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Italian preconsonantal s-voicing is not regressive voice assimilation

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Abstract: In the literature of laryngeal phonology Romance languages are considered voice languages, exhibiting a binary distinction between a voiced lenis and a voiceless fortis set of obstruents. Voice languages are characterised by regressive voice assimilation (RVA) due to the phonological activity of [voice]. Italian manifests a process similar to RVA, called preconsonantal s-voicing; that is, /s/ becomes voiced before voiced consonants. Since /sC/ is the only obstruent cluster in Italian phonotactics, Italian seems to fulfil the requirements for being a prototypical voice language. However, this paper argues that s-voicing is not an instance of RVA, at least from a synchronic phonological point of view. RVA and Italian preconsonantal s-voicing essentially differ at every level of a synchronic comparison: in the input, in the trigger, in the domain of application and in the frequency of the processes. In Italian only sibilant fricatives may undergo voicing before consonants; however, other obstruents (which mostly appear in loanwords) do not assimilate for [voice]. Italian preconsonantal s-voicing does not take place at the word boundary or at morpheme boundaries, and it seems to be optional in new loanwords; thus, it is not a postlexical process like RVA. The synchronic differences between the two phenomena are analysed in Classical Optimality Theory. The laryngeal system of Italian prefers faithfulness over markedness, which means that non-/sC/ obstruent clusters surface with underlying voice values; while the voicing of /s/ before voiced consonants is seen as phonetic and not phonological.

Keywords: Classical Optimality Theory; Italian phonology; Laryngeal Realism; regressive voice assimilation; s-voicing

1 Introduction

The laryngeal phonology of Italian is surprisingly underrepresented in the phonological literature, although it presents a unique panorama which is fundamentally

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divergent from the ordinary Romance pattern, and from that of so-called “true voice languages” in general. Huszthy (2019) recently pointed out that Italian speakers tend to retain underlying voice values in differently voiced obstruent clusters, e.g. *abside* [bs] ‘apse’, *afgano* [fg] ‘Afghan’, *McDonald*’s [kd] etc.; that is, they do not apply voice assimilation. The only obstruent which undergoes voicing before voiced consonants is /s/, e.g. *sbaglio* [zb] ‘error’, *asma* [zm] ‘asthma’ etc.; however, /s/ is not contrastive for the laryngeal feature in most positions in most varieties. This paper attempts to capture the issue of Italian preconsonantal s-voicing in OT, proposing that the voicing phenomenon that Italian /s/ undergoes in various contexts is not *regressive voice assimilation*, as could be expected from a true voice language under the assumptions of *Laryngeal Realism* (LR) and that /s/ can be realised as a proper obstruent or some kind of sonorant that lacks the laryngeal node, and in this case it may appear as voiced.

1.1 Laryngeal Realism

LR (Beckman et al. 2013; Cyran 2011, 2014; Harris 2009; Honeybone 2002, 2005; Iverson and Salmons 1995; Petrova et al. 2006; etc.) is a phonetically-based, i.e. “realistic”, theoretical-phonological background, intended to sort languages according to systematically marked laryngeal features. LR contradicts the general conception about voicing contrast formulated in the framework of SPE (Chomsky and Halle 1968; followed, among many others, by Wetzels and Mascaró 2001), where [$\pm$ voice] is handled as a phonologically universal binary feature. The latter approach is labelled by LR the “broad interpretation of voice”; in contrast, LR is based on the “narrow interpretation of voice” (van Rooy and Wissing 2001: 295), with the assumption that languages categorise their obstruents according to their actual phonetic realisation (such as *voicing*, *postaspiration* [spread glottis] and *glottalisation* [constricted glottis]). In this paper only two-way laryngeal systems will be concerned based on voicing and [spread glottis], while the [constricted glottis] feature and three-way and four-way distinctions will be out of consideration.

In the literature of LR, languages which exhibit a two-way laryngeal distinction based upon the marked [voice] feature are labelled *voice languages* (e.g. Slavic, Romance, Hungarian, etc.), while languages which use the marked [spread glottis] feature, are called *aspiration languages* (e.g. most Germanic languages, Mandarin Chinese, etc.). The “narrow interpretation of voice” has several phonetic and phonological benefits. First of all, it helps to better approach laryngeal phonology by creating a direct contact between phonological theory and phonetic realisation; and so it corrects some errors which derive from the unreasonable generalisations of the “broad interpretation of voice”. It also simplifies binary laryngeal contrasts through the *fortis–lenis* dichotomy and

through markedness, where voiced and aspirated stops are marked, while plain voiceless stops are unmarked (cf. Balogné Bérces and Huber 2010: 446).

Voice languages and aspiration languages essentially differ as only voice languages present “thoroughly voiced” initial stops, which in phonetic terms means that voiced plosives (such as [b d g]) in utterance-initial position appear with an early VOT lead, that is, they are fully voiced (cf. Iverson and Salmons 1995). On the other hand, in aspiration languages initial lenis stops appear with a short lag VOT, so they are not sufficiently voiced from an acoustic point of view. In these languages obstruent voicing is usually *passive*, that is, possible only in inter-sonorant position (between vowels or sonorants); while in voice languages voiced obstruents have their own voice value (which is considered active and so it can spread, evoking voice assimilation). Conversely, fortis stops are generally unaspirated in voice languages, and their acoustic shape is similar to the case of lenis stops in aspiration languages (viz. they have a short lag VOT) whereas, in the latter category, fortis stops are heavily aspirated (with a long lag VOT), and [spread glottis] is the marked feature of the laryngeal contrast.

1.2 Romance languages in LR

According to LR, Romance languages are classical examples of “true” voice languages, which exhibit a binary laryngeal distinction between the marked lenis series of underlyingly voiced obstruents and the unmarked fortis series of underlyingly voiceless unaspirated ones (cf. Petrova et al. 2006). Due to the phonological activity of [voice], voice languages are characterised by *regressive voice assimilation* (RVA), a postlexical phonological process which unifies obstruent clusters by the positive or negative voice value of the rightmost obstruent of the cluster (Balogné Bérces and Huber 2010; Petrova et al. 2006; Wetzels and Mascaró 2001; etc.).

It is a controversial issue in the literature, whether RVA is a necessary characteristic of voice languages, or just a typical one (cf. Ringen and Helgason 2004; van Rooy and Wissing 2001). Several phonetically based studies claim that the appearance of RVA in voice languages is not as straightforward as the phonological literature wishes; for instance, RVA is often absent in Hungarian in slow careful speech or when the obstruent clusters are interrupted by pauses (cf. Mády and Bárkányi 2015; Markó et al. 2010). Moreover, phonological problems may also arise with RVA, such as the question of Hungarian /v/, which undergoes devoicing but does not trigger voicing, or that of Hungarian /x/, which triggers devoicing but does not undergo voicing (cf. Siptár and Törkenczy 2000: 202). We find a similar issue in Dutch, which displays RVA unless the right or both members of the cluster is a fricative, in which case it is progressive devoicing, fed by final devoicing (cf. Iverson and Salmons 2003; van der Hulst 2014).

Nonetheless, the argument of this paper is based on the claim that RVA is a phonologically obligatory process in voice languages, even if exceptions are allowed; however, as we will shortly see, Italian preconsonantal s-voicing is more than exceptional compared to RVA. A few examples for the regular outcomes of RVA in Romance languages are given in (1).

(1) Romance examples for RVA

- a. Word-internal voicing by RVA
(Port.) *Lisboa* [ʒb] ‘Lisbon’ (Mateus and D’Andrade 2000: 142)
(Sp.) *fútbol* [ðβ] ‘football’ (Colina 2006: 186)
(Rom.) *totdeauna* [d:] ‘always’ (Wetzels and Mascaró 2001: 221)
- b. Sandhi voicing by RVA
(Cat.) *cap dau* [bd] ‘no dice’ (Recasens 2014: 165)
(Cat.) *gos bo* [zβ] ‘good dog’ (Recasens 2014: 165)
(Rom.) *aş vrea* [zv] ‘I would like’ (Wetzels and Mascaró 2001: 220)
- c. Word-internal devoicing by RVA
(Sp.) *obsoleto* [ps] ‘obsolete’ (Colina 2006: 188)
(Fr.) *médecin* [ts] ‘physician’ (Snoeren et al. 2006: 243)
- d. Sandhi devoicing by RVA
(Fr.) *robe sale* [ps] ‘dirty dress’ (Snoeren et al. 2006: 243)
(Port.) *dez patos* [ʃp] ‘ten ducks’ (Mateus and D’Andrade 2000: 145)

In Romance languages – as is usual in voice languages – RVA targets obstruent clusters of underlyingly differing voice values (Recasens 2014: 165; also cf. Schmid 2016: 483), both word-internally (1a, 1c) and in sandhi position (1b, 1d). Although the distribution of coda obstruents is phonotactically restricted in some Romance languages, such as in Spanish (cf. Colina 2006: 179), we find RVA in loanwords as well (like in 1a).

1.3 Italian compared to the romance pattern

Similarly to Spanish, Italian phonotactics also restricts the distribution of obstruent clusters – actually only /s/ plus consonant sequences (henceforth /sC/) are well-formed (Krämer 2009: 138; Morelli 1999: 162). Other obstruent clusters were diachronically eliminated from Italian, mostly by deletion or place assimilation; for instance, in the Italian version of the Latin word *abstractus* ‘abstract’ (>*astratto*) both processes take place, and only /sC/ is preserved (cf. Rohlfs 1966).

We take a brief look here at the Italian *coda condition* (cf. Section 4.3), since some loans apparently allow non-/sC/ obstruent clusters, which needs clarification. Word-internal codas in Italian can be the first part of a geminate (e.g. /'patto/ 'pact'), a sonorant consonant (e.g. /'venti/ 'twenty', /'kɔrpo/ 'body', /'kolpo/ 'blow') and /s/ (e.g. /'pasta/ 'pasta'); on the other hand, in some exceptional loanwords stops may seemingly appear in the coda, e.g. /'kɔpto/ 'Coptic', /at'lante/ 'atlas', /'kaktus/ 'cactus' (Krämer 2009: 139). Ulf sbjorninn (2017) analyses such combinations in a Government Phonology account as not real clusters but bogus clusters, with intervening empty V slots between the stops, which can occasionally be filled by vowel epenthesis (e.g. /pθs/icologa > /pis/icologa 'psychologist'). This analysis is confirmed by our Laboratory Phonology approach of the same cluster type: an acoustic experiment shows that Italian speakers tend to use various repair strategies in order to avoid singleton obstruents in the coda other than /s/. The most frequent strategies are schwa epenthesis (e.g. *cac[ə]tus*) and preconsonantal obstruent gemination (*te[k:k]nico* 'technician', *a[f:f]gano* 'Afghan'). The results indicate that non-sibilant codas are not handled without problems by Italian speakers (cf. Huszthy 2019: 108–125); for this reason, we allow only /sC/ here as a phonotactically well-formed obstruent cluster in the synchronic phonology of Italian.

In Italian /s/ undergoes a voicing process before voiced consonants, which we label here *preconsonantal s-voicing*, and the literature treats it as a form of RVA (Bertinetto 1999: 271; Bertinetto and Loporcaro 2005: 134; Krämer 2009: 209; Nespor 1993: 74–76; Schmid 2016: 483). The regular laryngeal outcomes of Italian /sC/ are shown in (2).

(2) Laryngeal outcomes of Italian /sC/ clusters

a. /s/+voiceless obstruent	b. /s/+voiced obstruent	c. /s/+sonorant
[sp]aro 'gunshot'	[zb]arra 'barrier'	[zm]ettere 'to stop'
[st]oria 'history'	[zd]egno 'disdain'	[zn]ello 'thin'
[sk]alo 'layover'	[zg]abello 'footstool'	[zl]itta 'sled'
[sf]era 'sphere'	[zv]eglia 'alarm clock'	[zr]otolare 'to unroll'

Most of Italian /sC/ clusters are word-initial, for several diachronic reasons.¹ In this position, /s/ appears as voiceless before voiceless obstruents

¹ One of the reasons is that /sC/ clusters were formed at the boundary of phonological words; more precisely, upon the concatenation of /s/-final derivational prefixes (e.g. *s-*, *bis-*, *cis-*, *dis-*, *mis-*, *tra(n)s-*, etc.; but among these *s-* is the most frequent) and consonant-initial lexical words, e.g. (It.) *s-* + *buco* 'hole' → [z]bucare 'to pop out', *dis-* + *gusto* 'taste' → di[z]gusto 'disgust'.

(as in 2a), while it is voiced before voiced obstruents (2b) and sonorants (2c).² Monomorphemic intervocalic /sC/ clusters are quite rare: they are voiceless if C is an obstruent, e.g. *pa[st]a* ‘pasta’, *a[sk]oltare* ‘to listen’; while /s/ is usually voiced before sonorants, e.g. *a[zm]a* ‘asthma’, but the voicing can also be optional. Word-internal /s/ plus voiced obstruent clusters only appear in loanwords, as we will see in Section 2, and in this case the voicing of /s/ is optional, too.

The input of the sibilant fricative is widely accepted to be voiceless (i.e. /s/), because [z] never appears word-initially before a vowel or word-finally in Italian (Nespor and Vogel 1986; Nespor 1993; Bertinetto and Loporcaro 2005; Krämer 2009). However, since the distinction [s]–[z] is not contrastive, or only marginally so in some varieties, underlying /s/ is most likely to be laryngeally underspecified, which is the same as voiceless in a privative account. Intervocalic /s/ is subject to s-voicing in all Northern Italian varieties, as well as in many Central and Southern Italian varieties through the influence of the Northern accents (cf. Krämer 2003, 2005, 2009: 207–218).

The laryngeal behaviour of Italian /sC/ does not seem very exceptional until this point compared to classical voice languages; still, plenty of phonological problems arise in connection with the phenomenon, even when compared to s-voicing in other Romance languages. In the following sections these peculiarities will be detailed and we will attempt to demonstrate that Italian preconsonantal s-voicing does not equal RVA.

2 The absence of RVA in Italian

Linguists dealing with Italian phonology notice that the synchronic characteristics of preconsonantal s-voicing do not exactly overlap with those of RVA in voice languages. The most important difference is that s-voicing occurs only within the domain of a single word, that is, it seems to be a lexical form of voice assimilation (Bertinetto 1999; Bertinetto and Loporcaro 2005; Nespor 1993; Nespor and Vogel 1986). Moreover, word-internally voiced obstruent clusters do not occur in Italian, except at the prefix-stem juncture and in loanwords, e.g. *di[zg]razia* ‘disgrace’, *fo[zɖʒ]ene* ‘phosgene’ (Krämer 2009: 209).

The voicing patterns in loanwords are particularly interesting, but phonological analyses of this kind are extremely rare in the literature. Muljačić (1972: 91) was the first to mention that Italian speakers do not apply RVA in loanwords which contain obstruent clusters other than /sC/, his examples are: *afgano* ‘Afghan’,

² Chart (2) could also include /s/+glide clusters, since /sw/ in loanwords tends to undergo s-voicing in word-initial position – this fact will be considered in Section 3.

substrato ‘substrate’, *abside* ‘apse’, *feldspato* ‘feldspar’ and *tungsteno* ‘tungsten’. However, Muljačić does not attribute any phonological relevance to these sporadic examples, and leaves them without an analysis; he calls these groups of obstruents “pseudo clusters”, because the juncture of the crucial consonants is often separated in the Italian pronunciation by a release or schwa epenthesis (i.e. these obstruent combinations behave as bogus clusters in Italian). Following Muljačić’s lead, a massive study was recently carried out in order to explore the laryngeal behaviour of loanwords in Italian (Huszthy 2016, 2019), whose results are summarised in the next subsections.

2.1 Data

The experiment this theoretical study is built on is a loanword test. The material of the corpus was prepared with 108 target loanwords and foreign proper names (each containing a marked consonant cluster, 42 of which had obstruents with differing input voice values, while 10 /s/ plus sonorant clusters)³ which were organised into 18 Italian sample texts. Some examples of target words are listed in Chart (3). The words illustrate different cluster types and combinations of various places of articulation, such as voiced stop (D) plus voiceless stop (T) and vice versa, clusters with fricatives and affricates, and also /sC/ clusters. The most typical realisations produced by the informants are given in the third column.

(3) Selected target words from the corpus

Cluster type	Target word	Most typical realisation
DT	<i>vodka</i>	[ˈvɔːdka]
	<i>sudcoreano</i> ‘South Korean’	[sudkoreˈaːno]
	<i>subcultura</i> ‘subculture’	[subkulˈtuːra]
	<i>ragtime</i>	[regˈtajmə]
	<i>Südttirol</i> ‘South Tyrol’	[sudtiˈrɔːlə]
TD	<i>catgut</i>	[katˈgatə]
	<i>McDonald’s</i>	[mekˈdɔːnald]
	<i>upgrade</i>	[apˈgrejdə]
	<i>footbal</i>	[ˈfutbalə]
	<i>Samppdoria</i>	[sampˈdɔːrja]
C + fricative	<i>gangster</i>	[ˈgaŋster]
fricative + C	<i>abside</i> ‘apse’	[ˈaːbside]
	<i>afgana</i> ‘Afghan, fem.’	[afˈgaːna]

3 The other marked control clusters (e.g. voiceless obstruent clusters) served for a comparison among the repair strategies used by the speakers, or served as distractors.

	<i>sovkh</i> oz	[ˈsɔːvkodz̩]
	<i>surf</i> boat	[serfˈbɔːt]
C + affricate	<i>ecz</i> ema	[ekˈdʒɛːma]
/sC/	<i>ice</i> berg	[ˈajsbergə]
	<i>James</i> Bond	[ˌdʒɛmsˈbondə]
	<i>silence</i> drive	[ˌsajləsˈdraːjvə]

The recording phase of the data collection was carried out on different occasions, in two soundproof studios: at the Research Institute for Linguistics in Budapest, and at the Laboratorio di Linguistica “Giovanni Nencioni” of the Scuola Normale Superiore di Pisa. 15 informants participated in the experiment, all undergraduate or postgraduate students, who were selected from different dialectal zones of Italy. Information about the participants is given in Chart (4).⁴

(4) The informants of the experiment

Informants from	Male	Female	Age average	Total
Northern Italy	1	3	23.25	4
Central Italy	1	5	29.16	6
Southern Italy	2	3	26.8	5
Total	4	11	26.4	15

The participants’ dialectal heterogeneity was an important criterion of the data collection, since the aim was to compare different dialectal accents of Italian from the point of view of laryngeal activities. Two of the 4 Northern Italian informants are from Emilia-Romagna, one comes from the province of Verona, while the northernmost speaker is from the province of Trento. Two of the 6 Central Italian informants are from Pisa, 3 are from Rome (the dialectal accent of Rome is considered here a central accent, even if some Italianists consider it central-southern), while another informant comes from Nuoro, Sardinia (she is also considered central for convenience, even if Sardinian accents markedly differ from all other dialectal accents of Italian; her laryngeal results, however, fit among the Central Italian ones). Among the 5 Southern Italian informants 2 are from Southern Calabria (the province of Vibo Valentia), 2 from Naples and one from Northern Apulia (the province of Foggia).

The speakers were recorded alone in a soundproof cabin, with a high quality head microphone. They were asked to read out loud the texts which appeared on

⁴ Given that the informants were all highly educated, all spoke at least one language other than Italian, and they also belonged to the younger generation, someone could expect from them to produce realisations of the test words that are more faithful to the source, i.e. with disagreeing clusters and without vowel epenthesis. However, we must note that these clusters in the source languages are not disagreeing in voice, unlike in the Italian pronunciation (cf. Section 2.2).

the screen, in their normal speech tempo. Each sample text appeared five times, so the procedure took approximately half an hour per person. The files were handled and processed for acoustic and statistical analysis with Praat, Excel and R. Two spectrograms illustrating the results are shown below – in (5) the target word is *vodka*, in (6) the target word is *iceberg*.

(5) Italian pronunciation of the target word *vodka*

(6) Italian pronunciation of the target word *iceberg*

The acoustic analysis of the data clearly shows that the perfect adjacency of voiced and voiceless obstruents is entirely possible in the Italian pronunciation of loan-words, even when the first member of the cluster is /s/.

The figure in (5) shows the most typical Italian pronunciation of *vodka* occurring in the corpus, with a relatively lengthened mid-open [ɔ] in the stressed syllable, and no assimilation (or any kind of repair strategy) between the two stops. Both the waveform and the spectrogram testify the positive voice value of [d] and the negative voice value of [k]. The informant cited above is from Emilia-Romagna (Mirandola), which is also important because of the fact that Emilian dialects allow highly marked obstruent clusters and RVA (cf. Cavarani 2018; Cavarani and Hamann under review); however, the Emilian speaker of the study did not apply RVA in Standard Italian.

In the target word *iceberg* in figure (6) we can observe a voiceless [s] testified by the empty voice bar on the bottom of the spectrogram, which is followed by a voiced [b], showing quasiperiodic waves and a positively filled voice bar. The transition between the segments is absolutely smooth, no schwa epenthesis or silence breaks the contact between the obstruents. This realisation of the /sb/ cluster is quite surprising, even compared to the literature of Italian phonology itself, in which /sC/ clusters are claimed to undergo RVA. Further spectrograms are available in Huszthy (2019).

2.2 Statistics

Realisations like those shown in the previous section are not unique in the corpus. The overall statistics reveal that the 15 Italian informants retain the underlying voice values in the respective obstruent clusters in 65% of the cases; that is, they avoid RVA in a two-thirds majority, which characterises the performance of all the informants rather evenly. The only slight variation is found in geographical terms: Southern Italian speakers (cf. Chart (4)) avoid RVA somewhat more systematically than speakers coming from Northern or Central Italy, but even the “most repairing” informants of the study retain voice values in more than 50% of the clusters. The distribution of the speakers’ solutions is shown in Diagram (7).

(7) Repair strategies occurring in the 1,685 target obstruent clusters

The pie chart in (7) includes the pronunciation variants of 32 target words containing non-/sC/ obstruent clusters (some of which are listed in Chart (3)). In total 1,685 relevant clusters are counted, from which 1,098 are realised with the preservation of the underlying voice values (65% of “NoVA”). It cannot be said that voice assimilation is absent in the dataset; in fact, in 24% of the occurrences the adjacent obstruents share voice values. However, if we zoom into this phenomenon, we only find 4% of *regressive voicing* (“RVA-voi”, e.g. *football* [db]), while the rest of such clusters is voiceless, by *regressive devoicing* (11% of “RVA-dev”, e.g. *vodka* [tk]) or by *progressive devoicing* (9% of “PD”, e.g. *football* [tp]).

According to the claims of LR, only regressive voicing is true phonological evidence for RVA, since what appears to be devoicing may not be the result of a process at all but the realisation of an underlying voiceless segment which surfaces unchanged in the absence of passive voicing – stemming from the lack of a source element (Balogné Bércecs and Huber 2010). This is the laryngeal

characterisation of aspiration languages in the LR typology: they may seem to exhibit “bidirectional devoicing” (analysed as such on the basis of, for instance, the spelling of the words);⁵ instead, they are analysed as having voiceless unaspirated lenis and voiceless aspirated fortis underlyingly, with no true laryngeal activity; therefore, the “devoicing processes” they appear to display are not processes at all, since the voiceless forms are not derived but underlying (cf. Balogné Bérces and Huszthy 2018).

Among the repair strategies used by the Italian informants of this study, regressive voicing is the least preferred solution; that is, a mere 4% of the relevant clusters provide really hard evidence that RVA is indeed at work. The speakers also use other strategies in order to resolve the marked clusters (11% of “Other”); for instance, deletion (e.g. *gangster* /ngs/ → [ns]) and metathesis (e.g. *röntgen* → r[nt]e[ŋg], *catgut* → ca[t:]u[g]), but unique mispronunciations are also classified into this category (e.g. *ginkgo* → [ˈdʒɪŋkudəgo], *backslash* → [bakˈʃalʃ]), *Bildungsroman* → [ˈbilɡusman]. Furthermore, schwa epenthesis also arises as a repair strategy, but it is not included in Diagram (7), since it may co-occur with other strategies, between obstruents of identical voice values as well. Epenthetic schwas appear in 16% of all pronounced clusters (e.g. *ab*[ə]*side*, *up*[ə]*grade*).

To conclude, in the vast majority of potential RVA contexts the adjacent obstruents surface in the Italian informants’ pronunciation with differing voice values and without repair strategies. Further statistical issues – regarding sociolinguistical and dialectal differences among the informants, token frequency effects, etc. – are available in Huszthy (2019).⁶

3 RVA versus Italian preconsonantal s-voicing

On the basis of the data presented in Section 2 we can draw several phonological conclusions. First of all, we aim to model a theoretical separation between the RVA of classical voice languages and Italian preconsonantal s-voicing. In fact, if we compare these phenomena in phonological terms, we find essential differences at

⁵ What we mean here is that an analysis taking a fully voiced [b] as the input, simply because it is spelt with letter B, in *football* and *obtain*, will identify left-to-right assimilation in the former (/tb/ → [tp]) and right-to-left assimilation in the latter (/bt/ → [pt]).

⁶ The corpus was supplemented by a control group of five Hungarian informants, fluent speakers of Italian as L2, who were recorded reading out the Italian sample texts of the corpus. Foreign accents appropriately reflect the laryngeal phonology of L1, and since Hungarian is a classical voice language, obstruent clusters are supposed to undergo RVA in the Hungarian foreign accent, too. In fact, the Hungarian control informants produced sharply different results compared to the Italians, and applied RVA in 81% of the obstruent clusters, as opposed to the Italians’ 15% of RVAs.

every level of the comparison: in the input, in the trigger, in the domain of application and in the obligatory versus optional character of the processes, as shown in Chart (8).

(8) General comparison between RVA and Italian preconsonantal s-voicing

	RVA	Preconsonantal s-voicing
a. Input:	Any obstruent	Only sibilant fricatives
b. Trigger:	Segments with distinctive voice (obstruents)	Any voiced consonantal segment
c. Domain:	The utterance (postlexical)	The phonological word (lexical)
d. Occurrence:	Obligatory	Optional (except word-initially)

First we will take a closer look at the inputs (8a) of Italian preconsonantal s-voicing as compared to RVA. In the native vocabulary of Italian all voiced obstruent clusters begin with [z] (cf. (2b)). This fact may have various phonological interpretations (see Section 4), including the hypothetical underlying nature of /z/ (cf. Section 4.1), but for now we will handle the appearance of [z] as the result of a process. As we have seen in the previous section, other obstruent clusters occurring in the non-native vocabulary do not share voicing. Accordingly, if the voicing of /s/ is induced by a process, this voicing process does not target obstruents other than /sC/.

We must immediately extend this claim to the class of *sibilant fricatives*. Italian dialects and regional accents present a broad phonetic variety of sibilant fricatives, and dialectal studies reveal that any sibilant fricative may undergo voicing, both in preconsonantal and in intervocalic position (cf. Rohlf 1966; Huszthy 2017, 2019). So does, for instance, the alveo-palatal [ç], which is widespread in northern varieties (examples from the substandard spoken in Bologna: *sposa* ‘bride’ [ˈçpoːza], *sgamato* ‘sly’ [zɡ]), or the palatal [j] of central-southern varieties, which appears in the place of etymological /s/ through a palatalisation process in preconsonantal position (examples from the substandard spoken in Naples: *sbirro* [ɟb] ‘policeman’, *sviluppo* [ɟv] ‘development’).⁷

The voicing of the preconsonantal [j] may also arise in loanwords of Standard Italian, especially before sonorants, e.g. *kalashnikov* [ɟn], *krishna* [ɟn], etc. (Huszthy 2019). Apart from sibilant fricatives, other obstruents in loanwords do not undergo voicing in the standard (or substandard) Italian pronunciation (cf. the data presented in Section 2). However, the regular voicing patterns which

⁷ The palatalisation of preconsonantal /s/ is not only a diachronic process in Southern Italian dialects, it is still active in synchrony, which is attested by intraspeaker variation in the substandard varieties between [s, z] and [j, ɟ] (Huszthy 2017).

characterise RVA concern any obstruent, and apparently other Romance languages perform RVA in loanwords, too (cf. the Spanish example in (1a)). In conclusion, if we consider Italian preconsonantal s-voicing a form of voice assimilation, it appears to be an unusually restricted instance of it, which applies only for sibilant fricatives.

From a phonological point of view RVA may only arise between consonants contrastive for [voice]; that is, both its inputs and its triggers are obstruents. Certain phonological frameworks, like *Element Theory* (ET) (cf. Backley 2011; Harris 1994), cannot even capture presonorant voicing as assimilation: since sonorants are not specified for voice, they cannot act as triggers of RVA; in ET terms, they cannot induce L-spreading. Accordingly, presonorant voicing is phonologically problematic, still we find it in various languages, such as in several Spanish varieties (Colina 2009; Schmidt and Willis 2011), in Slovak (Blaho 2008; Bárkányi and G. Kiss 2015), in West Flemish (Strycharczuk 2012; Strycharczuk and Simon 2013) and in Cracow Polish (Gussmann 1992; Rubach 1996). Cyran (2012) analyses the phenomenon in the latter case as basically phonetic (passive voicing), and only partly systemic (phonological). Sonorants are handled as underspecified for [voice] in other theories as well (contrastive underspecification), and they are presumed to get a voicing feature (value) only at the surface (cf. Avery and Rice 1989).

In Italian, sibilant fricatives may undergo voicing before any consonantal segment, sonorants included (cf. (2c) and (8b)). Presonorant s-voicing is often triggered by the glide [w] as well, mostly word-initially, such as in loanwords like *swimming* [zw], *suite* [zw], *swing* [zw], *swatch* [zw] (Huszthy 2017, 2019). On the basis of the triggers (or the context), we can distinguish three types of s-voicing in Italian phonology: preobstruent, presonorant and intervocalic. Out of these, only the first one could be conciled with the phonological requirements of RVA, but it is also the least frequent phenomenon of the three, and it has further phonological irregularities as well.

The domain of application (cf. (8c)) of each kind of s-voicing appears to be the phonological word in Italian. The analysis of intervocalic s-voicing (typical of northern Italian varieties but increasing in the central and southern accents, too) is a major argument to distinguish the prosodic word in Nespor and Vogel (1986); however, Krämer (2003, 2005, 2009)'s OT-analyses of morpheme-juncture voicing point out that the phenomenon can also be accounted for even without crucial reference to the prosodic word. We cannot make the same claim about preconsonantal s-voicing, at least in synchrony. From a diachronic point of view, most of the Italian /sC/ clusters were formed at the boundary of phonological words: /s/-final derivational prefixes (e.g. *s-*, *bis-*, *cis-*, *dis-*, *mis-*, *tra(n)s-*, etc.) and consonant-initial lexical words, e.g. *s-* + *buco* 'hole' → [z] *bucare* 'to pop out',

bis- + *nonno* ‘grandfather’ → *bi[z]nonno* ‘great-grandfather’, *dis-* + *gusto* ‘taste’ → *di[z]gusto* ‘disgust’, *tras-* + *bordo* ‘side of a ship’ → *tra[z]bordo* ‘trans-shipment’. The fact that such words regularly underwent s-voicing indicates that this voicing process was diachronically different than in synchrony. However, we propose that the status of Italian preconsonantal s-voicing has changed, and it is not working anymore as RVA.

RVA found in voice languages is typically a postlexical process, viz., “it applies across any type of boundary as long as no pause intervenes” (Siptár and Törkenczy 2000: 198); in other words, the domain of application of RVA is the phonological utterance (Nespor and Vogel 1986: 229–230). On the other hand, several /s/-final well integrated loanwords show that Italian preconsonantal s-voicing does not take place at the word boundary in synchrony, e.g. *rebus difficilissimo* [sd] ‘a very hard riddle’, *autobus bianco* [sb] ‘white bus’ (Nespor 1993: 74); *lapis blu* [sb] ‘blue pencil’ (Bertinetto 1999: 271); further examples from the corpus of this study: *Agnu[s] Dei* ‘Lamb of God’, *Jame[s] Bond*, *Pier[s] Bro[z]nan*, (Italian accented) *I[z]la[s] Balears* ‘Balearic Islands’ (Huszthy 2019). The voicing of /s/ is often blocked at the edge of compound words as well, e.g. *gasdotto* [sd] ‘pipeline’ (Bertinetto 1999: 280), *iceberg* [sb] (Huszthy 2019); etc. Accordingly, the domain of application of preconsonantal s-voicing seems indeed to be the phonological word in Italian, which creates a further problem in its phonological categorisation as a form of RVA.

The last aspect in the comparison of RVA and preconsonantal s-voicing (8d) is in part linked to their domain of application (8c). RVA, being postlexical, is considered obligatory, i.e. exceptionless, in phonological terms.⁸ Preconsonantal s-voicing is consistent word-initially in Italian (cf. the examples of Chart 2); however, it appears to be optional word-internally. For instance, in our corpus the loanword *slash* is regularly pronounced by the speakers with [z], but in the compound word *backslash* the voicing process in the same cluster is optional.⁹

⁸ Obviously, from a phonetic point of view we can always find exceptions, i.e. occurrences of not (or partially) realised RVA in voice languages, especially in spontaneous speech or when the obstruent clusters are interrupted by pauses (Markó et al. 2010). In such cases statistical analyses may help the orientation of phonologists; for instance, the Hungarian control group of the corpus of this study (cf. footnote 6) also left obstruent clusters without RVA, but only in 4% as opposed to the 65% of the Italian informants (Huszthy 2019).

⁹ The Italian pronunciation of *backslash* with the [kzl] cluster (Huszthy 2019) is particularly interesting in our case. In this kind of realisation we find presonorant s-voicing (/sl/ > [zl]), but we do not find RVA between [z] and [k]. If s-voicing were induced by voice spreading (namely RVA), the [voice] of [z] should also spread to [k], but it does not. In our corpus (cf. Section 2) only two Italian resolutions appear to realise the /ksl/ cluster in *backslash*: [ksl] and [kzl], i.e. the variant *[gzl] is entirely absent, the only realisation which would testify the effect of RVA.

Similarly, s-voicing is optional in new loanwords as well, like in *facebook* [sb]~[zb], *frisbee* [sb]~[zb], *baseball* [sb]~[zb] (Huszthy 2019). Apart from the word-initial cases, preconsonantal s-voicing seems a tendency rather than a “rule” in the synchronic phonology of Italian.

On the basis of the experiment presented in Section 2 and the argumentation of this section we claim that Italian phonology does not have classical post-lexical “across-the-board” RVA in synchrony. The process of preconsonantal s-voicing might also be seen as a morphologically conditioned, heavily restricted instance of RVA, but we will consider it a distinct phonological phenomenon, supported by the OT-analyses of the following section.

4 Proposals for phonological analysis

The phenomena compared in the previous section may be subject to various phonological analyses, in different frameworks. Huszthy (2019) aims to point out that even “contradictory” theoretical approaches may be adequate to capture the unusual behaviour of Italian laryngeal phonology, like *Element Theory* (ET) and classical *Optimality Theory* (OT) (Prince and Smolensky 2004 [1993]) – in different ways, though (about the possibilities to reconcile representation based and computation based theoretical models cf. Balogné Bérces and Honeybone 2020).

In terms of ET Italian is usually considered an L-language (i.e. voice language), as all Romance languages. However, the Italian data strongly suggests that Italian is entirely suitable to be handled as an aspiration language. The main motivation for this idea is the absence of L-spreading in Italian phonology (i.e. the lack of RVA), and the mild aspiration found in Italian voiceless stops, whose values fall between the standard VOT means measured for voice languages and aspiration languages (cf. Nodari 2015; Sorianello 1996; Stevens and Hajek 2010a, 2010b). In the ET approach preconsonantal s-voicing cannot be explained through L-spreading, mostly because s-voicing may also happen in presonorant position. Sonorants do not have an active L-element, since they are not specified for voice, so they cannot induce L-spreading. In this interpretation the presonorant appearance of [z] is either phonetic or underlying, but it is certainly not based on RVA. An accurate ET analysis of the phenomena is beyond the scope of this paper (for further details cf. Balogné Bérces and Huszthy 2018; Huszthy 2019). Instead, we will focus here on the development of the OT-analyses, remaining on the ground of the classical hypothesis considering Italian a voice language.

In an OT account RVA is the result of two high ranked constraints: a markedness constraint (9a), which requires obstruent clusters to agree in their voice value, and a positional faithfulness constraint (9b), which requires *presonorant* obstruents to be faithful to their underlying voice specifications (the term “presonorant” refers here to both sonorants and vowels). Since the presonorant obstruent is the rightmost of the cluster, the assimilation will always be regressive (cf. Blaho 2003; Kenstowicz et al. 2003; Lombardi 1999; Petrova et al. 2006; Rubach 2008).

(9) Constraints in voice agreement

- a. AGREE(VOICE): Obstruent clusters should agree in [voice].
- b. IDENTPRESONORANT(VOICE): Obstruents preceding [+sonorant] segments (including vowels) should be faithful to their input with respect to [voice].
- c. IDENT(VOICE): Output correspondents have the same specification for [voice] as input correspondents.
- d. *VOICE: Voiced obstruents are prohibited.

Constraints (9a) and (9b) have various forms in the literature, with different labels and phrasings; e.g. (9a) is also used as UNIFORMITY (Kenstowicz et al. 2003) or VOICE ASSIMILATION (Rubach 2008); while (9b) is often replaced by IDENTONSET(VOICE), requiring onset obstruents (which are also rightmost in a cluster) to be faithful to underlying voice specifications (cf. Brown 2016; Krämer 2000; Lombardi 1999; Wetzels and Mascaró 2001). Notwithstanding these differences, the concepts behind are basically the same, implying regressive voice agreement among obstruents; we will use the variants (9a) and (9b) in this paper.

Brown (2016: 399) provides a basic typology of voice agreement based on the distribution of the four constraints in (9). In languages where *VOICE is first ranked, we do not find voicing contrast, such as in Hawaiian. In classical voice languages AGREE(VOICE) and IDENTPRESONORANT(VOICE) are higher ranked than IDENT(VOICE) and *VOICE, so we get RVA; for instance, in Hungarian we find RVA and voicing contrast because of a ranking (9a), (9b) » (9c) » (9d); on the other hand, in Dutch we find RVA and final devoicing because of a ranking (9a), (9b) » (9d) » (9c).

Brown (2016: 401) also identifies a pattern with no RVA at all (called “unrestricted voice”), when faithfulness dominates markedness; i.e. IDENT(VOICE) precedes AGREE(VOICE) in the ranking. In such languages (e.g. in Berber and Khasi) mixed-voice clusters can surface intact, so voice disagreement is allowed or even favoured. The situation of the synchronic laryngeal phonology of Italian is similar to this pattern, as we will see in the following subsections.

4.1 The absence of RVA

In the perspective of OT the synchronic phonology of Italian is seen as *conservative*, which is mainly manifested in tendencies of “input preservation”. Diachronic strategies of obstruent deletion or place assimilation are no longer productive in Italian; instead, speakers tend to extend new input forms (loanwords) in order to avoid deletion processes or assimilations between obstruents (cf. Huszthy 2019).¹⁰

Two typical Italian repair strategies to satisfy these requirements are schwa epenthesis and preconsonantal obstruent gemination: speakers often add additional segments to the input forms rather than deleting an obstruent or a feature of it, e.g. *vodka* [ˈvɔdːəkə], *eczema* [ekːəˈdʒɛːma], etc. (cf. Section 2). These two strategies heavily affect the foreign accent of Italian speakers as well (cf. footnote 10; Huszthy 2019).

In terms of OT this kind of “phonological conservatism” means that faithfulness constraints responsible for input preservation are very high ranked in synchronic Italian phonology, especially MAX-IO (10a), which requires every input segment to be present in the output as well (cf. Kager 1999). On the other hand, the opposite faithfulness constraint, DEP-IO (10b) is much lower ranked, thus allowing insertion processes like schwa epenthesis and preconsonantal obstruent gemination. Constraints (10c), (10d), (10e) and (10f) derive from Brown (2016) and will be discussed later.

- (10) Input-output maximization and dependence constraints
- a. MAX-IO: Every segment in the input has a correspondent in the output.
 - b. DEP-IO: Every segment in the output has a correspondent in the input.
 - c. MAX(VOICE): Input [voice] is present in the output as well.
 - d. DEP(VOICE): Output [voice] is present in the input as well.
 - e. MAX(VOICE)_{ONS}: Input [voice] in the onset is present in the output as well.
 - f. DEP(VOICE)_{ONS}: Output [voice] in the onset is present in the input as well.

¹⁰ These strategies were popular in the diachronic phonology of Italian, cf. the Latin word *abstractus* ‘abstract’ (→Italian *astratto*) where both processes take place, also mentioned in Section 1.3. However, in the synchronic phonology of Italian such repair strategies are not productive anymore, which is clearly manifested in the current Latin pronunciation of Italian speakers, who often tend to extend ill-formed clusters, rather than deleting any segment, e.g. Lat. *abstractus* → Italian accented [abːəˈstrakːətus].

In classical voice languages $\text{AGREE}(\text{VOICE})$ (9a) is assumed to be higher ranked than $\text{IDENT}(\text{VOICE})$ (9c), so RVA happens between differently voiced adjacent obstruents. Apparently, in Italian their order is the opposite, so RVA cannot apply, and underlying voice values surface unchanged in the output forms (similarly to the “unrestricted voice” pattern of the Brown-typology, cf. Section 4). The tableau in (11) below illustrates the absence of RVA in non-/sC/ obstruent clusters. Only one ranking difference is relevant here for the time being: (10a), (9b), (9c) » (9a), (10b), (9d); other rankings are still unspecified.

(11) The absence of RVA in Italian

a. <i>vo/dk/a</i>	MAX-IO	IDENT PRESON(VOI)	IDENT (VOI)	AGREE(VOI)	DEP-IO	*VOICE
[tk]			*!			
[dg]		*!	*			**
[d̪k]				*		*
[k]	*!					
[k:]	*!		*		*	

b. <i>foo/tb/all</i>	MAX-IO	IDENT PRESON(VOI)	IDENT (VOI)	AGREE(VOI)	DEP-IO	*VOICE
[db]			*!			**
[tp]		*!	*			
[t̪b]				*		*
[b]	*!					*
[b:]	*!		*		*	**

The tableau in (11) is meant to reveal the main difference between Italian and regular voice languages: the reverse order of the faithfulness and the markedness constraints for [voice] ($\text{IDENT}(\text{VOI})$ » $\text{AGREE}(\text{VOI})$), otherwise the winning candidates would be *vo[tk]a* and *foo[db]all* (like, for instance, in Slavic languages and in Hungarian). The analysis also shows that the ranking between MAX-IO and DEP-IO has changed in the synchronic phonology of Italian, and now forms with deletion or place assimilation are punished, while forms with schwa epenthesis (like *vo[dək]a*) would also be optimal.

We will now consider Brown (2016)’s MAX and DEP constraints specified for [voice]. Note that (10c) and (10d) replace (9c), while (10e) and (10f) replace (9b); since the bidirectional faithfulness constraint IDENT is distinctly expressed through input defence and output defence. Given these constraints, Brown (2016: 412) establishes a typology of eleven laryngeal patterns which result from 720 possible rankings. In classical voice languages which exhibit regular RVA, $\text{AGREE}(\text{VOICE})$, $\text{MAX}(\text{VOICE})_{\text{ONS}}$, and $\text{DEP}(\text{VOICE})_{\text{ONS}}$ are higher ranked than MAX(VOICE) and DEP(VOICE), which practically equals the former ranking $\text{AGREE}(\text{VOICE})$, IDENTPRESONORANT(VOICE)

» IDENT(VOICE). The absence of RVA in Italian can also be expressed through these constraints: MAX(VOI), MAX(VOI)_{ONS}, DEP(VOI), DEP(VOI)_{ONS} » AGREE(VOI), *VOICE. This ranking is identical to Brown (2016: 412)'s "unrestricted voice" pattern, with possible voice disagreement. For now, however, we do not need these specifications in order to explain the conservative behaviour of Italian synchronic phonology. Two ranking settings are enough: MAX-IO dominates DEP-IO and IDENT(VOICE) dominates AGREE(VOICE), as in tableau (11); that is, input obstruent clusters surface intact in the output.

At the same time, this analysis does not solve all of our problems, since it leaves preconsonantal s-voicing without an explanation. As Cavarani and Hamann (under review) note, in Standard Italian coronal sibilants in coda position undergo a process that looks like RVA; however, the fact that coronal sibilants are the only segments that regularly become voiced in Italian (also before sonorants), rather supports a distinction between /s/ and the other obstruents, the former representing a special segment, as recognised by extensive typological and theoretical literature.

Fundamentally, three possibilities emerge in OT to capture Italian preconsonantal s-voicing, which will be developed in the next subsections; first, if we take /z/ as underlying (Section 4.2); second, if we handle s-voicing as a derived but strictly conditioned process at the level of syllable structure (Section 4.3); third, if we consider the voicing of /s/ passive, i.e. not phonological but phonetic (Section 4.4).

4.2 Voiced input

The analysis of Italian preconsonantal s-voicing is problematic in OT, especially when we aim to treat it simultaneously with the absence of RVA. A straightforward and plausible way out of the whole problem is to presume that preconsonantal [z] on the surface is in fact /z/ underlyingly; however, in this case we cannot talk about a process of s-voicing at all.

In the tableau in (12) three Italian words are confronted: *abside* 'apse' on the one hand, which presents the regular pattern of lacking RVA in a /Cs/ cluster, and *sbarra* 'barrier' and *asma* 'asthma' on the other, with a preobstruent and a presonorant /sC/ cluster. Constraints used in (11) are unchanged, but the irrelevant ones are left out from the tableau.

(12) Analysis with underlying /z/

a. <i>a/bs/ide</i>	IDENT(VOI)	AGREE(VOI)	*VOICE
[ps]	*!		
[bz]	*!		**
<i>☞</i> [bs]		*	*

b. <i>/zb/arra</i>	IDENT(VOI)	AGREE(VOI)	*VOICE
[sp]	*!*		
<i>☞</i> [zb]			**
[sb]	*!	*	*

c. <i>a/zm/a</i>	IDENT(VOI)	AGREE(VOI)	*VOICE
<i>☞</i> [zm]			*
[sm]	*!		

The assumption of the underlying /z/ is common in OT-analyses concerning the presonorant appearance of [z] (cf. Beckman et al. 2013; Lombardi 1999; etc.). However, this option is not completely satisfactory in the case of Italian, where /z/ generally is not presumed to be phonemic (Huszthy 2019).¹¹

Furthermore, even if the underlying /z/ explains the invariable cases, such as the word-initial and the morpheme-internal positions (as in (12b) and (12c)), it says nothing about the free variation cases (as in *iceberg* [sb]~[zb] and *frisbee* [sb]~[zb]), and it also goes against the OT idea of *Richness of the Base*, since it implies a specific restriction on the input (cf. Kager 1999: 19; also cf. Section 4.4). Although this would be a straightforward and plausible way out of the whole problem, it would also be the most simplifying and the least interesting solution, so we leave it out of consideration in this paper.

4.3 Tautosyllabic voicing

The second possibility to analyse Italian preconsonantal s-voicing is through syllable structure. The idea is that the cases which show alternation (like *iceberg*) can be ascribed to the vacillating syllabification of the relevant items. In fact, several phonological arguments suggest that word-internal /sC/ clusters can be

¹¹ /z/ seems to be phonemic only in Tuscan varieties, but only a few minimal pairs can be found which are questionable, too. Most importantly, *pre[s]ento* ‘to have a presentiment, 1sg’ versus *pre[z]ento* ‘to present, 1sg’. However, the verb *pre[s]entire* ‘to have a presentiment’ includes two phonological words (*pre+sentire*) – i.e. /s/ is initial and as such, it could not appear as [z] –, while the verb *pre[z]entare* ‘to present’ forms a single phonological word, so /s/ undergoes intervocalic s-voicing (cf. Nespor and Vogel 1986: 128). For further arguments against the phonemic status of [z] (cf. Huszthy 2019).

parsed as both heterosyllabic and tautosyllabic in Italian phonology (Bertinetto 1999, 2004; Huszthy 2019; Marotta 1995). By way of the potential tautosyllabicity of /sC/, we add Baković (2005)’s AGREETAUTOSYLLABIC(VOICE) constraint (13a) to our constraint set. In such a way, we may obtain an explanation for the regularity of word-initial s-voicing, and the optionality of word-internal s-voicing, since when /sC/ is parsed as heterosyllabic, the voicing process is not activated.

In the following analysis a further constraint will be introduced, which is related to the *coda condition* for Italian (cf. Section 1.3). According to Krämer (2009: 138), a coda consonant in Italian may only be a sonorant /l, m, N, r, j, w/, half of a geminate consonant and /s/. However, the CODACONDITION constraint used here (13b) does not allow /s/ in the coda; i.e. it punishes any singleton coda obstruent. Note that if we handle the Italian coda condition as a violable OT-constraint, we do not need to allow /s/ in the coda so as to accept the possible heterosyllabicity of /sC/.

(13) Additional constraints

- a. AGREETAUTOSYLLABIC(VOICE): Tautosyllabic obstruent sequences must have the same specification for [voice].
- b. CODACONDITION(ITALIAN): A coda consonant is a sonorant or the half of a geminate.

The tableau in (14) shows the analysis of the words *iceberg* /ajsberg/ and /sb/arra ‘barrier’, syllable boundaries in the candidates are marked by dots. By the addition of the new constraints the ranking seen in (11) changes as follows: MAX-IO, AGREETAUTO(VOI) » IDPRESON(VOI) » ID(VOI), CODACOND » AGREE(VOI), DEP-IO, *VOICE.

(14) Analysis through syllabification

a. /ajsberg/	AGREETAUTO(VOI)	IDPRESON(VOI)	ID(VOI)	CODACOND
[ajs.berg]				**!
☞ [ajs.ber.gə]				*
[aj.sber.gə]	*!			
☞ [aj.zber.gə]			*	
[ajz.ber.gə]			*	*!
[ajs.per.gə]		*!	*	*

b. /sb/arra	AGREETAUTO(VOI)	IDPRESON(VOI)	ID(VOI)	CODACOND
[sp]		*!	*	
☞ [zb]			*	
[sb]	*!			

The word-internal /sC/ cluster in (14a) has two winning candidates, with s-voicing when tautosyllabic ([aj.zber.gə]) and without when heterosyllabic ([ajs.ber.gə]). The variant without final schwa insertion ([ajs.berg]) is punished by the coda condition, as is the candidate with heterosyllabic s-voicing

([ajz.ber.gə]), because it also violates the $\text{ID}(\text{VOI})$ constraint at the same ranking level. Alternatives with progressive devoicing (such as [ajs.per.gə]) are punished by the $\text{ID}_{\text{PRESON}}(\text{VOI})$ constraint. The candidate with tautosyllabic /sC/ and without s-voicing ([aj.sber.gə]) fails by the newly introduced $\text{AGREE}_{\text{TAUTO}}(\text{VOI})$ constraint. Finally, in the case of (14b) only one candidate may be optimal, since the cluster is word-initial: the one with s-voicing ([zb]arra).

However, the analysis developed in (14) is problematic again: it can only be applied to clusters of *obstruents*, so it cannot explain presonorant s-voicing. At the same time, preconsonantal s-voicing seems to be more consistent before sonorants than before voiced obstruents, while other tautosyllabic clusters (like TR) do not undergo voicing in Italian. There are also further arguments which weaken the efficacy of the analysis in (14); for instance, the syllabification of /sC/ clusters is apparently unpredictable in Italian (Bertinetto 2004), so we cannot surely connect s-voicing to the tautosyllabicity of /sC/. A good argument is stressed vowel lengthening in open syllables. In Italian stressed syllables must be heavy, but syllable weight is maximised in two morae (Krämer 2009: 179). When the stressed vowel undergoes lengthening before /sC/, we may suspect that the cluster is tautosyllabic, e.g. ['a:zma]; when it does not, the cluster is probably heterosyllabic, e.g. ['azma] (cf. Huszthy 2019). The problem is that s-voicing may happen in both cases.

We can also develop the analysis with the aid of Brown (2016)'s $\text{MAX}/\text{DEP}(\text{VOICE})$ constraints (10c–f). The updated constraint ranking is the following: $\text{AGREE}_{\text{TAUTO}}(\text{VOI}) \gg \text{MAX}(\text{VOI})_{\text{ONS}}, \text{MAX}(\text{VOI}) \gg \text{DEP}(\text{VOI}), \text{CODA}_{\text{COND}} \gg \text{AGREE}(\text{VOI}), \text{DEP}(\text{VOI})_{\text{ONS}}, * \text{VOI}$. With these settings we get one optimal output: if the input is /sb/, the winning candidate is [s.b] in a heterosyllabic form (as in the case of any other obstruent cluster); if the input is /zb/, the winning candidate is [zb] in a tautosyllabic form. So, this approach cannot account for [sC]–[zC] variation and for the influence of syllabification on s-voicing. If we combine the proposals of Section 4.2 and Section 4.3, and take /z/ as underlying before voiced consonants, we can also ignore the highly marked $\text{AGREE}_{\text{TAUTO}}(\text{VOI})$ constraint, since the high ranked $\text{MAX}(\text{VOI})_{\text{ONS}}$ eliminates the tautosyllabic [s]+voiced consonant clusters; but, this analysis predicts that /zC/ clusters are tautosyllabic.

4.4 Phonological versus phonetic voicing

It seems quite challenging to find a proper solution to simultaneously analyse the absence of RVA, the consistent word-initial s-voicing and the optional word-internal s-voicing, with respect to the difference between preobstruent and presonorant s-voicing as well. In order to come closer to such a solution, we

separate the phonological and the phonetic nature of voicing, and we suppose that preconsonantal /s/ may surface in Italian as a delaryngealised [S], which may undergo passive voicing in the phonetics (for similar approaches of delaryngealised obstruents which undergo passive voicing in intersonorant position cf. Broś 2018; Strycharczuk 2012; Strycharczuk and Simon 2013). Accordingly, in the next tableau (16) further candidates will be introduced, which contain [S] without a laryngeal specification, while related constraints will also be used (15).

- (15) Additional constraints (Lombardi 1999)
- a. *LAR: Obstruents must have no specification for voice.
 - b. IDENT(LAR): The input laryngeal specification must be preserved in the output.

The constraints introduced in (15) are lower ranked than AGREE(VOI), and to ensure delaryngealisation we also must rank *LAR higher than IDENT(LAR) (cf. Broś 2018). The current ranking used in (16) is: IDENT PRESON(VOI) » IDENT (VOI) » AGREE(VOI) » *LAR » IDENT(LAR), whose effects are shown on a preobstruent (16a) and on a presonorant (16b) /sC/ cluster.

(16) Analysis with laryngeally unspecified [S]

a. /sb/	IDENT PRESON(VOI)	IDENT (VOI)	AGREE(VOI)	*LAR	IDENT(LAR)
[sb]			*!	**	*
[zb]		*!		**	*
[sp]	*!	*		**	*
☞ [Sb]				*	*

b. /sn/	IDENT PRESON(VOI)	IDENT (VOI)	AGREE(VOI)	*LAR	IDENT(LAR)
[sn]				*!	
[zn]		*!		*	*
☞ [Sn]					*

The voicing of preconsonantal /s/ is not an option in the analysis in (16) – the winning candidates are those with the laryngeally unspecified [S]. In fact, high ranking IDENT(VOICE) is not violated if an /s/ is mapped to an [S] because that [S] does not have a laryngeal node. This seems a satisfying solution in the case of pre-sonorant /s/, since sonorants may induce passive voicing on the preceding /s/ in several languages (cf. Strycharczuk and Simon 2013). However, the presumed passive voicing of /s/ before obstruents is problematic, since passive voicing as generally understood cannot be triggered by a subsequent voiced obstruent. At the same time, the introduction of the delaryngealised [S] may help to separate

presonorant s-voicing from preobstruent s-voicing in Italian. Thus, we claim that preconsonantal /s/ is in general delaryngealised, and then passively voiced before sonorants.

The idea of the delaryngealised [S] may raise a further problem. Since the constraints are very general, it looks like any obstruent can escape an AGREE(VOI) violation by delinking LAR, and so surface as laryngeally unspecified being subject to passive voicing. We must thus restrict the surfacing of delaryngealised obstruents to the coronal sibilant in Italian; in fact, plenty of phonetic and phonological arguments suggest that /s/ must be treated differently from other obstruents (cf. Baroni 2014; Bertinetto 2004; Cavarani and Hamann under review; Huszthy 2017; Marotta 1995; Morelli 1999; etc.).¹²

In order to better approach preobstruent s-voicing we must scrutinise the word-initial cases, too, which show consistency compared to the sporadic word-internal s-voicing. We could assume that since most /sC/ clusters are word-initial in Italian, s-voicing is lexicalised in this position, so it is no longer productive as a phonological process, but it is still active as an optional voicing process word-internally by analogy in non-native and new compound words. In this way we can appeal to the idea expressed in Section 4.2, and use underlying /z/ for the word-initial cases. However, this solution still goes against Richness of the Base. We will rather suppose that /s/ is actively voiced word-initially by a process specific to Italian, which can be expressed through OT-constraints (17).

(17) Additional constraints

- a. LENITE #/s/: Word-initial /s/ is lenis before voiced obstruents and sonorants.
- b. SPECIFY #/s/: Word-initial /s/ must have a laryngeal specification.

Since in LR lenis obstruents are subject to being automatically voiced, we propose that word-initial /s/ is lenis in Italian before sonorants and voiced obstruents (expressed by constraint (17a)). We also propose that word-initial /s/ cannot surface in Italian as a delaryngealised [S], it must have a laryngeal specification in this position (17b). The new constraints are the highest ranked in the tableau in (18), while the ranking between them is unspecified.

¹² Furthermore, if we consider Richness of the Base, we must reckon with feeding inputs like /zenzo/ (i.e. *senso* 'sense'), whose optimal form would be *zenzo because of the high ranking of IDENT(VOI) and IDENTPRES(VOI). This problem would be solved by an additional constraint that militates against prevocalic [z], i.e. *zV. However, this constraint would also go against intervocalic s-voicing which is a widespread phenomenon in current Standard Italian, and is expressed in OT by the *VsV constraint (cf. Krämer 2003, 2005).

(18) Word-initial /sC/

a. /sp/aro	SPECIFY #/s/	LENITE #/s/	IDPRESON (VOI)	AGREE (VOI)	*LAR	IDENT (LAR)
[⌈] [sp]					**	
[zb]			*!		**	**
[Sp]	*!				*	*

b. /sb/arra	SPECIFY #/s/	LENITE #/s/	IDPRESON (VOI)	AGREE (VOI)	*LAR	IDENT (LAR)
[sb]		*!		*	**	
[⌈] [zb]					**	*
[sp]			*!		**	*
[Sb]	*!				*	*

c. /sw/atch	SPECIFY #/s/	LENITE #/s/	IDPRESON (VOI)	AGREE (VOI)	*LAR	IDENT (LAR)
[sw]		*!			*	
[⌈] [zw]					*	*
[Sw]	*!					*

With the help of the analysis in (18) we are able to make a difference between word-initial and word-internal s-voicing in Italian, since the voicing of /s/ is regular in initial position, but it is not word-internally. In the latter case preconsonantal /s/ surfaces as a delaryngealised [S], and undergoes passive voicing before sonorants in the phonetics. The sporadic voicing attested before voiced obstruents may be due to RVA, in the same way as other obstruents also undergo RVA in a small percentage of the cases (cf. the study presented in Section 2); however, in our proposal what happens is that a following voiced obstruent (sometimes) fails to curb the passive voicing coming from the vowel that precedes /s/ (in the same way as a following sonorant consonant does across the board and as a following vowel does most of the time (as in the case of intervocalic s-voicing)). In this view neither case of s-voicing can be identified with RVA in the synchronic phonology of Italian.

5 Conclusion

This paper argued for the synchronic phonological separation of RVA on the one hand, and Italian preconsonantal s-voicing on the other. Section 2 aimed to show that the classical postlexical RVA known from voice languages is not active in the synchronic laryngeal phonology of Italian. From a theoretical point of view this is a problem, since in our framework, LR (Section 1), languages which exhibit a binary laryngeal distinction are categorised upon the phonological activity of the [voice]

feature, and voice languages are supposed to have RVA. Apparently Italian is a voice language without RVA. The clarification of this inconsistency is beyond the scope of this paper – our goal was to expose the theoretical problem by the phonological separation of RVA and Italian preconsonantal s-voicing.

In Section 3 various phonological arguments have been listed showing that RVA and preconsonantal s-voicing differ according to their inputs, their triggers, their domain of application and their frequency of occurrence. The OT analyses of Section 4 also confirm that the two phenomena compared can be considered disparate; moreover, we can also make distinctions among the various types of Italian s-voicing. First of all, we must separate intervocalic s-voicing from preconsonantal s-voicing. But even the various forms of preconsonantal s-voicing need specific analyses, according to word-initial or word-internal occurrence, as well as to the presonorant or the preobstruent position.

To sum up, the synchronic laryngeal system of Italian appears to be similar to the “unrestricted voice” pattern of Brown (2016)’s typology, as far as non-/sC/ obstruent clusters are concerned. Grammars of this pattern prefer faithfulness over markedness, which is expressed in OT through the high ranking of $\text{MAX}(\text{VOICE})$ and $\text{DEP}(\text{VOICE})$ constraints dominating $\text{AGREE}(\text{VOICE})$. Italian seems to present a laryngeal system which not only allows voice disagreement in non-/sC/ obstruent clusters, but actually favours it; while the voicing of /s/ before voiced consonantal segments can be seen as not a process at all but a phonetic side effect.

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