Constraints on the Metathesis of Sonorant Consonants in Judeo-Spanish

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Abstract

Judeo-Spanish denotes those varieties of Spanish preserved by the Sephardic Jews who were expelled from Spain in 1492 and have emigrated throughout Europe, North Africa, the Middle East, and the United States. This paper examines three types of consonant metathesis in Judeo-Spanish: *daldo* < *dadlo* 'give it', *terné* 'I will have' < *tener* 'to have', and *tadre* < *tarde* 'late, afternoon'. The first two types are analyzed in terms of syllable contact optimization, following Holt's (2004) Optimality-theoretic analysis of *dl* and *dn* metathesis in Old Spanish. Heteromorphemic *dm* clusters were immune from metathesis in Old Spanish, and the same restriction is found in modern-day Judeo-Spanish: *dadme* vs. **damde/dande* 'give me'. A novel analysis is proposed in which nasal place assimilation and positional faithfulness constraints block *dm* metathesis across morpheme boundaries. Unlike *dl* and *nr* metathesis, transposition of *rd* clusters in Judeo-Spanish does not result from syllable contact optimization. This innovation is analyzed as an effect of the Obligatory Contour Principle, whereby adjacent segments identical in place, manner, and voicing specifications are prohibited. The analyses developed in this paper highlight the role of constraints on segmental features, which interact with sonority constraints to generate the attested patterns of consonant metathesis. The paper also considers additional metathesis patterns from other languages in light of the proposed analyses, as well as some of the difficulties posed by the Hispano-Romance data with respect to perceptually-based alternative approaches.

1. Introduction

Judeo-Spanish (henceforth, JS) denotes those varieties of Spanish preserved by the Sephardic Jews who were expelled from Spain in 1492 and have emigrated throughout Europe, North Africa, the Middle East, and the United States. Despite its current status as an endangered language due to the lack of monolingual speakers and to the ever decreasing number of fluent speakers under the age of fifty-five (T. Harris 1994), modern JS remains underrepresented in recent work on Ibero-Romance phonetics and phonology and in general phonological theory. Previous descriptions of JS emphasize its conservative, archaic nature, highlighting its similarities to Old Spanish (henceforth, OS), while other research points up the novel characteristics that distinguish JS from both OS and other varieties of Modern Spanish (henceforth, MS). One phonological phenomenon of JS in which both retention and innovation can be observed is consonant metathesis. This paper develops an account of several types of consonant metathesis in JS within the constraint-based framework of Optimality Theory (McCarthy and Prince 1995, Prince and Smolensky 1993/2004).

Holt (2004) accounts for *dl* and *dn* metathesis in OS, e.g., *daldo* < *dadlo* ‘give it’, *dandos* < *dadnos* ‘give us’, as a strategy for repairing bad syllable contact, formalized in terms of interacting constraints on sonority and segmental ordering. Holt’s analysis readily extends to modern JS, which has retained *dl* metathesis in imperative-clitic sequences. Also evident in OS and in some JS dialects is the metathesis of *nr* clusters in irregular future and conditional forms, e.g., *terné* ‘I will have’ < *tener* ‘to have’. I show that *nr* metathesis receives a straightforward account in terms of syllable contact optimization. In OS, metathesis did not affect heteromorphemic *dm* clusters, and the same restriction is found in modern-day JS, e.g., *dadme* vs. **damde/dande* ‘give me’. To

explain the failure of *dm* metathesis across morpheme boundaries, I extend Holt's (2004) account through higher-ranking nasal place assimilation and positional faithfulness constraints. On this analysis, the bad syllable contact in *dm* is tolerated because it is better than the metathesized alternatives: *md* does not share place features, and *nd* changes the place of articulation of the morpheme-initial nasal.

Modern JS dialects also show a case of innovative rhotic metathesis in which heterosyllabic *rd* was transposed to tautosyllabic *dr* within and across morphemes, e.g., *tadre* < *tarde* 'late, afternoon', *par amodre de* < *par amor de* 'for the love of'. Unlike *dl* and *nr* metathesis, transposition of *rd* does not result from syllable contact optimization. I analyze this innovation as an effect of the Obligatory Contour Principle (Leben 1973, McCarthy 1986), whereby adjacent segments identical in place, manner, and voicing specifications are prohibited. I hypothesize that /ɾ/ in JS came to be realized phonetically as approximant [ɻ] in coda versus noncontinuant [ɾ] in onset, due to syllable-position effects (Kochetov 2006, Krakow 1999). Heterosyllabic [ɻ.ð] contains adjacent coronal voiced approximants, whereas coronal clusters of coda [ɻ] followed by [t], [n], [l], or [s], as well as tautosyllabic [.ðɾ], all have non-identical featural specifications. The ranking of OCP(place, manner, voice) above constraints on segment order explains why only *rd* clusters underwent metathesis in JS.

This paper is organized as follows. Section 2 presents the basic metathesis data and reviews the syllable-contact analysis of Holt (2004). Section 3 extends the analysis to account for the restriction involving *dm*. Section 4 examines *rd* metathesis and develops an account in terms of the Obligatory Contour Principle. Section 5 considers some additional data in light of the proposed analyses, as well as some of the difficulties posed

by the OS and JS data with respect to perceptually-based approaches to consonant metathesis. Section 6 concludes.

2. Nasal and lateral metathesis as optimization of syllable contact

Atonic vowel loss in Late Spoken Latin often created instances of "bad syllable contact" involving tautomorphemic *dn* and *dl* clusters, which were sometimes repaired in OS by metathesis, among other strategies not shown here.[1] The examples in (1a) and (1b) illustrate *dn* and *dl* metathesis, respectively (García de Diego 1970, Holt 2004, Lloyd 1987, Martínez-Gil 1991, 1994, 2003, Menéndez-Pidal 1941, Penny 2002, Pountain 2001). While variable forms are attested in OS, only the metathesized clusters are preserved in MS.

(1)

	Latin	OS	MS	
a.	CATENATU	*cadnado ~ candado*	*candado*	'padlock'
	ANTENATU	*adnado ~ andado*	*andado* (cf. learnèd *antenado*)	'stepchild'
	LEGITIMU	*lidmo ~ lindo*	*lindo*	'pretty'
	RETINA	*riedna ~ rienda*	*rienda*	'rein'
b.	SPATULA	*espadla ~ espalda*	*espalda*	'back'
	CAPITULU	*cabidlo ~ cabildo*	*cabildo*	'town council'
	FOLIATILE	*hojadle ~ hojaldre*	*hojaldre*	'puff pastry'
	TITULO	*tidle ~ tilde*	*tilde*	'written accent'

Metathesis also variably affected heteromorphemic *dn* and *dl* in OS plural imperative-clitic sequences, as shown by the examples in (2a,b). Metathesis across the morpheme boundary no longer occurs in MS.

(2)

	OS	MS	
a.	*dadnos ~ dandos*	*dadnos*	'give us'
	hazednos ~ hazendos	*hacednos*	'do us'
b.	*dadlo ~ daldo*	*dadlo*	'give it'
	dezidlo ~ dezildo	*decidlo*	'say it'

Like MS, JS has retained the lexicalized outcomes of morpheme-internal metathesis. Examples such as *lindo* ‘pretty’ and *espalda* ‘back’ are attested in Nehama’s (1977) JS-French dictionary, based on the variety of JS spoken in Salonika. Unlike MS, however, JS still exhibits productive metathesis of *dl* in plural imperative-clitic sequences. The forms presented in (3) are documented in T. Harris (1994: 75), and similar examples and descriptions are found in Agard (1950: 207-208), Baruch (1930: 139), Crews (1935: 229), Luria (1930: 136), Subak (1906: 136-137), and Wagner (1914: 127-128).

(3)

JS	MS	
tomalda	*tomadla*	‘take it’
bushkalda	*buscadla*	‘look for it’
daldo	*dadlo*	‘give it’
metelda	*metedla*	‘put it’
traeldo	*traedlo*	‘bring it’

Metathesis in OS verbal forms did not affect heterorganic *dm* clusters, as suggested by the lack of attested examples such as **damde/dande* for *dadme* ‘give me’ (Holt 2004: 51, Fn. 8). The first person plural pronoun *nos* ‘us’ in MS corresponds to *mos* ‘us’ in JS, the latter due to an independent and innovative change in the place of articulation of the nasal (Penny 1992: 137-138). To the best of my knowledge, there are no reports in the descriptive literature on JS of metathesis in forms such as **damde/dande* for *dadme* or **damdos/dandos* for *dadmos* ‘give us’.

Drawing upon previous work on the role of sonority in syllable structure (Bat-El 1996, Clements 1990, Hooper 1976, Murray and Vennemann 1983, among many others), Holt (2004) develops an analysis in Optimality Theory (henceforth, OT) of metathesis as a repair strategy for avoiding bad syllable contacts. Optimization of syllable contact is accounted for by the interaction among sonority constraints (4a,b,c), alignment (4d), and faithfulness (4e,f).

(4) a. MINIMAL DISTANCE IN SONORITY – MINDISTSON
There must be a minimum difference in sonority between members of a syllable onset.
b. SONORITY SEQUENCING PRINCIPLE – SSP
Between any member of a syllable and the syllable peak, only sounds of higher sonority rank are permitted.
c. SYLLABLE CONTACT LAW – SYLLCON
Sonority should not rise across a syllable boundary.
d. ALIGN
The elements of a morpheme should not extend beyond the stem boundary and should remain at the proper edge.
e. LINEARITY
The output is consistent with the precedence structure of the input and vice-versa.
f. MAXIMALITY
Input segments must have output correspondents.

To understand the role of syllable contact in OS metathesis, let us assume a sonority scale such as the one shown in (5). The sonority profiles of several different clusters are given in (6), where periods indicate syllable divisions. SYLLCON is violated by heterosyllabic *d.n* and *d.l* in (6a) because there is a rise in sonority across the syllable boundary. The opposite ordering of segments in (6b) satisfies the constraint because there is no sonority rise.

(5) Obstruents < Nasals < Liquids < Glides < Vowels (Clements 1990)
0 1 2 3 4

(6) a.	* *d.n*	0 → 1	* *d.l*	0 → 2	… violate SYLLCON
b.	√ *n.d*	1 → 0	√ *l.d*	2 → 0	… satisfy SYLLCON

The variability of metathesis results from a partially-ordered hierarchy in which the relationship between some of the constraints is in flux (see Anttila and Cho 1998, Anttila 2002). Tableau (7) illustrates the particular ranking of constraints that produces metathesis within morphemes and in imperative-clitic sequences. High-ranking MAXIMALITY rules out candidates with consonant deletion, which are not considered here. The apostrophe in the input /espad'la/ reflects the historically prior loss of the atonic vowel. Brackets indicate morpheme boundaries in the output forms of /dad-lo/. For the

moment, I abstract away from the continuancy alternation in Peninsular Hispano-Romance between stop [d] and approximant [ð] (although this difference will play a crucial role in the analysis of *rd* metathesis in JS proposed in Section 4). Heterosyllabic *d.l* in (7a) is a bad syllable contact, violating SYLLCON. The remaining three candidates avoid the bad syllable contact, but not all are equally optimal. The onset clusters *.dl* and *.ld* in (7c,d) violate sonority conditions on onsets.[2] The low ranking of LINEARITY ensures that the problematic cluster is repaired by metathesis in (7b). The analysis is essentially the same for heteromorphemic /dad-lo/. In addition to LINEARITY, metathesis violates ALIGN because the right edge of the verbal stem *dad* and the left edge of the clitic pronoun *lo* do not coincide in (7f,h).

(7) OS *espalda* 'back' and *daldo* 'give it'

		/espad'la/	MINDISTSON	SSP	SYLLCON	ALIGN	LINEARITY
	a.	es.pad.la			*!		
☞	b.	es.pal.da					*
	c.	es.pa.dla	*!				
	d.	es.pa.lda	*!	*			*

		/dad-lo/	MINDISTSON	SSP	SYLLCON	ALIGN	LINEARITY
	e.	dad.][lo			*!		
☞	f.	da[l.d]o				*	*
	g.	da.d][lo	*!				
	h.	da.[ld]o	*!	*		*	*

Holt attributes the lack of metathesis in MS plural imperative-clitic sequences to the external influence of the prescriptivist Real Academia Española, which would have favored maintaining the integrity of each component morpheme. As a result of this influence, MS has settled on the fixed ranking of ALIGN » SYLLCON, which disfavors productive metathesis across the morpheme boundary. Candidate (8e) wins under this ranking because alignment is respected at the expense of allowing a bad syllable contact.[3] Once OS outputs like (7b) were optimized and lexicalized, there would have been no way

for speakers to recover the etymological Latin form. Since prescriptivism could not undo the outcome of morpheme-internal metathesis, MS retains the *l.d* cluster in (8b).

(8) MS *espalda* ‘back’ vs. *dadlo* ‘give it’

	/espalda/	MINDISTSON	SSP	ALIGN	SYLLCON	LINEARITY
a.	es.pad.la				*!	*
☞ b.	es.pal.da					
c.	es.pa.dla	*!				*
d.	es.pa.lda	*!	*			

	/dad-lo/	MINDISTSON	SSP	ALIGN	SYLLCON	LINEARITY
☞ e.	dad.][lo				*	
f.	da[l.d]o			*!		*
g.	da.d][lo	*!				
h.	da.[ld]o	*!	*	*		*

I argue that the absence of normative pressure in JS has resulted in the retention of productive *dl* metathesis in plural imperative-clitic sequences. In contrast to the fixed MS ranking and the variable OS ranking, JS now has the fixed ranking of SYLLCON » ALIGN, which favors *daldo* (7f) over *dadlo* (7e). Like MS, JS has retained morpheme-internal metathesis, due to optimization and lexicalization of outputs like *espalda* in (7b).

The analysis presented thus far accounts for another type of metathesis in OS, not specifically treated by Holt (2004), which is retained in some modern JS dialects. In OS irregular future and conditional forms, deletion of the theme vowel of the infinitive often resulted in a nasal-rhotic cluster. Such derived clusters were variably resolved through metathesis, assimilation, and intrusive stop formation (Wanner 1989: 437). Baruch (1930: 139) and Lamouche (1907: 983) document synchronic alternations involving nasal-rhotic metathesis in modern JS irregular verbal forms, illustrated in (9). MS has retained the forms with intrusive stops, whereas the JS examples show metathesis.

(9)

JS	MS		
terné	*tendré*	‘I will have’	(cf. *tener* ‘to have’)
verné	*vendré*	‘I will come’	(cf. *venir* ‘to come’)

The fixed ranking of SYLLCON » LINEARITY in modern JS accounts for *rn* metathesis in terms of syllable contact optimization, as in the case of *dl* > *ld* discussed above. According to the sonority scale proposed in (5), the heterosyllabic *n.r* cluster in (10a) presents a sonority rise across the syllable boundary, violating SYLLCON, whereas the opposite ordering of segments in (10b) satisfies the constraint.

(10) a. * *n.r* 1 → 2 … violates SYLLCON
b. √ *r.n* 2 → 1 … satisfies SYLLCON

In tableau (11), the apostrophe in the input /ten'ɾ+e/ reflects the deletion of the theme vowel of the infinitive. Heterosyllabic *n.r* in (11a) is eliminated for its bad syllable contact, and the *.nr* and *.rn* clusters in (11c,d) are ruled out for their violations of sonority conditions on onsets. The metathesis candidate (11b) is optimal because LINEARITY is low-ranking.[4]

(11) OS/JS *terné* 'I will have'

	/ten'ɾ+e/	MINDISTSON	SSP	SYLLCON	ALIGN	LINEARITY
	a. ten.ɾe			*!		
☞	b. teɾ.ne					*
	c. te.nɾe	*!				
	d. te.ɾne	*!	*			*

3. Nasal place alternations and the failure of *dm* metathesis

One prediction of the sonority-based account is that since *m* and *n* have the same sonority rank, *dm* should undergo metathesis as easily as *dn.* However, only homorganic *dn* underwent metathesis in OS imperatives, and forms such as **damde/dande* < *dadme* and **damdos/dandos* < *dadmos* remain unattested in JS. Holt (2004: 51, Fn. 8) suggests in passing that this restriction has to do with perceptibility: "[T]he different points of articulation of /d/ and /m/ presumably remain perceptually distinct and therefore these

segments are immune from reordering. That is, metathesis would yield no appreciable gain in perceptibility." However, the morpheme-internal cluster in the third example of (1a), LEGITIMU > *lidmo ~ lindo,* did undergo metathesis and regressive nasal place assimilation, ultimately producing MS/JS *lindo* 'pretty'. More generally, assimilation took place when atonic vowel deletion in Late Spoken Latin produced nasal-stop clusters within the morpheme. As shown in (12), intervocalic stops first became voiced, and vowel loss then produced nasal-stop clusters that were subject to regressive place assimilation (Penny 2002: 59, 87-88).

(12)	a.	COMITE > **comide* > **comde* > *conde*	'count'
		LIMITARE > **limedar* > **limdar* > *lindar*	'to border upon'
		SEMITA > **semida* > **semda* > *senda*	'path'
	b.	BONITATE > **bonidade* > *bondad*	'goodness'
	c.	MANICA > **manega* > *ma*[ŋ]*ga*	'sleeve, hose'
		DOMINICU > **dominigo* > *domi*[ŋ]*go*	'Sunday'

The final forms in (12a,c) show that homorganicity was achieved at the expense of sacrificing the original place features of the nasal. Place features of the following syllable-initial stop were maintained intact. In (12b), vowel deletion produced a homorganic cluster by default.

The generalization emerging here is that stop-nasal metathesis is permitted just in case the resulting syllable-final nasal can share the place features of the following stop. In the case of LEGITIMU > *lidmo ~ lindo,* metathesis is licensed on independent grounds because nasals generally give up their place features to become homorganic with a following tautomorphemic stop, as seen in (12a,c). In the case of *dadnos ~ dandos,* metathesis can occur because the resulting cluster is homorganic by default, as in (12b). Since heteromorphemic *dm* is immune to reordering, it must be the case that morpheme-initial nasals are protected from losing their input place specifications. I propose a formal

account of this pattern involving nasal place assimilation and positional faithfulness constraints:

(13) a. NASALASSIMILATION – NASASSIM (Pater 2001: 175)
A nasal must share place features with a following consonant.
b. IDENT(place) (McCarthy and Prince 1995)
Corresponding input and output segments have the same place features.
c. IDENTMORPHEME-INITIAL(place) – IDENTMI(place) (cf. Beckman 1997: 56, Casali 1996: 27)
Corresponding input and output segments in morpheme-initial position have the same place features.
d. Ranking: NASASSIM, IDENTMI(place) » IDENT(place)

The markedness constraint in (13a) penalizes nasal-consonant clusters that do not share major place features, where place ∈ {LABIAL, CORONAL, PALATAL, DORSAL}. The context-free faithfulness constraint in (13b) is violated whenever an input segment undergoes a change in place features in its output correspondent. The positional faithfulness constraint in (13c) militates against a change in place features when the relevant segment is morpheme-initial (cf. Beckman 1997: 52-53 on the psycholinguistic motivation of root-initial positional faithfulness constraints).

When integrated within the analysis outlined in Section 2, the ranking in (13d) successfully accounts for the failure of *dm* clusters to undergo metathesis across a morpheme boundary. Although (14a) violates SYLLCON, the violation is tolerated because the metathesis candidates fare worse on the higher-ranked constraints. The heterorganic cluster in (14b) violates NASASSIM because the labial nasal does not share place features with the following coronal stop. The place-assimilated nasal in (14c) violates IDENTMI(place) because the initial labial nasal of the input clitic changes to coronal in the output.[5] This analysis captures the fact that it is worse to create a heterorganic nasal-consonant cluster (14b) or to change place features of a morpheme-initial nasal (14c) than it is to tolerate a sonority rise across the syllable boundary (14a).

In contrast, since the nasal of input /dn/ is already coronal, metathesis in (14e) improves syllable contact without violating higher-ranked NASASSIM. Gratuitous changes of the coronal nasal to any other place of articulation, such as labial in (14f), are ruled out by violations of NASASSIM and the positional faithfulness constraint IDENTMI(place).

(14) OS/JS *dadme* 'give me' vs. OS *dandos* 'give us'

	/dad-me/	NAS ASSIM	IDENTMI (place)	SYLL CON	IDENT(place)	ALIGN	LINEARITY
☞	a. dad.][me			*			
	b. da[m.d]e	*!				*	*
	c. da[n.d]e		*!		*	*	*

	/dad-nos/	NAS ASSIM	IDENTMI (place)	SYLL CON	IDENT(place)	ALIGN	LINEARITY
	d. dad.][nos			*!			
☞	e. da[n.d]os					*	*
	f. da[m.d]os	*!	*		*	*	*

The same ranking would have allowed both metathesis and nasal place assimilation within the morpheme in OS, as illustrated in tableau (15). Given the ranking of SYLLCON above IDENT(place) and LINEARITY, the input labial nasal undergoes metathesis with and assimilates in place of articulation to the coronal stop, as in (15c). Since the nasal in this case is not morpheme-initial, IDENTMI(place) is irrelevant (cf. (14c)). Variable ranking of SYLLCON with respect to IDENT(place) can account for the variability between *lidmo* (15a) and *lindo* (15c) in OS.

(15) OS *lindo* 'pretty'

	/lid'mo/	NAS ASSIM	IDENTMI (place)	SYLL CON	IDENT(place)	ALIGN	LINEARITY
	a. lid.mo			*!			
	b. lim.do	*!					*
☞	c. lin.do				*		*

In the positional faithfulness approach, SYLLCON targets both *dm* and *dn* equally, but higher-ranking constraints on nasal place alternations block metathesis of the former

cluster. In a possible alternative account, the markedness constraint responsible for triggering metathesis could be made to target only the homorganic cluster, presumably due to the similarity of place features. Cross-linguistically, metathesis often affects adjacent segments that are acoustically or perceptually similar in some way. Based on the work of Kawasaki (1982) and Ohala (1990, 1993), Hume (1998: 303) argues that "sharper changes in the speech signal increase the salience of cues in the portion of the signal where the modulation takes place; the greater the magnitude of the modulation, the better the signal is detected." The greater susceptibility of homorganic *dn* to undergo metathesis can thus be attributed to a reduced modulation of the speech signal. This functional explanation is in agreement with Holt's (2004 : 51, Fn. 8) suggestion, cited above, that greater perceptibility impedes *dm* metathesis.

Hume (1998, 2001) proposes a formal analysis of similarity effects in consonant metathesis in terms of constraint conjunction (Alderete 1997, Crowhurst and Hewitt 1997, Smolensky 1993, 1997). Specifically, the markedness constraint violated by the non-metathesized candidate is conjoined with an Obligatory Contour Principle (henceforth, OCP) constraint targeting the particular feature shared by the adjacent segments.[6] Leben (1973) first proposed the OCP in order to explain distributional regularities in lexical tone systems, and McCarthy (1986) subsequently modified the OCP to apply also to nonlinear segmental phonology. Some OT approaches to the segmental OCP have formulated the principle as a violable constraint taking different features as its arguments. Applying this approach to the OS data, let us assume the definition of Local Conjunction in (16a), as well as the OCP constraint in (16b), which targets CORONAL place:

(16) a. The Local Conjunction of C_1 and C_2 in domain D, $[C_1 \& C_2]_D$, is violated when there is some domain of type D in which both C_1 and C_2 are violated. (Smolensky 1993)
b. OCP(CORONAL)
Adjacent segments identical in CORONAL place are prohibited.
c. $[\text{OCP(COR)} \& \text{SYLLCON}]_{\text{AdjacentSegments}}$

Local conjunction provides a way to limit metathesis to clusters of coronal consonants that exhibit a bad syllable contact. The conjoined constraint in (16c) is violated by an output candidate if and only if both of the simplex constraints are violated within the domain of adjacent segments.

The tableaux in (17) repeat those in (14), except that IDENTMI(place) is omitted and the conjoined constraint $[\text{OCP(COR)} \& \text{SYLLCON}]_{\text{AdjSeg}}$ replaces the simplex constraint SYLLCON. The alternative analysis produces the correct results for heteromorphemic contexts. The cluster in (17a) does not violate the conjoined constraint because the simplex constraints SYLLCON and OCP(COR) are not simultaneously violated within the domain of adjacent segments. Although *d.m* violates SYLLCON, it satisfies OCP(COR) because the consonants are not both coronal. NASASSIM and IDENT(place) rule out the metathesis candidates in (17b,c), and the underlying segment order is preserved in the output. Since the cluster in (17d) violates both SYLLCON and OCP(COR), the conjoined constraint is also violated, and metathesis is optimal in (17e).

(17) Alternative analysis involving constraint conjunction

	/dad-me/	NAS ASSIM	$[\text{OCP(COR)} \& \text{SYLLCON}]_{\text{AdjSeg}}$	IDENT(place)	ALIGN	LINEARITY
☞ a.	dad.][me					
b.	da[m.d]e	*!			*	*
c.	da[n.d]e			*!	*	*

	/dad-nos/	NAS ASSIM	$[\text{OCP(COR)} \& \text{SYLLCON}]_{\text{AdjSeg}}$	IDENT(place)	ALIGN	LINEARITY
d.	dad.][nos		*!			
☞ e.	da[n.d]os				*	*
f.	da[m.d]os	*!		*	*	*

While the local conjunction approach successfully distinguishes between *dm* and *dn* across morpheme boundaries, the account falls short in morpheme-internal contexts. A comparison of candidates (17a) and (18a) reveals that the conjoined constraint cannot distinguish between derived and non-derived *d.m* clusters. In both cases, the same ranking of constraints selects the candidate that preserves the segmental ordering of the input. This is the wrong outcome for morpheme-internal clusters, as indicated by the 💣 symbol appearing next to the candidate in (18a). In the positional faithfulness approach, however, SYLLCON targets both derived and non-derived *d.m* clusters in (14a) and (15a), respectively. Since IDENTMI(place) is irrelevant when the nasal is not morpheme-initial, metathesis and nasal place assimilation can apply simultaneously in (15c).

(18) Alternative analysis cannot produce morpheme-internal metathesis

	/lid'mo/	NAS ASSIM	[OCP(COR) & SYLLCON]$_{AdjSeg}$	IDENT(place)	ALIGN	LINEARITY
💣	a. lid.mo					
	b. lim.do	*!				*
	c. lin.do			*!		*

Thus far, I have shown that metathesis of *dn, dl,* and *nr* clusters in JS can be readily understood in terms of syllable contact optimization. The restriction of metathesis to homorganic stop-nasal sequences across morpheme boundaries is best accounted for by the interaction of additional constraints governing nasal place alternations. The next section turns to the case of innovative *rd* metathesis in JS, in which cluster transposition cannot be motivated in terms of syllable contact.

4. Rhotic metathesis as a segmental OCP effect

In almost all varieties of JS except the northwest Balkans, inherited words that contained *rd* clusters in OS now have corresponding *dr*. Penny (1992: 138) states that since this

feature is unattested in other varieties of Hispano-Romance, it should be included among the innovations of JS. The data in (19a) are from T. Harris (1994: 75), and similar examples are found in Agard (1950: 206), Crews (1935: 188), Luria (1930: 136), Nehama (1977), and Sala (1971: 51). Subak (1906: 171-172) documents the example in (19b) from Istanbul JS showing *rd* metathesis across the word boundary. Apparently, transposition of the original *rd* cluster led to lexicalization of the resulting blend *amodre*, thus requiring a second appearance of the preposition in the phrase *par amodre de* 'for the love of'.

(19) a.

JS	MS	
tadre	*tarde*	'late, afternoon'
sodro	*sordo*	'deaf'
pedron	*perdón*	'pardon'
godro	*gordo*	'fat'
pedrer	*perder*	'to lose'
vedra(d)	*verdad*	'truth'
kwedra	*cuerda*	'cord'
akodro	*acuerdo*	'agreement'
guadrar	*guardar*	'to keep'
vedre	*verde*	'green'

b. *par amodre de mi* 'for the love of me'
(< **par amodre*
< *par amor de*)

What motivates *rd* metathesis? Syllable contact cannot be at issue because *r.d* already has the preferred sonority drop across the syllable boundary, i.e., $2 \rightarrow 0$ according to the sonority scale in (5). Blevins and Garrett (2004: 136) suggest in passing that the *rd* > *dr* shift in JS may be a consequence of coarticulatory effects: "[w]hen C_1C_2 gestural overlap results in nearly simultaneous closure, with C_1 released after C_2, a C_2C_1 cluster may be perceived." However, it remains to be explained why only *rd* clusters would have been subject to overlap but not other clusters containing a rhotic. For example, metathesis failed to affect *r* before noncoronal consonants in (20a). The absence

of attested examples like (20b) reveals the directionality of metathesis, which transposed *rd* to *dr* but not vice-versa. Metathesis is also unattested in other rhotic-coronal clusters, as shown in (20c).

(20)	a.	*amargo*	**amagro*	‘bitter’
		yerva	**yevra*	‘grass’
	b.	*kwadro*	**kwardo*	‘frame’
		padre	**parde*	‘father’[7]
	c.	*arto*	**atro*	‘full, fed up’
		karne	**kanre*	‘meat’
		perla	**pelra*	‘pearl’
		diverso	**divesro*	‘diverse’

A brute-force markedness constraint such as **rd* ranked above LINEARITY and ALIGN would generate the patterns in (19a,b), respectively. However, such an approach merely stipulates *rd* as a target of metathesis without explaining why the clusters in (20) were unaffected. I propose that *rd* was targeted because *the adjacent consonants were maximally similar in place, manner, and voice features.* This explanation rests upon several claims about the phonetic realization of JS /ɾ/ and /d/ in different syllabic contexts. First, recent articulatory studies document syllable-position effects in several languages, whereby syllable-initial consonants tend to show more stable patterns of intrasegmental gestural coordination and greater degrees of constriction than the same consonants in syllable-final position (Kochetov 2006, Krakow 1999, and studies cited therein). A plausible hypothesis is that in JS, coda /ɾ/ came to be realized more frequently as an approximant (transcribed here as [ɻ̝] with the IPA lowering diacritic), while /ɾ/ associated to the syllable onset was realized with tighter constriction degrees (see Blecua 2001 for an acoustic description of approximant and stop-like realizations of /ɾ/ in modern Castilian Spanish). Second, in most JS varieties, the voiced obstruents /bdg/ show the same allophonic distribution as in Peninsular Hispano-Romance varieties, with approximant [βðɣ] appearing in most positions and stop [bdg] only after a pause or nasal,

and also after a lateral in the case of /d/ (Penny 1992: 137). Third, Spanish approximants [βðɣ] involve less articulatory precision and do not have release bursts, in contrast to their plosive counterparts (Martínez-Celdrán 2004).

If correct, the hypothesis that *rd* in JS was realized phonetically as [ɾ̥.ð] makes it possible to analyze rhotic metathesis as a segmental OCP effect. I propose an analysis of *rd* metathesis involving the OCP constraint in (21), which operates over features such as the ones shown in (22) for coronal consonants.

(21) OCP(place, manner, voice) – OCP
Adjacent segments identical in place, manner, and voice features are prohibited.

(22)

	[ɾ̥]	[ð]	[ɾ]	[d]	[t]	[n]	[l][8]	[s]
CORONAL	√	√	√	√	√	√	√	√
[continuant]	+	+	–	–	–	–	–/+	+
[nasal]	–	–	–	–	–	+	–	–
[lateral]	–	–	–	–	–	–	+	–
[burst]	–	–	–	+	+	–	–	–
[voice]	+	+	+	+	–	+	+	–

Although arguably universally non-contrastive, the phonetic feature [burst] is included in (22) to distinguish between the noncontinuants [ɾ] and [d] (see Steriade 2000). The heterosyllabic sequence [ɾ̥.ð] violates (21) because the approximants [ɾ̥] and [ð] are identical in place, manner, and voice features. Heterosyllabic clusters of [ɾ̥] followed by coronal [t], [n], [l], or [s] are non-identical in manner and/or voice features and, therefore, do not violate the constraint. Since noncontinuant [ɾ], which surfaces *ex hypothesi* in onset position, differs from [ð] with respect to [continuant], tautosyllabic [.ðɾ] is also non-identical and immune from the OCP.[9]

The tableaux in (23) illustrate the analysis of *rd* metathesis both word-internally and across word boundaries. The distribution of coda [ɾ̥] versus onset [ɾ] and the appearance of [ð] are controlled by other constraints not shown here. The ranking of OCP

» LINEARITY favors the [.ðɾ] onset cluster in (23b) over heterosyllabic [ɾ.ð] in (23a). Heterosyllabic [ð.ɾ] in (23c) violates SYLLCON because sonority rises across the syllable boundary. Tautosyllabic [.ɾð] in (23d) violates sonority sequencing because sonority does not rise between the rhotic and the syllable peak. Optimal outputs like (23b) were eventually lexicalized in JS, thus giving rise to the metathesized forms observed in (19a). The analysis is the same for the phrase /amoɾ ðe/, except that metathesis across the word boundary in (23f) also violates ALIGN. In contrast to the frequency of word-internal *rd* metathesis, the paucity of examples showing *rd* metathesis across the word boundary suggests ALIGN » OCP » LINEARITY as a more appropriate ranking, with only sporadic inversion of the top two constraints producing occasional blends such as *amodre*.[10]

(23) *rd* metathesis in JS *tadre* 'late, afternoon' and *amodre* 'love (of)'

		/taɾðe/	MINDISTSON	SSP	SYLLCON	OCP	ALIGN	LINEARITY
	a.	taɾ.ðe				*!		
☞	b.	ta.ðɾe						*
	c.	tað.ɾe			*!			*
	d.	ta.ɾðe		*!				

		/amoɾ ðe/	MINDISTSON	SSP	SYLLCON	OCP	ALIGN	LINEARITY
	e.	a.moɾ.][ðe				*!		
☞	f.	amo.[ðɾ]e					*	*
	g.	a.mo[ð.ɾ]e			*!		*	*
	h.	a.mo.ɾ][ðe		*!				

Indirect evidence supporting the OCP account comes from the Bosnian variety of JS. Baruch (1930) observes that unlike other JS dialects, Bosnian JS exhibits only stop allophones of /bdg/. Specifically, "la *d* oclusiva es perceptible en posición intervocálica y precedida de *r, l, n: kada, modu, gordu, prenda, moldi*" (p. 138). Baruch goes on to note that *rd* metathesis is regular in all JS-speaking regions *except* in Bosnia, where forms

such as *vardi* ‘green’, *parder* ‘to lose’, and *gordu* ‘fat’ maintain the original *rd* clusters intact (p. 139). I argue that these two observations are related. Assuming the same distribution of coda [ɾ̪] versus onset [ɾ] hypothesized above, the lack of approximant [ð] in Bosnian JS suggests that *rd* and *dr* clusters would have been realized phonetically as [ɾ̪.d] and [.dɾ], respectively. Given the feature specifications in (22), neither of these phonetic sequences would have violated the OCP. Any deviation from the order of segments in the input would have been ruled out by violations of ALIGN and/or LINEARITY, regardless of the ranking of the OCP with respect to these constraints. In sum, the fact that the absence of approximant [ð] correlates with the absence of the *rd* > *dr* shift within the same JS dialect suggests that featural identity was a necessary condition for *rd* metathesis.

5. Additional metathesis data and alternative perceptual accounts

In this section, I consider some additional patterns of consonant metathesis from the perspective of the OT analysis developed in this paper. First, a reranking of the constraints that account for the failure of *dm* metathesis in OS and JS predicts a pattern that is attested in Sidamo and other Ethiopian languages. Second, in addition to the *rd* > *dr* shift, JS also exhibits sporadic leftward metathesis of *r* to the first complex onset of the word. Finally, I point out some of the difficulties posed by the OS and JS data with respect to perceptually-based approaches to consonant metathesis.

In Section 3, segmental alternations were shown to play a crucial role in limiting the range of consonant clusters that can be targeted by metathesis in OS and JS. Since SYLLCON dominates ALIGN, heteromorphemic stop-nasal clusters generally undergo metathesis to optimize syllable contact. Since NASASSIM and IDENTMI(place) dominate

SYLLCON, metathesis is licensed only if the homorganicity of the output cluster can be achieved without altering the input place features of the morpheme-initial nasal. In this way, metathesis is limited to *dn* clusters, leaving *dm* clusters intact. The opposite ranking of IDENTMI(place) below SYLLCON predicts a language in which input place features of the metathesized morpheme-initial nasal can be changed to achieve homorganicity. This pattern is attested in Sidamo, Darasa, Gedeo, Hadiyya and Kambata (Hudson 1975, 1995, Hume 1998). The data from Sidamo in (24) show that suffix-initial /n/ is regularly transposed with a root-final obstruent, to which the nasal assimilates regressively in place.

(24)	a.	/hab+nemmo/	[hambemmo]	‘we forget’
	b.	/gud+nonni/	[gundonni]	‘they finished’
		/it+noommo/	[intoommo]	‘we have eaten’
		/has+nemmo/	[hansemmo]	‘we look for’
	c.	/duk+nanni/	[duŋkanni]	‘they carry’
		/ag+no/	[aŋgo]	‘let’s drink’

The output clusters in (24a,c) show that homorganicity is achieved by sacrificing input nasal place features, while the clusters in (24b) are homorganic by default.

The analysis of the Sidamo pattern is illustrated in (25). High-ranking SYLLCON and NASASSIM rule out the bad syllable contact in (25a) and the heterorganic cluster in (25b), respectively. In the optimal candidate (25c), the initial coronal nasal of the input suffix changes to labial in the output, but unfaithfulness is tolerated because IDENTMI(place) is dominated by the top two markedness constraints. Unlike the OS/JS grammar in (14), the Sidamo ranking allows morpheme-initial nasal place features to be altered in order to satisfy the homorganicity requirement in metathesis contexts. The same ranking guarantees metathesis of input /dn/ clusters, as shown in (25e).

(25) Sidamo metathesis and nasal assimilation

	/hab-nemmo/	NAS ASSIM	SYLL CON	IDENTMI (place)	IDENT (place)	ALIGN	LINEARITY
	a. hab.][nemmo		*!				
	b. ha[n.b]emmo	*!				*	*
☞	c. ha[m.b]emmo			*	*	*	*

	/gud-nonni/	NAS ASSIM	SYLL CON	IDENTMI (place)	IDENT (place)	ALIGN	LINEARITY
	d. gud.][nonni		*!				
☞	e. gu[n.d]onni					*	*
	f. gu[m.d]onni	*!		*	*	*	*

Constraints on segmental feature distribution block *dm* metathesis in OS and JS, but we have also seen that segmental constraints can trigger metathesis when syllable contact is not at issue. In Section 4, the *rd* > *dr* shift in JS was analyzed in terms of an OCP constraint against adjacent segments identical in place, manner, and voice features. Candidates (23c,d,g,h) all satisfy the OCP but violate constraints on sonority sequencing or syllable contact. Therefore, while syllable contact itself does not trigger *rd* metathesis, optimal syllabification of the output cluster is determined by sonority constraints that are otherwise active in the grammar.

The transposition of *rd* clusters was an innovative and highly regular sound change in the majority of JS dialects. However, there is yet another, less productive type of rhotic metathesis that deserves mention. Baruch (1930: 139), T. Harris (1994: 75), Luria (1930: 136), and Sala (1971: 154) document the following examples:

(26)

	JS	MS	
a.	*prisona*	*persona*	‘person’
	prisigir	*perseguir*	‘to pursue’
	treseru	*tercero*	‘third’
b.	*impruviser*	*empobrecer*	‘to impoverish’
	provi	*pobre*	‘poor’
	krosta	*costra*	‘scab’

A comparison of the JS forms with their MS counterparts shows that *r* has migrated leftward from coda position in (26a) and from the second position of a complex onset in (26b), ending up in the first complex onset of the word.

A similar and much more productive case of leftward rhotic metathesis is found in the Sardinian dialect of Sestu Campidanian (Bolognesi 1998, Frigeni 2005a,b). Some varieties of Sardinian also exhibit the *rd* > *dr* shift, but unlike JS, other rhotic-coronal clusters have undergone total assimilation.[11] A comprehensive analysis should be able to account for the types of *rC* and *Cr* clusters that are targeted by metathesis, as well as differences in the direction of movement (i.e., why rhotics generally move leftward except in the context of *rd* clusters, which are transposed to *dr*). In Alber's (2001) OT account of leftward rhotic metathesis in Sardinian, a positional markedness constraint interacts with LINEARITY constraints to trigger metathesis of the rhotic to a prominent position such as the onset of the first syllable. This account can plausibly be extended to cover the sporadic cases of leftward rhotic metathesis in JS, although space constraints prevent such an extension here.

Recent work in phonological theory has approached the phenomenon of consonant metathesis from the perspective of listener-based sound change (Ohala 1993). According to Blevins and Garrett (2004), perceptual metathesis involves segments with acoustic features that can be realized over temporal domains spanning entire syllables or even strings of syllables (e.g., lowered F3 for rhotics and rhotic vowels, lateral formants for laterals and lateral vowels, and spectral zero / nasal resonance for nasals and nasalized vocoids). Metathesis occurs when listeners reinterpret the elongated feature in a non-historical position. The OS and JS data present several problems for this approach. First, Spanish /ɾ/ is typically described as having an extra-short acoustic duration of

approximately 20 ms (Quilis 1993), which arguably makes it one of the shortest segments cross-linguistically. At least with respect to the long-distance metatheses in (26b), it seems difficult to reconcile the extreme brevity of /ɾ/ with the requirement that an acoustic feature extend over a sufficiently long domain in order for perceptual metathesis to occur. Second, temporal extension of acoustic features alone cannot explain the directionality of the *rd* > *dr* shift in (19), nor the failure of the clusters in (20a,c) to undergo transposition. Third, Blevins and Garrett predict that local metathesis should not affect stop-nasal clusters in any language, since there is no way for nasality to extend across the adjacent stop without directly affecting it. In a brief footnote, they suggest that the Spanish *tn* > *nd* sound change has been erroneously classified as metathesis and that the shift instead occurred via loan adaptation, although they provide no further discussion or evidence to support such a claim. However, it is clear from the written record that coronal stop-nasal metathesis was a productive, albeit variable, sound change internal to OS. The examples in (1a) are patrimonial lexical items inherited directly from Late Spoken Latin, while those in (2a) are morphologically complex forms created via productive cliticization. Nasal metathesis is indeed possible and follows directly from the interaction of markedness and faithfulness constraints in the grammar.

Hume (2004) proposes a model in which two conditions must obtain in order for metathesis to occur. First, the linear ordering of elements must exhibit indeterminacy, which is a function of both the listener's experience with those elements and the quality of information occurring in the speech signal. Second, the structure resulting from metathesis must be attested in the language. Word-medial *dn* and *dl* clusters are extremely rare in Spanish (see Eddington 2004: 67), and this no doubt would have led to indeterminacy regarding their linear order in OS due to the listener's inexperience with

these clusters. However, temporal extension of "stretched out" acoustic features also leads to indeterminacy, which makes Hume's approach subject to the same criticisms raised above regarding the perceptual metathesis of *dn* in OS and long-distance rhotic metathesis in JS. Furthermore, Hume argues that since stop release is favored prevocalically but perceptually masked in preconsonantal contexts, "the observation that a stop/consonant sequence is reordered so that the stop emerges instead before a vowel is thus to be expected" (p. 218). From this perspective, it is a mystery why *rd* metathesis in JS consistently transposed the already prevocalic voiced coronal obstruent to preconsonantal position.

6. Conclusion

While metathesis is typically described as an irregular and unpredictable sound change, Hock (1985) and others have noted that metathesis often serves to repair phonotactically illicit sequences or to bring about preferred syllable structures. Building upon Holt's (2004) syllable-contact account of OS metathesis, I have proposed a formal explanation of why heteromorphemic *dm* is immune from metathesis in both OS and JS. While the transposition of a coronal stop and a following nasal consonant is triggered by a constraint on syllable contact, the change is blocked by higher-ranking constraints governing nasal place alternations. I have also proposed to explain the *rd* > *dr* shift in JS as an OCP effect motivated by the avoidance of adjacent segments identical in place, manner, and voice features. The theoretical relevance of these novel proposals is that they highlight the role of constraints on segmental features, which interact with sonority constraints to generate the patterns of consonant metathesis attested in Hispano-Romance varieties.

Notes

[1] Other attested strategies include dissimilation, palatalization, intrusive stop formation, deletion and strengthening. A particular word from Latin may show several variant forms in the written record from OS, e.g., ANTENATU > OS *adnado ~ andado ~ andrado ~ alnado ~ anado ~ annado* 'stepchild' (see Holt 2004: 44, Fn. 1 and references cited therein).

[2] In Spanish, complex onsets consist of an obstruent /p, t, k, b, d, g, f/ followed by a liquid /l/ or /ɾ/, but there are exceptions involving clusters of a coronal stop followed by the lateral. While /dl/ is not a permissible onset cluster in any dialect, onset /tl/ is allowed in some varieties such as Mexican Spanish (see J. Harris 1983: 13-14, 20-22, 31-35). Given the sonority scale in (5), MINDISTSON actually predicts that stop-lateral onsets should be as well formed as stop-rhotic onsets, since both types present the same sonority distance. Additional constraints must be invoked to account for /tl/ and /dl/ clusters, but I do not address the issue in this paper. For further discussion and analysis of stop-lateral onsets, see Martínez-Gil (2001) and, more recently, Bradley (2006).

[3] A further change has arisen in some Peninsular varieties of MS, whereby the final /d/ of informal plural imperatives is replaced by /ɾ/, e.g., *apagadla* > *apagarla* 'turn it off', *decidme* > *decirme* 'tell me' (Eddington 2004: 66-68). José Ignacio Hualde (personal communication) observes that a form such as *da*[d]*lo* 'give it' is only a reading pronunciation nowadays and that *da*[ɾ]*lo* is more characteristic of the spoken language. D. Eric Holt (personal communication) suggests that the *-r* imperative form is the result of a morphological change rather than rhotacism per se. Since Spanish allows *r*-final verbal infinitives to be used as imperatives when the recipient is unspecified, as in directions for household items, recipes, etc., speakers may have co-opted the preexisting infinitival forms as informal plural imperatives via analogy (Eddington 1991).

[4] Furthermore, LINEARITY must rank below the faithfulness constraint penalizing consonant insertion, DEPENDENCY-C, in order to select outputs with *rn* metathesis over outputs with intrusive stops. For a more detailed OT analysis of consonant intrusion in OS and Old French, see Martínez-Gil (2003). For a feature-geometric account of OS, see Holt (2002: 93-94).

[5] A fourth potential candidate, *da*[m.b]*e*, would satisfy all three top-ranked constraints by sacrificing the place features of the input stop instead of the morpheme-initial nasal. Another positional faithfulness constraint, IDENTONSET(place), is necessary in order to preserve the place features of the stop when syllabified in onset position (see Beckman 1997). Such a constraint is independently necessary to account for regressive place assimilation in morpheme-internal contexts in (12).

[6] In Hume's (1998, 2001) formal analysis, consonant metathesis is triggered by a family of markedness constraints (AVOID C/X) that penalize the positioning of consonants in perceptually weak contexts. For consistency, I follow Holt's (2004) syllable-contact account and consider the implications of conjoining SYLLCON with the OCP. The difference in assumed markedness constraints should not affect the discussion pursued here.

[7] Penny (1992: 138, Fn. 8) acknowledges the sporadic transposition of *dr* > *rd* in some MS dialects (e.g., Chicano Spanish *pierdas* < *piedras* 'stones', Louisiana Isleño Spanish *parde* < *padre* 'father') but views this as hypercorrection of earlier *rd* > *dr*.

[8] Following Holt (2002), I assume that laterals contain both primary and secondary place nodes that dominate different values of [continuant], although nothing in the present analysis hinges upon the distinction.

[9] Based on an idiolect of modern Istanbul JS, Bradley and Delforge (2006: 83-86) find (1) that syllable-initial and word-final rhotics are realized as voiced approximants of variable duration and (2) that word-final liquids exhibit a tendency towards frication and devoicing, possibly due to phonological transfer from

Turkish. The approximant realization of coda [ɾ̞] hypothesized to have existed at prior historical stages in JS might plausibly have become generalized to onset position in the speech of some contemporary JS speakers, after the time of the *rd* > *dr* shift. Further investigation is needed to determine the complete distribution of approximant rhotics across syllabic contexts as well as the source of the innovation in modern JS.

[10] The difference in the frequency of *dl* versus *rd* metathesis across morpheme boundaries could also be related to differences in prosodic representation. If enclitics are adjoined to the preceding prosodic word (PW) to form an outer PW, then the *dl* cluster of ((*dad*)$_{PW}$*lo*)$_{PW}$ falls within a PW domain. If prepositions are similarly adjoined to the following PW, then the *rd* cluster of (*amor*)$_{PW}$(*de*(*mi*)$_{PW}$)$_{PW}$ spans the boundary between two PWs.

[11] See Frigeni (2005a) for a comparison of the developments in Sardinian dialects. See Frigeni (2005b) for an account of the conditions on coda rhotics in terms of representational contrast and featural similarity.

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