RECONSIDERING FORTITION: FEATURES AND LICENSING[*]

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1. Introduction

This paper analyzes one class of external sandhi phenomena in Southern Sardinian (Romance; henceforth SSard), the strengthening class.

Strengthening patterns arising in sandhi contexts are analyzed as the result of an operation that licenses morpheme-final consonants. The proposed licensing model strongly relies on the feature specification of the edge segments, that is a morpheme-final consonant and the following morpheme-initial one. In particular, right-edge consonants can be licensed as codas by the following left-edge onset (–C#C–) only if they can share feature specification.

The paper is organized as follows. First, the relevant data are presented. They illustrate that the fortition patterns do not conform to the outputs predicted by a traditional model of consonantal strengthening, but instead a phonological model for SSard sandhi is needed, as also argued by Ladd and Scobbie (2003) for Sardinian in general. The model is outlined in the rest of the paper. The underlying representation for each of the morpheme-final consonant in the SSard system is provided and justified. These representations are shown to inform the derivational process responsible for the sandhi outputs. Conclusions follow.

2. The relevant data

External sandhi phenomena in SSard are of particular interest for two reasons: their strengthening and weakening patterns are paradoxical within a traditional approach to fortition and lenition and they do not show traces of gestural overlap, and should thus be considered phonological (Ladd and Scobbie 2003). The lenition context is post-vocalic and shows the following patterns.

(1) a. *-V#{P, T, K}-*

/paru Pittikka/	[paɾu **β**itːikːa]	“I-look/seem small.F”
/paru Tostata/	[paɾu **ð**ɔstaða]	“I-look/seem stubborn.F”
/paru Kalma/	[paɾu **ɣ**alma]	“I-look/seem quiet.F”

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b. *-V#{B, D, G}-*

/paru Betʃtʃa/	[paɾu **b**ɛtʃːa]	“I-look/seem old.F”
/paru Dillikata/	[paɾu **d**ilːiɣaða]	“I-look/seem delicate.F”
/paru Garbata/	[paɾu **g**arbaða]	“I-look/seem polite.F”

The fortition context is post-consonantal and presents the following patterns.

(2) a. *-C#{P, T, K}-*

/parit Paku/	[paɾi pːaɣu]	“it-looks/seems less.M”
/parit Tostau/	[paɾi tːostau]	“he-looks/seems stubborn.M”
/parit Karu/	[paɾi kːaɾu]	“it-looks/seems expensive.M”

b. *-C#{B, D, G}-*

/parit Betʃtʃu/	[paɾi βɛtʃːu]	“he-looks/seems old.M”
/parit Dillikau/	[paɾi ðilːiɣau]	“he-looks/seems delicate.M”
/parit Garbau/	[paɾi ɣarbau]	“he-looks/seems polite.M”

Notice that for a traditional, phonetic-based model of consonantal strengthening (e.g., Lavoie 2000, Kirchner 2001), the outputs of the voiceless series in (2a) are consistent, whereas the outputs of the voiced series in (2b) are paradoxical. As for the contexts, strengthening is triggered by two different morpheme-final segments: consonantal desinences (symbolized as *-C*) and ghost consonants (*(C)*).[1]

3. The need for a phonological model

A possible phonetic explanation for the realization of the underlying voiced series as approximant in fortition context is at hand. As pointed out by Ohala (1983) and Kirchner (2001), voiced geminates require articulatory effort for maintaining voicing over time. Thus, they might be realized as voiced approximants.

Is this explanation sufficient for SSard? On the one hand, the observation by Ohala (1983) and Kirchner (2001) seems true: SSard does not have many voiced geminates, as there were few already in Latin (Giannini and Marotta 1989). On the other hand, voiced stops can geminate in this system, and this occurs precisely in external sandhi environments. In fact, the consonantal plural ending $-s_{\text{pl}}$, in contrast to any other word-final *–s* (for instance, the 2SG verbal ending), can trigger the gemination of the following word-initial {B, D, G}, as illustrated in (3):

[1] *(C)* refers to historical final consonants, that is Latin final consonants that no longer surface but trigger synchronic strengthening in SSard (Virdis 1978, Contini 1986:531, Bolognesi 1998:51, among others). *(C)* is assumed for the following function words: ɛ “and” (Lat. ET), nɔ “not” (NOT), a “at/to” (AD), ɔ “or” (AUT).

(3)	*/is/#C–*	*[$_{DP}$ /is/ N.PL]*	*“the.PL N.PL”*
	P	[i**s** **p**ippiuzu]	“the children”
	T	[i**s** **t**amːatːiɣaza]	“the tomatoes”
	K	[i**s** **k**arːuzu]	“the wagons”
	B	[i **β**akːaza]/[i **bː**akːaza]	“the cows”
	D	[i **ð**omuzu]/[i **dː**omːuzu]	“the houses”
	G	[i **ɣ**werːaza]/[i **gː**werːaza]	“the wars”

Thus, the phonetic explanation appears to be insufficient. The inadequacy of the phonetic explanation calls for a phonological model able to predict the different outputs in the different contexts. More specifically, the model should be able to answer the following questions: (i) what is the structural difference between plural -s_{pl} (3) and the other final consonants (2) in the system? (ii) why does the voiced series (2b) appear to respond paradoxically to the strengthening requirement (surfacing as approximant in a gemination context)? (iii) what is special about plural -s_{pl}(3)? why does the voiced series show different outputs after plural -s_{pl} (alternation between geminate and approximant as in (3))?

4. Implementing a phonological model

4.1. The representation of Sardinian morpheme-final consonants

SSard has a three-way contrast between plural -s_{pl}, other consonantal desincences -*C*, and ghost (*C*). Evidence is provided by the fact that they trigger different phonological processes when utterance-final (4a), when followed by a V-initial morpheme (4b), and when followed by a C-initial morpheme (4c):

(4)					
	a.	-s_{pl}	/pippius/##	[pippiuz**u**]	“child.PL”
		-*C*	/pappat/##	[pappað**a**]	“eat.3SG”
		-*(C)*	/no(C)/##	[nɔ]	“not”
	b.	-s_{pl}	/tres arrosas/	[trɛ**s** **a**rːɔzaza]	“three roses”
		-*C*	/tʃikkat arrosas/	[tʃikːa**ð** **a**rːɔzaza]	“look-for.3SG roses”
		-*(C)*	/no(C) andat/	[nɔ andaða]	“(s)he does not go”
	c.	-s_{pl}	/is pippius/	[i**s** **p**ipːiuzu]	“the children”
		-*C*	/pappat pira/	[papː**a** **pː**ira]	“eat.3SG pears”
		-*(C)*	/no(C) pappat/	[n**ɔ** **pː**apaða]	“(s)he does not eat”

As shown in (4a), the contrast between -s_{pl} and -*C* is neutralized in utterance-final position, since they both require the insertion of a copy-vowel afterwards. The small set of function words for which *(C)* is assumed underlyingly appear utterance-finally only in elicitation lists. Utterance-finally, *(C)* never surfaces, and

no copy-vowel is inserted. As for the outputs of the morpheme-final consonants when followed by a V-initial morpheme, cf. (4b), the behaviour of -s_{pl} and -*C* contrasts with that of *(C)* since the members of the former set surface, while the member of the latter set does not. However, when they are followed by a C-initial morpheme, cf. (4c), -*C* and *(C)* behave as a class (show the same outputs, that is #P > [pː] and #B > [β]), in contrast to -s (#P > [s\#p] and #B > [β]/[bː]).

SSard thus shows three different morpheme-final consonants. In order to capture how these three morpheme-final consonants differ with regard to their underlying structure, two levels of representation are not sufficient, as they attain only a two-way contrast, as shown in (5a,b). I assume these levels to be level ® and level [F]. Level ® is the root node level, where a root node is assumed to be (i) an anchor for segmental features and (ii) a unit on the *skeletal* or *timing* tier (Mohanan 1983, Clements 1985; for discussion see Broselow 1995:175ff.). Level [F] is the level on which the featural specification of segments is displayed.

(5) a.

-s_{pl}	-*C*	*(C)*
®	®	®
|	|	
[F]	[F]	

b.

-s_{pl}	-*C*	*(C)*
®	®	®
|		
[F]		

The underlying contrastive configuration in (5a) groups together -s_{pl} and -*C* in contrast to (*C*) (see (4a) and (4b)). On the other hand, the configuration in (5b) represents -*C* and (*C*) as a single class which contrasts with -s_{pl}. This approach explains only the pre-consonantal pattern in (4c). I argue that in order to model the three-way contrast among SSard morpheme-final consonants, a further level of representation is needed underlyingly. This level is a prosodic level which I refer to as level μ. I further assume that this level is specified in the lexicon only for plural –s_{pl}, as given in (6):

(6)

-s_{pl}	-*C*	*(C)*
μ		
|		
®	®	®
|	|	
[F]	[F]	

The structural configurations in (6) attains a double classification: one where -s_{pl} and -*C* are grouped together because of level [F] (specification thereof), and one where -*C* and (*C*) are classed together due to level μ (lack of specification thereof).

4.2. Interpreting moras in a weight-insensitive grammar

SSard shows weight-insensitive characteristics: (i) the SSard foot is a syllabic (not moraic) trochee; (ii) there is no sign of compensatory lengthening phenomena; (iii) there is no lexical contrast between short and long vowels.

What status have moras in a grammar in which weight does not seem to play a role? The only hint of an underlying moraic structure in SSard, according to moraic theory (Hayes 1989), is the presence of phonemic geminates in the language (geminates are consonantal segments underlyingly associated with a mora; McCarthy and Prince 1986, Hayes 1989). Under this moraic view of geminates, SSard plural -s_{pl}, which I proposed to be underlying specified as moraic, must be interpreted as underlyingly geminate.

I claim that moraicity is necessary but not sufficient for being a geminate. There are two features characterizing geminates:[2] (i) being underlyingly moraic (i.e., being rhymal) and (ii) being parsed as ambisyllabic (i.e. being long). That to be moraic means to be rhymal has been proposed by Steriade (1991). This hypothesis implies that CVC syllables are always bimoraic, and weight is 'coerced' (Morén 2001) by language-specific sonority thresholds (Zec 1988, 1995). SSard plural -s_{pl} thus shows only the first characteristic of geminates, i.e., moraicity, but not ambisyllabicity. That is, SSardinian plural -s_{pl} is underlyingly specified for being rhymal, i.e. for being a coda, while the other Sardinian morpheme-final consonants -*C* and (*C*) are not.

4.3. Parsing versus Licensing

Another important distinction between SSard plural -s_{pl} and underlying geminates is that while the latter, being word-internal, are *parsed* as syllabic constituents by the syllabification algorithm, morpheme-final segments are *licensed* (Piggott 1999). Differentiating between parsing and licensing can capture what has been traditionally referred to as extraprosodic: extraprosodic segments are not parsed but licensed. How do we derive the difference between parsing and licensing? I propose to view parsing (syllabification) as driven by contextual information on the featural level. The algorithm, which I assume to be universal, runs as given in (7). Language-specificity arises in the definition of the third step of the algorithm (principles for parsing codas).

(7) I. parse nucleus according to maximal sonority relative to the context;
II. parse onset on the left of the nucleus;
III. parse coda according to language-specific constraints relative to featural make-up.

[2] I will not touch upon the ongoing debate on the underlying representation of geminates. As Tranel (1991:299) points out "underlying geminate consonants appear to require a phonological theory able to encode length directly rather than by resorting to weight." The need to distinguish between the concepts of weight and length has also been argued for by Lahiri and Koreman (1988) and Kraehenmann (1998). See also Broselow (1995:199-201) for discussion.

In contrast to parsing, licensing takes care of the segments which remain unparsed due to lack of contextual information on the featural level, that is the segments at the edges of a morpheme.

4.3.1. Parsing versus Licensing in SSard

In order to account for parsing of consonants into codas in SSard, a condition on (7III) is required, as in (8).

(8) III. can you share structure with the segment on your right?
III.i yes > get parsed as coda

This is essentially the coda constraints in SSard, where the only segments allowed in coda position are: (i) first portion of a geminate (share all features); (ii) homorganic nasals (share place); (iii) /s/ only for voiceless sC heterosyllabic clusters (identity on the SV tier: absence of SV specification).[3]

As for the segments on the right edge, I claim that they are D(irect)-licensed in Sardinian, that is they are licensed at the syllable (σ) level, not at a higher prosodic level (Foot (Ft), or prosodic word (ω)) (Piggott 1999:164). Moreover, I claim that they are licensed according to the same feature-driven system active for parsing. Thus, parsing and licensing in Sardinian can be understood as two cycles of the same algorithm.

If morpheme-final consonants resemble morpheme-internal codas (i.e., the same segments or a proper subset thereof are allowed morpheme-finally as morpheme-internally), then morpheme-final consonants are D-licensed (Piggott 1999:167). SSard morpheme-final consonants have a coda profile, as the same contraints appear to apply. Word-internal codas in SSard are restricted to /s/, homorganic nasals /N/, and the first portion of geminates. Word-final segments in SSard are restricted to /s/ and /t/, both coronal, which I assume to be underspecified for Place features (Rice 1996 among others).

Moreover, stress is not relevant to Sardinian external sandhi, so no role is played by higher prosodic constituents like foot or prosodic word in licensing the morpheme-final consonants (which would imply R(emote)-licensing; Piggott 1999).

(9)

a. (C)# σ́ σ ...	b. (C)# σ σ́ ...
[nɔ ˈpːintaða] “does not paint”	[nɔ pːinˈtaða] “did not paint”
[nɔ ˈtːundiði] “does not cut hair”	[nɔ tːunˈdiði] “did not cut hair”
[nɔ ˈkːastjaða] “does not look (at)”	[nɔ kːasˈtjaða] “did not look (at)”

[3] As demonstrated by Frigeni (2003) SSard is a S(onorant) V(oice) system (*sensu* Avery 1996): voiced obstruents are ‘sonorant obstruents’ (Piggott 1992, Rice 1992, Rice 1993), as they pattern with sonorants.

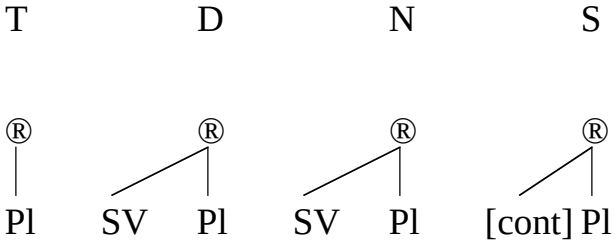
[nɔ ˈβufːaða] “does not drink”	[nɔ βuˈfːaða] “did not drink”
[nɔ ˈðɔnaða] “does not give”	[nɔ ðoˈnaða] “did not give”
[nɔ ˈɣɔzaða] “does not enjoy”	[nɔ ɣɔˈzaða] “did not enjoy”

5. Licensing the right edge: Featural Identity

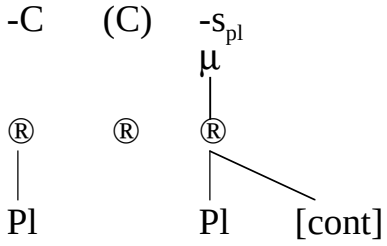
In this section the outstanding questions within the model are addressed: (ii) why does the voiced series appear to respond paradoxically to the strengthening requirement (surfacing as approximant in a gemination context)? (iii) what is special about plural -s_{pl}? why does the voiced series show different outputs after plural -s_{pl} (alternation between geminate and approximant)?

The feature specifications of the relevant segments are provided in (10) (based on Frigeni (2003)). Labials and dorsals are specified for the features [lab] and [dor] respectively under the Place node.

(10) a. main classes



b. final segments



5.1. The SV identity condition

Why does the voiced series appear to respond paradoxically to the strengthening requirement (surfacing as approximant in a gemination context)?
As shown in (10b), morpheme-final -*C* is not specified for SV. By considering the strengthening patterns in (2a,b), it is possible to draw the following generalizations:

(11) a. if SVless -*C* followed by equally SVless morpheme-initial (voiceless series), then orthodox gemination pattern
b. if SVless -C followed by C specified for SV (voiced series), then paradoxical behavior

Thus, it appears that identity with respect to the specification on the SV tier constrains the licensing: contextual featural information not only drives but also constrains licensing. Let us now illustrate the relevant derivations in detail.

5.1.1. Deriving the voiceless pattern: SV identity

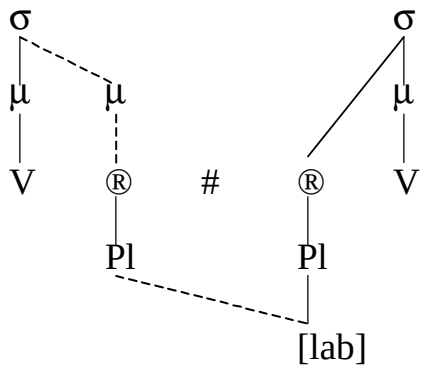
Morpheme-final segments (which are SVless) show identity on the SV tier with a following morpheme-initial consonant when the latter is also SVless (i.e., voiceless series {P, T, K}). This SV identity configuration allows the spreading of the other

features which are specified on the morpheme-initial consonant. These are place of articulation features in the case illustrated in (12). If the morpheme-initial segment is coronal (as is the preceding morpheme-final consonant), OCP effects arise.

Spreading and OCP both assure that the two edge segments completely share their structure. Shared structure D-licenses the morpheme-final segment as a coda; the fact that the shared structure includes all features creates a geminate.

(12) a. /Vt#pV/ > [VpːV] e.g.: /pappat pira/ > [papːa pːɪra] “eat.3SG pear”

b.

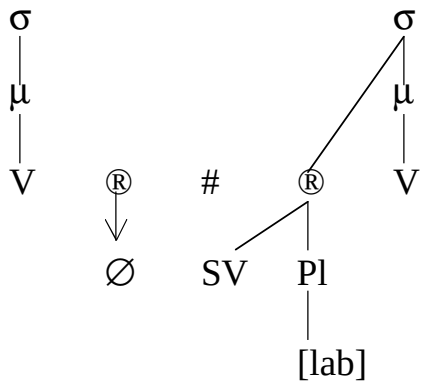


5.1.2. Deriving the voiced pattern: SV mismatch

If the morpheme-final consonant and the following morpheme-initial one display a mismatch on the SV tier (i.e., SVless final C # {B, D, G}), then the licensing of the final consonant is blocked. The unlicensed final consonant undergoes Stray Erasure. Morpheme-initial {B, D, G} are now in a post-vocalic context and thus weakened (approximant output).

(13) a. /Vt#bV/ > [VβV] e.g.: /parit bɛtʃtʃu/ > [paɾi βetʃːu] “seem.3SG old”

b.



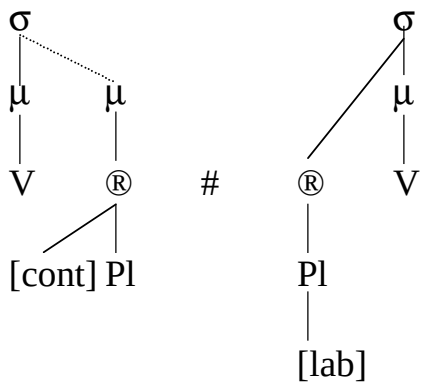
5.1.3. Deriving the behaviour of plural -s_{pl}

What is special about plural s_{pl}? Why does the voiced series show different outputs after plural s_{pl} (alternation between geminate and approximant)?

I propose that the SV identity condition is responsible for the asymmetry between voiceless and voiced outputs after plural -s_{pl} as well.SV identity allows the following derivation for plural -s_{pl} followed by morpheme-initial {P, T, K}.

(14) a. /Vs$_{pl}$#pV/ > [VspV] e.g.: /is pippius/ > [is pip:iuzu] “the children”

b.



Why does plural -s_{pl} in (14) preserve its featural profile? I claim that when a segment is underlyingly specified for its prosodic licensing this ‘shields’ its featural specification. In (14), -s_{pl} is underlyingly specified for being licensed as a coda on the edge of the morpheme (graphically realized as a non-dotted line linking a mora to -s_{pl}). In this way no operation with respect to features needs to take place between the edge-segments. This can be translated in terms such as the ones exploited above: the underlying prosodic specification shields the underlying feature specification. Thus, just as the feature specification of a segment drives and constrains its prosodic licensing/parsing, so the prosodic specification of a segment —if underlyingly present—conditions its featural licensing.

How do we derive the output alternation for the voiced series? The SV mismatch between the two consonants implies that the derivation cannot proceed as for the voiceless series: specifically, the SV mismatch blocks the prosodic licensing of -s_{pl}

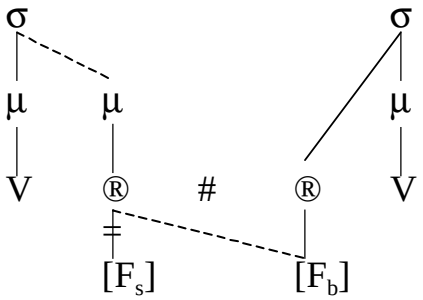
This conflicts with the fact that plural -s_{pl} is lexically specified for prosodic constituency. In order to model this conflict, it is useful to exploit OT constraints. A faithfulness constraint such as MAX(μ) requires the maintenance of the underlying coda profile. At the same time, the underlying prosodic specification enforces the requirement that -s_{pl} maintains its features (MAX([F])).

The output alternation is precisely the result of two competing resolution strategies. In (15) the feature specification is given up in order to preserve the underlying mora. The bare timing slot must be licensed as a coda, due to the underlying mora, and thus the features of the following morpheme-initial onset are spread onto it.

(15) a. Max(μ) >> Max([F]): geminate output

b. /is bakkas/ > [i bːakːaza] “the cows”

c.

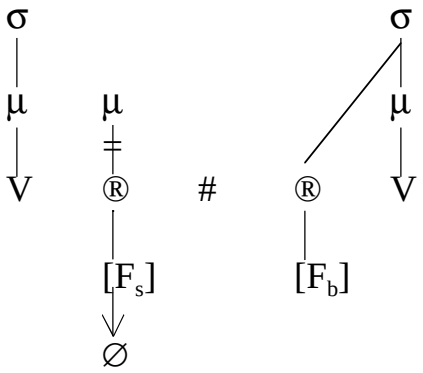


In (16), the mora is deleted in favor of the underlying feature specification. However, since the S#B sequence shows an SV mismatch, sharing is blocked and morpheme-final $–s_{pl}$ undergoes Stray Erasure. Word-initial B, now intervocalic, become an approximant (as in the lenition environment; see (1b).

(16) a. Max([F]) >> Max(μ): approximant output

b. /is bakkas/ > [i βakːaza] “the cows”

c.



6. Conclusions

In this paper I showed: the role played by features in driving parsing and licensing; that parsing and licensing in SSard are two successive cycles of the same algorithm; that if a segment is underlyingly specified for three levels of representation, the tight relationship between the prosodic and featural level informs the phonological processes in which this segment is involved.

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