

## Variation of s-voicing in two varieties of Italian

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### ***Abstract***

In this paper I give an optimality theoretic account of intervocalic s-voicing in Italian. The analysis covers the complete distributional patterns of the voiced and voiceless coronal fricative found in Northern Italian (Lombardian) in comparison with Tuscan. The comparison with Tuscan reveals that the word-medial position is particularly resistant against neutralisation. This resistance stands in conflict with observations in the literature that the left margin of roots is the preferred place for the expression of phonemic contrast (Beckman 1998 and references cited there). The particular behaviour of the fricative in the middle of the word will be accounted for by an extension of the contiguity constraint (McCarthy & Prince 1995) to the featural level.

### ***1. Introduction***

In intervocalic position, the short strident *s* is always pronounced as voiced in Northern Italian (1a-d).<sup>1</sup> In clitics and at word margins, *s* always surfaces as voiceless (1e,f and g,h respectively).

(1) Italian *s*-voicing:

- |            |                  |                    |                            |
|------------|------------------|--------------------|----------------------------|
| a. a[z]ola | 'buttonhole'     | e. lo [s]apevo     | 'I knew it'                |
| b. a[z]ilo | 'nursery school' | f. telefonati#[s]i | 'having called each other' |

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<sup>1</sup> All Italian data, even those taken from the literature, have been checked with several native speakers of Italian. My main informant stems from Lombardia in Northern Italy.

- |              |                    |             |                |
|--------------|--------------------|-------------|----------------|
| c. ca[z]a    | 'house'            | g. [s]apore | 'taste' (noun) |
| d. ca[z]-ina | 'house' diminutive | h. ga[s]    | 'gas'          |

With regard to prefixes one observes an asymmetry. Prefix-final *s* is voiced when followed by a vowel-initial stem (2c), but stem-initial *s* is realised as voiceless when preceded by a vowel-final prefix (2a).

(2) Intervocalic *s*-voicing and prefixes<sup>2</sup>

- |                   |                          |                  |                       |
|-------------------|--------------------------|------------------|-----------------------|
| a. a-[s]ociale    | 'asocial'                | c. di[z]-onesto  | 'dishonest'           |
| bi-[s]essuale     | 'bisexual'               | di[z]-uguale     | 'unequal'             |
| ri-[s]uonare      | 'to ring again'          | bi[z]-unto       | 'greasy, dirty'       |
| pre-[s]entire     | 'to hear in advance'     | d. di[s-p]iacere | 'displeasure'         |
| b. re[z]istenza   | 'resistance'             | di[z-g]razia     | 'disgrace'            |
| pre[z]entire      | 'to have a presentiment' | bi[s-k]ugino     | 'second grade cousin' |
| pre[z]upposizione | 'presupposition'         | bi[z-n]onno      | 'great granddad'      |

Nespor & Vogel (1986) concluded from these data that the rule of intervocalic *s*-voicing is restricted to the domain of the prosodic word. In their view consonant-final prefixes are included in the prosodic word of the stem, while vowel-final prefixes are not. Thus, the stem-initial *s* in (2a) is not in intervocalic position prosodic-word-internally, while the prefix-final *s* in (2c) is. Peperkamp (1995), giving an analysis within Optimality Theory (Prince & Smolensky 1993), slightly revised this arguing that consonant-final prefixes are only parsed into the following prosodic word in case this stem starts with a vowel and the prefix provides the onset for the first syllable of that stem. In all other cases a constraint aligning the left stem

<sup>2</sup> The form in (2b) is given as *re-sistenza*, i.e., as a morphologically complex form in large parts of the literature. Since, as Nespor & Vogel (1986) and Kenstowicz (1995) point out as well, this form is synchronically not decomposable into smaller morphological units, I treat it as monomorphemic rather than as a prefixed form.

edge with the left prosodic word edge is paramount in her analysis. This constraint interacts with a syllable wellformedness constraint which favours syllables with onsets over those without, as well as with the constraint against epenthesis.

Almost all analyses so far have claimed that both word-internal intervocalic voicing as well as voicing at the prefix-stem boundary are triggered by the same mechanism, either a rule on intervocalic s-voicing or a constraint like \*VsV (Nespor & Vogel 1986, Kenstowicz 1995, Peperkamp 1995, Bertinetto 1999, Loporcaro 1999, van Oostendorp 1999). Krämer (2001) took a different stance arguing that both instances of voicing have to be treated differently. In the following I will show that a closer look at two very similar varieties reveals a slightly more complicated situation and that there is no specific rule or constraint on intervocalic s-voicing at all.

The first observation to be made in this connection is that in Northern Italian, as in Lombardian for instance, voicing affects the fricative not only in intervocalic position. The final *s* of the prefix *trans-* is realised as voiced whenever directly followed by a vowel, even though not in intervocalic position (Bertinetto 1999: 273). Apart from this context *s* is always voiceless when preceded by a nasal. The latter holds for almost all varieties of Italian.

### (3) Italian sonorant + s clusters

a.	tran[z]-atlantico	'transatlantic'	b.	sen[s]o	'sense'
	tran[z]-oceanico	'transoceanic'		per[s]o	'lost'
	tran[z]uranico	'transuranic'		fal[s]o	'false'

In (3a) the voicing overapplies, since there is no postsonorant voicing in Italian as shown by the data in (3b). The situation is even worse. The sequence sonorant plus *z* never occurs in Italian except in the environment in (3a). The next piece of evidence comes from Tuscan

Italian. As mentioned in the introductory section already, Tuscan Italian has no intervocalic *s*-voicing. Word-internally *s* and *z* can occur freely between vowels. They provide phonemic distinctions as shown in (4).

(4) Tuscan Italian

a. [ˈfu:zo]	'melted'	b. di[z]onesto	'dishonest'
[ˈfu:so]	'spindle'	di[z]abituato	'unused'

Though intervocalic voicing does not apply, prefix-final *s* is always voiced when followed by a vowel-initial stem in Tuscan. The final *s* of the prefix *trans-*, however, is an exception to this generalisation. It is realised as voiceless in this environment.

On the basis of these observations I will now provide an analysis of these patterns which avoids a constraint on intervocalic *s*-voicing and accounts for the peculiar behaviour of prefixes, where voicing can occur in the wrong environment (as with the prefix *trans-* in Lombardian) and even in a variety which does not display intervocalic voicing in other environments (Tuscan).

The remainder of the paper is organised as follows. In section 2 I will give an account of the basic facts of the voicing pattern. The differences between both varieties emerge by reranking of two constraints, the contiguity constraint and a markedness constraint. Section 3 answers the question why it is the coronal fricative which is targeted by so many restrictions. According to general considerations of markedness this segment turns out to be the weakest obstruent. Section 4 is dedicated to a closer look at the prosodic structure of prefixed words in the two varieties of Italian. Section 5 concludes and discusses some of the proposals made in the literature.

## 2. *Featural contiguity*

In Tuscan (and Lombardian as well) we see syllabification of the prefix-final *s* into the first syllable of the root or stem of the word if the latter starts with a vowel. The syllabification for a word such as *disonesto* is [.di.zo.nes.to.]. This is the only context of voicing in Tuscan.

Following Peperkamp (1995) and Krämer (2000, 2001) I assume an alignment constraint which aligns the left stem edge with the left edge of a prosodic word. Given the prosodic hierarchy (Nespor & Vogel 1986, Selkirk 1995) and the Strict Layer Hypothesis (Selkirk 1981, 1984, Nespor & Vogel 1986) a syllable has to be completely parsed within one prosodic word. In case of syllabification of the last segment of a prefix as the onset of the following first syllable of the stem the onset stands between the two edges referred to in the alignment constraint, which records a violation for this configuration. Italian does not allow consonant epenthesis (only in very restricted environments; see Peperkamp 1995). Therefore we can assume that the anti-epenthesis constraint DEP-IO is ranked higher than conflicting ONSET. However, having an onset is more important than proper alignment, since we observe resyllabification over the prefix-stem boundary. By transitivity of ranking we can say that DEP-IO is ranked above ALIGNL as well. Definitions of the involved constraints and the ranking are given in (5).

(5) First grammar fragment for Italian:

- a. i. ALIGNL : Align the left edge of every stem with the left edge of a prosodic word.
- ii. Dep-IO : Every segment in the output is present in the input as well.
- iii. ONSET : Syllables start with a consonant.

b. Ranking

DEPIO >> ONSET >> ALIGNL

This grammar accounts for the syllabification of the last consonant in the prefix as the onset of the first syllable of a vowel-initial stem. The question is why is the prefix-final *s* voiced? As mentioned above most authors assume that this voicing is triggered by the same rule or constraint that is responsible for word-internal voicing. However, word-internally Tuscan has no consistent voicing pattern. Krämer (2000, 2001) proposes a local constraint conjunction to account for this and similar instances of voicing in other languages. The constraint ALIGNL is conjoined with a markedness or alignment constraint demanding voicing in onsets. The conjoined constraint is violated whenever both participating constraints are violated by the same segment. The segment *s* in the forms in question stands between the left edge of the syllable and the left edge of the stem when it is in onset position.

(6) OV: ALIGNLeft( $\sigma$ , [+voice]): 'Syllables start with a voiced segment.'

(7) Local Conjunction (**A&OV**): ALIGNL(stem, PWd) & OV};

Local domain = segment. (Krämer 2001: 42)

To avoid unnecessary complexity I depart from this view here and follow instead a proposal made by McCarthy & Prince (1993). In their view an alignment constraint such as ALIGNL(stem, pwd) is not only assessed on the segmental level of analysis but rather subsegmentally as well. The more feature nodes stand between two designated edges the more violations are counted. I assume here that the voicing of the prefix-final fricative is an extension of the voicing of the stem-initial vowel. With this extension of one feature of the leftmost stem segment to the left prosodic edge a candidate's performance on ALIGNL improves slightly. With this more detailed interpretation of the alignment constraint the grammar produces the desired output.

(8) Tuscan prefix-final voicing<sup>3</sup>

/dis-#onesto/	DEPIO	ONSET	ALIGNL	*[+voice]
a. dis.(#o.nes.to		*!		*
b. dis.( #o.nes.to	*!		*	*
c. di.(s#o.nes.to			**!	*
☞ d. di.(#zo.nes.to			*	*

In this tableau, candidates (a,b) are ruled out as ungrammatical because they have no onset for the first syllable of the stem (a) or epenthesised a consonant to satisfy the ONSET constraint, which violates high ranking DEP-IO. In candidate (c) the prefix-final *s* is between the two edges which should be aligned to satisfy ALIGNL, the stem edge and the edge of the prosodic word. Candidate (d) has a voiced *z* instead. This voicing is supplied by spreading of the laryngeal feature of the vowel. Since this vowel is the first segment of the stem, the left stem edge can be considered to be on the segment preceding this vowel if the segment in question bears one of the features of this vowel. For this reason candidate (d) is better than candidate (c). At least on the level of featural organisation this candidate has one feature of the left stem edge aligned with the left word edge. The single violation mark under ALIGNL is incurred by this candidate by the root node or segment position held by the segment *s*, which is not provided by the stem.

However, this analysis does not yet capture the facts in their entirety. Post-sonorant *s* is invariably voiceless in Tuscan. Furthermore, we observe a voicing contrast only in intervocalic position within words. At the margins of words *s* is invariably short and voiceless. The first observation, i.e., that post-sonorant *s* is always voiceless, can be captured by a markedness constraint against post-sonorant voiced *s*, or more generally against post-

<sup>3</sup> In this and following tableaux the square indicates an epenthetic consonant, the opening round bracket indicates the left prosodic word edge and the hatch stands for the left stem edge.

sonorant voiced obstruents \*SC̣. This is a near mirror image of Pater's (1996, 1999) \*NC̣ constraint against post-nasal voiceless obstruents.

(9) \*SC̣: 'No voiced consonants after sonorant consonants.'

This constraint must be highly ranked in Tuscan, but below ALIGNL in the Lombardian hierarchy.

(10) Tuscan *tran[s]alpino*

/trans- #alpino/	*SC̣	DEPIO	ONSET	ALIGNL
a. .trans.□#al.pi.no.		*!		
b. .trans.#al.pi.no.			*!	
c. .tran.z#al.pi.no.	*!			*
☞ d. .tran.s#al.pi.no.				**

(11) Lombardian *tran[z]alpino*

/trans- #alpino/	DEPIO	ONSET	ALIGNL	*SC̣
a. .trans.□#al.pi.no.	*!			
b. .trans.#al.pi.no.		*!		
☞ c. .tran.z#al.pi.no.			*	*
d. .tran.s#al.pi.no.			**!	

The next problem is to incorporate the phonemic distinction into the analysis. In (4) we saw that word-internally Tuscan has a phonemic voicing contrast /z/ ~ /s/. This contrast is

neutralised in stem-initial and in word-final position, where only voiceless short *s* can occur. There is obviously also no phonemic voicing contrast at the end of prefixes, since we don't have *bis-* ~ *biz-* supplying different morphological information. Simply ranking faithfulness above the neutralisation grammar, i.e., \*[+voice] would give us the wrong results. We would expect pairs such as [s]ale 'salt' ~ \*[z]ale which the language does not display at all.

Itô & Mester (1996) propose a self-conjoined constraint LINEARITY<sup>2</sup> for just such cases where neutralisation occurs at morpheme boundaries only, while morpheme-internally contrast is maintained.

(12) LINEARITY (McCarthy & Prince 1995):

$S_1$  reflects the precedence structure of  $S_2$ , and vice versa.

(With  $S_1$  = input; and  $S_2$  = output)

(13) LINEARITY<sup>2</sup> : LINEARITY&LINEARITY (Itô & Mester 1996):

'The neighborhood of a segment must be preserved.'

If  $\alpha$  precedes/follows  $\beta$ , then the correspondent of  $\alpha$  precedes/follows  $\beta$ .

The constraint LINEARITY<sup>2</sup> is violated when the underlying neighbourhood relations are destroyed at both sides of a segment in an output candidate. Consequently the constraint can only be violated by deviant segments which are couched between two other segments in the input already. Rather than introducing a self-conjoined constraint it seems theoretically less expensive to consider a solution with a simplex constraint delivering exactly the observed pattern. McCarthy & Prince (1995, 1999) propose the CONTIGUITY constraints, given in (14, 15).

(14) I-CONTIGUITY ("No Skipping", McCarthy & Prince, 1995):

The portion of  $S_1$  standing in correspondence forms a contiguous string.

Domain ( $\mathfrak{X}$ ) is a single contiguous string in  $S_1$ .

$\mathfrak{X} /xyz/ \rightarrow xz$

(15) O-CONTIGUITY ("No intrusion", McCarthy & Prince, 1995):  $\mathfrak{X} /xz/ \rightarrow xyz$

These constraints are violated whenever the neighbourhood relations in the middle between elements are destroyed. The constraints are intended to ban the skipping or the insertion of a segment within a string, while they are not violated if segments are inserted or deleted at morpheme margins. Extending this constraint scheme to the featural level gives us a constraint that guards the featural precedence structure within morphemes.

(16) F-CONTIGUITY: On the featural level:

a.

X	X	X		X	X	X	
/F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub> /	→	F <sub>1</sub>		F <sub>3</sub>	✎

b.

X	X	X		X	X	X	
/αF <sub>1</sub>	βF <sub>2</sub>	δF <sub>3</sub> /	→	αF <sub>1</sub>	-βF <sub>2</sub>	δF <sub>3</sub>	✎

For the current purpose it is not relevant whether features are binary or privative. In case of privative features the constraint is violated by the mapping in (16a), because the contiguous feature string is interrupted in the surface form. In case of binary features which are not

removed or inserted but rather only change their value, the same holds. In the mapping in (16b), the relation between  $F_1$  and  $F_2$  is destroyed by altering the value of  $F_2$ , likewise is the relation between  $F_2$  and  $F_3$  by this alternation. If either  $F_1$  or  $F_3$  were changed no violation would be recorded since the neighbourhood relations between only two segments would be disturbed rather than between three.

If this constraint is ranked high in Tuscan, the resulting grammar maintains a phonemic distinction morpheme-internally but not at morpheme margins. See the tableau below with a hypothetical word subject to F-CONTIGUITY.

(17)

	/zizal/	F-CONTIGUITY	*[+voice]
a.	sizal	✓	*
b.	zizal	*!	**
c.	sisal	*!	
d.	zizal	✓	**!

A problem arising in this connection is the exact analysis of stems in Italian. For a word like [kasa] 'house' the answer to the question whether the noun root ends in *s* or in a vowel is crucial here. Nouns usually end in a vowel, either *-e*, *-a*, or *-o* in singular and *-i*, or *-e* in the plural. Some nouns however have a final (usually stressed) vowel which does not alternate according to morphological context (such as *città* 'city'). One class of nouns ends in an unstressed *e* in the singular and takes an exceptional *-i* in the plural whether this fits in with the noun's gender or not. (*-i* usually serves as the plural marker for masculine nouns; but note *torre* 'tower' (feminine) vs. *torri* 'towers') Some nouns do not have a vowel at all at the right edge and also do not get one under inflection.

A similar picture emerges for verbs. Verbs have a thematic vowel at the end of the root, either *i*, *e* or *a*. It can be argued whether this is part of the root or a sort of class marker or part of the inflectional affixes in the respective paradigm. Scalise (1983, 1984) argues that Italian roots contain the final vowel, if they have one, while Peperkamp (1995) argues against this analysis. The current discussion supports Scalise's position that the final vowel belongs to the root – whether underspecified or not does not matter. With this morphological analysis the position of contrast is within the morpheme rather than at the margin. The root-adjacent vocalic inflectional affix fuses with the root-final vowel on the surface to avoid a hiatus, as in *casa* /casV +a<sub>[+feminine]</sub>/ 'house'.

Inserting F-CONTIGUITY into the grammar yields the right results. For expository purposes I will tentatively include Kenstowicz's (1995) markedness constraint \*VsV into the grammar which is violated by voiceless *s* in intervocalic position. Since we find voiceless *s* in intervocalic position within the word in Tuscan, F-CONTIGUITY has to rank above the markedness constraint triggering intervocalic *s*-voicing. F-CONTIGUITY has to rank higher than the general markedness constraint against voiced obstruents as well, because Tuscan has word-internal voiced *z*. However, Tuscan has no voiced *z* after a nasal in any position. Thus, the markedness constraint on NC clusters is higher in the Tuscan hierarchy than F-CONTIGUITY. With this ranking we get the following input-output mappings for possible underlying forms. At morpheme margins contrast is neutralised on the surface (18a,b,c) and morphem-internally contrast is maintained (18d, e).

## (18) F-Contiguity in Tuscan

i.		*SC̣	F-CONTIG	*VsV	*[+voice]	IO-IDENT
a.	/zale/ ~ zale				*!	
	☞ /zale/ ~ sale					*
b.	/buz/ ~ buz				*!	
	☞ /buz/ ~ bus					*

ii.		*SC̣	F-CONTIG	*VsV	*[+voice]	IO-IDENT
c.	/senzo/ ~ senzo	*!			*	
	☞ /senzo/ ~ senso		*			*
d.	☞ /kazo/ ~ kazo				*	
	/kazo/ ~ kaso		*!	*		*
e.	/kasa/ ~ kaza		*!		*	*
	☞ /kasa/ ~ kasa			*		

It is very unlikely that Tuscan speakers have any of the underlying forms in (a,b,c). Since the patterns are static learners will assume the underlying representations which are as close as possible to the surface forms. However, this analysis conforms to the Richness of the Base Hypothesis (Prince & Smolensky, 1993). The complete distribution of voiced and voiceless coronal fricatives is determined by the grammar.

Lombardian further differs from Tuscan in that F-CONTIGUITY ranks below the constraint on intervocalic s-voicing. To summarise the differences between the two varieties, we have now detected two differences in the ranking of constraints.

## (19) Interim grammars of Tuscan and Lombardian

## a. Tuscan:

ONSET, \*SÇ, >> F-CONTIGUITY, DEP-IO >> \*VsV, ALIGNL >> \*[+voice] >> IDENT(voice)

## b. Lombardian:

ONSET >> DEP-IO >> \*VsV, ALIGNL >> \*SÇ, \*[+voice] >> F-CONTIGUITY, IDENT(voice)

In the next section, I examine why it is only the coronal fricative which is subject to intervocalic voicing and none of the other obstruents. This will result in a replacement of \*VsV by a more general markedness constraint.

### 3. *Why the coronal fricative?*

As mentioned above Kenstowicz (1995) assumes a markedness constraint \*VsV, which is violated by the occurrence of a voiceless coronal fricative between two vowels. This is a highly specific constraint and is needed only for Northern Italian and seemingly no other language. Similarly, Nespor & Vogel (1986) formulate a rule which changes voiceless intervocalic *s* into voiced *z*. For this rule the same criticism applies.

Instead we can assume a more general constraint on the voicing of intervocalic consonants \*VCV which has a broader base in languages where intervocalic consonants are generally voiced.<sup>4</sup> The prevailing problem to be resolved is, why it is the coronal fricative only which is affected by restrictions on voicing, while all stops and noncoronal fricatives can occur more or less freely as voiced or voiceless in the two Italian varieties under discussion. Nespor & Vogel's suggestion in a footnote on p. 144 that intervocalic voicing applies because there is no phonemic voicing contrast /s/~z/ does not explain the facts, since we still have to find reasons for why the fricative is voiced in some environments and voiceless in others. Furthermore,

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<sup>4</sup> See also Jessen & Ringen (2002) for a discussion of the same constraint, labelled PASSIVE VOICE there.

voicing is contrastive word-internally in Tuscan. Nevertheless, voicing occurs at the prefix-stem boundary. If noncontrastive features were underspecified, underspecification would have to be limited to certain morphologically and phonologically defined positions, and would again raise the question: why is underspecification distributed in this way?

To approach a principled solution I will draw on a finding by Grijzenhout & Krämer (2000). Examining voicing assimilation in Dutch they had to account for an asymmetry between fricatives and stops. Usually voicing assimilation is regressive in Dutch. The first member of a cluster, presumably in coda position, takes on the voicing specification of the second member in a cluster which is presumably a syllable onset (20a). Where fricatives are involved as the second member of the cluster the pattern turns into progressive devoicing. The first member of the cluster, always devoiced due to final devoicing, imposes its voicelessness on the following fricative (20b).

(20) Dutch regressive and progressive voicing assimilation

a.	['kɫɔb.dɔr]	'swing-door'	b.	['slɑ:p.sɑk]	'sleeping-bag'
	['stɔv.duk]	'duster'		['dɑk.fɛn.stɔr]	'dormer'
	['hɑnt.pɑlm]	'palm'		['ɑs.fɑt]	'dustbin'
	['stɔ:f.pɛ:r]	'stewing-pear'			

Grijzenhout & Krämer (2000) assume a specific faithfulness constraint on stops, which monitors the input~output match of voicing in stops only, in addition to a general faithfulness constraint on voicing. Ranked appropriately with respect to the rest of the neutralisation grammar, the result is a recessive behaviour of fricatives. In Italian, we can assume that identity of stops is ranked higher than general identity.

(21) IO-IDENTITYSTOP(voice) >> IO-IDENTITY(voice)

The next part of the puzzle relates to the place of articulation of the vulnerable Italian fricative, since it is only the coronal fricative which undergoes voicing alternations while the labial fricative has a stable phonemic voicing contrast. As Ortmann (1998) points out in his survey of consonant epenthesis, coronals are frequently chosen as epenthetic segments, while labials or velars are no good epenthetic segments. He proposes to universally rank anti-insertion constraints accordingly, with DEPlabial and DEPdorsal higher ranked than DEPcoronal. He draws on Lombardi (1997) who proposes a universal ranking of markedness constraints with exactly the same dominance relations for markedness constraints against the respective features (see as well Prince & Smolensky 1993, ch. 9).<sup>5</sup>

Relating both findings we can extend the universal ranking on place features to Identity constraints on voicing. The respective faithfulness constraints might be primitive constraints or alternatively local conjunctions of the respective markedness constraints against place features with a simple identity constraint on voice.<sup>6</sup> However, if we integrate these constraints into a grammar with the specific identity constraint proposed by Grijzenhout & Krämer and the markedness constraint against intervocalic voiceless consonants we get the grammar in (22) for Northern Italian.

(22) IDENT<sub>lab</sub>(voice), IDENT<sub>dors</sub>(voice), IDENT<sub>stop</sub>(voice) >> \*VC̥V >> IDENT<sub>cor</sub>(voice) >>  
IDENT(voice)

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<sup>5</sup> There is a rich literature on the special status of coronals. I will not discuss this in further detail here. The interested reader is referred to Rice & Avery (1989), papers in Paradis & Prunet (1991), Hall (1997) to name only a few.

<sup>6</sup> In case we deal with local conjunctions here, it might be interesting to note that in this case the universally fixed ranking for the markedness constraints should also hold for the local conjunctions they are involved in. This automatically produces the desired ranking of complex faithfulness constraints without any further stipulation.

As we can see in tableau (23), with this ranking of externally motivated constraints, the coronal fricative is the odd one out. The form containing an underlying /s/ is the only one which is subject to intervocalic voicing.

(23) The coronal fricative as the weakest obstruent

	IDENT <sub>lab</sub> (voice)	IDENT <sub>dors</sub> (voice)	IDENT <sub>stop</sub> (voice)	*VC <sub>◌</sub> V	IDENT <sub>cor</sub> (voice)	IDENT (voice)
☞ a. /sofa/ ~ sofa <sup>7</sup>				*		
b. /sofa/ ~ sova	*!					*
☞ c. /rete/ ~ rete				*		
d. /rete/ ~ rede			*!			*
☞ e. /kroko/ ~ kroko				*		
f. /kroko/ ~ krogo		*!				*
g. /kasa/ ~ kasa				*!		
☞ h. /kasa/ ~ kaza					*	*

This partial ranking combined with the grammar developed so far with the three faithfulness constraints on top of the hierarchy, results in a grammar where only the coronal fricative is subject to the voicing patterns induced by ALIGNL, \*SC<sub>◌</sub>, \*VC<sub>◌</sub>V and \* [+voice]. Though the markedness constraints affect only the coronal fricative there is no constraint that exclusively refers to coronal fricatives.

Returning to the difference between Tuscan and Lombardian, word-internal intervocalic voicing emerges with the intervocalic voicing constraint outranking F-CONTIGUITY, while the

<sup>7</sup> sofa 'sofa', rete 'net', croco 'crocus', casa 'house'.

word-internal voicing contrast observed in Tuscan emerges by a reranking of the two constraints.

#### ***4. The domain of intervocalic s-voicing***

Finally it should be noted that so far the grammar would produce an ungrammatical *\*a[z]ociale* instead of *a[s]ociale* 'asocial'. Stem-initial *s* is voiced when brought in intervocalic position. This problem can be eliminated by restricting the markedness constraint against voiceless intervocalic obstruents to the domain of the prosodic word, as previously done by Nespor & Vogel with their rule on intervocalic *s*-voicing.

The alternative would be to attribute the underapplication in this context to output-output correspondence, as proposed in Kenstowicz (1995). In this analysis the stem *sociale* in *asociale* is faithful to its simplex surface form *sociale* without the prefix. This blocks intervocalic voicing. In case we choose for the latter option the question arises why is the machinery developed here necessary at all?

First, Kenstowicz' output-output correspondence account does not predict the distribution of voiced and voiceless *s* at all. There is no reason in this account why we find a contrast within words and neutralisation to voicelessness at the margins. Furthermore Kenstowicz' approach cannot explain why in Lombardian the final *s* of the prefix *trans-* voices as well in connection with a vowel-initial stem. As far as Tuscan is concerned, the approach crucially relies on the activity of an intervocalic voicing constraint. In a variety where intervocalic voicing does not apply consistently there is no explanation for the coherent voicing of prefix-final *s* in the neighbourhood of a vowel-initial stem. In conclusion the analysis provided by Kenstowicz neither accounts for the Lombardian variety nor for the Tuscan one.

Furthermore there are some more Italian words which pose a problem for the output-output account. Words such as *pre[z]upposizione* 'presupposition' could be analysed as consisting of

the prefix *pre-* plus the independent word [*s*]*upposizione*. In the output-output account they have to be analysed as such. This generates the wrong output candidate \**pre[s]upposizione* which has to be faithful to the simplex form of the noun. There is no room for lexicalised forms with shorter 'relatives'.

In the rare compounds with a first member ending in an *s* and the second member starting in a vowel, the *s* gets voiced as in *ga[z]olio* 'diesel' consisting of *ga[s]* 'gas' and *olio* 'oil'. The voicelessness of the *s* in *gas* would be protected by output-output faithfulness in Kenstowicz' analysis and accordingly the compound should be \**ga[s]olio*. In the current proposal the *s* of *gas* is voiced because it is in the onset position of the first syllable of the second stem in the construction. The alignment constraint chooses the candidate with the voicing of the vowel *o* extended to the left syllable edge. Such a form is also problematic for Nespor & Vogel. They establish on independent grounds that compounds consist of as many prosodic words as members in the construction. Thus, the *s* in question would not be in intervocalic position within a prosodic word in their view, even if we allow overlapping prosodic words. Consequently, there would be no reason for voicing. Given the arguments against an output-output analysis of this aspect of Italian phonology, the limitation of the intervocalic voicing constraint to the domain of the prosodic word turns out to be the more economic choice.<sup>8</sup>

(24) \*(VC<sub>σ</sub>V)<sub>PWD</sub>: No voiceless obstruents between vowels within a prosodic word.

The analysis here follows to a certain degree the one given by Peperkamp (1995, 1997) and that by van Oostendorp (1999). In their accounts it is also the constraints DEP-IO and ONSET which force a syllabification which does not strictly coincide with the left stem boundary. In

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<sup>8</sup> A last argument in favour of an output-output account would be that it perfectly accounts for diminutives such as *bu[s]ino* from *bus* 'bus'. However, Bertinetto (1999) notes that Italians would never produce such a form. In support of Bertinetto's claim all my informants frowned when confronted with words like *bussino* and insisted that they wouldn't say such a word, regardless of the voicing of the *s*.

satisfaction of an additional constraint ALIGN-MORPH (Peperkamp 1995; or PR=LX in van Oostendorp's (1999) analysis) the consonant-final prefixes are incorporated into the prosodic word of vowel-initial words. ALIGN-MORPH aligns each edge of every prosodic word with the edge of a morpheme.<sup>9</sup>

(25) ALIGN-MORPH: Align (PrWd, E<sub>α</sub>, Morph, E<sub>α</sub>) (Peperkamp, 1995: 232)

If a prefix (or other morpheme) contributes its last segment as the first segment of the following prosodic word the whole morpheme has to be parsed into this word.

This incorporation of prefixes violates Peperkamp's ALIGNL(stem, pwd). However, the latter constraint forces exclusion of all prefixes from the prosodic word in case the stem starts in a consonant or the prefix fails to supply a consonant for the onset of the first syllable of vowel-initial stems. This is a much more insightful analysis than the wholesale inclusion of consonant-final prefixes into the prosodic word of their host as proposed by Nespors & Vogel.

(26) ALIGN-MORPH and prefixes

	ALIGN-MORPH	DEP-IO	ONSET	ALIGNL(stem, pwd)
a. dis.(#o.nes.to			*!	
b. di.(z#o.nes.to	*!			
☞ c. (di.z#o.nes.to				*
☞ d. dis.(#pia.tʃe.re				
e. (dis.#pia.tʃe.re				*!

<sup>9</sup> For a similar idea see Itô & Mester's CRISP-EDGE constraint (1999) or van Oostendorp's (1999) PR=LX constraint.

Actually there is no independent evidence for an inclusion of any prefix into the prosodic word. The constraint ALIGN-MORPH is a stipulation that derives from the Strict Layer Hypothesis (Selkirk 1981, 1984, Nespor & Vogel 1986) rather than from actual linguistic data. In the current analysis the prefix-final *s* does not need to be in intervocalic position prosodic-word-internally, since its voicing is regarded an effect of the optimization of the alignment of the left stem edge with the left edge of a syllable or the prosodic word. A constraint aligning the left edge of the stem with the left edge of a prosodic word is necessary anyway to exclude vocalic prefixes from being parsed into a prosodic word with their stem. This would bring a prosodic-word-initial fricative in intervocalic position, where it would have to be voiced, as in candidate (b) in tableau (27ii). Given this we can replace the alignment constraint on stems and syllables by the alignment constraint on stems and prosodic words, since the latter does both jobs required. Accordingly candidate (c) in tableau (27i) receives four violation marks on the alignment constraint, one for each segment between the left stem edge and the left edge of the prosodic word and one for the nonalignment on the featural level. This analysis chooses between the forms (d) and (e) the one which has the prosodic word edge as close to the stem edge as possible.

(27) Tuscan intervocalic prefix voicing

i.	/dis-#onesto/	DEPIO	ONSET	F-CONTIG	*VC <sub>0</sub> Vpwd	ALIGNL	*[+voice]
a.	dis.(#o.nes.to		*!				*
b.	dis.(□#o.nes.to	*!				*	*
c.	(di.s#o.nes.to				*!	****	*
d.	(di.z#o.nes.to					**!*	**
☞ e.	di.(z#o.nes.to					*	

ii.	/a- sotʃale/	F-CONTIG	*VC <sub>◌</sub> V	ALIGNL	*[+voice]
a.	(a#sotʃale		*!	*	*
b.	(a#zotʃale			*!	*
c.	a(#zotʃale				*!
☞ d.	a(#sotʃale				

iii.	/kasa/	F-CONTIG	*VC <sub>◌</sub> V	*[+voice]
☞ a.	kasa		*	
b.	kaza	*!		*

Given that an analysis in which the prefix-final *s* is in intervocalic position word-internally is available and that we can explain the voicing of *s* in this and no other environment in Tuscan with additional reference to the contiguity constraint now, one could ask, why reference to the alignment of features is necessary at all. Recall that in Lombardian the final *s* of the prefix *trans-* is voiced in connection with vowel-initial stems, which it is not in Tuscan. Also in Lombardian nasal plus *s* sequences are voiced nowhere else than at the prefix-stem margin. The current analysis can account for this particularity without any further assumption as illustrated above in (10) and (11).

The final grammar for the two Italian varieties under comparison is given in (28).

(28) Final ranking

a. Tuscan:

ONSET, \*SC<sub>◌</sub>, >> F-CONTIGUITY, DEP-IO >> \*VC<sub>◌</sub>V, ALIGNL >> \*[+voice], IDENT(voice)

b. Lombardian:

ONSET >> DEP-IO >> \*VC̣V, ALIGNL >> \*[+voice], \*SC̣, F-CONTIGUITY, IDENT(voice)

### 5. Discussion

In the previous sections I have given a detailed examination of the distribution of voiced and voiceless *s* in Tuscan and Lombardian. Comparison of these two varieties revealed some interesting details of the phonotactics of Italian. I have based my account on previous ones within Optimality Theory taking them further to gain a deeper insight into the phenomenon and in our understanding of linguistic structures. The particular vulnerability of *s* was explained here as an effect of universal markedness relations among different classes of sounds (Prince & Smolensky 1993, Lombardi 1997, Ortmann 1998, Grijzenhout & Krämer 2000). The emergence of a laryngeal contrast exclusively in the middle of morphemes in Tuscan is also a remarkable trait, since the most favoured position for the maintenance of phonemic contrast is the first syllable of stems cross-linguistically (see Beckman 1998). This was accounted for here as an effect of the contiguity constraint. The only remaining site of intervocalic *s*-voicing in Tuscan is at the left stem edge. Voicing occurs here only in case of a mismatch between morphology and prosody, i.e., if the prosodic and morphological edges do not coincide. This instance of voicing can thus be interpreted as a signal for a mismatch in a place which is of high importance for interpretive parsing (see also Krämer 1999, 2001 for a discussion of similar cases in Breton and German).

Loporcaro (1999) examines a much broader range of languages with respect to intervocalic *s*-voicing. He suggests a rule on intervocalic *s*-voicing which states that *s* gets voiced between two vowels whenever no morpheme boundary of strength two or higher strength precedes it. This strength value relates to a scale of morphological boundaries, according to which the word boundary is the strongest or most salient (receiving a value of 5) while the inflectional

suffix boundary is the weakest (scaled as 1). There are two disadvantages of this account. First, as Loporcaro admits, the rule has to be switched off stem-internally for Tuscan Italian, French, Catalan and some other Romance languages. Furthermore this rule misses the generalisation that the whole process is triggered by a syllabification that ignores a morphological boundary with high importance for interpretational parsing.

Bertinetto (1999) follows the same strand and provides a more sophisticated strength scale for morphological boundaries. One of his main insights is that we need to have explicit markers of morphological edges in surface representations. It is doubtful whether this is really the case.

In the current proposal for instance the Alignment constraint can be replaced by an Anchoring constraint (McCarthy & Prince 1995, 1999). In that case the constraint is referring to the morphological edges in the input. Since the morphemes are supplied as single morphemes, not as an ordered string in the input, morphological edges are easily detectable at that level of representation. With the anchoring constraint guarding the mapping of morphological edges in the input with prosodic edges in the output there is absolutely no necessity to have any morphological edges explicitly and abstractly marked in surface representations.

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