

# A Dual Theory of Roots: Evidence from Gender-Marking Languages

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## 1. Introduction

This paper is motivated by the theoretical question of whether roots have syntactic features and if they do, what kind of objects they are and how they interact with the rest of the syntactic structure. The motivation for the question comes from an inherent contradiction in the theoretical literature. While most work in the Distributed Morphology framework argues that roots have no syntactic features (Marantz, 2001; Arad, 2003, among others), for instance, Harley (2014) argues for roots being able to take syntactic complements and in turn having to include syntactic features in the root's representation (but see Alexiadou 2014; Svenonius 2014, among others, for counterarguments). The theoretical divide is more apparent in recent work on gender and number marking languages. According to some authors, gender and number may be features stored with the nominal representation in the lexicon (Steriopo & Wiltschko 2008; Kramer 2009; Kučerová to appear, among others). While other authors (Ritter 1993, 1995; Kramer 2015, among others) argue that gender and number is a feature introduced by a higher functional head. That is, it is not part of the root representation.

We argue that the disagreement has an empirical underpinning. We propose that roots may have syntactic features. If they do, this structural property interacts with derivational timing. More precisely, we argue that roots without syntactic features are late inserted, while roots with syntactic features must be early inserted. The rationale for our proposal is that features on roots must be available to the syntactic computation. In contrast, if roots lack syntactic features, then computational economy forces late insertion.

Here, we concentrate on the domain of gender and make a distinction between *indexed roots* and *featured roots*. Indexed roots ( $\sqrt{i}$ ) do not have syntactic features. Instead, their representation contains a structured index (Acquaviva 2008) that provides a reference to a gender value. We argue that these roots are late inserted. Since they are not present in the derivation when the extended nominal domain is built, they associate with a default functional architecture. That is, idiosyncratic properties of the root  $\sqrt{i}$  ( $\sim$ gender) are irrelevant for the functional structure of the DP. Featured roots ( $\sqrt{F}$ ), on the other hand, are early inserted forcing the functional architecture of their extended domain to be dependent on the root's syntactic features.

Which is to say, we argue that provided there are features on the roots and provided these features are syntactic objects, then the functional structure of that extended nominal domain reflects their structural presence. In contrast, if roots come with no syntactic features, the extended nominal domain cannot project with any direct reference to such features. We thus differ from Embick (2015) and others who take the position that roots with features are late inserted as the presence of their features regulates their morphological realization. Although the choice between these two positions is ultimately empirical, our position is more in line with the behavior of syntactic features in other domains. That is, if features on roots are syntactic objects we expect them to do more than regulate morphological insertion. Instead, they should be checked and/or enter into an agree relation with other functional material, and the domain of their application should be subject to locality restrictions. The remainder of the paper presents a case study of Polish nominal gender. We argue that the Polish gender

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system exhibits precisely the type of inflectional and derivational interactions one would expect under our proposal.

## 2. The (ir)regular gender system of Polish

### 2.1. Types of nouns and agreement variation

Polish common nouns exhibit a three-way gender system (masculine, feminine, neuter; for example, *książka* ‘book.F.SG’, *stół* ‘table.M.SG’ *krzesło* ‘chair.N.SG’).<sup>1</sup> The domain of Polish Profession Attributive Nouns (PPANs) is different in that it exhibits a two-way system, i.e., PPANs are only masculine or feminine. Interestingly, while some profession nouns exist both in a masculine and a morphologically derived feminine form, other nouns may be only morphologically and grammatically feminine, i.e., they are formed by a nominal stem and a feminizing morpheme and trigger feminine agreement, while other profession nouns can morphologically be only masculine, i.e., incompatible with a feminine derivational morpheme, irrespective of the natural gender of their referent. We can thus distinguish three types of profession nouns. Type I nouns have regular masculine and feminine forms, where the feminine forms are derived by the nominal feminizing morpheme *-ka*, as in (1-a).<sup>2</sup> Type II nouns have only masculine forms without *-ka*, as in (1-b), and type III nouns have only derived feminine forms but no masculine counterpart, as in (1-c). We are not aware of any phonotactic or morpho-syntactic restrictions that would underlie the derivational restrictions on type II and III.

#### (1) Types of Polish profession attributive nouns:

- |    |  |      |     |
|----|--|------|-----|
| a. | TypeI: <i>kurier</i> +∅ ‘courier.M’ vs <i>kurier+ka</i> ‘courier.F’            | ✓M,  | ✓F  |
| b. | TypeII: <i>premier</i> ‘PM.M’ vs * <i>premier+ka</i> ‘PM.M’                    | ✓M,  | * F |
| c. | TypeIII: * <i>guwernant</i> ‘governess.M’ vs <i>guwernant+ka</i> ‘governess.F’ | * M, | ✓F  |

In addition to morphological derivational restrictions, these three types of nouns differ in agreement patterns they exhibit in their extended nominal domains. We observe two agreement patterns. First, type I and III nouns show regular homogenous agreement throughout the extended nominal domain. I.e., if a noun of type I is masculine, all agreeing elements in the extended domain agree in masculine, but when such a noun is feminine, all agreeing elements agree in feminine. Both types of agreement are shown in (2). Type III forms a separate group in that they only exhibit feminine agreement as shown in (3). In contrast, nouns of type II display a heterogeneous agreement pattern. While the noun in and of itself appears to be masculine, the agreeing elements in the extended domain are sensitive to the natural gender of the referent, as in (4). If the referent is masculine, the agreeing elements are masculine. If the referent is feminine, the agreeing elements are feminine.

#### (2) Homogeneous agreement in type I:

- |    |        |       |                  |       |
|----|--------|-------|------------------|-------|
| a. | Ten    | nasz  | kurier           |       |
|    | that.M | our.M | courier.M        | ✓MMM  |
| b. | *Ta    | nasza | kurier           |       |
|    | that.F | our.F | courier.M        | * FFM |
| c. | Ta     | nasza | kurierka         |       |
|    | that.F | our.F | female courier.F | ✓FFF  |
| d. | *Ten   | nasz  | kurierka         |       |
|    | that.M | our.M | female courier.F | *MMF  |

<sup>1</sup> We ignore animacy. This might turn out to be a problem as we deal with a variation in the domain of animate nouns. The reason we think this is a fairly safe move is that in Polish animacy is grammatically encoded only in masculine nouns but the issue we investigate concerns both feminine and masculine nouns.

<sup>2</sup> To our knowledge, *-ka* is the only nominal feminine ending in Polish. Other feminine endings, such as *-owa* in *krawiec – krawc-owa* ‘tailor’, *-ini* in *maszalek – marzalk-ini* ‘marshal’, *-ina* in *wojewoda – wojewodz-ina* ‘governor’ and *-na* in *rad-ny – rad-na* ‘council member’, are morphologically adjectival.

(3) *Homogeneous agreement in type III:*

- |    |        |       |                   |      |
|----|--------|-------|-------------------|------|
| a. | Ta     | nasza | guwernantka       | ✓FFF |
|    | that.F | our.F | governress.F      |      |
| b. | *Ten   | nasz  | guwernantka       | *MMF |
|    | that.M | our.M | governress.F      |      |
| c. | *Ten   | nasz  | guwernant         | *MMM |
|    | that.M | our.M | male governress.M |      |

(4) *Heterogeneous agreement in type II:*

- |    |        |       |         |                        |
|----|--------|-------|---------|------------------------|
| a. | Ten    | nasz  | Premier | ✓MMM (male referent)   |
|    | that.M | our.M | PM.M    |                        |
| b. | Ta     | nasza | Premier | ✓FFM (female referent) |
|    | that.F | our.F | PM.M    |                        |

### 3. Gender-indexed vs gender-featured roots

We argue that the restriction on nominal gender pairs and mixed agreement patterns attested in Polish is a direct consequence of the distinction between roots that encode gender in their index (indexed roots) and roots that encode gender as a syntactic feature on the root (featured roots). Concretely, common nouns and PPANs of type I, i.e., those that can be both masculine and feminine, are an instantiation of indexed roots. On the other hand, PPANs of type II and III, i.e., those that restrict their nouns only to one of the two genders, are an instantiation of featured roots. The reason there are four classes, instead of two, is that both index gender and syntactic gender can be represented in the lexicon as valued or unvalued.

Noun types based on indexed roots are thus common (non-PPAN) nouns (e.g., *kobieta* ‘woman.F.SG’, *mężczyzna* ‘man.M.SG’, *dziecko* ‘child.N.SG’; *książka* ‘book.F.SG’, *stół* ‘table.M.SG’, *krzesło* ‘chair.N.SG.’) and type I PPANs (*kurier* ‘male courier’, *kurierka* ‘female courier’). We argue that in this group of nouns, agreement features are mediated by an index. That is, no syntactic agreement is carried out by functional heads of the extended nominal domain.<sup>3</sup> Consequently, roots are late inserted because there is no reason to insert them early. They differ in that whether their index is set to a particular idiosyncratic value, or whether it remains unspecified for gender. Thus, common (non-PPAN) nouns have index feature valued specified - making their overall gender fixed. Type I PPANs are also Late Inserted, but do not exhibit idiosyncratic gender assignment because the index for gender has an unspecified value. The gender value is determined by a functional head (D) later in the course of the derivation. Consequently, the overall gender of a nominal derived from a Late Inserted root that is part of an unspecified for gender structure is sensitive to the natural gender of the referent.

The other derivational group, i.e., nouns based on gender-featured roots is exemplified by masculine only PPANs (type II: *premier* ‘PM’, *\*premierka* ‘female PM’) and feminine only PPANs (type III: *\*guwernant* ‘male governress’, *guwernantka* ‘governress’). For both these types there is a syntactic gender on their root. This feature enters into an agree relation with higher functional projections and in turn enforces syntactic agreement on functional heads in the extended nominal domain. Since the feature on these roots interacts with functional projections, these roots must be early inserted. The difference between type II and type III lies in the value of the gender feature. We propose that the syntactic feature on the root is a binary feature which can either be marked or unmarked. The feature that underlies the formation of type II PPANs (masculine-only) is unmarked, and in turn is subject to impoverishment. The consequence is that while the gender value is fixed in the lower spell-out domain, it is variable in the higher spell-out domain. In contrast, the gender that underlies the formation of type III PPANs (feminine-only) is marked, which translates into its value being fixed throughout the extended nominal domain.

The rest of this section spells out the technical details of the proposal and demonstrates how the derivational timing interacts with spell-out and agreement domains.

<sup>3</sup> By syntactic agreement we mean Agree under c-command.

### 3.1. Derivational basics

To proceed with the derivations, we must first clarify the first step of the derivation in the light of the option that roots may be inserted late. We follow DeBelder & Van Craenenbroeck (2015) and assume *First Merge* as a derivational starter. This means that for us the work space starts as the empty set ( $\emptyset$ ). The motivation is that merge is always binary. In addition the empty set provides a placeholder for late-root insertion. To make the derivations explicit we assume three minimally needed functional projections: *n*, *Num* and *D* (Ritter, 1995; Borer, 2005).

Crucially, we assume that every instantiation of merge, be it internal or external, is based on agree (*merge as agree*). In the case of external merge, agree reflects c-selection (Adger 2003). This assumption is critical for labeling of the Merge set. Effectively all features of the merged set become the label.

The other two notions that need to be clearly defined are work space and spell-out domain. We define *work space* as the minimal extended projection that includes all defining features of the category associated with the root inserted or to be inserted. In the nominal domain of our interest, the workspace includes number and gender but excludes features introduced by *D* (person; Ritter 1993). A *spell-out domain* is then defined as the smallest work space where all features have been checked (but not necessarily valued). Crucially, only a terminated workspace can be spelled-out. As for the *morphological realization* of a spell-out domain, we assume that the lexical insertion of the inflected noun subsumes the adjacent functional heads (*n* & *Num*). This, however, is possible only if the features of the functional heads are a subset of the inserted lexical items. In cases when they are not a subset, the features of the higher functional heads must be realized as a separate morpheme.

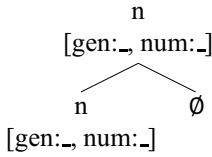
The following subsections give step-by-step derivations for the four different types of nouns attested in Polish. The purpose of this admittedly daunting exercise is twofold: (a) to demonstrate that the proposal can be worked out into an internally consistent system, and (b) to highlight the interaction of derivational timing, morphological realization and syntactic agree.

#### 3.2. Case(I): Common (non-PPAN) nouns (masculine/feminine/neuter; standard case)

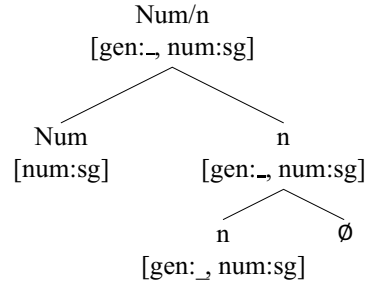
We argue that roots of common nouns are stored with an index that contains a specified gender value. Most Polish nouns which have fixed gender value belong to this group. A simplified derivation of this type is given in (5). Since this is an indexed root, the root is late inserted. In turn, a first merge workspace does not contain a root. Instead, a functional head (*n*) is merged directly with the empty workspace ( $\emptyset$ ). Since only *n* contains features (here, unvalued number and gender), *n* and its features project, as seen in (5-a). In the next step, (5-b), the *Num* head is merged with *n*. For concreteness, we assume that *Num* comes with a valued *num* feature on *Num*. In this step of the derivation, all unvalued instantiations of unvalued *num* feature become valued by merge as agree. Since all defining features are now present, in the next step, (5-c), the work space terminates and root insertion takes place. The presence of the root material, including its indexed gender information causes post-syntactic agreement and feature adjustment within the previously built nominal domain, (5-d). Finally, *D* is merged. We assume that *D* is a bundle of unvalued  $\varphi$ -features and a valued person feature. As before, merge as agree takes place and all unvalued gender and number features get valued. After *D* is merged and feature valuation takes place, the complement of *D* is spelled-out, (5-e).

(5) *Simplified derivation of kobieta.F ‘woman’*

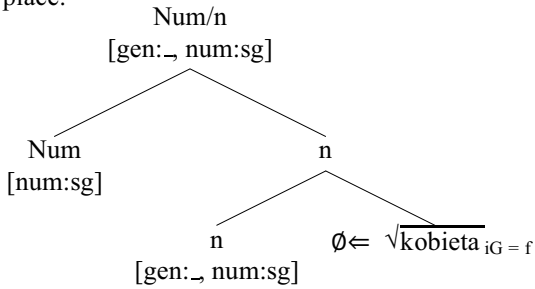
a. no root; functional head (n) merged directly with work space; n projects:



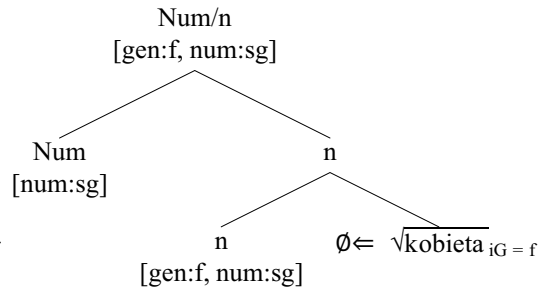
b. Num merged with n; valued num feature on Num; valuation of num by Merge as Agree:



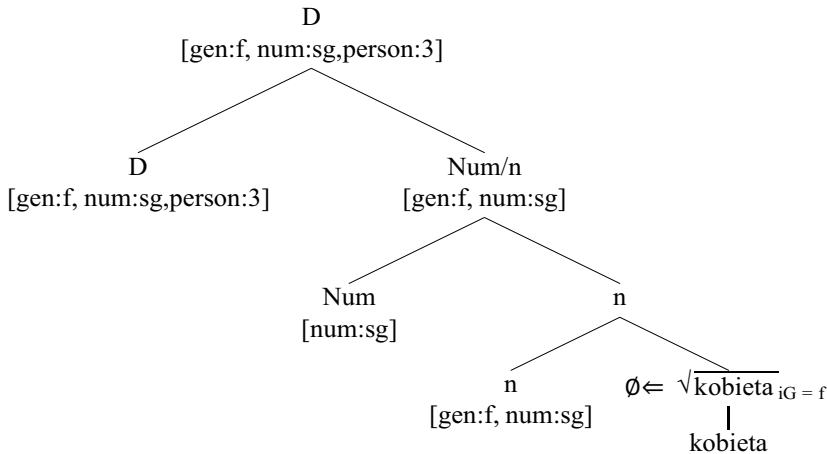
c. Work space terminates, root insertion takes place:



d. Post-syntactic agreement/feature adjustment:



e. D merged (~ a bundle of unvalued  $\phi$ -features + valued person): Merge as Agree (for gender & number) & Spell-out of the complement of D:



The consequence of this derivation is that everything in the D domain and above shares the features of the adjusted label of Num/nP. An important property of the proposed derivation is that an unvalued gender feature on D copies any gender value from the indexed root because the work space that triggers root insertion precedes merge of D. Another crucial property is that at no point of building the extended nominal domain, features get valued by agree as a goal-seeking relation in the DP domain. Instead, all feature sharing is done by merge as agree. Such a derivation is thus reminiscent of the postulation of the theoretical distinction between concord and agree (Norris, 2014) but derives it as a consequence of derivational timing of root insertion.

### 3.3. Case II: Type I PPAN roots ( $\checkmark$ masculine, $\checkmark$ feminine)

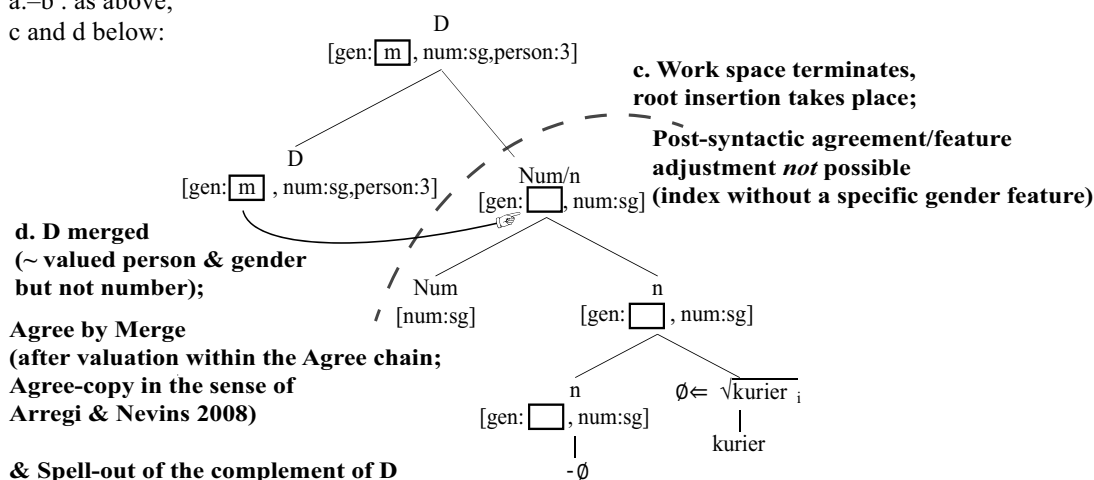
Let's now turn to the derivation of the other type of nouns that is based on indexed gender feature. We argue that type I PPAN nouns, like non PPAN roots, are also based on index gendered roots, but

they can alternate between gender values depending on the referent. This is because, unlike their common-noun-counterpart, there is no specified gender value associated with the index.<sup>4</sup> Furthermore, we argue that since the gender value is not specified by the index, it must be introduced by a higher functional head, concretely D, whose gender valuation gender valuation reflects the contextual value of the referent (Kramer 2009, 2015; Steriopo & Wiltschko 2008; Kučerová to appear, among others).

A simplified derivation of a masculine version of such a noun is given in (6). The first steps of the derivation proceed exactly as in (5). In both cases there is no root merged at the start of the derivation, (6). The PPAN type I derivation differs from the Non-PPAN at the point when the work space terminates and root insertion takes place, (6). Since no gender value is associated with the index, no post-syntactic agreement can take place. Instead, the derivation continues with an unvalued gender feature. Only when D is merged in (6), the unvalued feature on D gets valued from the context (here as masculine). Since there is a pre-existent agree relation between the gender feature on D and the unvalued gender features in the lower part of the structure (because of agree by merge), all instances of the unvalued gender features within this previously established agree chain become automatically valued - in this case as masculine because of D's valuation. Once the complement of D is spelled-out, morphology reflects this valuation.

(6) *Simplified derivation of kurier.M 'male courier'*

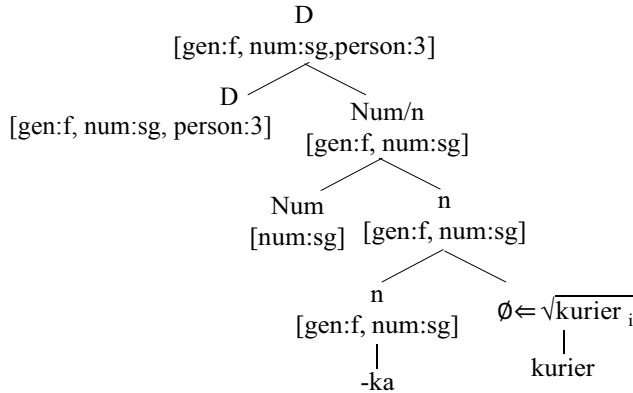
a.–b . as above,  
c and d below:



Note that there is no overt morphological realization of the features on n, as Polish nominal morphology does not have an overt masculine morpheme that could realize n. Crucially, if an unvalued index combines with a feminine feature introduced by D, morphology realizes the feminine gender on n by a feminine-specific *-ka*, as seen in a simplified derivation of a feminine version of type I PPAN in (7). Since there is no feminine gender on the root, the subset principle does not apply and the features of the functional head trigger its own morphological realization.<sup>5</sup>

<sup>4</sup> We assume that gender valuation is implied by the index having a nominal specification.

<sup>5</sup> The prediction is that the feminine forms of such nouns must be DPs as the feminine feature is introduced by D. We are not convinced that this prediction is (always) correct (putting aside the non-trivial question of how we determine what constitutes the NP/DP distinction in a language like Polish). That the valued gender feature is introduced by D is not crucial for us. Any higher functional head would do. For instance, a head like Pesetsky (2013)'s *-x̄c* would work well for this type of nouns.

(7) *Simplified derivation of kurierka.F 'female courier'*

## 3.4. Case III: Type III PPANs (\* masculine, ✓ feminine)

We can now turn to the derivations based on roots with a syntactic feature, here gender ( $\sqrt{G}$ ). We argue that gender as a syntactic feature on a root is represented as a binary feature ( $\pm\text{AGR}$  feature). That is, such a feature has a marked and an unmarked value but there is no idiosyncratic non-binary valuation of the three-way type attested in Polish (masculine/feminine/neuter). We argue that if a root comes with such a syntactic feature, the root must be early inserted and the feature projects a functional structure.

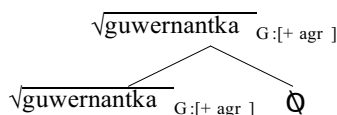
Let's start with type III nouns, i.e., nouns that can only be feminine. We argue that this class of nouns is an instantiation of a marked gender on a root ( $+\text{AGR}$ ). We further argue that this  $+\text{AGR}$  feature projects a functional head, and in turn, the gender on the functional head is marked and as such cannot be impoverished. In turn, morphology associates roots with the feminine affix *-ka*, as an overt morphological reflex of feminine being the marked gender in Polish. That is to say, for us, the presence of *-ka* does not correspond to an overt realization of a feminine feature on *n*, instead, it is an inherent part of the root representation

A simplified derivation of Type III PPAN is given in (8) on the next page. In the first derivational step, (8-a), the root with the  $+\text{AGR}$  feature is merged directly with the work space. Here, the root projects because it contains a syntactic feature. In the next step, (8-b), *n* merges with the root. By virtue of merge as agree, the unvalued gender feature on *n* gets valued as  $+\text{AGR}$ . It is this valued feature that projects further when *Num* is merged, (8-c). When the work space terminates, (8-d), no additional insertion or agree valuation takes place. Finally, *D* is merged, (8-e). By merge as agree, the unvalued feature on *D* also gets valued as  $+\text{AGR}$ . Since feminine is the marked feature in Polish, when the complement of *D* is spelled out (and later the complete DP), morphology realizes the marked gender feature as feminine.

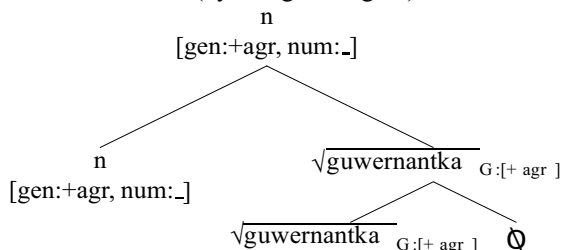
Consequently, there are no masculine forms of such a noun as the *-ka* ending is not an overt realization of the *n* head with a valued feminine feature but instead, it is included in the stored root entry. Furthermore, no masculine agreement in the *D* domain is possible, as the gender feature value is fixed by the  $+\text{AGR}$  and the gender feature on *D* cannot be valued from the context.

(8) *Simplified derivation of guwernantka.F 'governress'*

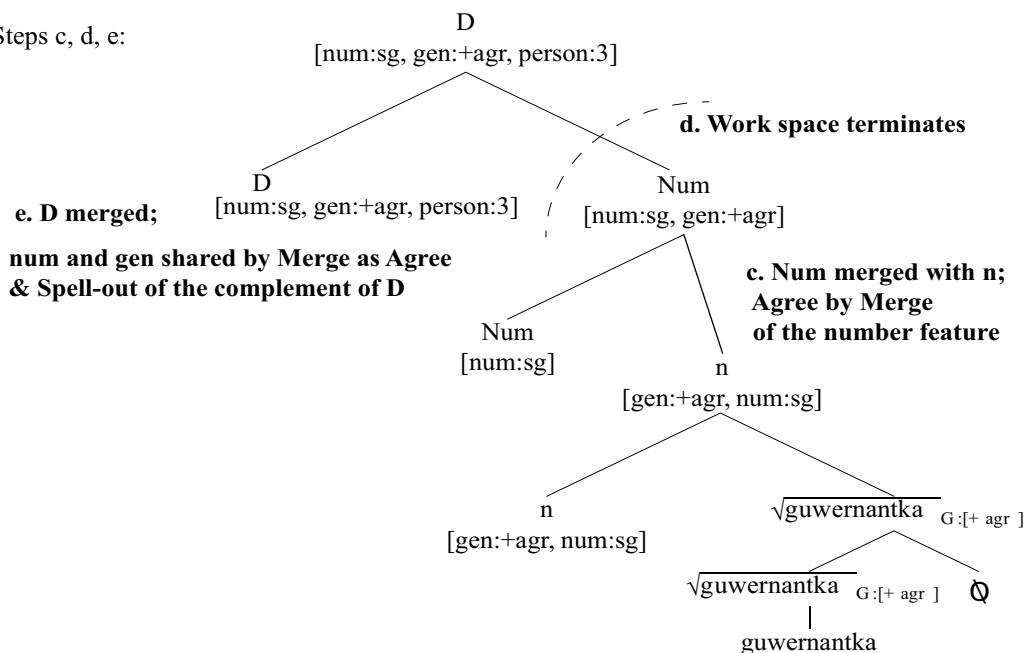
a. root with a gender feature (+AGR) merged directly with work space ( $\emptyset$ ); the root projects:<sup>6</sup>



b. n merges with the root; gender feature on n valued: by the root (by Merge as Agree):



Steps c, d, e:

3.5. *Case IV: TypeII PPANs (✓masculine, \*feminine; mixed agreement in DP)*

We can now turn to the last class of Polish nouns: type II nouns, i.e., those that can only be masculine. Masculine gender agreement on D is blocked by the presence of -AGR on the root which prevents D's features being valued from context. Morphological markedness blocks context valuation. Even though the feature is unmarked, it still projects a functional head. Crucially, the gender of this functional head is unmarked and in turn becomes subject to impoverishment (Halle, 2000; Bonet, 1995). Since the gender feature on n becomes impoverished, morphologically these nouns correspond to affix-less roots.

A simplified derivation of such a noun is given in (9). First, the root with an unmarked gender feature is merged directly with the empty work space, (9-a). An unvalued gender feature root merges with n, which also has unvalued features. Thus feature valuation between the root and n returns gender as unvalued, (9b). Once the workspace terminates, and after D is merged, impoverished gender features cannot value D, nor can D affect the lower workspace as there are no unvalued gender features below D, (9-a). Thus, derivation correctly captures the observation that the masculine version of this type of noun corresponds to a male referent, instead of being unspecified for natural gender.

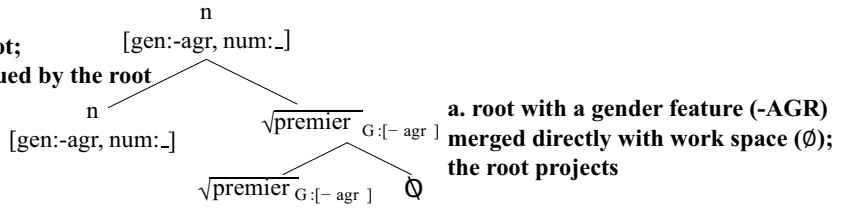
<sup>6</sup> Dan Milke (p.c.) has raised the question of why the  $\emptyset$  cannot be used to insert another root. Note that if such an additional root was early inserted, it wouldn't be able to project and in turn it would fail to check its syntactic features. If such a root was late inserted it would be inserted in a structurally infelicitous context.



(9) *Simplified derivation of premier.M 'prime minister'*

Steps a, b:

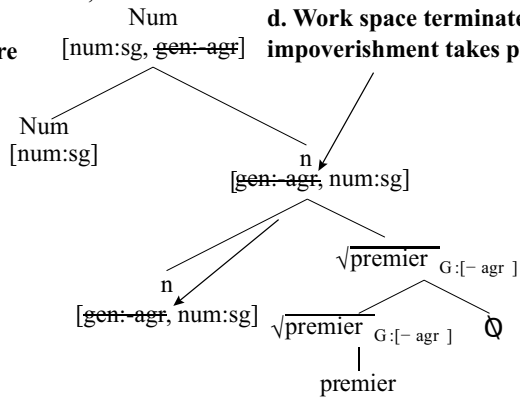
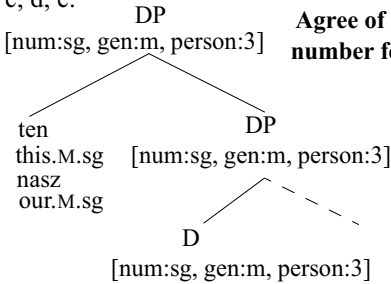
**b. n merges with the root;  
gender feature on n valued by the root  
(by Merge as Agree)**



Steps c, d, e:

**c. Num merged with n;  
Agree of the number feature**

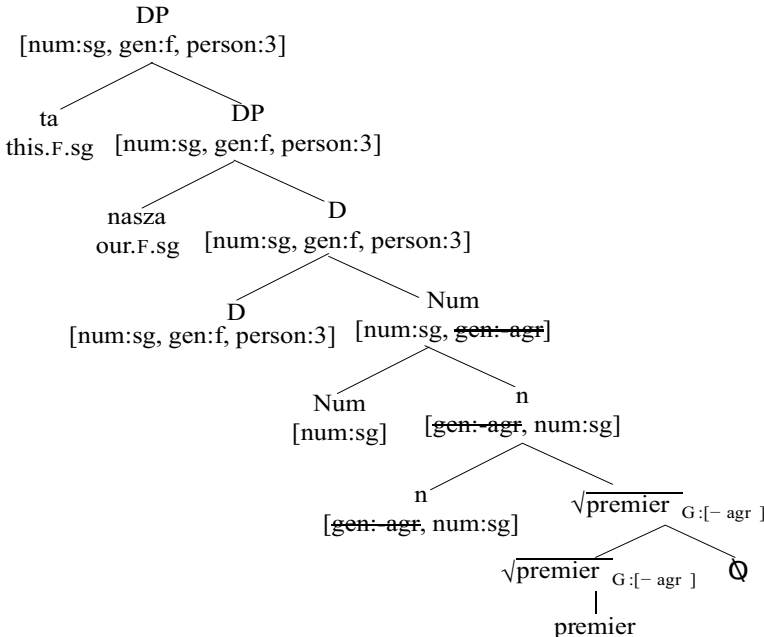
**d. Work space terminates,  
impoverishment takes place**



**e. D merged with NumP;  
D with valued gender (m) and person (3);  
num shared by Merge as Agree  
& Spell-out of the complement of D**

The derivation plays out differently when the gender feature on D is valued as feminine. In such a case, all unvalued gender features within the D part of the extended nominal projection become valued as feminine. However as before, the valuation cannot affect the lower work space. Instead, the structure gets morphologically spelled-out as if the lower part was masculine, while the higher part is in feminine, resulting into a mixed agreement pattern, (10).

(10) *Simplified derivation of premier.F 'female prime minister'*



## 4. Conclusions

We have proposed that roots are not homogeneous when it gets to their syntactic features. While some roots don't have any syntactic features from the lexicon, other roots do. This distinction has consequences for derivational timing and properties of the extended functional domain. We argue that it also has consequences for our typology of features.

We can thus distinguish three different types of features. First, syntactic features on functional heads are familiar well-behaved features that may be valued or unvalued and are subject to matching and valuation by agree. Features of indexed roots are different in that non-binary values are possible (noun classes, 3-way gender systems etc.). These features may be post-syntactically copied on unvalued features.<sup>7</sup> Finally, we have identified features of featured roots. These features are strictly binary and always valued (the logic being that otherwise they wouldn't need to be represented in the lexicon). Crucially, these features project through the structure by merge as agree (Adger 2003). We suggested that our proposal sheds light on the stipulated distinction between concord and agree, however, a closer examination of this suggestion awaits future research.

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<sup>7</sup> The basic idea is reminiscent of Arregi & Nevins (2008) and their distinction between Agree-value and Agree-copy. Note that in our system the application of Agree-copy is more restricted.

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