1. Introduction

McCarthy (2012) proposes a combination of Harmonic Serialism (HS from now on; Prince & Smolensky 1993, McCarthy 2000, and other work) and the theory of Optimal Interleaving by Wolf (2008) (OI henceforth) to account for different phonological and morphological phenomena found before a pause in Arabic. He calls this combined theory HS/OI. HS is a derivational model of Optimality Theory in which GEN can perform only one change at a time. The output of each pass through GEN and EVAL becomes the input to a next pass through GEN and EVAL and so on until no further harmonic improvement is possible, in which case convergence is reached. At each pass the ranking of the constraints is the same. OI is a theory of the phonology-morphology interface based on Optimality Theory with Candidate Chains (McCarthy 2007), adapted to HS in McCarthy (2012). The key aspect of this theory is the idea that the input to the phonology contains only abstract morphemes (bundles of morphosyntactic features), represented in this paper with small caps, e.g.: /DOG/. The selection of morphs or spell-out ('Vocabulary Insertion' in Distributed Morphology terms; Halle & Marantz 1993) is a GEN operation; in this particular example the morph /dɔɡ/DOG will be inserted. The new phonological information does not replace the morphosyntactic information but is added to it. Spell-out is controlled by the constraint hierarchy, which contains faithfulness constraints like MAX-M(F) in (1) (Wolf 2008: 26 (16)). MAX-M(F) penalises morphemes that lack a corresponding morph. F can refer to roots (MAX-M(ROOT)) or affixes (for instance, MAX-M(PLURAL)).

(1) MAX-M(F): For every instance φ of the feature F at the morpheme level, assign a violation-mark if there is not an instance φ′ of F at the morph level, such that φℜφ′.

The HS/OI model can be illustrated with an example from McCarthy (2012) that is relevant for the cases to be discussed in this paper. The requirement that in Classical Arabic at the end of an utterance (before a pause) there be a heavy syllable is satisfied in different ways that include epenthesis, metathesis, choice of a specific allomorph, etc. Indefinite nouns often surface with a suffix -n, a phenomenon called 'nunation', which appears illustrated in (2a). However, in the nominative and the genitive, before a pause (marked with subscripted Pau) only the stem is found, as shown in (2b). Contextual, non-final forms are marked with subscripted Cont.

(2) a. kita:b-u-nCont    b. kita:bPau    'a book (nom.)'

The realisation of the stem alone in these cases is a puzzle because the form with nunation in (2a) ends in a heavy syllable, and it seems that no change would be necessary to satisfy the heaviness requirement. These puzzling facts follow naturally from the HS/OI perspective. The input to the phonology is /BOOK-NOM-INDEF]/Ult/. The two tableaux in (3) show the two steps needed to reach the output [kita:bPau]. (3b) corresponds to McCarthy 2012: (24)). HIP stands for the constraint HEAVYINPAUSE,
which penalises monomoraic syllables in utterance-final position. The other relevant constraints, MAX-M(ROOT) and a more general MAX-M, are ranked in such a way to ensure spell-out of the root, the most embedded constituent, before less embedded ones. Since HS allows only one change at a time, and spelling out a morpheme constitutes one change, the winner of step 1 contains a realised root and two abstract morphemes, as shown in (3a). At step 2, in (3b), the candidate with realised case, kita:b-u-[INDEF]_Utt, violates the phonological constraint HIP and is ruled out in favour of the candidate with only a realised root, identical to the input. For this reason convergence is reached at step 2, and it is therefore impossible to generate a candidate /kita:b-u-n\_Utt/. Throughout this paper it is assumed that when morphs are inserted the morphosyntactic features remain, but they are not shown in order to simplify the representations. A candidate like (3bii), for instance, should be interpreted as /kita:b\_ROOT-u\_NOM-[INDEF]\_Utt/.

(3) \langle BOOK-NOM-INDEF\_Utt, kita:b-NOM-INDEF\_Utt \rangle

a. Step 1

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
& BOOK-NOM-INDEF\_Utt & MAX-M(ROOT) & HIP & *CMP & MAX-M \\
\hline
\textit{a} & kita:b-NOM-INDEF\_Utt & & & & \\
\hline
\textit{i} & BOOK-NOM-INDEF\_Utt & & & & \\
\hline
\textit{ii} & BOOK-u-INDEF\_Utt & 1W & & & \\
\hline
\textit{iii} & BOOK\_u\_INDEF\_Utt & 1W & 1W & & \\
\hline
\end{tabular}
\end{table}

b. Step 2: convergence

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
& BOOK-NOM-INDEF\_Utt & MAX-M(ROOT) & HIP & *CMP & MAX-M \\
\hline
\textit{a} & kita:b-NOM-INDEF\_Utt & & & & \\
\hline
\textit{i} & kita:b-NOM-INDEF\_Utt & & & & \\
\hline
\textit{ii} & kita:b-u-INDEF\_Utt & 1W & & & \\
\hline
\end{tabular}
\end{table}

McCarthy excludes, at step 2, the generation of a candidate /kita:b-NOM-n\_Utt/, with the outermost suffix spelled out instead of the inner suffix, under the assumption, taken from Wolf (2008), that spell-out proceeds strictly inside outward.\footnote{By the same token, candidate (3aiii) should not be a possible candidate; it has been included in step 1 following other examples in McCarthy (2012).} However, it could likewise be assumed that GEN has no such restriction and that candidates like /kita:b-NOM-n\_Utt/ can in fact be generated. This candidate would not be the winner at step 2 because it would violate *COMPLEXCODA (*CMP), a constraint that McCarthy (2012) includes in the ranking for other cases. In section 2 it will be shown that this second option must be adopted; GEN cannot control which morpheme should be spelled out at each step.

In this paper I examine two phenomena from Catalan that involve the plural morph s in nominals, in one case within the word and in the other case within the DP. The first one, in section 2, is the selection of a marked masculine allomorph to avoid a contact of sibilants when the stem ends in a sibilant and the plural morph, also a sibilant, is inserted. After summarising the parallel analysis of this phenomenon in Bonet, Lloret & Mascaró (BLM) (2007), I show that an account of it within HS/OI implies forcing the plural morpheme to be spelled out before the gender morpheme, through the relevant ranking of specific MAX-M constraints; the outermost suffix must be realised before the inner suffix. The second phenomenon, in section 3, is found in one dialect of Catalan and involves the non-realisation of the plural morpheme in prenominal position under specific syntactic and phonological conditions. The parallel analysis of the phenomenon...
in Bonet, Lloret & Mascaro (BLM) (to appear), can be adapted with few changes to the HS/OI. Section 4 is devoted to the implications for the parallel and the HS/OI analyses when the two phenomena co-occur within the same phrase. It is shown that HS/OI cannot account for the data, even if different constraint rankings are assumed for word-internal and phrasal phonology. The parallel analysis does not face such problems. Section 5 contains some conclusions and further remarks.

2. First piece of the argument: masculine allomorph selection and plurals in Catalan

Catalan masculine nominals have a gender-related morpheme with the allomorphs Ø and -o (pronounced [u] in most dialects).\(^2\) Most nominals choose the allomorph Ø; much fewer select -o. Some examples of each type appear in (4). The same gender-related allomorph appears when the nominal is plural. As mentioned earlier, the plural morph is -s.

(4) **Masculine nominal allomorphs**

<table>
<thead>
<tr>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>gat-Ø</td>
<td>gat-Ø-s</td>
</tr>
<tr>
<td>resum-Ø</td>
<td>resum-Ø-s</td>
</tr>
<tr>
<td>estrany-Ø</td>
<td>estrany-Ø-s</td>
</tr>
<tr>
<td>feixuc-Ø</td>
<td>feixuc-Ø-s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>mic-o</td>
<td>mic-o-s</td>
</tr>
<tr>
<td>llor-o</td>
<td>llor-o-s</td>
</tr>
<tr>
<td>gueny-o</td>
<td>gueny-o-s</td>
</tr>
<tr>
<td>xat-o</td>
<td>xat-o-s</td>
</tr>
</tbody>
</table>

However, when a nominal with allomorph Ø has a stem ending in a sibilant (s, z, ñ, ñ̥, ñ̞), the masculine allomorph -o is chosen in the plural. This change of allomorph prevents a contact between two sibilants, one from the stem and one from the plural suffix s. Some examples of this phonologically-conditioned allomorphy appear in (5). The Ø that appears in the singular forms corresponds to the gender-related allomorph. The singular morph is also Ø but is omitted for clarity. A voiceless [s] is spelled as ss between vowels. The spelling ix corresponds to [ʃ] in the examples below, and tx corresponds to [tʃ].

(5) **Mixed masculine nominals: Ø in the singular, -o in the plural**

<table>
<thead>
<tr>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>gos-Ø</td>
<td>goss-o-s</td>
</tr>
<tr>
<td>peix-Ø</td>
<td>peix-o-s</td>
</tr>
</tbody>
</table>

\(^2\) There is a third, less common, allomorph /a/, which will be ignored in this paper for expository reasons. Gender-related morphemes have also been called word markers, class markers or form-class morphemes, among others. The exact nature of these morphemes and their direct or indirect relation to gender is irrelevant for the purposes of this paper. For some discussion, see, for instance, Harris (1991) or Harris (1999).
BLM (2007) propose an analysis of these cases within a parallel model of OT in which the input contains underlying phonological representations. Following Mascaró (2007), they propose that the input of all masculine nominals contains the two allomorphs, in an ordering relation. The lexical entry of this morpheme appears in (6); ' > ' (‘dominates’) is to be interpreted as 'is preferred to' or 'is less marked than'.

(6) MASCULINE: \{Ø > o\}

A universal constraint called PRIORITY, defined in (7) (see Mascaró 2007: (18)), penalises the choice of the less preferred allomorph -o.

(7) PRIORITY: Respect lexical priority (ordering) of allomorphs.

Given an input containing allomorphs m₁, m₂, ..., mₙ, and a candidate mᵢ', where mᵢ' is in correspondence with mᵢ, PRIORITY assigns as many violation marks as the depth of ordering between mᵢ' and the highest dominating morph(s).

The tableaux in (8) and (9) show how different allomorphs of the masculine are chosen in the singular and in the plural, respectively, when the stem, here gos 'dog', ends in a sibilant (see BLM 2007 for a detailed analysis). The input contains the root plus the allomorphs of the masculine, with their ordering relation. The constraint OCPṣib penalises sequences of sibilants. In (8), because there is no phonological conflict, PRIORITY determines the choice of the unmarked, dominant allomorph Ø. In (9), the addition of the plural suffix -s causes a violation of OCPṣib if the unmarked masculine allomorph Ø is chosen; the ranking OCPṣib >> PRIORITY forces the selection of the marked allomorph -o.

(8) Tableau corresponding to gos 'dog' (singular) in parallel OT

<table>
<thead>
<tr>
<th>gos-{Ø &gt; o}</th>
<th>OCPṣib</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. gos-Ø</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. goss-ø</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(9) Tableau corresponding to gossos 'dogs' (plural) in parallel OT

<table>
<thead>
<tr>
<th>gos-{Ø &gt; o}-s</th>
<th>OCPṣib</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. goss-o-s</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b. goss-ø-s</td>
<td>1W</td>
<td>L</td>
</tr>
</tbody>
</table>

Let us see now how these facts must be handled in HS/OI. In OI the input contains only morphosyntactic features, and in HS GEN can perform only one operation at a time. An output like goss-o-s cannot be obtained if we assume, as McCarthy (2012) does, that spell-out necessarily takes place inside outwards (see the discussion around (3)).

Even though within Principles and Parameters / Minimalist approaches to syntax there seems to be no consensus on the structural position of gender (or class) and number, when the two are considered it is assumed that the category hosting number dominates
input at step 2 would be /gos-masc-pl/ and we would expect [MASCULINE] to be spelled out before [PLURAL]. But at that stage nothing would prevent the insertion of the dominant allomorph Ø: the allomorph -o would violate PRIORITY, and OCPsub would be satisfied in both cases; the output /goss-o-pl/ would be harmonically bounded by /goss-Ø-pl/, and we would expect the same allomorph Ø that we find in the singular gos.

What triggers the insertion of the masculine allomorph -o is the morph -s corresponding to [PLURAL]; it is a case of outward-looking allomorphy. This means that the assumption that spell-out strictly proceeds inside outward must be abandoned in favour of a weaker model where the ranking of specific Faith-M constraints determines the order of spell-out, not a restriction on GEN (see Wolf 2008: chapter 3 for discussion along the same lines). We need a constraint MAX-M(PLURAL) ranked above MAX-M(MASCULINE). The derivation of goss-o-s must be <DOG-masc-pl, gos-masc-pl, gos-masc-s, goss-o-s>.

The tableaux in (10) show the HS/OI derivation of goss-o-s with the crucial ranking MAX-M(PLURAL) >> MAX-M(MASCULINE). At step 1, /gos-masc-pl/ is the winner due to the high ranking of MAX-M(ROOT). The relevant steps are step 2, in (10b), and step 3, in (10c). At step 2 GEN creates candidates with either [MASCULINE] or [PLURAL] spelled out, but not both. Since [MASCULINE] has two allomorphs either of them can be inserted. Subscripts have been added to each allomorph to indicate their lexical preference relation: Ø1 is the dominant, preferred allomorph, and -o2 the less preferred one; the latter, but not the former violates PRIORITY. The sequence /gos-masc-s/, which is the only candidate that violates OCPsub, is selected as the optimal output because of the high ranking of MAX-M(PLURAL). At step 3 a violation of OCPsub is avoided only by the candidate with the marked morph -o, the winner. At step 4, not shown in (10), convergence is reached, since no further harmonic improvement is possible.

(10) Derivation of gossos 'dogs' in HS/OI

a. Step 1

<table>
<thead>
<tr>
<th>DOG-masc-pl</th>
<th>MAX-M (ROOT)</th>
<th>MAX-M (PLURAL)</th>
<th>OCPsub</th>
<th>MAX-M (MASC)</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>gos-masc-pl</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>dog-masc-pl</td>
<td>1W</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

b. Step 2

Ranking proven: MAX-M(PLURAL) >> OCPsub, MAX-M(MASC)

<table>
<thead>
<tr>
<th>gos-masc-pl</th>
<th>MAX-M (ROOT)</th>
<th>MAX-M (PLURAL)</th>
<th>OCPsub</th>
<th>MAX-M (MASC)</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>gos-masc-s</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>gos-Ø1-pl</td>
<td></td>
<td>1W</td>
<td>L</td>
<td>L</td>
<td>1W</td>
</tr>
<tr>
<td>gos-Ø2-pl</td>
<td></td>
<td>1W</td>
<td>L</td>
<td>L</td>
<td>1W</td>
</tr>
<tr>
<td>gos-masc-pl</td>
<td>1W</td>
<td>L</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

the category hosting gender (or class). See, for instance, Picallo (2008) or Schoorlemmer (2009).
c. Step 3

**Ranking proven: OCP\textsubscript{SIB} >> PRIORITY**

<table>
<thead>
<tr>
<th>gos-MASC\textsubscript{S}</th>
<th>MAX-M (ROOT)</th>
<th>MAX-M (PLURAL)</th>
<th>OCP\textsubscript{SIB}</th>
<th>MAX-M (MASC)</th>
<th>PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. goss-o\textsubscript{2}-s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>ii. gos-Ø\textsubscript{1}-s</td>
<td>1W</td>
<td></td>
<td></td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>iii. gos-MASC-s</td>
<td>1W</td>
<td>1W</td>
<td></td>
<td></td>
<td>L</td>
</tr>
</tbody>
</table>

In this section it has been shown that masculine allomorphy before plurals in Catalan is a case of outward-looking allomorphy which requires a weakening of the claim that spell-out operates strictly inside outward. The phenomenon can be accounted for within HS/OI if constraints of the MAX-M(F) family can be ranked freely. In this case, the necessary ranking is MAX-M(PLURAL) >> MAX-M(MASCULINE), with the phonological constraint OCP\textsubscript{SIB} being ranked below MAX-M(PLURAL). An analysis in terms of parallel OT does not present any problems either.

3. Second piece of the argument: plural non-realisation in NEC Catalan

3.1. The phenomenon

Catalan, like most Romance languages, has gender and number concord within the DP triggered by the noun, as (11) illustrates. The noun is feminine plural and all the modifiers (determiners, adjectives) are feminine plural, whether prenominal or postnominal.

(11) Aquest-e-s vell-e-s **cas-e-s** abandonad-e-s
    this-FEM-PL old-FEM-PL **house-FEM-PL** abandoned-FEM-PL
    'these old abandoned houses'

In North-Eastern Central (NEC) Catalan, however, the plural morph -s does not surface in prenominal position when it would appear between two consonants (C\_\_C). The two necessary conditions for the non-realisation of the plural morph -s appear in (12).

(12) Conditions for non-realisation of plural -s:
    a. the plural morph belongs to a prenominal element
    b. the plural would appear in the context C\_\_C

Some examples of this phenomenon appear in (13), where the absence of the expected plural morph (present in other dialects of Catalan) is indicated with a low dash (\_). The examples are taken from BLM (to appear) (see also Wolf 2008 and Nevins 2011 for examples and discussion of this phenomenon). The noun appears in boldface in all the examples of this type that are mentioned in the paper so that it is easier to distinguish prenominal and postnominal modifiers.

(13) a. molt_ poc_ bon_ **professional-s**
    very few good professional-PL
    'very few good professionals'
    b. aquest_ **cabell-s** llarg-s tenyt-s
    this_ hair-PL long-PL dyed-PL
    'these dyed long hairs'
In (13a) the three modifiers appear in prenominal position (condition 12a)), and all of them start and end in a consonant (condition (12b)); for these reasons they do not surface as *mols* 'very/many-PL', *pocs* 'few-PL', and *bons* 'good-PL'. In (13b), as expected, the prenominal demonstrative *aquests* 'these' surfaces without the plural morph (the two conditions in (12) are met), but the noun and the two postnominal adjectives do surface with the plural morph, in spite of the fact that the -s appears between two consonants in each case; condition (12a) is not met. In (13c), the demonstrative *aquells* 'those' surfaces without the plural morph because of the presence of two surrounding consonants, but the prenominal adjective *vells* 'old-PL' does surface with the plural morph -s because the following noun, *amics*, starts with a vowel; condition (12b) is not met. Finally, in (13d) the plural morph surfaces in all prenominal modifiers and the noun because it is always preceded by a vowel (the feminine-related morph -e, pronounced [ə]); condition (12b) is not met.

### 3.2. Failure of concord, not deletion

In section 3.1 it was assumed that the missing -s in NEC Catalan is a case of non-realisation of a morpheme rather than the result of phonological deletion. This section is devoted to showing that this is indeed the right interpretation (see McCarthy 2012 for some similar arguments for Classical Arabic). A deletion analysis faces problems related to the target of the deletion and to the domain of the deletion.

This phenomenon does not have the properties of conventional phonological deletion, because it does not affect other coronal sibilants of the language in the same phonological context (C_C), as the examples in (14a,c) show. In (14a) the DP-internal modifier ends in s but it is not deleted in spite of the fact that it is prenominal and appears between two consonants, because the s belongs to the stem of the adjective *fals*. This example constitutes an almost minimal pair with (14b), where the plural -s of the prenominal adjective is not realised; this adjective is pronounced *mals* before a vowel in NEC Catalan (e.g. *mal-s amic-s* 'bad friends'). In (14c) an s that is the exponent of a morpheme is realised between two consonants, but this morpheme is not the plural found in nominals but a second person singular morpheme found in verbs, in this case *pots*. Again, the example in (14d) constitutes an almost minimal pair with (14c); in (14d) the absent s is the exponent of the plural morpheme of a prenominal modifier, and it is not realised because it appears between two consonants; before a vowel or in any context in other dialects of Catalan, this modifier would be realised as *pocs* (e.g. *poc-s amic-s* 'few friends').
The domain in which the absence of the plural morph is found cannot be characterised easily in phonological terms either. In order to capture the prenominal-postnominal asymmetry a single prosodic phrase would have to be postulated containing all prenominal elements plus the noun; each postnominal modifier would have to constitute an independent prosodic phrase: deletion would affect plural s between two consonants within a prosodic constituent. The needed prosodic constituency is shown schematically in (15). ’Mod’ stands for any type of determiner or adjective; curly brackets indicate prosodic boundaries.

(15) \{Mod_1 \ Mod_2 \ N\} \{Mod_3\} \{Mod_4\}

The prosodic structure in (15) cannot be justified on prosodic grounds. According to Prieto (2002a,b), intermediate prosodic phrases in Catalan are characterised by an abrupt intonational rise on the last syllable, optionally preceded by lowering on the same syllable and optionally followed by a pause; length is not distinctive. Two or more prosodic phrases are found in sentences with long subjects, adjuncts, coordinated structures, most subordinated structures, or peripheral elements. No description of Catalan intonation can be found that makes a distinction in the intonation of noun-adjective sequences versus adjective-noun sequences, although given the facts from NEC Catalan one would expect nouns to belong to a different phrase than a following adjective, while an adjective should belong to the same prosodic phrase as a following noun. But there are no differences in the intonational contour of sentences like those in (16). In (16a) the adjective follows the noun while in (16b) the adjective precedes it.  

(16) a. Hi havia una boira densa  
    there had a fog dense  

b. Hi havia una densa boira  
    there had a dense fog  
    'there was a dense fog'

BLM (to appear) also show that non-realisation occurs, whenever the two conditions in (12) are met, regardless of the heaviness of the prenominal sequence. It could be claimed that the prosodic phrasing that originates the asymmetries is not visible on the surface because different factors, like speech rate or weight, modify it. But even if this were the case, which is unlikely if we are considering the phenomenon to be phonological deletion, some reasonable mechanism would have to derive the needed initial prosodic phrasing. One could try to adapt to these cases aspects of the proposal put forward in Ackema & Neeleman (2003) for clausal agreement asymmetries.

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^4 See Dehé and Samek-Lodovici (2009) for similar conclusions for Italian, a closely related language.
Following work by Selkirk and others, they propose the Alignment constraint in (17).

This constraint operates at the output of the syntax and creates an initial prosodic structure.

(17) Align the right edge of an XP with the right edge of a $\phi$.

In the cases they consider, this constraint parses differently sequences of a subject followed by the verb, which form a single prosodic phrase, and sequences where the subject follows the verb, in which case two different prosodic phrases are created. But in Principles and Parameters / Minimalist syntax no analyses of the DP can be found that would derive the prosodic structure in (15) because, for instance, adjectives are assumed to head APs, and a prenominal adjective, then, would cause the undesired presence of a right AP boundary to the left of the NP.

An additional reason in favour of the non-realisation interpretation is that other languages have agreement asymmetries within the DP, most often without any obvious phonological context participating in them. In Moroccan Arabic (Shlonsky 2004) demonstratives agree in gender and number with the noun when postnominal, but are bare stems when prenominal; Central Ladin (Rasom 2008) feminine plural nouns trigger gender and number agreement postnominally, but only gender agreement prenominally; Asturian (Fernández-Ordóñez 2007) has mass agreement postnominally but gender agreement prenominally. Other examples can be found in Abkhaz (Hewitt 1979) or Spanish (Eddington & Hualde 2008), for instance.

Finally, and in a more general basis, claiming that we are dealing with a case of phonological deletion would imply modifying some standard, well established assumptions on how phonology works. Since the deletion would occur at the phrasal level, we would be dealing with a postlexical phenomenon. But the process would have to crucially mention the morphosyntactic status of the target, the fact that it is the plural morph.

There are enough reasons to conclude that the absence of the plural -s is the result of lack of agreement (lack of concord), rather than phonological deletion.

3.3. Analysis in parallel OT and HS/OI

The parallel analysis of plural non-realisation in NEC Catalan to be presented here is the one proposed in BLM (to appear), somewhat simplified. In this proposal, the syntax is responsible for postnominal agreement only (possibly through a Spec-Head configuration). Postyntactically, morphosyntactic faithfulness and markedness constraints that are interspersed with phonological constraints determine the final agreement patterns. The faithfulness constraint $\text{Max}(-\text{MPH})$, defined in (18a), prevents the deletion of agreement features assigned by the syntax, present on the noun and postnominal modifiers; the markedness constraint $\text{Conc}(\text{Ord})$, defined in (18b), penalises the lack of concord with the noun for any modifier (determiner, quantifier, adjective) present in the DP, either prenominal or postnominal. $\text{Max}(-\text{MPH})$ and $\text{Conc}$ can be relativised to different agreement features (gender, number), in NEC Catalan the relevant features being those corresponding to number.
(18) a. **MAX(-MPH)**: Every morpheme of the input has a correspondent in the output (no morphological deletion).
   b. **CONC(ORD)**: if a N has an inflectional feature F, all other modifiers within the DP must have the inflectional feature F.

The tableau in (20) illustrates how final concord is obtained for an example like (13c), repeated here as (19). The input contains the plural feature of the noun *amic* and that of the postnominal adjective *present* already realised; postnominal agreement has taken place syntactically, and the corresponding morphs have been inserted. The phonological constraint that penalises an interconsonantal *s* appears simplified as *CsC.*

(19) Aquell_vell-s amic-s present-s
    that old-PL friend-PL present-PL
    'those old present friends'

(20) Simplified tableau for (19)

<table>
<thead>
<tr>
<th>Input: aquell_vell amic-sPL present-sPL</th>
<th>MAX(num)</th>
<th>*CsC</th>
<th>CONC(num)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. acquell_vell-sPL amic-sPL present-sPL</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>b. acquell-sPL vell-sPL amic-sPL present-sPL</td>
<td>2W</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>c. acquell_vell-sPL amic__ present-sPL</td>
<td>1W</td>
<td>L</td>
<td>2W</td>
</tr>
</tbody>
</table>

Candidate (20c) is the only candidate that satisfies the phonological constraint fully but it is ruled out by the higher ranked constraint MAX(num) because the noun has not preserved the feature [PLURAL] that was present syntactically. Candidate (20b) satisfies the constraint that requires full concord CONC(num), but it does not win because it violates the phonological constraint more than the winner. For candidate (20a), the winner, the ranking MAX(num) >> *CsC ensures that the plural morph is realised on the noun and in postnominal position, regardless of the phonological context; the ranking *CsC >> CONC(num) triggers prenominal concord as long as a vowel appears before or after the plural morph, as is the case in the partial sequence *vell-s amic-s* in (20). In sequences like *fals conseller* 'false counselor', in (14a), the root-final *s* of the adjective appears already in the input and MAX-SEGMENT, ranked above *CsC prevents its deletion.

Let us see now how this phenomenon can be accounted for within HS/OI. We can assume, as in the previous analysis, that syntactically there is only postnominal agreement. With this assumption, the input of (19) will be as shown in (21), with abstract roots and the feature [PLURAL] (and [MASCULINE]) only on the noun and the postnominal adjective.

(21) Input in HS/OI: THAT OLD FRIEND-MASC-PL PRESENT-MASC-PL

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5 The proposal in BLM (to appear), is slightly simplified in this paper, for expository reasons. In that paper a distinction is made, for inputs like /amic-sPL/, between deletion of a morphosyntactic feature like [PLURAL], which violates MAX(num), and deletion of its exponent, which violates MAX-SEGMENT. Candidate (20c) violates both.
We can assume with McCarthy (2012: §7) that in the first steps of the derivation the spell-out of morphemes and word-internal changes take place in parallel for each word; the domain for serial and gradual derivation is the $X^0$. At the phrasal level the domain has expanded and it is natural to assume that any change that takes place at any locus within the DP will then count as one change. In what follows, the relevant domains, the word or the DP, appear between square brackets. With these assumptions, at step 1 of the derivation the root of each word is inserted in parallel, due to the high ranking of MAX-M(PL). The input to step 2 is therefore as shown in (22).

(22) Input to step 2: [aquell] [vell] [amic-MASC-PL] [present-MASC-PL]

Given the ranking of the spell-out constraints MAX-M(PL) >> MAX-M(MASC), argued for in section 2, the input to step 3 (output of step 2) is presumably as in (23a), with plural morphs on the noun and the postnominal adjective derived in parallel. The input to step 4 (output of step 3) is as in (23b), with the phonologically realised masculine morphs (dominant allomorph Ø, which satisfies PRIORITY). Prenominal modifiers are kept unmodified because at the word level there is no relevant operation that could apply to them, given that agreement is a phrasal operation, and the derivation has to proceed bottom-up.

(23)  
   a. Input to step 3: [aquell] [vell] [amic-MASC-s] [present-MASC-s]  
   b. Input to step 4: [aquell] [vell] [amic-Ø-s] [present-Ø-s]

The output of step 4 is identical to its input for the purposes of this paper (irrelevant phonological modifications are ignored here). At the phrasal domain, the CONC constraints have to force gender and number agreement to spread to prenominal elements, and these features must be phonologically realised, forced by the effect of MAX-M constraints. Ignoring here whether CONC targets one modifier at a time or whether number and gender spread independently of each other, the input to the relevant step for the issues at hand, called here step 5, will be as in (24). The features [MASCULINE] and [PLURAL] are now present on the prenominal modifiers. The intermediate square brackets of (23) have disappeared and the whole DP, the phrasal domain here, appears between brackets.

(24) Input to step 5: [aquell-MASC-PL vell-MASC-PL amic-Ø-s present-Ø-s]

At this point the relevant constraints are the ones that realise the gender and number features (MAX-M(PL) and MAX-M(MASC)) and the phonological constraint *CsC. The ranking of *CsC above MAX-M(PL) ensures that the plural morph is realised only when there is no phonological conflict, as the tableau in (25) illustrates. The last modifier, presents, has been suppressed to concentrate on the relevant, prenominal, modifiers. Although, the realisation (or non-realisation) of the plural morphs should proceed gradually, from modifier to modifier, tableau (25) shows all the relevant steps at the same time, for convenience, and the steps are numbered as steps 5/6. In (25) the candidate with all the plural morphs realised, (25b), is ruled out because the first one (in aquell-MASC-s) violates the phonological constraint; the faithful candidate, (25c) violates the constraint MAX-M(PL) twice, while the winner, (25a) violates it only once.
(25) Steps 5/6  

<table>
<thead>
<tr>
<th>Input: aquell-MASC-PL vell-MASC-PL amic-Ø-s</th>
<th>*CsC</th>
<th>Max-M (PL)</th>
<th>Max-M (MASC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. aquell-MASC-PL vell-MASC-s amic-Ø-s</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>b. aquell-MASC-s vell-MASC-s amic-Ø-s</td>
<td>1W</td>
<td>L</td>
<td>2</td>
</tr>
<tr>
<td>c. aquell-MASC-PL vell-MASC-PL amic-Ø-s</td>
<td>2W</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Ranking proven: *CsC >> Max-M(PL)

At steps 7/8, the feature [MASCULINE] will be realised, with Ø over -o being selected by PRIORITY. The output at convergence will be [aquell-Ø-PL vell-Ø-s amic-Ø-s].

It seems, then, that HS/OI can account for the asymmetric non-realisation of the plural morpheme in NEC Catalan nicely. The problems with this model appear when the two phenomena cooccur; that is, when in NEC Catalan a prenominal modifier has a stem ending in a sibilant and the noun is masculine plural. This is shown in the next section.

4. Cooccurrence of allomorph selection and plural non-realisation

4.1. Problems for HS/OI

Not too surprisingly, those adjectives that end in a sibilant, like escàs 'scarce', in (5), and occur in prenominal position before a masculine plural noun surface with the less preferred, marked gender-related allomorph -o and the plural -s, escass-o-s; the vocalic gender-related allomorph favours the realisation of the plural morph, because the C__C context is not met. One such example appears in (26).

(26) escass-o-s fet-Ø-s [askàsusfèts] (*escàs fets)
scarce-MASC-PL fet-MASC-PL
'very few facts'

Following the analysis that was given for (19), aquell_vells amics presents, the steps for (26) will be, up to the problematic steps, as shown in (27). The input to step n, in (27e), contains the adjective with the gender and number features, which have satisfied the constraint CONCORD in one or two steps.

(27) a. input to step 1: [ESCÀS] [FET-MASC-PL] (word domain)
b. input to step 2: [escàs] [fet-MASC-PL] (word domain)
c. input to step 3: [escàs] [fet-MASC-s] (word domain)
d. input to step 4: [escàs] [fet-Ø-s] (word domain)
...  
e. input to step n: [escàs-MASC-PL fet-Ø-s] (DP domain)

The tableau in (28) shows the derivation of step n, which has [escàs-MASC-PL fet-Ø-s] as the input. Only one of the abstract morphemes can be spelled out. The candidate with the plural morpheme realised, (28c), cannot be the winner because it violates *CsC (and in addition OCP sub), which is crucially ranked above Max-M(PL). The ranking *CsC >> Max-M(PL) was proven in tableau (25), corresponding to aquell_vells amics (presents). There is a crucial competition between candidates (28a) and (28b) (28d) is included only for completeness). In order to achieve the desired final output escass-o-s fet-s we would need the marked gender-related allomorph -o₃ to be selected, but
because the plural morph has not yet been inserted, there is no pressure for its selection (no violation of the phonological constraints *CsC or OCP\textsubscript{Sib}), and the candidate with the less marked, dominant allomorph Ø\textsubscript{1} is the winner instead.

(28) Step n

<table>
<thead>
<tr>
<th>Input: escàs-MASC-PL fet-Ø-s</th>
<th>*CsC</th>
<th>Max-M (PL)</th>
<th>OCP\textsubscript{Sib}</th>
<th>Max-M (MASC)</th>
<th>PRIOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. escàs-Ø\textsubscript{1}-PL fet-Ø-s</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. escass-Ø\textsubscript{2}-PL fet-Ø-s</td>
<td>1</td>
<td></td>
<td></td>
<td>1W</td>
<td></td>
</tr>
<tr>
<td>c. escàs-MASC-s fet-Ø-s</td>
<td>1W</td>
<td>L</td>
<td>1W</td>
<td>1W</td>
<td></td>
</tr>
<tr>
<td>d. escàs-MASC-PL fet-Ø-s</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in (29), the consequences of step n are fatal at convergence, because the final output is [escàs-Ø-PL fet-Ø-s], that is, the ungrammatical *escàs fets of (26). Resorting to a different constraint ranking for phrasal phonology, as in Stratal OT (Kiparsky 2000, Bermúdez-Otero to appear), will not solve the problem. As mentioned above, the only candidate that would ultimately lead to the right grammatical output, escass-Ø-s fet-Ø-s, would be candidate (28b), with the -o allomorph, but this candidate is harmonically bounded by the candidate with the dominant Ø allomorph (28a), the winner, so there is no constraint ranking that could make (28b) the winner.

(29) Step n+1: Convergence: *escàs fets

<table>
<thead>
<tr>
<th>Input: escàs-Ø\textsubscript{1}-PL fet-Ø-s</th>
<th>*CsC</th>
<th>Max-M (PL)</th>
<th>OCP\textsubscript{Sib}</th>
<th>Max-M (MASC)</th>
<th>PRIOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. escàs-Ø\textsubscript{1}-PL fet-Ø-s</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. escass-Ø\textsubscript{1}-s fet-Ø-s</td>
<td>1W</td>
<td>L</td>
<td></td>
<td>1W</td>
<td></td>
</tr>
</tbody>
</table>

The problem that sequences like escassos fets in NEC Catalan pose for HS/OI is directly related to the need for the plural morph to be present for the marked gender-related allomorph -o to be inserted, but at the same time we need the -o to be present for the plural morph to have a chance to surface. These two operations cannot be done sequentially, which is precisely the basic feature of HS; they must be done in parallel.

4.2 A parallel analysis

A parallel account of the two phenomena does not face the problems that arise with HS/OI. The appropriate ranking of the constraints necessary to derive the selection of a less preferred gender-related allomorph (OCP\textsubscript{Sib} >> PRIORITY), shown in section 2, tableau (9) for goss-Ø-s, and the constraint ranking needed to account for the asymmetric absence of the plural morph within the DP (MAX(num) >> *CsC >> CONC(num)), shown in tableau (20) for aquell_ vells amics presents, accounts also for the cases where the two phenomena cooccur, like escass-Ø-s fet-Ø-s in (26). The tableau in (30) shows the one-step derivation of this sequence. In the input, as has been assumed all along, the prenominal adjective does not have any gender and number features; these are assigned at PF by GEN, together with the corresponding morphs, and are controlled by the relevant constraints. The noun contains all the allomorphs of [MASCULINE] and
the plural morph -s. No candidates are included in (30) that violate \( \text{MAX}(\text{num}) \) to focus on the fate of the adjective.

<table>
<thead>
<tr>
<th>(30) Parallel OT</th>
<th>Ranking proven: ( \text{CONC}(\text{num}) &gt;&gt; \text{PRIORITY} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input: escas</td>
<td>fct-{Ø₁ &gt; o₂}_MASC-§PL</td>
</tr>
<tr>
<td>a. escass-Ø₁-s</td>
<td>fct-Ø₁-s</td>
</tr>
<tr>
<td>b. escas-Ø₁</td>
<td>fct-Ø₁-s</td>
</tr>
<tr>
<td>c. escas-Ø₁-s</td>
<td>fct-Ø₁-s</td>
</tr>
<tr>
<td>d. escas</td>
<td>fct-Ø₁-s</td>
</tr>
</tbody>
</table>

Because in parallel OT candidates can have any number of changes with respect to the input, candidate (30a) is a valid candidate, an option not available in HS/OI. Contrary to candidates (30b) and (30d), the winner agrees in gender and number with the noun and therefore satisfies \( \text{CONC}(\text{num}) \) and also \( \text{CONC}(\text{gend}) \) (added here for completeness). The candidate with the dominant masculine allomorph Ø, (30c), violates the two phonological constraints, which makes (30a) the winner, because it only violates low ranked \( \text{PRIOR} \). The simultaneous presence of -o and -s in (30a) has as a consequence the satisfaction of \( \text{*CsC} \) and \( \text{OCP}_{\text{SIB}} \), a possibility that is unavailable in a model in which morphs must be introduced one at a time.

5. Conclusions

The model HS/OI has been shown to be well suited, with a crucial modification, to account separately for two related phenomena from Catalan. One of the phenomena, the selection of a marked masculine-related allomorph -o that avoids sequences of sibilants, is general in Catalan and, as was shown, it is a case of outward-looking allomorphy. A first result of this paper is that this fact requires giving up a restriction on \( \text{GEN} \) so that spell-out works strictly inside outward; the burden must be passed to constraints and constraint ranking. The crucial ranking \( \text{MAX-M(PLURAL)} >> \text{MAX-M(MASCULINE)} \) forces the insertion of the plural morph first, which, in a later step, forces the selection of the marked allomorph -o to avoid an \( \text{OCP}_{\text{SIB}} \) violation. The second phenomenon, restricted to NEC Catalan, is found in the phrasal domain, the DP, and consists of the non-insertion of the plural morph -s only in prenominal position when it would surface between two consonants. For this type of cases it was assumed that the syntax triggers only postnominal agreement and that at PF constraints on agreement, interspersed with phonological constraints, determine final agreement within the DP. For NEC Catalan, the crucial ranking \( \text{*CsC} >> \text{MAX-M(PL)} \) at a phrasal step prevents the spell-out of the plural morph. A second, more important, result of this paper is that it has been shown that HS/OI is incapable of deriving the right output when the two phenomena cooccur within the same DP, that is when a prenominal modifier with a stem ending in a sibilant appears next to a masculine plural noun starting with a consonant, in which case the prenominal adjective surfaces with the marked -o allomorph plus the plural morph. For the -o allomorph to be selected, the plural morph -s should have been inserted first, but

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As in OI, it could be assumed that the input contains only abstract morphemes, \( \text{GEN} \) giving access to all the exponents. This option is is ignored here for simplicity; the relevant aspects of the analysis would not change.
for the plural morph to be realised, the presence of a previously selected -o allomorph would be necessary, but these two desired situations cannot be achieved simultaneously in a model, like HS, where changes can only be introduced one at a time. A parallel analysis of each case and the combination of the two does not run into the problems faced by the HS/OI approach, because in parallel OT GEN can introduce several changes at a time. Here it crucially can insert any gender-related allomorph together with the number allomorph.

Although the parallel approach has been shown to be more adequate for the phenomena analysed in this paper, it cannot account for the very first phenomenon from Classical Arabic, exemplified in (2), that was used to illustrate HS/OI. McCarthy (2012) shows the clear advantages of deriving the absence of nunation in pause in HS, with the gradual insertion of morphs. In principle, parallel OT wrongly predicts that the output before pause should be identical to the output in the contextual form, because a form like [kita:b-u-nCont] satisfies the heaviness requirement (HIP); the output [kita:b_pau] (more precisely [kita:b-NOM-INDEF_pau] is not expected.

If we put together the three phenomena that have been discussed in this paper, two from Catalan and one from Classical Arabic, one possible conclusion to draw from this puzzle is that only for word-internal evaluation is GEN restricted to make one step at a time; for phrasal phenomena GEN would not have such restriction. This might not be a desirable move because it would imply that different properties are attributed to GEN depending on the level of derivation, but more research is needed on HS and phrasal phenomena to find out whether this is the direction to go. Obviously, the other option is to find an alternative analysis for the Classical Arabic facts in a parallel approach or to find a different analysis for the Catalan phenomena in HS, but this is beyond the scope of this squib.

References


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