

# On two sources of $\phi$ -feature valuation and the consequences for syntactic computation: A case study from the Italian nominal inflection

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While it has been recognized in the semantics literature that gender features may be valued either from the syntactic structure, or from the context (Heim, 2008; Spathas, 2010; Sudo, 2012, among others), the consequences of the two sources of valuation for establishing  $\phi$ -feature Agree chains have not been sufficiently explored. This paper attempts to remedy the situation by presenting a case study of Italian nominal inflection that directly bears on this question. The Standard Italian nominal system morphologically marks two distinct genders, three distinct nominal classes (idiosyncratic nominal endings), and two numbers, a combination which lends itself to a theoretical investigation of number-gender interactions. Crucially, Italian nominal inflection also distinguishes between grammatical, i.e., idiosyncratic, and natural, i.e., context-dependent, gender. This paper provides evidence that even though the source of valuation of these two genders is distinct, their grammatical locus is the same. More precisely, they enter the same gender Agree chain. The main theoretical contribution of the paper comes from configurations in which there are two possible sources of valuation of the same gender Agree chain. This in turn allows us to investigate the timing of related syntactic operations and their interactions in a controlled way.

I use the intricate patterns to argue that we need to distinguish between valuation by Agree, i.e., a narrow-syntax process that utilizes Feature Inheritance (Richards, 2007; Chomsky, 2008, and subsequent work) and Agree, and variable binding, i.e., a process that gets triggered by labeling modeled as minimal search (Chomsky, 2013). While in most cases the output of these two processes is identical, I present data from the domain of socio-linguistic variation where we can observe a reflex of the distinction in the overt morphology.

More precisely, the data provide evidence that unvalued  $\phi$ -features within DP are always introduced by D. If  $\phi$ -features appear on lower functional heads, it is only via Feature Inheritance. Their value, however, may be assigned either by an assignment function introduced by D, triggered by labeling at the Transfer to the interpretive component, or it may be encoded in the lexical entry of a nominal root (cf. Kramer 2009).<sup>1</sup>

The option of having features valued from two different places, combined with Feature Inheritance, yields non-trivial timing interactions, including interactions that are best modeled in terms of  $\phi$ -feature Agree intervention. The crucial observation is that only properly individuating D introduces a complete set of gender and number features. Consequently, gender assignment is dependent on the divisional function in the sense of Borer (2005), and not on the counter function, related to the Number feature.

The second major contribution of the paper is that it provides evidence that there is no gender and number dependency as such (cf. Greenberg 1963; Noyer 1992; Harley and Ritter 2002, among others). Instead, the paper argues that the seeming gender-number dependency is a side effect of gender valuation being dependent on the (non-)deficiency of the divisional head. The empirical motivation for the proposal comes from the domain of mass nouns and nominals denoting predicative or non-atomic relations; namely, from the observation that Ds referring to non-atomic entities give rise to defective gender and number chains in a way parallel to defective T in the CP domain.

Aside from providing a theoretical motivation for distinguishing between valuation by Agree and variable binding, and a theoretical explanation for the cross-linguistically common dependency between number and gender, the paper makes one additional theoretical contribution. Namely, that only a subset of nouns are based on category-neutral roots (cf. Marantz 1997), a conclusion supported by data from derivational morphology and compounding.

## 1 The puzzle

In his foundational study of Spanish nominal inflection, Harris (1991) provides extensive evidence that gender and class markers<sup>2</sup> must be modeled as two sepa-

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<sup>1</sup>I assume throughout that feature matching is distinct from feature valuation (Chomsky, 2000; Adger, 2003; Pesetsky and Torrego, 2007, among others).

<sup>2</sup>I will use the term ‘class marker’ as a descriptive label for idiosyncratic nominal vowel endings. The theoretical status of these markers is one of the questions to be addressed in this study.

rate entities. The same pattern that motivated Harris' conclusions arises in Standard Italian.<sup>3</sup> In general, native speakers of Italian share the intuition that vocalic endings on nominals correspond to grammatical gender.<sup>4</sup> Namely, a noun which in singular ends in *-o* is grammatically masculine (M) where grammatically masculine means that it triggers a masculine agreement on agreeing elements such as determiners or predicative adjectives, while nouns ending in *-a* are grammatically feminine (F), and nouns ending in *-e* can be either. Even though this correlation is frequent, a closer look at the data does not support this intuition beyond it being a statistical tendency. While it is indeed the case that some nouns ending in *-o* are grammatically always masculine, such as *il libro* 'the.M book',<sup>5</sup> there is a handful of *-o* nouns that are grammatically always feminine such as *la mano* 'the.F hand' and some *-o* nouns denoting people may be grammatically masculine or feminine depending on the natural gender of their referent, such as *il soprano*, *la soprano* 'the.M soprano, the.F soprano,' or *il chirurgo*, *la chirurgo* 'the.M surgeon, the.F surgeon'.<sup>6</sup>

The same type of gender variation is attested with nouns ending in *-a* and *-e* as well, for instance, *l'artista bravo* 'the-artist good.M' vs *l'artista brava* 'the-artist good.F', *il giornalista* 'the.M journalist' vs *la giornalista* 'the.F journalist', and *il preside* 'the.M head (of something)' vs *la preside* 'the.F head (of something)', *il vigile* 'the.M watch person' vs *la vigile* 'the.F watch person'.

Based on this data we can conclude that class marker and grammatical gender cannot correspond to the same grammatical representation because the same ending can correspond to either gender and either gender can be realized by any of the vocalic endings. It follows that if both gender and class marker are part of the morpho-syntactic module,<sup>7</sup> they must be modeled as separate entities.

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<sup>3</sup>The basic facts extend to Italo-Romance and Ibero-Romance dialects, though the dialectal groups show distinct behavior in agreement patterns and in some nominal domains, such as mass nouns. See [left out for anonymity].

<sup>4</sup>Unless indicated otherwise, the data are from my ongoing project with [left out for anonymity]. The data were either collected from native speakers, or are a result of systematic dictionary, grammar, and internet searches.

<sup>5</sup>Throughout the paper I mark gender in glosses on elements that agree in gender with the noun in question. Abbreviations used in the paper: M: masculine, F: feminine, GEN: gender, NUM: number, SG: singular, PL: plural, CL: class, MN: mass noun.

<sup>6</sup>The agreement properties of nouns that may be grammatically feminine or masculine depending on the natural gender of their referent is complicated by various socio-linguistic factors, such as social prestige. I will discuss the existing variation in ending and agreement properties in detail in Section 2.7.

<sup>7</sup>I assume a Distributive Morphology style of grammar architecture (Halle and Marantz, 1993),

Interestingly, there is a class of nouns which challenges this conclusion, namely, nouns with endings that change depending on the natural gender of their referent. In these nouns, so called *mating nouns* of Harris (1991), the vocalic ending is strictly determined by the grammatical gender of the referent. More precisely, if a mating noun ends in *-o*, for instance *il bambino*, *il ragazzo*, then it denotes a male or an underspecified individual. Thus, *bambino* denotes a baby or a baby boy, while *ragazzo* denotes a boy or a child in general. In contrast, *-a* versions of mating nouns strictly denote females. Thus, *la bambina* is the baby girl, and *la ragazza* is the girl.<sup>8</sup>

The attested pattern thus raises following questions: (i) What is the relationship between grammatical and natural gender? (ii) What is the relationship between class marker and gender? (iii) How come in some instances natural gender ‘rewrites’ the nominal ending, while in others leaves it intact?

The rest of the paper is organized as follows. Section 2.1 will introduce a toy grammar of Italian nominal inflection. In order to minimize theoretical assumptions which might obscure some less obvious properties of the system, the account will first be somewhat naïve, becoming more refined as we consider more complex data, some of them being introduced as predictions of the system. Crucially, the basic pieces introduced here will have major consequences for the overall architecture of the proposed model. Section 2.2 will introduce natural gender and will argue that gender may come into the derivation either via the root or via D. That the value of the gender feature can come from two distinct places introduces non-trivial timing issues. 2.3 explores the two basic configurations differing only in where the feature value comes from. Nouns strictly based on gender valued by D are investigated in Section 2.4. Section 2.5 refines the distinction between the two sources of gender value by introducing PERSON into the system. The two basic configurations differ in the amount of structural information that must be present in the lexicon. As we will see, only a subset of the nouns are formed by category-neutral roots. Section 2.6 looks closely at predictions stemming from this conclusion. Section 2.7 investigates socio-linguistic variation attested in the gender marking system, and provides a crucial piece of evidence of the proposed distinction between variable binding and valuation by Agree. Section 2.8 comments on some predictions the system makes for V-N compounds.

A crucial assumption of the proposal is that  $\phi$ -features are strictly introduced

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however, I will use the term ‘morpho-syntactic’ as a useful shortcut for syntactic features and representations which will play role in the morphological realization module.

<sup>8</sup>See Percus 2011 for an extensive discussion of such examples.

by D, and if they appear on lower functional heads it is only by Feature Inheritance. Since, as we will see, features may be valued from two distinct places: D and the root, we expect to find Agree intervention type of data. ‘Relational’, ‘predicational’ and mass nouns investigated in Section 3 show that this prediction is borne out. Section 4 concludes by addressing some cross-linguistic issues raised in the existing literature.

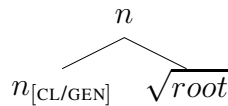
## 2 How many genders are there: A case study of feature valuation

### 2.1 Dissociating class marker and gender

We have seen in the previous section that we need to dissociate the grammatical realization of gender and class marker (or at least the nominal vocalic endings) in order to account for the basic data patterns in Standard Italian. I argue that we will need to make one more distinction: we will need to distinguish between gender being an idiosyncratic part of the lexical specification and gender being introduced in syntax. In order to see what type of grammatical restrictions the data patterns impose on us, I will first propose a toy grammar of the nominal inflection of Standard Italian. After we introduce the basic pieces, the next section will investigate how to add natural gender to the system.

The basic idea is this: if a class and/or gender value is idiosyncratic, then it needs to be associated with the root already in the lexicon, be it a valued feature of some sort or a lexical diacritic.<sup>9</sup> Consequently, such a root cannot be category neutral in the sense of Marantz (1997). Furthermore, if the valued feature appears on a higher functional head, it must have been valued by Agree.

Formally, such an idiosyncratic value might come about in two distinct ways. Either the root is stored in a lexicon as a nominal structure, i.e., a structure already including category-defining  $n$ :

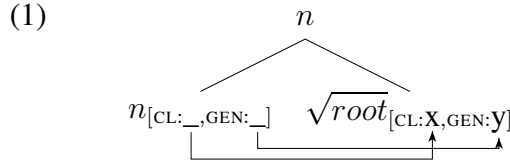


valued class feature/diacritic which will restrict which functional head will be able to combine with such a root,  $\sqrt{root}_{[CL/GEN]}$ .<sup>10</sup> As for the latter option,  $n$  would

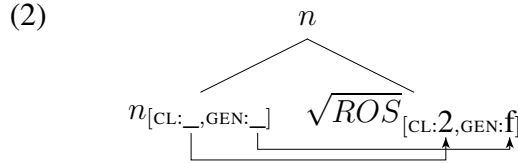
<sup>9</sup>Embick (2000); Embick and Noyer (2007, and subsequent work) argue that even though the phonological form of a root is not syntactically represented, other properties, such as features, might be in principle accessible to syntax.

<sup>10</sup>If c-selection can be reduced to Agree, such a diacritic needs to be modeled as some kind

be merged in syntax (as category-defining  $n$ ) and the class and/or gender feature value would be assigned via Agree:



For concreteness, if we assign *-a* nouns class value 2, a noun like *rosa* ‘rose’, which is grammatically feminine would have the following representation:



I assume that the actual vocalic ending is inserted in morphology, with the morphological realization being determined by morphological mapping rules strictly based on the subset principle (Halle and Marantz, 1993). The mapping rules need to reflect number, which we don’t have in the system yet, but ultimately we want something like (3).<sup>11</sup> Note that the mapping rules reflect the intuition that the vocalic endings reflect the class, not the gender.

- (3)
- a. [CL:1, GEN:α] → -o
  - b. [CL:2, GEN:α] → -a
  - c. [CL:3, GEN:α] → -e
  - d. [CL:1, pl] → -i
  - e. [CL:2, pl] → -e
  - f. [CL:3, pl] → -i

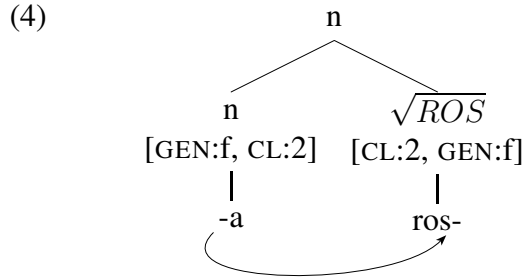
If we assume some form of morphological affixation (be it m-merger, affix hopping, or whatever bound morpheme procedure the reader prefers), we obtain the

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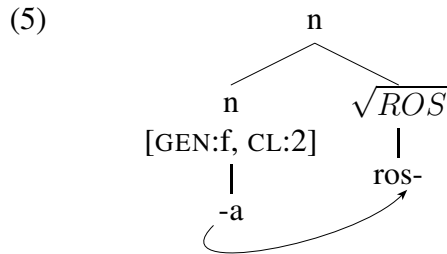
of feature, though it is not clear to me what type of feature it would be. Another option is that  $n$  would select a root based on a list of possible nominal roots. This would mean, however, that technically such a root would be category-neutral. In Section 2.6, we will see evidence that these roots indeed are not.

<sup>11</sup>Since then the plural endings of class 1 and class 3 are identical, we could in principle collapse the (d)–(f) rules into two. Since such a move would make no difference for the rest of the paper, I’ll stick to the more transparent version.

following structure for *rosa* ‘rose’:



Note that if we assumed a structure with CL/GEN features on *n* being already valued in the lexicon, the structure for *rosa* would be as in (5). As the reader can easily verify for herself, there is no difference between these two representations, neither for the purposes of morphological insertion nor feature interaction with a higher syntactic structure. In the remainder of the paper, I will use this simpler representation for the sake of clarity of presentation. In fact, if unvalued gender features are introduced to the derivation only by D, the simpler option is the only viable option. Unless, of course, category-defining *n*P forms a phase. Since I am not aware of any data that would directly bear on the question of the potential phasehood of *n*P, I will leave this question for future exploration. Note also that if the unvalued gender feature comes from D, it couldn't participate in c-selection (if indeed c-selection can be reduced to Agree, as argued for instance in Adger 2003).



With this system in place, we predict that any combination of class and gender should be possible, which is correct. Thus, we straightforwardly derive the possibility of having masculine *-o* nouns, masculine *-a* nouns, feminine *-o* nouns, feminine *-a* nouns, masculine *-e* nouns, and feminine *-e* nouns.

Though the current system seems to cope well with the basic type of Italian

nouns, it raises some nontrivial questions. First, it is indeed the case that most *-o* nouns are masculine and that most *-a* nouns are feminine. In the proposed system, this comes out as an accident. I do not have a principled answer to this concern but perhaps it is benign, as the dissociation of class and gender is relatively recent in the history of Indo-European languages and the statistical tendency toward a uniform mapping might simply be an accidental leftover of an earlier system lacking the dissociation. Another related question concerns the nature of the class marker. Having such a feature in the structure is suspect, as it does not seem to interact in any way with the rest of the syntactic structure. It is plausible that the class marker is a semi-fossilized structure from previous stage of the language system. Recall that class and gender dissociation is a rather recent development: even though the class feature remains an important property of the system, its syntactic role has diminished and has been mostly replaced by grammatical gender. Under such a view, it isn't surprising that the class feature in and of itself cannot interact beyond the limited scope of *n*P. The model to be developed in the next two sections essentially captures such an intuition. In addition, the assumption provides an obvious account for the existing socio-linguistic variation discussed in Section 2.7. Yet, it is worth considering whether we might be able to get rid of the class marker altogether. The most obvious move to make would be to say that the vocalic ending is part of the root (or the stem) and there is only a gender feature associated with the root. We could then adjust our mapping rules that no vocalic ending would be mapped onto *n* whenever the stem would end in a vowel.<sup>12</sup> Even though it is possible to devise a technical solution, we would lose the extension to the existing variation discussed in Section 2.7. Furthermore, I am not aware of any other data that would distinguish between these two proposals. Consequently, I am not convinced it is a move worth making as it doesn't seem to provide any insights and in fact it obscures some of the interactions. In the remainder of the paper, I will thus assume that there is a class marker in the structure as it makes the discussion more transparent, but the reader is welcome to consider the alternative.

Before we start looking at interactions with natural gender, let's make sure we can build a complete DP out of the current structure. To obtain a complete DP, we need to merge at least Num and D projections (Ritter, 1993, 1995; Borer, 2005).<sup>13</sup> Since D agrees in number and gender, it will need to have unvalued NUM and GEN

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<sup>12</sup>Having the mapping rules sensitive to the phonological form of the stem is necessary because of mating nouns in which gender 'rewrites' the vocalic ending. Mating nouns would need to have consonant-final roots.

<sup>13</sup>Even though I follow Borer (2005) in her basic insights, I will not make use of her more fine-grained nominal structure.

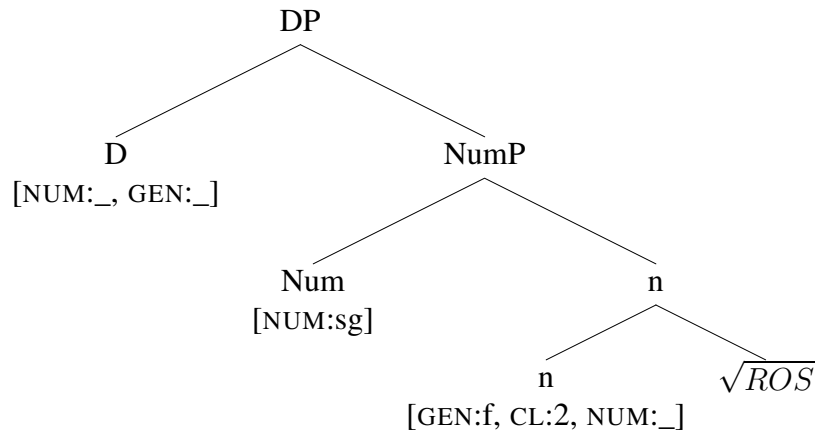


features. For concreteness, we can assume that Num comes with a valued NUM feature from the lexicon, though we will need to revise this assumption in the next section, Section 2.2.<sup>14</sup> Note also that I use simplified labels F/M and SG/PL in order to avoid for now the question of the exact feature geometry.

As for the technical details, let's assume downward probing Agree, with matching and valuation being distinct (Chomsky, 2000; Adger, 2003; Pesetsky and Torrego, 2007).<sup>15</sup> The complete step-by-step derivation of *la rosa* 'the.F rose' is given in (6).

(6) *la rosa* 'the.F rose': feminine -a noun

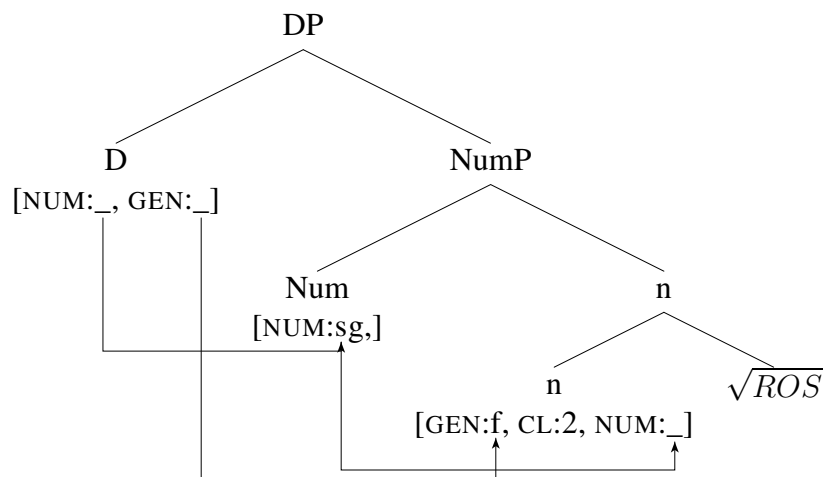
a. feature distribution taken from the lexicon:



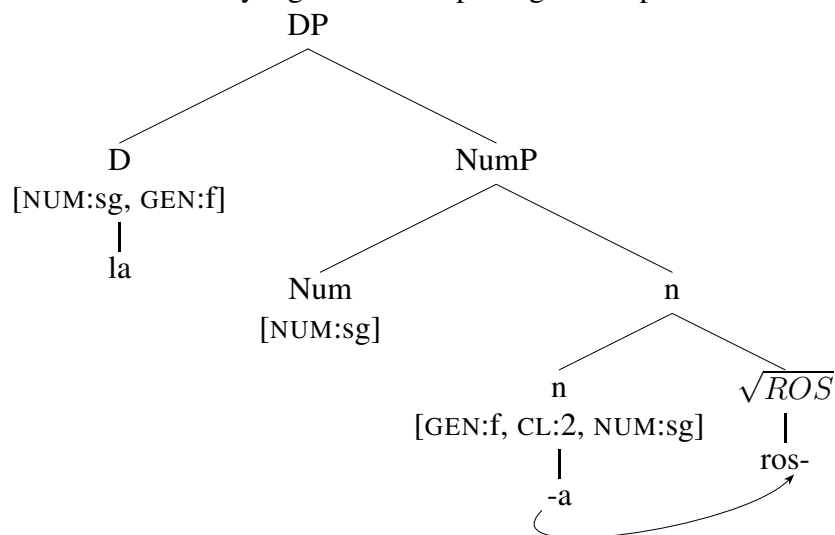
b. Matching:

<sup>14</sup>We also need unvalued NUM feature on *n* in order to have a complete set of features required by the morphological mapping rules.

<sup>15</sup>Note that with the system set up this way,  $\phi$ -features need to probe separately because if we included a requirement on  $\phi$ -completeness, nothing would ever get valued within a DP. (See Danon 2011 for a detail discussion of the issue of  $\phi$ -completeness within DP.) However, once we introduce Feature Inheritance, we will be able to dispense with this stipulation.

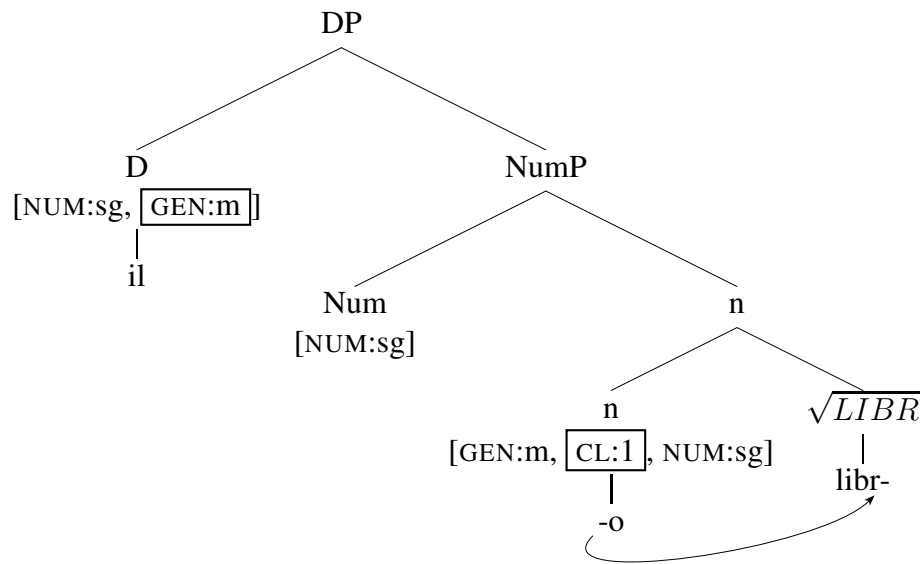


c. Feature valuation by Agree and morphological output:

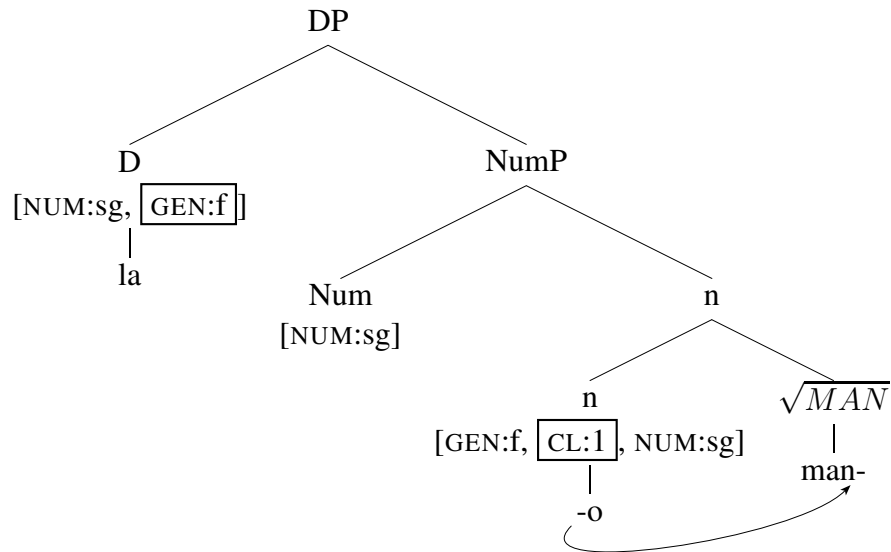


As the simplified derivations in (7)–(8) show, the same structure gives us a masculine *-o* noun such as *il libro* ‘the.M book’, i.e., another case in which the vocalic ending seems to correspond to gender. In order to derive a feminine *-o* noun such as *la mano* ‘the.F hand’, we only need to alter the value of gender on *n*. The boxes indicate which features are central for the morphological realization.

(7) *il libro* ‘the.M book’: masculine *-o*-noun



- (8) *la mano* ‘the.F hand’: feminine -o noun



## 2.2 Natural gender, and the issue of timing

This cannot be the full story though as there are nouns that come from the lexicon with an idiosyncratic class marker but their grammatical gender is determined by the natural gender of their referent. Thus there are -o nouns that can grammatically

be either masculine or feminine, such as *il/la soprano* ‘the.M/F soprano’ and *il/la chirurgo* ‘the.M/F surgeon’. The same gender duality is attested with *-a* nouns (for instance, *artista* ‘artist’ and *autista* ‘driver’) and *-e* nouns (e.g. *preside* ‘head (of something)’ and *vigile* ‘watch person’) as well. Interestingly, for some speakers, the grammatically masculine form of these nouns can refer to a female as well. Here gender cannot be determined on the root, unless we posit two distinct lexical entries.

The data is reminiscent of mismatches between grammatical and natural gender attested in pronominal systems. Consider the following examples from Czech:

- (9) To děvče přeběhlo přes ulici...  
 that.N.SG girl.[N].SG run-quickly.PAST.3.SG.N across street  
 ‘The girl ran quickly across the street...’
- a. a já jsem si říkal, jak  
 and I am.PRES.1.SG REFL said.PAST.1.SG.M how  
 byla krásná.  
 was.PAST.3.SG.F beautiful.SG.F
- b. a já jsem si říkal, jak  
 and I am.PRES.1.SG REFL said.PAST.1.SG.M how  
 bylo krásné.  
 was.PAST.3.SG.N beautiful.SG.N
- ‘and I was thinking how beautiful she was.’

As these examples demonstrate, if there is a mismatch between the natural and grammatical gender of the referent (*děvče* ‘girl’ is grammatically neuter but it denotes a female), the anaphoric pronominal  $\phi$ -feature representation can agree either with the natural gender of the referent (feminine, as in (9a)), or with the grammatical gender (neuter, as in (9b)). The crucial observation here is that pronominal agreement and gender specification on pronouns is anaphoric, but the source of the relevant antecedent is in principle twofold (Heim and Kratzer, 1998): namely, the  $\phi$ -feature valuation can be determined either from the structure (syntax), or from the context. Technically, the gender feature is construed as a variable (Heim, 2008; Spathas, 2010; Sudo, 2012, among others), and its value is determined by an assignment function.

I follow the essence of this treatment here and I argue that unless  $\phi$ -features within DP are specified from the lexicon, they must be introduced by D. I model D as a (situational) pronoun (Percus, 2000; von Stechow and Heim, 2007/2011; Schwarz, 2009), i.e., a bundle of  $\phi$ -features where the individual features are mod-

eled as variables bound within the structure or from the context.<sup>16</sup> I argue that in syntactic terms binding such features corresponds to unvalued  $\phi$ -features being valued. The critical distinction is whether the valued feature will come from the lexicon, or whether it will be determined by D, accessing the value either from the syntactic, or from the non-syntactic context.<sup>17</sup> If  $\phi$ -features appear on lower functional heads, aside from those introduced in the lexicon, it is by Feature Inheritance (Richards, 2007; Chomsky, 2008, and subsequent work). If the features will be valued from the context, we will effectively obtain natural gender. In contrast, if the value of gender is determined in the lexicon, we will obtain grammatical gender. Crucially, there is no formal distinction between grammatical and natural gender features as such. In other words, while the source of valuation is twofold (the syntactic structure in the case of grammatical gender, the context in the case of natural gender), their locus is the same, i.e., both grammatical and natural gender enter the same Agree chain.

Interestingly, as we will discuss in detail in Section 2.7, even though the locus of grammatical and natural gender is the same *within* a DP, the difference in valuation will play a critical role in the labeling of the nominal structure (Chomsky, 2013).

Let's now turn to the syntactic derivation. Since the value of  $\phi$ -features may be determined from the structure (here, the value on  $n$  obtained from the lexicon) or from the context, we need to make sure that the individual operations happen in the right order. I argue we need the following order of syntactic operations:

- (10) *The timing of syntactic operations:*
- (i) Merge of D
  - (ii) inheritance of unvalued  $\phi$ -features from D onto lower functional heads
  - (iii) matching
  - (iv) valuation by Agree using features already present in the structure

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<sup>16</sup>Using variable representations avoids some non-trivial difficulties associated with constructing context-dependent valuation as Agree. As we will see in Section 2.7, there are non-trivial differences between variable bounding and valuation by Agree but crucially they concern labeling of the nominal structure (Chomsky, 2013), not the Agree chain within the nominal structure.

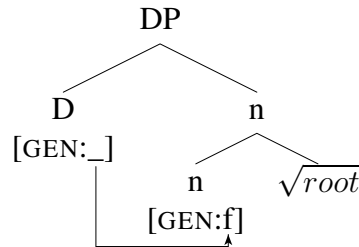
<sup>17</sup>The proposed system might seem reminiscent of Collins and Postal (2012) and their idea that there might be a pronoun embedded within a syntactically larger DP. In the present proposal, however, there are no two distinct values of  $\phi$ -features. The purpose of D being modeled as a situational pronoun is solely to have a formalization of how natural gender values might be made accessible to syntax proper. We will see more details on how exactly this is done in Sections 2.4 and 2.5.

- (v) valuation of D from the context for the features that have not been valued yet
- (vi) valuation by Agree of remaining features, simultaneous throughout the Agree chain

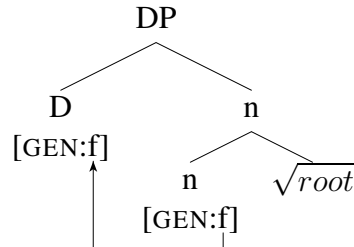
The two basic configurations of gender valuation within a DP are given in (11)–(12). I indicate the difference between grammatical and natural gender by adding an index to the feature valued by D.<sup>18</sup>

(11) *Configuration I: Gender from the lexicon (n)*

a. Matching:



b. Valuation by Agree within the structure:

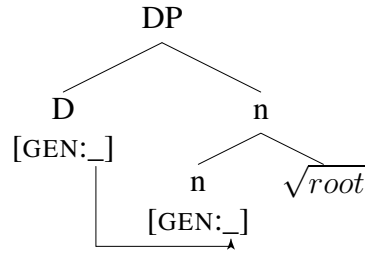


(12) *Configuration II: No gender from the lexicon (D)*

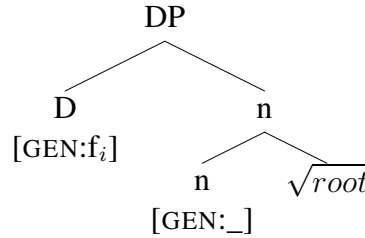
a. Matching:

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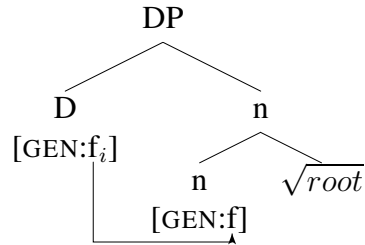
<sup>18</sup>For now, I use the index only for explanatory purposes, however, as we will see in Section 2.5, the presence of the index indicates a [+PERSON] feature and is relevant for the semantic interpretation of the structure.



- b. No valuation within the structure, D valued from outside:



- c. Valuation by Agree within the structure:



Note that even though we have discussed only gender, number should be modeled analogically to gender. While in most cases, the number on a nominal is determined from the context (either from the world of evaluation or from the syntactic structure), it may be determined from the lexicon as well as in the case of pluralia tanta. I will not articulate the argument here, but from now on I will assume that number is indeed introduced by D as well. With this move, there is no point in the derivation when Agree would take place before the complete set of unvalued  $\phi$ -features is introduced in the structure. Consequently, we can dispense with the worry expressed in the current literature (cf. Danon 2011), according to which  $\phi$ -features in the DP domain are unlike  $\phi$ -features in the CP domain in that they need to probe separately. Once we take the notion of Feature Inheritance seriously,  $\phi$ -features in both of these domains can be modeled in an identical way.

The attentive reader might wonder whether the proposed system utilizes some notion of semantic agreement. Though it might superficially seem to be the case,

so far the system is strictly based on the syntactic notion of Agree. As it will become clearer once we discuss the implementation for concrete examples, the interpretive effect is restricted only to the LF interpretation of the referential index associated with the valuation from the context.

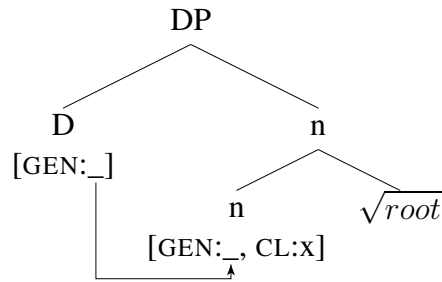
## 2.3 Gender-class interactions

As we have seen, the current system utilizes two basic configurations for Italian nominal inflection: one with the value of gender being determined from the lexicon, and one with the value being introduced by D. The structure in (11) corresponds to the cases we have investigated so far (*il libro, la rosa, . . .*). The structure in (12) schematizes what happens when gender is not determined from the lexicon but is determined by D instead. The structures are simplified in that they don't take the role of the class feature into account. We will turn to the interaction of class and gender in this section.

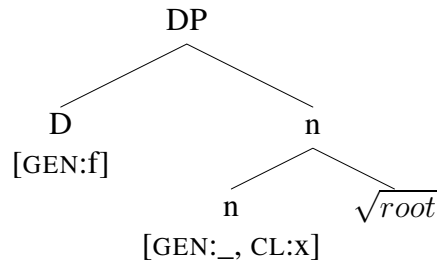
There are two basic sub-configurations of (12) to consider. In the first one, even though there is no gender value from the lexicon, the root structure comes with a class feature. With the mapping morphological rules introduced in (3) and repeated below, we expect no change in the form of the noun itself, as the vocalic ending is determined by the class. In contrast, the determiner and other agreeing elements should reflect the gender value introduced by D. A schematic representation for such a configuration is given in (13). As before, the features crucial for morphological insertion are indicated by boxes.

- (3)
- a. [CL:1, GEN: $\alpha$ ]  $\rightarrow$  -o
  - b. [CL:2, GEN: $\alpha$ ]  $\rightarrow$  -a
  - c. [CL:3, GEN: $\alpha$ ]  $\rightarrow$  -e
  - d. [CL:1, pl]  $\rightarrow$  -i
  - e. [CL:2, pl]  $\rightarrow$  -e
  - f. [CL:3, pl]  $\rightarrow$  -i
- (13) *Configuration IIa: No gender but class from the lexicon*
- a. Matching:

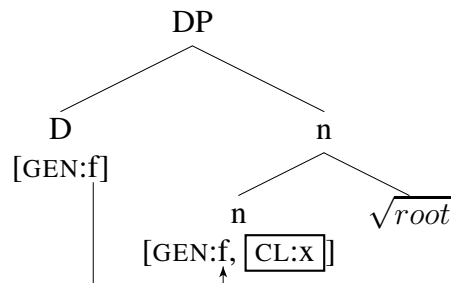




- b. No valuation of gender within the structure, D valued from outside:



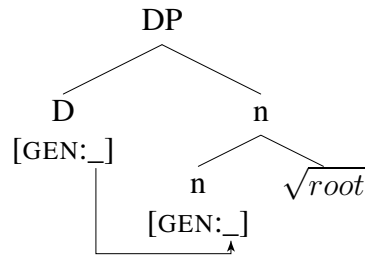
- c. Valuation by Agree within the structure:



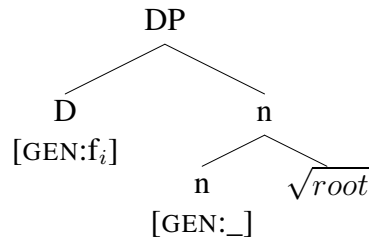
On the other hand, the system predicts that if there are nouns formed by category-neutral roots (i.e., roots that neither have a gender feature nor a class marker determined in the lexicon), their morphological form, including the vocalic ending on the noun itself, should solely be determined by the gender value brought to the structure by D. Such a configuration is schematized in (14).

- (14) *Configuration IIb: No gender or class from the lexicon (D)*

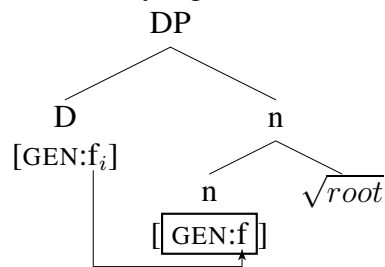
- a. Matching:



- b. No valuation within the structure, D valued from outside:



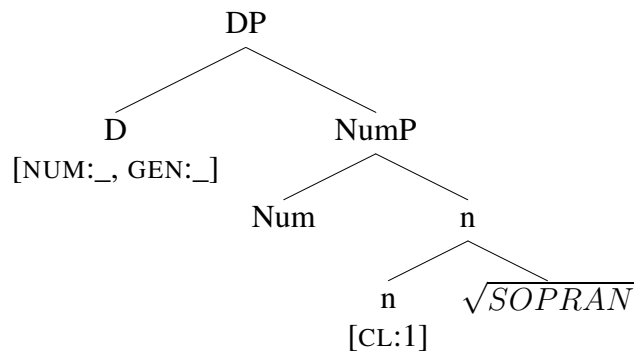
- c. Valuation by Agree within the structure:



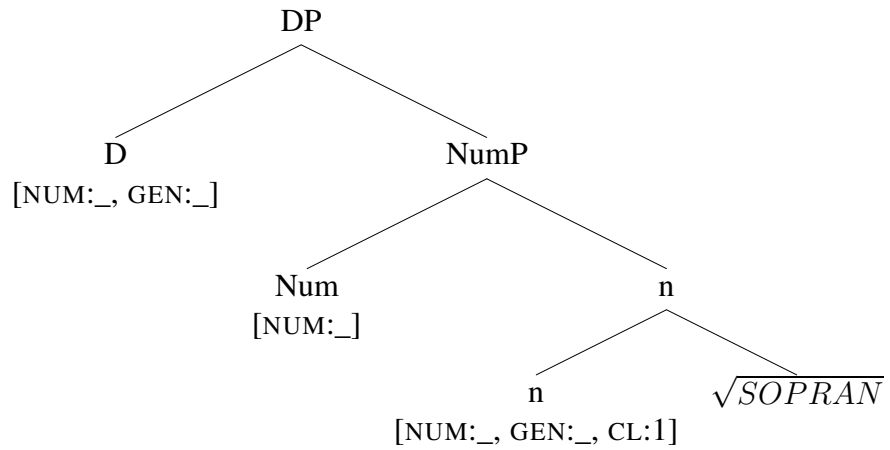
Both of these configurations are empirically attested. The configuration in (13) corresponds to nouns like *soprano*, i.e., nouns for which grammatical gender is dependent on the natural gender of the referent but the form of the noun itself remains unaltered. A detailed derivation of *il soprano* is given in (15). The parts crucial for morphological realization are again indicated by boxes.

(15) *il soprano* ‘the.M soprano’

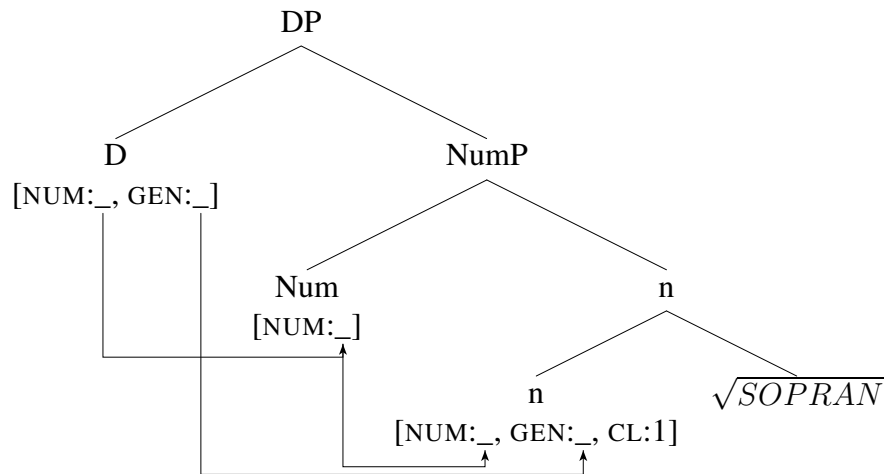
- a. feature distribution taken from the lexicon:



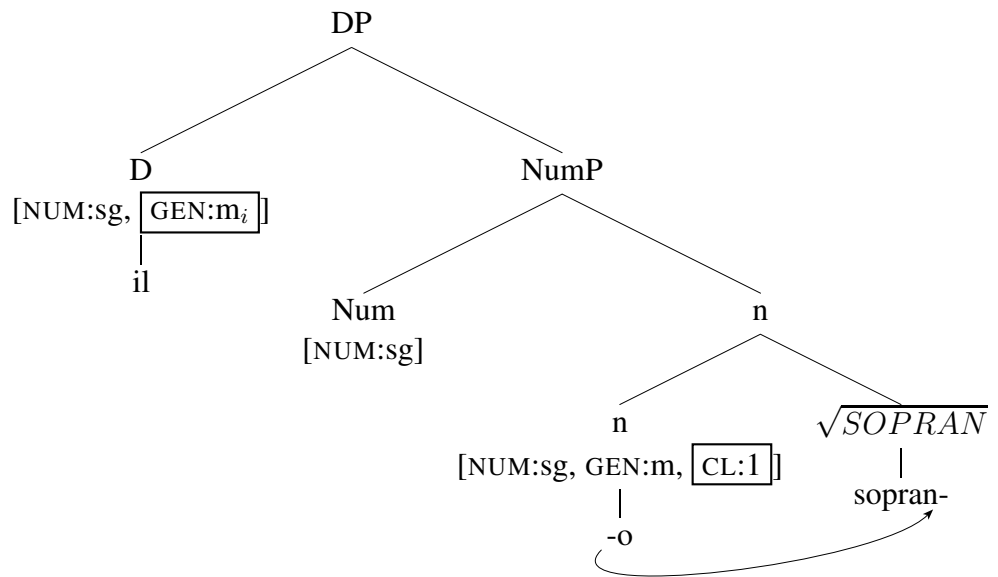
- b. feature distribution after feature inheritance takes place:



- c. Matching:

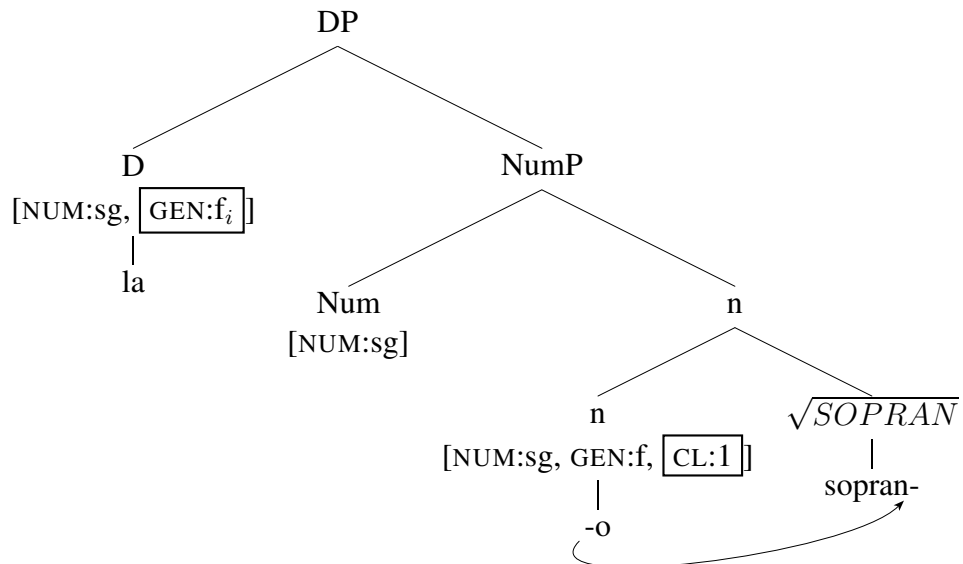


- d. Feature valuation and morphological output:



A simplified derivation of the feminine version of *soprano*, i.e. *la soprano* ‘the.F soprano’ is given in (16). The only difference in the derivation is that this time the gender feature on D gets valued as feminine.

(16) *la soprano* ‘the.F soprano’



In all of these configurations, agreement with the rest of the syntactic structure is strictly determined by the value of the gender feature introduced by D.

## 2.4 When gender trumps class: mating nouns

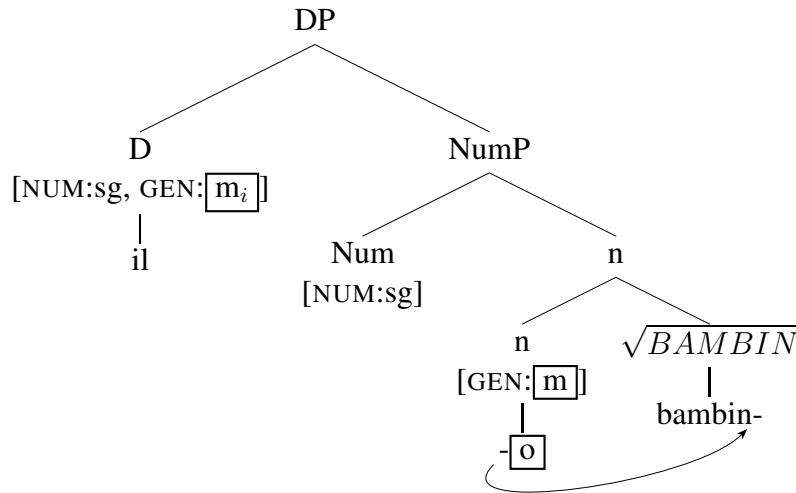
Let's now turn to nouns corresponding to (14). These are nouns with no gender or class feature determined from the lexicon. Since D introduces only  $\phi$ -features to the structure, there should be no class marker in the structure. Instead we expect the vocalic ending to be strictly determined by gender, i.e., the vocalic ending is the exponent of a gender feature. This is exactly what we find with so-called mating nouns, i.e., nouns whose vocalic endings are dependent on the natural gender of their referent, such as *il bambino* 'the.M baby/baby boy' vs *la bambina* 'the baby girl', *il ragazzo* 'the.M kid/boy' vs *la ragazza* 'the.F girl'.

In order to account for the morphological realization, we need to expand our set of mapping rules for  $n$  to include rules sensitive to gender. The most straightforward way to account for the data is to posit a set of rules such as those given in (17).

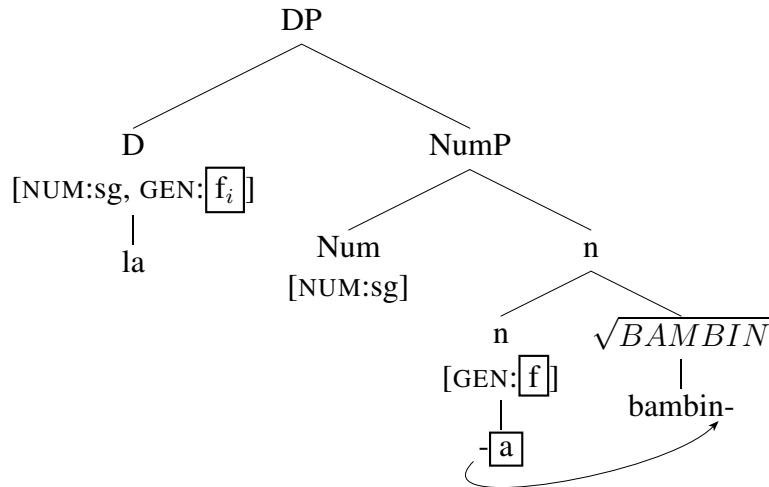
- (17) *Mapping rules for  $n$*
- a. [CL:1, GEN: $\alpha$ ]  $\leftrightarrow$  -o
  - b. [CL:2, GEN: $\alpha$ ]  $\leftrightarrow$  -a
  - c. [CL:3, GEN: $\alpha$ ]  $\leftrightarrow$  -e
  - d. [GEN:m]  $\leftrightarrow$  -o
  - e. [GEN:f]  $\leftrightarrow$  -a

With such mapping rules and the current system in place, we straightforwardly derive the alternation attested in mating nouns, as the reader can verify for herself in the simplified structures in (18) and (19).

- (18) *il bambino* 'the.M baby/baby boy'



(19) *la bambina* ‘the.F baby girl’



## 2.5 The lost person

We currently have two sources of gender valuation: the gender value can be either determined idiosyncratically from the lexicon, or it may be supplied by D. Interestingly, D seems to provide the gender value only if D refers to an animate referent. In other words, whenever D is the source of valuation, it is animate. I argue that in technical terms the observation corresponds to saying that whenever

D is the source of the gender value, D is valued for PERSON. Furthermore, I argue that there is a formal dependency between PERSON feature and GENDER feature on D, namely, only the [+PERSON] feature may value the [ $\pm$ GENDER] feature.

More precisely, there is a co-occurrence restriction on PERSON and gender values. The guiding intuition is that only if D can be associated with an animate object, may the identity of the object be used to assign a natural, i.e., context-dependent, gender. This formally corresponds to saying that only D associated with a referential index ( $i$ ) and a [+PERSON] feature may become a source of gender valuation.

Note that this implementation also sheds light on the traditional distinction between animate and inanimate gender. Technically, animate gender is a gender feature which requires the co-occurrence of a [+PERSON] feature. Inanimate gender lacks this co-occurrence requirement. In the next section, we will investigate how exactly the co-occurrence restriction interacts with the rest of the structure.

Before we do so, let's have a closer look at the notion of the index. So far, we have taken the presence of the index to be an indication of D being valued from outside. More precisely, the syntax of the index corresponds to the combination of a [+PERSON] feature and gender, which is valued by the PERSON feature. The index, however, plays a crucial role in the semantic interpretation of the gender feature as well.

Note that once we allow both types of gender features to enter the same Agree chain, we need to ensure that they don't get interpreted more than once. More precisely, only gender features that correspond to the biological gender of the referent, i.e., those associated with the [+PERSON] feature and a referential index, not grammatical gender introduced in the lexicon, must be semantically interpreted. The denotation of gender features proposed in (20) is meant to achieve exactly this interpretative effect.

- (20) (modeled after Heim and Kratzer 1998; Sudo 2012)
- a.  $\llbracket [\text{GEN:f}_i] \rrbracket^{w,g} = \llbracket [\text{she}_i] \rrbracket^{w,g} = \llbracket [\text{herself}_i] \rrbracket^{w,g} = g(i)$  if  $g(i)$  is female in  $w$ , undefined otherwise
  - b.  $\llbracket [\text{GEN:m}_i] \rrbracket^{w,g} = \llbracket [\text{he}_i] \rrbracket^{w,g} = \llbracket [\text{himself}_i] \rrbracket^{w,g} = g(i)$  if  $g(i)$  is a person in  $w$ , undefined otherwise

Since the interpretation function in (20) ultimately interprets a referential index associated with the gender ( $i$ ), not the actual gender feature, it will return a semantic denotation corresponding to natural gender only if the values of features on D are determined from the context. This semantic restriction is achieved by the

relevant assignment function being accessible only to D, and D being the source of the features on lower functional heads. If the gender value is assigned in the lexicon, it won't be interpreted by (20) because it lacks the index.<sup>19</sup> Note also that while the denotation specifies feminine grammatical gender as denoting a female, the masculine gender is in principle compatible with both natural genders, which is exactly what we find in Standard Italian.<sup>20</sup> Thus, feminine *la soprano* 'the.F soprano' must denote a female, whereas *il soprano* 'the.M soprano' may denote a person of either gender.<sup>21</sup>

Finally, let's consider the properties of the gender feature if D is valued for [−PERSON]. In this case, the gender of the nominal is either determined by a gender value on the root, or it is the morphological default, i.e., [−GENDER], which in Italian corresponds to masculine. I will keep using the labels masculine and feminine in the rest of the paper, but the markedness of feminine and the dependency of the gender on D and person will be relevant for the predictions made by the system.

## 2.6 Predictions: Category neutral roots

Before we continue refining the current system, it is useful to consider some robust predictions the system makes, to ensure that the proposed implementation is in principle on the right track. First of all, the current proposal makes a clear prediction that concerns the fact that some roots should come from the lexicon as being specified for nominal features, while others seem to be category neutral. Since only mating nouns are based on category-neutral roots as they do not carry any idiosyncratic marking from the lexicon, only mating nouns should be able to have corresponding verbs derived from the same root without any special verbal derivational morphology, i.e., derived only by the default inflectional suffix *-are*. This prediction is borne out. As far as I have been able to establish, there are no verbs based on the roots of nouns that carry a class marker, as approximated in (21).<sup>22</sup> In contrast, mating nouns tend to have verbal counterparts, as seen in (22),

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<sup>19</sup>Though it might obtain a natural gender interpretation indirectly from the lexical semantics of the root.

<sup>20</sup>The proposed asymmetry only holds for the semantic interpretation. There is nothing in the proposed system which would make F syntactically marked.

<sup>21</sup>The preference for masculine gender being interpreted as a male in certain context presumably results from a Gricean reasoning.

<sup>22</sup>Some of these pairs might be excluded on semantic grounds. What matters though is that I am not aware of *any* verb based on the same root as class-marked nouns (putting aside denominal



based on examples from Fabrizio (2013).<sup>23</sup>

- (21) *Noun-verb pairs based on category-specific roots are nonexistent*
- a. il libro ‘the book’ ↔ \*librare ‘to book’
  - b. la rosa ‘the rose’ ↔ \*rosare ‘to rose’
- (22) *Noun-verb pairs based on category-neutral roots*
- a. la sposa ‘the bride’, lo sposo ‘the groom’ ↔ sposare ‘to marry’
  - b. il figlio ‘the son’, la figlia ‘the daughter’ ↔ figliare ‘to give birth’
  - c. l’astrologo, l’astrologa ‘astrologer’ ↔ astrologare ‘to practice astrology’
  - d. il monaco ‘the monk’, la monaca ‘the nun’ ↔ monacare ‘to put someone into a convent, to make him/her become a monk/nun’
  - e. il commissario, la commissaria ‘commissioner’ ↔ commissariare ‘to put under a commissioner’

Another prediction concerns loan words. If a loan word ends in a consonant, it cannot be associated with any class marker.<sup>24</sup> By the same logic, such a loan word cannot be associated with a gender from the lexicon either. Consequently, consonant-final loan words should be based on category neutral roots. Furthermore, if they denote objects, they cannot have their gender assigned by D. In turn, they should be realized with a default grammatical gender, namely, masculine. In other words, the system predicts that consonant-final loan words should be masculine and that they should be able to have verbal counterparts derived without specialized verbal derivational morphology. Both of these predictions are borne out, as witnessed by the examples in (23).

- (23) *Loan noun-verb pairs based on the same root*
- a. il chat ‘the.M chat’ ↔ chattare ‘to chat’
  - b. il film ‘the.M film’ ↔ filmare ‘to film’
  - c. il blog ‘the.M blog’ ↔ bloggare ‘to blog’

---

verbs derived by specialized verbal morphology).

<sup>23</sup>Not all mating nouns have a verbal counterpart but I assume this is because of additional restrictions, such as the semantic interpretation of the root. The crucial point here is that there are some that do.

<sup>24</sup>Note that this follows only if class marker is indeed a separate entity, not if the vocalic ending is part of the root/stem.

## 2.7 Variable binding vs valuation by Agree: a socio-linguistics case study

As I mentioned in footnote 6, there is a persistent gender and agreement variation in the domain of names of professions in which there is sociological prestige traditionally associated with the noun being in some grammatical sense masculine even if the profession is currently performed by women, such as *l'avvocato* 'the.M lawyer', *il chirurgo* 'the.M surgeon', and *il ministro* 'the.M minister'. While the sources of the variation, its extent and an accurate empirical description go beyond the scope of this paper, the proposed system sheds light on the attested variation, and, in turn, it allows us to investigate intricate interactions between natural and grammatical gender. As we will see, the data provide empirical support for distinguishing variable binding (here modeled as a result of labeling by minimal search in the sense of Chomsky 2013), and valuation by Agree.

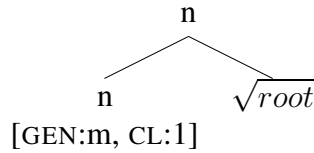
Feminine versions of masculine nouns in Standard Italian may be either formed by the feminine derivational suffix *-essa*, or they may be formed with the inflectional morphology we investigate here.<sup>25</sup> As I mentioned in passing, the rise of gender and animacy is a relatively recent phenomenon, and it is thus plausible that animacy, i.e., gender introduced by the [+PERSON] feature, replaced some of the original class specifications only relatively recently. Consequently, the switch from the vocalic endings being associated with a class marker to them becoming a morphological realization of gender might still be an active process. Consequently, there are in principle three possible forms of an originally masculine noun formed by the *-o* class marker if such a noun denotes a female, i.e., it is valued for [+PERSON] and derived feminine gender. The first option is the most conservative one, i.e., a noun which is stored in the lexicon with its class and gender feature already valued, (24a). The second option is semi-conservative in that such a noun retains the class value in the lexicon but the gender is strictly determined by D, (24b). The third option, let's call it liberal, is that neither class nor gender is stored in the lexicon, (24c).

### (24) Possible representations taken from the lexicon

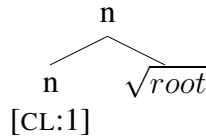
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<sup>25</sup>For instance, there are three distinct feminine counterparts of the noun *avvocato* 'lawyer'. Even though there is a designated feminine form derived by a feminine derivational morpheme *-essa*, *avvocatessa*, most speakers strongly prefer *avvocata* or *avvocato*.

a. Conservative:



b. Semi-conservative:



c. Liberal:  $\sqrt{root}$

Let's start with the liberal option. This is a mating noun, i.e., a noun which comes without any gender or class specification from the lexicon, and its form and gender is fully determined by the gender of its referent. Speakers whose lexicon contains this option thus produce *il ministro*, *la ministra* 'the.M minister, the.F minister', *il soprano*, *la soprano* 'the.M soprano, the.F soprano', *l'avvocato*, *l'avvocata* 'the.M lawyer, the.F lawyer'.<sup>26</sup> Consequently, since D is valued only for natural gender, any agreeing elements in the structure will agree with this gender. Thus we get *il soprano bravo* 'the.M soprano good.M' and *la soprano brava* 'the.F soprano good.F'.

We have seen the semi-conservative option as well. This is how we derived the contrast between *il soprano* and *la soprano*, i.e., nouns that do not store gender in the lexicon but they still retain their class marker. Again, as with mating nouns, such nouns have the gender value on D determined by their referent and agreeing syntactic elements agree with this gender. Thus we get *il soprano bravo* 'the.M soprano good.M' and *la soprano brava* 'the.F soprano good.F'.

Finally, let's consider the conservative option. This is a noun which comes from the lexicon with a valued gender feature and a class marker. Seemingly, such a noun looks exactly like *il libro* or *la rosa*, i.e., a noun whose behavior is strictly determined by the values taken from the lexicon. Interestingly, if such a noun denotes a person, it will also have the [+PERSON] feature on D. Since the person feature is a potential source of an additional value of gender, we need to look at the structure more closely, and indeed, as we will see, this structure is

<sup>26</sup>Since these nouns are based on category-neutral roots, one expects that they might have a verbal counterpart. This is partially confirmed as there is *avvocatare* 'to practice law' but I have not found any other verb of this sort. Note though that this might be simply because this is a rather small group of nouns, and not all of them are compatible with a verbal interpretation. In addition, the relevant form might have already been lexicalized with a distinct meaning, such as *ministrare* which means 'to give food to someone'.

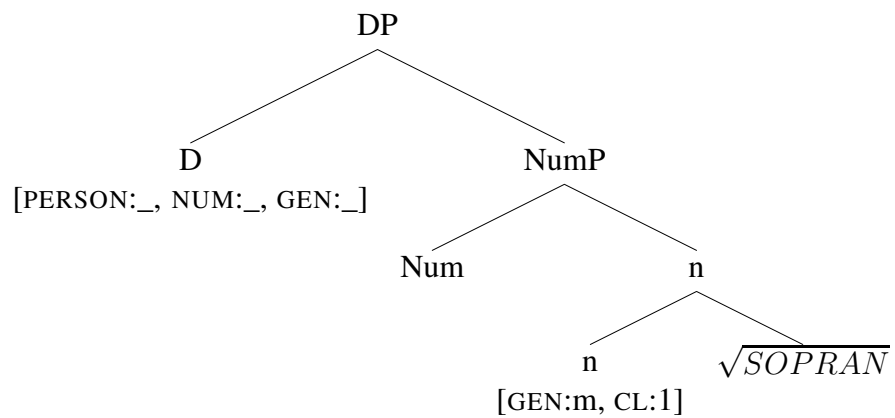
critical for our investigation.

Recall that in Section 2.2 we proposed the following order of syntactic operations:

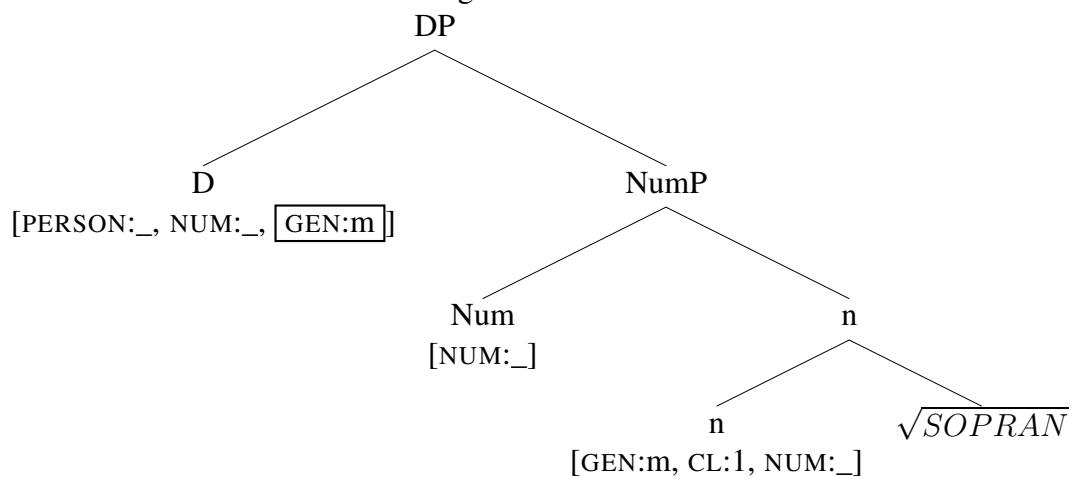
- (10) *The timing of syntactic operations:*
- (i) Merge of D
  - (ii) inheritance of unvalued  $\phi$ -features from D onto lower functional heads
  - (iii) matching
  - (iv) valuation by Agree using features already present in the structure
  - (v) valuation of D from the context for the features that have not been valued yet
  - (vi) valuation by Agree of remaining features, simultaneous throughout the Agree chain

This order predicts that the gender value on D will be determined by the feature value on the root before D may be valued from outside. Consequently, the gender relevant for morphological insertion will be the gender from the root, irrespective of the gender valued by D. The individual derivational steps are schematized in (25). Note that there is a potential tension in the structure: the gender feature chain within the DP is strictly valued as masculine. Yet, if we were to consider the gender feature derivable from the [+PERSON] feature, it could be feminine. I mark the potential for the PERSON-related gender valuation by the subscript *f* on the PERSON feature.

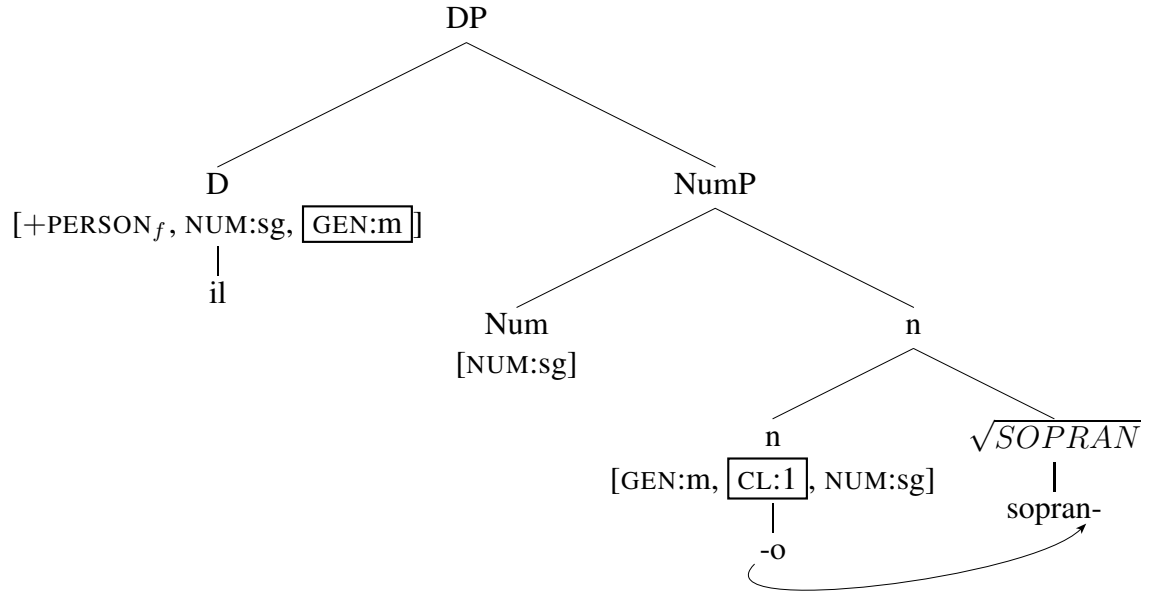
- (25) a. feature distribution from the lexicon:



b. Feature inheritance and Agree:



c. D valued from outside and the morphological output:



One way to understand this configuration is that even though such a noun is masculine with respect to its internal structure, its feature composition is ambiguous for the purposes of outer Agree probing. I argue that the gender value introduced by D is structurally more prominent because it is induced by the [+PERSON] feature. I argue that technically this is a result of labeling of the completed DP structure by minimal search in the sense of Chomsky (2013), a process during which the PERSON feature and its associated gender feature will be visible to the search procedure, while its counterpart taken from the lexicon will remain muted for the purposes of the minimal search (Chomsky, 2013). More precisely, I assume, in agreement with much of the recent work on  $\phi$ -feature Agree, that  $\phi$ -feature Agree is a free-rider on the presence of a valued PERSON feature. Thus, the minimal search procedure identifies the PERSON feature and labels the DP structure by this feature. The PERSON feature will in turn trigger  $\phi$ -feature Agree. Consequently, outer elements can in principle agree with the gender value introduced by person.

This seems to be correct. While prescriptive grammars require *avvocato* to be grammatically masculine even if the noun refers to a female, feminine agreement is common, as witnessed by following examples from the internet: *brava avvocat[ina] una donna meravigliosa...* (Facebook; accessed on April 16, 2014); *brava avvocato, grazie di causa...* (Twitter, February 2013). The same fact is

acknowledged by other sources, such as Treccani encyclopaedia, which gives the following examples of possible gender mismatch *il soprano è andato* vs *il soprano è andata* or *la soprano è andata*, i.e., both the determiner and the participle can be masculine (*il ... andato*), or they both can be feminine (*la ... andata*), or the determiner may be masculine but the participle feminine (*il ... andata*). Similarly, grammatically feminine nouns such as *la sentinella* ‘the.F guard’ may trigger masculine agreement if they denote a male person. Google search for examples, such as *sentinella coraggiosa* ‘guard.F brave.F’ and *sentinel coraggioso* ‘guard.F brave.M’ further confirms this prediction.<sup>27</sup>

The dissociation of agreement with  $\phi$ -features determined by minimal search and valuation by Agree through features introduced by Feature Inheritance has far reaching theoretical consequences. I argue that the dissociation corresponds to the suggested, though never fully worked out, distinction between variable binding and valuation by Agree. While valuation by Agree is restricted to the narrow syntax, variable binding is a process triggered at the interfaces. The intuitive distinction is clear, I believe: valuation by Agree is an automatic procedure induced by Feature Inheritance and feature matching. No recourse to the interfaces is necessary. In contrast, labeling by minimal search is a process which might happen in the narrow syntax but which must happen at the interfaces in order for the structure to be interpretable (see, for instance, Narita 2011 for an argument that minimal search might be restricted only to the CI interface). In other words, it is only when Transfer takes place, i.e., the structure is sent to the interpretive component, when valuation by context-dependent values becomes possible.

There is an additional difference between these two types of processes: while valuation by Agree is ultimately a bottom-up process related to structure building, variable binding is a top-down process. Interestingly, while in most cases these two types of valuation return the same output,<sup>28</sup> in a restricted set of cases, as in the socio-linguistically triggered cases discussed here, the two types of valuation may be dissociated.<sup>29</sup>

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<sup>27</sup>I have not discussed here nouns of the third class, such as *dottore* ‘doctor’ and *studente* ‘student’. These are strictly masculine, and their feminine counterparts are always realized by the feminine suffix *-essa*. These nouns are not susceptible to the variation described in this section. While this might be significant because the third class is the only class that does not have a morphological overlap with gender marking, I find it more likely that this is an accidental result of the derived feminine form being socio-linguistically unmarked, combined with the fact that there are only very few nouns of this type.

<sup>28</sup>This might be a result of some economy considerations.

<sup>29</sup>I suspect that it not an accident that the recent suggestion of Agree being always upward, as, for example, in Zeijlstra (2012), is semantically motivated. A closer look at the cases might indeed

## 2.8 A Note on V-N Compounds

I will finish this section by investigating a slightly different prediction which concerns compounds; more precisely, V-N nominal compounds. If the gender of the nominal part of the compound is determined from the lexicon, then the compound should never inherit the gender of the noun, as the nominalizing D-*n* structure attached to the V-N compound cannot establish an Agree chain with the gender value on the nominal root. This is because the  $\phi$ -features on D cannot be inherited by the intervening V structure. Furthermore, if such a compound denotes an object, it should not be able to get the gender value from D either, as D would not be valued for [+PERSON]. Consequently, we expect such compounds to always surface with default morphological gender, which is masculine. This prediction is borne out, as the following examples from Gracanin-Yuksek (2006) demonstrate.

- (26) *V-N compounds derived from mano ‘hand’* – F.SG
- a. l’asciugamano (m.sg.) - gli asciugamani (m. pl.)  
‘the towel’ - lit. the ‘(to) dry-hand’
  - b. il baciamano, m.sg. - i baciamani, m. pl.  
‘hand kiss’ - lit. the ‘(to) kiss-hand’

In contrast, if such a compound denotes a person, we expect its gender to be determined by the gender of its referent, while its vocalic ending to be determined by its lexically determined class. This prediction is borne out as well, as the following example from Gracanin-Yuksek (2006) shows.

- (27) un /una ficca-naso  
a.M /a.F thrust-nose  
‘busybody’

## 3 Defective chains: The number-gender dependency revisited

I have argued in the previous sections that unvalued  $\phi$ -features are introduced by D. Consequently, they may appear on lower functional heads only by Feature Inheritance (Richards, 2007; Chomsky, 2008, 2013). If this is correct, we expect to find instances of defective  $\phi$ -feature Agree chains within a DP in a way parallel

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reveal that Upward Agree is based on variable binding as advocated for in this paper.



to defective Agree chains in the CP domain.

For concreteness, I follow Borer (2005) and argue that  $n$  enters a regular gender and number Agree chain only if it is associated with a divisional function.<sup>30</sup> It follows that the  $\phi$ -complete set is inherited only if D is referential and individuating. In contrast, if D refers to non-atomic entities, then we expect the  $\phi$ -feature chain to be defective, giving rise to irregular gender/number interactions. Crucially, since the dependence is on the divisional function, and not on the counter function, i.e., the head which encodes number, the irregular patterns should be independent of whether or not the relevant noun can be counted. As we will see in this section, this prediction is borne out, as witnessed by ‘relational’, ‘predicational’ and mass nouns.

The system thus provides an explanation for what seems to be a widely attested dependency between number and gender (Greenberg, 1963; Noyer, 1992; Harley and Ritter, 2002, among others). Crucially, what appears to be a dependency is a side-effect of establishing the relevant Agree chain which is dependent on the divisional function. If we look closely at the right type of data, the seeming dependency between number and gender disappears.

### 3.1 Relational nouns

There is a class of nouns that are always masculine in the singular but may be masculine or feminine in the plural, depending on how their plurality is interpreted. I call these nouns *relational nouns* as they typically denote body parts, relations to a space, and other relational properties, i.e., nouns such as *braccio* ‘arm’, *labbro* ‘lip/edge’, or *muro* ‘wall’.

If these nouns denote plurality of relations (body parts, relations to a space etc.) instead of atomic entities (Sternefeld, 1998; Beck and Sauerland, 2000) for instance, when we count lips as one relational object, instead of a pair of individualized muscles, their plural is always feminine as can be seen in (28).

- (28) *Relational pattern:*
- a. il braccio → le braccia ‘arms’
  - b. il labbro → le labbra ‘lips’
  - c. il muro → le mura ‘walls of a city/fort’
  - d. l’osso → le ossa ‘human bones’

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<sup>30</sup>Borer uses a more fine-grained structure of functional projections. I abstract from her fine distinctions as they don’t seem to play a role in the patterns investigated in this paper.

- e. il membro → le membra ‘human body parts’
- f. lo staio → le staia (measure term used for grains)

In contrast, if these nouns denote plurality of atomic entities instead of plurality of relations, they acquire regular masculine gender and vocalic ending, as can be seen in (29). The semantic distinction is most clearly seen on nouns like *il dito* ‘the finger.M.SG.’ which counts as *dita*, i.e., feminine, if it counts plurality of fingers attached to a hand. In contrast, if such fingers were detached and counted separately from their body attachment, i.e., individual atoms, for instance, in an anatomy class setting, the plural becomes *diti*, i.e., masculine plural.

(29) *Atomic pattern:*

- a. il braccio → i bracci ‘arms of a lamp/cross’
- b. il labbro → i labbri ‘borders, edges’
- c. il muro → i muri ‘a number of walls’
- d. l’osso → gli ossi ‘bones to be eaten etc.’
- e. il membro → i membri ‘family members’
- f. lo staio → gli stai ‘bushels’

Historically, all these nouns come from Latin neuter, and one might thus consider positing a new nominal class for them, i.e., a class which would switch the gender value for separate lexemes associated with a given lexical entry. However, in doing so we would lose the generalization that if these nouns constitute regularly counted atomic elements, their gender pattern is regular.

I propose instead that relational nouns arise via defective intervention. Concretely, if the plurality constitutes plurality of relations, instead of plurality of atomic elements, *n* is not associated with the divisional function. Consequently, D cannot cyclically probe the gender feature on the root. The resulting F.PL agreement is the morphological default that arises in case of failed agreement for gender.<sup>31</sup>

In contrast, if we count atomic entities, the divisional function on *n* enables establishing a complete Agree chain which may in turn be valued by the gender on the root. Consequently, we obtain regular masculine plural agreement.

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<sup>31</sup>Note that the default in this case is not masculine plural which is the case if there is no gender feature value available, as with V-N compounds in Section 2.8. Since this agreement arises from a defective intervention interaction, it becomes marked. I don’t have a good explanation for this switch but note that such behavior is common. For instance, the agreement attested with weather predicates is often neuter in languages with a three-way gender distinction, while their morphological default is masculine.

The crucial property of this treatment is that establishing the Agree chain is strictly dependent on valuing the divisional function, not on the number/ $\pm$ counter as such. Thus, the proposed implementation provides a novel formalization of the prevalent dependency of gender on number (Greenberg, 1963; Noyer, 1992; Harley and Ritter, 2002, among others). If the proposal is correct, there is no direct number-gender dependency but the apparent dependency arises via its formal relation to the divisional function.

### 3.2 Predicational nouns

Another relevant case to investigate is that of nouns that denote properties associated with a person, such as *la vittima* ‘the victim’ or *la persona* ‘the person’. I call these nouns *predicational nouns* to capture the fact that they do not denote a referential individual but instead they identify certain properties associated with the individual. These nouns are invariably feminine, irrespective of whether they denote a male or a female, and unlike nouns like *sentinella* ‘guard.F’, discussed in Section 2.7, they cannot trigger masculine agreement irrespective of the gender of the referent. I argue that since they do not denote a referential individual, their divisional function is defective; the reason being that the primary function of the divisional function is to bring in atomic referentiality. Consequently, their D cannot acquire a gender feature independently of their lexically given gender valuation.

We cannot see the defective pattern on the form as such because the plural is feminine, which might be either the default defective form as in the case of relational nouns, or it could be their regular plural form. However, if the divisional function is defective, and consequently the gender valuation on D is defective, such a noun should trigger agreement only if there is no referential D in the structure which might be visible for the labeling search (Chomsky, 2013).

Evidence that this prediction is borne out comes from the appositive construction, as in (30). As we see, if there is no competing referential D, T probes the defective D resulting in F. However, if there is a referential D (in this case, *Genaro Chierchia*) the agreement switches to masculine.<sup>32</sup>

- (30) a. La persona bella      è molto ingegnosa/ \*ingegnoso.  
          the.F person.F beautiful.F is very clever.F/ \*clever.M

<sup>32</sup>Not all speakers seem to agree with the judgments in (30). For some of them, the appositive structure in (30b) is ungrammatical irrespective of the gender. The speakers who found (30b) acceptable though require masculine agreement.

- ‘The beautiful person is very clever.’
- b. La persona bella, Gennaro Chierchia, è molto \*ingegnosa/  
 the.F person.F beautiful.F Gennaro Chierchia is very \*clever.F/  
 ingegnoso.  
 clever.M  
 ‘The beautiful person, Gennaro Chierchia, is very clever.’

### 3.3 Mass nouns and nominalized infinitives

Finally, if gender is dependent on the divisional function, we expect that any uncountable noun should exhibit defective behavior. Since there is no plural formation, we cannot easily test this prediction in Standard Italian. However, data from Italo-Romance (and Ibero-Romance) dialects show that this is indeed the case. To my knowledge, all Italo-Romance and Ibero-Romance dialects have a two-way gender system like Standard Italian. However, their mass nouns<sup>33</sup> systematically trigger a special agreement form.<sup>34</sup>

Thus, for example, some dialects have three distinct singular forms of demonstratives: one for masculine singular, one for feminine singular and one for mass nouns. The examples in (31) from Servigliano demonstrate a case in which the three-way distinction is manifested by distinct affixes, accompanied by a morpho-phonemic alternation.

- (31) *Demonstratives in Servigliano (Rome-Ancona corridor)*
- |    |                        |      |
|----|------------------------|------|
| a. | kwístu, kwíssu, kwíllu | M.SG |
| b. | kwésta, kwéssa, kwélla | F.SG |
| c. | kwésto, kwéssu, kwéllo | MN   |
- ‘this’, ‘that’, ‘that (over there)’

The examples in (32) are from several dialects south of the Rome-Ancona corridor. In these dialects, so called raddoppiamento sintattico, i.e., morpho-phonologically triggered consonantal doubling, regularly appears only with feminine nouns. However, it may accompany a masculine noun as well but only if such a noun is used as a mass noun. For instance, in Neapolitan if the noun *kaffé* ‘coffee’ is counted, as in ‘the cup of coffee’, there is no raddoppiamento sintattico. In contrast, if the same noun is used as a mass noun, its form changes into *kkaffé*.

<sup>33</sup>And nominalized infinitives I will not discuss here.

<sup>34</sup>See [left out for anonymity] for a recent discussion and literature overview.

- (32) Raddoppiamento sintattico on mass M
- |    |      |                       |                                 |
|----|------|-----------------------|---------------------------------|
| a. | (i)  | o kaffé               |                                 |
|    |      | ‘the (cup of) coffee’ | M.SG                            |
|    | (ii) | o kkaffé              |                                 |
|    |      | ‘the coffee’          | MN [+RS] ( <i>Neapolitan</i> )  |
| b. | (i)  | lu lúpu               |                                 |
|    |      | ‘the wolf’            | M.SG                            |
|    | (ii) | lu llátti             |                                 |
|    |      | ‘the milk’            | MN [+RS] ( <i>S. Campania</i> ) |
| c. | (i)  | u pá:nə               |                                 |
|    |      | ‘the loaf’            | M.SG                            |
|    | (ii) | u ppá:nə              |                                 |
|    |      | ‘bread’               | MN [+RS] ( <i>Puglia</i> )      |

I argue that the observed three-way gender behavior is a result of defective intervention as predicted by the proposed system. Since in all these cases the Agree chain cannot be successfully established, the gender value assigned to the root from the lexicon is not shared by the rest of the structure. As the gender value cannot be determined by D either, the gender valuation of the Agree chain is not successful. In turn, the morpho-phonological marking of the agreeing elements reflects the defective nature of the chain.

## 4 Conclusions

This paper makes two major theoretical contributions. The first contribution concerns the question of what the possible sources of feature valuation are, and if indeed there is more than one source, what consequences this would have for the syntactic derivation. We have seen evidence that some features may indeed be valued from the lexicon, or from the context, and this duality reflects itself in how  $\phi$ -feature chains get valued. I argued extensively that in order to account for the range of attested variation in the domain of gender agreement, we need to distinguish between valuation by Agree and variable binding.

The second major contribution concerns the cross-linguistically prevalent appearance of gender being dependent on number. This section surveys some of the major work on the topic and sketches how the reported data and suggested generalizations follow from the proposal presented in this paper.

As Greenberg noticed in his observations about language universals, there

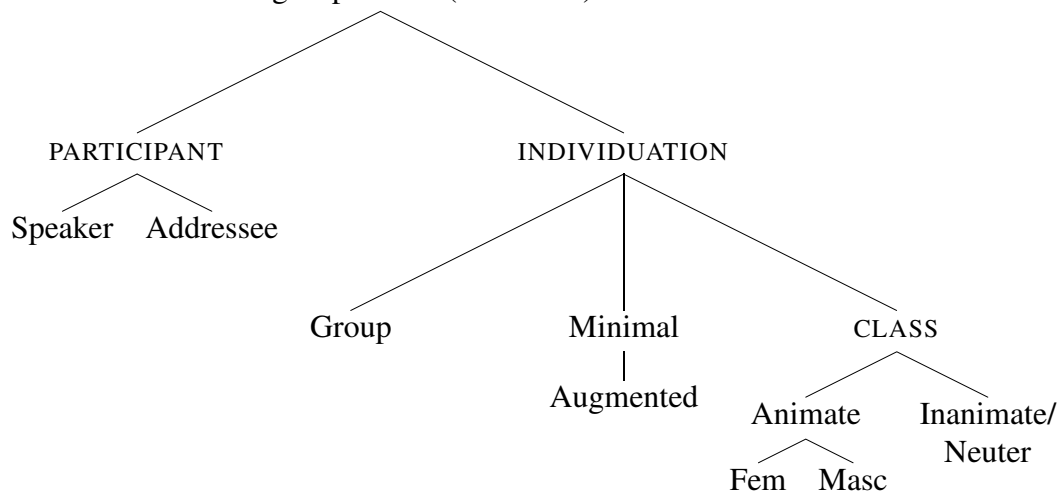
seems to be a formal dependency between gender and number features, (33).

- (33) *Greenberg's generalizations about gender-number dependency*
- a. Universal 36: '[i]f a language has the category of gender, it always has the category of number' (Greenberg, 1963, p. 95)
  - b. Universal 37: 'A language never has more gender categories in non-singular numbers than in the singular.' (Greenberg, 1963, p. 95)
  - c. Universal 45: 'If there are any gender distinctions in the plural of the pronoun, there are some gender distinctions in the singular also.' (Greenberg, 1963, p. 96)

Noyer (1992) and Harley and Ritter (2002) formulated the dependency in terms of feature geometry dependencies, (34) and (35), respectively.

- (34) Noyer (1992): *Universal Feature Hierarchy*  
 person features  $\succ$  number features  $\succ$  gender features  $\succ$  class features

- (35) Harley and Ritter (2002, p. 486, (6))  
 Referring Expression (=Pronoun)



Even though these proposals differ in the actual technical implementation, they share the intuition that the notion of individuation is crucial for establishing the number-gender dependency. The present paper attempts to make this intuition more precise by dividing the labor between the phase head induced Feature inheritance and specifying the role of the divisional function in the Feature Inheritance process.

The current proposal supersedes the previous accounts in that it proposes a

principled explanation of the attested interactions. As we have seen, both gender and number features can be valued either from the idiosyncratic lexical representation or via a semantically informed procedure, while being part of the same chain. Consequently, the difference between interpretable and uninterpretable syntactic features cannot be syntactically relevant. At least not in the trivial sense of the features being of categorically distinct types. Instead, I have suggested that interpretability is a side-effect of a combination of gender/number with additional features, in particular PERSON being the feature responsible for the interpretability of gender (cf. Percus 2011).<sup>35</sup>

Finally, the proposal opens the possibility for a cross-linguistic investigation of number-gender interaction in terms of distinct sources of feature valuation. We have known at least since the foundational work of Picallo (1991) and Ritter (1993) that the domain of gender valuation varies. As Ritter (1993) observed, nominal derivational morphology in Hebrew does not preserve the gender of the root noun. However, the gender of a Hebrew noun cannot switch because of the natural gender of its referent, as it is the case in Spanish (Harris, 1991). As we have seen in this paper, neither of these two facts is surprising. Natural gender-dependent switching (mating nouns) is possible only if a noun comes from the lexicon without a lexically valued gender feature.<sup>36</sup> While this is occasionally possible in Romance, Hebrew does not seem to have this option. In contrast, the fact that the lexically specified gender does not percolate through Hebrew derivational nominal morphology is not surprising. Recall our discussion of Italian V-N compounds in Section 2.8. As we have seen, if the derivational D cannot access the lexically given gender feature on the root (for reasons of locality), the overall gender is fully determined by the outer derivational morphology.<sup>37</sup> Similarly, if the form of the root noun is in principle independent of the lexically determined gender feature value, it is not surprising that in languages like Hebrew, what appears in its surface form to be a masculine noun (meaning its phonotactic

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<sup>35</sup>There is, of course, the intriguing question of the categorical status of neuter, be it a default, a defective value, or a third gender. Recent work, for instance, Giurgea (2008), following Cornilescu (2000), on Romanian, and Quer (2001) and Picallo (2002) for Spanish, addresses some of these questions but a careful consideration of the facts goes beyond the scope of this paper.

<sup>36</sup>That nouns may differ in whether or not their gender feature is lexically specified has independently been argued for by Alexiadou (2004) for Romance, Greek, and Hebrew, and Riente (2003) for Italian.

<sup>37</sup>Languages differ in how nominal derivational morphology treats gender. While languages like German resemble Hebrew in that, for example, the gender of a diminutive is solely determined by the derivational morphology (neuter for German), in other languages, such as Russian, the gender of the diminutive retains the lexically determined value of the nominal root.

shape corresponds to what tends to be a masculine noun), can still trigger feminine agreement, (36).

(36) Ritter (1993, ex. 8, p. 799)

- a. šana tova  
year.F.SG good.F.SG.  
\*šana tov  
year.F.SG good.M.SG.
- b. šan-im tovot  
year.F.PL good.F.PL.  
\*šan-im tov-im  
year.F.PL good.M.PL.



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