Lenition in Tuscan Italian (Gorgia Toscana)

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Abstract

Tuscan Italian features a lenition process known as *gorgia toscana,* which effects the spirantisation of stop consonants in weak positions. *Gorgia* spans word boundaries and is active in many different registers.

The focus of this chapter is on the description any analysis of the phonetic output of this process in Florentine and Pisan Italian. Outputs are variable and may not always be predicted (especially for the velar voiceless plosive /k/). Another finding is that *gorgia toscana* is sensitive to the place of articulation: velar stops are much more prone to lenition than dentals and labials.

A detailed phonetic analysis isolates the basic cues of lenition, among which most prominently feature the quality and the duration of VOT. On the basis of their acoustic structure, a new class of segments, semifricatives, are identified; they are shown to be weaker than the corresponding stops. This leads to a reinterpretation of the role of VOT, which cannot serve as a diagnostic for consonantal strength alone. We argue that the burst also needs to be recognised as a basic indicator of strength in the case of plosives.

Finally, the variability of outputs not withstanding, a formal interpretation of *gorgia toscana* is proposed that takes advantage of the tools of Government Phonology in general, and of CVCV in particular.

1.   Introduction

This chapter describes and analyzes the lenition of plosives which occurs in Tuscan Italian. The process is commonly known as *gorgia toscana* (literally 'Tuscan throat') and basically effects a spirantization.

After a short introduction to Italian phonology (§ 2) and to the more general phenomenon of lenition that occurs in many other Italian varieties (§ 3), we will present a fine-grained analysis of *gorgia toscana* based on a wide corpus of data; our focus will be on the varieties of Tuscan Italian spoken in the cities of Florence and Pisa.

We will show that, for *gorgia* to apply, a basic syllabic constraint has to be met: a stop is a target for Tuscan lenition only if it is preceded by a vowel (§ 4.2); that is, after a heterosyllabic consonant or a pause, lenition is blocked. On the other hand, an input stop undergoes lenition when it is either followed by a vowel, by a glide or by a liquid. The occurrence of *gorgia* in branching

Onsets deserves a particular mention: stops engaged in *muta cum liquida* clusters behave exactly like their simplex intervocalic peers. The evidence provided thus feeds the dossier of lenition in branching Onsets, which has not received much attention in the past and for which the literature does not offer cross-linguistic generalizations.

The relation between lenition promotion/inhibition and morpho-syntactic margins will be dealt with, showing how *gorgia* applies spanning word and phrase boundaries (§ 4.2).

Even though there is an important literature on the topic (among many others, see Castellani 1960, Contini 1960, Izzo 1972, Giannelli & Savoia 1978, 1979-80, Marotta 1995a), acoustic analyses of Tuscan lenition are recent and still rare (see Marotta 2001-02, Sorianello 2001-02, Villafaña 2006). Section 4.3 presents original data which show a large variability in the phonetic output: fricatives are found besides stops and approximants; in Pisan, segment deletion is also possible for the input /k/ (§ 5).

The spirantization of palatal affricates which occurs in Tuscan as well as in other central varieties of Italian is also discussed. The context of application of this process is basically the same as for *gorgia* (§ 7). Therefore, we argue that the deaffrication process is a special case of the general weakening drift that characterizes Tuscan Italian.

On the grounds of the acoustic analysis, we then propose an intermediate class between plosives and fricatives (§ 8). This prompts a fresh view on articulatory and perceptual aspects of lenition processes (§ 9).

In the final section of the article, we will sketch a phonological analysis of *gorgia* within *Government Phonology* (§ 10), with special reference to its recent development in *Lateral Theory* (§§ 11,12).

2. Background: Italian Phonology

With respect to Latin, Italian is probably one of the most conservative languages within the Romance domain. This observation seems to be true especially at the phonetic level and for the vernacular varieties spoken in the Southern part of the Italian peninsula.[1] Basically, the varieties of Italian are divided into three classes, corresponding to the major geographic areas of Italy, i.e. North, Centre and South.

Standard Italian (henceforth SI) is based on the Tuscan dialect; more precisely, on Florentine as spoken in the late 13th/14th centuries. It is well known

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[1] The basic reference is still the classical monograph written by Rohlfs (1949). Pellegrini (1977) is also useful for a general picture of Italian dialects. For a more recent survey, see Maiden & Parry (1997).

that the Florentine dialect acquired its prestige because the first masterpieces of Italian literature were written by Florentine authors, in particular Dante and Boccaccio (see Lepschy & Lepschy 1977).

Although the phoneme inventory of SI is more or less what is found in Florence, many phenomena that are typical for Tuscan are absent from SI. For instance, the following phonological processes belong to the competence of Tuscan speakers without being shared by SI (see Marotta 1995a, 2000; Giannelli 2000).

- so-called *gorgia toscana*, see the detail below in §§ 4ff.
- deletion of postvocalic vowels in word-final position; e.g. Tsc *la mi' bimba* 'my child' (fem.), SI *la mia bambina*; Tsc *la tu' sorella* 'your sister' (sing.), SI *la tua sorella*; Tsc *le tu' sorelle* 'your sisters' (plur.), SI *le tue sorelle*; Tsc *de' dolci* 'some sweet things', SI *dei dolci;* Tsc *mangia' tanto* '(I) ate a lot', SI *mangiai tanto*.
- spirantization of palatal affricates in intervocalic position; e.g. SI *amici* 'friends' [aˈmiːt͡ʃi], Tsc [aˈmiːʃi], SI *bicicletta* 'bike' [ˌbit͡ʃiˈkletːa], Tsc [ˌbiʃiˈxletːa] (see § 7).
- affrication of /s/ after alveolar sonorants; e.g. SI *salsa* 'sauce', Tsc [ˈsal͡tsa], SI *borsa* 'bag', Tsc [ˈbor͡tsa], SI *pensiero* 'thought' Tsc [penˈt͡sjɛːro].
- truncation of infinitive verbal forms; e.g. SI *mangiàre* 'to eat', Tsc [manˈd͡ʒa], *vedére* 'to see', Tsc [veˈðe], SI *sentìre* 'to hear', Tsc [senˈti].[2]

Consonant gemination is certainly one of the most relevant phonological features that Italian has preserved in the evolution from Latin: the contrast between *C* and *C:* is not only distinctive for almost all consonants of the phonemic inventory (Bertinetto & Loporcaro 2005), but it also bears a very high functional load. However, it should be noticed that Northern dialects lack long consonants, to the effect that Northern speakers of Italian may show a less consistent and systematic quantity correlation.

Gemination is also involved in the sandhi process called *Rafforzamento* (or *Raddoppiamento*) *Fonosintattico*, a strengthening that is observed after certain function words and after words with a final tonic vowel; e.g. *io e* [lː]*ui* 'me and him', *da* [mː]*ilano* 'from Milan', *un caffè* [fː]*orte* 'a strong coffee', *mangiò* [tː]*utto* '(he) ate everything'. The process was historically triggered by

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[2]   The three latter phenomena are shared by many regional varieties of the Centre-South of Italy; see Rohlfs (1949), Maiden & Parry (1997).

the assimilation at word boundaries between an etymologically final consonant and a following initial consonant (see Loporcaro 1997). Central and Southern dialects as well as their respective varieties of Italian share the process, although the lexical distribution can vary from place to place; the phenomenon is not found in the North, where – as was already mentioned – gemination is not contrastive.

In SI as well as in Tuscan, there are three places of articulation for plosives: bilabial /p b/, dental /t d/, and velar /k g/. The consonantal system of Italian appears to be rather unmarked, apart from the feature of gemination, a set of long affricates ($\widehat{ts}$: $\widehat{dz}$: $\widehat{tʃ}$: $\widehat{dʒ}$: /) and palatals (/ʃ: ɲ: ʎ:/),[3] which historically evolved from Vulgar Latin clusters (e.g. Italian *vigna* 'vineyard' < **vinja*, *paglia* 'straw' <**palja*).

3. Italian Lenition

In Italian, voiceless (/p t k/) and voiced (/b d g/) plosives occur only in Onset position: they may be found word-initially, after sonorants, in intervocalic position and as geminates. In the latter case, the first timing slot of the segment is associated with a Coda position and takes all content features from the following Onset.

Intervocalic voiceless plosives in Italian varieties deserve special attention. Roughly, they appear as voiced in Northern dialects, lenited or spirantized in the Centre, while they tend to be stable in the South. However, in some Southern dialects, for instance in Campania, Calabria and Sicily, lenition may occur as well (Rohlfs 1949, § 209, Loporcaro 1988: 105ff., Marotta & Sorianello 1992: 80ff., Giannelli & Cravens 1997; Nocchi & Schmid in press). In regional pronunciations of Italian, lenited outputs for stops in intervocalic position may also be produced, but this phenomenon varies according to the register adopted by the speaker.

Following the mainstream literature on lenition/fortition, we may consider Central and Southern lenition on the one hand and Northern voicing on the other as two facets of the same drift towards weakening: all processes involve opening of the stricture in the release phase of a stop with a decrease of articulatory energy.

Before moving on, it is useful to explain our use of the word 'lenition': according to the spirit of the book, this term is a *passe-partout* that describes a weakening process. However, lenition may refer to different processes within

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[3]   Again, in the North of Italy these consonants cannot be considered as long, due to the lack of contrastive quantity.

the Italian tradition (see also Szigetvári, this volume a): one effects some opening and produces fricatives, affricates or approximants (Lass 1984: 178); the other provokes a partial voicing of stops, as for example in many varieties of the Centre and the South such as the variety of Italian that is spoken in Rome (cf. Bernhard 1998, Marotta 2006). We refer to the former process when talking about *gorgia*, but to the latter when considering other varieties of Italian.

That is, lenited segments in the Italian varieties at hand are produced with a lesser degree of tension in the vocal folds and a parallel loss of muscular tension; as a consequence, pressure (both hypolaryngeal and oral) and segment duration decrease.[4] From the acoustic point of view, lenited stops in the Centre-South of Italy have a particular structure in spectrograms: a slight voicing activity is visible at low frequency; the amplitude is less than that of the voice bar typical for plain voiced stops; VOT is not always present and the friction noise spans over a reduced frequency band; normally, no burst occurs; if present, it has very little energy (cf. Marotta 2006). Another acoustic feature is duration: lenited segments are longer than the corresponding voiced stops, but shorter than unlenited voiceless stops (Marotta 2006; Nocchi & Schmid in press).

While voicing usually disappears when the standard language is pronounced by Northern speakers, lenition and spirantization tend to persist in central and Southern varieties of Italian. For instance, given the strong trend towards spirantization, for Tuscans it is very difficult to produce a stop in intervocalic position, even in formal and slow speech (see below); the same holds for Romans, who are inclined to normally pronounce intervocalic voiceless stops as lenited segments.

4. *Gorgia Toscana*
4.1. How it works, what it affects and where (in Tuscany) it occurs

Gorgia toscana is a regular weakening process that occurs in Tuscan varieties of Italian and roughly effects a spirantization of stops (Giannelli & Savoia 1978, 1979-80, Giannelli 1997, Marotta 2001-02). Although its targets are primarily stops, *gorgia* is pervasive within the whole consonant system in Tuscany. That is, non-stops are also affected: fricatives and sonorants tend to become approximants; liquids can be deleted; nasals may nasalize the preceding vowel and drop. The present chapter focuses on the lenition of stop seg-

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[4]   The traditional feature *fortis~lenis* could be used in order to interpret this special type of Italian lenition; see Kohler (1984), Jessen (1998).

ments. Also, it is important to understand that *gorgia* is a synchronically active process.

Tuscany is variably affected by *gorgia* (see Giannelli 2000). As a matter of fact (see Figure 1), *gorgia* is absent from the very North-West (Massa, Carrara, the Northern part of the Lucca district): the dialects of this area fall outside of Tuscan. Therefore, voiceless stops in intervocalic position weaken *via* voicing, not *via* spirantization (Rohlfs 1949, Giannelli 2000: 114ff., 129ff.). In the remaining North-Western areas of the region (districts of Lucca, Pisa and Livorno) as well as in the South (Grosseto), *gorgia* is present, but restricted to /k/, /t/ and /d/. In the Central area, roughly corresponding to Florence, Siena, Prato, Pistoia and their surroundings, the process is very active: all stops (both voiceless and voiced) undergo spirantization by default. Finally, in the Eastern area of Tuscany (district of Arezzo), *gorgia* occurs only with /k/ and conflicts with another kind of consonantal weakening, i.e. a lenition process consisting of an articulatory laxing commonly shared with other varieties of the Centre and South of Italy (Giannelli & Savoia 1978, 1979-80, see also §3).
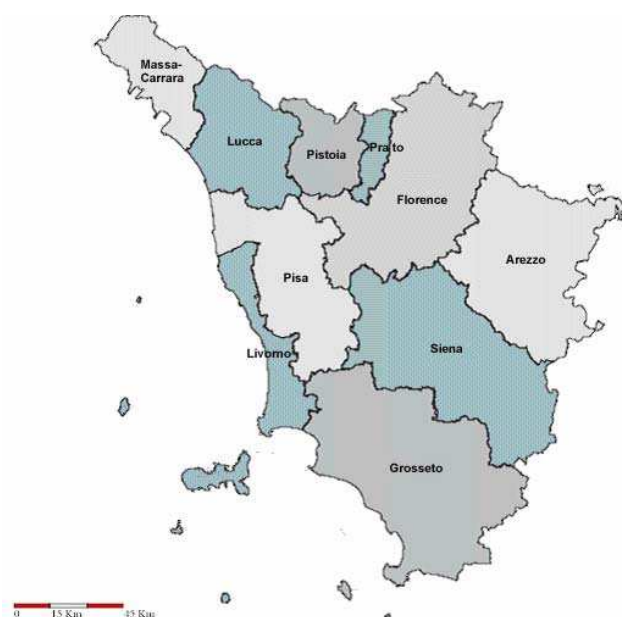

Figure 1. Map of Tuscany, with indication of the ten regional districts

Thus it appears that the distribution of *gorgia* shows a very common pattern of diffusion of phonological processes, focused on the contrast between the centre and the periphery: Florence is the centre of diffusion of the weakening process, whereas Pisa is in a peripheral area; therefore, the process is more

advanced in Florence than in Pisa, where it still shows intermediate outputs that Florentine speakers cannot recover (see below).

In this chapter, we concentrate on the Florentine and the Pisan varieties, which respectively represent the central and the Western areas.

Although it is possible that *gorgia* existed when Dante wrote (late 13th - early 14th century), no historical testimony of the process exists until the middle of the 16th century, when the Sienese grammarian Claudio Tolomei published his work *Polito* where the 'aspiration' of /k/ and /g/ is mentioned.[5] Hence there is evidence that velar consonants were the first segments to undergo lenition. The spirantization then spread to stops with a different point of articulation. Taking into consideration the present distribution of *gorgia* within the region, it is reasonable to assume that spirantization was born in Florence, which is and has been for a long time its capital; subsequently, it reached the close cities and quite soon became a typical feature of Tuscan pronunciation.

At present in Italy, the aspiration of /k/ is considered the prototypical feature of the Tuscan (and especially of the Florentine) way of speaking. Within the region, no negative judgement accompanies spirantization (cf. Cravens 2000: 13ff., Villafaña 2006: 240ff.). Quite on the opposite, *gorgia* confers a covert prestige. Because of the special relationship between Tuscan and Standard Italian, Tuscan speakers appear to be finely conscious of their dialectal features; nevertheless, they are more aware of /k/ lenition than of the one concerning other stops. In fact, Tuscan people refer to *gorgia* in terms of "*aspirazione della c*" (with reference to the orthographic representation of /k/), thus confirming that they are only aware of the process for the velar point of articulation. It appears that the spirantization of stops, and particularly of /k/, is consistently associated with being Tuscan; *gorgia* thus has some social significance in the sense that it is a carrier of local identity.

4.2. Triggering and blocking contexts

We have seen that the primary target of *gorgia* are stops. *Gorgia* occurs in intervocalic position, or more precisely in postvocalic position (see below): stops followed by a glide or a liquid (the only consonants allowed in the second position of complex Onsets) also undergo the weakening process.

Gorgia spans word and phrase boundaries: its regular scope is the utterance or the intonational phrase included between pauses or prosodic breaks; no

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[5] Further historical details regarding *gorgia* may be found in the exhaustive work by Izzo (1972).

syntactic boundary, however strong, may block the process (*contra* Nespor & Vogel 1982).

Below we provide some examples of the process in Florentine, in word internal contexts under (1), across word boundaries under (2).

(1) *gorgia* inside words
     a. intervocalic position

SI-Tus	SI	Tuscan	spelling	gloss
p-ɸ	aˈpɛrto	aˈɸɛrto	aperto	open
b-β	aˈbeːte	aˈβeːθe	abete	fir
t-θ	ˈlaːto	ˈlaːθo	lato	side
d-ð	ˈpjɛːdɛ	ˈpjɛːðɛ	piede	foot
k-x,h[6]	ˈbruːko	ˈbruːxo, ˈbruːho	bruco	caterpillar, worm
g-ɣ	ˈlaːgo	ˈlaːɣo	lago	lake

     b. in a branching Onset

SI-Tus	SI	Tuscan	spelling	gloss
pr-ɸr	ˈkaːpra	ˈkaːɸra	capra	goat
br-βr	riˈbretːso	riˈβretːso	ribrezzo	disgust
tr-θr	ˈliːtro	ˈliːθro	litro	liter
dr-ðr	ˈlaːdro	ˈlaːðro	ladro	thief
kr-xr	aˈkroːbata	aˈxroːβaθa	acrobata	acrobat
gr-ɣr	ˈmaːgro	maːɣro	magro	thin

(2) *gorgia* across word boundaries
     a. intervocalic position

SI-Tus	SI	Tuscan	spelling	gloss
p-ɸ	la ˈpaːga	la ˈɸaːɣa	la paga	the salary
b-β	la ˈbimba	la ˈβimba	la bimba	the girl (fem.)
t-θ	la ˈtɛsta	la ˈθɛsta	la testa	the head
	ˌmandʒo ˈtutːo	ˌmandʒo ˈθutːo	mangio tutto	(I) eat everything
d-ð	la ˈdotʃːa	la ˈðotʃːa	la doccia	the shower
	il ˌbimbo ˈdɔrme	il ˌbimbo ˈðɔrme	il bimbo dorme	the child is sleeping
k-x,h	la ˈkɔːsa	la ˈhɔːsa	la cosa	the thing
	ˌbevo kaˈfːɛ	ˌbevo ɦaˈfːɛ	bevo caffè	(I) drink coffee
g-ɣ	la ˈgamba	la ˈɣamba	la gamba	the leg

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[6] The outputs for /k/ are variable; this issue is further discussed below.

b. in a branching Onset

SI-Tus	SI	Tuscan	spelling	gloss
pr-ɸr	la ˈswɔːra preːga	la ˈswɔːra ɸrɛːɣa	la suora prega	the Sister prays
br-βr	lo ˈbruːtʃi	lo ˈβruːʃi	lo bruci	(you) burn it
tr-θr	lo ˈtrɔːvi	lo ˈθrɔːvi	lo trovi	(you) find it
dr-ðr	la ˈdrɔːga	la ˈðrɔːga	la droga	the drug
kr-xr	la ˈkrɛːma	la ˈxrɛːma	la crema	the cream
gr-ɣr	la ˈgrɔtːa	la ˈɣrɔtːa	la grotta	the cave

In Standard Italian as well as in Tuscan, a stop may only be followed by a vowel, a liquid or a glide. Since all these segments do not block *gorgia*, the process appears to be constrained only by the left side of the string; therefore, the triggering context of *gorgia* may simply be defined as postvocalic (cf. Marotta 1995a).

The process is thus blocked if the stop is either geminated, preceded by another consonant or stands in absolute initial position, i.e. after a pause. Some illustration is provided under (3) below.

(3)   *gorgia* blocked

a. in gemination

SI-Tus	SI	Tuscan	spelling	gloss
pp	ˈtapːo	ˈtapːo	tappo	cork
bb	aˈbːratːʃo	aˈbːratːʃo	abbraccio	embrace
tt	ˈgatːo	ˈgatːo	gatto	cat
dd	ˈfredːo	ˈfredːo	freddo	cold
kk	ˈsakːo	ˈsakːo	sacco	sack
gg	ˌagːanˈtʃaːre	ˌagːanˈtʃaːre	agganciare	to hook

b. after consonants

SI-Tus	SI	Tuscan	spelling	gloss
Cp	ˈkampo	ˈkampo	campo	field
Cb	ˈɛrba	ˈɛrba	erba	grass
Ct	ˈpɔrta	ˈpɔrta	porta	door
Cd	anˈdaːre	anˈdaːre	andare	to go
Ck	ˈarko	ˈarko	arco	arch
Cg	ˈlargo	ˈlargo	largo	large

c. in initial position (beginning of an utterance or after a pause)

SI-Tus	SI	Tuscan	spelling	gloss
## __	ˈprendilo	ˈprendilo	Prendilo!	take it !
	ˌprɛndo la ˈborsa	ˌprɛndo la ˈβorsa	Prendo la borsa	(I) take the bag
	ti ˈaːmo	ti ˈaːmo	Ti amo	(I) love you
	ˈkariko	ˈkariho	Carico l'orologio	(I) wind up the
	ˌloroˈlodʒo	ˌloroˈloʒo		watch
	dorˌmiːto	dorˌmiːθo	Dormito bene?	did you sleep
	bɛːne	βɛːne		well?

Since *gorgia* is not sensitive to word or phrase boundaries, it appears that in Tuscan the well-known conservative influence of the initial position is restricted to the utterance-initial context: morphological and syntactic boundaries are invisible for *gorgia*.

One might wonder whether in the phonological competence of Tuscan speakers the fricatives [ɸ β θ ð x ɣ] could be considered as phonemes, i.e. as lexically stored elements, or rather as the result of a weakening process, i.e. a derivation. The evidence in favour of the latter interpretation is two-fold. First, there is no contrast between stops and their spirantized counterparts, i.e., say, between [k] and [x]. Second, both word-internally and word-initially, the two classes of segments are in truly complementary distribution along the lines shown under (1)-(3).

In a non-linear framework, the representation of *gorgia* in terms of syllable structure easily allows us to express the core of the process: only stops associated to an Onset position which follows a Nucleus may undergo the weakening process.

Hence *gorgia* instantiates the typical division between weak and strong positions: intervocalic and Coda consonants are weak, while their post-consonantal and initial peers are strong.[7] In more modern terms, we could say that *gorgia* is compatible with the *Coda Mirror* effect as proposed by Ségeral & Scheer (2001, this volume a, b). This general principle states that consonants are strong in #_V and VC._V, while they are weak in V_#, V_.CV and V_V. The only thing that needs to be added is that in Tuscan, "initial" means utterance-initial, rather than word-initial (see Ségéral & Scheer this volume a on this issue).

However, due notice is to be taken of the fact that stops are absent from the record in V_# and V_.CV both in Tuscan and the standard language. Hence these positions may not be tested. In word-final position, no stops are allowed;

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[7]   There is a large literature on the relative strength of the different positions; in the traditional Romance domain, the fundamental reference remains Weinrich (1958).

only a few sonorant-final function words are licensed in Italian. Examples are the negation *non* 'not', the articles *il* 'the', *un* 'a', the prepositions *in* 'in', *con* 'with', *per* 'to'. Obstruents do not occur at all, except in loanwords: e.g., *gas, nord, sud, stop, fax, ticket*, etc.

However, Tuscan is more restrictive than the standard language in this area: it does not permit any final consonant even in full (loan)words. That is, the above quoted words come out as *gasse, norde, sudde, stoppe, faxe, tickette* in Tuscan, especially in low registers of the language. Two phonological processes apply: vowel epenthesis after word-final consonants and lengthening of the originally word-final consonant.

The second process may be interpreted as a way to preserve the original syllable structure: the final consonant remains associated to a Coda. Good evidence to this end comes from loanwords that end in a final cluster such as *nord, fax*. No lengthening, only vowel epenthesis occurs in these cases. Moreover, in informal speech, a form like *fax* may be produced as ['fasːe], instead of ['faks] or ['fakse], where the long sibilant is the output of an assimilation of the original stop in Coda to the following fricative (see Bafile 2003).

Finally, no stops are admitted in word-internal Codas (*V_.CV*) either in Italian or in Tuscan. Indeed, Vulgar Latin stops in this position have been assimilated to the following consonant: e.g. Vulg. Lat. *septem, factum, noctem* > SI and Tsc *sette* 'seven', *fatto* 'fact', *notte* 'night' (cf. Rohlfs 1949; Lausberg 1969: § 427 ff.).

4.3. Output variability

For both voiced and voiceless input stops, different outputs are possible according to the Tuscan sub-area considered. Please recall that the present chapter refers to the two Tuscan varieties of Florence and Pisa.[8]

Let us first look at voiced stops, for which three basic outputs may be identified: fricatives, approximants and plosives.[9] Some examples for unlenited

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[8] The data discussed belong to a wide corpus of Tuscan Italian, composed of spontaneous and read speech; the material is taken from the data archives collected thanks to the Italian National Grants *AVIP*, *API*, *IPAR*. For further details, we refer the reader to the articles by Marotta (2001-02) and Sorianello (2001-02), where an exhaustive phonetic analysis of Tuscan spirantization is presented. Also, a systematic acoustic analysis of Florentine stops has recently been presented by Villafaña (2006).

[9] On the grounds of the experimental analysis, the number of surface variants could be increased; for instance, Sorianello (2001-02) and Villafaña (2006) propose up to seven allophone categories. However, given the minimal difference between some of these al-

stops (which occur especially in Pisa) are *ciabatta* [tʃaˈbatːa] 'slipper', *incubo* [ˈiŋkubo] 'nightmare', *adesso* [aˈdɛsːo] 'now', *pagare* [paˈgaːre] 'to pay'.

Weak outputs may appear indistinctly with approximant or fricative realisations for the same word; for instance, *sabato* 'saturday' occurs as [ˈsaːβaθo] and [ˈsaːβ̞aθo], *nido* 'nest' as [ˈniːðo] and [ˈniːð̞o], *mago* 'wizard' as [ˈmɑːɣo] and [ˈmɑːɣ̞o], *magro* 'thin' as [ˈmɑːɣro] and [ˈmɑːɣ̞ro].

The percentage of preservation of the original voiced stop is particularly high for /b/ within this class, whereas /d/ is the phoneme that is most often spirantized and actually quite often deleted, thereby following the well-known 'syndrome of the coronals' (cf. Kenstowicz 1994). The deletion of /d/ seems to occur especially in the case of function words, for instance in the prepositions *di* and *da* (cf. Marotta 2001-02: 52ff.).

Let us now have a look at voiceless stops. The first observation is that plosives as an output are less frequent than for voiced inputs. Tuscan thus is quite unlike other Romance languages in this respect: in Spanish for instance, voiced, but not voiceless stops, are systematically spirantized in intervocalic position.

The next thing to be noticed are some relevant differences between Florentine and Pisan. While in the latter variety output stops occur, they are almost absent in the former.

For voiceless phonemes, fricatives are the default output in Florentine; approximants are very frequent, too. Moreover, the output segments are often voiced. For instance, both [θ] and [ð] are attested for /t/ (see Sorianello 2001-02): *abito* [ˈaːβiθo] 'suit, dress', *dito* [ˈdiːðo] 'finger', *musica* [ˈmuːsiɦa] 'music'.

In our corpus of reference (see footnote 8), plosive voiceless outputs are only attested for /p/ in Florentine, thus confirming the higher resistance of the labial point of articulation. Fricatives and approximants cover the great majority of the reflexes of /k/; in particular, /k/ produces most frequently the voiced glottal fricative (see Sorianello 2001-02).

A special aspect of Florentine *gorgia* concerns the occurrence of glottal fricatives, both voiceless and voiced, as a possible output of voiceless dental inputs; for instance, phrases like SI *voi parlate* 'you speak', *mangiavate* '(you) were used to eat', *veduto* 'seen', *mangiato* 'eaten', can be pronounced [vu pːarˈlaːhe], [vu pːarˈlaːɦe], [ˌmandʒaˈvahe], [ˌmandʒaˈvaɦe], [veˈðuːho], [veˈðuːɦo], [manˈdʒaːho], [manˈdʒaːɦo], respectively. The process is morpho-

lophones, we prefer to reduce the number of categories. Acoustic representations are of course a *continuum*, but it is also true that the human perception is categorial.

logically constrained since it appears to be restricted to verbal morphemes of the II plural form and the past participle (see Giannelli & Savoia 1991; Bafile 1997).

In Pisan Italian, besides plosives and fricatives we found a special class of segments which shares some features with plosives, others with fricatives. Indeed, these segments contain two distinct periods: first one with very low amplitude (if any) in the spectrum, corresponding to the articulatory closure, and a second with diffused noise, associated with a long phase of *Voice Onset Time*. Usually no burst occurs between the two periods. We therefore consider these segments as affricates, or better as semifricatives.[10] Their phonetic transcription could consequently be [p^ϕ], [t^θ], [k^x]. Some examples taken from the Pisan corpus are *andato* [anˈdaːt$^\theta$o] 'gone', *tuta* [ˈtuːt$^\theta$a] 'overall', *poco* [ˈpɔːk^{x}o] 'little', *Napoli* [naːˈp$^\phi$oli] 'Naples'.

Semifricative outputs for stop phonemes may be considered a *nova facies* of consonant lenition, a special feature of *parlar toscano*, i.e. 'to speak Tuscan'. In our opinion, the production of semifricative segments coherently enters into the general drift of consonant weakening which is typical of the Tuscan varieties of Italian. More precisely, we could say that these Pisan semifricatives, or affricates, are the reflex of a primitive stage of the lenition process, which was lost in Florentine (see below, §§ 8,9). It is indeed characteristic for wave-type phenomena that the more peripheral areas (here, Pisa) conserve older stages longer than central areas (Florence, see Figure 1).

Finally, in Pisan the number of outputs is particularly high in the case of /k/: the plosive [k] is still present (e.g. *poco* 'little' [ˈpɔːko], *la carta* 'the paper' [la ˈkarta], the semifricative is well attested (e.g. *Luca* 'Luke' [ˈluːk^{x}a], *baco* 'worm' [ˈbaːk^{x}o]), the fricative [x] is very frequent (e.g. *nevicato* 'snowed' [ˌneviˈxaːθo], *dico* '(I) say' [ˈdiːxo]), the fricative [ç] is also attested when /k/ is followed by a high front vowel or glide (e.g. *pochi* 'a few' [ˈpɔːçi], *Machiavelli* 'Machiavel' [ˌmaçjaˈvɛlːi], *la chiave* 'the key' [la ˈçjaːve], *mi chiese* '(he) asked to me' [mi ˈçjɛːze]) and the deletion of the consonant is possible as well (e.g. *dico* '(I) say' [ˈdiːo], *poca* 'little' [ˈpɔːa], *amico* 'friend' [aˈmiːo], *comico* 'comic' [ˈkɔːmio], [ˈkomjo]).

The presence of output stops in Pisan Italian indicates that the weakening process is not as categorical as in Florence, where plosives in intervocalic position are systematically banned. Florence coherently appears to be the

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[10]   In her study on lenition in Spanish and English, Lavoie (2001) proposes to interpret as affricates some weak segments that come quite close to our category of semifricatives. This special class of sounds and its acoustic parameters are discussed in greater detail by Marotta (2001-02).

leader of the phenomenon, whereas Pisa can be considered as a double-faced reality: it is a peripheral point in the spreading of the lenition, but at the same time constitutes an area of original development, for instance regarding /k/ deletion (see the following section).

5.   Deletion of /k/ in Pisan Italian

The deletion of /k/ is a special feature of Pisan when compared with other Tuscan varieties.[11] For instance, words like *amì*/k/*o* 'friend', *formì*/k/*a* 'ant', *di*/k/*o* '(I) say' as well as *pò*/k/*a* 'little' (fem.), *brù*/k/*o* 'caterpillar', *ba*/k/*àto* 'worm-eaten, rotten' may become *amìo, formìa, dìo, pòa, brùo, baàto*, respectively. In these cases, a hiatus is produced, i.e. a phonetic structure with a high degree of markedness.

The special status of /k/ within the general weakening process is thus confirmed by the fact that it is the only segment which can be deleted; in particular, the corresponding voiced segment cannot drop: since /g/ rarely undergoes spirantization in Pisan, the next (and last) step of the weakening process, i.e. deletion, cannot take place. In the case of Tuscan *gorgia*, voiceless segments again are confirmed to be more attacked by lenition than their voiced peers.

The velar voiceless stop is the primary target of *gorgia* both in quantitative[12] and in qualitative terms. Hence the deletion of this consonant appears to be nothing but the final step of the weakening drift.

The loss of /k/ is particularly frequent in informal speech, when the speech rate is high and the register used by the speaker low. The process seems to be more probable in function words following a word-final vowel (e.g. *che* 'what', *còsa* 'thing', *col* 'with the', *cóme* 'like', adv.), but is also attested for nouns and verbs; for instance *càsa* "home", *amìca* "friend" (fem.), *cantàre* "to sing", *còsta* "(it) costs".

When the /k/ is preceded by an unstressed [i], however, a hiatus may be avoided since the vowel in question becomes a glide after /k/ deletion and forms with the following vowel a rising diphthong. For example, SI *medico* [ˈmɛːdiko] 'doctor', *plastica* [ˈplastika] 'plastic', *particolare* [ˌpartikoˈlɑːre] 'particular', *specifico* [speˈtʃiːfiko] 'specific' are realized as [ˈmɛːðjo], [ˈplastja], [ˌpartjoˈlɑːre], [speˈʃiːfjo] in Pisan.

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[11]   Pisa shares this feature with the close city of Livorno as well as with the countryside around it. However, /k/ deletion is also attested for some central areas of Tuscany; see Sorianello (2001-02).

[12]   Weak variants show the highest percentage of occurrence for /k/ when compared to the other voiceless stops; see Marotta (2001-02), Sorianello (2001-02), Villafaña (2006).

These Pisan outputs are grounded on a phonetic path which starts with the stop – which still is the underlying form for Tuscan speakers – and ends with a new syllable structure, *via* spirantization and segment deletion. Therefore, the three basic steps under (4) may be recognized.

(4)   phonetic path of /k/ deletion
        a.   spirantization of /k/; e.g. [ˈplastika] 'plastic'> [ˈplastixa]
        b.   deletion of /k/: [ˈplastixa] > [ˈplastia]
        c.   weakening of /i/ into glide: [ˈplastia] > [ˈplastja]

The phonetic path, synchronically observed, shows a *crescendo* of weakening and segmental reduction, culminating in the loss of a syllable.

However, if the velar stop belongs to a complex Onset and is followed by a liquid, /k/ deletion normally does not occur; for instance, [ˈlaːkrima] 'tear' may be pronounced as [ˈlaːxrima], [ˈlaːɸrima], [ˈlaːhrima], but never as [ˈlaːrima]; the same holds true for words like *acre* 'acrid', *micro* 'micro', *bicicletta* 'bike', which cannot appear as **are, *miro, *biciletta*. In an analogous manner, sequences like *la crema* 'the cream', *la cravatta* 'the tie', *la crisi* 'the crisis', *ti credo* 'I believe you', *la clava* 'the club', *la classe* 'the class', *la clinica* 'the clinic' all show the weakening of /k/ into [x], but never segment deletion.

Still different is the behaviour of clusters composed of /k/ and a *glide*. In this context, /k/ deletion is frequent: /kj/ and /kw/ can be simply reduced to [j] and [w], respectively, although the phenomenon is more frequent for the labiovelar sequence. For instance, *liquore* 'liqueur' may be pronounced [liˈxwɔːre] or [liˈwɔːre], phrases like *la quarta* 'the fourth' (fem.), *la chiave* 'the key' may appear as [la ˈxwarta] or [la ˈwarta], [la ˈçjaːve] or [la ˈjaːve], respectively.

In Pisan as well as in Livorno Italian, especially in informal speech and in words like *questo* 'this', *quello* 'that', or *quando* 'when' when these are preceded by a vowel-final word (e.g. *di questo, dopo quello*), the deletion of intervocalic /k/ produces the strengthening of the remaining glide [w] into a labio-dental fricative [v]. The words mentioned thus come out as [ˈvesto], [ˈvelːo], [ˈvando] (for further details see Nocchi 2003).

6.   **Place of articulation and stress**

In both Tuscan varieties considered, the features of voice and place of articulation play a role in the phonological process of *gorgia*. We have already seen

that voiceless phonemes appear to be more prone to *gorgia* than their voiced counterparts.

A place of articulation effect can also be observed: *gorgia* does not apply to all targets with the same strength. In detail, *ceteris paribus*, velar segments undergo lenition more easily than dentals and labials; labial segments resist *gorgia* more than dentals and velars.[13]

This asymmetrical behaviour within the same natural class of stops may have different reasons. First of all, it can quite easily be interpreted in articulatory terms: in the case of a velar plosive, the greater oral pressure associated with this place of articulation combines with the reduced constriction of the tongue body that is observed for the velar gesture: both factors coherently conspire in a stronger trend towards consonant lenition (Villafaña 2006: 205ff.).

These production constraints are flanked and may also be reinforced by perceptual constraints: as Villafaña (2006) correctly observes, there are no back fricatives in the Italian phoneme inventory (i.e. velar, uvular or glottal) which could be confused with the lenited outputs of /k g/. Although lenition of a stop normally represents some kind of loss of phonetic information, weak [+back] outputs (fricatives, semifricatives or approximants) from /k/ and /g/ for which the stop closure gesture is not recoverable anymore still provide cues that refer to the original place of articulation. These different back segments ([x k^x h ɦ]) can be perceived by Tuscan or even Italian speakers without any interference with other similar sounds.

The same does not hold for the other two points of articulation, i.e. labial and dental: the spirantization of /p b/ as well as of /t d/ gives rise to sounds which could easily be confused with the labiodental fricatives /f v/, which are present in Italian as well as in Tuscan not only as allophones, but also as phonemes. Therefore, the principle of minimization of perceptual confusion as expressed by Boersma (1998) conspires with the trend towards avoidance of weakly perceptible contrasts (Hume & Johnson 2001) in making velar stops the optimal target for lenition processes in Tuscan Italian.

Nevertheless, we have seen that the perceptual constraints mentioned do not prevent dental and labial stops from undergoing *gorgia*. That is, if there seems to be good evidence for a phonetically constrained pattern (both in production and perception) as far as velar plosives are concerned, lenition of non-velar stops appears to be conditioned rather by phonological factors (e.g. identical behaviour within the same natural class of plosives). Recall that the diachronic evolution of Tuscan is in agreement with the picture drawn so far: *gorgia* started with /k/, and only after a while spread to /p t/.

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[13]   Villafaña (2006) presents data where labials undergo *gorgia* more frequently than dentals, a *datum* that is not compatible with the large literature on the topic.

The role of stress seems to be more difficult to evaluate. As a general principle, lenition should be promoted in unstressed syllables and inhibited in stressed syllables (cf. Honeybone 2001, Bye & De Lacy this volume). Therefore, we could expect that, all other things being equal, *gorgia* is found more frequently in unstressed than in stressed syllables. However, the quantitative analysis of our empirical corpus (see note 8) does not confirm this prediction: no significant contrast appears when comparing the percentages of weak outputs in different prosodic contexts (Marotta 2001-02). This, however, may be due to the kind of stress considered: if we talk about lexical stress, the result is not really surprising since we know that many lexical stresses are deleted or weakened in connected speech. Hence what should be investigated is the relation of *gorgia* with the prominence of its position in the domain of the intonational phrase.

7. Lenition of Palatal Affricates

Another relevant weakening process in Tuscan is the spirantization of palatal affricates /t͡ʃ d͡ʒ/.[14] Just as *gorgia*, affricates spirantize in postvocalic position (intervocalic position in traditional terms). And as before, both word-internal and word-initial items are concerned. Some illustration is provided below.

(5)   affricate spirantization inside words
   a. in intervocalic position

SI-Tus	SI	Tuscan	spelling	gloss
t͡ʃ-ʃ	aˈmiːt͡ʃi	aˈmiːʃi	amici	friends
	speˈt͡ʃaːle	speˈʃaːle	speciale	special
	ˈkaːt͡ʃo	ˈkaːʃo	cacio	cheese
d͡ʒ-ʒ	ˈmaːd͡ʒiko	ˈmaːʒixo	magico	magic
	aˈd͡ʒɛnte	aˈʒɛnte	agente	agent
	faˈd͡ʒɔːlo	faˈʒɔːlo	fagiolo	bean

   b. across word boundaries

SI-Tus	SI	Tuscan	spelling	gloss
t͡ʃ-ʃ	la ˈt͡ʃeːna	la ˈʃeːna	la cena	the dinner
	ˌkwesta t͡ʃaˈbatːa	ˌkwesta ʃaˈβatːa	questa ciabatta	this slipper
d͡ʒ-ʒ	ˌkwesta ˈd͡ʒɛnte	ˌkwesta ˈʒɛnte	questa gente	this people
	la ˈd͡ʒakːa	la ˈʒakːa	la giacca	the jacket

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14   Tuscan Italian shares this process with other central varieties of Italian (e.g. Umbrian, Roman), as well as with the dialects of a wide area of the Centre; cf. Rohlfs (1949).

It is worthwhile observing that this weakening process creates a segment that is absent from Standard Italian, i.e. the voiced palatal fricative [ʒ], thus filling a *case vide* in the consonant inventory.

All Tuscan speakers of whatever area[15] invariably pronounce palatal affricates as palatal fricatives in the contexts shown. The lenition process applies not only in informal and fast speech, but even in high registers and in diaphasic and diastratic contexts that are marked as more formal. We could even say that the spirantization of /t͡ʃ d͡ʒ/ is more frequent than *gorgia*: in weak contexts, Tuscan speakers are not conscious anymore that an affricate is underlying.[16]

As in the case of *gorgia*, spirantization of affricates is blocked if the affricate is geminate, preceded by another consonant or in absolute utterance-initial position. Hence as in the case of *gorgia* morphological and syntactic boundaries appear to be invisible. Some illustration is provided under (6) below.

(6)   affricate spirantization blocked
     a. in gemination

SI-Tus	SI	Tuscan	spelling	gloss
t͡ʃ-t͡ʃ	ˈfat͡ʃːo	ˈfat͡ʃːo	faccio	(I) make
	ˈrɔt͡ʃːa	ˈrɔt͡ʃːa	roccia	rock
d͡ʒ-d͡ʒ	ˈmad͡ʒːo	ˈmad͡ʒːo	maggio	May

     b. after consonants

SI-Tus	SI	Tuscan	spelling	gloss
t͡ʃ-t͡ʃ	aˈrant͡ʃa	aˈrant͡ʃa	arancia	orange
	ˈselt͡ʃe	ˈselt͡ʃe	selce	flint
	ˈpant͡ʃa	ˈpant͡ʃa	pancia	paunch
d͡ʒ-d͡ʒ	arˈd͡ʒɛnto	arˈd͡ʒɛnto	argento	silver
	ˈɔrd͡ʒa	ˈɔrd͡ʒa	orgia	orgy
	in d͡ʒiˈnɔkːjo	in d͡ʒiˈnɔkːjo	in ginocchio	on your knees

     c. in initial position (beginning of an utterance or after a pause)

SI-Tus	SI	Tuscan	spelling	gloss
##__	t͡ʃaːo	t͡ʃaːo	Ciao!	bye
	t͡ʃi ˈveŋgo	t͡ʃi ˈveŋgo	Ci vengo	(I) come there
	ˈd͡ʒiːralo	ˈd͡ʒiːralo	Giralo!	turn it!
	ˌd͡ʒa ˈdːetːo	ˌd͡ʒa ˈdːetːo	Già detto	already said

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15   Obviously except the areas of Massa and Carrara, which do not feature the process at hand; cf. § 4.1.

16   In order to bring home this point, we would like to quote the case of the former President of the Italian Republic, Carlo Azeglio Ciampi, a Tuscan speaker born in Livorno, who was not able to pronounce /t͡ʃ d͡ʒ/ in postvocalic position, even in official addresses.

It is easy to observe that the two processes of consonant lenition discussed (spirantization of /t͡ʃ d͡ʒ/ and *gorgia*) have many points in common. The only difference is the fact that stops may be followed by a vowel, a liquid or a glide, whereas affricates can only appear before vowels. Therefore, we believe that the spirantization of palatal affricates may be considered as a particular instantiation of *gorgia*. As a matter of fact, what basically happens in both weakening processes is the loss of articulatory closure: stops change into fricatives, while palatal affricates lose their stop phase and become fricatives as well.

Thus if /t͡ʃ d͡ʒ/ are regular inputs into *gorgia toscana*, they may turn out to be stops, rather than affricates.[17] This option indeed has some appeal.

First of all, palatal affricates are contrastive in gemination in Standard Italian; this feature is shared by plosives, but not by the other affricates, i.e. /t͡s d͡z/, which are always long underlyingly (Bertinetto & Loporcaro 2005). Minimal pairs are for instance *caccio* [ˈkatːʃo] '(I) banish; (I) hunt' *versus cacio* [ˈkat͡ʃo] 'cheese', *maggio* [ˈmad͡ʒːo] 'May' *versus Magio* [ˈmaːd͡ʒo] 'Magus'. Of course, the gemination-based contrast is recoverable in Tuscan since it appears in the coat of a long affricate on the one hand against a short fricative on the other; thus *caccio* [ˈkatːʃo] *versus cacio* [ˈkaːʃo], *Maggio* [ˈmad͡ʒːo] *versus magio* [ˈmaːʒo]. Also, the spirantization of the voiceless palatal affricate in Tuscan allows for an opposition of gemination between a simple [ʃ] from an input /t͡ʃ/ and a long [ʃː] whose input is /ʃː/ in both SI and Tuscan. For instance, minimal pairs like *pece* /ˈpet͡ʃe/ 'pitch' versus *pesce* /ˈpeʃːe/ 'fish', *pace* /ˈpat͡ʃe/ 'peace' vs. *pasce* /ˈpaʃːe/ '(he) pastures', *la cena* /la ˈt͡ʃena/ 'the dinner' vs. *la scena* /la ˈʃːena/ 'the scene' show the same phonemic opposition in SI and Tuscan (/t͡ʃ/ vs. /ʃː/). However on the surface, this contrast still appears in the coat of an affricate against a long fricative in SI, while Tuscan features a simple difference in length, i.e. [ʃ] < /t͡ʃ/ vs. [ʃː] < /ʃː/.

The second reason for establishing /t͡ʃ d͡ʒ/ as stops is that they behave like simple plain stops when it comes to the selection of determiners: words beginning with /t͡ʃ d͡ʒ/ select consonant-final masculine allomorphs (*il, un, quel*), whereas initial /t͡sː d͡zː/, being underlyingly long, select vowel-final allomorphs (*lo, uno, quello*). This is parallel to the other segments that are phonemically

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[17] The first proposal in this direction was made by Baroni (1993); I have later adopted it myself (Marotta 1995b), though with some caution.

long, i.e. /ʃː ɲː/. Some examples of this contrasting behaviour appear under (7) below.

(7)   selection of determiners
    a. /t͡ʃ/: *il cielo* 'the sky', *un cesto* 'a basket', *quel cibo* 'that food'
    b. /d͡ʒ/: *il giocattolo* 'the toy', *un gelato* 'an ice-cream', *quel giovane* 'that youngster'
    c. stop: *il ponte* 'the bridge', *quel tavolo* 'that table', *un cane* 'a dog', *il battello* 'the boat', *quel tappo* 'that cork', *un gatto* 'a cat'
    d. /t͡sː/: *lo zio* 'the uncle', *quello zucchero* 'that sugar'
    e. /d͡zː/: *lo zingaro* 'the gipsy', *uno zaino* 'a sack'
    f. /ʃː ɲː/: *lo sciame* 'the swarm', *uno gnomo* 'a goblin'

Typological evidence in favour of a shared treatment of palatal affricates with the class of stops can also be brought to bear: cross-linguistically, palatal affricates are much more frequent than palatal stops (cf. Maddieson 1984). This establishes the relative markedness of plosives for the palatal locus. In the Italian domain, palatal plosives [c ɟ] are attested for some dialects of the South (cf. Rohlfs 1949, Maiden & Parry 1997).

Finally, diachronic evidence also seems to converge with the interpretation of palatal affricates as the default output for the palatal place of articulation: palatalization processes normally give rise to affricates or fricatives, not to palatal plosives. In Romance palatalization for instance, Latin /k/ changes into the affricate /t͡ʃ/ before a front vowel in Italian, but into /s/ and /ʃ/ in French, e.g. Latin *caelum* 'sky' > SI *cielo* [ˈt͡ʃɛːlo], Latin *centum* 'one hundred' > SI *cento* [ˈt͡ʃɛnto]. In synchronic alternations as well, palatalization normally produces affricates, rather than palatal stops; consider for instance the Italian alternation between [k] and [t͡ʃ] before front vowels; e.g. SI *amico* [aˈmiːko] 'friend', Plur. *amici* [aˈmiːt͡ʃi] 'friends', *pratico* [ˈpraːtiko] 'practical', plur. *pratici* [ˈpraːtit͡ʃi].

In conclusion, we believe there is good reason to believe that palatal affricates are stops; in particular, we think that the deaffrication of /t͡ʃ d͡ʒ/ in intervocalic position can be considered as an expression of the weakening process that takes place in Tuscan; that is, Tuscan pronunciations like [aˈmiːxo] and [aˈmiːʃi] could be both instances of *gorgia*.

A possible counter-argument may come from the diatopic distribution of the deaffrication: since it occurs in an area larger than Tuscany, why do we have to assume a relationship of this process with *gorgia*? Actually, we are not assuming a genetic relationship between the two processes (spirantization of palatal affricates and *gorgia*); rather, we propose that synchronically, they

behave in the same way: both are expressions of the general drift towards obstruent lenition that is active in Tuscany.

8.   Phonetic Evidence for Lenition Scales

Tuscan lenition allows us to set up a scale of strength where the various outputs correspond to different degrees of weakening.

   Given the two fundamental lenition paths evidenced for example by Lass (1984: 178), Honeybone (2001) and Szigetvári (this volume a), Tuscan lenition appears to belong to the opening type. This means that the resistance to the airflow decreases, whereas no change in voicing occurs. The trajectory of the process can be represented under (8) where the lenition of the velar stop is taken as a reference.

(8)	0	1	2	3	4
	stop	*affricate*	*fricative*	*approximant*	*elision*
	k	k^x	x	h	ø

   The rather thorny question we would like to address now concerns the various phonetic expressions of lenition and their relative relevance. In the large literature on consonant weakening, one of the most used criteria to measure the degree of weakening is certainly segment duration: for a long time, it has been assumed that weaker segments are shorter than stronger segments. For example, Lavoie (2001: 159) writes at the end of her study on lenition that "the main acoustic correlate of lenition is decreased duration".

   In order to quantify weakening, Lewis (2001) singles out different acoustic parameters that may be used: duration of the closure, VOT, percentage of closure voicing, peak intensity and release burst. According to him, the lenition of a stop is inversely proportional to the first two parameters, whereas it is directly proportional to the others.

   Regarding Tuscan *gorgia*, we measured the segment duration of Pisan intervocalic stops in a previous study (Marotta 2001-02) and found the following scale: stops are longest, followed by semifricatives, fricatives and approximants. Another indicator appeared to be the lack of release burst:[18] not

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[18]   In the spectograms, the acoustic cue corresponding to a burst can be described as a 'spike', i.e. a vertical bar located between the period of closure and the following VOT; in the wave form, it is represented by a short period of increased amplitude. In physical terms, the burst is generated by the change of pressure that occurs in the transition from closure (which is associated to an opening of the larynx) to the release of the constriction, with concomitant closure of the vocal folds; cf. Ladefoged (1997), Maddieson (1997).

only was the burst completely absent in the acoustic representation of the semifricatives, but it was also quite often unrecoverable in the spectrograms of the stops. This suggests that the criterion at hand is a robust cue for detecting the degree of strength of an obstruent segment.

Following Lavoie (2001) and Lewis (2001), Sorianello (2001-02) considers intensity and duration to be the most reliable correlates of weakening: in her study on Florentine *gorgia*, she substracts the maximum value of intensity of the following vowel from the maximum intensity of the preceding consonant and concludes that increased intensity is a good indicator for lenition. On the grounds of her experimental analysis of Florentine, Villafaña (2006: 126ff.) more recently agrees with the aforementioned acoustic studies of Tuscan *gorgia*. In her opinion, the most reliable cues for lenition are the relative duration of the segment and the absence of release burst.[19]

Kirchner (1998, 2000, 2004) adopts a different physical approach to lenition. He proposes the introduction of functional and independently motivated principles into the formal theory of *Optimality Theory*. Kirchner believes that phonological representation should include articulatory properties that are controlled by the speaker. That is, a *continuum* of contrastiveness is produced by the position of the relevant features on a gradual scale.

In his cross-linguistic survey of lenition processes in a large number of natural languages, Kirchner (1998) also quotes Tuscan spirantization. He refers to the Florentine data presented by Giannelli & Savoia (1978, 1979-80) more than twenty years ago. The core of Kirchner's proposal is that lenition is due to a scalar markedness constraint called LAZY, which militates for the "minimalization of the articulatory effort".[20]

Trying to provide an explicit definition of what articulatory effort is, Kirchner (1998: 37) comes up with a twofold notion: biomechanical and neurochemical effort. These are a function of the amount of adenosine triphosphate (ATP) that is produced by the muscles of the vocal tract. Since at present it is not possible to measure the global muscular activity involved in articulatory gestures, Kirchner prefers to resort to a computational model based on a mass-spring system. The basic assumption is that the articulator in resting position is in an open position and subject to no influence from any force. In order to produce a consonant gesture connected with oral constriction, some force, i.e. muscular effort, is needed. Thus *ceteris paribus* fricatives are compara-

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[19]   Villafaña (2006: 62ff.) basically adopts the criteria proposed by Lewis (2001), although with some revision; for instance, closure duration is calculated as the ratio of constriction duration and the duration of the total sequence *VCV*.

[20]   LAZY is very similar to traditional functional principle known as *minimal effort* (cf. Boersma 1998).

tively less effortful than stops since the articulatory distance as well as the effort and degree of oral constriction are greater in the latter.[21]

In Kirchner's analysis, Florentine spirantization is considered as the effect of the continuous application of LAZY, conflicting with faithfulness constraints of the kind PRESERVE. These aim at maintaining the correspondence between the input and the output. Each phonetic output receives a numerical value that corresponds to the degree of effort which needed for its production in a specific register. As a general principle, the greater the effort, the higher the value. At the same time, though, the higher the value, the faster the speech. For instance, in the velar region the stop [k] will be associated with the highest value of effort, which progressively decreases for the fricative [x] and the glottal fricative [h].

The computational system automatically generates the surface outputs with the associated values of effort. However, the numerical indexes that indicate the effort of the different outputs are based on an arbitrary scale. In particular, it is not clear how the articulatory system may carry out this kind of fine-grained calculus of the degrees of effort and assign the corresponding values to the different outputs. Moreover, at any given level of effort, all places of articulation are assigned the same effort value. We have seen, however, that *gorgia* is sensitive to this parameter: velars undergo lenition much more than dentals and labials (see § 6).[22]

9. Lenition and Aspiration

The overall consonant system of Tuscan Italian shows a clear trend towards the production of phones marked by low values of strength. Considering the different outputs of plosive inputs, the scale under (9) may be proposed (from strong to weak).

(9)   stop
        semifricative
        fricative
        approximant
        C deletion

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[21] However, other factors also play a role in determining the effort of production. For instance, a greater effort is needed for the production of a sibilant with respect to non-sibilant fricatives; see Kirchner (2004).

[22] For a critical review of Kirchner's OT analysis of *gorgia*, we refer the reader to Marotta (2006), where a different OT-based interpretation of the process in terms of *Stochastic OT* is advanced.

On this strength hierarchy, the class of semifricatives occupies an intermediate position between stops and true fricatives. We have seen that the acoustic representation of these segments shows a long period of VOT with systematic lack of release burst. Their weakness is thus suggested by both properties: long VOT and no burst. Note that in our proposal, aspirated stops (as e.g. in English) which show long VOT and burst occupy the first position on the strength hierarchy, higher than plain stops, whereas Tuscan semifricatives remain between stops and fricatives.

Remember that in the phonetic literature VOT is traditionally used for the identification of aspirated stops, i.e. of segments with a high strength value (see Maddieson 1997, Cho & Ladefoged 1999). However, the use of VOT alone produces ambiguous results: given identical VOT length, this criterion may be a detector for strengthening in the case of true aspirated stops, but on the contrary for weakening in the case of semifricatives.

In our view, it is time to rethink the traditional meaning of this acoustic parameter: VOT lengthening is not a mere factor of strengthening. Rather, in order for a consonant to be perceived as aspirated, or even simply as a stop, the relevant element is in fact the burst, where the energy is released after a previous closure period. A release burst can indeed occur when the articulatory closure is retained at some point of the vocal tract for at least 30 msec (Shadle 1997). Only a total constriction of this size allows for an accumulation of air pressure sufficient to produce a burst. Therefore, only consonants with a great amount of oral closure will produce bursts. We would like to propose that consonant strengthening is due to the release burst more than to the preceding VOT length.

If this is admitted, a new phonetic parameter may be added to the ones that are already used in standard feature models: burst could be interpreted as a specific index of strengthening. Consider the two features [tense] and [spread glottis] that describe the state of the glottis in articulatory terms: the former is assigned to voiceless stops by default, while the latter is regularly used in order to discriminate between aspirated plosives (where it has a positive value) and plain stops (negative value). On the acoustic side, the latter feature corresponds to VOT lengthening, whereas the former is associated with amplitude.

Following our above proposal, it is possible to insert the new class of semifricatives into a binary matrix of features. In other words, we are able to discriminate between voiceless aspirated stops, *strong*, and semifricative segments, *weak*: even in case the VOT value is identical, the presence or absence of a release burst will guarantee an individuation of the two classes of sounds in question.

Table (10) below shows the implementation of this idea into features.

(10)

	[VOT]	[burst]	[tense]	[spread glottis]
aspirated stops	+	+	+	+
stops	+	+	+	-
semifricatives	+	-	-	-
fricatives	-	-	-	-

On this strength hierarchy, the Tuscan semifricatives are in an intermediate position between stops and fricatives, while aspirated stops occupy the highest position.

In a cognitive perspective, perceptive cues are relevant since they are responsible for the perception and categorization of sounds. In the case at hand and in absence of a burst, the noise period of VOT will be responsible for the perception of a fricative sound, rather than of an aspirated stop.

However, semifricatives are often perceived as plosives by Tuscan speakers. This suggests that the basic cue for the perception of these phones could be silence: a very short interruption of the phonetic string, even a few msec, is enough to give the listener the perception of constriction, namely of occlusion. Therefore, there could be two competitive parameters: the burst on one hand, silence on the other. Both are able to carry phonetic information into the cognitive system. Silence is a basic auditory cue: stops are no more than *sounds of silence*; but the release burst is also important: it expresses the articulatory substance of the sounds at hand.

Considering semifricatives as affricates does not imply that they originate in a strengthening process. As a matter of fact, the strength value of affricates is the topic of a long standing debate: their ranking on the strength hierarchy is not always clear. In historical linguistics, affricates are normally considered an intermediate step in the weakening process from stops to fricatives.[23]

In our opinion, it is not possible to assign an absolute rank to affricates on a strength hierarchy. Their relative position may only be defined with reference to the underlying segment as well as to the phonological system in which they evolve. This being said, of course it does make a difference whether a stop or a fricative turns into an affricate (Lavoie 2001: 46). Finally, phonological processes cannot be classified without reference to their context of occurrence. Szigetvári (this volume a) correctly points out that "the melodic change in itself is insufficient to tell whether a given change is lenition, fortition, or something else".

For Pisan Italian, the possible affrication of stops into semifricatives, i.e. weak affricates, may be considered as a *nova facies* of consonant lenition. As such it is an expression of the general weakening trend characteristic of the

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[23] There is a large literature on the topic; we refer the reader to Szigetvári (this volume a); see also Pagliuca & Mowrey (1987), Honeybone (2001).

Tuscan varieties of Italian ('*il parlar toscano*'). On the other hand, the affrication of /s/ after a sonorant (for instance, SI *penso* '(I) think', Tsc [ˈpɛntso], see § 2) which occurs in Tuscan and other varieties of Italian can reasonably be considered a fortition process.

Before closing this section, we would like to insist on relativity as a necessary methodological principle: the same phonetic cue may mean different things for the cognitive system according to the underlying identity of the sound at hand (the old notion of phoneme) and the phonemic system of the language.

10. Government Phonology

In the previous sections, we have seen that the phonological process of *gorgia toscana* shows a high degree of variability: given an input segment in the appropriate context, it is difficult to predict the phonetic result.

Recent debate in theoretical phonology has paid much attention to the relation between input and output, hence reviving the classical notions of *Underlying Structure* and *Surface Structure*. In the 80s, the derivational apparatus has been progressively reduced in favour of representations; as a consequence, *Surface Structure* has become richer and the distance between input and output was progressively reduced. In recent years, then, phonology resembles more and more phonetics.

Phonetic roots were recently invoked to explain phonological markedness, a move which is in complete agreement with mainstream research where phonetics and phonology are less and less distinct.[24] However, in classical generative theory, appeal to a functional explanation has always been avoided: factors like phonetic constraints were seen as external elements that represent natural tendencies, but which are useless for the understanding of the true nature of linguistic representations; these are only abstract and symbolic (cf. Anderson 1981, Lass 1984).

The research program which aims at tightening the relationship between phonology and phonetics is at present shared by different theoretical frameworks such as *Articulatory Phonology*, *Laboratory Phonology* and even *Optimality Theory*. However, in our opinion, a separation between the two levels of analysis is in order: phonological analysis must somehow be symbolic and abstract. Therefore, we believe that the most relevant pattern now available for

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[24]   Among others, see Boersma (1998), Flemming (2001), Hayes *et al.* (2004), Kirchner (2000; 2004), Steriade (1999). It should be noticed, though, that phonetic explanation in phonology is not a novelty. Teleological notions have been invoked since the Prague Circle, and by the Neo-grammarians in the XIXth century.

phonological analysis is *Government Phonology*.[25] In particular, *Government Phonology* (henceforth GP) appears to be the most adequate formal framework for the study of lenition. Within GP, lenition can easily be represented as a reduction phenomenon: weakening is expressed in terms of a reduction of the number of phonological primes that a segment is made of (Harris 1990, 1994).

The melodic primes of GP are phonological entities (called 'elements'); they compose the melodic structure of segments. Elements are cognitive units that have a monovalent status and correspond to specific phonetic properties which are usually expressed in terms of binary features. In Standard GP, stops are formally represented with the element of closure ʔ as the head of the structure, whereas fricatives, which are the normal outputs of lenition, are headed by the noise element h.

The first analysis of Tuscan spirantization within GP is due to Bafile (1997): following Harris (1990, 1994), she represents the different stages of lenition that occur in Florentine as a progressive loss of complexity in the structure of the segment: the element ʔ which contributes closure is lost.

We now set out to show that GP makes some interesting predictions regarding Tuscan *gorgia*, but as a whole cannot account for it. As is common for consonant weakening (see Honeybone 2001), the intervocalic position (i.e. *V_V*) is a lenition-promoting context in *gorgia*, whereas initial and post-consonantal positions (i.e. *#CV, VC_*) are lenition-inhibiting contexts. This may be explained with reference to the notion of *Government*.

There are two kinds of government in GP:

- *Constituent Government* goes from left to right;
- *Interconstituent Government* goes from right to left.

As a general principle (see Harris 1990, 1994), a segment in governing position is stronger than its governee and therefore does not undergo weakening. By contrast, a segment in governed position is a typical candidate for weakening.

Thus the following predictions are made when this perspective is implemented into syllable structure.

- in simple Onsets (-*VCV*-), the stop is governed by the following Nucleus; therefore, the theory predicts this position to be lenition-promoting; this is borne out as far as *gorgia* is concerned;

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[25] Relevant literature regarding GP and its developments includes Kaye *et al.* (1985, 1990), Harris (1990, 1994), Harris & Lindsay (1995), Scheer (1999, 2004).

– in branching Onsets (i.e. *TR*),[26] the stop, although being licensed by the following Nucleus, governs the following sonorant; therefore, it is a governor, i.e. a strong unit, which should not experience lenition; however, lenition does affect stops in *TR* clusters in Tuscan.

Hence the predictions regarding the Onset position that are made by Standard GP are only partially satisfied when confronted with *gorgia*. The predicted contrast between governed and governing positions is not reflected in Tuscan Italian where spirantization applies to *T* both in intervocalic position and when involved in a *TR* cluster (see § 4.2). In this respect, Tuscan Italian behaves just as Celtic (see Jaskula this volume) and French (see Ségéral & Scheer this volume a).

In heterosyllabic sequences C_1C_2, GP holds that C_1, being a Coda (there are no complex Codas in GP), is governed by the Onset C_2; therefore, the theory predicts that C_1 can lose some complexity, whereas C_2 cannot. That is, lenition may strike C_1, the governee, but not C_2, the governor. Since stops are not allowed in coda position (unless they are geminates) in Italian, the predictions may only be tested for C_2, which indeed does not undergo spirantization in Tuscan: *C_V* is a lenition-inhibiting context.

11. Lateral Theory

Within the general framework of GP, a new pattern has recently been proposed by Scheer (1999, 2004). His *Lateral Theory* (henceforth LT) can be considered as a coherent development of the original GP theory. Following Lowenstamm (1996), a strict sequence of non-branching Onsets and non-branching Nuclei (hence CVCV) is assumed to be the only skeleton available in the phonology of natural languages. The attribute 'lateral' relates to the essence of the model: horizontal relations among constituents, Government and Licensing, are the fundamental forces which define syllable structure and are at the origin of positional phenomena (see Scheer 2004: 18ff., *passim*).

With respect to Standard GP, the basic innovations of LT can be summarized as follows.

– the representation is grounded on a fixed skeleton *CVCV*; hence there are neither Codas nor Complex Onsets nor Complex Nuclei;
– *Empty Nuclei* are always present within consonant clusters;[27]

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[26]   Here and henceforth, *T* stands for any stop, *R* for any sonorant.

[27]   The proliferation of *Empty Nuclei* is regulated by the *Empty Category Principle*, which was imported from generative syntax (see Scheer 2004: 149ff.).

  – *Government* and *Licensing* go only from right to left;
  – *Empty Nuclei* and *Full Nuclei* have a different governing power;
  – a partially new set of melodic elements is adopted.

The strict CV approach of LT does not allow branching constituents. This assumption has three relevant consequences:

  – so-called *gorgia toscana*, see the detail below in §§ 4ff.
  – there is no more room for Constituent Government;
  – all Government relations are regressive;
  – the head can be final only.

Following Scheer (2004: 139), we assume that Government (henceforth GOV) inhibits the segmental expression of its target, whereas Licensing (henceforth LIC) enhances the segmental expression of its target. In other words, LIC gives melodic richness to the licensed segment, while GOV puts its target constituent under pressure so that eventually melodic primes may be lost. The process of Tuscan lenition may be exhaustively interpreted with crucial reference to GOV and LIC on the one hand, and to the *Coda Mirror* effect (Ségéral & Scheer 2001, this volume b) on the other.

Let us first look at the intervocalic position (*V_V*). LT predicts the promotion of lenition since the input stop is licensed, but also governed by the following Nucleus. It is therefore a weak context, and indeed intervocalic stops undergo lenition in g*orgia toscana*. In post-consonantal position (*VC_V*), the stop is only licensed, but not governed: the following full Nucleus has to govern the empty Nucleus which separates the cluster.[28] Therefore post-consonantal consonants are in strong position, which means that they are shielded against lenition. This is also in line with the behaviour of stops in g*orgia toscana*. Finally in initial position, the stop is again licensed, but not governed according to the *Coda Mirror*. The effect is the same as before: lenition inhibition. This is indeed what happens in *gorgia toscana*, though only in absolute initial position: recall that *gorgia* is blocked at the beginning of an utterance after a pause, but applies word-initially in utterance-internal position. It is thus a representative of those languages where phonology "applies

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[28] Recall that a consonant cluster always encloses an empty Nucleus in LT: there is no Coda. This means that in the surface sequence $V_1C_1.C_2V_2$, the traditional coda consonant C_1 occurs before a governed empty Nucleus (cf. Scheer 2004: 141). Since only full Nuclei can govern and licence their Onsets, a consonant in this position is neither governed nor licensed. Therefore, the coda position is weak and represents an optimal target for lenition.

across word boundaries" and initial effects are only observed for broader morpho-syntactic units (see Ségéral & Scheer this volume a).

In sum, thus, the intervocalic and the coda position are weak and favour lenition.[29] By contrast, post-consonantal and initial Onsets are strong; they inhibit lenition. *Gorgia* is in line with these predictions for both strong contexts (i.e. *VC_V* and *##_V*), but only for one of the two weak contexts (i.e. *V_V*) since stops do not occur in coda position in Tuscan Italian.

12. Branching Onsets

Tautosyllabic clusters of the kind *muta cum liquida* are normally considered to be branching Onsets in non-linear frameworks. Although they appear to be typologically marked when compared to other syllabic configurations (see Ségéral & Scheer this volume a), branching Onsets are well attested in Romance languages and in other families.

For the time being, the behaviour of branching Onsets in regard of lenition has not been analyzed in LT or *Coda Mirror* theory. It is for sure, however, that no branching constituents exist. Hence TR clusters will always be separated by an empty Nucleus.

What binds them together in LT is so-called *Infrasegmental Government* (henceforth IG). IG builds on the classical notion of complexity, but finds that sonorants are more complex than obstruents. Hence the former govern the latter. Therefore in a TøR sequence, T is a governee, while R is a governor. Accordingly, T is in a lenition-promoting weak position, whereas R is associated to a lenition-inhibiting strong position.[30]

Gorgia toscana offers perfect illustration of this prediction: stops engaged in complex Onsets lenite and behave exactly as those in simple Onsets.

In sum, thus, Standard GP and LT make different predictions regarding lenition in branching Onsets: the former holds that the obstruent governs the sonorant, while the latter proposes the reverse relationship. The empirical facts provided by *gorgia toscana* are to the advantage of LT since obstruents in TR

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29   Note, however, that the two weak positions not always provoke the same effect: there are two ways of being weak (see Szigetvári, this volume a, Ségéral & Scheer this volume a). Typical lenition trajectories are different, and processes such as spirantization are typically observed in intervocalic position, while deaspiration or debuccalization are typical coda effects.

30   In some way, IG appears to remember the notion of constituent government of Standard GP, with the difference that the head is always final; moreover, a hierarchical criterion is introduced in the horizontal relation between elements occurring on the same autosegmental line of representation.

clusters are weak, not strong. Also, the fact that they behave just like simple obstruents is captured since the obstruents at hand are governees in both cases (T in TR is governed by the R, in VTV by the following vowel).

13. Conclusion

Gorgia toscana is a regular weakening process that causes lenition of stops in weak positions. It is largely shared by speakers across generations and is present in different registers of Tuscan speech. Our analysis has focused on Florentine and Pisan varieties of Tuscan Italian. These share many features, but are also specific in some respects.

The surface output of *gorgia* is variable and not always predictable: in the same context, the same speaker may produce different segments without following any obvious pattern. The variability is particularly high in the case of the velar voiceless plosive /k/. Also, *gorgia toscana* is a place-sensitive process: velar consonants are much more prone to lenition than dentals and labials, while labials promote lenition less than dentals. We have inquired on the reasons of this asymmetric behaviour.

A detailed phonetic analysis of the weakening process has also been presented. Aiming at capturing the basic cues of lenition, we have reconsidered the contribution of the classical notion of VOT to lenition: it is not a sufficient cue for the detection of consonantal strength. Rather, the burst is a fundamental cue for the strength of plosives that must be taken into account alongside with VOT.

On our analysis, the deaffrication of palatal affricates is an instance of the general weakening drift that is observed in Tuscan: *variatis variandis*, the process and its constraints are the same as those found for *gorgia*.

The large variability of the output is a fact that should not preclude a formal interpretation of the process at hand. We have therefore offered an analysis of Tuscan spirantization in terms of Government Phonology. We argue that this theory is able to provide a stimulating account of *gorgia* and its basic constraints. In Government Phonology, lenition is interpreted as a reduction of melodic complexity, that is the loss of the ʔ element in the case of spirantization. Finally, a recent development of Government Phonology, Lateral Theory, appears to be better equipped for the representation of Tuscan lenition than the standard version of the framework.

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