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VOWEL HARMONY

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1. Introduction

Vowel harmony refers to the phonological phenomenon that requires vowels in certain morphological or prosodic domains to agree in specific phonological features. For example, in the most common pattern of Eastern Andalusian Spanish, a final vowel that is lax due to the aspiration or complete loss of word-final -*s* causes a stressed non-high vowel to become lax as well (lax vowels are more open than their tense counterparts), as in *nenes* /nenes/: [ˈnɛnɛ] 'boys' (cf. *nene* /nene/: [ˈnene] 'boy'). The segment that originates the harmony is called *the trigger* (e.g., the final

unstressed vowel in [ˈnɛnɛ]); the segment that undergoes harmony is called *the target* (e.g., the stressed vowel in [ˈnɛnɛ]), and the transmitted feature is *the harmonizing feature* (e.g., "lax" in [ˈnɛnɛ]).

From the point of view of articulation, harmony may result in gestural simplification, because it minimizes differences in the production of agreeing segments. From the point of view of perceptibility, the harmonizing features become more perceptible, since they extend to other segments and thus turn out to be more salient acoustically. The cost of harmony is that certain phonological input features are overridden by the transmitted features. Empirical data provide a notable diversity of harmony patterns that phonological theories try to accommodate. This chapter presents different types of vowel harmony within and across varieties of Spanish, and discusses related theoretical issues focusing on the characteristics of the trigger and the target as well as the domain of harmony. The discussion is organized as follows. First, we describe the harmony patterns that have been reported for some varieties located in the south-east area of peninsular Spanish (§2). In §3 we highlight the theoretical concerns that these data raise. In §4 we carry out an OT analysis of the prototypical vowel harmony systems described within the prominence-based licensing approach developed by Walker (2005, 2011). In §5 we extend the typology to other Iberian Romance varieties displaying vowel harmony, which include data from some Cantabrian Spanish varieties (the other Spanish dialect that shows vowel harmony) as well as data from varieties of Asturian and Catalan. Finally, in §6 we present the conclusions.

2. Data from southern peninsular Spanish

Spanish has a five-vowel inventory (i.e., /a, e, i, o, u/), traditionally described as showing a tendency to be realized with tenser (more closed) allophones in open syllables and with laxer (more open) allophones in closed syllables (Navarro Tomás 1982). The strong restrictions that general Spanish has on word-final codas (only fricatives, nasals and liquids, all of them coronal, and in certain varieties /h/, are allowed) sometimes lead to the weakening or the complete loss of final consonants; this, especially in the latter case, may be compensated by opening the preceding vowel in some varieties (Navarro Tomás 1938), thus accentuating the differences between tense and lax vowels up to the point of creating new surface lexical and morphological contrasts: e.g., *ve* [ˈbe] 's/he sees' vs. *vez* [ˈbɛ] 'time (occasion)'; *ve* [ˈbe] 's/he sees' vs. *ves* [ˈbɛ] 'you-SING. see'. In Eastern Andalusian (EA) Spanish (spoken in the provinces of Almería, Granada, Córdoba, and Jaén) and in Murcian Spanish (spoken in the neighboring region of Murcia), the lax character of the rightmost vowel can extend to the preceding syllables, giving rise to a process of vowel harmony (*nenes* [ˈnɛnɛ], *comes* [ˈkɔmɛ] 'you-SING. eat'), which is the focus of this chapter.

The process of vowel harmony in EA Spanish has been studied for many years, dating back as far as Navarro Tomás (1938, 1939). Other relevant classical studies are Rodríguez-Castellano and Palacio (1948), Alonso *et al.* (1950), Alvar (1955a,b, 1996a), Salvador (1957, 1977), Alarcos Llorach (1958, 1983), Llorente Maldonado de Guevara (1962), Mondéjar (1970, 1979, 1991), Contreras Jurado (1975-1976), Hooper (1976), Gómez Asencio (1977), Moya Corral (1979), Zubizarreta (1979), López Morales (1984), Llisterri and Poch (1986), Martínez Melgar (1986, 1994), Sanders (1994, 1998), Hualde and Sanders (1995). More recent studies, sometimes focusing only on analytic aspects of the process, include Jiménez and Lloret (2007), Lloret and Jiménez (2009, 2018), Carlson (2012), Soriano (2012), Herrero de Haro (2016a,b, 2017b,c, 2018, 2019), Henriksen (2017), Lloret (2018), Neumann and Kanwit (2018) and, specifically

for the Murcia region, Hernández-Campoy and Trudgill (2002). (See Herrero de Haro 2017a for an in-depth revision of the literature on EA.)

The contrast between tense and lax vowels is typically captured with the common practice of using the [ATR] feature, though, as is well known (see, e.g., Rice 1999), there is no exact correlation for all languages between the quality of vowels and the advanced/retracted tongue root position. The tense (more closed) version of each vowel is considered to be [+ATR], while the lax (more open) version is considered to be [-ATR] (1).

(1)	Coronal			Labial		
[+ATR]	i				u	High
[-ATR]	ɪ			ʊ		
[+ATR]	e			o		
[-ATR]	ɛ		ɔ			
[+ATR]		a				Low
[-ATR]		ạ				

Navarro Tomás (1939), Alonso *et al.* (1950), Salvador (1957), Gómez Asencio (1977), Mondéjar (1979), Alarcos Llorach (1983), Hernández-Campoy and Trudgill (2002), Soriano (2012), among others, consider the difference between the tense and lax counterparts of high vowels significant enough to be taken into account. Salvador (1977: 12) excludes the laxing of final /u/, except for educated speakers. Other authors (e.g., Rodriguez-Castellano and Palacio 1948; Zubizarreta 1979; Llisterri and Poch 1986; Sanders 1994, 1998; Henriksen 2017; Rincón 2018) do not consider the difference to be significant for high vowels. Experimental studies in general favor the former view (see, e.g., Martínez Melgar 1986, 1994, and for /i/, Herrero de Haro 2018), though some variation may be found across varieties.

A characteristic that southern peninsular Spanish varieties with vowel harmony share is the fact that [-ATR] harmony proceeds leftwards, usually from a weak position (i.e., the final unstressed vowel) to a strong position (e.g., the stressed vowel). The scope of vowel harmony, though, shows noteworthy divergences within and across varieties, which fall into two main patterns: one that imposes phonological requirements and another that additionally places specific morphological conditions. Throughout the paper, the phonologically-conditioned vowel harmony will be illustrated with data from Granada (as presented in Jiménez and Lloret 2007, 2018; Lloret and Jiménez 2009; Lloret 2018, based mainly on data from Alonso *et al.* 1950 and Sanders 1994) and Murcian (as described in Hernández-Campoy and Trudgill 2002), and the morphologically-conditioned vowel harmony with data from Jaén (as described in Soriano 2012).

2.1. *Phonologically-conditioned patterns*

In the EA variety spoken in Granada, -/s/ and -/h/ (in the few words that present a final <j> in Spanish, as in *reloj* 'watch') typically delete (a short aspiration is also a possible alternative in emphatic pronunciations), irrespective of their morphological filiation; concomitantly, any contiguous preceding vowel opens (and /a/ further fronts, represented as [æ]): e.g., *ves* [ˈbɛ[(h)]] 'you-SING. see', *vas* [ˈbæ[(h)]] 'you-SING. go', *mis* [ˈmɪ[(h)]] 'my.PL.', *reloj* [reˈlɔ[(h)]] 'watch'. Word-final coronal liquids (-/l/, -/ɾ/) can also delete (or weaken) along with the opening of the preceding vowel; however, while the opening of the vowel is quite systematic before fricatives, it is variable before liquids and is usually described as a low-level phonetic effect that produces a lesser degree of opening than in the fricative context, as shown in the examples with the diacritic indicating a lowered vowel: e.g., *girasol* [hiɾaˈso[(l)]] ~ [hiɾaˈsǫ[(l)]] 'sunflower', *cantor* [kanˈtǫ[(ɾ)]] 'singer-MASC.'. Word-final nasals are always maintained while all other word-final consonants systematically

delete, but in none of these contexts is the preceding vowel open: e.g., *melón* [meˈloŋ] 'melon' vs. *tarot* [taˈɾo] 'tarot', *anorak* [anoˈɾa] 'anorak'.

Final vowels that are open (i.e., [-ATR]) due to the loss (or weakening) of a word-final fricative in non-oxytones cause obligatorily stressed non-high vowels, and optionally pretonic and posttonic non-high vowels within the prosodic word (clitics included), to become [-ATR] (2a-c). In oxytones, pretonic non-high vowels may also take the [-ATR] feature from the last vowel (2d). The opening can affect non-final low vowels as well, but the process seems to be less regular (see Henriksen 2017). On the other hand, high vowels, stressed or not, are not targeted by vowel harmony, as the words *libros* and *muchos* in (2a) show; they act as *neutral* vowels. Nonetheless, they do not interrupt the spreading of the harmonizing feature in this variety; they are thus *transparent* to harmony, up to the point of allowing discontinuous [-ATR] vowel strings: see, for instance, *molinos* in (2b) or *cómicos*, *económicos*, and *consíguelos* in (2c). Finally, words such as *ídolos* and *consíguelos* in (2c) illustrate another pattern: in proparoxytones with a stressed high vowel, posttonic mid vowels may agree with the opening of the last vowel even though the stressed vowel remains closed: e.g., [ˈiðɔlɔ(h)].

(2) Interaction between opening in the rightmost vowel and vowel harmony in Granada EA (induced by word-final coronal fricatives and -/h/)

    a. 2-syllable paroxytones: final opening, with obligatory spreading to the stressed (except if it is high)

nenes	'boys'	[ˈnɛnɛ(h)]
asas	'handles'	[ˈa̝sæ(h)]
libros	'books'	[ˈlißɾɔ(h)]
muchos	'many-MASC.'	[ˈmuʃɔ(h)]
jueves	'Thursday'	[ˈhwɛßɛ(h)]

Burgos   'city name'   [ˈbuɾɣɔ⁽ʰ⁾]

b. 3-syllable or larger paroxytones: final opening, with obligatory spreading to the stressed (except if it is high) and optional spreading to the pretonic (except if they are high)

comemos	'we eat'	[koˈmɛmɔ⁽ʰ⁾] ~ [kɔˈmɛmɔ⁽ʰ⁾]
abetos	'firs'	[aˈßɛtɔ⁽ʰ⁾] ~ [a̦ˈßɛtɔ⁽ʰ⁾]
molinos	'mills'	[moˈlinɔ⁽ʰ⁾] ~ [mɔˈlinɔ⁽ʰ⁾]
monederos	'purses'	[moneˈðɛɾɔ⁽ʰ⁾] ~ [mɔnɛˈðɛɾɔ⁽ʰ⁾]
horrorosos	'horrifying-MASC.PL.'	[oroˈrɔsɔ⁽ʰ⁾] ~ [ɔrɔˈrɔsɔ⁽ʰ⁾]

c. Proparoxytones: final opening, with obligatory spreading to the stressed (except if it is high) and optional spreading to the posttonic and the pretonic (except if they are high)

tréboles	'clovers'	[ˈtrɛßolɛ⁽ʰ⁾] ~ [ˈtrɛßɔlɛ⁽ʰ⁾]
cómicos	'comic-MASC.PL.'	[ˈkɔmikɔ⁽ʰ⁾]
ídolos	'idol-MASC.PL.'	[ˈiðolɔ⁽ʰ⁾] ~ [ˈiðɔlɔ⁽ʰ⁾]
económicos	'economic-MASC.PL.'	[ekoˈnɔmikɔ⁽ʰ⁾] ~ [ɛkɔˈnɔmikɔ⁽ʰ⁾]
recógelos	'gather them-MASC.'	[reˈkɔhelɔ⁽ʰ⁾] ~ [reˈkɔhɛlɔ⁽ʰ⁾] ~ [rɛˈkɔhɛlɔ⁽ʰ⁾]
consíguelos	'get them-MASC.'	[konˈsiɣelɔ⁽ʰ⁾] ~ [konˈsiɣɛlɔ⁽ʰ⁾] ~ [kɔnˈsiɣɛlɔ⁽ʰ⁾]

d. Oxytones: final opening, with optional spreading to the pretonic (except if they are high)

coméis	'you-PL. eat'	[koˈmɛj⁽ʰ⁾] ~ [kɔˈmɛj⁽ʰ⁾]
revés	'other side'	[reˈßɛ⁽ʰ⁾] ~ [rɛˈßɛ⁽ʰ⁾]

The variability encountered in (2) in cases with pretonic and posttonic vowels gives rise to three different patterns according to the domain in which harmony applies, which are illustrated with the words *rocógelos* and *consíguelos* in (3): minimal extension, in which only stressed non-high vowels harmonize (pattern *a*, (3a)); medium extension, in which all non-high vowels of the main foot harmonize (pattern *b*, (3b)), and maximal extension, in which all non-high vowels of the

prosodic word harmonize (pattern *c*, (3c)). Here it is important to stress that if the pretonic vowels

harmonize, the posttonic vowels harmonize as well (as in [rɛˈkɔhɛlɔ⁽ʰ⁾], [kɔnˈsiɣɛlɔ⁽ʰ⁾]), but not the

other way around (*[rɛˈkɔhelɔ⁽ʰ⁾], *[kɔnˈsiɣelɔ⁽ʰ⁾]).

(3) Domains

	a. Pattern *a* Minimal extension	b. Pattern *b* Medium extension	c. Pattern *c* Maximal extension
recógelos	[reˈkohelɔ⁽ʰ⁾]	[reˈkɔhɛlɔ⁽ʰ⁾]	[rɛˈkɔhɛlɔ⁽ʰ⁾]
consíguelos	[konˈsiɣelɔ⁽ʰ⁾]	[konˈsiɣɛlɔ⁽ʰ⁾]	[kɔnˈsiɣɛlɔ⁽ʰ⁾]

In the Murcian variety, all word-final consonants except nasals delete and concomitantly

induce the opening of a non-high preceding vowel (and /a/ further fronts); the resulting [-ATR]

final vowel, stressed or not, causes all the preceding non-high vowels to become [-ATR] in the

domain of the prosodic word (clitics included), as the examples in (4) illustrate.

(4) Interaction between vowel harmony and opening in the rightmost vowel in Murcia
(induced by all word-final consonants, except for nasals)
a. Words with a final fricative

nenes	'boys'	[ˈnɛnɛ]
asas	'handles'	[ˈæsæ]
comemos	'we eat'	[kɔˈmɛmɔ]
abetos	'firs'	[æˈßetɔ]
monederos	'purses'	[mɔnɛˈðɛɾɔ]
horrorosos	'horrifying-MASC.PL.'	[ɔrɔˈrɔsɔ]
tréboles	'clovers'	[ˈtrɛßɔlɛ]
recógelos	'gather them-MASC.'	[rɛˈkɔxɛlɔ]
coméis	'you-PL. eat'	[kɔˈmɛj]

b. Words with other final consonants

comer	'to eat'	[kɔˈmɛ]
destrozar	'to smash'	[dɛttrɔˈθæ]
clavel	'carnation'	[klæˈßɛ]
coñac	'cognac'	[kɔˈɲæ]

In Murcian, high vowels do not participate in the harmonic process at all (they are neutral to harmony). On the one hand, final high vowels neither become open as an effect of word-final consonant loss nor trigger the opening of preceding non-high vowels (5a). On the other, in words with final non-high vowels, the presence of high vowels in any position blocks harmony further left, as illustrated by *molinos* or *cómicos* in (5b). Hence, high vowels are *opaque* to harmony and, consequently, discontinuous [ATR] domains do not arise from vowel harmony; note that the last two examples in (5b) do not constitute an instance of a discontinuous [-ATR] domain, since the opening of the initial vowels is related to the next coda-consonant and not to the final vowel.

(5) Interaction between high vowels and opening in the rightmost vowel in Murcia (induced by all word-final consonants, except for nasals)

a. Words with a final high vowel

tesis	'thesis'	[ˈtesi]
yogur	'yogurt'	[ʒoˈɣu]

b. Words with a final non-high vowel

libros	'books'	[ˈlißrɔ]
muchos	'many-MASC.PL.'	[ˈmut͡ʃɔ]
molinos	'mills'	[moˈlinɔ]
cómicos	'comic-MASC.PL.'	[ˈkomikɔ]
ídolos	'idols'	[ˈiðɔlɔ]
consíguelos	'get them-MASC.PL.'	[konˈsiɣɛlɔ]

capacitar	'to enable'	[kapaθiˈtæ]
hospitalizar	'to hospitalize'	[ɔppitaliˈθæ]
extintor	'fire extinguisher'	[ɛttinˈtɔ]

2.2. Morphologically-conditioned patterns

In Jaén EA any final non-nasal consonant can be deleted producing an opening effect on the previous vowel (and the fronting of /a/): e.g., *ves* [ˈbɛ], *vas* [ˈbæ], *reloj* [reˈlɔ]; *girasol* [xiɾaˈsol] ~ [xiɾaˈsɔ], *cantor* [kanˈtoɾ] ~ [kanˈtɔ]; *tarot* [taˈɾɔ], *anorak* [anoˈɾæ]. From the set of final lax vowels, only those related to the loss of the infinitive mark -/ɾ/ or to the loss of (part of) an inflectional suffix containing -/s/ (namely, the plural nominal marker -/s/ or -/es/, the second-person singular verb suffix -/s/, and the final sibilant of the first and second person plural verb suffixes -/mos/ and -/is/, respectively) yield harmony (6). In words with one of the aforementioned suffixes, harmony takes over all the syllables in the prosodic word (clitics included), as in *coméis* [kɔˈmɛj], and even over non-final high vowels, as in *muchos* [ˈmʊʃɔ] (6a). Contrariwise, non-listed endings do not trigger harmony, as in *jueves* [ˈhweßɛ] (6b).

(6)   Interaction between vowel harmony and opening in the rightmost vowel in Jaén EA

    a.   /s/&/ɾ/ ⊆ suffix (-/s/, -/es/, -/mos/, -/is/; -/ɾ/): final opening, with spreading to all vowels

coméis	'you-PL. eat'	[kɔˈmɛj]
nenes	'boys'	[ˈnɛnɛ]
asas	'handles'	[ˈæsæ]
muchos	'many-MASC.'	[ˈmʊʃɔ]
comemos	'we eat'	[kɔˈmɛmɔ]
abetos	'firs'	[æˈßɛtɔ]
molinos	'mills'	[mɔˈlɪnɔ]
monederos	'purses'	[mɔnɛˈðɛɾɔ]

horrorosos	'horrifying-MASC.PL.'	[ɔrɔˈɾɔsɔ]
tréboles	'clovers'	[ˈtɾɛßɔlɛ]
cómicos	'comic-MASC.PL.'	[ˈkɔmɪkɔ]
recógelos	'gather them-MASC.'	[rɛˈkɔhɛlɔ]
comer	'to eat'	[kɔˈmɛ]
destrozar	'to smash'	[dɛʰttɾɔˈθæ]

b. /s/&/ɾ/ ⊄ suffix (-/s/, -/es/, -/mos/, -/is/; -/ɾ/): final opening, without further spreading

revés	'other side'	[reˈßɛ]
jueves	'Thursday'	[ˈhweßɛ]
Burgos	'city name'	[ˈbuɾɣɔ]
extintor	'fire extinguisher'	[eʰttinˈtɔ]
yogur	'yogurt'	[ʒoˈɣʊ]

2.3. *Summary*

For the sake of comparison, table (7) sums up the variation documented in the harmony systems of the varieties under study according to the quality of the vowel and its position in the word.

(7)

	Input	Output			
		Targets			Triggers
		Pretonic	Tonic	Posttonic	Final (tonic or a-tonic)
	/e/	e ~ ɛ	ˈɛ	e ~ ɛ	ɛ
	/o/	o ~ ɔ	ˈɔ	o ~ ɔ	ɔ
	/a/	a ~ ạ	ˈạ	a ~ ạ	æ
	/i/	i	ˈi	i	ɪ
Granada	/u/	u	ˈu	u	ʊ

	/e/	ɛ	'ɛ	ɛ	ɛ
	/o/	ɔ	'ɔ	ɔ	ɔ
	/a/	æ̞	'æ̞	æ̞	æ̞
	/i/	ɪ	'ɪ	ɪ	ɪ
Jaén	/u/	ʊ	'ʊ	ʊ	ʊ
	/e/	ɛ	'ɛ	ɛ	ɛ
	/o/	ɔ	'ɔ	ɔ	ɔ
	/a/	æ̞	'æ̞	æ̞	æ̞
	/i/	i	'i	i	i
Murcia	/u/	u	'u	u	u

As can be seen, in all the reported patterns the harmonizing feature is [-ATR], which is generated by the loss (or weakening) of certain word-final consonants. However, while in Granada the [-ATR] feature that enhances harmony emerges from the loss (or weakening) of the fricatives (-/s/ and -/h/) and in Murcia from the loss of any non-nasal consonant, in Jaén it only emerges from the loss of -/s/ and -/ɾ/ of certain inflectional suffixes (see Table (8)).

(8)	Conditionings on the -C that concomitantly opens the rightmost vowel	
	Phonologically-conditioned VH	Morphologically-conditioned VH
Granada	any -/s/ or -/h/	
Jaén		-/s/ (from the inflectional suffixes -/s/, -/es/, -/mos/, -/is/) and -/ɾ/ (from the infinitive suffix)
Murcia	any non-nasal -C	

Another point of discrepancy across varieties is the behavior of high vowels: in Jaén, high vowels behave just like any other vowel with regard to harmony; in Murcia, high vowels never become [-ATR] and block harmony; in Granada, final high vowels preceding word-final fricatives may open, but the [-ATR] feature is not harmonically transmitted to non-final high vowels, even though they do not block harmony. In other words, with regard to the targets of harmony, Granada and Murcia harmonies point at non-high vowels, while Jaén harmony targets all vowels; as for the blockers of harmony, Granada and Jaén show none (though in Granada high vowels are neutral transparent vowels), whereas in Murcia high vowels are neutral opaque vowels (see Table (9)).

(9)	Conditionings on the possible triggers and targets of vowel harmony		
	Affected ([-ATR]) rightmost vowels	Harmonized vowels	Blocker
Granada	all vowels	all non-high vowels	none
Jaén	all vowels	all vowels	none
Murcia	all non-high vowels	all non-high vowels	high vowels

The directionality of harmony is the same for all patterns: from the final vowel leftwards. They also coincide in affecting as a norm the stressed vowel (though high vowels are unaffected in Granada and Murcia), but they diverge in the treatment of pretonic and posttonic vowels: in Granada, harmony can target the stressed vowel, the stress foot (and hence posttonic vowels are affected) or the whole prosodic word (and hence pretonic are affected as well); in Murcia and Jaén, harmony targets the whole prosodic word, though in Murcia the transmission is interrupted by the presence of high vowels. Table (10) summarizes the domains of vowel harmony, ignoring sequences with neutral high vowels.

(10)	Domains of vowel harmony (without high vowels)			
	Pretonic	Tonic	Posttonic	Final (trigger)
Granada	variable	obligatory	variable	obligatory
Jaén	obligatory	obligatory	obligatory	obligatory
Murcia	obligatory	obligatory	obligatory	obligatory

3. Theoretical concerns

The vowel harmony patterns attested for southern peninsular Spanish raise several theoretical concerns, some of which are specific to Spanish while other have to do with the grounding of harmony.

To begin with, the emergence of lax vowels, which are the triggers of harmony, originated a debate on their phonemic status in Spanish. Some authors argued that new grammatical contrasts created by the lax vowels under the loss of the suffix -/s/ (11) favor the recognition of new phonemes, and therefore proposed a split system (/a, ạ, e, ɛ, i, ɪ, o, ɔ, u, ʊ/), known as

"desdoblamiento vocálico" ('vowel doubling' or 'vowel splitting') in the Hispanic literature (e.g.,
Navarro Tomás 1938, 1939; Alarcos Llorach 1949; Alonso *et al.* 1950; Alvar 1955a; Salvador
1957, 1977; Gómez Asencio 1977, and, for the Murcian variety, Hernández-Campoy and Trudgill
2002).

(11) a. va 's/he goes' [ˈba]   b. vas 'you-SING. go' [ˈbæ]
       ve 's/he sees' [ˈbe]   ves 'you- SING. see' [ˈbɛ]
       mi 'my.SING' [mi]   mis 'my-PL.' [mɪ] ([mi] in Murcia)
       lo 'him' [lo]   los 'them-MASC.' [lɔ]
       tu 'your.SING.' [tu]   tus 'your-PL.' [tʊ] ([tu] in Murcia)

As Herrero de Haro (2017a: 319) notes, one should distinguish between *vowel doubling*, which implies the acceptance
of new lax phonemes, and mere *vowel system doubling*, which does not necessarily entail the addition of new
phonemes but just the emergence of new allophones derived from the basic five-vowel system (see Alarcos Llorach
1958, 1983; Mondéjar 1979; Cerdà 1992). Recall that, as we said above, some authors defend incomplete split systems,
usually without the lax version of the two high vowels (as in Murcian).

The vowel doubling view, with the final lax vowels as the only exponent of some
morphological information (i.e., with alleged underlying contrasts such as /nene/ 'boy' vs. /nenɛ/
'boys'), has been challenged by a variety of claims from the synchronic perspective. Firstly, the
harmonic systems under study are favored, but not determined, by the fact that vowel quality is
the only exponent of a grammatical contrast, since it may affect not only words where -/s/ is the
exclusive representative of an inflectional suffix (*nenes* [ˈnɛnɛ], *comes* [ˈkɔmɛ]) but also cases
where -/s/ is just part of an inflectional suffix (*vemos* [ˈbɛmɔ] 'we see', *coméis* [kɔˈmɛj], *meses*
[ˈmɛsɛ] 'months'). Additionally, the process can also affect endings that are dubiously inflectional
(*jueves* [ˈhwɛßɛ], *lejos* [ˈlɛhɔ] 'far') and cases where the fricative is part of the stem (*revés* [rɛˈßɛ]).

Secondly, the selection of the -/es/ plural allomorph in nouns (*meses* [ˈmɛsɛ]) and the morphophonological alternations it generates (*mes* [ˈmɛ] 'month', *mesecito* [meseˈsito] 'month-DIM.') provide further evidence for the presence of an input consonant, even if it is realized as an aspirate in some varieties (*me*[h]*ecito*). Thirdly, diphthong formation across words is blocked when the first vowel is affected by the laxing process, which is another reminder of the presence of an input word-final consonant (*claveles y tomates* [ɛ.i] 'carnations and tomatoes' vs. *tomate y clavel* [ej] 'tomato and carnation'). One last claim, already pointed out by Alarcos Llorach (1958, 1983), connects the realizations of internal codas with those of word-final codas: in southern peninsular Spanish word-internal /s/-codas typically undergo aspiration or deletion, or trigger gemination of the following consonant (with possible retention of the aspiration) (*casco* [ˈkahko], [ˈkako], [ˈkakko], [ˈkaʰkko] 'helmet'), and the same outcomes arise when an undisputed word-final /s/ comes in contact with a consonant (*mes completo* [mɛ⁽ʰ⁾kkomˈpleto] 'full month'). Given that varieties displaying word-final opening also present similar results in the contact of plural forms and the following word (*los cascos* [lɔ⁽ʰ⁾kˈkạ⁽ʰ⁾kkɔ⁽ʰ⁾] 'the helmets'), it is reasonable to assume that the plural morph is a fricative consonant as well. All in all, the data indicate that a simple five-vowel phonemic set, with underlying final consonants, is sufficient to account for the laxing of vowels, even for cases in which the opening is the only trace of a grammatical contrast.

Another issue of debate is the source of [-ATR] induced by consonant loss (or weakening). Fricatives (contrary to stops) and liquids (contrary to nasals) share a more open gesture in the oral tract, which presumably may induce the opening of the contiguous vowel. Along these lines, Jiménez and Lloret (2007) and Lloret and Jiménez (2009), building on data from Granada, propose that [-ATR] emerges from local assimilation, as a cue preservation of the laryngeal specification [spread glottis] that fricatives have (Vaux 1998, Gerfen 2002), based on the fact that [spread

glottis] contributes to the raising of the first formant in vowels (i.e., to their opening) and that opening guarantees sufficient perceptual salience of this feature (Gordon and Ladefoged 2001: 400). Likewise, the further fronting of an adjacent /a/ is seen as a way to preserve the place feature [coronal] of the lost consonant (Hualde and Sanders 1995), though it can also be understood as a strategy to reinforce the contrast between the plain low vowel ([a]) and its lax, more open counterpart ([æ]). The data from Jaén and Murcia, though, challenge this phonetically-grounded interpretation, since the deletion of any word-final non-nasal consonant (including stops) causes the opening effect. Hence, further investigation of the link between articulation and acoustics is needed to capture plausible phonetic reasons for the emergence of [-ATR] as a trace of consonant loss (or weakening) in the resulting word-final open syllable.

In the traditional Hispanic view, the opening of vowels is usually considered an aspiration-dependent phenomenon: "la espiración glotal característica de [h] (realización de /s/), antes de perderse totalmente, deja como recuerdo o la abertura de la vocal o la infección sobre la consonante [siguiente]" ['the glottal aspiration (which is the realization of /s/), before being completely lost, leaves as a reminder either the opening of the vowel or the infection of the [following] consonant'] (Alarcos Llorach 1958: 197; our translation). Hualde and Sanders (1995), instead, propose that the weakening of final consonants in EA just triggers the reinforcement of a prior phonetic difference between close vowels in final open syllables and open vowels in final closed syllables, since the same kind of vocalic contrast is well attested in other Spanish and Romance varieties that do not aspirate /s/ (see along these lines Henriksen 2017: 122).

Though the phonological interpretation of vowel doubling and the phonetic grounding for the source of [-ATR] have attracted considerable interest among scholars, these issues are peripheral to the core discussion on vowel harmony and we will not pursue them here. What is relevant for our purposes is that in these systems [-ATR] serves as a marked value that enhances

harmony as a means to maximize its salience. That is the reason why harmony takes place from a weak position (the final unstressed syllable) to a strong position (the stressed syllable, the foot or the whole prosodic word). The existence of patterns with discontinuous [ATR] sequences, as in *tréboles* [ˈtɾɛ-ATRßo+ATRlɛ-ATR$^{(h)}$] in Granada, gives support to the view that southern peninsular Spanish vowel harmony is primarily perceptually based, though articulation is also favored in non-discontinuous sequences, as in *tréboles* [ˈtɾɛ-ATRßɔ-ATRlɛ-ATR$^{(h)}$] (Lloret 2007). It is important to highlight at this point that theories grounded on the articulatory benefits of harmony, that is, on the attempt to minimize the resetting of articulators — especially Gestural Uniformity (e.g., Pulleyblank 2002), but also Optimal Domains Theory (Cole and Kisseberth 1994) and Span Theory (McCarthy 2004) — can correctly account for cases in which a uniform [-ATR] span is created, as in Jaén and Murcia and in certain patterns of Granada. Indeed, a simple instruction banning [+ATR] specifications before a final [-ATR] vowel would generally induce the transmission of [-ATR] to the left, as in [ˈtɾɛßɔlɛ$^{(h)}$]. However, this approach runs into problems when dealing with cases presenting discontinuous domains (e.g., [ˈtɾɛßolɛ$^{(h)}$] in Granada), in which vowel harmony gives rise to non-homogeneous articulatory sequences. The alternative approach to these issues is perceptually based (e.g., Boersma 1998): harmony results from languages attempting to attach features to maximally perceptible positions. This perceptual interpretation, already present in the Optimal Domains Theory (Cole and Kisseberth 1994) and Span Theory (McCarthy 2004), has been refined in the prominence-based licensing approach to vowel harmony put forward by Walker (2005, 2011) and will be the basis of our analysis in §4. In this view, featurally discontinuous strings such as [ˈtɾɛßolɛ$^{(h)}$], albeit not optimal, are not troublesome at all, since the harmonic transmission of [-ATR] to the stressed syllable makes this feature perceptually more salient.

In an articulatory-based analysis, transparent intervening high vowels (as in *cómicos* [ˈkɔmikɔ^(h)]) could be handled by assuming that these segments are underspecified for the harmonic [ATR] feature. Note, however, that final high vowels that are contiguous to -/s/ undergo opening in Granada (e.g., *mis* [mɪ] 'my.PL.', *tus* [tʊ] 'your.PL.') and thus presumably are able to acquire the [-ATR] feature. As for posttonic mid vowels that may not be affected by harmony (as in [ˈtɾɛβolɛ^(h)]), underspecification is not a plausible explanation; prominence relations, though, could still justify why within the metrical foot they may remain unaffected, since the posttonic syllable is the weakest position within the foot: Hualde (1989), for instance, explains this configuration as an instance of percolation of the harmonizing feature to the head of the prosodic foot only. In our view, both perceptual and articulatory factors contribute to vowel harmony, but the summation of all the data suggests that the primary motivation for spreading is perceptual.

Finally, southern peninsular Spanish harmony also contributes to the debate on how the harmonizing features are transmitted. In the common view, harmony is seen as a long-distance assimilation process that spreads a feature from vowel to vowel. But this interpretation is incompatible with discontinuous sequences, in which harmony is most likely achieved through operations of feature copying (which can skip a segment) rather than through feature spreading (see discussion in §4).

4. OT prominence-based licensing approach to southern peninsular Spanish vowel harmony

In this section we provide an OT prominence-based licensing analysis (Walker 2005, 2011; Jiménez and Lloret 2007, 2018; Lloret and Jiménez 2009; Lloret 2018) of the three vowel harmony systems under discussion, focusing on how the harmonizing [-ATR] feature of final vowels extends further left. As stated above, they are licensing-driven systems because harmony targets prominent positions and thus serves to improve the perception of the [-ATR] value, singled out because its initial host is usually a weak segment, i.e., a final unstressed vowel. The spreading of

[-ATR] seeks to satisfy the constraint LICENSE(-ATR, S-Pos) (cf. the general constraint LICENSE(F, S-Pos): "Feature [F] is licensed by association to strong position S," Walker 2005: 941), which in the harmonies under study minimally targets the stressed syllable, that is, it demands that the harmonizing feature is linked to that syllable. On the other hand, the faithfulness constraint IDENT(ATR) (cf. IDENT(F): "Correspondent segments have identical values for the feature F," McCarthy and Prince 1999: 294) enforces the maintenance of the input [ATR] value in all vowels. The basic ranking that allows [-ATR] vowels to be derived from harmony is 'LICENSE(-ATR, S-Pos) >> IDENT(ATR)', as illustrated in (12): candidate (12b) is preferred over (12a) because [-ATR] is realized on the stressed vowel at the expense of incurring an additional faithfulness violation. All the analyses below concentrate on harmony and thus only take into account candidates with the final vowel already opened as a remnant of the word-final consonant (either lost or weakened). Note, however, that this trace allows candidates to satisfy a faithfulness constraint, not included in the tableaux, against the total loss of the final consonant (such as MAX-IO: "Every segment of the input has a correspondent in the output," see McCarthy and Prince 1999: 225). We assume, in line with Walker (2011: 178-179), that the satisfaction of MAX-IO is achieved through a coalescence process between the final consonant and the preceding vowel, as the subscripts in candidates (12a-b) indicate. For the sake of completeness, though, in (12) we also consider the possibility that [-ATR] is only realized on the stressed vowel to satisfy the licensing requirement, as in candidate (12c) [ˈnɛ₂ne₁]; this mapping, in which the output exponent of the lost final consonant only attaches to the stressed vowel, is ruled out by the action of RIGHT-ANCHOR(I-O) ("An element at the right periphery of I[nput] has a correspondent at the right periphery of O[output]," McCarthy and Prince 1999: 295) at the top of the ranking. (In all the rankings proposed throughout the paper, constraints for which the data do not impose a rank ordering have been

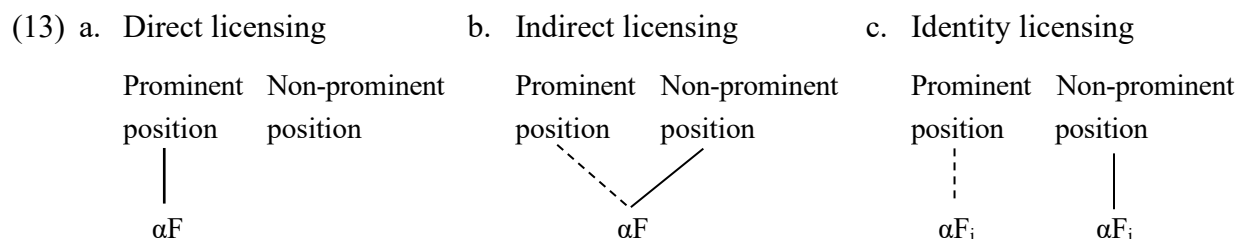placed as high as possible, following the constraint demotion algorithm; see Tesar and Smolensky 1994.)

(12)

/nene$_1$s$_2$/	Right-Anchor(I-O)	License(-ATR, S-Pos)	Ident(ATR)
a. 'nenɛ$_{12}$		*!	*
☞ b. 'nɛ$_2$nɛ$_{12}$			**
c. 'nɛ$_2$ne$_1$	*!		*

Variation in the patterns due to the scope of harmony (i.e., the harmony domains and its blockers) as well as to restrictions in the combination of certain features (to prevent, e.g., high vowels from opening) are discussed in the following sections.

4.1. *Phonologically-conditioned vowel harmony: Murcia and Granada*

In Murcia, vowel harmony affects non-high vowels in the domain of the prosodic word, as in *monederos* [mɔnɛˈðɛrɔ] and *tréboles* [ˈtrɛßɔlɛ]. Since the general domain of harmony is the whole prosodic word, the active licensing constraint that enhances harmony targets all vowels; it is an instance of the maximal licensing constraint License([F], ∀V), posited by Walker (2011: 246) to account for unbounded harmony, according to which a [F] ([-ATR] in our case) must be licensed by association with all syllables in a prosodic word. High vowels are never affected by the opening, whether they are the rightmost vowel next to the lost consonant (e.g., *tesis* [ˈtesi]) or one of the targets of harmony (e.g., *ídolos* [ˈiðɔlɔ]), and they additionally block the transmission of [-ATR] further left (e.g., *cómicos* [ˈkomikɔ], *molinos* [moˈlinɔ], *consíguelos* [konˈsiɣɛlɔ]). The prohibition of opening high vowels can be seen as a limitation imposed by the feature co-occurrence constraint *High/-ATR (cf. RTR/HIGH Condition: "If [-ATR] then not [+high]," in Archangeli and

Pulleyblank 1994: 176), which must be ranked above the maximal licensing constraint (and also above the aforementioned MAX-IO constraint, which demands the maintenance of some trace of the final consonant). The interruption of high vowels to the spreading can be seen as a ban against ill-formed gapped, discontinuous configurations (Archangeli and Pulleyblank 1994: 357). To accommodate this prohibition, we use the devices provided by the license theory. In this approach, Walker (2011: 7), following Steriade (1995), defines three configurations that can satisfy the general licensing constraint LICENSE(-ATR, S-Pos): *a*) when [F] is contained wholly within a strong position (*direct licensing*, as in (13a)); *b*) when [F] originally appears in a weak position but spreads to a strong adjacent position (*indirect licensing*, as in (13b)), and *c*) when [F] originally appears in a weak position but is duplicated, through feature copying, in a strong non-adjacent position (*identity licensing*, as in (13c)); feature copying is considered the only available configuration when the target is not adjacent to the trigger.

(13) a. Direct licensing   b. Indirect licensing   c. Identity licensing

Prominent position	Non-prominent position		Prominent position	Non-prominent position		Prominent position	Non-prominent position

αF αF αF_i αF_i

Under licensing, spreading is a local operation in GEN: it can only give rise to local assimilations, limited to adjacent targets, as in indirect licensing (13b). Non-local assimilations, which operate at a distance over unaffected intervening segments, are instead achieved via feature copying, that is, through duplication of the feature in the prominent position, as in identity licensing (13c). For instance, to produce a discontinuous [-ATR] string such as [ˈkɔ$_{-ATR}$mi$_{+ATR}$kɔ$_{-ATR}$] or [ˈtrɛ$_{-ATR}$ßo$_{+ATR}$lɛ$_{-ATR}$], the [-ATR] feature of the last vowel must have a duplicant feature in the

stressed syllable. Although that configuration satisfies LICENSE(-ATR, S-Pos), it violates the markedness constraint against any duplicated feature, *DUPLICATE(F) (Walker 2011: 54). Local assimilation via indirect licensing, whenever possible, is preferred to feature copying because it does not entail any *DUPLICATE(F) violation. In Murcia, the ranking of *DUPLICATE(F) above the licensing constraint LICENSE(-ATR, ∀V) guarantees the exclusion of long-distance harmonies to skip high vowels. (For a discussion of the viability of assimilation via segmental linking or via segmental correspondence, see, among others, Walker 2000, Hansson 2001, Rose and Walker 2004, McCarthy 2007.)

Similar markedness constraints that have been used in the OT literature to discard gapped configurations are *GAP (Pulleyblank 1996; Ní Chiosáin and Padgett 2001; Walker 1998, 2005), PROXIMITY (Rose and Walker 2004), LOCALITY (Walker 2010: 172) or *SKIP(X) (Kimper 2012: 303). Some authors resort instead to faithfulness constraints such as IO-INTEGRITY (Krämer 2003: 93) or O-CONTIGUITY (Jiménez and Lloret 2007, Lloret and Jiménez 2009: 314).

The final ranking at work for Murcia is presented in (14). Tableaux (15) and (16) illustrate that, in words without high vowels, the [-ATR] feature of the final vowel is spread, via indirect licensing, to all the syllables in the word, so that a [-ATR] homogeneous string is generated. Instead, high vowels are never targeted by vowel harmony, due to *HIGH/-ATR, as the example in (17) shows.

(14)   Ranking for Murcia: maximal licensing (all non-high vowels harmonize; high vowels are opaque):

    *HIGH/-ATR, *DUPLICATE(F) >> LICENSE(-ATR, ∀V) >> IDENT(ATR)

(15)

/tɾeboles/	*HIGH/-ATR	*DUPL	LICENSE(-ATR, ∀V)	IDENT(ATR)
a.　'tɾeßole			**!	*
b.　'tɾɛßole		*!	*	**
☞　c.　'tɾɛßolɛ				***

(16)

/monedeɾos/	*HIGH/-ATR	*DUPL	LICENSE(-ATR, ∀V)	IDENT(ATR)
a.　mone'ðeɾɔ			***!	*
b.　mone'ðɛɾɔ			**!	**
c.　monɛ'ðɛɾɔ			*!	***
☞　d.　mɔnɛ'ðɛɾɔ				****

(17)

/mut͡ʃos/	*HIGH/-ATR	*DUPL	LICENSE(-ATR, ∀V)	IDENT(ATR)
☞　a.　'mut͡ʃɔ			*	*
b.　'mʊt͡ʃɔ	*!			**

The blocking of vowel harmony over an unaffected intervening high vowel is illustrated in tableaux (18) and (19) with the behavior of two proparoxytones displaying a different combination of high and non-high vowels in the tonic and posttonic positions. When the penult syllable contains a non-high vowel, as in (18), LICENSE(-ATR, ∀V) can drive the harmonization of this vowel, even though the stressed high vowel remains unchanged. However, when the intervening penult contains a high vowel, as in (19), it blocks the spreading altogether, so that both the penult and the antepenult are unaffected. In both tableaux, the propagation of [-ATR] across high vowels (candidates (18d) and (19b)) is discarded because it should be achieved through feature copying and that configuration is prohibited by *DUPLICATE(F). In sum, in words containing a high vowel,

the [-ATR] feature of the last vowel extends leftwards to all available targets until the first high

vowel is reached.

(18)

/konˈsigelos/	*HIGH/-ATR	*DUPL	LICENSE(-ATR, ∀V)	IDENT(ATR)
a. konˈsiɣelɔ			***!	*
☞ b. konˈsiɣɛlɔ			**	**
c. konˈsɪɣɛlɔ	*!		*	***
d. kɔnˈsiɣɛlɔ		*!	*	***

(19)

/komikos/	*HIGH/-ATR	*DUPL	LICENSE(-ATR, ∀V)	IDENT(ATR)
☞ a. ˈkomikɔ			**	*
b. ˈkɔmikɔ		*!	*	**
c. ˈkɔmɪkɔ	*!			***

The data from Granada EA pose two additional challenges to the general schema of licensing.

First, high vowels, which are also unaffected by harmony though they open as an effect of word-

final consonant loss (or weakening), are transparent to harmony. Second, three different domains

of harmony have been reported: a minimal extension domain targeting a non-high stressed vowel;

a medium extension domain targeting the main foot, and a maximal extension domain targeting

the whole prosodic word (see (3)). From now on, the examples for Granada will illustrate the

analysis with loss of the word-final fricative, which is the least marked outcome and the common

norm in all EA varieties (see, e.g., García Marcos 1990, who reports 69% cases of deletion, 30%

cases of aspiration, and 1% cases of maintenance of the sibilant for Granada. On the formalization

of the variation for the case of word-final aspiration in Spanish, see Lloret 2014 and references therein).

As for the behavior of high vowels, the ranking of *HIGH/-ATR above the relevant licensing constraints overrules, as in Murcia, the harmonic opening of high vowels (e.g., *muchos* [ˈmuʃɔ]). Note, however, that, since in Granada rightmost high vowels that are adjacent to a final deleted (or weakened) consonant are opened (e.g., *tesis* [ˈtɛsɪ]), *HIGH/-ATR must be ranked below the constraint MAX-IO, responsible for leaving a [-ATR] trace of the final consonant on the preceding vowel (contrary to the top-most position that it occupies in the Murcia ranking).

The fact that intervening transparent high vowels do not interrupt harmony (as in *cómicos* [ˈkɔmikɔ]), runs again into the debate of how harmonizing features are extended. According to the three configurations that can satisfy LICENSE(-ATR, S-Pos) presented in (13), in Granada harmony, oxytones that do not obligatorily compel harmony because the [-ATR] feature of the final vowel is already realized in a strong position (i.e., the final stressed vowel, as in *revés* [reˈßɛ]) are an instance of direct licensing (20). However, if [-ATR] is associated to an unstressed position, it seeks to target a vowel in a strong position (i.e., the stressed vowel), as in *nenes* [ˈnɛnɛ]), which shows an instance of indirect licensing (21a). In cases where the stressed vowel is followed by a transparent penult high vowel, as in [ˈkɔmikɔ], [-ATR] also targets the stressed vowel, giving rise to an identity licensing configuration (23a). Medial posttonic (non-high) vowels may optionally undergo harmony: if they do, the span of [-ATR] vowels fits into the indirect licensing scheme, as in *tréboles* [ˈtɾɛßɔlɛ] (21b); if they do not, the resulting configuration follows the identity licensing pattern instead, as in [ˈtɾɛßolɛ] (23b). Pretonic vowels may also harmonize: again, if the result is a homogeneous [-ATR] span, the configuration fits indirect licensing, as in *momentos* [mɔˈmɛntɔ] (22a) or *revés* [rɛˈßɛ] (22b), as it does in paroxytones if [-ATR] only spreads to the stressed vowel,

as in *momentos* [moˈmɛntɔ] (22c); but if an intervening transparent high vowel occurs, identity

licensing emerges, as in *molinos* [mɔˈlinɔ] (24). All identity licensing schemes in (23) and (24)

serve to allow structures in which two vowels interact at a distance across a non-intervening

segment. The admissibility of discontinuous configurations in Granada shows that *DUPLICATE(F)

has a lower position in the hierarchy than in Murcia, where only continuous [-ATR] spans are

allowed.

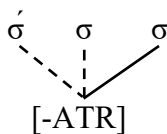(20) Patterns without [-ATR] spreading: Direct licensing

/rebes/: [reˈßɛ]

σ   σ́
      |
   [-ATR]
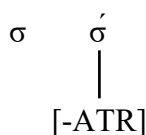
(21)   Patterns with continuous [-ATR] domains, without pretonic vowels: Indirect licensing

a.   /nenes/: [ˈnɛnɛ]   b.   /treboles/: [ˈtɾɛßɔlɛ]

σ́   σ   σ́   σ   σ

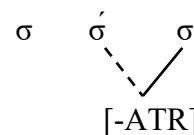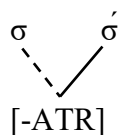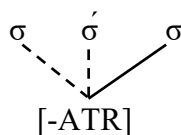[-ATR]   [-ATR]

(22) Patterns with continuous [-ATR] domains, with pretonic vowels: Indirect licensing

a.   /momentos/: mɔˈmɛntɔ]   b.   /rebes/: [rɛˈßɛ]   c.   /momentos/:[moˈmɛntɔ]

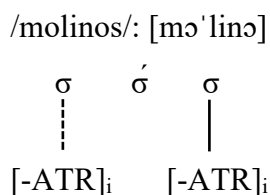σ   σ́   σ   σ   σ́   σ   σ́   σ

[-ATR]   [-ATR]   [-ATR]

(23) Patterns with discontinuous [-ATR] domains, without pretonic vowels: Identity licensing
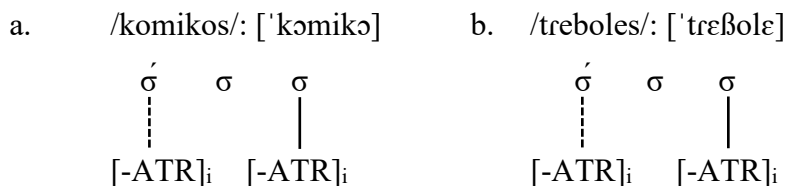
    a.   /komikos/: [ˈkɔmikɔ]   b.   /treboles/: [ˈtrɛßolɛ]

           σ́   σ   σ   σ́   σ   σ

        [-ATR]ᵢ   [-ATR]ᵢ   [-ATR]ᵢ   [-ATR]ᵢ

(24) Patterns with discontinuous [–ATR] domains, with pretonic vowels: Identity licensing

    /molinos/: [mɔˈlinɔ]

       σ   σ́   σ

   [-ATR]ᵢ   [-ATR]ᵢ

In the maximal extension pattern of Granada (pattern c in (3)), the ranking in (25), with the demotion of *DUPLICATE(F) with respect to Murcia (cf. (14)), is enough to obtain the grammatical results. As in Murcia, in candidates with non-high vowels harmony operates to the full possible extent within the word (see (26) and (27)).

(25) Ranking for pattern c (provisional): maximal licensing (all non-high vowels harmonize):

    *HIGH/-ATR >> LICENSE(-ATR, ∀V) >> *DUPLICATE(F), IDENT(ATR)

(26)	/treboles/	*HIGH/-ATR	LICENSE(-ATR, ∀V)	*DUPL	IDENT(ATR)
	a. ˈtrɛßolɛ		**!		*
	b. ˈtrɛßolɛ		*!	*	**
☞	c. ˈtrɛßɔlɛ				***

(27)	/monedeɾos/	*HIGH/-ATR	LICENSE(-ATR, ∀V)	*DUPL	IDENT(ATR)
a.	mone'ðeɾɔ		***!		*
b.	mone'ðɛɾɔ		**!		**
c.	monɛ'ðɛɾɔ		*!		***
☞ d.	mɔnɛ'ðɛɾɔ				****

In words with high vowels, *HIGH/-ATR rules out candidates with harmony targeting them, as shown in (28b) and (29c). The low position of *DUPLICATE(F) in the ranking, though, renders possible candidates in which the high vowels are skipped by harmony, that is, candidates with non-local harmony (see (28d) and (29b)).

(28)	/konsigelos/	*HIGH/-ATR	LICENSE(-ATR, ∀V)	*DUPL	IDENT(ATR)
a.	kon'siɣelɔ		***!		*
b.	kon'sɪɣelɔ	*!	**	*	**
c.	kon'siɣɛlɔ		**!		**
☞ d.	kɔn'siɣɛlɔ		*	*	***

(29)	/komikos/	*HIGH/-ATR	LICENSE(-ATR, ∀V)	*DUPL	IDENT(ATR)
a.	'komikɔ		**!		*
☞ b.	'kɔmikɔ		*	*	**
c.	'kɔmɪkɔ	*!			***

The medium extension pattern of Granada (pattern *b* in (3)) poses a further challenge to the analysis, because in proparoxytones with a stressed high vowel and pretonic and posttonic non-high (as in *consíguelos*), the posttonic non-high vowel harmonizes, although the stressed high vowel and the pretonic non-high vowel do not ([konˈsiɣɛlɔ]) — a configuration that has usually gone unnoticed in previous work. In line with Jiménez and Lloret (2007, 2018) and Lloret and Jiménez (2009), we propose that the different extension patterns found in Granada vowel harmony reveal the scalar nature of licensing requirements: *a*) *minimal licensing* only requires that [F] is licensed in *a* minimally strong position (whose trigger in Granada EA harmony is LICENSE(-ATR, σ́), according to which [-ATR] must be licensed by association with the stressed syllable of a prosodic word); *b*) *medium licensing* demands that [F] is licensed in a *stronger* position (whose trigger in Granada EA is LICENSE(-ATR, Foot), according to which [-ATR] must be licensed by association with the main foot of the prosodic word), and *c*) *maximal licensing* requires that [F] is licensed in *all* available positions in the prosodic word (which in Granada EA is brought by LICENSE(-ATR, ∀V)). Hence, in our view, maximal licensing is not independent from prominence (as Walker 2011 assumes), but it is another instance of prominent-based licensing systems where the harmonizing feature seeks to target all the positions in a higher prosodic constituent. The three proposed licensing constraints are progressive (i.e., they are in an implicational relation), because the stressed vowel is part of the main foot and the main foot is contained in the prosodic word; thus, if minimal licensing is violated, so are medium and maximal licensings, and if medium licensing is violated, so is maximal licensing, but not the other way around. As we will see at the end of this section, these implications neatly fit the attested and unattested patterns in Granada.

The relevant partial ranking common to all Granada EA patterns is '*HIGH/-ATR >> LICENSE(-ATR, σ́) >> IDENT(ATR)'. In the pattern with maximal licensing, already analyzed in (26)-(29),

the ranking of all the licensing constraints at the same point of the hierarchy, below *HIGH/-ATR and above *DUPLICATE(F) and IDENT(ATR), ensures maximal spreading (30). We do not repeat the tableaux here because, due to the implicational nature of the proposed licensing constraints, no change arises in the selection of the optimal candidates, and the same holds for the ranking of Murcia proposed in (13).

(30)   Ranking for pattern *c* (final): maximal licensing (all non-high vowels harmonize):

*HIGH/-ATR >> LICENSE(-ATR, σ́), LICENSE(-ATR, Ft), LICENSE(-ATR, ∀V) >> *DUPLICATE(F), IDENT(ATR)

In the medium licensing pattern (pattern *b* in (3)), not only does the presence of a posttonic high-vowel not block harmony of the stressed non-high vowel (as in [ˈkɔmikɔ], see (35)), but the presence of a non-harmonic stressed vowel does not impede posttonic non-high vowels from harmonizing (as in [konˈsiɣɛlɔ], see (34)). These results are obtained by ranking LICENSE(-ATR, σ́) and LICENSE(-ATR, Foot) together, crucially above *DUPLICATE(F) and IDENT(ATR) and with LICENSE(-ATR, ∀V) at the bottom of the hierarchy (32). With this ranking, all available targets belonging to the main foot are harmonized and posttonic high vowels can be skipped via identity licensing, as illustrated in (32)-(35) (see specially (35b)).

(31)   Ranking for pattern *b*: medium licensing (stressed non-high vowels and posttonic non-high vowels harmonize; pretonic vowels do not harmonize):

*HIGH/-ATR >> LICENSE(-ATR, σ́), LICENSE(-ATR, Foot) >> *DUPLICATE(F), IDENT(ATR) >> LICENSE(-ATR, ∀V)

(32)

/treboles/	*HIGH/-ATR	LICENSE (-ATR, σ́)	LICENSE (-ATR, Ft)	*DUPL	IDENT (ATR)	LICENSE (-ATR, ∀V)
a. ˈtɾeβolɛ		*!	**!		*	**
b. ˈtɾɛβolɛ			*!	*	**	*
☞ c. ˈtɾɛβɔlɛ					***	

(33)

/monederos/	*HIGH/-ATR	LICENSE (-ATR, σ́)	LICENSE (-ATR, Ft)	*DUPL	IDENT (ATR)	LICENSE (-ATR, ∀V)
a. moneˈðeɾɔ		*!	*!		*	***
☞ b. moneˈðɛɾɔ					**	**
c. monɛˈðɛɾɔ					***!	*
d. mɔnɛˈðɛɾɔ					****!	

(34)

/konsigelos/	*HIGH/-ATR	LICENSE (-ATR, σ́)	LICENSE (-ATR, Ft)	*DUPL	IDENT (ATR)	LICENSE (-ATR, ∀V)
a. konˈsiɣelɔ		*	**!		*	***
b. konˈsɪɣelɔ	*!		*	*	**	**
☞ c. konˈsiɣɛlɔ		*	*		**	**
d. kɔnˈsiɣɛlɔ		*	*	*!	***!	*

(35)

/komikos/	*HIGH/-ATR	LICENSE (-ATR, σ́)	LICENSE (-ATR, Ft)	*DUPL	IDENT (ATR)	LICENSE (-ATR, ∀V)
a. ˈkomikɔ		*!	**!		*	**
☞ b. ˈkɔmikɔ			*	*	**	*
c. ˈkɔmɪkɔ	*!				***	

Finally, in the minimal licensing pattern (pattern *a* in (3)), *DUPLICATE(F) and both the medium and maximal licensing constraints are ranked below IDENT(ATR) (36). As shown in tableaux (37)-(40), with this ranking the [-ATR] feature of the last vowel only extends up to stressed non-high vowels at the expense of creating non-homogeneous configurations (see (37b) and (40b)).

(36)   Ranking for pattern *a*: minimal licensing (only stressed non-high vowels harmonize):

*HIGH/-ATR >> LICENSE(-ATR, ó) >> IDENT(ATR) >> *DUPLICATE(F), LICENSE(-ATR, Foot), LICENSE(-ATR, ∀V)

(37)

/tɾeboles/		*HIGH/-ATR	LICENSE (-ATR, ó)	IDENT (ATR)	*DUPL	LICENSE (-ATR, Ft)	LICENSE (-ATR, ∀V)
a.	ˈtɾeßolɛ		*!	*		**	**
☞ b.	ˈtɾɛßolɛ			**	*	*	*
c.	ˈtɾɛßɔlɛ			***!			

(38)

/monedeɾos/		*HIGH/-ATR	LICENSE (-ATR, ó)	IDENT (ATR)	*DUPL	LICENSE (-ATR, Ft)	LICENSE (-ATR, ∀V)
a.	moneˈðeɾɔ		*!	*		*	***
☞ b.	moneˈðɛɾɔ			**			**
c.	monɛˈðɛɾɔ			***!			*
d.	mɔnɛˈðɛɾɔ			****!			

(39)

/konsigelos/		*HIGH/-ATR	LICENSE (-ATR, ó)	IDENT (ATR)	*DUPL	LICENSE (-ATR, Ft)	LICENSE (-ATR, ∀V)
☞	a. konˈsiɣelɔ		*	*		**	***
	b. konˈsɪɣelɔ	*!		**	*	*	**
	c. konˈsiɣɛlɔ		*	**!		*	**
	d. kɔnˈsiɣɛlɔ		*	***!	*	*	*

(40)

/komikos/		*HIGH/-ATR	LICENSE (-ATR, ó)	IDENT (ATR)	*DUPL	LICENSE (-ATR, Ft)	LICENSE (-ATR, ∀V)
	a. ˈkomikɔ		*!	*		**	**
☞	b. ˈkɔmikɔ			**	*	*	*
	c. ˈkɔmɪkɔ	*!		***			

The licensing approach developed here yields a typology of vowel harmony consistent with the Granada patterns under study, as illustrated in (41) with words displaying pretonic and posttonic vowels at the same time (i.e., *recógelos* and *consíguelos*): either all (non-high) vowels harmonize ((41a), maximal licensing), or harmony reaches all (non-high) vowels in the main foot ((41b), medium licensing), or just the stressed (non-high) vowel harmonizes ((41c), minimal licensing). Except when the posttonic is a high vowel (e.g., *económicos*, pronounced with maximal licensing: [ɛkɔˈnɔmikɔ]), utterances with harmonized pretonic vowels leaving the posttonic unaffected (41d) are neither attested nor expected. This is an important upshot of our analysis, since no re-ranking of the proposed constraints leads to the unattested pattern, which is a desirable consequence for factorial typology: indeed, to open pretonic vowels, LICENSE(-ATR, ∀V) must

dominate IDENT(ATR), but the inverse ranking is necessary to prevent posttonic vowels from opening as well (see (41d)).

(41)	**Inputs**		/ɾekohelos/ /konsigelos/	**Rankings**	**Domain**
	Possible outputs	a.	[ɾɛˈkɔhɛlɔ] [kɔnˈsiɣɛlɔ]	LICENSE(-ATR, σ́), LICENSE(-ATR, Ft), LICENSE(-ATR, ∀V) >> *DUPLICATE(F), IDENT(ATR)	Max.
		b.	[ɾeˈkɔhɛlɔ] [koˈnsiɣɛlɔ]	LICENSE(-ATR, σ́), LICENSE(-ATR, Ft) >> *DUPLICATE(F), IDENT(ATR) >> LICENSE(-ATR, ∀V)	Med.
		c.	[ɾeˈkɔhelɔ] [konˈsiɣelɔ]	LICENSE(-ATR, σ́) >> IDENT(ATR) >> *DUPLICATE(F), LICENSE(-ATR, Ft), LICENSE(-ATR, ∀V)	Min.
	Impossible outputs	d.	[ɾɛˈkɔhelɔ] [kɔnˈsiɣelɔ]	**No ranking available:** Spreading to the pretonic ⇒ LICENSE(-ATR, ∀V) >> IDENT(ATR) Posttonic gap ⇒ IDENT(ATR) >> LICENSE(-ATR, ∀V)	—

In line with Kaplan's (2015) work, an analysis with a single licensing constraint, LICENSE(-ATR, ∀V), and positional faithfulness constraints restricted to relative metrical prominent positions (pretonic syllables being a stronger site than posttonic syllables) is also possible, as explored in Lloret (2018). In minimal licensing both pretonic and posttonic vowels would be protected, whereas in medium licensing just the pretonic (the more prominent) would. Even though the analysis works, it relies on the assumption that in non-maximal patterns unstressed vowels are preserved over stressed ones, which goes against the usual expectations of positional faithfulness (Beckman 1998). We thus prefer to stick to our split version of LICENSE(-ATR, S-Pos), which is well-suited to capturing the scalar nature of vowel harmony.

4.2. *Morphologically-conditioned vowel harmony: Jaén*

As Soriano (2012) points out, in Jaén EA vowel harmony leftward spreading of [-ATR] appears as a concomitant strategy to maximize certain morphological contrasts, since it takes over the whole prosodic word but is only triggered by a few inflectional suffixes (namely, -/s/ of the plural nominal suffix -/s/ or -/es/ or the verbal suffixes of second-person singular -/s/, first person plural -/mos/ and second person plural -/is/, as well as the infinitive suffix -/ɾ/). Hence, some constraint referring to the morphosyntactic information contained in these suffixes is needed. Inflectional suffixes are considered less prominent than roots; they are thus well suited to raise prominence-based licensing issues.

To capture morpheme-specific licensing, we adopt Walker's (2011: 59-63) view based on the lexical indexation approach proposed in Pater (2009). We assume the following:

> The phonological exponence of a morpheme is the phonological material that is identified with that morpheme in an output. […] [F]or a feature specification to qualify as the phonological exponence of a morpheme, it does not have to be that morpheme's sole phonological exponence […]. The morpheme in question could also be identified with other phonological material in the output, but only the content specified in the constraint —here, F— is in the scope of licensing. (Walker (2011: 61)

In Jaén EA, the suffixes triggering vowel harmony are marked with a subscript '$_L$'. All of these morphemes, for independent phonetic reasons that affect all non-nasal final consonants, surface with deletion of the final consonant, with the concomitant effect of opening all the preceding adjacent vowels (and further fronting /a/). In this scenario, only lexically indexed suffixes propagate the [-ATR] traces of their lost exponents to the domain of the whole prosodic word, due to the role of LICENSE$_L$(-ATR, $\forall$V). The simplified ranking presented in (42) is sufficient to illustrate the analysis

(we do not include *DUPLICATE(F) in the ranking, because, as we have demonstrated for Granada EA, in systems with maximal extension this constraint is low-ranked and, therefore, not relevant for the discussion).

(42)   Simplified ranking for Jaén EA:

LICENSE_L(-ATR, ∀V) >> *HIGH/-ATR, IDENT(ATR) >> LICENSE(-ATR, ∀V)

The morpheme-specific nature of the pattern captured by the ranking in (42) entails that only indexed morphemes compel harmony in the whole domain of the prosodic word, as illustrated in tableaux (43) and (44). In (43) the indexed constraint LICENSE_L(-ATR, ∀V) assigns violations to candidates in which the [-ATR] traces of the indexed morpheme do not spread to all the vowels of the prosodic word (43a-b). Note that, in this variety, the subordinate position of *HIGH/-ATR in the ranking allows the spreading of [-ATR] with total disregard for the creation of [-ATR] high vowels (43c). In (44), instead, the presence of a final -/s/ that is not morphologically marked leaves LICENSE_L(-ATR, ∀V) without effect, so that the candidate (44a), with opening of the rightmost vowel but without any modifications in the stressed vowel, is selected. It is important to stress that the ability to induce vowel harmony is totally dependent on the marked affixes: a same root, for instance, *extintor* 'fire extinguisher', surfaces with only final opening in the singular, but with overall harmony in the plural form: [eʰttinˈtɔ] vs. [ɛʰttinˈtɔɾɛ].

(43)

/komikosₗ/	Licenseₗ(-ATR, ∀V)	*High/-ATR	Ident (ATR)	License(-ATR, ∀V)
a. ˈkomikɔ	**!		*	**
b. ˈkomɪkɔ	*!	*	**	*
☞ c. ˈkɔmɪkɔ		*	***	

(44)

/buɾgos/	Licenseₗ(-ATR, ∀V)	*High/-ATR	Ident (ATR)	License(-ATR, ∀V)
☞ a. ˈbuɾɣɔ			*	
b. ˈbʊɾɣɔ		*!	**!	*

5. Vowel harmony in other Iberian Romance varieties

In the previous section, we showed that southern peninsular Spanish harmonic processes are well suited to the prominence-based licensing approach, because the features typically spread from a weak position to strong positions, sometimes permitting discontinuous configurations. This pattern of feature propagation from weak to strong positions is quite common among the Iberian Romance languages (see a typological survey in Jiménez and Lloret 2011). In this section, we present data from these other varieties without providing a formalized OT analysis but just highlighting the similarities and differences with the southern peninsular harmonic patterns previously analyzed.

To start with, in the central Asturian variety of Lena the high unstressed vowel -/u/ of the masculine suffix triggers a raising of the preceding stressed vowels /e, o, a/ to [i, u, e], respectively, emphasizing in this way the contrast with the mid unstressed vowel -/o/ of the mass suffix, which does not induce any alteration in the root: e. g., [ˈfiu] vs. [ˈfeo] (see (45a-b); cf., on this issue,

Neira Martínez 1955, 1983; Penny 1969; Hualde 1989, 1998; Dyck 1995; Walker 2005, 2011; Martínez-Gil 2006; Campos-Astorkiza 2009; Finley 2009). Height harmony does not apply when -/u/ is not an inflectional suffix, as in the adverb [aˈßaxu], or when it appears in words referring to objects that do not allow for the mass/count distinction, as in [ˈjelsu] (see (45c)). Lena harmony is neither triggered by the coronal vowel -/i/, which does not present a height contrastive distribution with -/e/ in inflectional suffixes: e.g., [ˈventi] (see (45d); cf. Campos-Astorkiza 2009, though see Hualde 1989). The central Asturian variety of Aller permits the spreading of height from a final front vowel -/i/ as well, but limited to verbal forms, which are the only ones displaying a contrast between final -/i/ and -/e/: for instance, [eˈßɾi] vs. [aˈßɾe] (see (46c-d)). Note that in western and eastern Asturian varieties, where there is no contrast between high and mid vowels in final position, there is no vowel harmony either: e.g., [ˈt͡ʃoßu] 'wolf', [ˈpet͡ʃu] 'breast' (cf. [ˈt͡sußu], [ˈpit͡ʃu] in Lena Asturian). Overall, Asturian varieties provide an instance of morphologically-conditioned harmony triggered from a final weak position, since the set of endings that induce the spreading is defined by their morphological content, as in Jaén EA (cf. Campos-Astorkiza 2009 for an analysis along these lines).

(45) Height harmony in Lena Asturian

a.	feu	'ugly-MASC.SG.'	[ˈfiu]	b.	feo	'ugly-MASS'	[ˈfeo]
	tontu	'silly-MASC.SG.'	[ˈtuntu]		tonto	'silly-MASS'	[ˈtonto]
	santu	'saint-MASC.SG.'	[ˈsentu]		santo	'saint-MASS'	[ˈsanto]
c.	abaxu	'down'	[aˈßaxu]	d.	venti	'twenty'	[ˈbenti]
	yelsu	'plaster'	[ˈjelsu]		madre	'mother'	[ˈmaðɾi]

(46) Height harmony in Aller Asturian

a. calderu ‘cauldron’ [kalˈdiɾu]   b. calderos ‘cauldrons’ [kalˈdeɾos]

    fechu ‘made-MASC.SG.’ [ˈfit͡ʃu]   fechos ‘made-MASC.PL.’ [ˈfet͡ʃos]

c. abri ‘open-IMP.’ [ˈeßɾi]   d. abre ‘it opens’ [ˈaßɾe]

    corri ‘run-IMP.’ [ˈkuri]   corre ‘s/he runs’ [ˈkore]

A fundamental source of variation found in the EA harmonic patterns is the scope of the harmonic domain, which in our analysis is accounted for through different licensing constraints. Similar scalar patterns in the harmonic domain are found in other peninsular dialects as well (on this issue, see especially Hualde 1989, which offers an autosegmental and metrical analysis of the northwestern varieties of Spain using, as in this paper, a three-way scope distinction). Height harmony in Lena Asturian, for instance, targets only the stressed syllable (minimal licensing); gapped structures, with medial compatible segments unaffected, are allowed, as in [ˈpexaɾu] (see (47a)).

(47) Height harmony in Lena Asturian, with gapped configurations

a. truébanu ‘beehive’ [ˈtɾwißanu]

    silicóticu ‘silicotic-MASC.SG.’ [siliˈkutiku]

    páxaru ‘bird-MASC.SG.’ [ˈpeʃaɾu]

b. truébanos ‘beehives’ [ˈtɾweßanos]

    slicóticos ‘silicotic-MASC.PL.’ [siliˈkoticos]

    páxara ‘bird-FEM.SG.’ [ˈpaʃaɾa]

Centralization harmony in Cantabrian (also known as Montañés), which also initiates from a final unstressed vowel, is an example of a weak-to-strong assimilation process illustrating

harmonic domains beyond the stressed syllable. In Tudanca Montañés, a final high labial vowel is centralized (this vowel is described as centralized and as more open than [u]) and its [-ATR] feature extends up to the stressed syllable, including posttonic vowels (48a) (medium licensing) (centralized vowels are indicated, as in our sources, by capitalization; see Penny 1978; McCarthy 1984; Vago 1988; Hualde 1989, 1998; Dyck 1995; Walker 2005, 2011; Finley 2009). Centralization also applies when the last syllable contains an underlying high front vowel (48b). Final -/i/, however, neutralizes with -/e/ in a non-centralized vowel ranging from [ə] to [i]; hence, the underlying quality of high front vowels is only visible in its effects upon the stressed syllable (see (48c)). In Pasiego Montañés, on the other hand, the centralization of -*u* spreads to the whole prosodic word, clitics included (maximal licensing), as shown in (49a). Final -*i*, which neutralizes with final -/e/ in a schwa-type vowel, does not trigger centralization in this dialect (see (49b)); the contrast between -/i/ and -/e/, though, is maintained in forms with a stressed mid vowel due to height harmony from -/i/ (see (49b-c) and the description of this height harmony process below).

(48) Centralization in Cantabrian Spanish varieties: Tudanca Montañés

 a. [simˈpAtIkU]   'nice-MASC.SG.'
     [antiˈɣwIsImU]   'very old-MASC.SG.'
     [aˈka el ˈmEðIkU]   'to the doctor's'

 b. /abɾi/   'open-IMP.'   [ˈAßɾə]   c.   /abɾe/   'it opens'   [ˈaßɾə]
     /meti/   'put in-IMP.' [ˈmEti]   /mete/   's/he puts in' [ˈmeti]
     /komi/   'eat-IMP.'   [ˈkOmə]   /kome/   's/he eats'   [ˈkomə]

(49) Centralization in Cantabrian Spanish varieties: Pasiego Montañés

 a. [sImˈpAtIkU]   'nice-MASC.SG.'
     [IskAlOfɾiˈAU]   'shivering-MASC.SG.'

[kUn Il mAˈyIstɾU]   'with the teacher'

b. /abɾi/   'open-IMP.'   [ˈaßɾə]   c. /abɾe/   'it opens'   [ˈaßɾə]

/bebi/   'drink-IMP.'   [ˈbißə]   /bebe/   's/he drinks'   [ˈbeßə]

/komi/   'eat-IMP.'   [ˈkumə]   /kome/   's/he eats'   [ˈkomə]

The southern peninsular Spanish systems described have also shown that the interaction of harmony-driving constraints with other faithfulness and markedness constraints yields an additional variation regarding the internal configuration of the harmonic domains. For instance, a low position of *DUPLICATE(F) in the ranking ensures the acceptability of discontinuous representations, as shown by *tréboles* [ˈtɾɛßolɛ] in the Granada EA minimal harmonic pattern (see (37)). The same structure is also possible in Lena height harmony, as the form [ˈpeʃaɾu] in (47a) reveals: the high feature reaches the stressed low vowel leaving the posttonic one unaffected. In both cases, modifying only the stressed vowel to satisfy minimal licensing serves to increase the saliency of the extended feature with the smaller amount of faithfulness violations.

The position of feature co-occurrence restrictions such as *HIGH/-ATR and their interaction with *DUPLICATE(F) also generate variation related to the configuration of the harmonic domains. In Granada EA vowel harmony, for example, high vowels are not affected by harmony (e. g., *muchos* [ˈmuʃɔ]), but they can be skipped, creating once again gapped domains (e. g., *cómicos* [ˈkɔmikɔ]). Similarly, in Pasiego Montañés, /e/ acts as a neutral transparent vowel with respect to centralization: it is not targeted by [-ATR] harmony, but does not impede the process either, giving rise to discontinuous [ATR] strings, as in *cOnfesOnAriU* 'confessional' (see McCarthy 1984, Finley 2009).

The weak-to-strong spreading systems just presented differ from other peninsular varieties in which features propagate the other way around: that is, from strong to weak positions. For instance, in some Valencian Catalan varieties a word-final unstressed -/a/ becomes [ɛ] or [ɔ] when preceded

by a stressed /ɛ/ and /ɔ/, respectively, thus spreading the place features [coronal] and [labial] from the stressed vowel (see (50a-b)). According to Jiménez (1998), the goal of this harmony is to improve the perceptibility of the marked mid-open vowels [ɛ, ɔ], which are typically limited to the stressed syllable (see also Walker 2005, 2011, and, for a phonetic analysis of the process, Herrero and Jiménez 2013 and Jiménez and Herrero 2015). The spreading of the place features is blocked whenever an intervening posttonic non-low vowel appears between the trigger and the target, as the words in (50c) exemplify.

(50)   Place harmony in Valencian Catalan

    a.   tela   'cloth'   ['tɛlɛ]   b.   cosa   'thing'   ['kɔzɔ]

        afecta 'it affects'   [aˈfɛktɛ]   tova   'soft-FEM.SG.' ['tɔvɔ]

    c.   còmica 'comic-FEM.SG.' ['kɔmika]

        mèdica 'medic-FEM.SG.' ['mɛðika]

Valencian vowel harmony usually affects only the posttonic syllable, a pattern that could be interpreted as a case of licensing targeting the main foot, similar to the medium extension pattern postulated for Granada EA (cf. Jiménez and Lloret 2011). A few southern Valencian varieties, though, allow the place features to extend to the whole prosodic word, as in southern peninsular Spanish maximal patterns: e.g. *afecta* [ɛˈfɛktɛ] (see Jiménez 1998).

With respect to the weak-to-strong and strong-to-weak dichotomy, height harmony in Cantabrian varieties falls into two different categories. In Tudanca Montañés, pretonic mid vowels raise to high if the stressed syllable contains a high vowel or a prevocalic glide, that is, in this variety the harmonized feature extends from a strong to a weak position (51). As the examples in

(51c) show, the process is unbounded, being able to affect more than one pretonic mid vowel; however, it does not reach proclitic elements such as articles or prepositions.

(51)   Height harmony in Tudanca Montañés

    a.   cerilla   'match'   [θiˈɾiya]   b.   cera   'wax'   [ˈθeɾa]

        cocina   'kitchen'   [kuˈθina]   cocer   'to cook'   [koˈθeɾ]

    c.   metería 'I would put in' [kumiˈɾia]   d.   meter 'to put in' [meˈteɾ]

        comería 'I would eat' [kumiˈɾia]   comer 'to eat' [koˈmeɾ]

Height harmony in Pasiego Montañés is a more complex phenomenon. As in some Asturian varieties, a final high vowel induces height harmony in the stressed syllable, but only mid vowels are targeted (52a). Additionally, as in Tudanca, pretonic mid vowels may raise when preceding a high vowel or a prevocalic glide in the stressed position (52c); pretonic vowel raising in Pasiego is unbounded, but, in contrast to Tudanca, the high feature spreads up to clitic forms (52e). In this variety, then, raising follows a twofold pattern: it can go from a weak unstressed final syllable to the stressed position and from this strong syllable to the weak pretonic positions. The main complexity of the pattern, though, arises because the process affecting the stressed syllable feeds the pretonic raising process, as the examples [rIˈðUndU] and [kUɾˈðIɾU] in (52a) illustrate. Note, finally, that in both patterns the spreading can apply through an intervening transparent low vowel, as in [ˈgwIɾfAnU] (52a) or [pUl kAˈmInU] (52e).

(52) Height harmony in Pasiego Montañés

a.	güérfanu	'orphan-MASC.SG.'	[ˈgwIɾfAnU]
	bebi	'drink-IMP.'	[ˈbißə]
	redondu	'round-MASC.SG.'	[rIˈðUndU]
	corderu	'lamb'	[kUɾˈðIɾU]
b.	güérfanos	'orphan-MASC.PL.'	[ˈgweɾfanʊs]
	beber	'to drink'	[beˈßeɾ]
	redondos	'round-MASC.PL.'	[reˈðondʊs]
	corderos	'lambs'	[koɾˈðeɾʊs]
c.	cogería	'I would take'	[kuxiˈɾia]
	comería	'I would eat'	[kumiˈɾia]
d.	cogeré	'I will take'	[koxeˈɾe]
	comer	'to eat'	[koˈmeɾ]
e.	pol caminu	'by the road	[pUl kAˈmInU]
	me lo dio	's/he gave it to me'	[mi lu ˈðjo]
f.	por la calle	'by the street'	[po la ˈkaʎe]
	me lo compró	's/he bought it to me'	[me lo komˈpɾo]

All the harmonic processes presented in this chapter share a common trait: a constraint favoring feature spreading (i.e., a constraint from the LICENSE(F, S-Pos) family) is in a high-ranked position in the hierarchy, crucially, above IDENT(F). From that position, it drives harmony at the expense of altering the features of other input segments, with discontinuous configurations admitted (e.g., in Granada EA) or with only homogeneous strings (e.g., in Jaén EA and Murcia). Other plausible orderings produce alternative results in Spanish. The most radical option is that the constraints promoting vowel harmony appear below the faithfulness constraint protecting input vocalic specifications. This ordering would completely rule out the spreading of the harmonizing feature.

Yet the final consonant might still open the adjacent vowel if the faithfulness constraint demanding to retrieve the lost consonant (i.e., MAX-IO) is in a high enough position in the ranking. The opening of the last vowel without further spreading is found in Jaén EA in words without the listed suffixes (e.g., *Burgos* [ˈbuɾɣɔ], see (44)), but is also the usual outcome in some western Andalusian and other Spanish varieties, e.g., Albacete and Ciudad Real: *nenes* [ˈnenɛ]. To complete the typology, if the faithfulness constraints targeting vocalic features were at the top of the ranking, the final consonant might even be deleted without leaving any mark of its loss, as happens in western Andalusian as well as in Canarian and Extremaduran varieties: *nenes* [ˈnene] (see Alvar 1996a,b; Álvarez 1996).

6. Conclusion

In this chapter we have shown that the interaction of the licensing principles with other faithfulness and markedness constraints gives rise to a vast array of harmonic patterns, illustrating the way in which languages try to balance the need to preserve underlying information (phonological as well as morphological) and the requirements of structural simplicity. Our examination of the details of the triggers, targets, and scope of vowel harmony in southern peninsular Spanish leads us to conclude that, in the patterns reported, the compensation of word-final consonant loss with the opening of the rightmost vowel and further left spread is favored but not determined by a need to enhance grammatical distinctions. This is clear in the Murcian system, where, as highlighted by Hernández-Campoy and Trudgill (2002), the opening and harmonic effects due to the loss of any non-nasal word-final consonant fail to preserve many morphological and lexical distinctions (e.g., [pɾɛˈßɛ] is the outcome of *prevés*

'you-SING. foresee' and *prever* 'to foresee'; [sɔˈlæ] is the outcome of *solaz* 'solace' and *solar* 'building lot'). Likewise, the prohibition to open high vowels can create homophonous pairs ([ˈbiθi] is the outcome of *bici* 'bike' and *bicis* 'bikes'; [oˈi] is the outcome of *oí* 'I heard', *oís* 'you.PL. hear', and *oír* 'to hear'). Additionally, even in the morphologically-conditioned harmony of Jaén, there are morpheme triggers whose segmental material is not limited to the deleted consonant (i.e., the nominal plural suffix -/es/, the verbal first person plural suffix -/mos/, and the verbal second person plural suffix -/is/) and at the same time some grammatical distinctions may not be preserved in some words (e.g., [ɔˈɪ] is the outcome of *oís* and *oír* vs. [oˈi] *oí*).

To conclude, we highlight some directions for future work. First, it would be worth investigating the phonetics-phonology interaction responsible for the opening of the rightmost vowels and further fronting of /a/ under consonant loss or weakening. Additionally, since some studies on other languages claim that transparency is not a failure to participate in harmony but a failure to produce salient consequences of harmony on a specific class of segments (see, e.g., Gafos and Dye 2011), experimental work on the quality of high vowels in southern peninsular Spanish is a welcome addition to the debate. Finally, the intralinguistic variation encountered in the Granada EA system needs much more data to be able to attempt a quantitative-based variation approach to vowel harmony: the descriptions so far just mention an internal factor (i.e., phonological similarity) and two external factors (i.e., high speech rate and informal registers) that favor fully harmonized pronunciations.

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