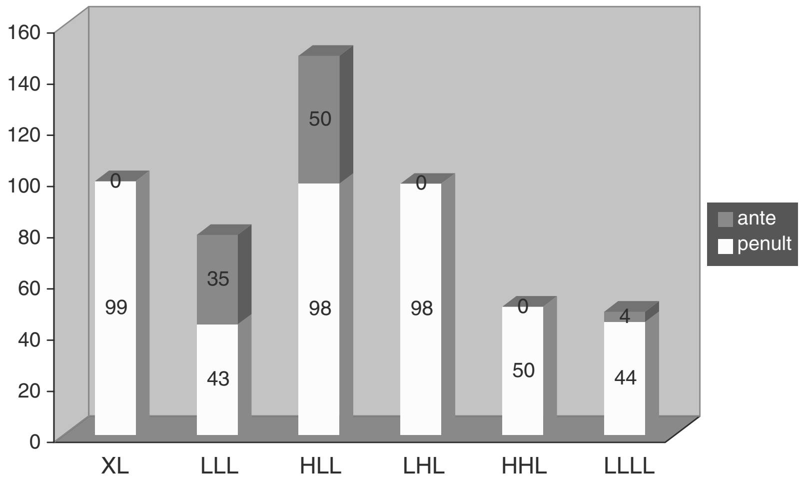
Here, I first present the results in terms of syllable types. Finally, the figures will be broken down by speakers. First of all, there was no significant variation according to the region from which the speakers came. Thus, the Roman, Umbrian, and Tuscan speakers did not show significant differences from the Lombardian or the Paduan speakers. Furthermore, there was a considerable variation within speakers; for example, the same speaker had different stress placement in the four different items of the LLL group, or for the same word singular and plural were realized with stress in a different place. (The latter, however, occurred less often than the former.) Given the former, future studies might reveal some minor influence of vowel sonority or some other factor contributing to and causing this kind of variation.

Altogether, because of the small scale, the small number of realizations and the artificial set-up of the experiment (word reading task), the results have to be taken with caution.

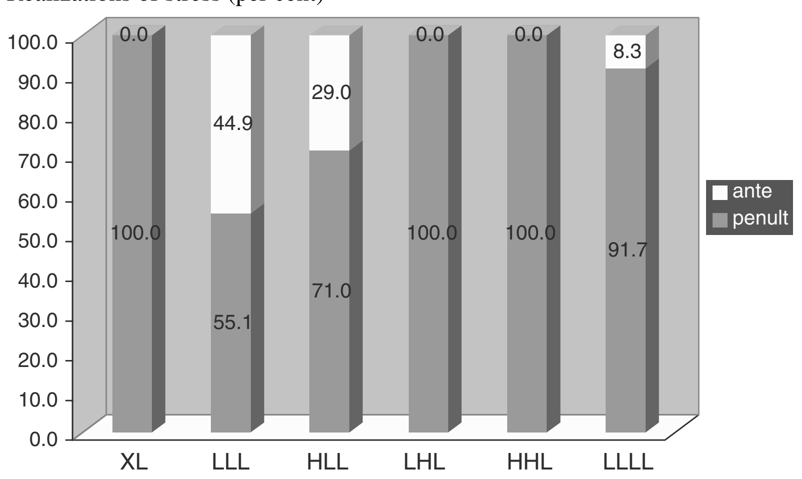
The stress placement results of this experiment are summarized in table (20). The table shows the complete number of realizations of all words of a certain type (LL, LLL, LHL, etc.) by all participants, and indicates how many of these had primary stress on the penultimate or antepenultimate (ante) syllable. The next table shows the percentage figures.

Unsurprisingly, the bisyllabic words all had stress on the penultimate syllable in all occurrences. Final stress is marked with an accent in Italian orthography. Thus, the speakers had no other choice in these forms. The trisyllabic words containing only light syllables (LLL, bar 2) fell into two groups here according to stress placement, with near-equal numbers of realization for penultimate and antepenultimate stress. A surprising result emerges if we compare this with the tetrasyllabic light syllable items (LLLL, bar 6). Here we find a strong bias towards the penult, even though one would have expected the same result as for trisyllabic words. Also, weight does not show a uniform effect. While a heavy syllable in second-last position (LHL and HHL) always receives stress, only one third of the realizations of HLL have stress on the heavy syllable, which is a lower proportion of stress on the antepenult than among LLL forms.

(20) Total realizations



(21) Realizations of stress (per cent)

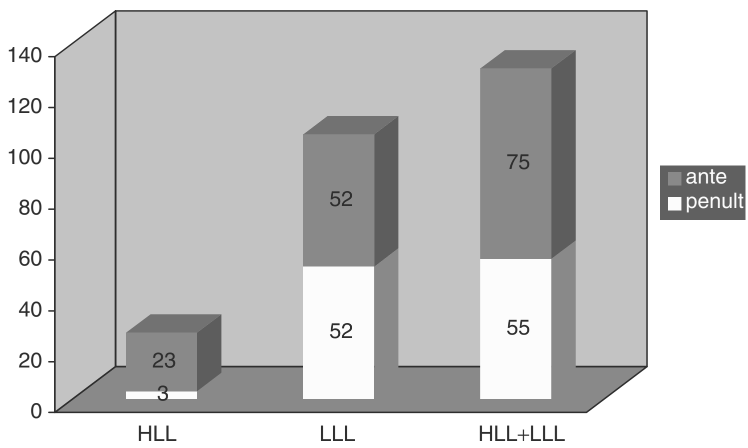


Neither the penultimate stress analysis (D'Imperio and Rosenthall 1999) nor the antepenultimate stress analysis (Morén 2001) can be rejected on grounds of the realizations of trisyllabic words with light syllables only. In these words speakers seem to have an option. In tetrasyllabic words with light syllables only, however, the pattern is much more straightforward. Most of the time these were realized with penultimate stress. The more surprising question arising here is whether we need two grammars, one for trisyllabic and one for tetrasyllabic words. We will see below in the analysis that Italian does not have different grammars for words of different length.

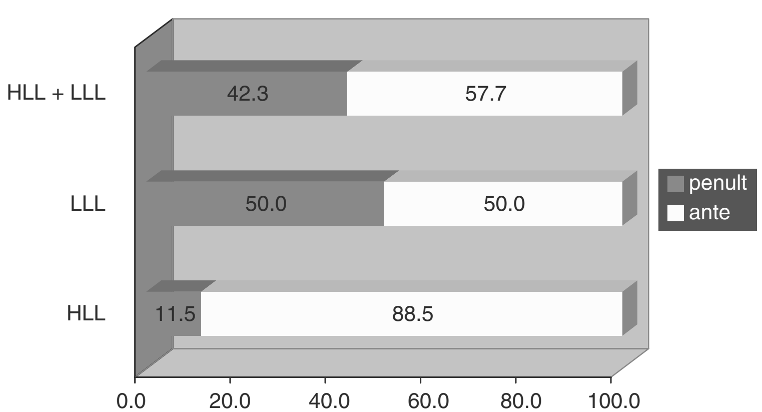
Syllable weight attracts stress to the penultimate syllable, as can be seen from the LHL and the HHL words, which consistently have stress on the penultimate. For the antepenultimate syllable weight seems to play a minor role. Surprisingly (again), among the HLL forms the number of penultimate stress forms is higher than that of antepenultimate stress and also higher than among LLL forms, almost as if heavy syllables in antepenultimate position repel stress. In the next section I will provide an explanation for this 'anti-weight-sensitive' pattern.

The two problematic HLL words, *sbancito* and *flempile*, as well as those ending in the sequence [iko], were removed from those groups in which they occurred. The reason is, as mentioned above, that these words might be analysed as morphologically complex. Participants could have analysed particularly the latter forms as adjectives (as e.g. *idrogra**fi**co* 'hydrographic', ***sto**rico* 'historic') and placed stress in analogy to the majority of adjectives with this ending. Tables (22) and (23) indirectly show the degree of analogic analysis.

(22) Stress placement in words ending in *ico*: realizations in total



(23) Realizations of stress in words ending in *ico* (per cent)



Comparison of tables (22) and (23) with (20) and (21), respectively, shows that analogy plays a role here, though a limited one. There is no 100 per cent analysis as morphologically complex. Otherwise the stress placement would be antepenultimate accordingly, but these items show a stronger tendency towards antepenultimate stress than do the other items in their respective groups. This is particularly clear for the LLL words. For the HLL words we have observed above that only a third of realizations of the other HLL words show stress on the heavy syllable. Here this is significantly increased, to over 80 per cent.

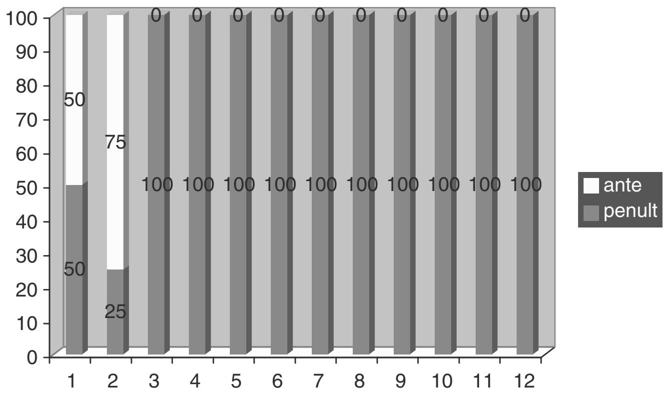
The preference for penultimate rather than antepenultimate stress in HLL words shows as 71 per cent of the remaining HLL words with penultimate and 29 per cent with antepenultimate stress. If the words ending in *-ile*, i.e. *flempile*, and *-ito*, i.e. *sbancito*, are included in the set, the penultimate stress is realized in 66.2 per cent and antepenultimate stress in 33.8 per cent. Thus, some speakers seemed to have analysed these as adjectives and participles, respectively, following the pattern of adjectives and participles with these endings, such as [prefeˈribile] 'preferable' and [prefeˈrito] 'preferred'. Since the remaining HLL nonce-words show more penultimate stress, one can see that the subjects showed a stronger tendency to treat *flempile* in analogy with adjectives ending in *-ile* than to interpret *sbancito* as the participle of non-existent *sbancire*. The former strategy increases the number of realizations with antepenultimate stress, while the latter strategy increases the number of realizations of items with penultimate stress.

Returning to the main corpus, in tables (20) and (21) all participants' responses were summed to one. Hence, these tables depict a 'generalized Italian' pattern and do not say anything about individual grammars. Deviation from this pattern in individual grammars, though, is very restricted. To exemplify this I have broken down realizations by speaker and word type. At this point the only interesting data concern LLLL, LLL, and HLL, since we find variation in these only.

The possibilities are the following. Each individual speaker could show the same amount of variation, which can be interpreted as one uniform grammar for all speakers that allows for various outputs. Alternatively, individual speakers might not show variation, the variation arising only between speakers, in which case we are dealing with different grammars for different speakers. As we will see shortly, the picture is somewhat more differentiated, and we have to take into account additional factors, such as number of tokens per type, total number of realizations by type, and number of realizations per type per speaker.

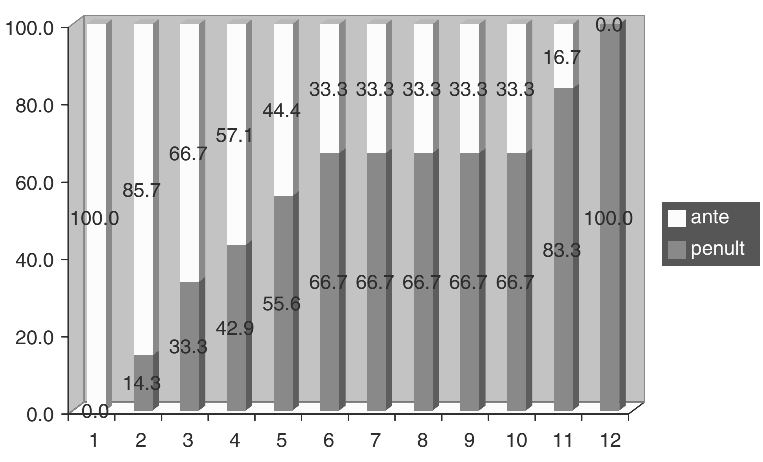
First we look at LLLL words. As we can see in table (24), only two speakers show variation between antepenultimate and penultimate stress. Thus, we could assume that for all the other speakers antepenultimate stress is ungrammatical or regarded as lexical. Furthermore, no speaker corresponds to the average: i.e. the 'average speaker' does not exist.

(24) Variation LLLL by speaker (per cent)



The LLL words show a more balanced picture. All but two speakers show variation. The two speakers without variation statistically cancel each other out, since one has only antepenultimate and one only penultimate stress. For this word type we even find speakers that are close to the average (speakers 4 and 5).[3]

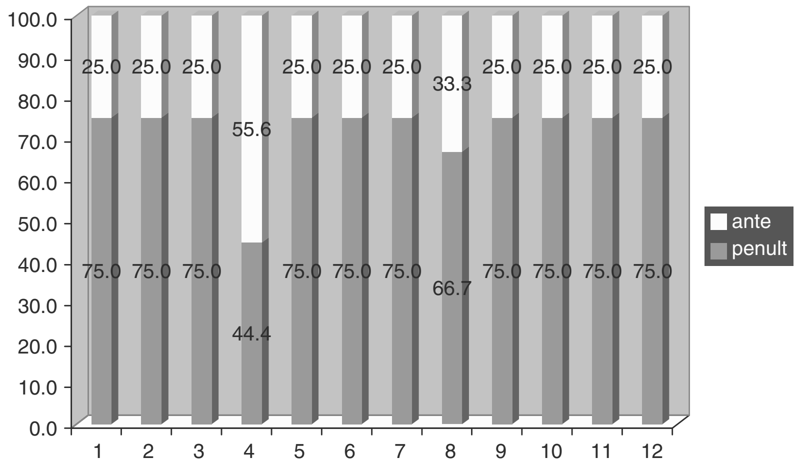
(25) LLL realizations by speaker (per cent)



The last word type shows even clearer results. Most speakers behave alike (1, 2, 5, 7, 8, 11); only speakers 4 and 9 deviate to differing degrees. For this last word type, we can assume that most if not all speakers have the same grammar.

[3] Speakers 4 and 5 are problematic cases. They have the highest number of realizations and each of them shows a high degree of variation. Speaker 5 has a degree in Romance linguistics and is aware of the problems with Italian stress placement. Thus, the methodologically soundest move is to exclude this subject's data from the corpus and regard them as metalinguistic commentary. Speaker 4 does not have this metalinguistic awareness, but just proves extremely talkative.

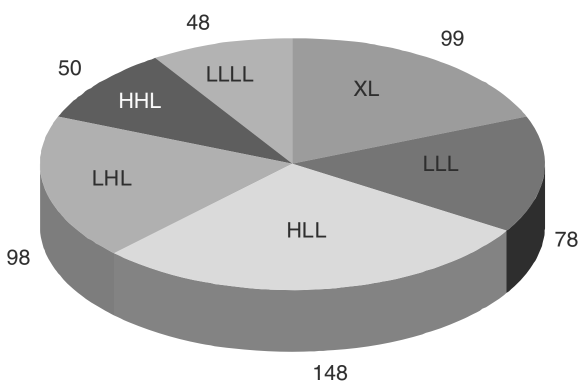
(26) Last pattern with variation: HLL by speaker (per cent)



A question arising here is why we find a relatively high degree of inter-speaker variation in the LLLL group, less in the LLL group, and the least inter-speaker variation in the HLL group. If we look at the total numbers of tokens and realizations we get an answer. There were only two words with LLLL structure, which were realized altogether 48 times, i.e. 4 realizations of this type by each speaker. A proportion of around 90 to 10 per cent cannot be observed in an individual speaker if s/he has only so few realizations, and those speakers which have realized penultimate stress only could well produce the occasional form with antepenultimate stress if they had enough opportunities.

The LLL type on the other hand was represented by three words which were realized 78 times altogether, around 6 realizations per speaker. The most numerous type in the corpus is HLL, with 6 items and 148 realizations. The numbers are summarized for all word types in (27).

(27) Total realizations by word type



If a form has only a relatively low probability of being produced, this is most likely to happen for each speaker in the word types with high numbers; while for a word type with a low number of total realizations and a low probability of antepenultimate stress being realized, it is simply impossible to observe this form in every speaker.

For these numerical reasons I assume that the results of the test are generalizable over the whole population for each word type. There is one exception, though. The two speakers who show no variation in LLL words might well be regarded as having a set default stress, i.e. penultimate and antepenultimate, respectively. The speaker with antepenultimate stress also has a high degree of antepenultimate stress in LLLL words (50 per cent).

Altogether, one has to treat the results presented here with caution; similar studies should be done with larger numbers of tokens per type, more realizations by token, and more speakers.

Further variables that could be significant are age, gender, and geographic area of origin. Age ranges from 30 to 65, with most participants between 30 and 45. The two oldest participants are also the only two from Padua. Hence, an age-based analysis would likewise be a comparison of Padua with the other areas, and based on quite small numbers. The whole group contains two males only, one from Lombardy and one from Tuscany. As a group, these two do not behave significantly differently from the females. The Tuscan participant has a slightly stronger tendency towards penultimate stress in general than the Lombardian male. Apart from this, the latter shows also more variation than any of the other participants. Since I have only a single participant from Tuscany, a single one from Umbria, one from Piedmont, two from Veneto (Padua), two from Rome, and five from Lombardy, the geographic distribution is somewhat imbalanced and I regard the numbers as too small to draw any valid conclusions on geographic variation in default stress assignment. This aspect has to be researched with larger numbers of speakers from more areas.

Another dimension of variation to be looked at is individual test words within word groups. The current set-up looks for the setting of variables such as quantity-sensitivity and right/left-edge orientation. Another potential factor that could determine stress placement is vowel quality (see Kenstowicz 1996b). Vowels could be stressed either because they are of relatively high sonority, or because they are not what are called corner vowels. The typology of vowel reduction and vowel deletion in unstressed syllables (Crosswhite 2001; Gouskowa 2003) shows the following: in unstressed position, non-high vowels are often raised to high or to schwa; in some systems only mid vowels are changed and become either low or high. The same holds for vowel deletion in unstressed syllables: the targets of change are either non-high vowels or mid vowels. Looking at this in another way, one might suspect that in some languages these vowels attract stress whenever possible to escape violation of markedness constraints on unstressed syllables. In the former case we get a scale with low vowels being preferably stressed, then mid vowels, and finally high vowels at the bottom of the scale or the reverse of this, while in the latter case the vowels *i, u, a* could repel stress while the mid vowels attract stress. Such factors could further contribute towards an explanation of the variation seen above.

Given the results from the HHL and LHL groups (strong tendency towards penult), one could speculate that either antepenultimate or penultimate stress in the HLL and in the LLL groups is determined against the default stress alignment and eventual quantity-sensitivity through vowel quality. Within the HLL group, there was only one word that did not display any variation: the item *brombulo* was invariably stressed on the antepenultima by all participants. *Flempile* comes close to this, with a 72 per cent tendency towards antepenultimate stress. In both cases a hypothesis favouring corner vowels as stress targets has to be refuted, since it is the non-corner vowel that carries stress even though a corner vowel is available. On the other hand, as mentioned above, there are languages in which a mid vowel in an unstressed syllable is something that should be avoided, while high vowels in unstressed syllables are fine. Thus, Italian could show an effect of constraints against mid vowels in unstressed syllables. Mid vowels are usually regarded as of higher sonority than high vowels. Thus, these two items lend support to sonority-based or non-corner vowel stress attraction being a factor here. The HLL words *frampeco*, *chiatteno*, *sbancito*, and *cincuco* all show a strong tendency towards penultimate stress (85 and 94 per cent). The first three of these have a high-sonority vowel in the antepenult and a less sonorous vowel in the stressed syllable. Thus, the sonority-based stress attraction becomes unstable here. The last item, *cincuco*, has two vowels of approximately the same sonority, which reveals penultimate stress placement as more important than quantity-sensitivity if the factor vowel quality is kept neutral. Thus, the data generated from this group show weak to no evidence of mid vowels attracting stress.

A factor determining stress placement which has recently come into focus again is onset weight (Davis 1988; Topintzi 2006). The sonorant consonant which is the second member of a complex onset might be moraic and contribute to the weight of a syllable and cause attraction of stress to the syllable containing it.[4] If we look at LLL words to shed light on this issue we find that (unfortunately) all three members of the class have a complex onset in the first syllable and a simple one in the second. Realizations with penultimate and antepenultimate stress are more or less balanced. The only word in this group that has 95 per cent realizations with antepenultimate stress, *nalico*, has a simple onset. Thus, onset complexity does not seem to play a determining role in stress placement.

Accordingly, the potential factors of quality-sensitivity and onset weight will not be considered further in the analysis of nonce-word stress patterns provided in the following section.

A further aspect to be looked at is in which individual test words and in which word groups we find the most variation in the production by individual speakers. For those items with high variation (i.e. many participants each offering more than one form), we can conclude that there is something in their phonotactics which causes friction between conflicting factors of stress placement. For LLL words, 3 participants each produced antepenultimate as well as penultimate stress on two items (*frunaco* and *frudalo*). For

[4] Alternatively, a complex onset might be less marked in a stressed syllable as opposed to an unstressed one. Such an analysis would avoid the assumption of moras linked to segments in onset position.

both items we get roughly a 50/50 split in the choice of stress placement. The word *fiesova*, on the other hand, was controversial across participants, with 50 per cent of realizations with antepenultimate stress and 50 per cent with the other option; intra-speaker variation for this word was observed in one participant only. Among HLL words, *brombulo* is the only one without any vacillating speakers, while *ancico* had the highest rate of intra-speaker variation (3 speakers produced varying outputs; note that the item was removed from the overall count because of its ending). The word with the highest rate of intra-speaker variation was *tospumo*, with either stress option produced by 6 participants. It did not seem to be clear to speakers whether the word is HLL or LLL, showing that syllable weight has an impact (though from this piece of data alone it is difficult to say whether the HLL syllabification (*tos.pu.mo*) or the LLL syllabification (*to.spu.mo*) preferably had antepenultimate stress). For all other word groups, intra-speaker intra-item variation was virtually nonexistent (two speakers varying on LLLL *rocapado* and one on *picutopa*). In general, intra-speaker variation on individual items was highest in the word groups that also show most variation in general (i.e. across speakers) and lowest correlating with low overall variation.

6.2.4 Analysis of nonce-word stress patterns

In the following sections I will use the constraints on stress placement invoked for Italian stress by D'Imperio and Rosenthall (1999) and Morén (2001), though (as we will see) they will be arranged in a different hierarchy. One aspect that has to be covered here is the intra-speaker variation reported above. Neither D'Imperio and Rosenthall nor Morén had to deal with variable data; they constructed ranking arguments based on assumptions about existing data, excluding the vacillating words (see (5)). There are several proposals in OT to deal with variation (for an overview see e.g. Anttila 2003). The core idea behind most of them is that variation is attributed to the constraint ranking being different on different occasions. Just as with the analysis of palatalization, where a co-phonology approach could be adopted to deal with the different behaviour in nouns and verbs and subclasses of these, one can assume that a speaker who displays variation for individual items or items of the same type has several constraint hierarchies at her/his disposal which produce different outputs. This multiple-grammars approach to variation was first put forward by Kiparsky (1993) (see also Anttila 1997). Boersma and Hayes (2001) take a different route, claiming that constraints are ranked on a scale and that some constraints are actually ranked on an area of this scale with the areas of constraints potentially overlapping. Assume we have a scale, say, from 10 (which is the highest position in the hierarchy) to 0 (which is the lowest) and we have a constraint A ranking on the range from 7 to 4 and a conflicting constraint B ranging between 5 and 3. Each constraint randomly assumes a position on the scale within the specified area at different points in time, i.e. we find constraint B sometimes at 5, sometimes at 4, sometimes at 3, while constraint A freely assumes its place on positions 7, 6, 5, or 4. A possible candidate evaluation has constraint A situated on 7 while B is on 4, while on another occasion the same evaluation is carried out with A on point 4 and B on point 5 on the scale, i.e. the ranking is reversed. The position of the respective areas on the scale and the size of the overlap determine the frequency with which A dominates B and B dominates A. With this theory we can calculate the probability with which A dominates B and vice versa.

A problem in my opinion is the learnability of such a system, especially in the case at hand. How does a learner arrive at a placement of the relevant constraints in their positions on the scale that allow for variation if the language does not present him any data that cause this placement, i.e. there is not much variation to be found in the existing lexical items? Given that the learner is confronted with a lot of conflicting stress data, one might expect that s/he does not rank many constraints, but rather gives up on this futile task and stores stress for each item lexically, leaving most constraints on stress placement in their initial state, i.e. unranked with regard to each other.

Therefore, I will use a less machinery-intensive and less trouble-sensitive model, labelled Stratified Grammar in Anttila (2003). Grammars are stratified by ranking constraints. A stratum, though, can contain more than one constraint. These can also be conflicting constraints. For a given language there is one stratified hierarchy. Unranked constraints within a stratum assume a random ranking in every evaluation. Hence, the frequency with which an output candidate is chosen over other competitors is determined by the number of unranked constraints. If two conflicting constraints A and B are unranked in one stratum and they are decisive in that A selects candidate 1 as the winner while B selects candidate 2 as the winner, there are two possible and likely probable rankings, of which one favours candidate 1 and one favours candidate 2. With this grammar we predict a 50/50 split between the two candidates. If we add one constraint to this stratum, say C, which favours candidate 2, i.e. which is violated by candidate 1, the frequency of occurrence changes in favour of the former candidate and we have modelled a two thirds/one third split. The possible rankings are given in (28).

(28) Relative frequency in variation due to unranked constraints A, B, C

Ranking	Winner
A $\gg$ B $\gg$ C	cand. 1
A $\gg$ C $\gg$ B	cand. 1
B $\gg$ A $\gg$ C	cand. 2
B $\gg$ C $\gg$ A	cand. 2
C $\gg$ B $\gg$ A	cand. 2
C $\gg$ A $\gg$ B	cand. 2

Candidates are not phonetic forms, they are linguistic structures. Hence, one and the same phonetic form might correspond to several candidates. For example, a form with three syllables and stress on the second syllable can correspond in structural terms to one analysis with a bisyllabic trochee, one with a bisyllabic iamb, and a third structure with a monosyllabic foot. If this stands in variation with a form with stress on the initial syllable, which corresponds to two structures only (trochee or monosyllabic foot), the chances to win might be higher for the phonetic form that corresponds to three different candidates than for the one that corresponds only to two prosodic analyses. This tendency in favour of one phonetic form, in addition, can be reinforced via the number of unranked constraints favouring one or the other structural analysis. On the other hand, if one output phonetic form has several phonological analyses, i.e. candidates, but they are all but one banned from surfacing by high-ranking constraints, the structural ambiguity does not result in higher frequency.

In the following analyses I will regard the whole population as one speaker for the reasons outlined above. One could treat some individual speakers separately in some aspects, for example the placement of stress in LLL forms. Here we have seen that two speakers did not show any variation. One put stress always on the penult, while the other put stress always on the antepenult. I will leave aside the details of these individual grammars for the sake of time and space.

6.2.4.1 All light syllables

In words with light syllables only subjects showed an overwhelming tendency to realize tetrasyllabic words with penultimate stress, while in trisyllabic words there was more or less a tie between penultimate and antepenultimate stress. I will first account for the near 50/50 split in LLL words and then look at the 90/10 split in LLLL words.

Below is a list of constraints that have been proposed in the OT literature on stress placement and used also in the analysis of Italian.

(29) Initial set of constraints on stress placement

a. NonFinal: The final syllable is not footed.
b. Edgemost-R: The stressed syllable is final in the prosodic word.
c. Parse-σ: Every syllable is part of a foot.
d. Foot=μμ: Every foot has exactly two morae.

D'Imperio and Rosenthall (1999) use a slightly different inventory. First, they do not consider Parse-σ but invoke *Lapse instead. Elenbaas and Kager (1999) define *Lapse as violated by any syllable that is not next to a stressed syllable or the word margin. If we consider our longest forms LLLL, the only two forms that could violate this constraint are ˈLLLL and LLLˈL. The latter is excluded as well via NonFinal. Actually, a ban on pre-antepenultimate stress in nouns should even be more important than the realization of lexical stress, if D'Imperio and Rosenthall's and many other people's observation that stress in Italian nouns falls into a three-syllable window at the right edge of the word is not just a historical accident. However, assuming a high ranking for *Lapse will be problematic later on in the analysis of secondary stress, since it forces a secondary foot on a four-syllable form with penultimate stress.

So far we have determined that the final syllable is unfooted if unstressed, and that a foot should not exceed two mora. The constraint is a conflation of Crowhurst's (1996: 412) foot minimality and foot maximality constraints. These two generalizations on stress are captured in the ranking of the constraints assumed so far (30).

(30) Ranking

NonFinal, Foot=μμ ≫ Parse-σ, Edgemost-R

A number of further constraints have to be highly ranked in Italian. First of all, coda consonants are moraic, as was observed above, which implies that the constraint assigning a mora to a coda, WEIGHT-BY-POSITION, has to be highly ranked. The complete absence of vowel lengthening in final stressed syllables indicates a top ranking of a constraint against exactly this: long vowels in word-final position, labelled NLV-R ('No long vowel at the right edge') in the literature (see e.g. Buckley 1998). These constraints are of minor interest for our current purpose, the analysis of (variation in) the default stress placement, and will be left out in the following paragraphs.

The two constraints we have not ranked yet are the one dragging stress to the right edge of the word (EDGEMOST-R) and the constraint demanding the inclusion of every syllable into a foot (PARSE-σ). When we have an LLL input, each of these two constraints favours a different candidate, as can be seen in tableau (31). The highly ranked constraint NONFINAL excludes all sorts of undesired candidates for good, i.e. candidate (31c) and (31e) with a foot aligned with the right edge of the word. The foot-size constraint excludes any undesired candidate with (for example) stress on the initial syllable and lengthening of the antepenultimate vowel (31f). The ranking of these two constraints with regard to each other is irrelevant for the issue at hand. Performance on the two unranked constraints in the lower stratum excludes candidate (31b) under any ranking of the two constraints, since this candidate's violations of these two constraints are a superset of the violations of both candidate (31a) and candidate (31d), respectively. The ranking of the two constraints in the lower stratum is relevant, however, since ranking PARSE-σ above EDGEMOST-R yields candidate (31a) as optimal, with antepenultimate stress, while the reverse ranking results in the choice of candidate (31d). Since either ranking is as likely as the other, this describes a balanced variation between the two forms.

(31) Trisyllables

	NONFINAL	FOOT=μμ	PARSE-σ	EDGEMOST-R
☞ a. (ˈfruda)lo			*	**
b. (ˈfruː)dalo			**!	**
c. fru(ˈdalo)	*!			*
☞ d. fru(ˈdaː)lo			**	*
e. (ˌfruda)(ˈlo)	*!			
f. (ˈfruːda)lo		*!	*	**

A last note on this tableau concerns candidate (31b). The form has vowel lengthening in the wrong position and does not violate any of the two highly ranked constraints. It violates each of the two constraints in the lower stratum twice, while the other two candidates competing at this point have a proper subset of the violations of candidate (31b). Hence, under any ranking candidates (31a) and (31d) fare better than candidate (31b). Candidate (31b) is harmonically bounded.

LLLL words show a different kind of variation. Penultimate stress prevails (90 per cent), but antepenultimate stress is possible (10 per cent). To get such a relation between two candidates we need to add more detail to the grammar, as can be seen in tableau (32). At the moment we can only describe even variation; and as far as LLLL words are concerned we predict the candidate with penultimate stress and a secondary stress on the first syllable (a) to surface in 100 per cent of cases. In (32) and following tableaux I have omitted the candidates ousted by the constraints in the higher stratum as well as these constraints to keep things simple. Candidate (32c) is the one with a stress pattern which never occurs in Italian nouns. As it stands this one is banned under any ranking, which is a desired result, but so is candidate (32b), which is not a desired result. Candidate (32d) is equivalent to candidate (32a) in placement of main stress. An interesting result of the nonce-word test I have not mentioned earlier is that the mid vowels *o* and *e* were very often realized as lax when stressed. The LLLL word *rocapado* was realized in some occurrences with stress on the penult and a lax vowel in the first syllable by the Roman speakers, indicating that candidate (32a) with secondary stress is the right analysis for these realizations. Since this was not consistent, form (32d) might be a valid option too. Pre-empting the discussion on secondary stress, secondary stress is realized sometimes only: creating other feet than the main foot is optional.

(32) Quadrosyllables

	PARSE-σ	EDGEMOST-R
☞ a. (ˌɾoka)(ˈpaː)do	*	
b. ɾo(ˈkapa)do	**	**
c. (ˈɾoka)pado	**	***
d. ɾoka(ˈpaː)do	***	*

Which factor (constraint) is responsible for the 8.3 per cent of antepenultimate stress in tetrasyllabic nouns? While EDGEMOST-R places the main stress, there are quite a few Alignment constraints on feet, one of which, ALLFEET-Right, aligns every foot with the right edge. This constraint swings the pendulum slightly towards antepenultimate stress, since a candidate with two feet violates it more than once with one foot. In fact, this constraint sets the two candidates free, (b) and (d). Now we have a grammar with a stratum of unranked constraints which can favour each of our three 'good' candidates under different temporary rankings.

(33) One constraint frees up two candidates

	PARSE-σ	EDGEMOST-R	ALLFTR
☞ a. (ˌɾoka)(ˈpaː)do	*	*	***
☞ b. ɾo(ˈkapa)do	**	**	*
c. (ˈɾoka)pado	**	***	**
☞ d. ɾoka(ˈpaː)do	***	*	*

With this grammar we have three rankings favouring candidate (a), two rankings favouring candidate (d), and one ranking favouring candidate (b). Candidate (c) is still suboptimal under any ranking. Out of six possible rankings, five favour penultimate stress. Given equal probability of any of the possible rankings of the three constraints, we get rankings favouring penultimate stress in LLLL words in 83.33 per cent. This is quite close to the observed occurrence of penultimate stress in the data (91.7 per cent). All six possible rankings are illustrated in tableaux below.

(34) Choosing candidate (a)

i.	Parse-σ	Edgemost-R	AllFtR
☞ a. (ˌɾoka)(ˈpaː)do	*	*	***
b. ɾo(ˈkapa)do	**!	**	*
c. (ˈɾoka)pado	**!	***	**
d. ɾoka(ˈpaː)do	**!*	*	*

ii.	Parse-σ	AllFtR	Edgemost-R
☞ a. (ˌɾoka)(ˈpaː)do	*	***	*
b. ɾo(ˈkapa)do	**!	*	**
c. (ˈɾoka)pado	**!	**	***
d. ɾoka(ˈpaː)do	**!*	*	*

iii.	Edgemost-R	Parse-σ	AllFtR
☞ a. (ˌɾoka)(ˈpaː)do	*	*	***
b. ɾo(ˈkapa)do	**!	**	*
c. (ˈɾoka)pado	**!*	**	**
d. ɾoka(ˈpaː)do	*	**!*	*

(35) Choosing candidate (d)

i.	Edgemost-R	AllFtR	Parse-σ
a. (ˌɾoka)(ˈpaː)do	*	**!*	*
b. ɾo(ˈkapa)do	**!	*	**
c. (ˈɾoka)pado	**!*	**	**
☞ d. ɾoka(ˈpaː)do	*	*	***

ii.	AllFtR	Edgemost-R	Parse-σ
a. (ˌɾoka)(ˈpaː)do	**!*	*	*
b. ɾo(ˈkapa)do	*	**!	**
c. (ˈɾoka)pado	**!	***	**
☞ d. ɾoka(ˈpaː)do	*	*	***

(36) Choosing candidate (b)

	ALLFTR	PARSE-σ	EDGEMOST-R
a. (ˌɾoka)(ˈpaː)do	**!*	*	*
☞ b. ɾo(ˈkapa)do	*	**	**
c. (ˈɾoka)pado	**!	**	***
d. ɾoka(ˈpaː)do	*	***!	*

We are still a few percentage points away from the actual result; but I leave the analysis of LLLL words here without going to the trouble of adding another constraint, since the result is already quite close.

6.2.4.2 Quantity

In the nonce-forms with heavy syllables we found that a heavy penult invariably attracts stress regardless of the weight of the preceding syllable, while a heavy antepenult attracts stress to a lesser degree than a light antepenult followed by a light penult.

To account for quantity-sensitivity we have to include another constraint in the hierarchy, which punishes forms with unstressed heavy syllables, the Weight-to-Stress Principle (Prince 1983; Prince and Smolensky 1993) or WSP.

(37) WSP: Heavy syllables are stressed.

I will deal with the variation pattern first. HLL words show antepenultimate stress only in about 30 per cent of all realizations. We add WSP in the stratum of unranked constraints and see which effect it has. First of all, the set of highly ranked constraints already excludes an important candidate with antepenultimate stress, the one with a trimoraic foot (38c). A further candidate that plays no role here and is banned from Italian is one with a stress clash, i.e. a foot with secondary stress on the heavy syllable and main stress on the following light syllable. Stress clash avoidance will become an issue in the discussion of compound and phrasal stress, and is left out here. As above, I ignore the sub-optimal candidates with final stress.

(38) HLL: two winners

kjatteno	NON FINAL	FOOT =μμ	PARSE-σ	ALLFTR	EDGEMOST-R	WSP
☞ a. kjat(ˈteː)no			**	*	*	*
☞ b. (ˈkjat)teno			**	**	**	
c. (ˈkjatte)no		*!	*	*	**	

With the WSP added we have four unranked constraints, of which two (ALLFTR and EDGEMOST-R) favour the candidate with penultimate stress (38a) and one (WSP) favours the candidate displaying weight sensitivity in the antepenultima (38b). In terms of rankings, we have 8 favouring quantity sensitivity and 16 favouring penultimate stress, i.e. the predicted occurrence of antepenultimate stress triggered by quantity sensitivity in 33 per cent of all realizations – not an exact match, but very close to the percentage of realizations encountered in the test data.

(39) a. Rankings favouring HˈLL
PARSE-σ ≫ ALLFTR ≫ EDGEMOST-R ≫ WSP
PARSE-σ ≫ ALLFTR ≫ WSP ≫ EDGEMOST-R
PARSE-σ ≫ EDGEMOST-R ≫ ALLFTR ≫ WSP
PARSE-σ ≫ EDGEMOST-R ≫ WSP ≫ ALLFTR
ALLFTR ≫ PARSE-σ ≫ EDGEMOST-R ≫ WSP
ALLFTR ≫ PARSE-σ ≫ WSP ≫ EDGEMOST-R
ALLFTR ≫ EDGEMOST-R ≫ PARSE-σ ≫ WSP
ALLFTR ≫ EDGEMOST-R ≫ WSP ≫ PARSE-σ
ALLFTR ≫ WSP ≫ EDGEMOST-R ≫ PARSE-σ
ALLFTR ≫ WSP ≫ PARSE-σ ≫ EDGEMOST-R
EDGEMOST-R ≫ ALLFTR ≫ PARSE-σ ≫ WSP
EDGEMOST-R ≫ ALLFTR ≫ WSP ≫ PARSE-σ
EDGEMOST-R ≫ PARSE-σ ≫ ALLFTR ≫ WSP
EDGEMOST-R ≫ PARSE-σ ≫ WSP ≫ ALLFTR
EDGEMOST-R ≫ WSP ≫ PARSE-σ ≫ ALLFTR
EDGEMOST-R ≫ WSP ≫ ALLFTR ≫ PARSE-σ

b. Rankings favouring ˈHLL
PARSE-σ ≫ WSP ≫ ALLFTR ≫ EDGEMOST-R
PARSE-σ ≫ WSP ≫ EDGEMOST-R ≫ ALLFTR
WSP ≫ PARSE-σ ≫ ALLFTR ≫ EDGEMOST-R
WSP ≫ PARSE-σ ≫ EDGEMOST-R ≫ ALLFTR
WSP ≫ EDGEMOST-R ≫ PARSE-σ ≫ ALLFTR
WSP ≫ EDGEMOST-R ≫ ALLFTR ≫ PARSE-σ
WSP ≫ ALLFTR ≫ PARSE-σ ≫ EDGEMOST-R
WSP ≫ ALLFTR ≫ EDGEMOST-R ≫ PARSE-σ

For the analysis of the two non-varying types, LHL and HHL, we do not have to add any constraints to the grammar. LHL and HHL show examples of harmonic bounding. Independently of the ranking of the involved unranked constraints, there is only one winner.

In tableau (40), evaluating LHL, (c), the candidate with penultimate stress harmonically bounds the candidate with antepenultimate stress (b), i.e. there is no ranking of the fluctuating constraints in which (b) is better than (c), because there is no constraint in which (b) incurs less violations than (c).

(40) LHL: invariant penultimate stress

	NON FINAL	FOOT =μμ	PARSE-σ	EDGEMOST-R	ALLFTR	WSP
a. (ˈtapiɾ)ko		*!	*	**	*	*
b. (ˈtaː)piɾko			**	**!	**	*!
☞c. ta(ˈpiɾ)ko			**	*	*	

The same holds for the two relevant candidates for HHL forms. Candidate (41a) with antepenultimate stress is harmonically bounded by (41b) with penultimate stress.

(41) HHL: invariant penultimate stress

	NON FINAL	FOOT =μμ	PARSE-σ	EDGEMOST-R	FOOT =σσ	WSP
a. (ˈdʒon)sikko			**	**!	*	*
☞ b. dʒon(ˈsik)ko			**	*	*	*

This is exactly what the grammar should produce according to the results of the nonce-word test.

6.2.5 *Comments and further refinement*

The wug test showed that for nouns the grammar is to some extent non-deterministic. The constraints responsible for right-edge alignment of stress and the constraint enforcing weight-sensitivity are unranked, and leave room for variation in the assignment of default stress. Undetermined ranking is no surprise, given the presence of lexical stress in almost all positions. Faced with conflicting evidence, the learner of Italian ranks faithfulness constraints relatively high and leaves most of the other constraints unranked.

Now it is no longer possible, however, to determine which words in Italian are not lexically marked for stress. Hence, both D'Imperio and Rosenthall as well as Morén are as right as they are wrong. There is a tendency for penultimate stress (D'Imperio and Rosenthall) but also for antepenultimate stress (Morén), and a tendency to weight-sensitivity, but not full-scale weight-sensitivity (D'Imperio and Rosenthall).

Above it was assumed that coda consonants are moraic in all candidates. Thus, WBYP (WEIGHT-BY-POSITION) is assumed to be top-ranked. D'Imperio and Rosenthall play with this assumption to explain the absence of words like **herpés*, but face difficulties here, especially because of the high-ranking WSP. Ignoring the possibility of lexical stress for the moment, we have no problem with such forms at this point. Default stress is assigned to the penultimate syllable in *herpes*, due to NONFINAL.

Consonant weight and the contrastive use of consonant length pose another issue here. As discussed in section 4.1, vowel length is not contrastive, but consonant length is. Thus, a long consonant is less marked than a long vowel. Pursuing this logic further, gemination of the consonant in the onset of the post-tonic syllable within words to provide the required second mora for a stress foot is an option that has to be ruled out. In Chapter 4 we established the ranking in (42).

(42) *Vμμ ≫ IO-Max-μ ≫ *Cμ

This ranking guaranteed the difference between [ˈkaːsa] and [ˈkassa] to be a length contrast in consonant length rather than vowel length. In the previous section we established further that the length of the vowel in *casa* is the result of a ban against the inclusion of the final syllable into foot structure, in conjunction with the demand to have bimoraic trochaic feet. This causes us a problem now, as can be seen in (43).

(43) Unattested consonant gemination to improve foot structure

/kasa/	NonFinal	Foot=μμ	*Vμμ	IO-Max-μ	*Cμ
a. (ˈka.sa)	*!				
b. (ˈka).sa		*!			
☹ c. (ˈkaː).sa			*!		
💣 d. (ˈkas).sa					*

Since faithfulness to consonant length is in any case more important than markedness, we can add a faithfulness constraint against the insertion of non-lexical moras to consonants above the markedness constraint against long vowels. This de-selects candidate (d).

(44) Choosing vowel lengthening over consonant gemination

/kasa/	Non Final	Foot =μμ	IO-Dep-Cμ	*Vμμ	Max-IOμ	*Cμ
a. (ˈka.sa)	*!					
b. (ˈka).sa		*!				
☺ c. (ˈkaː).sa				*		
☠ d. (ˈkas).sa			*!			*

Italian is well known for the process of raddoppiamento fonosintattico, which lengthens consonants in certain prosodic environments across word boundaries and in a limited class of affixation cases. We will return to this issue in the section on secondary stress (6.4) and, in more detail, in the section on prosodically driven consonant gemination (7.3). Saltarelli (2004) provides an OT analysis of vowel lengthening and consonant gemination in which both processes are responses to the Stress-to-Weight-Principle (SWP) that requires stressed syllables to be heavy (i.e. the reverse of the constraint enforcing quantity sensitivity used above). Similarly, Bye and de Lacy (in press) attribute both types of stressed syllable augmentation to a constraint favouring heavy syllables in main stress position (Main-to-Weight). At this point we can clearly say that neither constraint (the SWP or Main-to-Weight) plays a role in vowel lengthening. In section 7.3 we will see that rhythmic consonant doubling is a side-effect of the same force that causes vowel lengthening: the requirement on feet to be bimoraic.

6.3 LEXICAL STRESS

As was shown above, default stress assignment is quite complex and in some cases (as in LLL words) non-deterministic, i.e. the grammar does not give the speaker one output to favour over all others. While in LˈHL words the stress could be assigned by default, it has to be lexical in most other cases. Consider especially LLL words: if the stress wasn't lexically specified in words like *asino* [ˈazino] 'donkey' and *parola* [paˈɾoːla] 'word' we would expect vacillating stress, as found in *amaca* 'hammock'. In this section we will look at lexical stress in more detail. The issues that will be addressed are the emergence of lexical stress, the interaction of conflicting lexical stresses in morphologically complex words, and the word-final three-syllable window for lexical stress in nouns. Section 6.3.1 introduces the central data and issues, while 6.3.2 provides a constraint-based analysis, building on the grammar developed in the previous sections.

6.3.1 Conflicting stress marks

To get a better understanding of lexical stress, we reconsider the example paradigm of *agitare*. As we know from the evidence contributed by 2nd conjugation verbs, default stress in verbs is penultimate. In the *agitare* paradigm, repeated in (45), we find stress in three different positions, i.e. in the second last (a and c), third last (b), and fourth last syllable (d). The forms in (a), (c), and (d) have four syllables, and we would expect stress in the second last syllable. Since stress occurs in the fourth syllable in (d) this can definitely not be the emergence of default stress. I have chosen *agitare* also because it contains only light syllables—except when the second last is stressed, when this syllable has a long vowel and the syllable is regarded as heavy.

(45) 1st conjugation verbs and stress

a. adʒiˈtaːre 'to shake, get excited'

b. ˈadʒito	1sg.	c. adʒiˈtjaːmo	1pl.
ˈadʒiti	2sg.	adʒiˈtaːte	2pl.
ˈadʒita	3sg.	d. ˈadʒitano	3pl.

Regarding the stress in (d) as lexical also tells us something about the forms in (b): in these forms stress is on the same syllable as in (d). Since all these forms have the same root the stress in (b) is then the emergence of the lexical stress mark on the first vowel in the root, as in (d). This analysis of (b) and (d) excludes regarding the penultimate stress in (a) and (c) as generated by default assignment. Example (d) shows (as did the noun data in the beginning of the chapter) that lexical stress takes precedence over any kind of default mechanism. Thus, the stress placement in (a) and (c) has to be the result of another lexical stress mark competing with the lexical stress marked on the verb root and winning against it—although the first syllable in these cases can receive secondary stress. The default mechanism, then, chooses which one of the two lexically stressed syllables receives main stress.

(46) Lexical stress in *agitare* 'to shake, get excited'

a/c. /ˈadʒit -ˈare/ → (.ˌa.dʒi.)$_{Ft}$(ˈtaː.)$_{Ft}$re / .a.dʒi.(ˈtaː.)$_{Ft}$re
/ˈadʒit -ˈjamo/ →(.ˌa.dʒi.)$_{Ft}$(ˈtjaː.)$_{Ft}$mo / .a.dʒi.(ˈtjaː.)$_{Ft}$mo
/ˈadʒit -ˈate/ → (.ˌa.dʒi.)$_{Ft}$(ˈtaː.)$_{Ft}$te / .a.dʒi.(ˈtaː.)$_{Ft}$te
b. /ˈadʒit -o/ → (.ˈa.dʒi.)$_{Ft}$to
d. /ˈadʒit -ano/ → (.ˈa.dʒi.)$_{Ft}$ta.no

To build a second foot on the penultima in (d) would be an option. If this were a real option, however, we would see lengthening on the /a/, which does not occur. Another possibility is to have secondary stress on the root [*(.ˌa.dʒi.)$_{Ft}$(ˈtaː)$_{Ft}$ no].

If we want to know if the realization of lexical stress in affixes takes precedence over lexical stress in roots, we need additional data in which realization of both stresses would cause a clash. The *-ere* paradigm displays two different types of verb: those that have stress on the suffix in the infinitive and those that have stress on the root in the infinitive, as contrasted below.

(47) Stress patterns of 2nd conjugation verbs

a. kaˈdeːre	'to fall'	a′. ˈridere	'to laugh'
b. ˈkaːdo	1sg	b′. ˈriːdo	
ˈkaːdi	2sg	ˈriːdi	
ˈkaːde	3sg	ˈriːde	
c. kaˈdjaːmo	1pl	c′. riˈdjaːmo	
kaˈdeːte	2pl	riˈdeːte	
d. ˈkadono	3pl	d′. ˈridono	

A potential analysis here is to assume two infinitive markers /-ere/, one with and one without a lexical stress mark. A more economical view assumes just one underlying infinitive affix for the 2nd conjugation, which has no lexical stress mark.

For the forms in (a–d) we can say that the root does not have lexical stress and the penultimate stress in the infinitive is the default stress, while for the forms in (a′–d′) we can assume underlying stress on the root. Thus, default stress in verbs is penultimate (disregarding syllable weight for the moment), and stress on a preceding or following syllable is the result of lexical stress on a morpheme overriding the default assignment. The forms in (c′) show that lexical stress in affixes wins over lexical stress in roots. The underlyingly stressed vowel in the root surfaces as unstressed, and the lexical stress in the affixes wins. A problem here is the 3rd person plural. In (d′), the lexical stress of the root surfaces and we can deduce that the suffix /-ono/ has no underlying stress mark. In (d), however, we find antepenultimate, i.e. non-default, stress as well, which is not contributed by the root. A potential analysis holds the suffix as prestressing, while alternatively the antepenultimate stress in (d) could also be a paradigm uniformity effect, resulting from pressure from the 3rd person singular.

If the pre-stressing analysis is right, and if the generalization is right that lexical stress in suffixes takes precedence over lexical stress in roots, then we expect longer verbs with lexical stress on the root to have pre-suffixal stress in the 3rd person plural as well. (46), however, shows that this is not borne out. The form *[aˈdʒitano] is ungrammatical. Thus, the analysis invoking a paradigm effect in the 3rd person plural has to be preferred.

Given the non-deterministic nature of stress in nouns, the penultimate stress in derived nouns given earlier (such as [paˈɾɔːla] → [paɾoˈliːna] 'word'/'little word') can only be lexical. Another take here is to consider that all these affixes are derivational, while the affixation on verbs is mostly inflectional. The surprising feature here is that there does not seem to be a single derivational affix for nouns that does not attract stress. Hence, it seems as if this kind of stress shift is not due to the Rightmost-lexical-stress-wins mechanism found in verbal inflection but rather a marking of the morphosyntactic head through stress. Likewise, these affixes can be regarded as the second part of a compound at the stem level. In compounds, stress is realized on the rightmost member as well (as in [pɔɾtaˈtʃeneɾe] 'ashtray').

Other languages with lexical stress also display pre-stressing morphemes and post-stressing morphemes. So far, I have found only one suffix in Italian that could be regarded as a candidate for a prestressing morpheme, the affix /-(t)iko/. Most adjectives derived with this affix have antepenultimate stress. The regular case of antepenultimate stress is illustrated in (48a) and (48b). (48c) illustrates the exception. The adjective *antico* does not have a base in Modern Italian and accordingly is not analysed as a derived form.

(48) Adjective formation in *-ico*

a.	ˈakwa	'water'	aˈkwatiko	'aquatic'
b.	kaˈtastɾofe	'carastrophe'	katasˈtɾɔfiko	'catastrophic'
	ˈnumeɾo	'number'	nuˈmɛɾiko	'numeric'
c.			anˈtiːko	'antique'

There are plenty of ways to derive adjectives, such as the use of present and past participles or affixation with /-ˈoso/, /-ˈale/ or /-ˈabile, -ˈibile/, to name only a few.

(49) Means of adjective formation

a.	ˈgas	'gas'	gaˈzaːto	'excited'
	ˈɾideɾe	'to laugh'	ɾiˈdente	'laughing'
b.	ˈgas	'gas'	gasˈsoːzo	'sparkling'
	obˈbrɔbɾjo	'disgrace'	obbɾobɾiˈoːzo	'disgraceful'
c.	ˈledʒdʒeɾe	'to read'	ledʒˈdʒibile	'legible'
	leˈgaːɾe	'to tie'	leˈgabile	'tyable'
	naˈtsjoːne	'nation'	natsjoˈnaːle	'national'

In all cases we find lexical stress on the first vowel of the affix or on the theme vowel that comes with the affix (-abile/-ibile). The suffix /-iko/ is the only one that productively shifts stress to the vowel preceding it, i.e. a vowel that is definitely not part of the affix. A possible analysis explains the behaviour of this suffix by assumption of a weak foot part in the lexical representation of the affix.

There are, however, two more candidates. The 3rd person plural of present indicative active verbs is never stressed on the affix /-ono/. This case has been discussed already and might be a paradigm effect. A non-negligible group of 3rd conjugation verbs apparently repels stress, or might be regarded as post-stressing. These verbs take the stem extension /-isk-/ in some forms. The extension emerges whenever the stem would be stressed otherwise, while it is absent when a suffix can be stressed.[5]

(50) 3rd conjugation verbs

a. fiˈniːre	'to finish'		
fiˈnisko	1sg	fiˈnjaːmo	1pl
fiˈniʃːi	2sg	fiˈniːte	2pl
fiˈniʃːe	3sg	fiˈniskono	3pl
b. dorˈmiːre	'to sleep'		
ˈdɔrmo	1sg	dorˈmjaːmo	1pl
ˈdɔrmi	2sg	dorˈmiːte	2pl
ˈdɔrme	3sg	ˈdɔrmono	3pl

The paradigm in (50a) shows the extension in every form that has stress on the stem in the paradigm in (50b), while the forms which have stress on an affix in (50b) also do not take the extension in (50a). The class of verbs that take the extension cannot be defined on semantic grounds synchronically. The same arbitrary situation holds for the assignment of a verb to the whole class, i.e. 3rd conjugation.

6.3.2 OT analysis of lexical stress

As established earlier, we can assume that lexical stress overrides default stress assignment. This can be reflected in a high-ranking faithfulness constraint outranking all the constraints governing default stress placement.

(51) A ranking for lexical stress

Faith(stress) ≫ NonFinal ≫ Foot=μμ ≫ Parse-σ, Edgemost-R, AllFt-R, WSP

D'Imperio and Rosenthall (1999) exclude lexical stress from surfacing outside a word-final three-syllable window, since they have not found any nouns with stress on the fourth-last syllable. However, as mentioned already, if we look at inflected verb forms we do find stress on the fourth-last syllable, on the one hand as secondary stress as in forms like [teˌlefoˈnjaːmo] *telefoniamo* 'we telephone' and on the other as primary stress as in [teˈlefonano] *telefonano* 'they telephone'. Thus, I assume there is no point in excluding this kind of stress via the constraint ranking. However, one question that has to be answered is how the right-drift in forms with competing lexical stresses can be explained. This might either be due to higher priority of affix stress over root stress or be a side-effect of the default stress mechanism.

First we look at competing lexical stresses which do not potentially clash, as in the form *agitare*, which was argued above to have two underlying stresses.

[5] See Canclini (1999) for an insightful OT analysis of stress in 3rd conjugation verbs.

(52) Two lexical stresses

/ˈadʒit -ˈare/	FAITH	NON FINAL	FOOT =μμ	PARSE-σ	EDGE MOST-R	ALLFTR	SWP
a. adʒi(ˈtaː)re	*!			***	*	*	
b. (ˈadʒi)(ˈtaː)re				*	**!*	***	
☞ c. (ˌadʒi)(ˈtaː)re				*	*	***	

In this grammar, forms (a) and (b) are sub-optimal under every possible internal ranking of the unranked constraints. The unfaithfulness to lexical stress in the first syllable in candidate (a) causes a fatal violation of FAITH(stress) which the other two candidates satisfy. Underparsing of the initial two syllables in (a) is responsible for the additional violation marks under PARSE. The decision between the two left-over candidates, i.e. between initial or penultimate main stress, is left to the low-ranking constraint aligning the main stress with the right word edge.

The constraint banning secondary stress on one of the lexically stressed vowels which are adjacent in the surface form is *CLASH, which militates against adjacent stressed syllables. This has to rank higher than faithfulness.

(53) Competing lexical stresses

/ˈrid -ˈjamo/	*CLASH	FAITH	FOOT =μμ	PARSE-σ	EDGE MOST-R	ALLFTR	SWP
a. (ˌriː)(ˈdjaː)mo	*!			*	*	***	
☹ b. ri(ˈdjaː)mo		*		**	*	*	
💣 c. (ˈridja)mo		*		*	**	*	

Given that we assume constantly changing rankings among the unranked constraints, there are quite a few temporary rankings then on which form (c) can win. Since there are no verb forms with free variation in stress placement in the 1st person plural or any other form, there has to be another factor responsible for the stable preference of a lexical stress in affixes over lexical stress in roots, i.e. the faithfulness constraint has to be split up into two with the appropriate ranking in Italian.

Another solution is to assume different constraint hierarchies for nouns and verbs. As we have seen, there is a way to figure out where default stress is located in verbs. Hence, a learner is expected to take advantage of this and rank the constraints. First, the preference of penultimate stress motivates a ranking of EDGEMOST-R above PARSE-σ, since the latter is the constraint that causes antepenultimate stress to emerge. The SWP has to be ranked higher than ALLFTR. Moreover, its location in the hierarchy is problematic, since a high ranking of SWP causes quantity-sensitivity in the whole word rather than just in the last three syllables. To figure out if such a restriction is necessary at all, we have to look at those verbs that have a pre-antepenultimate heavy syllable.

(54) -*ére* verbs with a pre-antepenultimate heavy syllable

accadere	'to happen'	permanere	'to remain'
appartenere	'to belong to'	persuadere	'to persuade'
attenersi	'to cling on to sthg.'	possedere	'to possess'
avvedersi	'to perceive'	provvedere	'to provide'
compiacere	'to please'	soggiacere	'to be subjected'
dispiacere	'to dislike'	soprassedere	'to postpone'
dissuadere	'to dissuade'	sostenere	'to support'
ottenere	'to obtain'	trattenere	'to keep'

All these verbs are derived by prefixation to a shorter stem. Not all of them are still in use. *Manere* no longer occurs without a prefix, and *suadere* is used extremely rarely.

(55) . . . and their bases

cadere	'to fall'	sedere	'to be seated'
giacere	'to lie (e.g. on the ground)'	(*)suadere	
*manere		tenere	'to hold'
piacere	'to like'	vedere	'to see'

Any of these prefixes could be outside the stress domain. Thus, Italian does not give us the relevant data to decide on the local restriction of quantity-sensitivity. Recall that all other -*ere* verbs have lexical stress on the root, and thus do not qualify to make generalizations on the factors determining stress placement, or they have stress on a heavy syllable in the root. Thus, given the complete absence of evidence for a restriction of quantity-sensitivity to a three-syllable window, we can place SWP above EDGEMOST-R in the hierarchy.

We can now regard also -*ere* verbs with antepenultimate stress on a heavy syllable as derived by the default mechanism. Tableau (56) evaluates *vincere* 'to win' and *cadere* 'to fall' without assuming any underlying stress mark against the constraint hierarchy just developed for verbs.

(56) Default stress in verbs

	FAITH	FOOT =μμ	SWP	EDGEMOST-R	PARSE-σ	ALL FTR
a. /viNk -ere/ - vin(ˈtʃeː)re			*!	*	**	*
☞ b. /viNk -ere/ - (ˈvin)tʃere				**	**	**
☞ c. /kad -ere/ - ka(ˈdeː)re				*	**	*
d. /kad -ere/ - ˈ(kade)re				**!	*	*

With this grammar as a background we can return to the problem with competing lexical stresses as encountered in /ˈrid-ˈjamo/ ‘we laugh’. With the ranking set-up now, ungrammatical *[ˈridjamo] can no longer surface and there is no variation predicted.

(57) ‘We laugh’ revisited

/ˈɾid -ˈjamo/	FAITH	FOOT =μμ	SWP	EDGE MOST-R	PARSE-σ	ALLFTR
☺ a. ɾi(ˈdjaː)mo	*			*	**	*
☠ b. (ˈɾidja)mo	*			**!	*	*

In conclusion, the consistent victory of lexical affix stress over root stress in Italian does not result from a ranking of affix faithfulness over root faithfulness or, in Revithiadou’s terms, head faithfulness over general faithfulness, but is a side-effect of default stress placement. The default mechanism drags main stress to the penult (if the antepenult is not heavy), and if there is a choice between two lexical stress marks the one closest to the default position wins.

This analysis extends to lexical final stress as well. The next tableau shows this for /ˈɾid-eˈɾo/ ‘I will laugh’.

(58) ‘I will laugh’

/ˈɾid -eɾ -ˈo/	FAITH	FOOT =μμ	SWP	EDGE MOST-R	PARSE-σ	ALLFTR
a. ˈɾideɾo	*!			***	*	*
b. ɾiˈdeɾo	*!*			*	**	*
c. ɾideˈɾo	*!				**	
☞ d. ˌɾideˈɾo						*

For nouns, for which the lowest four constraints (SWP, EDGEMOST-R, PARSE-σ, ALLFTR) are unranked, the high ranking of faithfulness ensures that final stress, as in *città* ‘city’, surfaces faithfully.

The same highly ranked faithfulness constraint, though, also causes a problem for the generalization that nouns never have primary stress outside the word-final three-syllable window. The solution advanced in D’Imperio and Rosenthall makes a highly ranked *LAPSE responsible for this gap in the nominal pattern. D’Imperio and Rosenthall do not give a definition of the constraint, but the way in which they assess violations suggests they use the same definition as Elenbaas and Kager (1999: 282).

(59) *LAPSE: ‘Every weak beat must be adjacent to a strong beat or the word edge.’

In tableau (60) the underscore indicates the lexically marked stress.

(60) Absence of pre-antepenultimate stress as a systematic gap (D'Imperio and Rosenthall 1999: 17)

/<u>L</u>LLL/	*Lapse	Faith	Edgemost-R
a. (ˈ<u>L</u>L)LL	*!		***
b. <u>L</u>(ˈLL)L		*!	**
c. (ˈ<u>L</u>L)(ˌL)L			**!*
☞ d. (ˌ<u>L</u>L)(ˈL)L			*

In fact, *Lapse does not even have to be highly ranked. Candidate (d) bounds all other candidates in (60) under any ranking of these three constraints. A further assumption this analysis has to make is that underlying stress is representationally a strong beat or the marking of prominence, but not a mark for 'main stress' or absolute prominence, as implicitly assumed above in the discussion of verbs with competing lexical stresses on root and affix. Otherwise candidate (d) would violate faithfulness and candidate (c), with primary stress on the fourth-last syllable, would win.

6.4 SECONDARY STRESS

The existence of secondary stress in Italian is disputable. First of all, as noted by Vogel and Scalise (1982), there is no clear phonetic cue to secondary stress, especially not in Italian. Second, many native speakers have no intuitions whatsoever when asked to determine secondary stress in polysyllables. We have seen in 6.2.4 above, however, that the existence of a secondary stress foot was important in the analysis of the variation found in LLLL nonce-words. Furthermore, we have seen that, at least in the presence of mid vowels, there is a way to diagnose the presence or absence of secondary stress: the application or underapplication of raising. Vogel and Scalise develop an analysis of secondary stress based on intuitions of northern Italian native speakers. Vogel (1999) does not deal explicitly with secondary stress assignment, but assumes bisyllabic feet on non-main-stressed syllables. Before delving into an analysis of the placement of secondary stress, its evasive nature and some arguments for or against its existence should be considered.

The evidence I discuss here are unstressed vowel reduction, raddoppiamento sintattico in interaction with stress clash avoidance, and finally, vowel deletion and stress clash avoidance.

As mentioned already in the discussion of the segment inventory in 4.1, Italian has a smaller vowel system in unstressed syllables than in stressed syllables. The two lax mid vowels do not occur in unstressed position. Other languages which display vowel reduction in unstressed syllables (see e.g. Crosswhite 2001 for an extensive study of unstressed vowel reduction) and which have secondary stress, such as English, do not show reduction in syllables with secondary stress. In Italian, we find the alternation shown in (61).

(61) Stress shift

a. kafˈfɛ	‘coffee’	kaffeˈiːna	‘caffeine’
b. ˈlɔˑdʒiko	‘logic’	lodʒikaˈmente	‘logically’
dermaˈtɔˑlogo	‘dermatologist’	dermatoloˈdʒiːa	‘dermatology’

In the two forms containing the root ‘coffee’ we see an alternation. In the derived form, stress moves one vowel to the right. The vowel that loses stress also changes from lax to tense. The pairs in (b) are of special interest here, since according to Vogel and Scalise, the mid vowel in the first syllable of *logicamente* receives secondary stress in the adverb. If this syllable had the status of the head of a foot, the vowel should escape reduction, but this is (usually) not the case. The conclusion one can draw from this is that in a five-syllable word only one syllable is stressed, i.e. the one with the main stress. Take this with a pinch of salt, because we will revise it later. According to Bertinetto and Loporcaro (2005), raising of lax mid to tense mid vowels in positions that do not carry main stress applies obligatorily in inflected and derived forms (a), but not in compounds (b). In compounds they observe (optional) secondary stress on the originally stress bearing vowel of the first member.

(62) Stress shift and destressing

a. apˈpen̪do	‘I hang’	ˈtɔssiko	‘toxic’
appen̪ˈdjaːmo	‘we hang’	in̪tossiˈkaːre	‘intoxicate’
b. apˌpɛn̪diˈaːbiti	‘dress-hanger’	ˌtɔssikodipenˈdɛn̪te	‘drug addict’
c. ˌglɔttoloˈd͡ʒiːa	/ glotːoloˈd͡ʒiːa	‘glottology’	
ˌlɔːgopeˈdiːa	/ logopeˈ diːa	‘speech therapy’	
ˌpɔrtaˈfɔʎʎo	/ portaˈfɔʎʎo	‘wallet’	
ˌkɔpriˈlɛtto	/ kopriˈlɛtto	‘bed-cover’	

The examples Bertinetto and Loporcaro give for destressing in inflected and derived forms (62a), though, are too short ever to display any secondary stress on the vowels in question. In *intossicare* the most likely candidate for secondary stress is the first syllable, which is a prefix that could receive stress for its semantics, the morphological structure, and its prosodic size, a heavy syllable, or merely for being word-initial. An interesting fact Bertinetto and Loporcaro point out is that in compounds which are, according to them, opaque to the average speaker we find variation, as in (62c). Bertinetto and Loporcaro conclude that the speakers’ analysis as a compound or non-compound together with the distance to the main stress determine if raising applies or not. However, words like *glottologia* and *logopedia* have a doubtful status as compounds since neither part exists in isolation (i.e. **glotto*, **logia*, **logo*, **pedia*). Instead, these are dependent morphemes that can equally well be found in combination with other morphemes, as in *logofobia* ‘logophobia’. So they might as well have the status of derived forms rather than compounds.

Thus, the data actually point to the conclusion that (a) secondary stress in Italian is simply optional and (b) there cannot be secondary stress if this would create a stress clash, i.e. two adjacent stressed syllables.

The former observation is accounted for by the analysis of stress with variable rankings given above. Another tentative result produced in the analysis of lexical stress is that in the presence of two lexical stress marks in a form, a secondary stress on the first lexically marked vowel is expected, since a candidate with no realization of this stress would incur an additional violation of the faithfulness constraint guarding lexical stress. This prediction can be circumvented if we regard the lexical stress mark as a mark for prosodic headhood. As a stressed syllable is the head of a foot, the main stress position is the head of the prosodic word. Thus, if Italian marks only headhood of the prosodic domain/word lexically rather than the status as a head of a foot, only one lexical prosodic head mark can survive, given that words cannot have two main stresses or heads.

Raddoppiamento sintattico refers to the lengthening of intervocalic consonants as it occurs at word junctures (but also in other contexts: see the discussion in section 7.3) when the first word ends in a stressed vowel and the second starts in a single consonant (63a). No gemination occurs when the second word starts in a consonant cluster beginning with /s/ (63b).

(63) Raddoppiamento

a. kafˈfɛ kkorˈrɛtto ‘coffee with a shot’
   tʃitˈta ppuˈliːta ‘clean city’
b. tʃitˈta spaɲˈɲɔːla ‘Spanish city’

The motivation for this can be derived from the analysis of stress given above (see also the discussion in 7.3). If a stressed syllable is part of a foot and a foot has to be bimoraic and consonants can carry a mora, the final stressed syllable of the first word in these phrases can receive the required weight by gemination of the following consonant.

However, this picture is threatened when we look at phrases in which the second word starts in a stressed syllable.

(64) Over-application of raddoppiamento

a. tʃittavˈvɛkkja ‘old-town’
b. kaffelˈlatte ‘coffee with milk’

Both forms show stress retraction to avoid a stress clash, i.e. two adjacent stressed syllables. One indication of the lack of stress on the originally stressed word-final vowel is the emergence of the tense vowel in (64b). However, retraction of stress in this context removes the motivation for raddoppiamento as well, but still we find gemination.

Since we find gemination here, one could argue that this indicates secondary stress on the final vowel in the first word, and that therefore vowel reduction applies to vowels with secondary stress as well. This analysis runs into trouble with the generally held view that stress clashes are always avoided in Italian, either by stress shift or stress retraction. It might well be that destressing results in secondary stress and clash is tolerated if necessary. A different line of explanation involves a derivational point of view. Destressing to avoid stress clash could apply after raddoppiamento, rendering the emergence of a geminate opaque in (64), because a later process has destroyed the triggering environment for consonant doubling.

An additional pattern that could potentially contribute to our understanding of secondary stress is vowel deletion in compounds. Compounds are stressed on the syllable of the second member of the compound that is stressed when the word occurs alone. If the second member of the compound starts in a vowel, the final vowel of the first member is optionally deleted, as in (65a), or not, as in (65b).

(65) Vowel deletion in compounds

a.	ˈpsiko + aˈnalizi	psikoaˈnalizi	/ psikaˈnalizi	‘psychoanalysis’
	ˈpoɾta + omˈbɾelli	poɾtaomˈbɾelli	/ poɾtomˈbɾelli	‘umbrella stand’
b.	ˈfilo + ˈaɾabo	filoˈaɾabo	*fiˈlaɾabo	‘arabophile’
	ˈpoɾta + ˈabiti	poɾtaˈabiti	*poɾˈtabiti	‘clothes hanger’
c.	vaˈliːdʒa + aɾˈmaːdjo	validʒaaɾˈmaːdjo	*validʒaɾˈmaːdjo	‘wardrobe trunk’
	ˈwomo + uˈtʃello	womouˈtʃello	*womuˈtʃello	‘bird-man’

The ungrammaticality of deletion in (65b) can be explained by stress clash avoidance. In the form with deletion two stressed vowels would be adjacent, the first one carrying secondary stress and the second primary stress. The impossibility of deletion in (65c) cannot be explained this way. Vogel and Scalise classify forms like those in (65c) as loose compounds while the others are strict compounds. If there is no other criterion to classify a compound as a loose compound than the absence of vowel deletion, the argument becomes circular.

6.5 THE DOMAIN OF STRESS: THE PHONOLOGICAL WORD IN ITALIAN

As the term ‘word stress’ indicates, the placement of stress discussed in the preceding sections is limited to a domain, that of the word. The notion ‘word’, however, is problematic in linguistics in general. Generally, a distinction can be made between phonological or prosodic word (cf. e.g. Nespor and Vogel 1986; Peperkamp 1997) and morphological word. Since we are interested in phonology here, we have to ask the following two questions: how small can a prosodic/phonological word be? and what is contained in it?

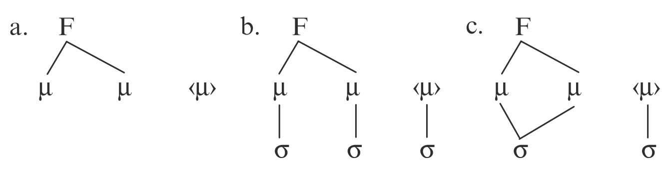
Looking at underived content words, inflection-defying nouns, and some inflected verb forms, we can see the minimal word. I exclude functional words here since they very often have the status of clitics, i.e. they are not assumed to constitute an independent prosodic domain. I will come back to cliticization further below. As the data in (66) show, a minimal word can consist of a single light syllable. In these forms the vowel is short due to the ban on long vowels at the right edge of the word.

(66) Italian minimal words

a. ˈbus	‘bus’	b. ˈgɾu	‘crane’
ˈbaɾ	‘bar’	ˈtɛ	‘tea’
c. ˈfa	‘do’	d. ˈe	‘is’
ˈdi	‘say’		

We have seen in the discussion of stress that Italian gives quite some leeway to lexical idiosyncrasy and, moreover, that these monosyllables constitute a tiny minority in the Italian lexicon. A spontaneous count in the *DiPI* (Canepàri 1999) reveals the following frequency of word lengths. In a total of three randomly chosen pages containing 382 entries, I counted 9 monosyllabic words, 82 bisyllabic words, 168 trisyllables, 106 words with four syllables, and 17 with more than four. The longest word had six syllables. This mini-corpus contains many proper names, place names, loanwords, also compounds and all sorts of inflected and derived forms. Furthermore, one might dispute the algorithm according to which I assigned syllable boundaries. Since this small corpus-linguistic enterprise just serves to give a rough impression, I refrain from going into the methodological details here. However, as far as lexical frequency is concerned, this count shows a lexical preference for trisyllabic words. We can do a similar experiment with an average text and count the occurrence of words of different sizes in a newspaper text. I randomly picked a text from the online edition of *La Repubblica*, 24 January 2007. I did not count function words, such as articles and prepositions. Nor were these seen as incorporated into a word, hosted by some neighbouring lexical items. The text contained 458 content words, of which 24 were monosyllabic, 171 bisyllabic, 149 trisyllabic, 79 had four syllables, and 35 more than four. While in the dictionary count the words with four syllables outnumber the words with two syllables, in the text count the latter category outnumber all other types in the text count. The overall impression we get is that trisyllabic words are the most popular when lexical frequency is considered (entries in the dictionary/lexicon), while bisyllabic words show the highest frequency of usage (occurrences in a text). In the discussion of stress, one of the conclusions was that the optimal structure is a bimoraic foot followed by an unfooted light syllable. This gives us optimally bi- to trisyllabic words.

(67) Optimal prosodic form



If we combine this with the findings on truncations, we see another piece of evidence that optimal word size is determined by foot form and size restrictions plus the drive to have an unfooted final syllable. In truncations, however, a slightly stricter restriction applied to foot form. A monosyllabic foot is the preferred choice in truncations, even at the cost of unfaithful lengthening of a vowel. We have observed the same preference as a mandatory requirement on stress placement (ignoring lexical stress) in verbs.

Just as this optimal structure does not exclude monosyllabic monomoraic words, it does not tell us anything about the upper limit for words. At this point it is difficult to say anything about this: we do not know exactly what can be included into a prosodic word—i.e. do prefixes join in with their host? do pronominals and prepositions, determiners and conjunctions form a prosodic unit with a lexical host? etc. Moreover, any upper limit that might be identifiable can ultimately be an effect of non-phonological forces; it might be due to morphological or morphosyntactic restrictions on the number of possible projections or simply constrained by short-term memory, i.e. outside the domain of linguistic analysis, but instead determined by a general restriction on cognitive organization (Golston 2007). Nonetheless, it is certainly worthwhile to attempt delimitation of the prosodic word in Italian by way of clarification as to which lexical and functional categories are grouped together into a prosodically relevant unit such as the prosodic word.

In the discussion of stress placement above we dealt with inflected nouns and verbs and to some degree with forms derived by affixation. Morphologically speaking, Italian has words consisting of roots plus derivational prefixes, stem-forming suffixes, and inflectional suffixes. Reflexives and object-marking pronouns can be cliticized to verbs on either side. Nouns have proclitic determiners and derivational as well as inflectional suffixes.

(68) Italian word structure

(clitics+(prefixes-((root)-suffixes)))+clitics)

The suffixes do most obviously form a close prosodic unit with the root, since we can often observe stress shift when comparing unaffixed with affixed forms, as exemplified most transparently by nominal derivations and verbal inflectional paradigms above.

Prefixes are a matter for discussion. First, they never cause stress shift to the left. They have been divided into two groups, consonant-final prefixes and vowel-final prefixes. The latter are assumed to be integrated into the prosodic word of their host (e.g. Nespor and Vogel 1986; Peperkamp 1997; Van Oostendorp 1999). Diagnostics for this are syllabification and the application of phonological processes that are assumed to apply only within the word domain and not across domains, such as intervocalic *s*-voicing in northern Italian (discussed in section 7.2). However, at least syllabification cannot be regarded as a good criterion, since we also find resyllabification across word boundaries, i.e. between lexical items. The latter occurs at the juncture between a consonant-final word and a following vowel-initial word. In this context we also find raddoppiamento, lengthening of the final consonant if the last syllable of the first word in the construction is stressed.

(69) Resyllabification over word boundaries

a. herpes incredibile	[.ˈheɾ.pe.siŋ.kɾe.ˈdiː.bi.le.]	‘incredible herpes’
b. bus azzurro	[.ˈbus.sad.ˈdzuɾ.ɾo.]	‘blue bus’

Clitics have the most problematic status, as one might expect. On the one hand it is clear that even longer sequences of clitics do not constitute a separate domain of stress assignment; on the other they do not attach to their host closely enough, as can be seen from their incapability to cause stress shift.

(70) Clitics do not cause stress shift (stress indicated by an accent here)

a. lo invía	's/he sends it'	a'. invíaglielo	'send it to him'
b. ce lo figuriámo	'we imagine it'	b'. figuriámocelo	'Let's imagine it'

This led Nespor and Vogel to introduce a level of analysis between word and phrase, the clitic group.

Nespor (1985) observes that clitics do not attract stress and that there can be consonant clusters at the verb/clitic boundary which are illicit word-internally. She concludes on this basis that clitics are not part of the prosodic word. The vowel length measurements by D'Imperio and Rosenthall (1999), though, lead to a different conclusion. Earlier in this chapter we discussed the nature of the foot in Italian in large part on the basis of their measurements of stressed vowels in open syllables in different positions in the word and the conclusions they draw. The crucial observation here was that in penultimate position vowels are significantly longer than in any other position. In their measurements of vowels in verbs they compare inflected verb forms with the same forms plus clitcs. It turns out that the addition of clitics to a verb form has an influence on the length of the stressed vowel. The stressed (here boldfaced) vowel in *fate* 'do!(2pl.)' or *dite* 'say!(2pl)' is significantly longer than the same stressed vowel in the cliticized forms of these verbs, as in *fatele* 'do them!' or *ditele* 'say them!' Hence, the shorter form has a bimoraic trochee on the stressed syllable to the exclusion of the following form-final syllable, while in the longer forms the foot can be extended over the following syllable which is no longer form-final.

(71) Footing of (non-)cliticized verbs (according to D'Imperio and Rosenthall 1999)

a. (ˈfaː)$_{\text{ft}}$te b. (ˈfate)$_{\text{ft}}$le
(ˈdiː)$_{\text{ft}}$te (ˈdite)$_{\text{ft}}$le

(72) Prosodic word parsing of (non-)cliticized verbs (according to Nespor 1985)

a. {ˈfaːte} b. {ˈfate}le
{ˈdiːte} {ˈdite}le

We cannot maintain both positions, i.e. Nespor's claim that clitics are outside the prosodic word and D'Imperio and Rosenthall's foot structure. Assuming both results in an unfooted structure which is both inside as well as outside the prosodic word, because the constraint that causes the last syllable to be unfooted, (NonFinal above) has to refer to some domain. We find a solution to this dilemma in D'Imperio and Rosenthall's analysis. Prosodic structure is assigned in a cyclic fashion—in other words, the cliticized form has the non-cliticized form as its base. The form with clitics keeps the stress stable that was assigned to the same form without the tail of clitics. In this way we keep the clitics outside the core prosodic word, but at the same time create a larger prosodic unit (word?) that includes the clitics.

This analysis, however, does not straightforwardly explain the processes and phonotactic liberties observed at the word-clitic juncture discussed by Nespor. First, when preceded by a stressed open syllable the first consonant of a clitic geminates.

(73) Gemination with clitics

	Real form			Expected form
a.	[ˈdammi]	dá mi	‘give me’	a′. *[ˈdaːmi]
	[aˈmɔllo]	amó lo	‘s/he loved him’ (archaic)	*[aˈmɔːlo]
b.	[ˈvattene]	vá te ne	‘go away’	b′. *[ˈvatene]

If the clitic is just incorporated into the prosodic word of its host in a second round of prosodification, we would expect vowel lengthening in (a) and no effect in (b), as indicated by the ungrammatical forms in (a′) and (b′).

The segment combinations we find at word-clitic junctures that are illicit word-internally pose a further problem, as in *darglielo* [ˈdarʎelo] ‘to give it to him/her’.

The problem with vowel shortening and gemination can be solved with relativized faithfulness. Compare in this respect tableaux (74) and (75). Stress shift in a verb form with a following clitic (or sequence of clitics) is blocked by high-ranking Output–Output correspondence of the cliticized form with its base with regard to stress. The base is the verb form without following clitics. Inclusion of the final syllable of the verb into the foot does not violate NONFINAL if there is a following syllable contributed by a clitic that can be left unfooted. However, parsing of the final syllable of the verb into the stress foot violates FOOT=μμ if the length of the stressed vowel is kept. This vowel length is optimal in the base as an effect of NONFINAL and FOOT=μμ. Thus, shortening of the vowel allows the form to have the following light syllable parsed in a foot, which reduces the distance of the stress foot to the right edge of the string.

(74)

	BO-IDENT STRESS	NONFINAL FOOT=μμ	ALIGN-R	RIGHTMOST	BO-MAXμ
a. (ˈfaːte)$_{ft}$le		*!	*	***	
☞ b. (ˈfate)$_{ft}$le			*	***	*
c. (ˈfaː)$_{ft}$tele			**!	***	
d. fa(ˈteː)$_{ft}$le	*!		*	**	*
Base: (ˈfaː)$_{ft}$te					

In the forms with a monosyllabic base, e.g. *dí* ‘say!’, lengthening of the vowel in the stressed syllable to satisfy FOOT=μμ changes the form in comparison to its base by inserting a mora associated with a segment that is part of this base. If this mora is associated to a segment that is not present in the base, i.e. a segment belonging to the added clitic, this violation of BO-DEP-μ is avoided. Hence, the longer form can finally adhere to the foot size requirement, but only by geminating a segment that is new to the form.

(75)

/di mi/	BO-IDENT STRESS	BO-DEPμ	NONFNAL FOOT=μμ	BO-MAXμ
a. (ˈdiː)$_{ft}$mi		*!		
b. (ˈdi)$_{ft}$mi			*!	
☞ c. (ˈdim)$_{ft}$mi				
Base: (ˈdi)$_{ft}$				

I will come back to this discussion below in section 7.3 on raddoppiamento sintattico.[6] In conclusion, the prosodic word as a unit in a spelled-out hierarchy becomes obsolete in a theory that sees strings of structure as the target of evaluation, with substrings of these larger units being subject to separate evaluation. Just as in earlier work, the prosodic hierarchy and bracketing of substrings of larger units was in part seen as dependent on syntactic structure (Nespor and Vogel 1986; Selkirk 1995). We can claim here that the more loose relation of clitics to their host is created as an emergent property of their syntactic status. Since the relation between the parts is mediated through output–output faithfulness, the postulation of a nested prosodic word or a clitic group intermediate between the prosodic word and the prosodic phrase is neither necessary nor supported by any aspect of the analysis or the data. Thus, a constraint such as NONFINAL, or any other constraint that determines foot and stress placement, has to refer to the domain of evaluation rather than some intermediate prosodic domain in a larger hierarchy.

The same reasoning can be extended to compounds and to phrases. The individual members of a (non-lexicalized) compound or phrase are evaluated separately. The stress assigned in this evaluation is protected in the evaluation of the more complex form via BO-faithfulness. Thus, we expect two stress peaks in a two-member compound. The stress placement grammar provided so far will pick the rightmost stress as the main stress, while the stress to the left can be realized as secondary stress.

In the discussion of secondary stress I pointed out that stress retraction happens only as a strategy to avoid stress clash, i.e. two adjacent stressed syllables. The constraint against clashes has to outrank BO-faithfulness to account for this. A problem, though, remains with respect to the gemination we find in this context in forms such as *caffè latte*. In the parallelist analysis sketched here, the last syllable of *caffè* loses stress to avoid the clash with the stressed syllable of *latte*; thus there is no reason to introduce a mora in the initial consonant of *latte* that would increase the foot of *caffè* to an optimal size, since this foot does not exist in the representation in question. Nevertheless, this kind of overapplication of gemination occurs abundantly.

[6] The remaining problem with consonant doubling is that the analysis provided here so far correctly generates the doubling of clitic-initial consonants, but fails to capture the doubling of initial consonants in lexical items, as in *va*[bː]*ene* ‘all right’.

7

PROSODIC PHONOLOGY

7.1 THE PROSODIC HIERARCHY

Most of the phonological processes that will be discussed in the following sections have figured prominently in the establishment of the theory of prosodic phonology (e.g. Selkirk 1980; 1984; Nespor and Vogel 1986; 1989). For example, intervocalic *s*-voicing was crucially seen as limited by the Prosodic Word (or phonological word), applying only to /s/ between two vowels which are both inside the same prosodic word (Nespor and Vogel 1986). Raddoppiamento sintattico was considered by Nespor and Vogel as applying within the Phonological Phrase, which, to a large extent, is determined via syntactic organization. In later work, Vogel (1997) considered the possibility that raddoppiamento sintattico actually applies within the Intonational phrase. Vowel deletion did not feature prominently in Nespor and Vogel (1986) and seems to be a relatively understudied issue in the generative literature on Italian phonology (Saltarelli 1970; Vogel et al. 1983; Burzio 1989; Nespor 1990), at least in comparison to the attention dedicated to intervocalic *s*-voicing (e.g. Nespor 1985; Nespor and Vogel 1986; Kenstowicz 1996a; Peperkamp 1995; 1997; Van Oostendorp 1999; Bertinetto 1999; Loporcaro 1999; Krämer 2001a; 2003b; 2005) or raddoppiamento sintattico (e.g. Vogel 1978; 1994; Chierchia 1986; Nespor and Vogel 1986; Sluyters 1990; Repetti 1991; Loporcaro 1999; Borrelli 2002; Saltarelli 1970; 1983; 2004). The organization of larger strings into prosodic phrases was identified as independent from syntax in response to size limitations on phrases by Nespor and Vogel (1979; 1986; 1989), which they detected by looking at the application of stress retraction. Selkirk (1995) identified cases of mismatches between prosodic and syntactic phrases in English. The process of stress retraction will be considered here first in connection with raddoppiamento sintattico, since Saltarelli (2004) showed that the two processes interact in an apparently opaque way in Roman Italian. Later on I will discuss stress retraction as a diagnostic to determine phonological phrase edges. Finally, we will look at the position of stress at the phrasal level, i.e. in units larger than the word, and the interaction of focus and stress placement with syntactic restrictions on word order.

Nespor and Vogel proposed the prosodic hierarchy given in (1).

(1) The prosodic hierarchy

U	utterance
IPh	intonational phrase
PPh	phonological phrase
CG	Clitic Group
PWd	prosodic word
Ft	foot
σ	syllable

In this theory it is assumed that segmental structure has to be integrated in higher layers of prosodic organization. This integration and the overall organization of the hierarchy is subject to several principles which add up to the Strict Layer Hypothesis (Selkirk 1980; 1984; Nespor and Vogel 1986).

(2) Layering principles (Nespor and Vogel 1986: 7)

Principle 1. A given non-terminal unit of the prosodic hierarchy, X^p, is composed of one or more units of the immediately lower category, X^{p-1}.

Principle 2. A unit of a given level of the hierarchy is exhaustively contained in the superordinate unit of which it is a part.

Principle 3. The hierarchical structures of prosodic phonology are *n*-ary branching.

Principle 4. The relative prominence relation defined for sister nodes is such that one node is assigned the value strong (s) and all other nodes are assigned the value weak (w).

Principle 1 excludes three different kinds of structure. It bans recursion in the sense that a syllable cannot be contained within another syllable, a foot cannot contain another foot, a prosodic word cannot contain another prosodic word, and so on. The latter condition in particular has been doubted by, for example, Peperkamp (1997), who proposes nested prosodic words to account for the behaviour of compounds among other things. The other configuration banned by principle 1 is a reversal of categories within the hierarchy, e.g. a prosodic word dominated by a foot. The third configuration that is excluded is the skipping of a level in the hierarchy. A prosodic word cannot be part of an intonational phrase if it is not part of a prosodic phrase etc. A syllable cannot be associated to a prosodic word without a foot mediating between the two levels. The latter configuration particularly is commonly assumed in the analysis of languages without secondary stress. As we have seen in Chapter 6, unfooted syllables are the norm in Italian. Principle 2 corresponds to a ban on the kind of configurations that are disfavoured by OT Alignment constraints. The analogy does not capture the situation satisfactorily, however. A bisyllabic foot, for example, could technically have the first syllable in one prosodic word and the second in a following prosodic word. This kind of structure is illegal according to principle 2. Ambi-syllabicity—the prosodification of a (consonantal) segment as the coda of a first and the onset of a second syllable—is not intended as a violation of principle 2. Nespor and Vogel explicitly exclude all structure below the level of the syllable node, including the constituents of the syllable (onset, rhyme, nucleus, and coda) and segments from the prosodic hierarchy. Principle 4 amounts to the stipulation of a universal headedness requirement. Any foot has to have a head, a strong (s) element, i.e. a syllable that displays prominence. By the same assumption, one of the feet contained in a prosodic word is given head status. If we just assume simple percolation down the hierarchy, the head of this foot then has to be the head of the word. The reflex of this, again, is relative prominence with respect to all non-heads. As has been well studied, feet can choose different heads on a language-particular basis, i.e. they can be iambic or trochaic. Likewise, languages vary in their choice of head position at the prosodic word level. Languages with regular stress assignment (i.e. those without lexical stress) systematically have initial, final, penultimate, antepenultimate, etc. stress. The question whether the same options of head positioning hold for the categories above the prosodic word will be discussed in 7.4 and 7.5.

Selkirk (1995) integrated this theory into the framework of OT, and showed that when broken down into its component parts the principles of the Strict Layer Hypothesis correspond to rankable and violable OT constraints and two universal and unviolable principles of organization.

(3) Constraints on prosodic domination (Selkirk 1995: 443)

(C^n = some prosodic category)

(i) Layeredness — No C^i dominates a C^j, $j > i$,
e.g. 'No σ dominates a Ft.'

(ii) Headedness — Any C^i must dominate a C^{i-1} (except if $C^i = \sigma$),
e.g. 'A PWd must dominate a foot.'

(iii) Exhaustivity — No C^i immediately dominates a constituent C^j, $j < i - 1$,
e.g. 'No PWd immediately dominates a σ.'

(iv) Nonrecursivity — No C^i dominates C^j, $j = i$,
e.g. 'No Ft dominates a Ft.'

The first two principles are still considered to be universally true by Selkirk and thus regarded as universally undominated constraints (or restrictions on GEN), while she acknowledges the violability of Exhaustivity (for the reasons just mentioned) and Nonrecursivity. Since Selkirk (1995) discusses the prosodification of clitics, an additional case of violation of Exhaustivity emerges due to Selkirk's rejection of the existence of the category Clitic Group.

A strange omission in the formulation of the theory was detected by Peperkamp (1997) and Van Oostendorp (1999). The prosodification of morphemes hardly ever allows for one morpheme to be split prosodically (at levels higher than the foot), being part of two prosodic words, as one could conceive with a little imagination (e.g. $(\text{a-so})_{\text{pwd}}(\text{t}\int\text{ale})_{\text{PWd}}$). Van Oostendorp (1999) observes a cross-linguistic tendency to avoid any kind of prosodic edge inside morphemes, including syllable boundaries.

The prosodic hierarchy itself has not been questioned, but individual categories have. The Clitic Group has been abandoned by most researchers (though see Nespor 1999). Instead intermediate levels have been introduced, such as major and minor phonological phrases (Selkirk and Tateishi 1988). Itô and Mester (2007) propose a modification that builds on the minimum prosodic hierarchy on which there is consensus in the literature, and in which they argue for three levels of projection of prosodic words and of phonological phrases.

(4) Prosodic hierarchy according to Itô and Mester (2007)

a.

```
U      utterance
|
IPh    intonational phrase
|
PPh    phonological phrase
|
PWd    prosodic word
|
Ft     foot
|
σ      syllable
```

b. Phphrase projections

```
IPh
|
ˈPPh   maximal
|
PPh
|
ˌPPh   minimal
|
PWd
```

c. Pword projections

```
PPh
|
ˈPWd   maximal
|
PWd
|
ˌPWd   minimal
|
Ft
```

A perturbing observation made in Chapter 6 was that the category prosodic word was challenged when the effect of clitics on penultimate lengthening was considered. If the analysis is correct that the final syllable is unfooted if unstressed, the question arises as to which domain this syllable is final in, since an added clitic causes the extension of the foot on a previously penultimate syllable over the following syllable, indicated by suspension of lengthening of the stressed vowel in this foot. With Itô and Mester's extended hierarchy one can capture these data, assuming that most of the constraints relating to stress placement refer to the core PWd (which explains the inability of clitics to cause stress shift), while NONFINAL refers to the maximal PWd (which explains the suspension of penultimate lengthening in the presence of clitics).

In the following section, 7.2, I will discuss intervocalic *s*-voicing very much in the spirit of Kenstowicz' (1996a) analysis, which does not make use of the PWd at all. Likewise, the domain of raddoppiamento sintattico has come under attack in the past decade. The answer to the question of which domain raddoppiamento sintattico actually applies to is an enterprise beyond the scope of this book, and I will content myself with Absalom et al.'s (2004) observation that raddoppiamento can apply whenever there is no pause between the participating segments (which might be interpreted as the Intonational Phrase). Apart from this, the discussion below in 7.3 will focus on finding the cause of raddoppiamento and explaining its interaction with stress retraction.

The chapter proceeds by showing the increasing role that syntactic structure plays in the analysis of phenomena applying in domains beyond the prosodic word. The process of vowel deletion will provide arguments for syntactic class features to play a role in the choice between realization and deletion of segmental structure. In the discussion of phrasal stress I will mostly discuss Cinque's argument that stress placement at this level is determined by syntactic structure rather than by the language-particular setting of parameters or the ranking of constraints on prosodic structure, unlike at the foot and word level. We will look at data that suggest that this edge orientation is a phonological effect, as argued for in more recent work in prosodic phonology (Truckenbrodt 2006; 2007 and references therein; Samek-Lodovici 2005). We will look at the determination of prosodic phrase boundaries via the processes of stress retraction and domain-final lengthening, which are dependent on syntactic structure to some degree but not completely so. In so doing, we will see that syntactic and prosodic domains do not always match.

7.2 INTERVOCALIC *S*-VOICING

7.2.1 Overview

As noted in the Chapter 4 on the segment inventory, the emergence of the voiceless and the voiced coronal fricative is predictable in most varieties. While /s/ assimilates to the laryngeal feature of adjacent obstruents and is otherwise always voiceless in most varieties, northern Italian displays an additional pattern of intervocalic *s*-voicing. The northern Italian pattern featured as a major argument for the prosodic word in Nespor and Vogel (1986) and later works in OT (Peperkamp 1997; Van Oostendorp 1999; Krämer 2001a; 2005). Kenstowicz (1996a), on the other hand, used the pattern to argue for Base-Output Faithfulness.

Loporcaro (1999), Bertinetto (1999), and Krämer (2003b; 2005) took a closer look at variation of the pattern across regional varieties.

In Lombardy, only voiced [z] surfaces in intervocalic position morpheme-internally (5a). While all other obstruents with a short/long distinction also display a voicing contrast among the geminates, the geminate coronal fricative occurs only as voiceless (5b). Intervocalic voicing also applies with derivational suffixes, such as the diminutive

(5c). At the word edge, only the voiceless fricative occurs (5d). If a word-initial fricative is brought into intervocalic position by addition of a proclitic, voicing does not apply. The same holds for /s/ at the beginning of postclitics (5e). The latter is subject to variation. Some speakers apply voicing in postclitics (i.e. *vende*[z]*i* 'for sale').

(5) Lombardian Italian *s*-voicing:

a.	a[z]ola	'buttonhole'
	a[z]ilo	'nursery school'
	ca[z]a	'house'
b.	ca[ss]a	'cash register'
c.	ca[z]-ina	'house' diminutive
d.	[s]apore	'taste' (noun)
	bu[s]	'bus'
e.	lo [s]apevo	'I knew it'
	vende [s]i	'for sale'

Prefixes fall into two groups. If the prefix ends in a vowel and the following stem starts in a coronal fricative, no voicing applies (6a). Prefix-final /s/ is voiced when followed by a vowel-initial stem (6b). A preceding voiceless obstruent blocks voicing of prefix-final /s/ (6c), while for some speakers voicing applies if the preceding consonant is a nasal (6d).

(6) Intervocalic *s*-voicing and prefixes

a.	a-[s]ociale	'asocial'
	bi-[s]essuale	'bisexual'
	ri-[s]uonare	'to ring again'
	pre-[s]entire	'to hear in advance'
b.	di[z]-uguale	'unequal'
	bi[z]-entusiastico	'extremely enthusiastic'
	mi[z]-uso	'misuse'
c.	e[ks]-amico	'ex-friend'
d.	tran[z]-atlantico	'transatlantic'
	tran[s]-atlantico	

Looking at compounds, we see that the generalization does not only hold for affixes. If the intervocalic fricative is at the beginning of the second member of the compound it has to be voiceless (7a). If it is at the end of the first member of the compound it is voiced (7b). This generalization, however, stands on thin empirical ground, since there are not very many words ending in a coronal fricative (or any fricative) and the compound in (7b) might reasonably be assumed to be lexicalized, since it is semantically not transparent. Furthermore, the form does not display gemination, as would be expected at a word boundary (**ga*[ss]*olio*) (see 7.2 below). In this scenario, however, the compound in (7a) should be regarded as lexicalized on the same grounds, and the voiceless fricative is surprising.

(7) Compounds

a. gira[s]ole	'sunflower'	b. ga[z]olio	'diesel'

The coronal fricative is the only obstruent that undergoes voicing assimilation. When it precedes a voiceless obstruent it is voiceless as well (8a). If followed by a voiced obstruent it is voiced (8b). Word-internally, however, voiced clusters of this kind are virtually nonexistent. Both examples given to illustrate this are non-native vocabulary. However, word-initially we find such clusters (8e). If the fricative precedes a sonorant it is always voiced (8c), while it is invariably voiceless after a sonorant (8d). The same pattern is found at the prefix-stem juncture (8f, g).

(8) Voicing assimilation

a. vi[sp]o	'lively'	b. fo[zdʒ]ene	'phosgene'
pe[st]o	'pulp'	Fa[zb]inder	German movie director
c. O[zl]o	'Oslo'	d. o[rs]o	'bear'
co[zm]o	'universe'	fa[ls]o	'wrong'
		sca[ns]o	'avoidance'
e. [sp]ugna	'sponge'	f. di[sp]iacere	'displeasure'
[zb]attere	'knock'	bi[sk]ugino	'2nd cousin'
[zl]ancio	'jump'	mi[sk]oncezione	'misconception'
		tran[sk]arpaziano	'transcarpathian'
g. di[zg]razia	'disgrace'		
bi[zn]onno	'great-granddad'		
mi[zd]irigere	'misdirect'		
tran[zb]aicaliano	'Transbaicalian'		

The different behaviour in the process of vowel-final and /s/-final prefixes led Nespor and Vogel (1986) to the conclusion that consonant-final prefixes are integrated into the prosodic word of their host, while vowel-final prefixes are not. Intervocalic *s*-voicing is understood as a rule that applies to the fricative in intervocalic position within the domain of the prosodic word, i.e. in (5a) and (6b), but not in (5e) and (6a).

The differences in application at the prefix-stem boundary were later understood as a residual effect of the OT constraint ONSET conspiring with constraints on the prosodic hierarchy, so that the prefix-final consonant is used to provide an onset for the first syllable of the stem and the syllabification motivates the wholesale integration of the prefix into the following prosodic structure.

The voicing of the fricative in the prefix *trans-* when followed by a vowel is puzzling, though, especially since in the same variety word-internal postnasal /s/ is never voiced. This led Krämer (2001a; 2005) to the conclusion that the cause of voicing at the prefix-stem boundary is not necessarily only a restriction banning intervocalic voiceless [s], but voicing triggered as marking the syllabification over a major morpheme boundary. This kind of voicing is also attested in Sanskrit, Breton, Polish, and other languages (see Krämer 2000; 2001a for references).

The Trento variety is like Lombardian except that in Trento postnasal /s/ is always voiced while /s/ following other sonorants (*r*, *l*) is voiceless (Bertinetto 1999). In most varieties /s/ is voiceless after all sonorants, except after the nasal in the prefix *trans*- in Lombardian.

Tuscan Italian displays the same assimilation pattern, but the intervocalic/intersonorant voicing pattern is different. Intervocalic voicing does not apply morpheme-internally, resulting in a marginal contrast in this position. This reconfirms the claim made about contrast in Italian earlier: the best position for contrast is morpheme-internal.

(9) Marginal word-internal contrast in Tuscan

ca[z]o	'case'	fu[z]o	'melted'
ca[s]a	'house'	fu[s]o	'fuse'

At the prefix-stem boundary we find the same pattern as in Lombardian: the fricative is voiced. The only prefix that is different is *trans*-, whose final fricative undergoes hardening to [ts] together with all other post-sonorant coronal fricatives. As a stop, it is not subject to voicing.

The prefix *pre*- is revealing in this respect. In forms starting in the sequence [pɾe] with transparent morphosemantics and an independent base, we find [s] in both varieties, Lombardian and Tuscan. If the base is not recoverable, voicing applies in Lombardian, and in Tuscan the voicing specification is unpredictable. However, the situation is a little more complex. As can be seen from the example *presentimento*, whether a speaker decomposes a word into its component parts or not is not always predictable. If Lombardian speakers considered this word to be derived from *sentimento* 'sentiment, feeling' or ultimately regarded *sentire* 'to feel, hear, sense' as the base, as they do with *presentire*, it should have a voiceless fricative.[1]

(10) *pre*- prefixation and *s*-voicing in Tuscan and Lombardian

	Tuscan	Lombardian	Gloss	Base
presumere	[z]	[z]	'to imagine'	-/-
presentare	[z]	[z]	'to present'	-/-
presentimento	[s/z]	[z]	'foreboding'	-/-
presentire	[s]	[s]	'to hear in advance'	sentire
presocratico	[s]	[s]	'pre-Socratean'	Socrate

Other varieties, such as Abruzzian, show neither contrast nor intervocalic voicing and display the voiced fricative only in assimilation contexts.

[1] Some Lombardian speakers would also produce *pre*[s]*idente* 'president' (rather than *pre*[z]*idente*) or *pre*[s]*ervativo* 'condom'. It is difficult to find a reason why these words should be morphologically decomposed, while a word like *presentimento* is not. One could regard this as a case of hypercorrection and conclude that Lombardian is developing a similar kind of marginal contrast to that of Tuscan—although even when contrastive, /s/ and /z/ have a different distribution in the two varieties, as can be observed with the tenseness contrast in mid vowels. Both varieties display a contrast, but differ as to which lexical items actually have a lax or a tense vowel. For the moment I regard this as an open issue, and assume that the regular case in northern Italian is captured by the generalizations made above and by the analysis that follows below.

In northern varieties, the lack of geminates contributes an interesting twist to the pattern. The Paduan speakers I am familiar with do not realize any geminates. As far as singleton /s/ is concerned, they show the same pattern as Lombardian. Since the geminate /ss/ is short on the surface, it could be expected to undergo intervocalic voicing in the relevant context. However, the process is blocked by coronal fricatives which are long in other varieties, leading to a surface voicing contrast, illustrated in (11a,b). In the prefix *trans*- the nasal does not surface and the fricative does not voice in intervocalic context, against expectation (11c).[2] The other prefix with a consonant cluster *ex*- behaves in the same fashion. /k/ is not realized, but voicing of /s/ is blocked when the condition is met for it to apply (11)d.

(11) Veneto (Paduan)

a.	ca[s]a	'cash register'	e.	di[z]-onesto	'dishonest'
b.	ca[z]a	'house'		bi[z]nonno	'great-granddad'
c.	tra[s]-alpino	'transalpine'		mi[za]ventura	'misadventure'
d.	e[s]-amico	'ex-friend'	f.	a-[s]ociale	'asocial'

A surface-true analysis has to regard this pattern as the contrastive use of voice stem-internally and prefix-finally. The forms in (11a) and (11b) are distinguished by the contrastive specification of the feature [voice] in the intervocalic fricative, rather than by length as in other varieties. The fricatives in the prefixes *dis*-, *bis*-, *mis*- (11e) are underlyingly voiced, while the final fricative in *tras*- and *es*- is underlyingly voiceless. Krämer (2003b) takes a different route and regards this as a case of opacity. Paduan has underlying geminates and consonant clusters, and this structure blocks intervocalic voicing. Their simplification results in derived voicing contrasts. According to this analysis, the laryngeal feature is not lexically contrastive in the coronal fricative in Paduan Italian.

7.2.2 *Formal analyses*

In this section I will focus on the particulars of intervocalic *s*-voicing in northern Italian (Lombardian) in comparison with the Tuscan grammar displaying internal contrast and voicing in a derived environment only.

Kenstowicz (1996a) proposed an analysis in terms of Base-Output Correspondence, which basically held that in a form like *asociale* we do not find voicing of the fricative, because it stands in a relation with a base *sociale* to which it has to be faithful. Affixes, such as *dis*-, and underived forms, such as *casa*, do not have a base. Thus, voicing applies. Peperkamp (1997) criticizes Kenstowicz' account, because she sees a problem with the notion 'base'. According to her, the base *sociale* in *asociale* is inflected and

[2] The deleted nasal actually leaves its mark on the preceding vowel, i.e. the vowel is nasalized. The same holds in morpheme-internal position: *vacanze* 'holidays' is realized as [vakãse].

inflection is external to derivation. That is, in a derivational sense, derivation should apply first. This conceptualization also collides with other aspects of the language, such as compounds containing inflected forms, e.g. *aspirapolvere* 'vacuum cleaner' or *portapacchi* 'luggage rack'. In both compounds the first part is a verb inflected for 3rd person singular. In the second form the second member is a plural noun. The final *i* does not indicate plurality of the whole compound. Thus, I conclude that Peperkamp's objection is not valid.

Nespor and Vogel (1986) concluded that the consonant-final affixes are integrated in the prosodic word of their host, while the vowel-initial affixes are not, and that this is the reason why voicing applies in constructions involving the former but not the latter. Peperkamp (1995; 1997) proposes the reason why these two groups of affixes behave differently. The final consonant of the prefix serves as an onset in case the following syllable would otherwise start in a vowel. Syllabification of the final consonant as the onset of the following syllable drags the whole prefix into the prosodic word. The Strict Layering Hypothesis does not allow syllables that are part of two prosodic words at the same time.

With this in mind, I turn now to an implementation of an analysis in OT. I will by and large follow Krämer's (2005) account, but combine it with Kenstowicz' (1996a) analysis, since Krämer makes reference to the prosodic word in his analysis, which I want to avoid here for the reasons outlined at the end of Chapter 6. The voicing patterns observed in obstruent clusters as well as the pre-sonorant and post-sonorant patterning of *s* will not be considered here. Instead, I will concentrate on the provision of an account of the intervocalic pattern in Tuscan and Lombardian, including the voicing in clitics by the northern Italian outlier. The voicing of postnasal *s* in the prefix *trans-* crucially involved reference to the prosodic word in Krämer's (2005) analysis. Thus, I will address this issue here as well. For an analysis of the Paduan pattern consult Krämer (2003b).

Intervocalic voicing is usually conceived as triggered by a markedness constraint that does not allow the voiceless fricative between vowels, *VsV.[3] While Peperkamp utilizes two positional markedness constraints against voiced [z], one punishing word-initial voicing and one punishing word-final voicing, we can reduce this to one, *z, which punishes every occurrence of a voiced coronal fricative. Since we find no contrast in Lombardian and the two realizations are in complementary distribution, we can assume that both markedness constraints outrank faithfulness (Identity) and that the more specific markedness constraint *VsV is ranked higher than *z.

[3] Many varieties display not only voicing of the coronal fricative but also voicing of intervocalic singleton consonants, as well as other weakening processes (e.g. fricativization; the Gorgia Toscana). Krämer (2005) gives a detailed constraint-based account of the fact that the coronal fricative can be singled out as the only one undergoing the alternation, relying on differential markedness and faithfulness constraints for different places and manners of articulation in combination with de Lacy's (2006) theory of relative markedness. As a result, intervocalic *s*-voicing can be seen as triggered by a more general markedness constraint against intervocalic obstruents, rather than the quite descriptive *VsV.

(12) Voicelessness at edges and intervocalic voicing[4]

/zisal/	*VsV	*z	IO-Ident
a. zisal	*!	*	*
b. sisal	*!		*
c. zizal		**!	*
☞ d. sizal		*	**

Curiously, Tuscan displays a contrast only in morpheme-internal position. Thus, the general Identity constraint cannot be top-ranked in Tuscan. Krämer regards another faithfulness constraint as responsible for this positional emergence of contrast. Contiguity (McCarthy and Prince 1995; 1999) militates against changes inside representations. While McCarthy and Prince formulated this constraint type with reference to segments, violated by the insertion or deletion of segments in positions flanked by other segments in the representation, Krämer defines the specific constraint involved here as referring to segmental features. A change to a feature that is linked to a segment lying between two other segments in the input is not allowed. With this constraint ranked on top of the hierarchy, we generate the Tuscan pattern.

(13) Morpheme-internal contrast

i. /kasa/	Contiguity	*VsV	*z	IO-Ident
☞ a. kasa		*		
b. kaza	*!		*	*
ii. /zasso/				
c. zasso			*!	
☞ d. sasso				*

Permutation of Contiguity and *VsV gives us the Lombardian pattern, i.e. intervocalic voicing extended to the morpheme-internal context.

(14) Lombardian

/kasa/	*VsV	Contiguity	*z	IO-Ident
a. kasa	*!			
☞ b. kaza		*	*	*

The /s/ in a word such as *casa* is only morpheme-internal if the final vowel is assumed to be part of the stem, as proposed by Scalise (1984). Krämer (2005) discusses this

[4] The input displayed in this tableau and other tableaux below does not, of course, reflect what I believe the underlying representation of words such as *sisal* 'sisal' or *sasso* 'stone' to be. In cases of neutralization, the Richness of the Base Hypothesis forces us to consider these inputs which are unlikely underlying representations to illustrate that the proposed grammar actually is a neutralization grammar.

and gives evidence that final vowels in nouns are part of the stem, despite the fact that they alternate to show inflection for gender and number. Thus, the final vowels in (15a) could be regarded as underspecified, and the affixes for gender and number inflection fill in or overwrite the features of the final vowel. Consonant-final words do not show any inflection (15b). Thus, the inflectional affixes are smaller than segments, and realizing (for example) plural inflection at the end of a consonant-final stem would involve epenthesis of a vowel position. Stems that have a final vowel that does not alternate often have stress on this vowel (15c), but not all the uninflectable nouns with a final vowel have stress on the last syllable (15d). Thus, these can be regarded as specified for contrastive features which cannot be overwritten by features contributed by an affix against the pressure to inflect gender and number.

(15) Stem/root status of the final vowel

a.	bara	bare	'coffin.fem.sg/pl'
	baro	bari	'cheater, swindler.masc.sg/pl'
b.	bar	bar	'bar sg/pl'
c.	città	città	'city sg/pl'
	paltò	paltò	'coat sg/pl'
d.	analisi	analisi	'analysis sg/pl'

The next datum to be accounted for is the asymmetry between stem /s/ and prefix /s/ at the prefix-stem juncture, where we have observed voicing of the latter but not of the former in both varieties. Kenstowicz (1996a) introduces a Base-Output Faithfulness constraint which demands faithfulness to morphemes with a base, which in the most restrictive definition of 'base' (Kager 1999) are independently occurring surface forms.[5] Thus, stems have a base, but affixes do not. Accordingly, high-ranking BO-Ident deselects the candidate that satisfies *VsV if this has a voicing specification differing from the base form of a morphologically complex word. If the /s/ in intervocalic position is contributed by an affix, BO-Ident is not violated by a candidate with voicing and *VsV decides.

(16) Morpheme juncture voicing in Tuscan

i. /pre-sokrat-ik-o/	BO-Ident	Contiguity	*VsV	*z	IO-Ident
☞ a. presokratiko			*		
b. prezokratiko	*!			*	*
base: sokratiko					
ii. /dis-onesto/	**BO-Ident**	**Contiguity**	***VsV**	***z**	**IO-Ident**
c. disonesto			*!		
☞ d. dizonesto				*	*
base: onesto					

[5] See also the discussion of Base-Output correspondence in sections 4.2.2 and 6.3–6.5.

High ranking of BO-Identity also ensures in Lombardian that forms like *preso-cratico* or *asessuale* ‘asexual’ do not show voicing of the stem-initial fricative, while the prefix-final fricative is realized as voiced.

(17) Morpheme juncture voicing in Lombardian

i. /pre-sokrat-ik-o/	BO-Ident	*VsV	Contiguity	*z	IO-Ident
☞ a. presokratiko		*			
b. prezokratiko	*!			*	*
base: sokratiko					
ii. /dis-onesto/	BO-Ident	*VsV	Contiguity	*z	IO-Ident
c. disonesto		*!			
☞ d. dizonesto				*	*
base: onesto					

The analysis presented so far does not account for the lack of voicing in clitics. Among my informants there is only one northern Italian speaker who actually realizes clitic /s/ as voiced in intervocalic position.

(18) Wrong prediction for clitics: *telefonando si* ‘combing oneself’

/telefonando si/	BO-Ident	*VsV	Contiguity	*z	IO-Ident
☹ a. telefonandosi		*!			
💣 b. telefonandozi				*	

Krämer (2005) argues that clitics do not have a base they could be faithful to, and hence the BO-Faithfulness constraint does not protect them from voicing. Therefore, the markedness constraint *VsV has to be limited to the domain of the prosodic word. However, since I argued on the basis of vowel-length alternations in Chapter 6 on stress that the prosodic word does not play a role in Italian phonology, this move is not the preferred option. Otherwise, one must claim that the prosodic word is irrelevant for all matters relating to stress placement and foot structure, but its existence can nevertheless be detected in the context of intervocalic *s*-voicing.

On the other hand, these clitics are also and more often realized in phrase-initial position, as in (19a) and (19c). (19a) is in free variation with the construction with a final clitic (19b), and could serve as the base for all enclitic constructions. In the most attractive syntactic analysis, the latter form is derived from the former via raising/movement of the verb. Furthermore, in constructions that involve the finite form rather than the gerund (19c), post-positioning of the clitic (or movement of the verb) is ungrammatical (19d).

(19) Distribution of reflexive clitics

a. si sta uccidendo '(s/he) is killing her-/himself'
b. sta uccidendosi '(s/he) is killing her-/himself'
c. si baciano '(they) are kissing'
d. *bacianosi

Thus, we can assume that the blocking of *s*-voicing in clitics is a paradigm effect as well. The majority of phrase-initial realizations of *si* impact on its realization in post-verbal position. Uniform exponence of a morpheme across a paradigm is kept distinct from Base-Output Correspondence by Kenstowicz (1996a), and I will keep these two aspects of paradigm levelling distinct here as well.

(20) Uniform exponence of reflexives

/utʃːidendo si/	Uniformity	*VsV	Contiguity	*z	IO-Ident
☺ a. utʃːidendosi		*			
☠ b. utʃːidendozi	*!			*	

The behaviour of the speakers who display voicing in these constructions is accounted for by ranking Uniformity in a lower stratum, below *z.

(21) Voicing of reflexives, blocking of over-application

	*VsV	Contiguity	*z	Uniformity
a. sta utʃːidendosi	*!			
☞ b. sta utʃːidendozi			*	*
☞ c. si sta utʃːidendo				*
d. zi sta utʃːidendo			*!	

Voicing of the final fricative in the prefix *trans-* is not captured at all by this analysis. Simply reformulating the markedness constraint *VsV into one sensitive to, say, the feature [+sonorant] to the left of the target does more harm than good, since this would also predict across the board post-sonorant voicing word-internally, which is unattested in Italian. Krämer (2005) attributes this instance of voicing, as well as the voicing of all the other prefixes that end in /s/, to an edge-marking effect. The consonant is syllabified as the onset of the first syllable of the stem. Thus, it intervenes between the left edge of the prosodic word and the left edge of the stem, causing imperfect alignment. Alignment can be improved by extending a feature from the stem-initial segment to the beginning of the syllable, even if this is a redundant feature. The feature spreading leftwards here to improve alignment is the voicing of the vowel. As Krämer remarks with reference to Kehrein (2002), voicing is never contrastive on vowels.[6]

[6] If vowels are specified contrastively for a laryngeal feature, it is either [spread glottis] or [constricted glottis]. Italian vowels, however, are not specified contrastively for any laryngeal feature.

Since voicing at edges only occurs in morphological constructions that have a base in the sense of Base-Output Correspondence the alignment effect can be captured as a relation between the edge of the base and the edge of a syllable. Thus, the portion standing at the left edge of a syllable in a base should also be located at the left edge of a syllable in the derived form. To formalize this, I invoke McCarthy and Prince's (1995; 1999) Anchoring constraints which link edges in different representations. We will see in section 7.3 that the same type of constraint plays a role in shaping the pattern of phonological consonant doubling.

(22) {RIGHT, LEFT}-ANCHOR(S_1, S_2) (McCarthy and Prince 1999: 295)
Any element at the designated periphery of S_1 has a correspondent at the designated periphery of S_2.
Let *Edge*(X, {L,R}) = the element standing at the *Edge* = L, R of X.
RIGHT-ANCHOR. If x = Edge(S_1, R) and y = Edge (S_2, R) and y = Edge (S_2, R) then $x\Re y$.
LEFT-ANCHOR. Likewise, *mutatis mutandis*.

The relevant Anchoring constraint sees to it that what is at the left edge of the base—and according to the basics of syllabification has to be the left edge of a syllable in this representation—is also at the left edge of a syllable in the morphologically more complex form.

(23) L-ANCHOR(Base, σ): 'The left edge of the base is the left edge of a syllable in the output.'

Highly ranked, this constraint would prevent syllabification over prefix-base boundaries. In Italian we find syllabification over this boundary as well as over word boundaries. Thus, the constraint cannot be ranked too high. If the constraint is ranked less high it might allow a segment between the left edge of the base and the left edge of the first syllable of the base in the derived form. Now the exact assessment of violations becomes crucial. Usually, alignment and anchoring constraints are assessed segment-wise or syllable-wise, i.e. every segment or syllable between the two designated edges incurs a violation mark. McCarthy (2003b) proposes a categorical interpretation of alignment constraints,[7] i.e. the number of elements between edges does not matter. Krämer (2005) goes in a different direction, following McCarthy and Prince (1993), who assess violations also below the level of the segment, for every feature between the designated edges, in their analysis of German glottal stop epenthesis. In this view, not only the root node of a segment counts, but also every single feature associated with this root node.

Tableau (24) illustrates this interpretation. Candidate (a) has no violation of the constraint, since the left edge of the base is also at the left edge of a syllable in the derived form. Candidate (b) has one violation mark for the root node of the otherwise

[7] The definition of Anchoring also has a straightforward categorical interpretation. Either the element *x* is anchored at edge *E* or it is not. Below, however, it will be crucial that Anchoring constraints can access the 'distance' between *x* and *E*, in terms of the number of intervening features, segments, or syllables.

unspecified glottal stop. Candidate (c) has the final fricative of the prefix syllabified as the onset of the first syllable of the stem. Three violation marks represent the root node, the place feature [coronal], and the laryngeal node (I simplify matters slightly for the sake of exposition). Candidate (d) has one violation less than (c), because the voicing of the stem-initial vowel is extended to the preceding fricative and the latter no longer has a separate laryngeal node. Candidate (e) has only two violations because, while it has the same place feature as the following vowel, [labial], which saves one violation, it does not have the same voicing specification. The second violation is calculated for its root node. Candidate (f) shares place and laryngeal feature with the vowel, which reduces violations to one. The last candidate has split the base's vowel into two segments. This violates other faithfulness constraints, but satisfies L-ANCHOR. If any markedness constraint, such as ONSET, enforces glide formation we would, in all likelihood, have observed this in the base already. Thus, some other constraint banning glide formation has to outrank the constraint calling for a consonant at the beginning of syllables.

(24) Assessment of L-ANCHOR

/trans-uraliko/	L-ANCHOR(Base, σ)
a. tɾans.u. ɾa.li.ko	
b. tɾans.ʔu.ɾa.li.ko	*
c. tɾan.su.ɾa.li.ko	***
d. tɾan.zu.ɾa.li.ko	**
e. tɾan.fu.ɾa.li.ko	**
f. tɾan.vu.ɾa.li.ko	*
g. tɾans.wu.ɾa.li.ko	
Base: u.ɾa.li.ko	

We have seen earlier that the constraint favouring syllabification over C# #V word boundaries, ONSET, has to rank relatively low in Italian, because lack of onsets in syllables causes neither epenthesis nor deletion. L-ANCHOR has to rank below ONSET. Otherwise we would not encounter syllabification across word boundaries. High ranking of faithfulness constraints relating to other segmental features leaves spreading of voicing as the only remedy to violation of L-ANCHOR, as shown in tableau (25).[8]

[8] At this point it would be appropriate to discuss two issues: the unary or binary nature of features and the degree of surface specification of segments. The first issue arises because one could say that under-specification or absence of a feature in the segment between base and syllable edge could improve a candidate's performance on L-ANCHOR, as shown with the candidate containing glottal stop. Given the feature system set up in Ch. 4, it is crucial to refer to class nodes here, which should be present, but empty. See the discussion of binarity vs. privativity in section 4.2.1. Since vowels are not contrastive for voice Krämer (2005) treats them as specified for SV, sonorant or spontaneous voicing, at the surface. Some kind of non-distinctive laryngeal feature will also be needed to explain the voicing of *s* before heterosyllabic sonorants, as in *O*[zl]*o*.

(25) Juncture voicing in Lombardian

/trans-uraliko/	DEP/MAX	IO-IDENT (place)	ONSET	L-ANCHOR (Base, σ)	*z
a. trans.u.ɾa.li.ko			*!		
b. trans.ʔu.ɾa.li.ko	*!			*	
c. tran.su.ɾa.li.ko				***!	
☞ d. tran.zu.ɾa.li.ko				**	*
e. tran.fu.ɾa.li.ko		*!		**	
f. tran.vu. ɾa.li.ko		*!		*	

In Tuscan, which does not display voicing in this context, the ranking of the Anchoring constraint and the markedness constraint *z is the reverse of that displayed in (25).

This completes the analysis of intervocalic *s*-voicing. We have seen that this pattern can be accounted for without crucial reference to the prosodic word. While this in itself is not evidence against the existence of the domain of the prosodic word in Italian, it shows that this pattern is not necessarily evidence that proves the existence of this domain in Italian.

7.3 RADDOPPIAMENTO SINTATTICO

7.3.1 The different types of consonant doubling and their previous analyses

The term 'raddoppiamento (fono)sintattico' refers to the lengthening of consonants in certain phonological and syntactic environments. Previous studies distinguish basically three types of raddoppiamento: rhythmic gemination, backwards gemination, and lexical gemination triggered by function words.

Stress-induced or rhythmic doubling occurs when a word ending in a stressed vowel (which is always short) is followed by a word beginning with a consonantal onset. The usual approach to this kind of doubling is that the consonant is lengthened to provide weight to the preceding stressed syllable (Sluyters 1990; Repetti 1990; 1991; Borrelli 2002; Saltarelli 2004). We will come back to this in more detail below.

(26) Rhythmic gemination

a.	tʃitˈta bˈbɛlla	città bella	'beautiful city'
	palˈtɔppuˈlito	paltò pulito	'clean coat'
	ˈɛkkaˈɾino	è carino	'it is pretty'
b.	ˈvitaˈbɛlla	vita bella	'beautiful life'

This kind of gemination is blocked if the onset following the stressed vowel contains an /s/ plus another consonant. With other complex onsets, gemination applies (27b).

(27) Blocking of rhythmic gemination

a. tʃitˈta ˈspɔrka   città sporca   'dirty city'
    *tʃitˈta sˈspɔrka

b. tʃitˈta tˈtriste   città triste   'sad city'

The domain of application of syntactic doubling is a matter of debate. Example (28a) is the *casus belli* of Nespor and Vogel's (1986) motivation of the phonological phrase as a domain independent of the syntactic phrase. The non-application of doubling in the phrase *colibrì molto scuri* is unexpected when compared to the application in the same syntactic context in (26a), *paltò pulito*. On the other hand, the difference between (28b) and (28c) can be explained by recourse to the different syntactic structures that lead to the different interpretations. However, Vogel (1997) raises doubts on the accuracy of Nespor and Vogel's data, as do Agostiniani (1992), Helsloot (1995), and Absalom et al. (2004). Vogel (1997) reports that raddoppiamento sintattico applies in Tuscan within sentences without sensitivity to prosodic or syntactic phrasing, and Hajek (p.c.) maintains that examples (28b) and (28c) are indistinguishable for native speakers. The angled brackets ⟨ ⟩ in (28b′) and (28c′) indicate the possible syntactic analyses that give rise to the ambiguity. While in (28b′) the adjective modifies the noun *città* 'city', it forms an AP with the complex noun phrase *mappe di città* 'city maps' and thus modifies the complex NP in (28c′).

(28) The domain of syntactic doubling

a. ho [vv]isto tre [kk]olibrì [m]olto scuri   'I have seen three very dark hummingbirds'

b. le mappe di città [vv]ecchie   'the maps of old cities'

c. le mappe di città [v]ecchie   'the old maps of cities'

b′. ⟨le mappe di ⟨città [vv]ecchie⟩⟩

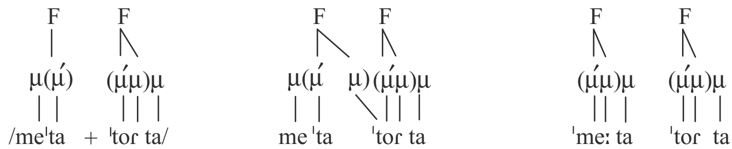
c′. ⟨le ⟨⟨mappe di città⟩ [v]ecchie⟩⟩

Consonant doubling does not apply if there is a pause between the stressed vowel and the following consonant, if the vowel is lengthened, if there is a glottal stop following the vowel, or if there is an intonational disruption/destressing of the final vowel in the first word (Loporcaro 1997). The latter, however, is contested by Saltarelli (2004), at least for Roman Italian.

Rhythmic gemination interacts with stress retraction. Stress retraction is found at the phrasal level to avoid stress clashes, i.e. two adjacent stressed syllables. Nespor and Vogel (1979) and Marotta (1986) claim that both phenomena, rhythmic doubling and stress retraction, are applied to the same ends, i.e. to avoid stress clash. In moraic terms, the lengthening of the initial consonant of the second word provides an additional mora that separates the two stressed moras. This is illustrated in (29) under application of the conditions on foot structure assignment developed in Chapter 6.

(29) The connection between rhythmic doubling and stress retraction

a. Clash environment b. Solution by gemination c. Solution by retraction



Repetti (1991) identifies the reason for gemination in clash situations as the bimoraicity requirement on feet, thereby unifying the motivation for rhythmic gemination in clash and in other situations (i.e. if there is an unstressed syllable between the two stressed syllables).

According to Nespor and Vogel (1979), stress retraction occurs in northern varieties of Standard Italian, which do not display consonant doubling, while the varieties that have rhythmic doubling do not have stress retraction. Saltarelli (2004: 65), however, proves this wrong. In his own Roman variety he can do both, but if stress retraction occurs this does not bleed rhythmic doubling, as would be expected under standard assumptions on foot structure as made by Saltarelli. The diagram showing the Roman over-application shows foot structure as assumed by Saltarelli (2004: 65, ex. 6). Note also that he does not make use of moraic representations.

(30) Over-application in Roman

caffè lungo	a.	[kaf.fèl.lúŋ.go]	'long (diluted) coffee'
		kaf.(fèl).(lúŋ.go)	
	b.	[kàf.fel.lúŋ.go]	
		(kàf.fel).(lúŋ.go)	

We find a similar situation in Canepàri's (1999) transcriptions of Standard Italian. He does not indicate secondary stress, but he indicates the tense/lax difference in mid vowels. While the prescriptively preferred form of the stressed vowel in 'coffee' as well as in the coordinated phrase is lax, it is transcribed as tense in the compound forms. We can deduce from this practice that there is secondary stress on the last syllable of 'coffee' in (31b), but no secondary stress in (31c,d). Nevertheless Canepàri gives a form with gemination (31d).

(31) Over-application in Standard Italian according to Canepàri

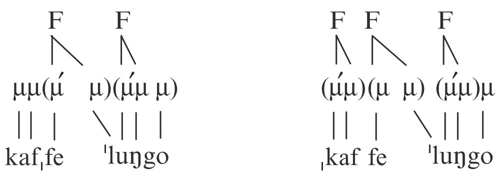
a. [kafˈfɛ]	caffè	'coffee'
b. [kaffɛeˈlatte]	caffè e latte	'coffee and milk'
c. [kaffeˈlatte]	caffelatte	'milk coffee'
d. [kaffelˈlatte]	caffellatte	'milk coffee'

Saltarelli admits that the overapplication of both retraction and doubling in the same realization of the same form 'is not predicted by a conventional theory of stress-driven initial consonant lengthening' (2004: 65). The presence of a geminate in the context of stress retraction causes a serious problem at least for a non-derivational theory: stress retraction removes the triggering environment or motivation for gemination. According to the principles of foot formation established in Chapter 6 on stress placement the final syllable of [ˈkaffe] is not footed, unlike in Saltarelli's analysis. Hence, the bimoraicity requirement on feet does not hold for the unfooted syllable *. fe*.

We have established above in the discussion of clitics that there is a correspondence relation between simplex forms and their realization in bigger units. Building on this, one can assume a foot on the destressed syllable in the Roman constructions with stress retraction and gemination, as in (32b).

(32) Roman over-application and prosodic structure

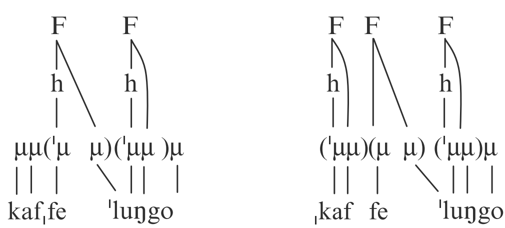
a. Solution by gemination b. Solution by retraction *and* gemination



The disadvantage of this analysis is that the foot on the syllable from which stress has been removed has to be headless. (32) is reproduced in (33) with foot heads inserted as an additional layer in the structure. This layer is missing in the medial foot in (33b).

(33) Survival of a decapitated foot

a. Clash and gemination b. Retraction and gemination



In the literature on prosodic structure, heads are usually assumed as obligatory in feet. If there is no prominent syllable that serves as the head for a foot, the syllable(s) in question are usually analysed as not being footed, or as part of an unbounded foot. On the other hand, metrical grid theory (Prince 1983) has a convenient mechanism, line conflation (Halle and Vergnaud 1987), according to which heads of feet can be removed at a certain stage of derivation, either because iterative footing is needed despite the absence of secondary stresses or to account for stress clash avoidance by destressing. That is, derivationally we can explain the over-application of rhythmic gemination as a case of counter-bleeding opacity. I will not pursue the derivational approach to this, but will instead focus on the technical details of the parallelist account below.

In combinations of words that end in a consonant plus a word that starts in a vowel, we find backwards doubling. The final consonant in the first word is lengthened (34).

A straightforward analysis frequently offered of this is that gemination here supplies a consonantal onset for the initial syllable of the second word (Borrelli 2002; Saltarelli 2004). A further restriction on this type of doubling is that the final closed syllable of the first word has to be stressed (b). Whether or not the first syllable of the second word is stressed does not matter. This observation gives further credit to the analysis as a response to the demand for a consonantal onset.

(34) Phonotactically triggered (or backward) gemination

a.	ˈtɾammeˈlɛttɾiko	tram elettrico	‘electric tram’
	oˈtɛlleleˈgante	hotel elegante	‘elegant hotel’
b.	ˈbaɾaˈpɛɾto/	bar aperto	‘open bar’[9]
	ˈbaɾɾaˈpɛɾto		
c.	ˈpanteon aˈpɛɾto	Pantheon aperto	‘open Pantheon’
	*ˈpanteonn aˈpɛɾto		

Since final syllables are not footed in the analysis developed above, the non-application of backward gemination in the absence of final stress in the first word is predicted. The final consonant is not affiliated to higher prosodic structure, and can be syllabified as the onset of the following syllable without lengthening.

A similar type of gemination can be found in morphological composition, i.e. word-internally. Consonant-final roots show gemination of this final consonant whenever a vowel-initial suffix is added (Fiorelli 1958; Passino 2005). This kind of gemination is, however, confined to obstruents (compare (35a) and (35b)).

(35) Word-internal backward gemination

a.	gas -oso	ga[sˈso]so	‘sparkling’
	autostop -ista	autosto[pˈpi]sta	‘hitchhiker’
	snob -are	sno[bˈba]re	‘be a snob’
b.	bar -ista	ba[ˈɾi]sta	‘barman’

While at the word boundary the presence or absence of stress in the final syllable of the first word explains the presence or absence of gemination, respectively, here we have to assume that the pre-suffixal syllable of the stem is destressed in every case. Thus, there is no reason for gemination. The lengthened consonant does not have to provide a mora for the preceding syllable to be a well-formed bimoraic foot on the surface. Thus, we are faced with the same problem as in the case of rhythmic doubling above: gemination over-applies. A possible solution could follow the same line as above. The destressed foot survives as a headless foot that still needs a second mora to be optimal, while the following suffix needs a consonantal onset for its first syllable; thus the consonant is stretched out over two syllables. The remaining piece of the puzzle is why the sonorant consonants do not geminate.

Finally, there is a closed class of functional items that do not end in a stressed vowel but nevertheless cause gemination of the following consonant. A list of these, taken from Borrelli (2002), is given in (36).

[9] The tap /ɾ/ is exceptional in that many speakers do not apply lengthening to it in the relevant contexts.

(36) Functional elements triggering gemination[10]

a	'to'	ma	'but'
che	'that'	o	'or'
chi	'who'	qua, qui	'here'
come	'how'	qualche	'some'
da	'from, by'	se	'if'
dove	'where'	sopra	'over, above'
e	'and'	tra, fra	'between, among'

In some analyses, the behaviour of the items above is attributed to an underlying (empty) consonant at the end of the function word (e.g. Nikiema 1992) or an underlying floating mora (Borrelli 2002). This is supported at least in some cases by historical data, i.e. a historically earlier form with a final consonant. The fact that all these items are functional elements and that there is no lexical item (i.e. noun, verb, adjective) that behaves in this way might either be due to the nature of the phonological strategies that applied in the history of Italian to eliminate final consonants or call for a syntactic explanation. An argument for the former is that historically, consonant-final noun and verb forms were eliminated by vowel epenthesis, while deletion applied to function words. However, I will discuss vowel/zero alternations in more detail later on, in section 7.3.

In summary, there are three types of consonant gemination that can be divided into two main types, phonologically and lexically conditioned gemination. Phonologically conditioned gemination is driven by the need of a word-final stressed syllable to achieve sufficient weight, or by the need of an onsetless word-initial syllable preceded by a word-final stressed closed syllable to have a consonantal onset. Lexically conditioned gemination is restricted to function words. Furthermore, the former interact with stress clash resolution. If stress is not realized on the first syllable in the construction to avoid clash with a following stressed syllable, gemination still applies. The domain of application of gemination is, despite a long history of discussion, still not satisfactorily defined. The latter question is definitely complicated by the nature of the phenomenon, which makes it difficult to elicit reliable data and almost impossible to rely on speakers' judgements.

The phenomenon is geographically stratified in that we do not find gemination at all in speakers from northern parts of Italy whose dialects do not realize contrastive geminates either. Such northern speakers who actually do realize geminates realize the contrastive geminates (i.e. the double consonants they find in the orthography) but do not apply raddoppiamento sintattico (Loporcaro 1988). Varieties from the centre and south display both phonological and lexical gemination, while some southern varieties have lexical but no phonological consonant gemination.

[10] Borrelli also lists *intra*, which is a prefix. Gemination with this prefix is, however, lexicalized. It does not apply in all words derived with this prefix. Compare *intravedere* 'catch a glimpse of' with *intravvenire* 'take part' (examples from Borrelli).

7.3.2 An OT analysis of phonological consonant doubling

Despite D'Imperio and Rosenthall's (1999) argumentation for foot well-formedness as the factor triggering gemination, the most recent analyses of rhythmic doubling in OT (Borrelli 2002; Saltarelli 2004) attribute the gemination to a constraint that prefers heavy stressed syllables over light stressed syllables (Stress-to-Weight), drawing on the proposal by Chierchia (1986).[11] In interaction with the ban on word-final long vowels, this causes gemination of the initial consonant of the second word to give additional weight to the final stressed syllable of the first word in the chain.

In section 6.2, in the discussion of stress placement, we saw that phonological vowel lengthening occurs as a means to create feet that are binary at the moraic level. As elaborated in great detail in this section, examination of the emergence of vowel length revealed that syllable augmentation is enforced at a phonological level in penultimate open syllables only. All stressed final and pre-penultimate syllables do not receive an additional mora if they have only one (i.e. if they are not closed by a consonant or a part of a geminate). This is a convincing argument for regarding lengthening as the effect of foot structure optimization rather than a prominence increase, i.e. it is not a Stress-to-Weight effect. If Stress-to-Weight does not play a role in the stress placement algorithm, it is quite surprising to find an effect of this constraint at the word boundary. Since we have an independent explanation for word-internal vowel lengthening (Foot-Binarity), the enterprise is worthwhile to expand this to capture rhythmic consonant gemination as well.

Despite a few idiosyncratic cases in which we see historical gemination of consonants in words with antepenultimate stress, as in *fémmina* 'woman', we find no word-internal consonant lengthening. The two constraints NonFinal ('Do not parse the final syllable into a foot') and foot binarity (Ft=μμ) enforce augmentation of penultimate syllables, since the expansion of the stress foot to include the final syllable would violate NonFinal, and a short vowel in a stressed open syllable violates foot binarity. However, the absence of lexically long vowels and the presence of lexically long consonants require a ranking that depicts long vowels as more marked than long consonants.

(37) Differential markedness of long vowels and consonants

/ˈfemmiːna/	*Vμμ	Maxμ	*Cμ
a. ˈfemmiːna	*!		
b. ˈfemiːna	*!	*	
c. ˈfemina		**!	
☞ d. ˈfemmina		*	*

If this grammar is combined with the stress grammar, we generate gemination in raddoppiamento contexts as desired. Word-internally, however, vowel lengthening is preferred over consonant lengthening to improve on foot structure. Thus,

[11] Not to be confused with the constraint on weight-sensitivity, Weight-to-Stress, which, if ranked high enough, enforces that heavy syllables receive stress (see Ch. 6).

derived consonantal moras have to be banned, while derived vocalic moras should be unproblematic. A derived consonantal mora violates DEPCμ (‘Do not insert a μ on a consonant’). WEIGHT-BY-POSITION was regarded as top-ranked in Italian in Chapter 5, because coda consonants have to be moraic by convention to account for the syllable size restriction to maximally a long vowel/diphthong or a short vowel plus one coda consonant. Since the constraint plays no role here I will ignore it. DEPCμ, though, has to rank higher than the markedness constraint against long vowels, *Vμμ. This ranking ensures that a candidate which displays vowel lengthening in response to FT = μμ is preferred over one that displays consonant gemination to achieve the same goal.

(38) Word-internal: V-lengthening preferred over C-lengthening

/puˈlito/	NON FINAL	FT=μμ	IO-DEPCμ	ONSET	*Vμμ	MAXμ	*Cμ
a. pu.(ˈli.to)	*!						
b. pu.(ˈli).to		*!					
c. pu.(ˈlit).o				*!			
d. pu.(ˈlit).to			*!				*
e. pu.(ˈliC).to			*!				*
☞ f. pu.(ˈliː).to					*		

With NLV-Right outranking both constraints, vowel lengthening is still not possible at the end of the word. Since Ft = μμ is also regarded as the constraint that causes selection of candidates with raddoppiamento sintattico in larger domains, it has to rank higher than DEPCμ.

(39) Word-finally no lengthening possible

/palˈtɔ/	FAITH STRESS	NLV-RIGHT	FT=μμ	IO-DEPCμ
a. (ˈpal)to	*!			*
b. pal(ˈtɔː)		*!		*
💣 c. pal(ˈtɔt)				**
☹ d. pal(ˈtɔ)			*!	*

IO-DEP has to be distinguished from IO-DEPCμ. The former punishes insertion of a consonantal root node, while the latter punishes assignment of a mora to a consonant position. To exclude the candidate with final-consonant epenthesis, IO-DEP has to rank higher than FT=μμ.

(40) Word-finally no lengthening possible

/pal'tɔ/	FAITH STRESS	NLV-RIGHT	IO-DEP	FT=μμ	IO-DEPCμ
a. ('pal)to	*!				*
b. pal('tɔː)		*!			*
c. pal('tɔt)			*!		**
☞ d. pal('tɔ)				*	*

If the consonant is already present in the input, IO-DEPC is not violated if a mora is assigned. If the lexical consonant is syllabified as an onset in the surface form and moraicity results in lengthening, it is debatable whether this violates an additional faithfulness constraint such as INTEGRITY. However, this is irrelevant for the current analysis. In the configuration in which we find rhythmic doubling, the consonant that provides weight to the stressed syllable is present in the input as the initial consonant of the word following the stressed open syllable in need of a second mora. In tableau (41), in which this case is evaluated, I do not include a candidate with an epenthesized consonant. Thus, high-ranking IO-DEPC is not violated by the forms assessed. The relevant constraint here is the one that forbids insertion of a mora to a consonant, IO-DEPCμ.

The difference between the morpheme- or word-internal and the across-word strategy to optimize the foot is that when a word is assessed, vowel lengthening is allowed, while this is banned in phrases. We can assume that forms in larger units, such as phrases, stand in a correspondence relation with the simple or isolated form. The relevant faithfulness constraint compares the simple output form and the same form in the context of other forms, i.e. in a phrase, and militates against the insertion of additional morae to vowels, OO-DEPVμ.

(41) Across words: C-lengthening preferred over V-lengthening

/pal'tɔ pu'lito/	FT=μμ	OO-DEPVμ	ONSET	IO-DEPCμ
a. pal('tɔ) pu('liː)to	*!			
b. pal('tɔː) pu('liː)to		*!		
c. pal('tɔp) u('liː)to			*!	*
☞ d. pal('tɔp) pu('liː)to				*
e. pal('tɔp) pu('lit)to				**!

By splitting up the DEP constraint we model the asymmetry between morpheme-internal and morpheme-final lengthening. In the former case, vowels are lengthened, while in the latter, consonants undergo lengthening.

At this point we make a short excursion back to an issue raised in the discussion of stress placement. In Chapter 6 we looked at D'Imperio and Rosenthall's observation that stressed penultimate vowels in verbs lose their length if a clitic is added. Furthermore, adding a clitic to a verb with final stress results in gemination of the clitic's initial consonant rather than lengthening of the verb-final vowel. These patterns raised the problem of what the domain of foot construction actually is and which edge constraints like NonFinal and NLV-Right actually refer to. If they refer to the domain or string under evaluation, as proposed above, rather than to the Prosodic Word, we generate the desired results without further assumptions. The constraint OO-Depμ used in the first approach to gemination of clitic-initial consonants is now replaced by the more specific OO-DepVμ, because the former in its high position would not allow us to generate gemination of initial consonants of lexical items, since these have an independent base the constraint can refer to.

A further candidate to consider is one that simply extends the foot over the first syllable of the second word in the construction.

(42) Footing of *paltò pulito* 'clean coat'

pal('tɔp)pu('liː)to > *pal('tɔpu)('liː)to

D'Imperio and Rosenthall (1999) attribute the failure of the candidate with the bisyllabic foot to the constraint Align-Ft, which is violated to a greater extent by incorporation of the following syllable than by incorporation of the initial consonant only. However, they do not give a definition of the constraint detailing which other edge the foot has to be aligned with. From their discussion we can deduce that the constraint aligns the foot with the prosodic word boundary. 'The only morphological boundary relevant for Italian stress and gemination is the prosodic word' (D'Imperio and Rosenthall 1999: 26). It is not obvious why the prosodic word edge is not simply extended together with the (final) foot. Since we have dispensed with the prosodic word as a relevant domain in the preceding chapter, the arguments referred to in the relevant edge-mapping constraint must be of a different nature altogether.

We have assumed above that a word within a bigger phrase stands in correspondence with its surface realization in isolation. I assume also that feet have to extend optimally over the segments they include in the base form. This is captured by Anchoring constraints (as introduced in the preceding section; McCarthy and Prince 1995; 1999), which map the edges of one representation to the edges of another.

(43) OO-Anchor-Ft: 'The edges of a foot coincide in corresponding representations R_1 and R_2.'

Tableau (44) shows how the constraint eliminates the unwanted candidate because of excessive extension of the foot boundary

(44) Minimal extension of feet across words

/palˈtɔ puˈlito/	Ft=μμ	OO-DepVμ	Onset	OO-Anchor-Ft	IO-DepCμ
a. pal(ˈtɔ) pu(ˈli:)to	*!				
b. pal(ˈtɔ:) pu(ˈli:)to		*!			
c. pal(ˈtɔp) u(ˈli:)to			*!	*	*
☞ d. pal(ˈtɔp) pu(ˈli:)to				*(p)	*
e. pal(ˈtɔpu)(ˈli:)to				**!(pu)	

The behaviour of complex onsets in gemination contexts shows that the Anchoring constraint has to be defined in a broader way, since otherwise we would not expect gemination of the initial consonant of a complex onset.

(45) Complex onsets geminate (*paltò prezioso* 'valuable coat')

pal(ˈtɔp)pɾets(ˈtsjo:)zo > pal(ˈtɔp)ɾets(ˈtsjo:)zo

What we see here is a general drive to preserve prosodic affiliation across surface representations at the foot level and at the syllabic level as well. The complex onset of the base form has to be preserved.

(46) OO-Anchor-PCat: 'The edges of a prosodic unit (syllable, foot) coincide in corresponding representations R_1 and R_2.'

The analysis is displayed in tableau (47). I ignore the first three candidates since they have been excluded already in the previous discussion. The two crucial candidates in competition are (d) and (e). Candidate (d) has simply dragged the labial stop from the following syllable into its final foot as a coda. This shift of prosodic affiliation changes the edge of the foot and of its constituent syllable to the right, resulting in two violations of OO-Anchor-PCat, and it also shifts the edge of the following syllable to the right, which provides a third violation of the constraint. Competing candidate (e) has geminated the consonant, keeping at least the original edges of the second syllable intact, and thus out-performs candidate (d).

(47) Minimal extension of prosodic categories

/palˈ tɔ pretsˈ tsjozo/	Ft= μμ	OO-DepVμ	Onset	OO-Anchor-PCat	IO-DepCμ
a. pal.(ˈtɔ).pɾets.(ˈtsjo:).zo	*!				
b. pal.(ˈtɔ:).pɾets.(ˈtsjo:).zo		*!			
c. pal.(ˈtɔ.pɾets).(ˈtsjo:).zo	*!			$****(\text{prets})_{ft}$	
d. pal.(ˈtɔp).ɾets.(ˈtsjo:).zo				$*(\text{p})_{ft}**(\text{p})_{\sigma}!$	*
☞ e. pal.(ˈtɔp).pɾets.(ˈtsjo:).zo				$*(\text{p})_{ft}*(\text{p})_{\sigma}$	*

Onsets containing an /s/ and one or two consonants do not geminate in this context—which is expected, since they are not part of the initial syllable according to the analysis provided in section 5.4.

Now we can turn our attention to the interaction of clash avoidance and gemination. The over-application of gemination in constructions with stress retraction was structurally explained as the emergence of a decapitated foot. Now we are going to implement this in our OT grammar.

Foot decapitation in the form of line conflation was introduced by Halle and Vergnaud (1987) to account for the stress placement regularities of languages like Cairene Arabic. The language marks only main stress, with no secondary stress. The location of stress cannot be predicted from the right edge of the word, but it can be predicted by looking at the distance of the stressed syllable to the left edge of the word. Even though this distance varies, the stable generalization is that in words with only light syllables the stressed syllable is always an uneven number of syllables away from the left edge.[12] The solution was, therefore, that the language constructs binary left-headed feet from the left edge of the word until it runs out of syllable pairs. The End-Rule places stress on the rightmost foot. In a final step, all other heads are deleted by line conflation, i.e. deletion of line two of the metrical grid, making all feet with secondary stress vanish.

Standard Optimality Theory, because of its non-derivational architecture, cannot model the construction of structure that is present at some point in the process only to be destroyed after it has fulfilled its purpose. The alternative proposed by Crowhurst (1996) and Crowhurst and Hewitt (1995) is to allow for feet that do not have a head constituent. This moves not only the determination of foot size but also foot headedness into the realm of evaluation through violable constraints. A desirable move, when seen from the original perspective of OT, whose research programme is to explain linguistic regularities in terms of constraint interaction, rather than universally prescribed representations. An issue that has to be addressed now, however, is how the foot is defined if not by headedness.

The option of headless feet requires the introduction of violable constraints which determine if a foot in a given context has a head or not, just as the various instantiations of Foot Binarity determine the size of feet. To this end, Crowhurst introduces the constraint FOOT-TO-HEAD, which prefers feet with head over feet without head. Headedness, in this as in any other theory of feet, also has to link head status with some phonetic correlate, such as intensity, duration, and/or pitch. Furthermore, headless feet can now emerge as the collateral damage of all other sorts of restriction (e.g. clash resolution), or as subject to directly opposing markedness constraints against the proliferation of heads in prosodic constituents. Crowhurst proposes two constraints, HEADMAX and MONOHEADEDNESS, of which the former requires every head of a foot to be the head of a prosodic word, while the latter prefers words with only one head. In tandem, they result in the suppression of all but the head carrying main stress. The latter two constraints, however, will play no role here.

[12] Cairene Arabic is quantity-sensitive, but I ignore these details here for the sake of brevity.

According to Saltarelli, Roman Italian tolerates forms with stress clash and gemination, but also forms with stress retraction and gemination. The former is accounted for by the present state of the grammar, as illustrated in (48).

(48) Clash tolerance in Roman Italian

/kafˈfɛˈluŋgo/	OO-DEPVμ	FT=μμ	ONSET	IO-DEPCμ
a. kaf(ˈfɛ) (ˈluŋ)go		*!		
b. kaf(ˈfɛː) (ˈluŋ)go	*!			
c. kaf(ˈfɛl) (ˈuŋ)go			*!	
☞ d. kaf(ˈfɛl) (ˈluŋ)go				*
☞ e. kaf(fel) (ˈluŋ)go				*
☞ f. (ˈkaf)(fel) (ˈluŋ)go				*

The removal of stress from the final vowel in the first word is effected by the constraint *CLASH, which is violated by representations with adjacent stressed syllables. Since each of the two stresses in two adjacent lexemes could be lexical, *CLASH also has to outrank IO-IDENT-Stress.

The survival of the first foot, even without a head, is warranted by Output-Output faithfulness, OO-MAX-Foot. Faithfulness now has to distinguish between the foot and its head. Thus, the faithfulness constraint guarding the persistence of heads of feet across corresponding surface representations, OO-MAX-Ft-Head, has to be less important. If the foot is required to be present in the optimal candidate, though without a head, the bimoraicity constraint is violated if it has the same size as in the base form, i.e. one mora.

(49) Emergent headless feet

/kafˈfɛ ˈluŋgo/	*CLASH	OO-DEPVμ	OO-MAX FT	FT=μμ	OO-MAX FT-HD
a. kaf(ˈfɛ) (ˈluŋ)go	*!			*	
b. kaf(ˈfɛː) (ˈluŋ)go	*!	*			
c. kaf(ˈfɛl) (ˈuŋ)go	*!				
d. kaf(ˈfɛl) (ˈluŋ)go	*!				
e. kaffe (ˈluŋ)go			*!		
f. kaf(fe) (ˈluŋ)go				*!	*
☞ g. kaf(fel) (ˈluŋ)go					*
☞ h. (ˈkaf)(fel) (ˈluŋ)go					*

The question that has yet to be answered is why stress is retracted (candidate h) rather than removed (candidate g).

If we go along with Nespor and Vogel (1986), Selkirk (1995), and many other researchers, we could simply claim that any lexical item is compulsorily realized as a prosodic word. EXHAUSTIVITY demands that every prosodic word has a head, which consists of a foot which has a head. In section 6.5, this view was abandoned. The presence of secondary stress on the first member of a compound or phrase of two lexical items is a matter of Base-Output correspondence rather than recursive or adjacent prosodic word structures. Following the current line, the difference between complete destressing and stress shift can also be due to a violable constraint demanding that every lexical word have a prosodic head, LEX-TO-HEAD.

(50) Stress shift

/kafˈfɛ ˈluŋgo/	LEX-TO-HEAD	OO-MAX FT	IO-IDENT stress	FT=μμ	OO-MAX FT-HD
e. kaffe (ˈluŋ)go	*!	*	*		
f. kaf(fe) (ˈluŋ)go	*!		*	*	*
g. kaf(fel) (ˈluŋ)go	*!		*		*
☞ h. (ˈkaf)(fel) (ˈluŋ)go			*		*

This completes the analysis of stress-driven consonant doubling. Before moving on to a formalization of the other two types of consonant doubling introduced above it is worth having another brief look at the peculiarities of stress retraction, because it will further substantiate the analysis of destressed positions as headless feet. In longer words, i.e. with three syllables or more, stress retraction has, in principle, several places where the stress can be located when it has to move from its original position. The intuitively most likely strategy is to put the stress on the syllable immediately to the left of its original position, which locates stress in the penultimate syllable of the word. However, this does not happen. In such cases the immediately preceding syllable is skipped.

(51) Long-distance retraction

a.	ventiˈtɾe	+ ˈtoɾte	= ˌventitɾetˈtoɾte	‘twenty-three cakes’
			*venˌtitɾetˈtoɾte	
b.	iŋkontɾeˈɾɔ	+ ˈluːtʃo	= iŋˌkontɾeɾolˈluːtʃo	‘(I) will meet Lucio’
			*iŋkonˌtɾeɾolˈluːtʃo	
c.	delutʃideˈɾɔ	+ ˈtutto	= deluˌtʃideɾotˈtutto	‘(I) will clarify everything’
			* delutʃiˌdeɾotˈtutto	
			* deˌlutʃideɾotˈtutto	

If the penultimate syllable had received stress in these examples, it would have had to undergo vowel lengthening to satisfy FT=μμ, which is not an option according to the analysis just developed, or the word-final syllable would have had to be incorporated into the new stress foot to satisfy FT=μμ—which is not possible either, because this following syllable is already in a foot, as the gemination shows. Thus, the only option is to place the stress one syllable further away. In this way there is enough material, a heavy syllable or two light syllables, to build an optimal foot. Alternatively, the skipping of a syllable in the context of retraction could be seen as evidence for secondary stress feet. The third example in (51) is used in Nespor and Vogel (1986: 174), who transcribe all data they provide in relation to stress retraction with secondary stress marks (as in *dèlucìderó tútto* → *dèlucídero tútto*). Secondary stress, however, is optional at best at the word level, as discussed in section 6.4.

The other type of phonological gemination, backwards doubling, is captured by this analysis without further assumptions. The discussion of syllable structure has provided us with the ranking of Max-IO and Dep-IO above Onset. As long as no Alignment constraint (or Anchoring) intervenes to map morphological edges to prosodic edges (e.g. as Align-Left(stem, syllable)), this ranking generates syllabification over word boundaries in case of adjacent consonant-final and vowel-initial words. The Anchoring constraint introduced above was ranked below Onset. Foot binarity (Ft = μμ) triggers consonant lengthening here as in the cases above. If the final consonant is exclusively syllabified as the onset of the first syllable of the following word, the final stressed syllable loses its second mora. This would then result in a monosyllabic stress foot, which can be avoided in this context by gemination. The analysis is illustrated in tableau (52).

(52) Onset-driven gemination across words

	Ft= μμ	OO-Dep Vμ	Onset	OO-Anchor-PCat	*Cμ
a. (ˈtɾam) e(ˈlɛtɾi)ko			*!		
b. (ˈtɾa) me(ˈlɛtɾi)ko	*!			*	
c. (ˈtɾaː) me(ˈlɛtɾi)ko		*!		*	
☞ d. (ˈtɾam)me(ˈlɛtɾi)ko				*	
e. (ˈpan)teon a(ˈpeɾ)to			*!		
f. (ˈpan)teonna(ˈpeɾ)to				*	*!
☞ g. (ˈpan)teo na(ˈpeɾ)to				*	

Word-internal backwards gemination (as in *gassoso* 'gaseous') is captured in this analysis under the assumption that the (or some?) derivational suffixes which draw stress away from the stem do not attach to a root but to a surface base. In this case, the part of the analysis which generates headless feet in stress retraction contexts in tautophrasal word sequences (e.g. *non vedró niente* [noɱvedronˈnjɛnte] 'I won't see a thing') causes a candidate with a non-prominent foot on the base to win. Ft=μμ in conspiracy with Onset prefers the form with gemination over a candidate with resyllabification (53).

(53) Onset-driven gemination and derivation

/ˈgas-ˈoso/	*CLASH	OO-MAX FT	IO-IDENT stress	FT=μμ	OO-MAX FT-HD	ONSET
a. (ˈgas)(ˈoː)so	*!					
b. (ga)(ˈsoː)so			*	*!	*	
c. ga(ˈsoː)so		*!	*		*	
☞ d. (gas)(ˈsoː)so			*		*	
e. (gas)(ˈoː)so			*		*	*!

7.3.3 Summary

In section 7.3.1 I introduced the three different types of consonant doubling that cause synchronic alternations between short and long consonants. We have seen that after centuries of research into the matter, the domain of application of raddoppiamento sintattico is still far from clear. In the analysis I have largely ignored the presumably free variation in application and concentrated on two issues: determining the force that drives syntactic doubling, and explaining the over-application of consonant gemination in the context of stress retraction. The cause of this type of gemination and of backwards gemination was identified as the restriction on Italian feet to being binary at the moraic level. This, together with the comparatively loose phonotactic restriction that syllables should start in a consonant, causes doubling of word-final consonants when they are followed by a vowel-initial word. The gemination behaviour of complex onsets, i.e. obstruent-sonorant sequences at the beginning of the second word in a sequence, leads to the insight that it is not the constraint ONSET, but rather faithfulness to syllabic affiliation in a base form, or Output-Output prosodic anchoring, which conspires with FT=μμ to effect doubling. Prosodic anchoring also leads to minimal adjustment (i.e. gemination) in cases where a whole unstressed light syllable at the beginning of the second word is available to optimize the size of the final foot in the first word. The initially puzzling observation of over-application of doubling in Roman in connection with stress retraction could finally be explained as the optimization of a headless foot, a concept motivated independently.

7.4 VOWEL DELETION

Italian displays several processes of vowel deletion, which are sensitive to segmental, prosodic, and syntactic factors. Furthermore, some instances of deletion are regarded as obligatory while others are optional or occur only in fast speech. For some cases, there is disagreement as to whether or not they are grammatical in standard Italian. Traditionally, a division is made between elision (*elisione*, in the Italian literature) and truncation (*troncamento*), as extrapolated from Italian grammars by Vogel et al.

(1983). This distinction is also used by Burzio (1989). The dropping of a word-final vowel before another vowel-initial word is regarded as elision, while truncation is the loss of a word-final vowel or whole syllable (i.e. including the preceding consonant) before a vowel- or consonant-initial word. Both definitions are sketchy and overlap to a considerable extent, such that one could regard elision as a sub-category of truncation. Because of this vagueness and the apparent circularity in the use of the terms, Vogel et al. drop this terminology and instead propose a systematic classification of vowel deletion (*cancellazione di vocale*) that takes into consideration syntactic, prosodic, and markedness factors. A further sub-category that has to be distinguished is vowel degemination (Nespor 1987), which is a phenomenon of rapid speech in which one of two identical vowels is deleted across a word boundary. This might alternatively be regarded as coalescence, i.e. merging of the two segments. The syntactic category of the words containing the vowel and the quality of the vowels does not seem to play a role in this process. However, the degemination is blocked if the second of the two vowels is stressed. Deletion of the final vowel of determiners, modifiers, and a handful of adjectives, i.e. deletion inside the syntactic domain of the DP, targets only the vowels /a/ and /o/, but not /i/ and /e/, while deletion of verb-final vowels, or VP-internal deletion, affects only /e/ and /o/ but not /i/ and /a/. Apart from these cases we also find vowel deletion word-internally at morpheme boundaries, but not within morphemes.

I will first illustrate all these different patterns, and then sketch a potential analysis of the asymmetry between morpheme-internal and marginal context and the different target requirements in verb phrases and noun phrases.

7.4.1 Deletion, syntactic structure, and speech rate

The data in (54a) illustrate the deletion of vowels word-internally. As can be see by comparison with (54b), vowels can only be deleted at morpheme junctures. Morpheme-internally heterosyllabic sequences of two vowels are tolerated.

(54) Word-internal vowel deletion

a.	fama	+oso	= famoso	'fame'/'famous'
	giallo	+astro	= giallastro	'yellow'/'yellowish'
	fiore	+aio	= fioraio	'flower'/'florist'
	castoro	+i	= castori	'beaver'/'beavers'
b.	paura	*pura	'fear'	
	caotico	*cotico	'chaotic'	
	meandri	*mandri	'meanders'	
c.	principio	+i	principi	'principle/s'

One might argue that there is no deletion observable at all here, since the final vowel in the base forms is an inflectional affix, and inflection for number and gender applies after word formation affixes have attached. However, in 7.2 we have argued, following Scalise (1984), that the final vowel in such forms must be lexically present in the root, even if it is an underspecified vowel. An underspecified final vowel allows for inflectional affixes present in the form of features (e.g. [dorsal]=feminine singular, [coronal, close[3]]=masculine plural, etc.) to be linked to it. The vowel in a word such as *fiore* has to be specified to a larger extent, since it does not allow inflection in the singular (**fioro*). Consonant-final nouns never show any inflection. This could be attributed to their status as loanwords and a general ban on inflection of loanwords or to the subsegmental nature of inflectional affixes. If this is a reasonable analysis of inflection, the derivational affixes can be analysed in the same fashion. The first vowel of the affix imposes its features on the root-final underspecified segment, and if two root nodes are present they merge to one in the surface representation. Apparently, derivational suffixes differ from inflectional affixes in their phonological structure, since they shift stress and combine with consonant-final roots, as in *bar* 'bar' – *barista* 'bartender'.

In the following overview of deletion at word edges I largely follow the classification given by Vogel et al. (1983), going first through the patterns within the DP, then looking at the VP pattern, and finally discussing the limitations of deletion in other (syntactic) units.

Determiners show regular and obligatory deletion of the final vowel of the feminine singular determiners, which is always /a/, in both definite and indefinite, but the plural definite determiner does not undergo vowel deletion (55a,b). The masculine determiners show a slightly different pattern. Here, the final vowel of the allomorph used for forms starting in an /s/ + consonant(s) cluster, an inherently long consonant or a vowel, deletes in the vocalic context (55c). As for the indefinite masculine article, the final vowel /o/ is present in the forms with a noun starting in /s/ + consonant(s) or an inherently long consonant and absent in the other environments (55d). The masculine plural determiner *gli* only shows deletion (55e) if the following vowel is an /i/. The latter is part of the pattern of vowel degemination, which is a phenomenon of rapid speech, to be discussed later.

Looking at the whole inventory of determiners, we see that even though four different vowels, /i/, /e/, /a/, and /o/, could be subject to deletion, only /a/ and /o/ actually undergo this process. Furthermore, the deletion of /a/ indicated in (55b) is optional.

(55) V deletion in determiners (targets /a/ and /o/ only)

a.	una donna	'a woman'	b.	un'oliva	'an olive'
	la donna	'the woman'		l'oliva	'the olive'
	le donne	'the women'		le olive *l'olive	'the olives'
c.	il ragazzo	'the guy'	d.	un ragazzo	'a guy'
	lo specchio	'the mirror'		uno specchio	'a mirror'
	l' imbranato	'the awkward person'		un imbranato	'an awkward person'
e.	gl' imbranati	'the awkward persons'			
	gli amici	'the friends'			

Article selection in the masculine paradigm has an additional caveat, as indicated in the chapter on syllable structure. According to Nespor (1990) there is no reasonable analysis that would link the two respective allomorphs, singular *il* and *lo* on the one hand and plural *i* and *gli* on the other, to a single morpheme each. An analysis that has both allomorphs (i.e. *il* and *lo*) in the input will never choose *il* as the output allomorph. Nespor (1990) (see also Bye 2007) analyses masculine determiner selection in Hayes' (1990) Precompilation Theory as a case of allomorph selection which has the context specified in the lexical entry of the determiner allomorphs, following Hayes' proposal for the English indefinite article allomorphy (*a* vs. *an*). Thus the lexical entry for the Italian masculine definite article contains both allomorphs and the information that *lo* is chosen before a vowel or non-syllabic consonant and *il* elsewhere. That the pattern is not phonologically 'natural' in the sense that the allomorph is chosen to optimize the output structure with respect to markedness requirements is especially obvious in the case of the plural allomorphy. The masculine plural definite article /i/ is less harmonic in any case, because it lacks an onset consonant, which the allomorph /ʎi/ provides.

The pattern of *nessun(o)* and other modifiers, as discussed by Burzio (1989), is a sub-category of vowel deletion in determiners. We find the same segmental restrictions.

(56) Obligatory deletion in quantifiers and adjectives

a.	quest' isola	'this island'
	quell' ufficio	'that office'
	quell' odioso insetto	'that odious insect'
	nessun individuo	'no individual'
	nessun eresia	'no heresy'
	quel tavolo	'that table'
b.	questa parola	'this word'
	questo nome	'this name'
	nessuna donna	'no woman'
c.	buon vino	'good wine'
	bel tavolo	'nice table'
	minor errore	'minor error'
d.	minor certezza	'minor certainty'
e.	buona torta	'good cake'
	bella donna	'pretty woman'
	tutto bene	'everything OK'
	tanti saluti	'many greetings'

A surprising feature of Vogel et al.'s data corpus is that deletion of the /a/ of the indefinite singular feminine determiner is obligatory in *un' orchidea* 'an orchid' but optional with *un(a) immagine* 'a picture'. On the other hand, deletion is obligatory in *quest' isola* but optional in *quest(a) offerta* 'this offer'. For such cases Vogel et al. assume that it is always possible, and actually preferable, to drop the vowel. In my experience, however, deletion is not obligatory in any of these cases. Vogel et al. list the following quantifiers as optionally allowing deletion. However, most examples show two identical vowels if deletion does not apply. Thus, one might conclude that we are actually dealing with vowel degemination (see below).

(57) Exceptionally optional deletion in quantifiers

molt(a) acqua	'much water'
quant(o) orgoglio	'so/how much pride'
quant(a) attenzione	'so/how much attention'
tant(o) olio	'a lot of oil'

As far as specifiers are concerned, vowel deletion is impossible in the following context, as discussed in Rizzi (1979), Vanelli (1979), Nespor and Scorretti (1985), Nespor (1990).

(58) Determiners as pronouns: deletion impossible

Ne ho uno arancione.	'(I) have an orange one of them.'
Ne ho comprato uno a poco prezzo.	'(I) bought one of them for little money.'

While earlier approaches explain the blocking effect here by the syntactic fact that the numeral/determiner is the head of an NP, which puts it in a different syntactic position than a determiner, i.e. the head of a lexical XP rather than of a functional XP, Nespor (1990) proposes an analysis in terms of Precompilation Theory.

With adjectives preceding a noun or other adjective, deletion is restricted to a handful of high-frequency items. As the examples in (59) show, most adjectives and numerals do not allow deletion. The same holds for nouns. The two comparative forms with a final /e/ in (59b), however, which do not inflect for gender and number, allow deletion. The adjectives *santo* 'holy/Saint' and *grande* also constitute a special case, since they allow deletion of the final vowel or of the final syllable (59c).

(59) No deletion in most adjectives

a.	cattiva indagine	'bad inquiry'
	cinque incidenti	'five incidents'
	poco spazio	'little room, space'
	nove esempi	'nine examples'
	brutta casa	'ugly house'
	lontano paese	'faraway village'
	singolo effetto	'single effect'
b.	miglior(e) libro	'better book'
	peggior(e) festa	'worse party'
c.	San Gennaro (santo)	'Saint Gennaro'
	sant uomo (santo)	'holy'
	Sant' Agostino	'Saint Agostino'
	Sant' Ursula	'Saint Ursula'
	gran' salto (grande)	'great/big jump'
	grand' uomo	'great/tall man'
	grand' amore	'great/big love'

In complex adjectival and adverbial phrases deletion of the final vowel of the modifier or adverb is not possible either, with the exception of the two in (60b).

(60) No deletion in complex APs

a.	molto interessante	'very interesting'
	poco intelligente	'little intelligent'
	piuttosto aggressivo	'quite aggressive'
	chiaramente orgoglioso	'clearly proud'
	meno obbrobrioso	'less disgraceful'
b.	ben difficile (bene)	'quite difficult'
	mal messo (male)	'badly put'

Vogel et al. also discuss lexicalized constructions, such as titles combined with surnames, as in *signor Rossi (signore)* 'Mr Rossi', *general(e) Martino* 'general Martino'. Deletion is obligatory with titles like *signore*, *monsignore*, *dottore*, *professore*, and optional with other titles that end *-ore* or *-ale*. A further interesting case is contributed by reduplicated adjectives and adverbs. In the first part of the construction the final vowel can be dropped in the masculine forms if it is preceded by a nasal which is preceded by a vowel. If the form starts in a vowel, deletion can also happen before /r/.

(61) Deletion in reduplicated forms

a.	zitto zitto		'very silent'
	poco poco		'very few/little'
	morbido morbido		'very soft'
	calvo calvo		'very bald-headed'
b.	piano piano /	pian' piano	'very slow'
	bene bene /	ben' bene	'very good'
	mano mano	man' mano	'little by little'
	pieno pieno	pien' pieno	'very full'
c.	piccino piccino	piccin' piccino	'very small'
	pochino pochino	pochin' pochino	'very very few/little'
d.	piena piena		'very full (fem)'
e.	materno materno		'very motherly/maternal'
f.	buffone buffone	? buffon' buffone	'very foolish/clownish'
	benone benone	? benon' benone	'very very good'
g.	amaro amaro	amar' amaro	'very bitter'
	ancora ancora	ancor' ancora	'very still'

To summarize the situation in the nominal constructions, while singular determiners are regularly subject to deletion, the plural endings do not allow the dropping of the vowel. Most quantifiers and adjectives do not allow deletion. Deletion is only an option for a few items in this group. While the undeletable inflectional plural endings are the vowels /e/ and /i/, whilst /a/ and /o/ can delete, the few adjectives that show deletion end in an /e/ which does not undergo inflection. We can conclude, therefore, that deletion is determined not so much by the quality of the vowel as by a need to express the morphosyntactic information (plurality) connected to the vowel in question.

The phonological conditions largely involve syllable phonotactics. Deletion of the final vowel has to result in a coda that is legal word-internally. Derived geminates are not tolerated.

In verbs, deletion is obligatory in combinations of infinitive plus clitic and optional or likely in combinations of infinitives with other items. The past participle does not allow deletion of the final vowel, but the present participle and gerunds do. Third person plural present tense forms also allow deletion.

(62) Verb-final V deletion (affects only /e/ and /o/)

a.	mangiarlo	'to eat it/him'
	vederlo	'to see it/him'
	vedermeglio	'to see better'
b.	essend(o) entrati	'being/having entered'
	avend(o) ordinati	'having ordered'
	leggon(o) volentieri	'(they) enjoy reading'
	son(o) entrati	'(they) have entered'
	son(o) sporchi	'(they) are dirty'
c.	avete ordinato	'you.pl have ordered'
	fossi uscito	'(they) might have left'
	abbia chiuso	'(s/he) might have closed'
	mangiato bene	'eaten well'
	partito in fretta	'left in a hurry'

Singular object enclitics to verbs show optional deletion if followed by a vowel. If the following verb is an auxiliary, deletion is obligatory. Direct objects in the plural and indirect objects are split orthogonally. While 3rd person does not allow deletion, 1st person and the reflexive/impersonal pronoun clitic do. However, in the 1st person plural deletion is limited to environments with an identical following unstressed vowel. Thus, in the latter case, only degemination is allowed.

(63) Deletion in preverbal clitics

a.	l'avevo (lo/la)	'I had him/her'
	cel' hanno portato (ce lo)	' they brought it/him to us'
b.	l(o) aprirò	'(I) will open it/him'
	l(a) invitiamo	'(we) invite her'
	vi odiano	'(they) hate you(pl)'
	ci odiano	'(they) hate us'
	ci isolano	'(they) isolate us'
	c(i) invitano	'(they) invite us'
	ci s(i) aspetta là	'(someone) expects us there'

c. li apro — '(I) open them(masc)'
le organizzo — 'I organize them(fem)'
te li offriva — '(s/he) offered them(masc) to you'
me le avrebbe spedite — '(s/he) would have sent them(fem) to me'

Finally, there is the rapid-speech phenomenon of vowel degemination (Nespor 1990). We have already seen that vowels followed by another vowel are more prone to deletion than vowels followed by a consonant, and vowels followed by an identical vowel are more likely to delete than vowels followed by some other vowel. In rapid speech the latter is extended to affect all the major lexical categories to the same extent. In the examples in (64), stress is marked and words displaying degemination are underlined, as in Nespor (1990: 383), to show that all lexical categories—nouns, verbs, adjectives, and adverbs—are affected and that the second vowel of the pair that degeminates is always unstressed.

(64) Rapid-speech vowel degemination

a. Credo che inviteró <u>Oliviéro</u> a parlare.
'(I) think (I) will invite Oliviero to speak.'
b. Dicono che Oréste <u>entrerá</u> nel partito.
'(They) say that Oreste will join the party.'
c. Sono tutti bambíni <u>intelligenti</u>.
'(They) are all intelligent children.'
d. Molto spesso si sedéva <u>accánto</u> a Oreste.
'Very often (s/he) used to sit next to Oreste.'

As hinted at just above the preceding examples, the process is sensitive to stress, according to Nespor. If the second vowel in the input configuration is stressed, degemination is blocked. The first vowel might be unstressed or stressed. The role of stress, however, could not be confirmed by my informants. The form marked with an asterisk in (65a) is fully acceptable for native speakers; and I thus regard this as inter-speaker variation. The pattern might be unacceptable for Nespor, but other speakers might produce it.

(65) Vowel degemination and stress

a. érano órridi > (*)éranórridi '(they) were horrible'
b. sará arrivato > sarárrivato '(he) will be arrived'

From this data Nespor concludes that the second vowel is the segment targeted by the process. This is surprising, since otherwise only word-final vowels delete. Word-initial vowels are never targeted in any of the other sub-patterns of vowel deletion. An alternative is to regard the blocking in (65a) as an effect of foot structure. If the two vowels merge, the last consonant of the first word has to be syllabified as the onset of the main stress foot of the second word. Thus, the edges of the foot do not coincide with its edges in a potential base form. I will come back to this in the next section.

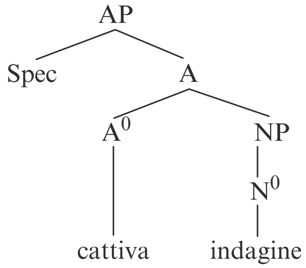
All vowel deletion processes that create consonant clusters create only clusters which are legal word-internally. Hence, one can conclude that in this larger domain the same phonotactic restrictions apply as within words. There are two deviations. First, derived clusters at this level never result in geminates and, in verbs, final vowels preceded by a geminate do not delete, neither before a consonant nor before another vowel. Second, determiners allow coda /s/ (as in *quest'analisi* 'this analysis') which is not attested in verb forms with vowel deletion.

As the phenomenon is (or the phenomena are) presented in the literature, it seems as if vowel deletion applies under different circumstances in different syntactic categories, or, as Nespor (1990) puts it, the process treats syntactic categories in an asymmetric fashion. She uses this observation to argue for an analysis as lexically precompiled phonology, i.e. the rule is not part of the general grammar but specified in lexical sub-categorization frames. Vogel et al., on the other hand, propose a syntactic analysis of the asymmetry between nominal categories and verbs that in essence postulates an effect of the c-command on the application of a deletion rule.

In their analysis, a vowel deletes if the syntactic item ending in this vowel c-commands the following item according to Cinque's (1979) definition of c-command. Thus, while in a VP the verb c-commands its complement and in a DP (though this functional projection was not available for Vogel et al.) the determiner c-commands the following adjective and/or noun, this is not the case for the subject noun in an NP VP sequence or the adjective in an AP in relation to the following element, since there is an additional node between the X^0 and the node dominating this one and the following terminal element. In their formulation, vowel deletion does not occur between distinct constituents that are dominated by the sentence node.

This explains why there is no deletion at the end of subject NPs, since they are not part of the following VP, nor do they contain the following VP; thus, there is no c-command relation between N and the following VP. However, if adjectives are regarded as the X^0 of an AP that dominates NP, which is the standard analysis (Abney 1987; Cinque 2005), the A c-commands the N, and we would erroneously expect deletion of the last vowel of the prenominal adjective.

(66) Adjective-noun order and c-command



The analysis of NP inside AP follows standard assumptions about DP structure (Cinque 1994; 2004 and references cited there). One could, against the current, assume that, in Italian, AP is a complement to NP, i.e. as seen in the default noun-adjective word order. In this case, the question is whether the whole AP moves up to a higher position in the adjective-noun word order, or just A^0 moves. In the former case, this analysis would explain the general absence of vowel deletion in adjective-noun sequences—but then we are left puzzling about why deletion is not the preferred option in noun-adjective sequences. Coming back to the position taken by Cinque (2004), the analysis of vowel deletion as dependent on c-command relations receives partial support in Cinque's recent analysis of word order in DPs as phrasal movement of AP and NP rather than head movement. However, we still have to understand why we do not see vowel deletion in constructions in which the constituents have not moved (e.g. in A N sequences) or in modifiers to adjectives (*men*(o) orride* 'less horrible').

A solution to the dilemma could be expected in the assumption that phonological phrasing does not always coincide with syntactic phrase structure (Nespor and Vogel 1986; Selkirk 1995), and that deletion applies within the phonological phrase but not at its margins. The conundrum arising here is similarly puzzling. If deletion applies within phonological phrases, it has to follow from some general principle that complement NPs are in the same phonological phrase as the preceding verb, while adjective and noun in any order, as well as modifier and adjective, are not inside the same phonological phrase.

I will show that the asymmetries and the specifics of the patterns by and large emerge because of the morphosyntactic and phonological structures, and because of the constraints active on surface representations that were argued for in previous sections and chapters. Thus, even though syntax still plays a role in the process, this role will be greatly reduced in comparison to previous analyses (see e.g. Vogel et al. 1983; Nespor 1990).

7.4.2 A unified analysis of deletion

One of the first observations made here on the deletion of vowels was that it happens preferably to unstressed vowels at morpheme margins and at word margins. Cross-linguistically we find regular processes of synchronic or diachronic deletion of word/morpheme-internal unstressed vowels (syncope). If we assume that vowels are likely to delete if they cannot be parsed into foot structure for some reason (i.e. to avoid violations of PARSE-σ), the absence of domain-internal deletion is a surprise, especially given the ambivalent status of secondary stress in Italian. Potential domain-internal deletion is severely restricted by the strict Italian syllable phonotactics. As we have seen above, the codas allowed to be created by vowel deletion are a subset of word-internal codas. Nevertheless, this still does not explain why a form such as [taˈrantola] 'tarantula' does not show shortening to, e.g. *[ˈtrantola], which is a phonotactically well-formed structure and out-performs the grammatical form on PARSE-σ. A constraint (family) that emerged as important again and again in the previous chapters was CONTIGUITY, which bans changes inside representations but is indifferent to changes at (word, morpheme) margins. Thus, the Italian preference for apocope over syncope is determined by a general property of the language, resistance against representation-internal changes due to high-ranking CONTIGUITY constraints (see the discussions in sections 4.2.1.3, 5.4, 7.2, and 7.3).

Furthermore, the part of the grammar determining foot structure and stress placement systematically and categorically excludes domain-final (unstressed) syllables from integration into foot structure via high-ranking NonFinal. The argument or domain this constraint applies to, apart from the stress foot, became controversial when we looked at the interaction of penultimate vowel lengthening with clitic attachment (see section 6.5). Apparently, a word without following clitics displays lengthening of the penultimate stressed vowel if it is in an open syllable, whilst this lengthening is suspended under cliticization. Thus, the word-final syllable is incorporated into the stress foot in the latter case, while it remains unfooted in the former. This is corroborated by a line of research into lengthening summarized by Bertinetto and Loporcaro (2005), claiming that penultimate lengthening is a phrasal rather than a word phenomenon. Thus, we can assume that vowel deletion applies to unfooted syllables at a domain edge beyond the prosodic word level. If, as proposed in Nespor and Vogel (1986) and elsewhere, in a larger syntactic unit the subject NP (or DP, eventually including an AP projection in between the DP and NP) loosely speaking constitutes one phonological phrase or intonational phrase while the whole VP, if it does not contain too much structure (like a PP embedded in the object NP for example), corresponds to another unit, we have an explanation why we find vowel deletion occurring at the end of a verb but not at the end of nouns: nouns and post-nominal adjectives are at the edge of the domain, and thus need an unfooted syllable if the final syllable is not stressed. Hence, deletion is impossible in this position—a violation of Parse-σ is enforced by NonFinal.

Furthermore, the same interaction of constraints that bans codas in word-final position (see Chapter 5) does so as well at the end of an intonational phrase, since a consonant that would be located there through the deletion of the following vowel could not be prosodified as a syllable onset.

I will illustrate this line of reasoning in the following. Evaluating a verb followed by some particle, with the overall phonological structure potentially leaving room for verb-internal as well as verb-final vowel deletion, tableau (67) shows the effect of Contiguity, banning word-internal vowel deletion as a means of reducing the number of unfooted syllables, as displayed by candidate (b). The effect of the Coda Condition (for its decomposition see section 5.4) is illustrated by the second evaluation in tableau (67), which selects the output for the past participle of the same particle verb.

(67) Determining the deletion environment, step 1: verbs

/tiˈrare ˈvia/	Contiguity	CodaCond	Parse-σ
a. ti(ˈɾaː)ɾe (ˈviː)a			***!
b. (ˈtɾaː)ɾe (ˈviː)a	*!		**
☞ c. ti(ˈɾaɾ) (ˈviː)a			**
/tiˈrato via/			
☞ d. ti(ˈɾaː)to (ˈviː)a			***
e. ti(ˈɾat) (ˈviː)a		*!	**

The tableau leaves out several candidates which, for example, could show resyllabification, as in [ti(ˈɾa) (ˈtviː)a], which are excluded independently already by constraints on syllable structure. Furthermore, the faithful realization of stress is simply assumed here, even though the example used here is one that displays exactly the environment for stress retraction when the verb-final vowel is omitted. I ignore this aspect of the analysis, simply assuming that optionally high-ranked *CLASH in concert with the rest of the grammar established in section 7.3 applies here, leaving foot structure intact apart from the foot head. The general vowel deletion pattern, unlike rapid-speech degemination, is not sensitive to foot structure, and the latter is sensitive to it in a way which is not relevant in the above example. We will come to the relevance of foot edges shortly.

Returning to the phrasal domain of the NONFINAL constraint, which I discussed above in syntactic terms, the alleged effect of the constraint could serve as evidence for the construction of phonological phrases which largely, but not exhaustively, overlap with syntactic phrases. The tableau in (68) indicates syllable breaks by full stops, as usual, foot structures determined on a word-by-word basis by round brackets, and syntactic phrase edges by angled brackets.

(68) Final vowel deletion and 'syntax-sensitive' NONFINAL

/scrivono un esame/[13]	NONFINAL	PARSE-σ
a. ⟨(skɾi.vo).no.⟨u.n⟨e.(zaː).me.⟩$_{NP}$⟩$_{DP}$⟩$_{VP}$		****!
b. ⟨(skɾi.vo).n⟨u.n⟨e.(zam).⟩$_{NP}$⟩$_{DP}$⟩$_{VP}$	*!	**
c. ⟨(skɾi.vo).no.⟨u.n⟨e.(zam).⟩$_{NP}$⟩$_{DP}$⟩$_{VP}$	*!	***
☞ d. ⟨(skɾi.vo).n⟨u.n⟨e.(zaː).me. ⟩$_{NP}$⟩$_{DP}$⟩$_{VP}$		***

In principle this first piece of the analysis partially explains cases of deletion other than infinitives and other cases of blocking than past participles. However, the analysis cannot account for the difference in application of deletion between infinitives and gerunds or other forms, i.e. in infinitives deletion always applies when the context is met, while in the other cases deletion may apply in rapid or colloquial speech but not always. The gerund, such as *essendo* 'being', only experiences deletion if followed by a vowel-initial item. The two consonants preceding the final vowel of the gerund make resyllabification indispensable, since otherwise the form would have a complex coda, which is generally unacceptable. The difference between past participle and gerund cannot be explained on these grounds, since the short /t/ preceding the final vowel in most past participles could easily syllabify as the onset of the following vowel-initial word. Here the difference between the two forms in syntactic behaviour is crucial. While the past participle can be used attributively, i.e. as an adjective, the gerund cannot. To use a present or imperfective or habitual form of a

[13] '(They) write an exam'. Higher-order syntactic structure, such as the level IP, to which an inflected verb must have moved, and any potential traces are left out for convenience.

verb as an adjective, a different form—the present participle—has to be derived, as in *barone rampante* > **barone rampando* 'rampant/climbing baron'. Thus, the gerund behaves more like the finite verb forms, while the past participle behaves like an adjective.

All these conditions do not, however, explain why prenominal adjectives as well as nouns following an adjective do not allow final deletion. And the differential behaviour of singular and plural specifiers, as well as the various inflectional endings in verbs, cannot be explained by the grammatical mechanisms discussed so far.

Specifiers are heads of functional projections (e.g. DPs), while all other forms that do not show regular deletion are heads of lexical projections (e.g. NP, AP).

In section 7.2 above it was motivated that the final vowel of nouns is part of the stem. All verbs and adjectives end in a vowel. The only verb forms that show obligatory deletion in non-final position end in an [e]. The only adjectives that show systematic deletion end in the same vowel (with very few exceptions, e.g. *bello* 'good, pretty'). We may conclude that the ban on word-final codas is enforced more rigorously in verbs (and adjectives), and that the final vowel of infinitives is actually an inserted vowel which is only present phrase-finally, to avoid violation of *CODA and/or NONFINAL.

As far as the differential behaviour among specifiers and object clitics is concerned, Vogel et al. note the role of markedness. The forms that block deletion carry more marked morphosyntactic information. Plural forms of functional elements cannot undergo deletion, while singular and especially singular masculine forms show regular deletion. As Vogel et al. observe, plural and feminine are the marked categories in comparison to singular and masculine. We find a similar systematic difference between verb forms. The more marked a verb form is the less it allows deletion. Indicative forms allow deletion more frequently than conditional or subjunctive, according to Vogel et al.

An account in Precompilation Theory as proposed by Nespor (1990) opens the door for large-scale arbitrary specifications of random phonological processes, since a lexical entry might contain all sorts of allomorphs and specify all sorts of unnatural contexts for these allomorphs to occur in. OT provides us with a simple and more restrictive alternative. Assuming that morphosyntactic features are privative, there can be lexically indexed IO-MAX constraints for the morphemes associated with the marked features of morphosyntactic oppositions, i.e. IO-$\text{MAX}_{\text{Plural}}$, but not IO-$\text{MAX}_{\text{Singular}}$, IO-$\text{MAX}_{\text{Feminine}}$, but not IO-$\text{MAX}_{\text{Masculine}}$, IO-$\text{MAX}_{\text{1st,2ndPerson}}$, but not IO-$\text{MAX}_{\text{3rdPerson}}$. For verbs we expect constraints like IO-$\text{MAX}_{\text{Perfect,Conditional,Conjunctive,Future...}}$, but not IO-$\text{MAX}_{\text{PresentTense}}$. Such constraints generally demand that morphosyntactic features are expressed by a phonological exponent in the positions where the syntax locates them. These outrank the constraints that cause deletion in the forms that carry an exponent of a less marked morphosyntactic feature or, if these do not exist because of the privative nature of these features, general faithfulness constraints, such as IO-MAX. The analysis is exemplified with the masculine and feminine singular and plural determiners preceding consonant- and vowel-initial nouns in (69).

(69) Differentiated deletion in determiners

	IO-MAX$_{Plural}$	*V.V	IO-MAX$_{Feminine}$	PARSE-σ	IO-MAX
a. uno ˈpaɾko				***!	
☞ b. un ˈpaɾko				**	*
☞ c. una ˈdonna				***	
d. un ˈdonna			*!	**	*
e. una oˈliːva		*!		***	
☞ f. unoˈliːva			*	**	*
☞ g. le oˈlive		*		***	
h. loˈlive	*!		*	**	*
i. ʎi oɾˈɾibili		*		***	
j. ʎoɾˈɾibili	*!			**	*

In the same vein, faithfulness differentiates between major lexical classes and between these and functional elements. It is reasonable to assume a Base-Output relationship here, i.e. between a form in isolation and its correspondent in a large syntactic structure. Thus, we get the BO-MAX constraint referring to lexical items of the nominal class (adjectives, past participles, and nouns), BO-MAX$_N$, generally outranking the same constraint referring to verbs, BO-MAX$_V$, since in verb forms deletion is more common. The latter is generally more important than faithfulness to functional elements (determiners, argument clitics), BO-MAX$_{Fnc}$.

(70) Italian meta-ranking of faithfulness for major lexical and functional classes

BO-MAX$_N$ $\gg$ BO-MAX$_V$ $\gg$ BO-MAX$_{Fnc}$

The non-application of deletion in determiners that are used as pronouns, as discussed in (58), suggests either that morphemes do not get their grammatical class feature only on a lexical basis but also according to their syntactic use or that this is a use of numerals which are of class N anyway and are therefore less susceptible to deletion. In the first option, the determiners used as (object) pronouns, as in *ne ho comprato <u>uno</u> arrancione* '(I) bought an orange one of these', constitute a full NP.

So far we have noted that at the word level NONFINAL determines the choice of base forms with a final unfooted syllable. At the phrasal level, these unfooted final syllables are particularly vulnerable to deletion in response to PARSE-σ. This influence of the latter constraint is countered by markedness restrictions on domain-marginal codas as well as by NONFINAL, which at this level demands unparsed final syllables as well. High-ranking faithfulness to nominals blocks domain-internal deletion at the right edge of nouns, adjectives, and past participles at the phrase level. Furthermore, faithfulness constraints referring to functional elements carrying particular marked morphosyntactic features block deletion in these forms. Another markedness constraint inducing deletion is *V.V, which prefers candidates without vocalic hiatus. We have seen that this constraint causes deletion in feminine determiners and other feminine clitics which is otherwise (i.e. before consonants) blocked.

A more specific version of this anti-hiatus constraint can be regarded as responsible in rapid-speech vowel degemination. The only additional vowels deleted in this process are those followed by another identical vowel. In normally paced speech this constraint (for convenience, *V ≑ V) has to rank at least on a par with, or lower than, the more general *V.V.[14]

As discussed in connection with example (65), vowel degemination is dependent on stress. If neither of the two involved vowels is stressed, deletion or merging applies; if the first vowel is stressed, degemination applies likewise; but if the second vowel is stressed, both vowels have to be realized. In previous discussions (especially 7.2 and 7.3) we have seen the effects of BO-ANCHORING constraints that map prosodic edges of base forms and prosodic edges of corresponding forms in larger domains. The asymmetric behaviour in vowel degemination suggests that it is less expensive with respect to prosodic anchoring to extend a foot to the right (which also improves the foot form with respect to FT=μμ) than to extend a foot to the left. In case of vowel suppression in an unstressed-stressed sequence, the preceding consonant ends up in the coda of the preceding syllable or as the onset of the following syllable. In the latter case it also has to be integrated into the stress foot of this stressed syllable. Thus, there is a mismatch in the anchoring of this foot.

(71) Vowel degemination and stress

	L-ANCHORFT	FT=μμ	*V ≑ V
☞ a. (ˈeɾa)no (ˈoɾ)ɾidi			*
b. (ˈeɾa)(ˈnoɾ)ɾidi	*!		
c. sa(ˈɾa) aɾɾi(ˈvaː)to		*!	*
☞ d. sa(ˈɾaɾ)ɾi(ˈvaː)to			

At first sight the analysis seems to suffer from a fatal inadequacy. If vowel degemination happens in violation of IO-MAX constraints, we would not expect violation of BO-ANCHOR-Ft constraints in contexts in which this improves aspects of foot and syllable structure, as discussed earlier. Thus, as hinted at in the introduction of these data, this is not a case of deletion, but rather the merging of two input segments into one at the surface, i.e. a violation of constraints against multiple faithfulness—*MC(Multiple Correspondence), in Lamontagne and Rice's (1995) terms—or violation of INTEGRITY in McCarthy and Prince's (1995; 1999) terminology. Thus, the crucial difference between average speech rate and rapid speech which causes this process to emerge is a demotion of the constraint INTEGRITY. The alternative analysis would postulate

[14] Though one might reasonably doubt whether such rapid-speech phenomena are a matter of phonology at all. They could equally well be explained as low-level phonetic co-articulation effects. Nevertheless, but especially since there is an observable influence of stress in this context, I will regard the pattern as phonological here, awaiting evidence to the contrary.

the promotion of the responsible markedness constraint, which, as just outlined, leads to undesirable side-effects.

I am aware that the above analysis is cursory at best, and is in dire need of further development to account for all the intricate peculiarities of vowel deletion in Italian. However, the goal of the current analysis was to integrate into one grammar phonological and syntactic factors contributing to the overall shape of the pattern. Particularly vulnerable points in previous analyses were, first, the modelling of the means of communication between syntax and phonology and, second, the definition of the edges of higher units of prosodic organization such as the phonological phrase and the intonational phrase on independent grounds. As we will see in the next section, the phonological phrase is a more elusive category than (for example) the next lower category, the prosodic word, in other aspects as well. As far as the first point is concerned, it is not at all clear how phonological processes should refer to a syntactic principle as the c-command. (For a more detailed discussion of the repercussions of Italian vowel deletion for the syntax-phonology interface, see the many contributions by Nespor and Vogel.) We have just seen, however, that neither this reference to the c-command nor the clear demarcation of phonological phrase edges is necessary or justifiable on the basis of the considered vowel-deletion data. Instead, the patterns can be explained through reference to phonological restrictions, markedness of morphosyntactic features (i.e. singular vs. plural, indicative vs. conjunctive, etc.), and reference to syntactic classes via features such as [±N] and [±V]. The latter non-phonological information is used in the definition of faithfulness constraints to specify the scope of reference for these.

7.5 PHRASAL STRESS AND FOCUS: PHONOLOGY AND SYNTAX IN INTERACTION

7.5.1 Overview

The basic observation about Italian prosodic prominence above the word level is that, across varieties, the assignment of stress seems to be stable, while the intonation patterns vary to a considerable degree. To put the latter observation in Rossi's (1998: 219f.) words, 'to describe the intonation of Italian appears an impossible task. Serious and exhaustive research in this domain would require an Atlas of regional intonations.' Such an enterprise is clearly beyond what can be achieved in this book, as Rossi considers it beyond his reach. D'Imperio (2002), also reviewing the findings on Italian intonation reported in the literature, gives an excellent summary of the few intonational patterns that can be regarded as 'Standard'. While D'Imperio's study examines Neapolitan intonation patterns, Avesani (1995) provides a study of the intonation of Tuscan professional speakers in the TOBI system. In this widely used approach to intonation (Pierrehumbert 1980; Beckman and Pierrehumbert 1986), intonational contours are decomposed into suprasegmental tonal features (essentially H and L, plus very few diacritics). Apart from the intricacies of which tones are associated where and in which order, tones are by and large associated with or aligned with positions which have phrasal stress. Phrasal stress, on the other hand, can only be assigned to units which have received word stress. An unstressed syllable therefore cannot be assigned phrasal stress. This statement oversimplifies matters slightly, since in a sentence such as *mangia i sogni* '(S/he) eats the dreams' one can place stress on the final syllable of *sogni*, which is usually unstressed, to emphasize the fact that s/he ate not just one dream—i.e. an affix can be brought into focus (or receive emphatic stress, cf. Nespor and Guasti 2002). This is, admittedly, an extraordinary case and quite unlikely to be exploited frequently by speakers. However, it indicates another aspect of phrasal organization, which is that the pragmatic role assignment of topic and focus to constituents overrides any default pattern.

To understand this connection between word stress and higher-level stress, we will look briefly at metrical grid theory and its connection with the nuclear stress rule (Halle and Vergnaud 1987).

In metrical grid theory, prosodic prominence is determined by the placement of asterisks on metrical grid lines. Ignoring weight-sensitivity for the sake of simplicity here, any syllabic peak receives a grid mark. According to the parameter settings of the language in question, additional grid marks are placed on the next higher line determining foot heads. The placement of a single mark for every lexical word on the next higher line determines word stress. In Halle and Vergnaud's theory, then, syntactic phrase boundaries bracketing two or more stressed words are interpreted as prosodic boundaries. This is in line with Nespor and Vogel's as well as Selkirk's algorithms, which set an upper limit of two (lexical) words on phonological phrases (and an optimum of two words).

Placement of an asterisk on the next line determines the next level of stress and so on. According to the Continuous Column Constraint (Prince 1983), grid marks can only be set on a line if there is a grid mark in the same column on the line immediately below the line on which a mark is to be set. This explains the general property of languages to place higher-level stress only on syllables that are stressed at the word level.

(72) Stress assignment in metrical grid theory

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                                                                        . . .
{                                                          x      }  line 5
{                         x  }  {                          x      }  line 4
            {             x  }                {            x      }  line 3
  x            x          x           x           x     x  x   x     line 2
  x            x          x           x           x     x  x   x     line 1
x x      x x   x x   x x  x x x x x    x    x  x    x x x x x    x   line 0
 Passiamo metà della vi ta a de r i d e r e ciò in cui altri credono
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'(We) spend half of our lives ridiculing what others believe in.'[15]

[15] *Passiamo metà della vita a deridere ciò in cui altri credono, l'altra metà a credere in ciò che altri deridono* ('We spend half of our lives ridiculing what others believe in, the other half in believing things others laugh about'): S. Benni, *Il bar sotto il mare* (Milan: Feltrinelli, 1987).

The location of stresses is thus connected to the syntactic structure, and the degree of syntactic recursion is infinite. Thus, recursion (or the number of distinct levels) in the prosodic hierarchy should also be infinite.

If we assume transitivity, i.e. that principles applying to lower-level constituents in the prosodic hierarchy also apply to higher levels of the hierarchy, we have to conclude that the Intonational Phrase is subject to a binarity requirement in parallel with the binarity requirement on phrases (two word stresses) and feet (two moras or syllables). If prosodic grouping is binary by nature, as syntactic branching is assumed to be (Kayne 1984), the prosodic hierarchy has to contain an infinite number of levels. The degree of syntactic embedding, then, ultimately determines the number of prosodic constituents stacked onto each other. A legitimate question arising in such a thought experiment is whether it still makes sense to distinguish between the various prosodic categories or rather to assume that there is one type of recursive grouping relation.

In the final section of this chapter I will concentrate on the assignment of phrasal prominence (or stress), and the question of how far this is determined by phonology or syntax. As Cinque (1993) remarks, taking Chomsky and Halle's (1968) *Sound Pattern of English* (*SPE*) as his point of departure, the Nuclear Stress Rule proposed in *SPE* invites the conclusion that phrasal stress is subject to the same kind of parameters that can be set on a language-particular basis to determine the placement of word stress.

Looking at the prosodic hierarchy, one can develop a similar argument. If the Intonational Phrase and the Phonological Phrase are higher-order constituents of the same hierarchy as the Prosodic Word and the foot, they have to be subject to essentially parallel constraints (as indicated with respect to the binarity requirement in the preceding paragraph). The existence of phrasal prominence indicates that phrases are characterized by an internal head-dependent relationship, like the Prosodic Word and the foot. Starting at the level of the foot, this domain is in most parts of the literature seen as subject to a parameter that locates the head of the foot (realized as prominence in one phonetic form or the other) on either the left or the right edge of the foot (resulting in trochees or iambs, respectively). Similarly, languages show variation with respect to the location of main stress (and secondary stress) at (or very near to) the left or right edge of the word. Thus, if these categories (the foot and the word) are part of the same hierarchy as the higher categories that organize words into larger units, the same kind of parametric options should be observable at all levels. Cinque (1993), however, argues that this is not the case. Phrasal stress is determined exclusively on the basis of syntactic structure. In a nutshell, phrasal stress is assigned to the most deeply embedded syntactic constituent. Given the prominence-attracting nature of focus, such a claim can only be made if we accept that there is such a thing as a neutral, or 'out of the blue', context in which no constituent receives focus through the conversational context. Cinque's proposal predicts that right-branching languages (such as Italian) all have phrase stress right-aligned, while left-branching languages display left-aligned phrase stress.

The determining role of syntax, though, is not entirely undisputed. While Donati and Nespor (2002) argue that intonational properties are used by infants to set syntactic parameters, and hence that the syntax of focus must be deterministic for prominence location, work based on Selkirk (1995; 2000), most prominently by Truckenbrodt (2006; 2007), holds that prosodic phrasing is subject at least to some extent to the relative importance of a set of syntax-prosody alignment constraints, as does Samek-Lodovici (2005) in his analysis of Italian phrase stress and focus.

The exact location of Phonological Phrase boundaries within the Intonational Phrase and intonation phrase boundaries within utterances cannot be determined by looking at prominence location, but rather by examination of where certain phonological processes apply or fail to do so, which was the main research programme of Nespor and Vogel. However, here we are concerned with the rhythmic organization of larger units with respect to prominence. Truckenbrodt (2006) proposes that each syntactic XP has to contain phrasal stress, and that the last XP receives stress in the Intonational Phrase. Focused constituents behave in the Intonational Phrase in a manner somewhat parallel to that of heavy syllables within the word in quantity-sensitive languages: they attract stress.

One could also view the issue of phrasal stress placement from the opposite perspective. If a language has flexible word order, the location of the focused constituent could be determined by prosodic factors rather than the syntax, i.e. syntactic movement is triggered by phonology rather than by the need to check syntactic features.

In the following sections I will begin by recapitulating the arguments relating to phrasal stress placement and phonological phrasing. To the degree that focus and stress interact, I will discuss focus as well. In this discussion I will keep a relatively undifferentiated conception of focus. For a more in-depth approach to the topic of focus, the reader should consult the respective literature (Frascarelli 2000; Samek-Lodovici 2005 and references cited there). Section 7.5.2 reviews the diagnostics for the detection of phrase edges. Section 7.5.3 discusses the location of default stress beyond the word level, and section 7.5.4 discusses the interaction of syntactic and phonological constraints in the expression of focus.

7.5.2 Phonological and syntactic phrasing

Despite the usual claim in the literature that syntactic phrase edges are translated into phonological phrase edges (to start with Chomsky and Halle 1968), syntactic and phonological phrases are not always entirely co-extensive (e.g. Nespor and Vogel 1986; Inkelas and Zec 1990; Selkirk 1995). In the section below we will look at the placement of stress within 'sentences' (or, say, CPs). Such strings are usually regarded as chunked into several sub-strings. To say something about the syntax-phonology mapping of phrases, we have to be able to detect the edges of Phonological Phrases and Intonational Phrases. These edges can be detected through various sandhi phenomena. We can observe processes which apply across words within phrases but not across words across phrase junctures. Thus, if a process applies when the given context is provided, this indicates the absence of a phrase boundary; if the same process is blocked in an otherwise appropriate environment, we can assume a phrase boundary. As discussed in 7.3, one such diagnostics, raddoppiamento sintattico, turned out to be problematic in this respect. For this reason I will only look at two other criteria of Nespor and Vogel (1986) to detect phrase edges: stress shift and final lengthening.

After brief discussions of stress shift in other contexts in this book (most importantly in section 7.3), I assume the reader to be already familiar with the basics of the process. In the example in (73) we see that the stress shifts from the final syllable of the noun *città* when it is followed by an adjective with stress on the first syllable, as in (73a), but no stress shift is observable in the example in (73b), in which the noun is also followed by a word starting in a stressed syllable. In both examples the context to trigger stress retraction is given. In section 7.3 we saw that stress retraction is a strategy to avoid stress clashes. In (73b), the clash is not repaired. The standard analysis of this under-application is that in (73a) the noun and the adjective are in the same Phonological Phrase, which is the domain of stress clash avoidance by stress retraction, and in (73b) the adjective and its modifier *molto* form a Phonological Phrase of their own. This leaves the noun in its own Phonological Phrase. Thus, there is no stress clash within one phrase. Whether we observe a mismatch of syntactic and Phonological Phrases here depends on the syntactic analysis we subscribe to.

(73) Stress retraction and phrasing

a. {le città nordiche}$_\phi$ non mi piaciono ‘I do not like the northern cities’
b. {le città}$_\phi$ {molto nordiche}$_\phi$ non mi piaciono ‘. . . the very northern cities’

Selkirk (1986; 1995) developed a theory of syntax-prosody alignment which explains cross-linguistic differences in phrasing that are not isomorphous with syntactic phrase structure as the effect of Alignment constraints which align edges of XPs (lexical projections, but not functional projections) with edges of Phonological Phrases.

(74) Phrasal Alignment

a. ALIGN-XP,R: ALIGN(XP, R; ϕ-phrase, R)
‘The right edge of each syntactic XP is aligned with the right edge of a ϕ-phrase.’
b. ALIGN-XP,L: ALIGN(XP, L; ϕ-phrase, L)
‘The left edge of each syntactic XP is aligned with the left edge of a ϕ-phrase.’

This is complemented by Truckenbrodt’s (1999; 2007) WRAP-XP, which prefers structures that have every lexical XP parsed in a Phonological Phrase.

(75) WRAP-XP

‘For each XP there must be a ϕ-phrase that contains the XP.’

Combined with a requirement on Phonological Phrases to be maximally binary (Nespor and Vogel 1986), formulated as a rankable and violable OT constraint in (76a), this set of constraints explains the application of stress retraction and its blocking in the examples in (73a) and (73b) respectively. We will come to phrase minimality (76b) shortly.

(76) Phrase Binarity

a. ϕ-Bin-Max: 'A phonological phrase contains maximally two main word stresses.'
b. ϕ-Bin-Min: 'A phonological phrase contains minimally two main word stresses.'

Truckenbrodt's (2007) analysis relies on a syntactic analysis assumed by Nespor and Vogel (1986) which has an NP-internal AP, as indicated by the angled brackets in the first candidate in (77).

(77) Phrasing according to Truckenbrodt (2007: 453)

	Align-XP,R	ϕ-Bin-Max	Wrap-XP
a. {⟨le città ⟨molto nordiche⟩$_{AP}$⟩$_{NP}$}$_{\phi}$		*!	
☞ b. {le città}$_{\phi}$ {molto nordiche}$_{\phi}$			*NP
c. {le città molto}$_{\phi}$ {nordiche}$_{\phi}$			*NP, *AP!

Below, in section 7.5.3, we will subscribe to a syntactic analysis that has the AP dominating the NP and assumes phrasal movement, following a proposal by Cinque. The different syntactic analysis does not pose a problem to the constraints-based syntax-prosody interface analysis. Rather, it gives us a further ranking argument for a refined grammar, which is different from Truckenbrodt's proposal. Under this analysis, Align-R demands a phonological phrase edge to the right of the noun in both forms, the one with the simple and the one with the modified adjective. ϕ-Bin-Max does not decide between the two candidates in (78a), since none of them exceeds the maximum of two words in a phonological phrase. This case provides the argument to rank Align-XP below Wrap-XP. The sequence with the modified adjective provides evidence for a high ranking of ϕ-Bin-Max. In tableaux (78) and (79), syntactic phrase boundaries are indicated by angled brackets and phonological phrase edges are indicated by curly brackets. I have indicated syntactic edges only in the first candidate, since they are the same in all candidates. Tableau (78) suggests that Wrap-XP has to outrank Align-XP,R. With ϕ-Bin-Max ranking on top, we generate the right result with the modified adjective (79) as well.

(78) Extensive phrasing

	ϕ-Bin-Max	Wrap-XP	Align-XP,R
☞ a. {⟨le ⟨⟨città⟩$_{NP}$ nordiche⟩$_{AP}$⟩$_{DP}$}$_{\phi}$			*
b. {le città}$_{\phi}$ {nordiche}$_{\phi}$		*AP!	

(79) Restructuring

	ϕ-BIN-MAX	WRAP-XP	ALIGN-XP,R
a. {⟨le ⟨⟨città⟩$_{NP}$ molto nordiche⟩$_{AP}$⟩$_{DP}$}$_\phi$	*!		*NP
☞ b. {le città}$_\phi$ {molto nordiche}$_\phi$		*AP	
c. {le città molto}$_\phi$ {nordiche}$_\phi$		*AP	*!NP

The other Italian diagnostic for phonological phrasing discussed by Nespor and Vogel (1986) is phrase-final lengthening. According to Nespor and Vogel, we find lengthening at the right edge of phonological phrases as they are indicated in (80). Hence, *pasticini* is lengthened in (80b), but not in (80a).[16] (80a′) and (80b′) indicate the syntactic phrasing assumed by Nespor and Vogel.

(80) Prosody-syntax non-isomorphism

a. Ho mangiato {dei pasticini ripieni}$_\phi$.
a′. Ho mangiato ⟨dei pasticini ripieni⟩$_{NP}$.
'(I) ate some filled doughnuts.'
b. Ho mangiato {dei pasticini}$_\phi$ {ripieni}$_\phi$ {di cioccolata}$_\phi$.
b′. Ho mangiato ⟨dei pasticini ⟨ripieni di cioccolata⟩$_{AP}$⟩$_{NP}$.
'(I) ate some doughnuts filled with chocolate.'

The grammar provided on the basis of stress retraction results in the same phrasing for the example in (80a) as for that in (73a), as shown in (81). The grammar operates on the syntactic structures introduced above, i.e. the NP is nested in the AP.

(81) Phrasing and lengthening

	ϕ-BIN-MAX	WRAP-XP	ALIGN-XP,R
☞ a. {⟨⟨pasticini⟩$_{NP}$ ripieni⟩$_{AP}$}$_\phi$			*
b. {pasticini}$_\phi$ {ripieni}$_\phi$		*AP!	

In the evaluation of the construction (80b), with a PP complement to the adjective, which is the case where syntax and phonology do not match, the grammar is not deterministic, considering only the three constraints used so far, as tableau (82) shows. These constraints leave candidates (b–d) as potential winners. The constraints at the bottom of the hierarchy are decisive this time. If ALIGN-XP,L is ranked higher than the binarity constraint that puts a lower limit of two words on each phonological phrase, candidate (e) wins. If the ranking is reversed, candidate (c) is chosen as optimal.

[16] In an ad hoc elicitation task, my informants did not show lengthening in any of the non-final words in (80b). In the absence of better knowledge I regard this as inter-speaker variation and discuss Nespor and Vogel's data in what follows. However, this indicates that more detailed fieldwork is desirable, and any theoretical claims made here be regarded as tentative.

(82) Syntax-phonology mismatch increased

	ϕ-Bin-Max	Wrap-XP	Align-XP,R	Align-XP,L	ϕ-Bin-Min
a. {⟨⟨pasticini⟩$_{NP}$ ripieni ⟨di ⟨cioccolata⟩$_{NP}$⟩$_{PP}$⟩$_{AP}$}$_{\phi}$	*!		*	*	
b. {pasticini ripieni}$_{\phi}$ {di cioccolata}$_{\phi}$		*AP	*!	*	*
c. {pasticini}$_{\phi}$ {ripieni di cioccolata}$_{\phi}$		*AP		*!	*
d. {pasticini}$_{\phi}$ {ripieni}$_{\phi}$ {di cioccolata}$_{\phi}$		*AP		*!	***
☞ e. {pasticini}$_{\phi}$ {ripieni di}$_{\phi}$ {cioccolata}$_{\phi}$		*AP			***

The winning candidate is not exactly the structure given by Nespor and Vogel, since the preposition *di* is parsed in a phonological phrase with the preceding adjective rather than with its closest syntactic affiliate, its nominal complement. There was no empirical evidence for Nespor and Vogel to assume this parsing. And here we also have only theory-internal reasons to assume this. It remains for further research to show whether such a non-isomorphic parsing is justified for Italian.

Candidate (82b) intuitively seems more appropriate for a construction in which the PP modifies the NP or the whole AP rather than the adjective, as in *case rosse di legno* 'red houses (made) of wood'. (Compare this with *case rosse di ruggine* 'houses red with rust', which corresponds syntactically to the structure *pasticini ripieni di cioccolata*.) Thus, we do not have to regard this candidate as completely ungrammatical in Italian. The most likely interpretation ('filled doughnuts made of chocolate') is just not available in the example discussed in connection with (82), which is probably attributable to speakers' knowledge of doughnuts rather than to grammatical restrictions. Thus, conceptual knowledge of doughnuts renders improbable a syntactic analysis of the PP as an adjunct to the DP. However, for DPs for which this analysis is available, the grammar yields the right result: the noun and the adjective (e.g. *case rosse*) are subordinate to the same AP, which has to be wrapped in a ϕ-phrase, and the PP remains on its own since the two constituents (AP and PP) are only dominated by another functional projection, the DP, rather than a lexical one.

(83) Candidate (b)

	ϕ-Bin-Max	Wrap-XP	Align-XP,R	Align-XP,L	ϕ-Bin-Min
a. {⟨⟨case⟩$_{NP}$ rosse⟩$_{AP}$ ⟨di ⟨legno⟩$_{NP}$⟩$_{PP}$}$_{\phi}$	*!		*	*	
☞ b. {case rosse}$_{\phi}$ {di legno}$_{\phi}$			*	*	*
c. {case}$_{\phi}$ {rosse di legno}$_{\phi}$		*AP!		*	*
d. {case}$_{\phi}$ {rosse}$_{\phi}$ {di legno}$_{\phi}$		*AP!		*	***
e. {case}$_{\phi}$ {rosse di}$_{\phi}$ {legno}$_{\phi}$		*AP!			***

In this section we have seen that phonological phrasing can be detected in Italian via the application or non-application of stress shift and phrase-final lengthening. These phonological processes are essential for syntactic boot-strapping, i.e. the detection and interpretation of syntactic structure.

7.5.3 Phrasal stress

To approach the placement of stress in phrases, we start with a discussion of Cinque's (1993) proposal that phrasal stress is assigned to the most deeply embedded syntactic constituent.

Italian compounds are mostly verbs followed by a noun, with the noun being the syntactic object of the verb; they thus look like basic VPs, as can be inferred from comparison of (84a) and (84c). (84b) serves to show that the compounds are based on the root of the verb plus an object NP, rather than an inflected form (3rd singular present indicative, for example). Stress placement is parallel in both structures, compounds and VPs. In a compound, main stress (indicated by double underlining) is placed on the rightmost word stress (indicated by single underlining), while in a basic phrase or sentence the main stress is placed on the rightmost constituent.

(84) Compounds and VPs[17]

a. il mangiasogni 'the dream eater'
   il portabagagli 'the luggage rack'
b. l'apriscatole 'the can opener'
c. Mangia i sogni 'S/he eats dreams.'
   Porta i bagagli 'S/he carries luggage.'

That stress is placed on the rightmost constituent rather than, say, the object NP (if present) can be seen when object NPs are modified, as in (85b), or when the whole VP is modified, as in (85c). In both cases the phrase stress is at the right edge.

(85) Phrasal stress shift

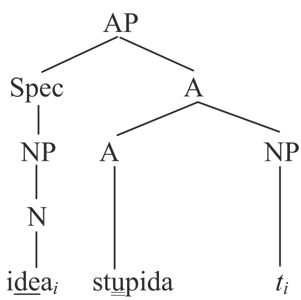
a. ⟨Mangiamo ⟨la cena⟩$_{NP}$⟩$_{VP}$. '(We) eat the dinner.'
b. ⟨Mangiamo ⟨la cena ⟨di natale⟩$_{PP}$⟩$_{NP}$⟩$_{VP}$. '(We) eat the Christmas dinner.'
c. ⟨Mangiamo ⟨la cena⟩$_{NP}$⟨in città⟩$_{PP}$⟩$_{VP}$. '(We) eat the dinner in town.'

[17] Noun-noun and noun-adjective compounds, e.g. *capostazione* 'stationmaster' or *cassaforte* 'safe', are possible as well, but the productivity of this pattern is extremely restricted in Romance languages. Note that in such constructions, the verb-noun and noun-noun compounds alike, the Italian (and generally Romance) compounds have the head to the left and stress on the right while English (and generally Germanic) compounds have the head on the right and stress on the left, i.e. not rightmost (cf. *capostazione* vs. *stationmaster*). In Cinque's analysis (see below), the English compound has the modifier (*station*) more deeply embedded than the head, i.e. [[*station*]$_{NP}$ *master*]$_{NP}$, which derives stress on the left. The syntactic structure for the Italian compounds then has to be the reverse [*capo* [*stazione*]$_{NP}$]$_{NP}$. The verb-noun compounds can be analysed analogically. However, in compounds such as *capolavoro* 'masterpiece', *fortunadrago* 'fortune dragon' (a character in Michael Ende's novel *The never-ending story*/*La storia infinita*), the head is apparently the rightmost member of the construction. Still, stress is rightmost, i.e. [[*capo*]$_{NP}$ *lavoro*]$_{NP}$. This might turn out to be problematic for the syntactic approach to phrase and compound stress in Italian.

Sentences such as (85c) are potential counterexamples to Cinque's proposal, since the final PP could be analysed as a sister node to VP, the latter containing V and the object NP. In this analysis the object NP would be more deeply embedded than the PP. According to Cinque, however, an analysis that has the PP more deeply embedded in the VP than the object NP is superior for syntactic reasons.[18]

Italian adjectival phrases seem to contradict Cinque's proposal as well. In Italian, as in Romance languages generally, the most common position for an adjective is post-nominal, as in (86). The common analysis is to regard the AP as dominating the NP and, as Cinque (2003; 2004) argues, movement inside the DP is phrasal movement. Essentially, movement affects not just the terminal element but the whole phrase. Thus, to get the noun into the right surface position within an AP the whole NP is moved, for example to the Spec position of the AP, as indicated in (86). If this analysis is correct, the most deeply embedded constituent is the noun rather than the adjective. Nevertheless, the adjective has phrasal stress.

(86) NP movement within AP and phrasal stress



'idea' + 'stupid' = 'stupid idea'

This mismatch between syntactic embedding and phrasal stress could be explained, and Cinque's (1993) analysis rescued, by considering the focus properties of such constructions.

The correlation between focus and phrasal stress in Italian is demonstrated by Cinque with the example of intransitive verbs which do not allow the subject to precede the verb if the subject receives focus. Otherwise, the order subject-verb is grammatical, as shown in (87). We will come back to the influence of focus and stress on word order in 7.5.4 below.

(87) Focus, stress, and movement

What's new?	Truman è morto.	'Truman died.'
	È morto Truman.	
Who died?	È morto Truman.	'**Truman** died.'
	*Truman è morto.	

[18] Cinque discusses adverbial phrases rather than PP adjuncts. The argument remains the same.

To save Cinque's proposal, one could assume that in an AP with the adjective following the noun, the adjective has contrastive focus, while in the adjective-noun order the noun has focus. Thus, one could conclude that focus determines some instances of movement, in that the constituent which is in topic position is raised to bring the focused constituent into a position where it can be stressed. However, this is not always the case. If an adjective is further modified by a degree adverbial, such as *molto* 'very', the modifier can be focused and accordingly stressed. Nonetheless, the adjective cannot be raised beyond the modifier to bring the latter into rightmost position in the phonological phrase, as in *notte molto buia* > **notte buia molto*. Thus, the limits of syntax enforce the violation of phonological constraints here—if we can regard the placement of phrasal stress as a phonological matter. That right-edge alignment of phrasal stress is not syntactically determined has been shown by Truckenbrodt (1995) with data from German. Even more challenging for a purely syntactic approach to phrasal stress are the Bengali stress patterns (Hayes and Lahiri 1991; Samek-Lodovici 2005). As we will see below in the discussion of the interaction of focus with stress alignment and syntax, stress in larger syntactic structures, in particular right dislocation constructions, cannot be analysed in a purely syntactic fashion either (Samek-Lodovici 2005).

Taking all these considerations together, I think the conclusion is justified that phrasal stress assignment at the right edge in Italian is due to phonological restrictions rather than syntactic embedding.

Since focus can determine word order to some extent, it seems reasonable to include focus as a feature in the syntax and accordingly postulate a functional projection, such as FocP (see Frascarelli 2000). On the other hand, focus is often not expressed via syntactic location but is rather indicated by stress (see Donati and Nespor 2003; Samek-Lodovici 2005 for an insightful discussion of the correlation between flexibility of word order and the realization of focus). Since almost any constituent can be in focus, a FocP has to be located relatively high in the tree. On the other hand, if a focused constituent is brought into final position such that it can be stressed with stress in the default position at the same time, this rather suggests that there is a topic projection, TopP, which attracts everything that is not in focus. Another difficulty for linguistic theory related to focus and phrasal stress is the interaction of syntax and phonology in this area. If focus is a syntactic feature, phonology has to have access to syntactic information (beyond information about the syntactic category of lexical items and syntactic phrase boundaries), just as it has access to information such as the position of lexical stress in morphemes. If the phonological restrictions that phrasal stress has to be rightmost and that focused constituents have to be stressed have an impact on word order, syntax has to provide more than one representation to Spell-out such that the phonology can determine which one is chosen; and hence syntax and phonology cannot be strictly separated.

With these remarks I turn to the discussion of stress placement beyond the level of the word, and to the issue of focus. In the next section I will provide Samek-Lodovici's (2005) analysis of the impact of stress and focus on word order.

7.5.4 Phrasal stress, focus, and syntactic movement

The interactive shaping of surface syntactic and prosodic structures in Italian is analysed by Samek-Lodovici (2005) in Optimality Theory. OT has the advantage over strictly modular theories that constraints of different components of grammar can be regarded as ranked within one hierarchy. Thus, the question of which module has access to what kind of information from which other module is answered in an elegant way. The Evaluator chooses an optimal surface representation among a set of representations provided by the Generator, containing both the syntactic and the phonological structure. Syntactic and phonological constraints can interact directly to choose the optimal candidate.

Samek-Lodovici regards rightmost stress and the fronting of non-focused material as responses to phonological constraints that outrank syntactic constraints. However, as he observes (and others before him, e.g. Frascarelli 2000), there must be some syntactic constraints in Italian which block movement in some constructions such that stress cannot always be realized on the rightmost potential stress bearer. Thus, it cannot be said that one module (e.g. phonology) strictly speaking has priority over the other (e.g. syntax).

As sketched already earlier, focused constituents are usually located at the right edge of the stress domain. This holds largely regardless of the syntactic status of a constituent as subject, object, or indirect object, as shown in (88) (examples are taken from Samek-Lodovici 2005). The rendition in (88a) is ungrammatical as an answer to the second question, while the rendition in (88b) is ungrammatical as an answer to the first question. (88c) shows a direct and an indirect object in focus.

(88) Rightmost focus

a. What happened? Gianni ha vinto la corsa. 'Gianni won the race.'
b. Who won the race? Ha vinto la corsa Gianni. 'Gianni won the race.'
c. Ho piantato in giardino un melo. 'I planted an apple-tree in the garden.'
Sono andato con Mario a Roma. 'I went to Rome with Mario.'

Topicalized constituents can end up to the right of a focused constituent under right dislocation, as shown in (89a). In these cases there is a marked intonational break and a pause preceding the dislocated constituent, indicating that the prosodic structure (e.g. the Intonational Phrase) still has the focused constituent at the right edge. Furthermore, the dislocated constituent has to be doubled, with a co-indexed pronominal clitic present in the preceding structure (*lo* in 18a). A further construction in which the focused element is not in rightmost position is quantifier phrases with focus on the quantifier, as shown in (89b). Positioning of the quantifier at the right edge is ungrammatical, and moving the stress to the right on to the quantified noun is not an option as an answer to the question indicated in (89b).

(89) Rightward but not rightmost focus

a. Who drank the wine?
Lo ha bevuto Gianni, il vino. 'Gianni drank the wine.'

b. How many cherries did you give to Maria?
Ho dato a Maria tre ciliegie. ‘I have given three cherries to Maria.’
*Ho dato a Maria ciliegie tre.
*Ho dato a Maria tre ciliegie.
Ne ho dato a Maria tre, di ciliegie.

In Samek-Lodovici’s analysis, rightmost stress is enforced by right-edge alignment constraints that demand stress on the rightmost stressable element at the phonological phrase level (HEAD-P), the level of the Intonational Phrase (HEAD-I), and the Utterance (HEAD-U). A further constraint is violated if the focused constituent is not stressed (SF). Any movement of non-focused constituents to the left (e.g. moving the VP beyond the subject NP, as in *ha vinto la corsa Gianni*) to bring the focused constituent to the right edge to satisfy all the phonological constraints violates the syntactic constraints against movement, Stay (‘No traces’) and the EPP (‘Clauses have subjects’). The latter two are widely assumed in the literature on OT syntax (for references see Samek-Lodovici 2005). To illustrate the working of this grammar I reproduce Samek-Lodovici’s analysis of the example *Gianni ha riso* ‘John has laughed’ with sentence-wide focus vs. *ha riso Gianni* ‘John has laughed’ with focus on the subject. The second sentence violates both the syntactic constraints, since the movement of the VP beyond the subject NP leaves traces (violating Stay) and the resulting clause above the NP no longer has a subject (which violates the EPP). Thus, in the case of sentence-wide focus the subject-final construction is suboptimal compared to the one represented by candidate (a), with the subject preceding the verb.

(90) Sentence-wide focus (adapted from Samek-Lodovici)

		SF	Head-I	Head-P	EPP	Stay
☞ a.	{ x $\}_{IPh}$ {x {x $\}_{PPh}$ ⟨S aux ⟨ V ⟨ t t ⟩⟩ $\rangle_f$ G. ha riso					**
b.	{ x $\}_{IPh}$ {x x $\}_{PPh}$ ⟨ aux ⟨ V ⟨ S t ⟩⟩ $\rangle_f$ ha riso G.				*!	*

In case of subject focus, high-ranking SF picks a candidate with stress on the subject. The Right Alignment constraints exclude all structures that have the stressed subject preceding the VP, because in these representations stress is not domain-final at the Intonational Phrase level (nor at the Utterance level). Hence, the winning candidate (91c) is the one that violates the syntactic constraints to satisfy the phonological constraints.

(91) Subject focus (adapted from Samek-Lodovici)

		SF	HEAD-I	HEAD-P	EPP	STAY
a.	{ x }IPh {x} { x }PPh ⟨Sf aux ⟨ V ⟨ t t ⟩⟩ ⟩ G. ha riso	*!				**
b.	{x }IPh {x} {x }PPh ⟨Sf aux ⟨ V ⟨ t t ⟩⟩ ⟩ G. ha riso		*!			**
☞c.	{ x }IPh {x x }PPh ⟨ aux ⟨ V ⟨ Sf t ⟩⟩ ⟩ ha riso G.				*	*

So far, all the syntactic constraints we have looked at are dominated by phonological constraints. However, as indicated in the example with a noun preceded by a numeral in (89), as well as in the degree modifiers to adjectives (e.g. *molto* 'very') earlier on, while NPs can be positioned to the right, quantifiers cannot be placed at the right edge when in focus. Thus, some syntactic requirements outrank right alignment of stress. Samek-Lodovici attributes the ungrammaticality of sentences that have an NP moved out of a quantifier phrase to the lack of government of these NPs. Thus, syntactic government is more important than right-edge alignment in Italian.

I leave out the details of the analysis here. The description of focus constructions in Italian given here is also by no means exhaustive. I have deliberately left out some non-trivial cases here, such as left-edge focus (which is possible only under left dislocation and can still be seen as right-edge stress placement at the level of the Intonational Phrase), to concentrate on the most important properties of the interaction of stress placement, focus, and syntactic parsing. An important point to be noted is that, in Samek-Lodovici's theory, individual syntactic constraints can be ranked with respect to individual phonological constraints. As Samek-Lodovici points out, the constraints referring to the two different kinds of linguistic structure are not ordered in blocks. On the other hand, most of the constraints discussed here refer exclusively to syntactic representation or to phonological representation, respectively, with the exception of WRAP-XP, the Alignment constraints that map XP edges to prosodic phrase edges and STRESS-XP. Samek-Lodovici concludes that such an analysis supports a modular view of syntax and prosody. However, a strictly modular view should not allow direct interaction of restrictions on different kinds of representation. The mere observation that syntactic representations are chosen according to how well they comply with phonological restrictions shows that a strictly modular view, in which a representation generated in the syntactic component is handed over to the phonology to prepare it for

Spell-out, is too restrictive. An alternative to save this kind of modularity lies in the assumption that in Italian, as well as other languages which do not have completely fixed word order, the syntax generates several representations which are passed on to the phonology and on the basis of which prosodified output candidates are chosen, while in languages in which focus does not cause topic movement, such as English, only one syntactic representation, with a fixed serialization of most morphemes, is available.

7.6 CONCLUSIONS ON PROSODIC PHONOLOGY

The purpose of this chapter has been to provide an overview of the prosodic processes that have featured in the literature on Italian, and to discuss the major theoretical arguments that have been developed on the basis of these.

A central theoretical construct in the discussion has been and still is the Prosodic Hierarchy. In Chapter 6, the category Prosodic Word already faced some headwind, in that the interaction of penultimate vowel lengthening and cliticization could be better understood without reference to this category. The first pattern to be discussed in Chapter 7, intervocalic *s*-voicing, received an analysis which works without any reference to the prosodic word, despite the prominent role this pattern played originally in the motivation of this category. The next pattern we looked at, raddoppiamento sintattico, turned out to apply whenever there is no pause between the two structures involved, i.e. potentially within the Intonational Phrase, rather than in a smaller domain, as originally argued by Nespor and Vogel. The phonological phrase turned out to be significantly different in its behaviour from the categories lower in the hierarchy, since these are subject to language-specific parametrization, which is not the case for the prosodic phrasing at the level either of the Phonological Phrase or of the Intonational Phrase.[19] On the other hand, the preferred placement of phrasal stress at the right edge results, in Italian, in movement of topicalized constituents to make room for focused constituents at the right edge. These interactions at the phonology-syntax interface actually lead to significant questions on the nature of the interaction between these modules of grammar and the architecture of grammar as a whole. However, such discussions have to be kept to one side in a book whose attention is centred on the phonology of Italian.

When it comes to stress retraction and phrase-final lengthening, the evidence is still in favour of a theory that assumes the phonological phrase as a domain in the hierarchy, rather than recursion of prosodic categories. The investigation of vowel deletion showed, among other things, that coda conditions are enforced more rigidly beyond words than word-internally.

[19] In a sense, this statement is probably too strong, since there is some evidence for left-edge alignment of phrasal stress as well (though not in Italian). While binarity plays a role in shaping the size of phrases, other factors that play a role in word stress systems, such as quantity sensitivity or the dichotomy between iambs and trochees, do not seem to be relevant at the phrasal levels of analysis.

The patterns most widely discussed in the literature are definitely intervocalic *s*-voicing and raddoppiamento sintattico. Accordingly, these patterns have received most attention in the present chapter. Many analyses of coda conditions or stress placement usually also provide an account of syntactic consonant doubling. The analysis provided here showed that, in line with some earlier approaches but in disagreement with the most recent analyses, syntactic doubling is connected to the well-formedness condition on feet that enforces bimoraicity of trochaic feet in Italian (and might be taken as responsible for the maximal syllable size restriction as well), rather than the Stress-to-Weight Principle. One of the advantages of the analysis presented here is that it fits in with the wider picture the language provides. A similar cross-fertilization of analyses was detected in the analysis of intervocalic *s*-voicing and vowel deletion. The same force that had been seen at work in the shaping of a different pattern of word-internal contrast and syllable structure, as opposed to the word/morpheme-marginal position, Contiguity, was also highly relevant in the analysis of intervocalic *s*-voicing and vowel deletion.

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