# When diachrony meets synchrony. How linguistic variation sheds light on the origin of synchronic phonological processes and theories of language change[*]

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(Emphasis in italics)

**Abstract**

A careful look at phonological change and variation across nearby linguistic varieties can lead to important insights into some of the theories of language change. On the basis of the analysis of an extensive set of processes drawn from Romance languages, this paper provides substantial empirical evidence for the need to refine the models embedded within the Optimality Theory framework to account for surface resemblances between the members of a paradigm. The main argument of this paper is that the Optimal Paradigms model (McCarthy [2001] 2005), developed to account for surface resemblances between the members of an inflectional paradigm, and the Transderivational Correspondence Theory (Benua [1997] 1999), developed to account for surface resemblances between the members of a derivational paradigm, should both be adapted in order to be sensitive to the internal organization of members within these paradigms, and therefore to the closer or looser connection which may exist between them depending on the type of inflection or derivation. Some of the criticisms that the former model has received can in fact be resolved by means of this new approach. This paper also provides extensive empirically-based arguments for the hypothesis found in McCarthy ([2002] 2005) according to which the direction of paradigmatic pressure is mainly governed by phonological markedness.

**Keywords**

# 1 INTRODUCTION

A diachronic approach to phonology is not —or it should not be— especially different from a synchronic or a diatopic approach. In both cases, it is necessary to reflect on the relation between the phonological structure of language and the physics of speech sounds, the physiology and the psychology of humans, and the physical, social and cultural context in which the communication takes place (Holt 2003, Bermúdez-Otero 2007). It is also necessary to formalize, regardless of the selected theoretical framework, the changes that occur in this structure over time and space and the causes of these changes. In fact, the actual difference between research in synchrony and research in diachrony is the accessibility that the researcher has to the empirical data: in the former case, access is relatively easy, in the latter, not as much. The fact is that, in general terms, studies in synchrony and studies in diachrony have evolved in parallel, in most cases within radically different scientific paradigms.

Nowadays, however, it is possible to find an impressive body of literature in which there is a significant compromise between synchronic and diachronic explanation: the same scientific paradigms and therefore the same kinds of argumentations are used and invoked to explain both synchronic phonological alternations and diachronic sound change. During the last few decades, moreover, both synchronic and diachronic phonology have become more and more concerned with finding an answer to *why* a phonic reality is the way it is and not something else. And many of the classical laws, principles and arguments invoked to explain sound change, first within the Neogrammarian paradigm and, later within the Natural (Generative) Phonological paradigm, have been revived in the form of universal constraints in the framework of Optimality Theory. One of these arguments is that of *analogy* or, in current terms, that of surface *paradigmatic pressures* between morphologically related words.

This paper aims to illustrate how the problems derived from access to intricate diachronic empirical data can sometimes be informed by a careful look at interdialectal microvariation, as well as how this linguistic microvariation can sometimes help to explain why a phonological process applies or has applied. It also seeks to further investigate the origin of what is phonologically marked and what is not in a specific variety. And, last but not least, it intends to show how the analysis of phonological change and linguistic variation in a specific linguistic variety and across nearby linguistic varieties can provide noteworthy insights about the architecture of some of the machineries developed within Optimality Theory to account for surface resemblances between the members of a given paradigm. Specifically, the paper provides empirical evidence for the desirability of refining the Optimal Paradigms model (henceforth, OP model; McCarthy [2002] 2005), developed to account for surface resemblances between the members of an *inflectional paradigm*, and the Transderivational Correspondence Theory (henceforth, TCT model; Benua [1997] 1999), developed to account for surface resemblances between the members of a *derivational paradigm*, in order to be sensitive to the internal organization of members within these paradigms. To achieve these goals, we will focus on some well-known phonological processes of Romance languages, in which paradigmatic pressures imply a reanalysis of the grammar in a given dialect and, in fact, a reinterpretation of what is phonologically marked and what is not in a given linguistic variety. The analysis of these processes, finally, supports McCarthy's hypothesis that the direction of paradigmatic pressure within inflection is governed by phonological markedness, and that therefore only overapplication of a process is possible due to paradigmatic pressure within the paradigm. This view diverges from previous accounts of the same data, which proposed that the direction of the paradigmatic pressure was governed by a special morphological status of the members in the paradigm.

## 2 PARADIGMATIC PRESSURES IN PHONOLOGY

### 2.1 *Paradigmatic pressures within generative phonology*

Paradigmatic pressures played an important role in Neogrammarians' work on sound change, where *exceptions to sound laws* were frequently accounted for by resorting to concepts such as analogy and contrast (see, among others, Paul 1880). In the SPE model[1] and in subsequent work, analogy and similar concepts were excluded from any phonological explanation: in this framework, paradigmatic influences between morphologically related words were expressed in terms of rule ordering, the cycle and the strata (see, among others, Chomsky & Halle 1968, Mascaró 1972, and Kiparsky 1982a,b). In Optimality Theory, traditional ideas of analogy and contrast between the members of a paradigm have been revived; indeed, Optimality Theory has developed a wide assortment of submodels and refinements with the purpose of accounting for surface similarities and dissimilarities across the members of a paradigm and which are applicable to explain both synchronic alternations and sound change (see § 2.3 and Downing & Hall & Raffelsiefen 2005).

### 2.2 *Overapplication and underapplication*

Two essential concepts when dealing with exceptions to sound laws, or, in most current terms, when dealing with cases of phonological opacity,[2] are *overapplication* and *underappplication*. Overapplication refers to situations where a phonological process applies even though the conditions that make it applicable are not visible. As illustrated in (1), for instance, the process of regressive place assimilation of the nasal to the following velar stop of Catalan depicted in (1b) overapplies in word-final position (2c). This is because the consonant responsible for the application of the process (*i.e.* the velar stop) is deleted in word-final position, that is, the context that makes it applicable has been destroyed, due to an independent process of cluster simplification of Catalan which affects word-final homorganic sequences of a nasal or liquid followed by a stop. Therefore, the process of assimilation is not surface-justified.

(1) *Normal application of regressive place assimilation in Catalan*

    a. *só*[n]        '(they) are'                 → no-application
    b. *só*[ŋ] *cars* '(they) are expensive'  → normal application

    (Data from Mascaró 1972)

(2) *Overapplication of regressive place assimilation in Catalan*

    a. *ve*[n]*em*    '(we) sell 1 *plur*. PI'    → no-application
    b. *ve*[ŋ]*guem* '(we) sold 1 *plur*. PS'  → normal application
    c. *ve*[ŋ]        '(I) sell 1 *sing*. PI'    → overapplication

    (Data from Mascaró 1972)

Underapplication occurs when a (phonological) process does not apply even though the conditions that make it applicable are met. For instance, the process of vowel reduction of the

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[1] SPE is the abbreviation used to refer to Noam Chomsky and Morris Halle's *The sound pattern of English*, published in 1968.
[2] Phonological opacity is a term coined by Kiparsky (1971, 1973), intrinsically related to the notions of underapplication and overapplication. It refers to those cases in which a linguistic generalization is not surface-true (*i.e.* it fails to apply), and to those cases in which a linguistic generalization is not surface-apparent (*i.e.* it unexpectedly applies).

low vowel [á] and the front mid-vowels [é], [ɛ́] to schwa, which is found in most Eastern Catalan varieties (3), underapplies in Majorcan Catalan, as seen in (4), when the unstressed vowel belongs to a productive derivational form with an alternating stressed [é] or [ɛ́] vowel in the corresponding primitive base-stem.
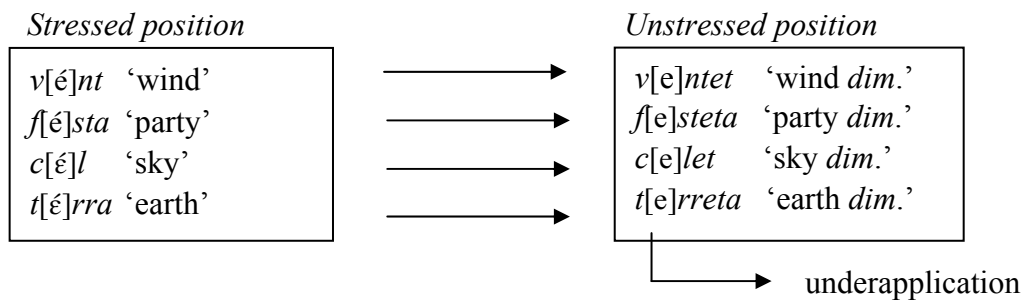
(3) *Normal application of vowel reduction in Majorcan Catalan*

    *Stressed position*                                  *Unstressed position*

    *c*[á]*sa*   'house'       ⟶       *c*[ə]*seta*   'house *dim.*'

    *caf*[ɛ́]   'coffee'     ⟶       *caf*[ə]*net*   'coffee *dim.*'

    *carr*[é]*r* 'street'    ⟶       *carr*[ə]*ró* 'street *dim.*'

                                                   ⟶ normal application

(4) *Underapplication of vowel reduction in Majorcan Catalan*

    *Stressed position*                                  *Unstressed position*

    *v*[é]*nt*   'wind'        ⟶      *v*[e]*ntet*   'wind *dim.*'

    *f*[é]*sta* 'party'      ⟶      *f*[e]*steta* 'party *dim.*'

    *c*[ɛ́]*l*   'sky'        ⟶      *c*[e]*let*   'sky *dim.*'

    *t*[ɛ́]*rra* 'earth'     ⟶      *t*[e]*rreta* 'earth *dim.*'
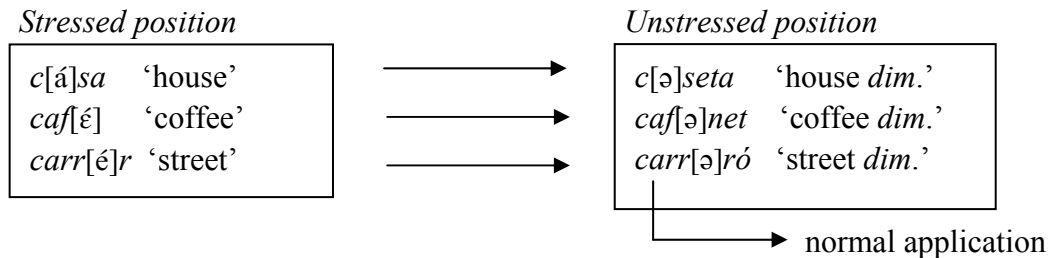
                                                   ⟶ underapplication
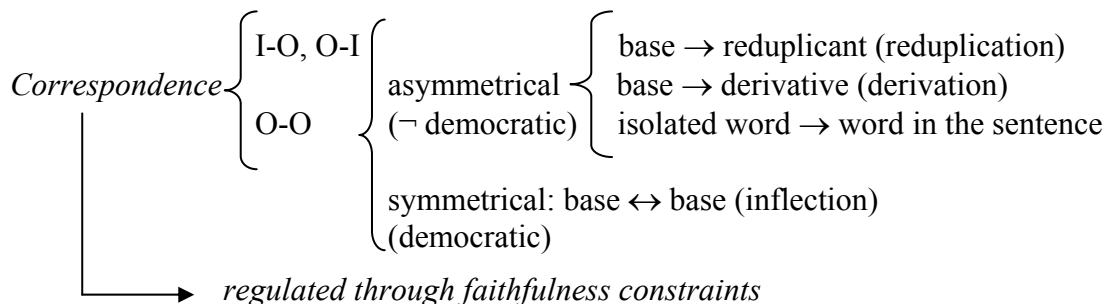
    (Data from Veny 1962, Bibiloni 1998, Mascaró 2002, 2005)

2.3 *Paradigmatic pressures within Optimality Theory*

In order to account for these apparent anomalies, Optimality Theory has developed a wide range of submodels, which, apart from the classic Input to Output and Output to Input correspondence, include *Output to Output correspondence*, namely, correspondence between surface forms. On the whole, as illustrated in (5), it is assumed that the surface correspondence relation between outputs is *asymmetrical* or *non-democratic* when dealing with reduplication, derivation or the occurrence of a word in the sentence, in that there is a base or a isolated word which has priority over the others and to which the other members of the paradigm are faithful. And it is assumed that the correspondence relation between outputs is *symmetrical* or *democratic* when dealing with inflection, since in this particular case there is no single base which has priority: all the forms in the inflectional paradigm have the chance to exert pressure over all the others and also to undergo this pressure.

(5) *Asymmetrical and symmetrical paradigmatic pressures* (after McCarthy [2002] 2005, Pons 2002, Mascaró 2005, Albright 2005)

*Correspondence* ⟨ I-O, O-I / O-O ⟩

    asymmetrical (¬ democratic)
        base → reduplicant (reduplication)
        base → derivative (derivation)
        isolated word → word in the sentence

    symmetrical: base ↔ base (inflection) (democratic)

    ⟶ *regulated through faithfulness constraints*

2.3.1 *Analogy within inflection*

The most influential model designed thus far to account for paradigmatic pressures within the inflectional paradigm is the OP model (McCarthy [2002] 2005). This model is designed to account for paradigmatic pressures within the inflectional paradigm. According to this model, candidates consist of entire inflectional paradigms, whose individual members are all subjected to evaluation through the standard markedness and Input-Output faithfulness constraints. Emulating the standard Input-Output correspondence, the stem of each paradigm member stands in a surface correspondence with the stem in every other paradigm member; this correspondence is articulated by a set of Output-Output faithfulness constraints (labeled Optimal Paradigm faithfulness constraints; henceforth, OP faithfulness constraints). We will illustrate the model with the classic example *honos ~ honoris > honor ~ honoris* from Latin, which has already been treated as the result of a paradigmatic effect in many traditional studies and more recently within the Optimality Theory framework by Kenstowicz 2002, Albright 2005). It is well known that in pre-Classical Latin intervocalic alveolar fricatives (see 6a) underwent a systematic process of rhotacism, leaving a non-homogenous paradigm like that shown in (6b), in which the alternation *s ~ r* was found. Eventually, due to a process of paradigm leveling, the final *s* in the nominative singular form also underwent the change to *r* (see 6c). (For the sake of clarity, orthographic forms are used for examples from Latin, with only the relevant segments transcribed phonologically and phonetically.)

(6) *Latin paradigm leveling*

|  | a. Stage I | | b. Stage II | | c. Stage III | |
|---|---|---|---|---|---|---|
|  | *sing.* | *plur.* | *sing.* | *plur.* | *sing.* | *plur.* |
| *nom.* | honō[s] | honō[z]ēs | honō[s] | honō[ɾ]ēs | hono[ɾ] | honō[ɾ]ēs |
| *acc.* | honō[z]em | honō[z]ēs | honō[ɾ]em | honō[ɾ]ēs | honō[ɾ]em | honō[ɾ]ēs |
| *gen.* | honō[z]is | honō[z]im | honō[ɾ]is | honō[ɾ]im | honō[ɾ]is | honō[ɾ]im |
| *dat.* | honō[z]ī | honō[z]ibus | honō[ɾ]ī | honō[ɾ]ibus | honō[ɾ]ī | honō[ɾ]ibus |
| *abl.* | honō[z]e | honō[z]ibus | honō[ɾ]e | honō[ɾ]ibus | honō[ɾ]e | honō[ɾ]ibus |

In Optimality Theory terms, the process of rhotacism can be interpreted as an effect of the constraint *V__V / Fricative, a constraint that penalizes an intervocalic fricative (see 7a) and that belongs to the universal prominence hierarchy for consonants in intervocalic position (see 8). This hierarchy favors elements of maximum sonority in intervocalic position. The ranking of this constraint above the faithfulness constraint penalizing featural changes induced this sound change (9).

(7) *Relevant markedness and faithfulness constraints*
   a. *V_V / Fricative: Assign one violation mark for every fricative in intervocalic position (see Uffmann 2005, after Prince & Smolensky 1993)
   b. IDENT(F): Assign one violation mark for each segment in the output which has a different featural specification than its correspondent in the output (see McCarthy & Prince 1995)

(8) *Prominence hierarchy for consonant segments in intervocalic position*
   *V_V / Stop >>  *V_V / Fricative >> *V_V / Nasal >> *V_V / Trill >> *V_V / Lateral >> *V_V / Tap >> *V_V / Glide (see Uffmann 2005, after Prince & Smolensky 1993)

(9) *Rhotacism in Latin*

| honō/z/es | *V_V / Fricative | IDENT(F) |
|---|---|---|
| ☞a. honō[ɾ]es | | * |
| b. honō[z]es | *! | |

The change to *r* in the nominative singular form is a clear case of overapplication in that the process is not induced by markedness: no markedness constraint penalizes the *s* in *non-intervocalic* position. This is a change prompted by the pressure of the remaining members of the paradigm, in which the process is factually motivated by markedness, namely by the markedness constraint *V_V / Fricative. Within the OP model, this would be formalized resorting to an OP faithfulness constraint, according to which correspondent segments in the stem must have the same featural specification (10).

(10) *OP faithfulness constraint motivating paradigm leveling*
OP-IDENT(F): Within the inflectional paradigm, assign one violation mark for every consonant in the base (stem) of an inflected form whose correspondent in another base has a different place specification (see McCarthy [2001] 2005). (= The segments under *surface* correspondence within the inflectional paradigm must have the same place of specification.)

In the tableau in (11), it is shown how the fully faithful paradigm candidate, with no changes with respect to the input forms (11a), is discarded because it involves multiple violations of the high-ranked markedness constraint *V__V / Fricative. The candidate with normal application of rhotacism, that is, with *just rhotacism in intervocalic position* (11b), is also discarded because it is not uniform in that the last consonant of the stem in the nominative singular form shows a different featural specification than the correspondent segment in the remaining forms of the paradigm. The winning paradigm candidate is the one in which there is maximum uniformity in the stem (11c).

(11) *Paradigm leveling in Latin*[3] (See also Kenstowicz 2002, Albright 2005)

| honō/s/, honō/s/es, honō/s/em, honō/s/ēs, honō/s/is, honō/s/im, honō/s/ī, honō/s/ibus, honō/s/e, honō/s/ibus | OP-IDENT(F) | *V__V FRICATIVE | IDENT(F) |
|---|---|---|---|
| *a*. honō[s], honō[z]es, honō[z]em, honō[z]ēs, honō[z]is, honō[z]im, honō[z]ī, honō[z]ibus, honō[z]e, honō[z]ibus *fully faithful paradigm* → underapplication | | * (x9)! | |

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[3] Between brackets we indicate the number of violations of each paradigm candidate. Note that the number of violations of the OP faithfulness constraints is computed according to the number of unfaithful mappings in a bidirectional way: for the surface correspondents *honōs ~ honōres*, for instance, two violations of the OP-IDENT(F) constraint are found, one of *honōs* with respect to *honōres*, and another of *honōres* with respect to *honōs*).

| | | | |
|---|---|---|---|
| *b.* honō[s], honō[ɾ]es, honō[ɾ]em, honō[ɾ]ēs, honō[ɾ]is, honō[ɾ]im, honō[ɾ]ī, honō[ɾ]ibus, honō[ɾ]e, honō[ɾ]ibus *harmonic paradigm non-uniform* → normal application | * (x18)! | | * (x9) |
| *c.* hono[ɾ], honō[ɾ]es, honō[ɾ]em, honō[ɾ]ēs, honō[ɾ]is, honō[ɾ]im, honō[ɾ]ī, honō[ɾ]ibus, honō[ɾ]e, honō[ɾ]ibus *uniform paradigm totally unfaithful* → overapplication | | | * (x10) |

As noted in § 2.3, according to the OP model, the relation among the members of the paradigm is strictly symmetrical, in that all the members of each paradigm can exert pressure over all the others, regardless of their morphological status. The model, however, predicts that just *overapplication* of a process is possible. This is not an *ad hoc* stipulation, but it is derived from the architecture of the model itself. Both underapplication and overapplication motivated by paradigm leveling satisfy the OP constraints. The difference between the two is that only overapplication satisfies the markedness constraint which induces the phonological change, while underapplication satisfies the relevant faithfulness constraints. And, since the markedness constraint outranks the faithfulness constraint, given the specific process in the language (*i.e.* *V__V / Fricative >> IDENT(F)), overapplication is always better because it satisfies the constraint ranked higher, that is, the markedness constraint. This can be seen in the very same tableau, in which, between the competing paradigm candidates with underapplication (11a) and overapplication (11c), the one selected as the optimal is the former because it satisfies the high-ranked constraint *V__V / Fricative.[4]

   This is an interesting and important prediction of the OP model: analogy is exclusively induced by phonological markedness, that is, what determines or governs the direction of the pressure is not a specific morphological status of a word but rather the need to respect phonological markedness. Thus, the entire paradigm is attracted by an unmarked structure (see McCarthy [2002] 2005] for relevant discussion). This hypothesis will be extensively confirmed in the course of this paper (see, in particular, § 4.1.1- 4.1.3).

### 2.3.2 *Analogy within derivation*

The most persuasive developed submodel within Optimality Theory to account for surface similarities between a base and the derived form or between a word and its occurrence in a sentence is the TCT (Benua [1997] 1999). According to this model, a set of Output-Output faithfulness constraints that emulate the Input-Output ones are invoked; but, as already observed, in this case the relation between the words subject to uniformity is expected to be asymmetrical, since there is a *base* to which the derived forms are faithful: the opposite

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[4] Underapplication can exceptionally occur when an independent constraint blocks overapplication.

direction, that is, the pressure of the derived form over the base, is proscribed by resorting to a specific constraint, coined BASE-PRIORITY). Precisely because of BASE-PRIORITY, both under- and overapplication are predicted by this submodel: only the forms which respect the base, whether they satisfy the relevant markedness constraint or not, will satisfy BASE-PRIORITY. A classical example of overapplication within derivation comes from English. In many English dialects, some clusters are reduced in word-final position, as the alternations in (12a) and (12b) show. But cluster reduction unexpectedly applies in productive derived words, like those in (12b), in which the cluster is *not* found in word-final position (see, among others, Borowsky 1986, 1993; Benua [1997] 1999, and Steriade 1999).

(12)  Cluster reduction in English (data from Benua [1997] 1999, Steriade 1999)

| a. *Primitive forms* → *cluster reduction* | | b. *Non-productive derived forms* → *cluster preservation* | c. *Productive derived forms* → *cluster reduction* |
|---|---|---|---|
| *condemn* | *conde*[m] | *conde*[mn]*ation* | *conde*[m]*ing* |
| *bomb* | *bo*[m] | *bo*[mb]*ard* | *bo*[m]*ing* |
| *long* | *lo*[ŋ] | *elo*[ŋg]*ate* | *lo*[ŋ]*ing* |
| *sign* | *si*[n] | *si*[gn]*ature* | *si*[n]*ing* |

Cases in (12c) are analysed as a typical instance of overapplication of a process within derivation (see Benua [1997] 1999, Steriade 1999), in that no markedness constraint penalizes these consonant clusters when followed by a vowel. The influence of the primitive form —in which cluster simplification is governed by markedness, in particular by the constraint *CC]σ (see 13c)— explains overapplication. The transderivational correspondence faithfulness constraints DEP-OO (penalizing the insertion of a consonant in surface correspondent stems) and MAX-OO (penalizing the deletion of a consonant in surface correspondent stems) explain why the consonant is not preserved in these productive derivative words: to maintain the uniformity of the stem (see the winning paradigm candidate in 14a *vs.* the ruled out non-homogenous paradigm candidate in 14c). BASE-PRIORITY determines that the direction of this influence is from the base to the derived form, and thus penalizes the potential underapplication of the process of cluster reduction in word-final position (*bo*[mb]) due to the influence of the derived forms (see the discarded fully-faithful candidate in 14b).

(13)  *Relevant constraints*

   a.  *Standard faithfulness constraints*
       MAX-IO: Assign one violation mark for every segment in the output which has no correspondent in the input (see McCarthy & Prince 1995).

   b.  *Transderivational correspondence faithfulness constraints*
       DEP-OO: Assign one violation mark for every segment in the stem of a member of a derivational paradigm which has no correspondent in the stem of another member of the same paradigm (adapted from Benua [1997] 1999).

       MAX-OO: Assign one violation mark for every segment in the stem of a member of a derivational paradigm which has no correspondent in the stem of another member of the same paradigm (adapted from Benua [1997] 1999).[5]

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[5] Note that both constraints penalize the same unfaithful mappings because we are dealing here with a surface to surface relation (*i.e.* OUTPUT to OUTPUT), not distinguishable as the INPUT to OUTPUT relation.

BASE-PRIORITY: Assign one violation mark for every modification of the base (see Benua [1997] 1999).

c. *Markedness constraint*

*CC]σ: Assign one violation mark for every tautosyllabic consonant cluster of two consonants in word-final position.

(14) *Overapplication of cluster reduction in English*

| *bo*/mb/*ing*<br>cf. BASE: *bo*[m] | BASE-PRIORITY | *CC]σ | DEP-OO | MAX-OO | MAX-IO |
|---|---|---|---|---|---|
| ☞ a. <*bo*[m], *bo*[m]*ing*> | | | | | ** |
| b. <*bo*[mb], *bo*[mb]*ing*> | * | *! | | | |
| c. <*bo*[m], *bo*[mb]*ing*> | | | * | *! | * |
| d. <*bo*[mb], *bo*[m]*ing*> | * | *! | * | * | * |

An interesting issue here, which will be addressed more fully in § 4.1.5, is the fact that overapplication is found only in *productive* derivative forms (of the type *bombing*), and not in *non-productive* derivative forms (of the type *bombard*). This discrepant behavior according to the type of derivation suggests the need for, as we will see, a refinement of the TCT in order to be sensitive to the *degree of closeness* between the base and derived form.

An interesting case of underapplication of a process paradigmatically induced, introduced in § 2.2, comes from Majorcan Catalan. In Majorcan Catalan, as in other Eastern Catalan dialects, the front mid-vowels [é] and [ɛ́] and the low vowel [á] are reduced to [ə] in unstressed position (e.g. *c*[á]*sa* 'house' ~ *c*[ə]*seta* 'house *dim*.'; *caf*[ɛ́] 'coffee' ~ *caf*[ə]*net* 'coffee *dim*.'; *carr*[é]*r* 'street' ~ *carr*[ə]*ró* 'street *dim*.'). But this general process fails to apply in productive derivational forms with an alternating stressed [é] or [ɛ́] vowel at the left edge of the corresponding base-stem (e.g. *v*[é]*nt* 'wind' ~ *v*[e]*ntet* 'wind *dim*.'; *c*[ɛ́]*l* 'sky' ~ *c*[e]*let* 'sky *dim*.'). In this case, there is *underapplication* of the general process of vowel reduction due to the pressure of the primitive form. This specific case will be addressed in detail in § 4.1.5.

## 4 EMPIRICAL ISSUES

### 4.1 *Overapplication in the inflectional paradigm*

#### 4.1.1 *Overapplication of cluster reduction in Catalan*

4.1.1.1 *Data*. In most Catalan varieties, word-final clusters made up of a lateral or a nasal followed by a homorganic stop are resolved through a process of cluster reduction which consists of the deletion of the stop consonant (15a). In some other varieties, these word-final clusters are maintained as such (15b). All varieties, however, reduce these final clusters when the plural morph –*s* follows (15c) and maintain the stop when the feminine morph –*a* follows (15d). The process of cluster simplification in word-final position never applies in heterorganic clusters (15e), nor in clusters with significant discrepancies of manner of articulation (15f). (Although not illustrated here, final sequences of a rhotic or an alveolar sibilant followed by a homorganic stop can optionally be reduced when followed by a homorganic stop: *verd* [bér] ~ [bért] 'green'; *gust* [gúst] ~ [gús] 'taste'; and all varieties also delete the word-final stop consonant when followed by a word with an initial consonant: *més* [ál] *que jo* 'higher than me').

(15)  *Cluster reduction in adjectival forms in Catalan varieties*

      a. *Some varieties*                    b. *Some varieties*

| *alt* | [ál] | 'tall *masc. sing.*' | ≠ | *alt* | [ált] | 'tall *masc. sing.*' |
|---|---|---|---|---|---|---|
| *sant* | [sán] | 'saint *masc. sing.*' | ≠ | *sant* | [sánt] | 'saint *masc. sing.*' |

          c. *All varieties*            d. *All varieties*

| *alts* | [áls] | 'tall *masc. plur.*' | *alta* | [áltə] | 'tall *fem. sing.*' |
|---|---|---|---|---|---|
| *sants* | [sáns] | 'saint *masc. plur.*' | *santa* | [sántə] | 'saint *fem. sing.*' |
| | | | *altes* | [áltəs] | 'tall *fem. plur.*' |
| | | | *santes* | [sántəs] | 'saint *fem. plur.*' |

      e. *All varieties*                                f. *All varieties*

| *remolc(s)* | [rəmólk(s)] | 'trailer *masc. sing. / plur.*' | *cens* | [séns] | 'census *masc. sing.*' |
|---|---|---|---|---|---|
| *calb(s)* | [kálp(s)] | 'bald *masc. sing. / plur.*' | *ferm* | [férm] | 'firm *masc. sing.*' |
| *parc(s)* | [párk(s)] | 'park *masc. sing. / plur.*' | *carn* | [kárn] | 'meat *masc. sing.*' |

4.1.1.2 *How dialects shed light on the origin of phonological processes (1)*. Different studies, framed formerly within autosegmental phonology and more recently within Optimality Theory, have tried to provide an answer for this behaviour. Most of them adapt the hypothesis, originally developed in Mascaró (1976, 1989), that there is cluster simplification provided that it does not imply the loss of too much phonological information, either of point of articulation or manner of articulation. The causes of cluster simplification, however, vary from one author to another (see, in this respect, Morales 1992, 1995; Colina 1995; Jiménez 1997, 1999; Herrick 1999). Some other authors believe that the process of reduction applies due to the lack of perceptual prominence of the stop in this context or, more specifically, due to the lack of perceptual contrast between the stop and the preceding consonant (see, in this respect, Côté 2000, 2004a, b; Pons 2004, 2006, 2007; Wheeler 2005).

However, a careful look at the behavior of other Catalan dialects, which show preservation of the cluster in this context (15a) but simplification when the plural morph is added (15c), can lead to another explanation of the facts: cluster simplification has its origin in the plural forms, a context in which the perceptual weakness of the stop is even more evident, in that it is flanked by two consonants (see Colomina 1996 for an analysis in this direction). This explains why simplification is triggered in *all* dialects in this context, and, due to paradigm uniformity (or analogy), the process has also been extended to word-final position. In fact, the same line of reasoning can be used when the behavior of other languages is analysed: whereas the process of cluster simplification is almost systematic in the context C_C in many languages, it is not so common in the context C_## (where ## stands for word-final position). Thus we have here some consistent universal implications, according to which:

(16)  *Universal implication*

    a.  If a language exhibits cluster simplification in tautosyllabic clusters of three segments, it will also exhibit cluster reduction in clusters of two segments.
    b.  No language exhibits simplification in tautosyllabic clusters of two segments and preservation in tautosyllabic clusters of three segments.

This implicational relation must have a consequence in the ranking of the contextual markedness constraints prohibiting consonant clusters, such as *CC]σ (17a) and *CCC]σ

(17b). Given (16), the hierarchy in (18) is a fixed one, that is, it is universally constant and invariable.

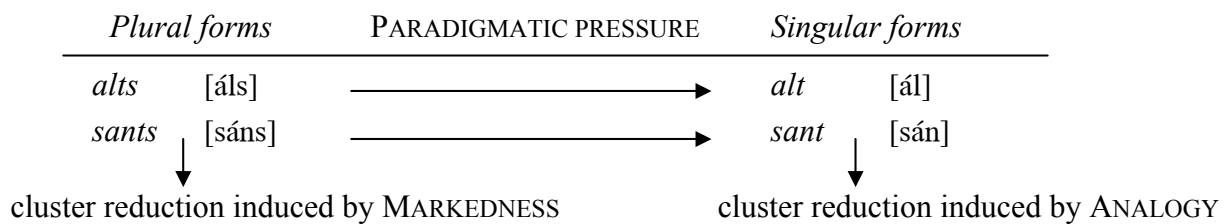(17)  *Contextual markedness constraints against consonant clusters*

    a.  \*CC]σ: Assign one violation mark for every tautosyllabic cluster made up of two consonants.

    b.  \*CCC]σ: Assign one violation mark for every tautosyllabic cluster made up of three consonants.

(18)  *Universal ranking of markedness constraints against consonant clusters*

    \*CCC]σ >> \*CC]σ

It can be interpreted, therefore, that the origin of this process is in the masculine plural forms, in which the process would be motivated by markedness reasons, in particular, to satisfy the high-ranked markedness constraint \*CCC]σ (17b). And these plural reduced forms would exert their pressure over the singular forms in the varieties with cluster reduction but would not in the varieties with cluster preservation, a circumstance which is easily explained by a different constraint ranking. (See Pons 2004: 391-396; 2006: 183-213, for an extensive analysis.)

(19)  *Paradigm leveling within Catalan inflection*

| *Plural forms* | | PARADIGMATIC PRESSURE | *Singular forms* | |
| --- | --- | --- | --- | --- |
| *alts* | [áls] | ⟶ | *alt* | [ál] |
| *sants* | [sáns] | ⟶ | *sant* | [sán] |

cluster reduction induced by MARKEDNESS           cluster reduction induced by ANALOGY

Within the OP model, this circumstance can be analyzed as follows. The markedness constraint \*CCC]σ is the most relevant in the hierarchy: it determines both cluster reduction in the plural forms and the direction of paradigm leveling, in that it obstructs paradigm leveling from the singular to the plural forms (see candidate 21a in the tableau of 21). The constraints responsible for paradigm leveling are OP MAX-C (20a) and OP DEP-C (20b).

(20)  *OP faithfulness constraints*

*a*. OP MAX-C (OP MAX-C): Within inflection, assign one violation mark for every consonant in the base (stem) of an inflected form which does not have a correspondent in the base (stem) of another inflected form (McCarthy [2001] 2005; Pons 2004, 2006 for Catalan).

*b*. OP DEP-C (OP DEP-C): Within number inflection, assign one violation mark for every consonant in the base (stem) of an inflected form which does not have a correspondent in the base (stem) of another inflected form. (McCarthy [2001] 2005; Pons 2004, 2006 for Catalan).

As illustrated in (21), the paradigm candidate with alternations in the stem (21b) is discarded by these two OP faithfulness constraints. Among the paradigm candidates with a uniform stem, the one selected as optimal is the one which satisfies the markedness constraint \*CCC]σ: it is, indeed, a case of *overapplication* and *attraction to the unmarked*. (For expository reasons, the stems will be underlined from now on.)

(21) *Paradigm leveling within Catalan number inflection*

| /sant/, /sant+z/, /sant+ə/, /sant+ə+z/ | *CCC]σ | OP MAX-C | OP DEP-C | MAX-IO |
|---|---|---|---|---|
| a. <sant, sants> | *! | | | |
| b. <sant, sans> | | * | *! | * |
| ☞ c. <san, sans> | | | | ** |

4.1.1.3 *How linguistic variation sheds light on theory (1)*. So far so good. However, we have yet to explain why the feminine forms (both singular, *santa*, and plural, *santes*), with preservation of the final consonant of the stem, do not equally exert pressure over the masculine singular ones. These cases are problematic for the analysis proposed here because feminine singular and feminine plural forms, which contain the stop at the end of the stem, could wrongly override the pressure that the masculine plural forms exert over the masculine singular ones, and thus bring about the selection of a paradigm candidate of the type <sant, sant+ə, sant+s, sant+ə+s>, which would be much more homogeneous than the actual one. This unwanted situation can be observed in the tableau in (22), where the paradigm candidate with the feminine forms as the attractors (22c) is wrongly selected as the optimal one.[6]

(22) *Wrong paradigm leveling within Catalan inflection*

| /sant/, /sant+z/, /sant+ə/, /sant+ə+z/ | *CCC]σ | OP MAX-C | OP DEP-C | MAX-IO |
|---|---|---|---|---|
| a. <sant, santə, sants, santəs> | *! | | | |
| ☹ b. <san, santə, sans, santəs> | | **** | ****! | ** |
| 💣 c. <sant, santə, sans, santəs> | | *** | *** | * |

On the other hand, with this constraint ranking nothing prevents the masculine plural form from inducing overapplication of cluster reduction not only in the masculine singular forms, but also in the feminine forms, both singular and plural, as illustrated by the candidate (23d) in the following tableau.

(23) *Wrong paradigm leveling within Catalan inflection*

| /sant/, /sant+z/, /sant+ə/, /sant+ə+z/ | *CCC]σ | OP MAX-C | OP DEP-C | MAX-IO |
|---|---|---|---|---|
| a. <sant, santə, sants, santəs> | *! | | | |
| ☹ b. <san, santə, sans, santəs> | | **** | ****! | ** |
| c. <sant, santə, sans, santəs> | | *** | *** | * |
| 💣 d. <san, sanə, sans, sanəs> | | | | **** |

This last contradiction has a straightforward explanation. Overapplication of simplification in the feminine forms is not possible because it implies the deletion of a consonant segment followed by a vowel, a circumstance practically unknown in Catalan and many other languages, which is explained by the high degree of perceptibility of consonants placed in prevocalic position. The high ranking of a (positional) faithfulness constraint like MAX-C / __V (see 24) explains the lack of overapplication of cluster reduction in these cases —see the candidate (25c) in the tableau in (25).

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[6] The sad face symbol ☹ appears before the actual candidate when it is not selected as the optimal one. The bomb symbol 💣 appears before a candidate which is wrongly selected as optimal.

(24) MAX-C [__V]: Assign one violation mark for every input consonant followed by a vowel which has no correspondent in the output (see Pons 2004, 2006, after Côté 2000).[7]
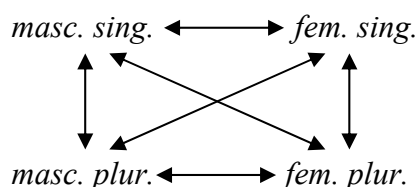
(25) *Wrong paradigm leveling within Catalan inflection*

| /sant/, /sant+z/, /sant+ə/, /sant+ə+z/ | *CCC]σ | MAX-C / __V | OP MAX-C | OP MAX-C | MAX |
|---|---|---|---|---|---|
| a. <sant, santə, sants, santəs> | *! | | | | |
| ☹ b. <san, santə, sans, santəs> | | | **** | ****! | ** |
| ☛ c. <sant, santə, sans, santəs> | | | *** | *** | * |
| d. <san, sanə, sans, sanəs> | | **! | | | **** |

Despite the introduction of this new constraint, however, the wrong paradigm candidate with no reduction in word final position is still selected as optimal (see 25c). The problem which arises in the preceding tableau is that the forms with a consonant at the right edge of the stem, justified by the positional faithfulness constraint MAX-C /__V, which can exert pressure over the masculine singular form, are much greater in number than those with no consonant at the right edge of the stem, justified by the markedness constraint *CCC. That is, feminine forms end up having more paradigmatic power than the masculine plural form. And this is reflected in the number of violations of the OP MAX-C and OP MAX-C constraints, which is higher in the actual candidate (25b) than in the candidate with underapplication (25c).

This is a consequence of the fundamental architecture of the OP model. As originally articulated, indeed, the OP model predicts *flat paradigms* with no formal distinction between categories such as singular, plural, masculine, feminine, tense, aspect, etc. The consequence of this architecture is that all the forms in a nominal or verbal paradigm have exactly the same potential of influence among themselves (see, as illustration, the diagram in 26a), regardless of the stronger connection which may exist between the members of a paradigm that *share more grammatical properties* (*i.e.* gender, number, tense, etc.) (see Paul 1880), regardless of the stronger connection which may exist between the members of a paradigm that *share more phonetic and phonological properties* (see Paul 1880), and regardless of the looser connection which may exist between the members of a paradigm that have a *higher token frequency* (see Paul 1880). In order to solve these kinds of contradictions, the OP proposal can be refined in such a way that the predicted symmetrical influence illustrated in (26a) can be modified by giving more power of reciprocal influence to members which share more grammatical properties and less power of reciprocal influence to members which share fewer grammatical properties (26b). The formalization of these structured subparadigms is in fact a matter suggested but not explored in McCarthy's paper, and also highlighted as intriguing.[8]

(26) *Refinement of the OP proposal*
a. *Standard OP paradigmatic pressure*       b. *Relativized OP paradigmatic pressure*



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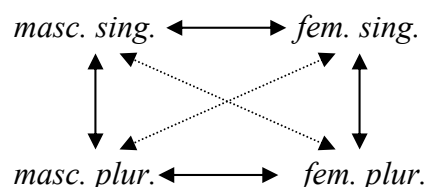
[7] In order for this constraint to affect heteromorphic consonant sequences, it is necessary to assume that morphs are ordered underlyingly, just as they are at the surface.

[8] Some precedents for the proposal presented but from another perspective are the network model, found in Bybee 1996, among other works, lexical conservatism, found in Steriade 1997, and global distance and gradient attraction, found in Burzio 2002, 2005.

This is what is in fact found in Pons (2004: 391-396; 2006: 183-213), who proposes to relativize the OP faithfulness constraints according to the kind of inflection, that is, to invoke intraparadigmatic faithfulness constraints for *each type of inflection* (for instance, gender and number, in the case of nominal inflection) (see 27), with the chance of ranking each of them (see 28). As these constraints only affect a specific set or "subparadigm" within the paradigm, we have labeled them *Optimal Subparadigm* faithfulness constraints:

(27)  *Optimal Subparadigm faithfulness constraints*

— OPTIMAL SUBPARADIGM NUMBER MAX-C (OSPN MAX-C): Within *number* inflection, assign one violation mark for every consonant in the base (stem) of an inflected form which does not have a correspondent in the base (stem) of another inflected form. (Pons 2004, 2006; after McCarthy [2001] 2005)
— OPTIMAL SUBPARADIGM GENDER MAX-C (OSPG MAX-C): Within *gender* inflection, assign one violation mark for every consonant in the base (stem) of an inflected form which does not have a correspondent in the base (stem) of another inflected form (Pons 2004, 2006; after McCarthy [2001] 2005)
— OPTIMAL SUBPARADIGM NUMBER DEP-C (OSPN DEP-C): Within *number* inflection, assign one violation mark for every consonant in the base (stem) of an inflected form which does not have a correspondent in the base (stem) of another inflected form (Pons 2004, 2006; after McCarthy [2001] 2005)
— OPTIMAL SUBPARADIGM GENDER DEP-C (OSPN DEP-C): Within *gender* inflection, assign one violation mark for every consonant in the base (stem) of an inflected form which does not have a correspondent in the base (stem) of another inflected form. (Pons 2004, 2006; after McCarthy [2001] 2005)[9]

(28)  *Constraint hierarchy*

*CCC >> OSPN DEP-C, OSPN MAX-C >> OSPG DEP-C, OSPG MAX-C >> MAX-IO

As seen in the tableau in (29), the proposal also entails a different system of candidate generation. For each input, apart from flat paradigms, GEN generates subparadigms, and the members in these subparadigms are those evaluated by the intraparadigmatic faithfulness constraints. For instance, in a language like Catalan (with inflection for gender and number), for the input *alt* ('tall'), four subparadigms are generated, two related by gender (e.g. *<alt, alta>* <'tall' *masc. sing.*, 'tall' *fem. sing.>*, *<alts, altes>* <'tall' *masc. plur.*, 'tall' *fem. plur.>*) and two related by number (*<alt, alts>* <'tall' *masc. sing.*, 'tall' *masc. plur.>*, *<alta, altes>* <'tall' *fem. sing.*, 'tall' *fem. plur.>*). The proposal, as articulated, predicts a higher pressure between members of the *same category* than between members of the same *inflectional paradigm*.[10] The effects of the hierarchy in (28) can be seen in the tableau in (29), where, thanks to the prominence of the intraparadigmatic faithfulness constraints related to number with respect to those related to gender, the paradigm candidate selected as optimal is that with deletion in the masculine forms and cluster preservation in the feminine forms (29d). (Due to expository reasons, standard OP faithfulness constraints are not included in the following tableau; because of stringency they are ranked below the OSP ones.)

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[9] See footnote 5.

[10] For the sake of brevity, we present here a very simplified account of this particular refinement of the OP model. See Ohannesian & Pons (2008), submitted, for a complete formalization of it.

(29) *Overapplication of cluster reduction in Catalan within a relativized OP model*

| /alt/, /alt+s, /alt+ə, /alt+ə+s/ | *CCC]σ | MAX-C [__V] | OSPN DEP-C | OSPN MAX-C | OSPG DEP-C | OSPG MAX-C | MAX-IO |
|---|---|---|---|---|---|---|---|
| a. <<u>alt</u>, <u>alts</u>>_N<br><<u>alt</u>, <u>altə</u>>_G<br><<u>altə</u>, <u>altəs</u>>_N<br><<u>alts</u>, <u>altəs</u>>_G >_INFL<br>*fully faithful paradigm – uniform → underapplication* | *<br><br>*! | | | | | | |
| b. <<u>alt</u>, <u>als</u>>_N<br><<u>alt</u>, <u>altə</u>>_G<br><<u>altə</u>, <u>altəs</u>>_N<br><<u>als</u>, <u>altəs</u>>_G >_INFL<br>*normal application - non uniform paradigm → normal application* | | | * | *! | <br><br>* | <br><br>* | *<br><br>* |
| c. <<u>al</u>, <u>als</u>>_N<br><<u>al</u>, <u>alə</u>>_G<br><<u>alə</u>, <u>aləs</u>>_N<br><<u>als</u>, <u>aləs</u>>_G >_INFL<br>*fully unfaithful paradigm totally uniform → overapplication in the entire paradigm* | | *<br>**<br>*! | | | | | |
| ☞ d. <<u>al</u>, <u>als</u>>_N<br><<u>al</u>, <u>altə</u>>_G<br><<u>altə</u>, <u>altəs</u>>_N<br><<u>als</u>, <u>altəs</u>>_G >_INFL<br>*uniform paradigm for number and not for gender → overapplication in the number subparadigm* | | | | | *<br><br>* | *<br><br>* | **<br>*<br><br>* |

This new architecture allows to us express, therefore, the closer connection that (may) exist between members depending on their kind of inflection (see § 4.1.2, 4.1.3, 4.1.4, for more evidence of this), and, in this particular case, between members related by number (see the new diagram in 30), which is reinforced by the higher formal (phonological) similarity between the members related by number than between the members related by gender.

(30) *Relativized OP paradigmatic pressure*
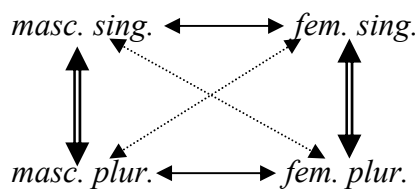


*Pressure in NUMBER inflection*
>
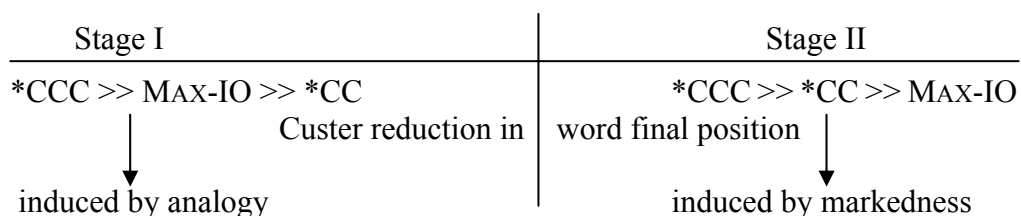*Pressure in GENDER inflection*
>
*Pressure in NOMINAL inflection*

In fact, the closer connection between members related by number with respect to members related by gender is not language-particular, but can be considered universal. Greenberg (1966) already detected the asymmetry between these two categories, number and gender, with the former less being marked than the latter, a circumstance which is corroborated by a set of cross-linguistically recurrent factors, namely: *a*) if a language has gender distinction, it will also have number distinction, but not viceversa; *b*) all languages have number distinction

but not all languages have gender distinction; *c*) number is more regular and automatic than gender; *d*) gender shows more syncretism than number in all languages; etc. Our prediction is, therefore, that the ranking OP-FAITH NUMBER > OP-FAITH GENDER is a universal one. This account, however, does not deny the pressure between members related by gender but predicts that if in a language members related by gender are under pressure it will do so members related by number, but not viceversa (For a complete justification and illustration of this ranking in terms of universals, see Ohannesian & Pons 2008, submitted.)

4.1.1.4 *The origin of what is phonologically marked.* An immediate objection to this account of the facts is that it is possible to find cluster reduction in invariable words like *mitjançant* [mid͡ʒənsán] 'through', *damunt* [dəmún] 'on, on top of, over', *davant* [dəβán] 'in front of', *durant* [duɾán] 'while, during', *dalt* [dál] 'up', *tranquil·lament* [tɾəŋkilləmén] 'calmly', *injustament* [inʒustəmén] 'unfairly', and in gerund forms such as *cantant* [kəntán] 'singing', *estudiant* [əstudján] 'studying', *patint* [pətín] 'suffering', etc., in which there is no inflected form that exerts pressure. Three possible explanations for this behavior are available. The first one is that of *lexical diffusion*. A widely spread pattern induced by analogy, that is, cluster simplification in word final position, is extended to a small set of words with the same phonological structure (*i.e.* sonorant plus stop homorganic clusters). The second one is *analogy*, but, in this case, outside the inflectional paradigm. These final consonant clusters are indeed systematically reduced when followed by a word with an initial consonant: *damunt* [dəmún] *la taula* 'on the table'; *durant* [duɾán] *la classe* 'during the class', etc. Given the functional character of these kinds of words and, therefore, given the high degree of occurrences of these words followed by a word with an initial consonant, analogy would be totally expected. The third possible explanation, finally, would be to resort to phonologically conditioned allomorphy: a form like *davant* would have two underlying forms, /dəban/ ~ /dəbant/, and the former would be selected due to the activity of the low ranked constraint *CC]σ introduced in (17a). It must be said, on the other hand, that in some of these cases (like *mitjançant* or *damunt*), there are no alternations with the stop; the only evidence comes from other dialects, which do show the final stop (*damunt* [dəmúnt]); thus an underlying form without this consonant could be posited in some of these cases.

Overall, from a strictly synchronic point of view, for the regular cases in (15a), it can be claimed that the paradigmatic pressure is still working or that a reinterpretation of the grammar, namely, of the constraint hierarchy, has taken place. In other words, what was phonologically *unmarked* in the past in most Catalan varieties (*i.e.* a word-final cluster of two consonants) has become *marked* in the present in some Catalan varieties.

(31) *Reinterpretation of the grammar in terms of reranking*

| Stage I | Stage II |
|---|---|
| *CCC >> MAX-IO >> *CC | *CCC >> *CC >> MAX-IO |
| ↓    Custer reduction in | word final position    ↓ |
| induced by analogy | induced by markedness |

Here it is worth mentioning Paul's believing that analogy was not just a notion relevant for language change but was present all the time, or Kiparsky's hypothesis according to which analogy can be interpreted as grammar optimization. It must be said, finally, that loan words which have been recently introduced to Catalan from languages such as English or German (i.e. *Power Point, Paint, Kant, volt, bamp, Colt*, etc.) exhibit an extremely amount of variation

between preservation and deletion of the final stop across speakers and even within the grammar of the same speaker.

4.1.1.5 *How dialects shed light on the origin of phonological processes (2).* Evidence which favors this particular interpretation of the facts based on analogy is the behavior of Eivissan Catalan as far as cluster reduction is concerned. Eivissan Catalan also shows cluster reduction in word-final position (32b), but, unexpectedly, it does not do so when the affected consonants belong to a verbal of the first conjugation in the 1 *sg*. PI form. In these cases, the cluster is preserved (32a).

(32) *Eivissan Catalan*

a. *1 sg. PI verbal forms*                                           b. *Nominal forms*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *cant* | /kant/ | [kánt] | '(I) sing' | *sant* | [sán] | | 'saint' |
| *salt* | /salt/ | [sált] | '(I) jump' | *molt* | [mól] | | 'a lot' |
| *camp* | /əkanp/ | [əkámp] | '(I) tend' | *camp* | [kám] | | '(I) go camping' |
| *ronc* | /ronk/ | [róŋk] | '(I) snore' | *banc* | [báɲ]~ | [báŋk] | 'bank' |

(Data from: Pons 2004, 2006; *Corpus Oral Dialectal*)

According to the proposal outlined above, this behavior is expected, because, unlike what happens in nominal paradigms, in the verbal paradigms of the first conjugation there is no form which can exert pressure and thus induce cluster reduction. In fact, all forms in the paradigm have a final stop at the right edge of the stem, because between this consonant and the second singular PI mark (–[s]) there is the tense mark of the PI (–[ə]) characteristic of the verbs of the first conjugation.

(33) *"Underapplication" of cluster reduction in Eivissan Catalan*

| *cant* | /kant/ | [kánt] | '(I) sing' | *salt* | /salt/ | [sált] | '(I) sing' |
|---|---|---|---|---|---|---|---|
| *cantes* | /kant+ə+z/ | [kántəs] | '(you) sing' | *saltes* | /salt+ə+z/ | [sáltəs] | '(you) sing' |
| *canta* | /kant+ə/ | [kántə] | '(s/he) sings' | *salta* | /salt+ə/ | [sáltə] | '(s/he) sings' |
| *cantam* | /kant+a+m/ | [kəntám] | '(we) sing' | *saltam* | /salt+a+m/ | [səltám] | '(we) sing' |
| *cantau* | /kant+a+w/ | [kəntáw] | '(you) sing' | *saltau* | /salt+a+w/ | [səltáw] | '(you) sing' |
| *canten* | /kant+ə+n/ | [kántən] | '(they) sing' | *salten* | /salt+ə+n/ | [sáltən] | '(they) sing' |

(Data from: Pons 2004, 2006; *Corpus Oral Dialectal*)

Interestingly enough, cluster preservation —or what we might improperly call here "underapplication" — of cluster reduction, although possible, is not as systematic in the verbs of the second and the third conjugation. In this case, the second person of PI does not exhibit an explicit tense mark , so that the cluster created in these cases is the same as in nominal inflection (nasal / lateral + stop + *s*), and more variation across speakers is found. Some speakers show systematic cluster reduction (see 34a), others exhibit cluster preservation (see 34b) and yet others exhibit cluster reduction in the third person and preservation in the first (see 34c). In speakers with cluster reduction in the whole paradigm, the constraint *CCC]σ motivates cluster reduction in 2 *sg*. PI forms and these reduced forms exert pressure over the 1 *sg*. and the 3 *sg*. forms, just like what occurs in nominal inflection. In speakers with cluster preservation, the pressure is exerted by the forms in which the last consonant of the stem is preserved due to the high-ranked constraint MAX-C/__V (in this case, therefore, overapplication is blocked by another markedness constraint, as also predicted in McCarthy's

model; see footnote 4). Finally, speakers with cluster reduction in the third person and preservation in the first person have the constraint penalizing identical forms in the same paradigm especially high-ranked (see Pons 2002a, 2002b, 2007, for a more complete analysis of these particular cases.)

(34)  *Normal, under- and overapplication of cluster reduction in Eivissan Catalan*

|  |  | *Variety I* | *Variety II* | *Variety III* |
|---|---|---|---|---|
| *romp* | /ɾonp/ | [ɾóm] | [ɾómp] | [ɾómp] |
| *romp* | /ɾonp+z/ | [ɾóms] | [ɾóms] | [ɾóms] |
| *romp* | /ɾonp/ | [ɾóm] | [ɾómp] | [ɾóm] |
| *rompem* | /ɾonp+ə+m/ | [rumpə́m] | [rumpə́m] | [rumpə́m] |
| *rompeu* | /ɾonp+ə+w/ | [rumpə́w] | [rumpə́w] | [rumpə́w] |
| *rompen* | /ɾonp+ə+n/ | [ɾómpən] | [ɾómpən] | [ɾómpən] |

(Data from: Alcover & Moll 1929-1933; Pons 2002a, 2002b, 2007; *Corpus Oral Dialectal*)

### 4.1.2  *Overapplication of depalatalization in Spanish*

4.1.2.1 *Data*. In Spanish, palatal consonants in the coda are proscribed, as the alternations in (35) show. In masculine singular forms, in which the consonant is located in coda position, depalatalization applies (35a), whereas in feminine forms, both singular and plural, in which the consonant is located in onset position, the place specification of the palatal segment is preserved (35b). Unexpectedly, however, depalatalization also applies in onset position in the plural forms, as shown in (36).

(35)  *Normal application of depalatalization in Spanish*

| a. MASC. SING. → *Coda position* | b. FEM. SING.  FEM. PLUR. → *Onset position* |
|---|---|
| *doncel*  [donθél]  'young male noble' | *doncella*  [donθéʎa]  'maiden' |
|  | *doncellas*  [donθéʎas] 'maiden *plur.*' |
| *don*   [dón]    'Mister' | *doña*   [dóɲa]    'Madam' |
|  | *doñas*  [dóɲas]   'Madam *plur.*' |

(36)  *Overapplication of depatalization in Spanish* MASC. PLUR. → *Onset position*

| | |
|---|---|
| *donceles*  [donθéles] 'young male noble *plur.*' |
| *dones*   [dónes]   'Mister *plur.*' |

This is a well-known process of Spanish, which has been analyzed by many scholars. In Mascaró & Lloret (2006), for instance, depalatalization in (35a) is attributed to a context-free markedness constraint (*¬CORONAL) penalizing non-coronal segments,[11] the effects of which are inhibited when the affected consonant is located in onset position (35b), thanks to the positional faithfulness constraint IDENTONSET(F) (see 37b). This inhibition is not found, however, in the plural forms (36), in which therefore occurs overapplication of depalatalization. These cases of overapplication are interpreted as a BASE-IDENTITY effect:

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[11] Although not illustrated in this paper, centralization also affects labial segments (*adámico* [aðámiko] 'Adamic'~ *Adán* [aðán] 'Adam'). This is why the authors resort to the constraint *¬CORONAL (which in fact is a shorthand for the universal hierarchy of context-free markedness constraints against specific place features, i.e. *DORSAL, *LABIAL > *CORONAL).

that is, the plural forms (36) have a base —that of the singular forms— to which they must be faithful in terms of place. The lack of pressure in the feminine forms (35a) is explained, on the other hand, by stipulating that in these cases there is no base which exerts pressure. In their analysis, therefore, the hypothesis that in inflectional paradigms the pressure is symmetrical is explicitly neglected, in that a base (*i.e.* the masculine singular form, which is the unmarked in the inflectional paradigm) has priority over the plural forms. The only case in which this does not happen is in pronoun forms (*i.e. él* [él] 'he'~ *ellos* [éʎos] 'they *masc. plur.*'~ *ella* [éʎa] 'she' ~ *ellas* [éʎas] 'they *fem. plur.*'; *aquel* [akél] 'that *masc.*' ~ *aquellos* [akéʎos] 'those *masc. plur.*'~ *aquella* [akéʎa] 'that *fem.*' ~ *aquellas* [akéʎas] 'those *fem.*'), in that there is no uniformity in the number paradigm. Mascaró and Lloret (2006) argue that el and *aquel* cannot function as bases for *ellos* and *aquellos* because they differ in the gender marker, which is –∅ in the former, and –*o*, in the latter.

4.1.2.2 *How linguistic variation sheds light on the theory (2)*. In our view, this behavior, with pressure from the singular to the plural forms but not to the feminine forms can be treated without loss of generalization and, in fact, constitutes additional evidence for the need to relativize the OP constraints according to the kind of inflection, as advocated above. Indeed, the fact that *only plural forms* are subject to paradigm leveling supports the hypothesis according to which the pressure between the forms related by number is much superior to the pressure between forms related by gender, and therefore supports the need to split the OP faithfulness constraints according to the type of inflection. As seen in the tableau in (38), the high ranking of the markedness constraint *¬CORONAL]σ, which penalizes a palatal segment in coda position, is responsible for the discarding of the fully faithful paradigm candidate with a member with a palatal in coda position (see 38c). The high-ranked OSP faithfulness constraint demanding homogeneity in the number subparadigm, on the other hand, is responsible for the discarding of the paradigm candidate with normal application of centralization in word final position and preservation of the palatal in plural forms (see 38d), and for the selection of the paradigm candidate with overapplication of centralization in plural forms (see the winning candidate paradigm in 38a). And, finally, the ranking of IDENTONSET(place) above the OSP faithfulness constraint demanding homogeneity in the gender subparadigm explains why overapplication does not affect the feminine forms (see 38b). The particular behaviour of the pronouns *él ~ ellos / aquel ~ aquellos*, without uniformity, could be analysed in terms of phonologically conditioned allomorphy, in line with the general proposal of Mascaró (2007) (See, in this respect, Ohannesian & Pons, submitted.)

(37)  *Relevant constraints*

a. *Markedness constraint*
— ¬CORONAL*]σ: Assign one violation mark for every palatal segment in coda position (adapted form Mascaró & Lloret 2006)

b. *Standard I-O (positional) faithfulness constraint*
— IDENT(F): Assign one violation mark for every output segment that differs from its input correspondent in place of articulation (McCarthy & Prince 1995)
— IDENTONSET(F): Assign one violation mark for every output segment syllabified in the onset that differs from its input correspondent in place of articulation (McCarthy & Prince 1995; Beckmann 1998)

c. *Optimal Subparadigm faithfulness constraints*
— OPTIMAL SUBPARADIGM NUMBER IDENT(place) (OSPN IDENT(place)): Within number inflection, assign one violation mark for every consonant in the base (stem) of an inflected

form whose correspondent in another base has a different place specification (see Pons 2004, 2006; Pons & Ohannesian 2008, after McCarthy [2001] 2005).
— OPTIMAL SUBPARADIGM GENDER IDENT(place) (OSPG IDENT(place)): Within gender inflection, assign one violation mark for every consonant in the base (stem) of an inflected form whose correspondent in another base has a different place specification (see Pons 2004, 2006; Pons & Ohannesian 2008, after McCarthy [2001] 2005).

In summary, paradigm leveling is, again, induced by markedness. And overapplication of the relevant process, yet again, is circumscribed to the *number paradigm*.

(38)  *Overapplication of depalatalization in the number subparadigm*

| /donθeʎ, donθeʎ+a, donθeʎ+s, donθeʎ+a+s/ | *¬CORONAL]σ | OSPN IDENT(place) | IDENTONSET (place) | OSPG IDENT(place) | IDENT (place) |
|---|---|---|---|---|---|
| ☞ a. <<donθél, donθéles>N <donθél, donθéʎa>G <donθéʎa, donθéʎas>N <donθéles, donθéʎas>G>INF *overapplication in the number subparadigm* | | | * * | ** ** | ** * * |
| b. <<donθél, donθéles>N <donθél, donθéla>G <donθéla, donθélas>N <donθéles, donθélas>G>INF *overapplication in the entire paradigm* | | | * * ** **! | | ** ** ** ** |
| c. <<donθéʎ, donθéʎes>N <donθeʎ, donθeʎa>G <donθeʎa, donθeʎas>N <donθeʎes, donθeʎas>G>INF *underapplication  fully-faithful set* | * *! | | | | |
| d. <<donθel, donθeʎes>N <donθel, donθeʎa>G <donθeʎa, donθeʎas>N <donθeʎes, donθeʎas>G>INF *normal application – no uniformity in number* | | **! | | ** | * * |

### 4.1.3   *Overapplication of centralization in Occitan*

4.1.3.1 *Data*. Occitan shows a similar pattern to Spanish. As the alternations in (39) show, palatal and labial consonants are proscribed in coda position, both in word-final position and when followed by another consonant (in the cases exposed here, the consonant corresponds to the plural morph, but the same pattern is found with any other type of consonant).

(39)  *Centralization in Occitan*

a. *Masculine adjectival forms*
→ centralization
*viè*[l]          'old *masc. sing.*'
*viè*[l]*s*        'old *masc. plur.*'

b. *Feminine adjectival forms*
→ non-centralization
*viè*[ʎ]*a*        'old *fem. sing.*'
*viè*[ʎ]*as*       'old *fem. plur.*'

| | | | |
|---|---|---|---|
| *estra*[n] | 'unusual *masc. sing.*' | *estra*[ɲ]*a* | 'unusual *fem. sing.*' |
| *estra*[n]*s* | 'unusual *masc. plur.*' | *estra*[ɲ]*as* | 'unusual *fem. plur.*' |
| | | | |
| *pri*[n] | 'thin *masc. sing.*' | *pri*[m]*a* | 'thin *fem. sing.*' |
| *pri*[n]s | 'thin *masc. plur.*' | *pri*[m]*as* | 'thin *fem. plur.*' |

(Data from Balaguer & Pojada 2005; confirmed with Rafèu Sichel)

4.1.3.2 *How linguistic variation sheds light on theory (3).* An intradialectal look at the data would conclude that the markedness constraint responsible for the process of centralization is similar to that adduced for Spanish depalatalization, that is, a constraint penalizing non-coronal consonants in the coda. In this case, however, the centralization process is due to a markedness constraint penalizing a non-coronal consonant followed by another consonant, and the direction of the paradigm leveling is therefore from the plural to the singular forms. This is not merely an *ad hoc* interpretation or stipulation of the facts, but is grounded cross-linguistically: in Gascon, for example, the process of depalatalization also applies, but *only* in the plural forms, that is, when the palatal segment is followed by a consonant (40b), and never in word-final position (40a). Interestingly enough, on the other hand, a process of change is detected in the case of labials, which can be realized with [m] and [n] in word-final position, incipiently mirroring the Occitan patterns.

(40)  *Centralization in Gascon*

a. *Masculine singular adjectival forms*
→ no centralization

| | |
|---|---|
| *ba*[ɲ] | 'toilet *masc. sing.*' |
| *hi*[ʎ] | 'thread *masc. sing.*' |
| *pri*[m] ~ *pri*[n] | 'thin *masc. sing.*' |

b. *Masculine plural adjectival forms*
→ centralization

| | |
|---|---|
| *ba*[n]*s* | 'toilet *masc. plur.*' |
| *hi*[l]*s* | 'thread *masc. plur.*' |
| *pri*[n]*s* | 'thin *masc. plur.*' |

The situation is similar to that depicted in § 4.1.1: the fact that two related languages, Occitan and Gascon, exhibit centralization of labials and palatals when followed by a consonant, whereas just one exhibits centralization as well as variation in word-final position, suggests indeed that the origin of the process is in the plural forms, that is, when the affected consonants are followed by a consonant, and that a process of change, similar to that of seen in Occitan, is applying in the case of labials in Gascon. This picture reveals a novel universal implication (41), which must transcend into the hierarchy of contextual markedness constraints (42c).

(41)  *Universal implication*

    If in a language palatal segments are prohibited in word-final position, they will also be prohibited when followed by another consonant, but not vice versa.

(42)  *Universal ranking of the contextual markedness constraints against palatal segments*

    a.  ¬CORONAL]σ: Assign one violation mark for every non-coronal segment in the coda.
    b.  ¬CORONAL C: Assign one violation mark for every non-coronal segment followed by another consonant.
    c.  * ¬CORONAL C >> * ¬CORONAL

The tableau in (43) illustrates the direction of things in Occitan. Paradigm leveling is again induced by markedness, in this case, by the constraint against a non-coronal segment followed by another consonant. And overapplication of the relevant process is, yet again, only triggered within the *number paradigm* (compare 43a *vs*. 43b).

(43)  *Centralization in Occitan*

| /vjéʎ, vjéʎs, vjéʎo, vjéʎos/ | *¬ CORONAL]C | OSPN IDENT(place) | IDENT ONSET(place) | OSPG IDENT(place) | IDENT (place) |
|---|---|---|---|---|---|
| ☞  a.  <<vjél, vjéls>N <vjél, vjéʎo>G <viéʎo, viéʎos>N <vjéls, vjéʎos>G>INF *overapplication in the number subparadigm* | | | * ⸻⸻ * | * ⸻⸻ * | ** * ⸻⸻ * |
| b.  <<vjél, vjéls>N <vjél, vjélo>G <viélo, viélos>N <vjéls, vjélos>G>INF *overapplication in the entire paradigm* | | | * ** *! | | ** ** ** ** |
| c.  <<vjéʎ, vjéʎs>N <vjéʎ, vjéʎo>G <viéʎo, viéʎos>N <vjélʎs, vjéʎos>G>INF *underapplication fully-faithful set* | *! | | | * ⸻⸻ * | |
| d.  <<vjéʎ, vjéls>N <vjéʎ, vjéʎo>G <viéʎo, viéʎos>N <vjéls, vjéʎos>G>INF *normal application – no uniformity in number* | | **! | | * | * ⸻⸻ * |

### 4.1.4  *Overapplication of centralization in Alguerese Catalan*

4.1.4.1 *Data*. In Alguerese Catalan, word-final palatal nasals and laterals undergo a process of depalatalization when followed by another consonant and also in word-final position (44a, b). This process of depalatalization also applies when a word-final prepalatal sibilant precedes a word with an initial consonant (44). In this case, however, the process does not apply in word-final position (44a).

(44)  *Palatal lateral and nasals in Alguerese Catalan*

   a. *any*          /aɲ/          [án]          'year'
   b. *anys*         /aɲ+z/        [áns]         'years'
   c. *any passat*   /aɲ##pas+a+d/  [àm pasát]    'last year'
   (cf. *anyet* [aɲét] 'small year')

   d. *aquell*       /akeʎ/        [akél]        'that'
   e. *aquells*      /akeʎ+z/      [akéls]       'those'

f. *aquell palau*   /akeʎ##paɾaw/       [akèl paɾáw]       'that palace'
   (cf. *aquella* [akéʎa] 'that')

(45)  *Palatal sibilants in Alguerese Catalan*

   a. *aqueix*        /akeʃ/          [akéʃ]             'this'
   b. *aqueixos*      /akeʃ+z/        [akéʃus]           'these'
   c. *aqueix palau*  /akeʃ##paɾaw/   [akès paɾáw]       'this palace'

4.1.4.2 *How linguistic variation sheds light on theory (4)*. In our view, the discrepant behavior between the cases in (44) and (45) calls for, once more, an interpretation of the facts based on analogy induced by phonological markedness, and furthermore supports the predictions made above. In the cases shown in (44), the plural forms exhibit depalatalization, and so do the singular correspondent forms; in the cases shown in (45), by contrast, the plural forms do not exhibit depalatalization —because a vowel follows the palatal sibilant— and neither do the singular correspondent forms (Serra 1996, Pons 2005). This account of the facts, moreover, is consistently corroborated by the data reported in historical grammars about this dialect: depalatalization was recorded when the palatal consonants were followed by another consonant, but not in word-final position (see Palomba 1906: 49, 51 79; Kuen 1932: 46-47). Everything indicates, therefore, that the origin of this process lies in the plural forms.[12]

4.2 *Underapplication in the derivational paradigm*

4.2.1 *Underapplication of vowel reduction in Majorcan Catalan*

4.2.1.1 *Data*. Majorcan Catalan exhibits an interesting case of underapplication of a process both within inflection and within derivation, as already noted in § 2.2. Most Majorcan Catalan varieties have a vowel system of eight vowels in stressed position (46) and a vowel system of four vowels in unstressed position (47).
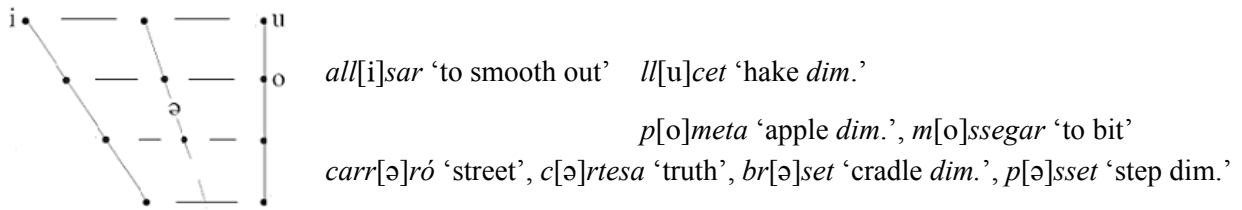
(46)  Majorcan vowel system in stressed position
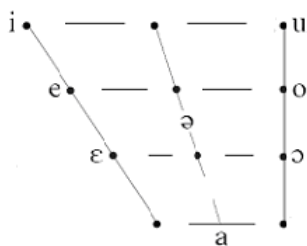


*ll*[í]*is* 'smooth'        *ll*[ú]*ç*  'hake'
*carr*[é]*r* 'street'       *p*[ó]*ma* 'apple'
                  *br*[ə]*s* 'cradle'
*c*[ɛ́]*rt* 'true'          *m*[ɔ́]*s* 'bit'

                  *p*[á]*s* 'step'

---

[12] In Jiménez & Lloret (2006) it is argued that the fact that the same analogical process has not operated in the cases of final labial nasals and stops (*i.e. fums* [fúns] but *fum* [fúm], without pressure; *amics* [amíts] but *amic* [amík], without pressure) somehow invalidates this hypothesis. It is clear that analogy does not function systematically (recall the examples from Gascon, in which the pressure is incipiently operating in the case of labial nasals, but not in the case of palatals).

(47) Majorcan vowel system in unstressed position



*all*[i]*sar* 'to smooth out'    *ll*[u]*cet* 'hake *dim.*'

*p*[o]*meta* 'apple *dim.*', *m*[o]*ssegar* 'to bit'

*carr*[ə]*ró* 'street', *c*[ə]*rtesa* 'truth', *br*[ə]*set* 'cradle *dim.*', *p*[ə]*sset* 'step dim.'

This specific picture is the result of a general process of vowel reduction, according to which the front mid-vowels [é] and [ɛ́], the low vowel [á] and the central vowel [ɔ́] are reduced to [ə] in unstressed position, and the back low-mid vowel [ɔ́] is reduced to [o], also in unstressed position.

(48) *Vowel reduction in Majorcan Catalan*
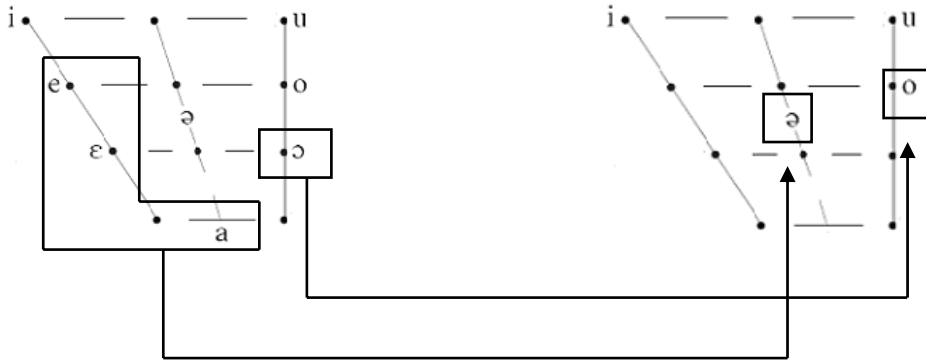


In Optimality Theory terms, the reduction of the vowel system in unstressed position is interpreted as an effect of the harmony scale for margins, that is, for vowels in unstressed position (49a). This harmony scale and the subsequent margin constraint hierarchy (49b), expresses the universal preference for segments of low sonority (see the sonority scale in 49c) in unstressed position or, in other words, the universal dispreference for segments of high sonority in the margins.

(49) Harmony scale and constraint hierarchy for margins

    a. *Universal harmony scale for margins* (See Prince & Smolensky 1993)

       M/ə ≻ M/i,u ≻ M/e,o ≻ M/ɛ,ɔ ≻ M/a

    b. *Universal constraint hierarchy for margins*

       *M/a >> *M/ɛ,ɔ >> *M/e,o >> * M/i,u >> *M/ə

    c. *Universal sonority scale for vowels (from less to more sonority)*

       ə > i,u > e,o > ɛ,ɔ > a

The application of vowel reduction for the vowels of the front series in Majorcan Catalan (see 48) is therefore due to the ranking of the context-free markedness constraints *M/a and *M/ɛ, *M/e, which penalize elements of higher sonority in the margins, above the faithfulness constraint which penalizes featural changes. Thus, in the following tableau, candidates with [a], [ɛ] or [e] in unstressed position are discarded (see candidates *i* in 50a, b, c); the candidate

with [ə], by contrast, is selected as optimal (see candidate *ii* in 50a, b, c). (See Wheeler 2005, Lloret & Jiménez 2008 for analysis of vowel reduction in the same direction.)

(50) *Vowel reduction in Majorcan Catalan*

| a. /fust+eɾ+iə/ | *M/a | *M/ɛ | *M/e | *M/ə | IDENT(F) |
|---|---|---|---|---|---|
| i. [fusteɾíə] | | | *! | | |
| ☞ ii. [fustəɾíə] | | | | * | * |
| b. /kəfɛn+ət/ | *M/a | *M/ɛ | *M/e | *M/ə | IDENT(F) |
| i. [kəfɛnə́t] | | *! | | | |
| ☞ ii. [kəfənə́t] | | | | * | * |
| c. /kaz+ət+ə/ | *M/a | *M/ɛ | *M/e | *M/ə | IDENT(F) |
| i. [kazə́tə] | *! | | | | |
| ☞ ii. [kəzétə] | | | | * | * |

These are the regular facts. However, productive derivational forms with an alternating stressed [é] or [ɛ́] vowel at the left edge of the base-stem of the primitive undergo vowel reduction not to [ə], but to [e] (see 51b). In these cases, therefore, there is underapplication of the general process of vowel reduction to [ə]. Non-productive forms with an alternating stressed [é] or [ɛ́] vowel at the left edge (51c) or productive forms with an alternating stressed [é] or [ɛ́] vowel at the right edge (51e) undergo regular vowel reduction.

(51) *Underapplication of vowel reduction in Majorcan Catalan*

| BASE | PRODUCTIVE DERIVATION[13] | | NON-PRODUCTIVE DERIVATION | |
|---|---|---|---|---|
| a. Stressed stem with [é] or [ɛ́] at the left edge | b. *Unstressed stem with the vowel at the left edge* → unexpected [e] | | c. *Unstressed stem with the vowel at the left edge* → expected [ə] | |
| p[é]ix  'fish' | p[e]ixet, p[e]ixot | 'fish *dim.*, *augm.*' | p[ə]ixater | 'fisherman' |
| p[é]dra  'stone' | p[e]dreta, p[e]drota | 'stone *dim.*, *augm.*' | p[ə]drera | 'quarry' |
| Est[é]ve  'Steven' | est[e]vet, est[e]vot | 'Stephan *dim.*, *augm.*' | | |
| t[ɛ́]rra  'earth' | t[e]rreta, t[e]rrota | 'earth *dim.*, *augm.*' | t[ə]rrestre | 'terrestrial' |
| c[ɛ́]l  'sky' | c[e]let, c[e]lot | 'sky *dim.*, *augm.*' | c[ə]lestial | 'celestial' |
| m[ɛ́]rda  'shit' | m[e]rdeta, m[e]rdota | 'shit *dim.*, *augm.*' | m[ə]rder | 'mess' |
| d. *Stressed stem with* [é] *or* [ɛ́] *at the right edge* | e. *Unstressed stem with the vowel at the right edge* → expected [ə] | | f. *Unstressed stem with the vowel at the right edge* → expected [ə] | |
| pap[é]r  'paper' | pap[ə]ret, pap[ə]rot | 'paper *dim.*, *augm.*' | pap[ə]rera | 'paper basket' |
| cast[é]ll  'castle' | cast[ə]llet, cast[ə]llot | 'castle *dim.*, *augm.*'' | cast[ə]ller | 'casteller' |
| fid[ɛ́]u  'noodle' | fid[ə]uet, fid[ə]uot | 'noodle *dim.* , *augm.* ' | fid[ə]uada | 'fideua' |
| caf[ɛ́]  'coffee' | caf[ə]tet, caf[ə]tot | 'coffee *dim.*, *augm.*' | caf[ə]teria | 'cofee shop' |

---

[13] Due to space reasons, we illustrate productive derivation with diminutives and augmentatives. The same patterns are found, however, with other productive suffixes such as –*ós* (*p*[é]*na* 'shame' ~ *p*[e]*nós* 'shameful', –*ada* (*p*[é]*dra* 'stone' ~ *p*[e]*drada* 'group of stones'), –*arro* (*p*[ɛ́]*u* 'foot' ~ *p*[e]*uarro* 'foot *augm. desp.*'), –*assa* (*h*[é]*rba* 'grass' ~ *h*[e]*rbassa* 'grass *augm.*'), etc.

The very same patterns under similar conditions are found in inflectional verbal paradigms (cf. underapplication of vowel reduction in *p*[é]*ga* '(s/he) hits' ~ *p*[e]*gam* 'we hit'; *esp*[é]*ra* '(s/he) waits' ~ *esp*[e]*ram* '(we) wait', where the first vowel is epenthetic, *vs.* normal application of vowel reduction in *cont*[é]*st* '(I) answer' ~ *cont*[ə]*stau* 'you *plur.* answer'; Bibiloni 1998), although in this case underapplication of vowel reduction is not found when the alternating stressed vowel is [ɛ́] (*x*[ɛ́]*rren* '(they) chat' *vs.* *x*[ə]*rram* '(we) chat'; see Mascaró 2005). Words of recent introduction with unstressed *e* also show [e], especially when located at the left edge of the stem and when preceded by a labial consonant (Bibiloni 1998: 536): *esp*[e]*cial* 'special', *p*[e]*l·lícula* 'film', *p*[e]*riodista* 'journalist', *b*[e]*cari* 'grant beneficiary', *b*[e]*nigne* 'benign', *b*[e]*nzina* 'gasoil', *m*[e]*dicina*, *m*[e]*dicament* 'medicament', *f*[e]*liç* 'happy', *v*[e]*locitat* 'speed', etc.[14]

4.2.1.2 *How linguistic variation sheds light on theory (5)*. Previous descriptive and theoretical approaches to these facts have already detected that a paradigmatic effect is at play here (Veny 1962, Bibiloni 1998, Mascaró 2002, Wheeler 2005). According to Mascaró (2005), on the other hand, cases with normal application of vowel reduction (*i.e. caf*[ə]*net*) and cases with underapplication of vowel reduction (*i.e. v*[e]*ntet*) exhibit a different behavior because the latter bear a lexical mark responsible for the demotion, in the constraint hierarchy, of the markedness constraint favoring the schwa in unstressed position. According to Wheeler (2005: 75-77), this discrepant behavior is attributed to a set of specific morphophonologically conditioned IDENT-BASE constraints demanding the homogeneity of the stem across the inflectional and derivational paradigm.

In our view, a more general and cross-linguistically grounded tendency is beyond these patterns. As described in § 4.5.1, there are *four* crucial conditions for the underapplication of vowel reduction, *none of which is sufficient on its own*.

a.  The unstressed affected vowel must have a correspondent stressed vowel in the stem of the primitive word. The first vowel of the word *petit* 'small', which does not alternate with any stressed vowel, undergoes regular vowel reduction to [ə] ([pətít]), whereas the first vowel of the word *ventet* 'wind *dim.*' does not undergo regular vowel reduction to [ə] because it alternates with a stressed vowel ([ventɛ́t] 'wind *dim.*'; cf. [vént] 'wind').

b.  The vowels in the alternating stressed stem must be front and mid (*i.e.* [é] and [ɛ́]), in that the pressure does not work when the primitive has the low vowel [á] (*c*[ə]*seta*; cf. *c*[á]*sa*).

c.  The position of the vowels under surface correspondence must be at the left edge of the stem (*pap*[é]*r* 'paper' ~ *pap*[ə]*ret* 'paper *dim.*', with normal application of vowel reduction to [ə], because the vowel is not at the left edge of the stem, *vs.* *p*[é]*ix* 'fish' ~ *p*[e]*ixet* 'fish *dim.*', *p*[e]*ixot* 'fish *augm* , and, also, *Est*[é]*ve* 'Stephan' *vs.* *Est*[e]*vet* 'Stephan *dim.*' —in which the first vowel is epenthetic—, with underapplication of vowel reduction, because the vowel is located at the left edge of the stem).

d.  The derived form must be productive (*p*[é]*ix* 'fish' ~ *p*[e]*ixet* 'fish *dim.*', *p*[e]*ixot* 'fish *augm.*', with underapplication of vowel reduction, *vs.* *p*[ə]*ixater* 'fisherman', *p*[ə]*ixateria* 'fish shop', with normal application of vowel reduction; see Bibiloni 1998, Mascaró 2002).

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[14] Due to space reasons, we omit the analysis of these cases here. For a complete analysis of them within the Optimality Theory framework, see Mascaró 2005, Ohannesian & Pons 2008, submitted, Pons submitted).

The formalization in Optimality Theory terms of the particular cases with respect to vowel reduction would go as follows.

— The condition in *a* can be interpreted, as in previous accounts, as a standard output-to-output faithfulness constraints effect. A constraint like O-OIDENT(F), which states that correspondent surface segments must have the same featural specification explains the lack of reduction; BASE-PRIORITY, on the other hand, ensures that the direction of the pressure is from the base to the derived form and not the other way round.

— The condition in *b* can be interpreted as the result of the activity of the context-free markedness hierarchy for margins (*i.e.* for unstressed vowels): *M/a >> *M/ε,ɔ >> *M/e,o >> *M/i,u >> *M/ə (repeated in a stringency form in 52). The high ranking of *M/a inhibits the possible effects of the constraint demanding homogeneity in the stem (*i.e.* O-OIDENT(F)) when the alternating vowel is [a] (c[á]*sa vs.* c[ə]*seta*). The high ranking of *M/ε, on the other hand, answers for the fact that the selected vowel in cases of paradigmatic pressure from a stem with [ɛ́] is [e] and not [ɛ] (*cel* [sɛ́l] *vs. celet* [selɛ́t]). The idea is that this vowel is too sonorous to appear in unstressed position in these dialects. (See Wheeler 2005, Lloret & Jiménez 2008 for an application of this hierarchy to vowel reduction in Catalan.)

(52)  *Universal constraint hierarchy for margins (stringency form)*
      *M/a >> *M/a, *M/ε,ɔ >> *M/a, *M/ε,ɔ, *M/e,o >> *M/a, *M/ε,ɔ, *M/e,o, *M/i,u >> *M/a, *M/ε,ɔ, *M/e,o, *M/i,u , *M/ə[15]

— The condition in *c* can be interpreted as a prominence effect, in that in a prominent position (such as the left edge of the stem) a more prominent vowel than the schwa (*i.e.* [e]) is selected, whereas in a non-prominent position (such as the right edge of the stem), a non-prominent vowel (*i.e.* [ə]) is selected. This behavior makes evident the necessity of recognizing an additional prominent position (*i.e.* the left edge of the stem) apart from those already detected in previous studies (like the syllabic onset with respect to the syllabic coda; stressed syllable with respect to the unstressed syllable; the pretonic syllable with respect to the posttonic syllable; the stem with respect to the affix, etc.; see Kenstowicz 1997, Crosswhite 1999; de Lacy 2002, 2004; and, for Catalan, Cabré & Prieto 2003, 2006; Jiménez & Lloret 2008). We propose, then, the following markedness positional constraint hierarchy according to which at the left edge of the stem, a prominent morphological position, elements of high sonority are preferred or, in other words, elements of low sonority are avoided.

(53)  *Prominence hierarchy for vowels according to their position within the stem*
      *ə/L-Stem-Edge >> *i,u/L-Stem-Edge >> *e,o/L-Stem-Edge >> *ε,ɔ/L-Stem-Edge >> *a/L-Stem-Edge

— The condition in *d*, finally, is a very important one in that it makes necessary a refinement of the submodel designed to account for surface resemblances between the members of a derivational paradigm, similar to that proposed in § 4.1.1 for the submodel designed to account for surface resemblances between the members of an inflectional paradigm. Since a different behavior is found depending on the kind of derivation (productive derivatives are more faithful to the base than non-productive derivatives), and given the fact that this is a very common pattern across languages (remember, just as illustration, the examples in 12: *conde*[m] ~ *conde*[m]*ing* ~ *conde*[mn]*ation*), generated derivational paradigms should have, as

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[15] For a complete justification of the stringency version of the universal constraint hierarchy for margins, see Pons & Ohannesian 2008, submitted, and Pons, submitted.

in inflectional paradigms, an uneven and irregular structure. In fact, a hierarchical structure is already predicted in Benua's TCT, in that the base has priority over the derived forms. But we propose an even more hierarchical structure: instead of flat paradigms, structured paradigms which contain subparadigms are generated, and therefore the OO-faithfulness constraints are relativized according to these subparadigms. In this way, the superior proximity of the productive derivative to the primitive form with respect to non-productive derivatives is explicitly formalized.[16]

In the tableaux in (55-57), it can be seen how the combination of these four conditions, expressed in terms of constraints, leads to the desired results. BASE-PRIORITY bans in all cases paradigmatic pressure from the derivative forms to the base (see candidates *d* in 55-57). The unranked constraints *ə/L-Stem-Edge and *M/e motivate a tie between the actual paradigm candidate with underapplication in the productive derivative (see candidates in 55-57) and paradigm candidates with underapplication of vowel reduction in the whole paradigm (see candidates *b* in 55-57) and paradigm candidates with normal vowel reduction (see candidates *c* in 55-57). The former, however, are discarded by the markedness constraint *M/e, in that they exhibit more instances of [e] in unstressed position than the actual paradigm candidate. The latter, on the other hand, are ruled out by the constraint OO-SUBPARIDENT(–post). Note, finally, how the unranked constraints *ə/L-Stem-Edge and *M/e favor the selection of the paradigm candidate with normal application of vowel reduction when the affected vowel is not placed at the left edge of the stem (see candidates *a* and *b* in 55).

(54)  *New relevant constraints*
a.  *Positional prominence constraints*
   *ə/L-Stem-Edge: Assign one violation mark for every [ə] at the left edge of the stem
   *M/a: Assign one violation mark for every [a] in the margin.
   *M/ɛ,ɔ: Assign one violation mark for every [ɛ] or [ɔ] in the margin.
   *M/e,o: Assign one violation mark for every [e] or [o] in the margin.
b.  *Transderivational correspondence constraints*
   OO-SUBPARIDENT(–post): Within the derivational paradigm, correspondent segments must have the same specification for the feature [–posterior].
   OO-SUBPARIDENT(–post): Within the derivational subparadigm, correspondent segments must have the same specification for the feature [–posterior].

(55)  *Underapplication of vowel reduction in productive derivational forms with an alternating stressed* [é] *at the left edge of the stem*

| /pedɾ+ə, pedɾ+ət+ə, pedɾ+er+ə/ | BASE -PRIOR | *ə/L-Stem Edge | *M/e | OO-SUBPAR IDENT (–post) | *M/e, *M/i | OO- PARIDENT (–post) | IDENT (F) |
|---|---|---|---|---|---|---|---|
| ☞ a. <<*p*[é]*dra, p*[e]*dreta>p*[ə]*drera>* uniformity in the subparadigm | | * | * | | | * | **** |
| b. <<*p*[é]*dra, p*[e]*dreta>p*[e]*drera>* uniformity in the paradigm | | | ** | | **! | | * |
| c. <<*p*[é]*dra, p*[ə]*dreta>p*[ə]*drera>* no uniformity - normal application | | ** | | **! | | *** | ** |
| d. <<*p*[ə́]*dra, p*[ə]*dreta>p*[ə]*drera>* pressure to the base | *! | ** | | | | | *** |

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[16] See Pons & Ohannesian 2008, submitted, for a detailed formalization of subparadigms within derivation based on the formal and semantic distances established between the base and the derivative forms.

(56) *Underapplication of vowel reduction in productive derivational forms with an alternating stressed [ɛ́] at the left edge of the stem*

| /tɛrr+ə, tɛrr+ət+ə, tɛrr+estr/ | *M/ɛ | BASE-PRIOR | *ə/L-Stem Edge | *M/e | OO-SUBPAR IDENT(F) (–post) | *M/e, *M/i | OO-PARIDENT (–post)) | IDENT(F) |
|---|---|---|---|---|---|---|---|---|
| ☞ a. <<t[ɛ́]rra, t[e]rreta>t[ə]rreste> partial uniformity in the subparadigm | | | * | * | | | **** | ** |
| b. <<t[ɛ́]rra, t[e]rreta>t[e]rreste> partial uniformity in the paradigm | | | | ** | | *! | | ** |
| c. <<t[ɛ́]rra, t[ə]rreta>t[ə]rreste> no uniformity - normal application | | | ** | | **! | | *** | ** |
| d. <<t[ə́]rra, t[ə]rreta>t[ə]rreste> pressure to the base | *! | | ** | | | | | *** |
| e. <<t[ɛ́]rra, t[ɛ]rreta>t[ɛ]rreste> no uniformity -normal application | ***! | | | | | | | |
| f. <<t[ɛ́]rra, t[ɛ]rreta>t[ə]rreste> total uniformity in the subparadigm | *! | | * | | | | **** | * |

(57) *Normal application of vowel reduction in (non-)productive derivational forms with an alternating stressed [é] or [ɛ́] at the right edge of the stem*

| /pəper, pəper+ət, pəper+er+ə/ | BASE-PRIOR | *ə/L-Stem Edge | *M/e | OO-SUBPAR IDENT(F) (–post) | *M/e, *M/i | OO-PARIDENT (–post) | IDENT(F) |
|---|---|---|---|---|---|---|---|
| ☞ a. <<pap[é]r, pap[e]ret>pap[ə]rera> uniformity in the subparadigm | | | * | | * | **** | * |
| b. <<pap[é]r, pap[e]ret>pap[e]rera> uniformity in the paradigm | | | **! | | **! | | |
| c. <<pap[é]r, pap[ə]ret>pap[ə]rera> no uniformity - normal application | | | | **! | | *** | ** |
| d. <<pap[ə́]r, pap[ə]ret>pap[ə]rera> pressure to the base | *! | | | | | | *** |

## 5 CONCLUDING REMARKS

Paradigmatic pressures do not work in a homogeneous or symmetric way. As already noted by many scholars, factors such as the degree of phonological similarity, the degree of semantic closeness, the degree of productivity between the members of a paradigm, or the number of grammatical properties which these members share are directly correlated with the degree of phonological pressure exerted between them. In this paper we have focused on these two latter factors.

We have seen that the Optimal Paradigms model can be straightforwardly refined in such a way that the predicted symmetrical influence between the members of an inflectional paradigm can be modified by giving more power of reciprocal influence to members which share more grammatical properties and less power of reciprocal influence to members which share fewer grammatical properties. On the basis of the analysis of a set of processes drawn from Catalan, Spanish and Occitan nominal inflection, we have detected a higher connection not only between members which share more grammatical properties but also between members related by number with respect to those related by gender. Our prediction is, in fact,

that the ranking OP-Faith Number > OP-Faith Gender is a universal one. This account does not deny the pressure between members related by gender but predicts that if in a particular language members related by gender are under pressure it will do so members related by number, but not viceversa. The Transderivational Correspondence Theory, as well, can be modified so that the degree of productivity between the base and the derived word has a direct consequence on the degree of phonological pressure established between them. In this case, the hierarchy *phonological pressure within productive derivation > phonological pressure within non-productive derivation* is at play. Our proposal, based on the subparadigm notion, can also account for this.

Other important results of the paper are the confirmation of McCarthy's prediction that phonological markedness governs the direction of the paradigmatic pressure and that only overapplication of a process due to paradigmatic pressure is possible within the inflectional paradigm. We have left some important issues for future research, such as an explicit formalization of the parallels between number inflection and productive derivation, on the one hand, and gender inflection and non-productive derivation, on the other hand, the possibility of establishing different universal degrees of phonological pressure depending on the type of derivation based on discrepant distances with respect to the primitive form, or the interconnection between the OP and the TCT models.

Overall, we have confirmed the claim with which we started this paper. A careful look at phonological change and microvariation across nearby linguistic varieties can provide truly valuable information into the architecture of some of the theories of language change.

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