Hybrid Agreement in Bosnian/Croatian/Serbian

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Abstract

This paper examines the hybrid agreement patterns in Bosnian/ Croatian/Serbian (BCS). Building on the previous work of the analysis demonstrates that by adopting a default unification mechanism and extending the existing type hierarchy, a feasible analysis of BCS hybrid agreement can be accomplished. The paper also explores a functor analysis, which delivers successful results with minor changes to the type hierarchy and lexical entries. The findings also refute the claim that the phenomenon of hybrid agreement in BCS gives evidence for the DP-hypothesis, thereby rendering the argument unable to favour either the NP or the DP hypothesis.

1 Introduction

The debate whether the noun or the determiner is the head of a nominal phrase has been ongoing since the 1980s with the emergence of the so-called DP-hypothesis. Prior to its emergence, the standard analysis held that the noun constitutes the head of a nominal phrase. The DP-hypothesis was first proposed by Szabolcsi (1983), Fukui (1986) and Abney (1987) in a reaction to Chomsky's reworking of the clause in order to maintain the parallelism between the structure of the clause and the nominal domain. As Minimalism in syntax (Chomsky 1993) became increasingly popular, the DP-hypothesis gained textbook status e.g. Adger (2003).

Nonetheless the debate is far from being settled in favour of the DP-hypothesis. Salzmann (2018) and Salzmann (2020) revisit the NP vs. DP debate and discuss the arguments seemingly supporting each hypothesis. To refresh the debate Salzmann (2020) works out a sharp definition of headedness and introduces a puzzle regarding hybrid agreement in Bosnian/Croation /Serbian (henceforward BCS).[1]

In BCS, the noun class II is of grammatical gender feminine but refers to male entities. While only agreeing in semantic gender for singular number, grammatical gender is triggered when the noun is being used in plural number. To complicate things even more some speakers allow for a mixed agreement inside the same sentence or noun phrase, hence feminine and masculine gender.

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[1]The language naming is based on alphabetical order to avoid any value-ranking (Alexander 2006: 426).

(1) (Puškar 2018: 278)

a. star-**i**/*star-**a** vladik-**a** me je juče
old-M.SG/old-F.SG bishop-SG me is yesterday
posetio-∅/*posetil-**a**
visit.PTCP-M.SG/F.SG
'the old bishop visited me yesterday'

b. star-**e** vladik-**e** su me juče posetil-**e**/posetil-**i**
old-F.PL bishop-PL are me yesterday visit.PTCP-F.PL/M.PL
'the old bishops visited me yesterday'

c. star-**i** vladik-**e** su me juče posetil-**i**/*posetil-**e**
old-M.PL bishop-PL are me yesterday visit.PTCP-M.PL/F.PL
'the old bishops visited me yesterday'

In (1a) the agreeing adjective *stari* 'old' and participle verb *posetio* 'visit' show agreement with the semantic gender of the noun *vladik* 'bishop', hence masculine gender. If the noun is used in plural number as in (1b), the agreeing elements bear feminine gender. Some speakers of BCS allow for semantic agreement for plural nouns as shown by the sentence in (1c) shows, some speakers even allow for a mixed agreement pattern as in (1b). Note, that once semantic agreement is used, succeeding agreeing elements can not bear grammatical gender. This behaviour is made explicit by the sentence in (1c), where the adjective bears masculine gender and the succeeding participle verb is only not permitted to bear feminine gender. This behaviour in hybrid agreement is in line with Agreement Hierarchy by Corbett (1979), which describes a decreasing probability of grammatical agreement along the agreement hierarchy. It ranges from the attributive domain via the predicative domain and the relative pronoun and end in the personal pronoun. This means that the chance of semantic agreement rises (with no intervening decrease) from the attributive domain to the personal pronoun (Corbett 2006: 207).

2 Discussion

The phenomenon of hybrid agreement was already addressed by Wechsler & Zlatić (2003) who assume two gender attributes, namely CONCORD|GENDER and INDEX|GENDER. The former being the grammatical and the latter the semantic property of the noun. Furthermore, they work out that while adjectives and determiners agree with the CONCORD gender the participle verb in BCS agrees with the INDEX gender. To derive the behaviour of class II nouns like *vladika* 'bishop', they employ a default unification system proposed by Lascarides & Copestake (1999). It unifies default values (represented on the right side of the forward slash), if there is no conflicting hard value, or other soft value specified by a type lower in the hierarchy (Wechsler &

Zlatić 2003: 42). That means that subtypes have priority when unifying over supertypes (Wechsler & Zlatić 2003: 66). Wechsler & Zlatić use the mechanism of default unification to constrain words of the type *noun-word*$_{ci}$ (concord-index) which is a subtype of *noun-word*$_{si}$ (semantics-index). In the type hierarchy they are structurally above the types for the declension classes.

(2) Default unification constraints (Wechsler & Zlatić 2003: 66)

a. *noun-word*$_{si}$:

$$\begin{bmatrix} \text{INDEX} & \left[\text{GENDER} \quad \textit{gender}/\boxed{1}\right] \\ \text{RESTR} & /\left[\text{SEX} \quad \boxed{1}\textit{sex}\right] \end{bmatrix}$$

b. *noun-word*$_{ci}$:

$$\begin{bmatrix} \text{CONCORD} & \begin{bmatrix} \text{GENDER} & /\boxed{3} \\ \text{NUMBER} & /\boxed{4} \end{bmatrix} \\ \text{INDEX} & \begin{bmatrix} \text{GENDER} & /\boxed{3} \\ \text{NUMBER} & /\boxed{4} \end{bmatrix} \end{bmatrix}$$

Wechsler & Zlatić posit that the type for the declension class II is further specified such that it employs a type *noun-II*$_{\emptyset}$ and *noun-II*$_{f}$, whereas the former is constrained for singular number and the latter for plural number and feminine concord gender (Wechsler & Zlatić 2003: 43). Bringing together the default unification and the type hierarchy has the effect that while singular nouns of type *noun-II*$_{\emptyset}$ are not constrained for concord gender the default unification of (2b) and (2a) apply. Assuming a male bishop the lexical sign for the noun *vladika* will show masculine gender values for the attributes SEX, INDEX and CONCORD as illustrated by (3). Thus, the sentence in (1a) can be derived.

(3)

$$\begin{bmatrix} \text{PHONOLOGY} & \begin{bmatrix} \text{STEM} & \textit{vladik} \\ \text{DECL} & \textit{II} \end{bmatrix} \\ \text{SYNSEM} & \begin{bmatrix} \text{CAT} \mid \text{HEAD} \mid \text{CONCORD} \mid \text{GENDER} \ \boxed{1} & \\ \text{CONTENT} & \begin{bmatrix} \text{INDEX} & \textit{i}\left[\text{GENDER} \quad \boxed{1}\right] \\ \text{RESTRICTIONS} & \begin{bmatrix} \text{PRED} & \left\{\textit{bishop(i)}\right\} \\ \text{SEX} & \boxed{1}\textit{masc} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

On the other hand, if the noun is used in plural number with the type *noun-II*$_{f}$, CONCORD|GENDER is set to *feminine*. Through the default unification constraint on type *noun-word*$_{ci}$ INDEX|GENDER is shared with CONCORD|GENDER. The default unification on *noun-word*$_{si}$ can not apply since the subtype has the priority here. The resulting lexical entry for *vladike* 'bishops' now bears feminine CONCORD and INDEX gender being able to produce the sentence in (1b). Wechsler & Zlatić note that some speakers of BCS allow masculine gender agreement also for nouns with plural number, thus they assume that for these speakers the type *noun-II*$_{\emptyset}$ is not constrained for singular number (Wechsler & Zlatić 2003: 71). But as the example in

(1b) shows, also mixed agreement patterns are possible. This pattern can not be derived with the system sketched by Wechsler & Zlatić, since the default unification constraint on *noun-word*$_{ci}$ ensures identical values for CONCORD and INDEX gender.

Salzmann (2020) introduces an example from BCS with even more complexity. Here, the switch from grammatical gender to semantic gender is made between the attributive adjective and the demonstrative *oni* 'those'.

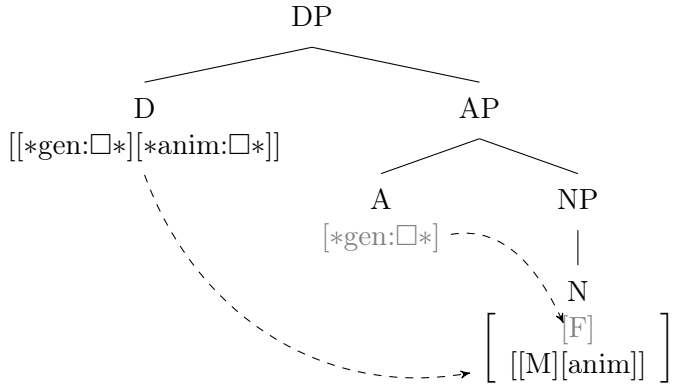
(4) BCS (Salzmann 2020: 34)
Oni star-e vladike su se posvadjal-i/*posvadjal-e na
Those-**M**.PL old-**F**.PL bishops are REFL argued-**M**.PL/argued-F.PL on
ulici.
street
'Those old bishops argued on the street'

For Salzmann this is evidence, that the head of the nominal phrase is D. He builds his argumentation upon the work of Puškar (2017) and Puškar (2018), who employs relativized probing to derive the agreement patterns of BCS. In short, the difference between semantic and grammatical gender lies in the complexity of their probes. The feature for semantic gender has an additional node for animacy. Salzmann defines that complex probes can only be valued by complex features. Furthermore, they can pass simple features, although simple probes cannot pass complex features. Moreover, simple probes cannot be valued by complex features. This has the effect that once a head's probe is valued by a complex feature, simple probes cannot look past it (Salzmann 2020: 35).

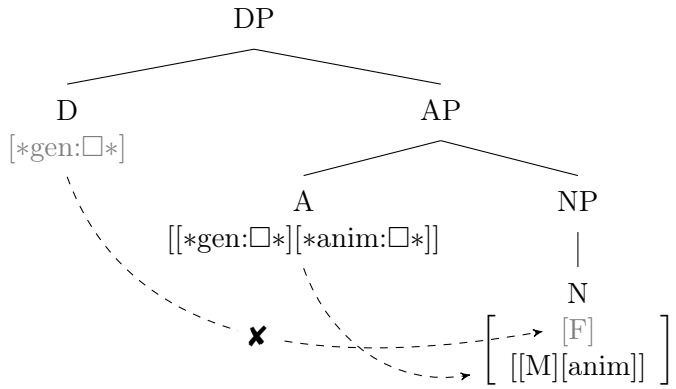
In (5) the adjective is merged first and therefore also probes first. The adjective in (5a) probes for a simple gender feature and is valued by the simple feature on the noun. After that the determiner with a complex gender probe is merged. It probes passed the adjective and is valued by the complex feature on the noun.

(5) (Salzmann 2020: 36)

a.



b.



On the other hand, if the adjective probes for a complex feature, like in (5b), and the determiner then tries to probe for a simple feature, derivation fails. The simple probe from the determiner cannot be valued by the features on the adjective nor can it probe past the adjective to be valued by the simple feature on the noun. In cases where the probes of the adjective and determiner correspond in terms of complexity, the derivation will always be successful. If another noun phrase, such as V, were to enter the derivation, the same principles relating to the complexity of probes would apply. Consequently, this system can derive the concordance patterns (1) and (4).

Salzmann states that under the NP-hypothesis this analysis would not function, as the features on N would be projected and thus accessible for probes from D and V, even in scenarios where grammatical agreement is disregarded (Salzmann 2020: 38). As will be shown in the next section an NP-analysis is possible, building on the work by Wechsler & Zlatić (2003). Furthermore, an alternative approach following Van Eynde (2020) will be assessed showing that default unification is not strictly necessary to derive the mixed agreement patterns of BCS.

3 Proposal

To account for the mixed agreement patterns of (1b,1c) and (4), the type hierarchy for class II nouns is augmented as shown in Figure 3. The type *noun-II*$_{\emptyset}$ is still constrained for singular number and the default unification constraints apply as described above and illustrated by (3). The second subtype is *noun-II*$_{pl}$, which is only constrained for plural number. Its subtypes are *noun-II*$_{f}$ and *noun-II*$_{m}$, whereas the former works the same as with Wechsler & Zlatić (2003) and the latter is underspecified for CONCORD|GENDER with the value *sex*. Furthermore, it is constrained for INDEX|GENDER *masculine*.

The type *noun-II*$_{f}$ will result in a lexical sign with INDEX|GENDER *feminine* producing sentences with an all feminine pattern. The type *noun-II*$_{m}$ has both CONCORD and INDEX gender specified and thus the default unification on type *noun-word*$_{ci}$ can not apply. Recall that in the YADU system the subtype

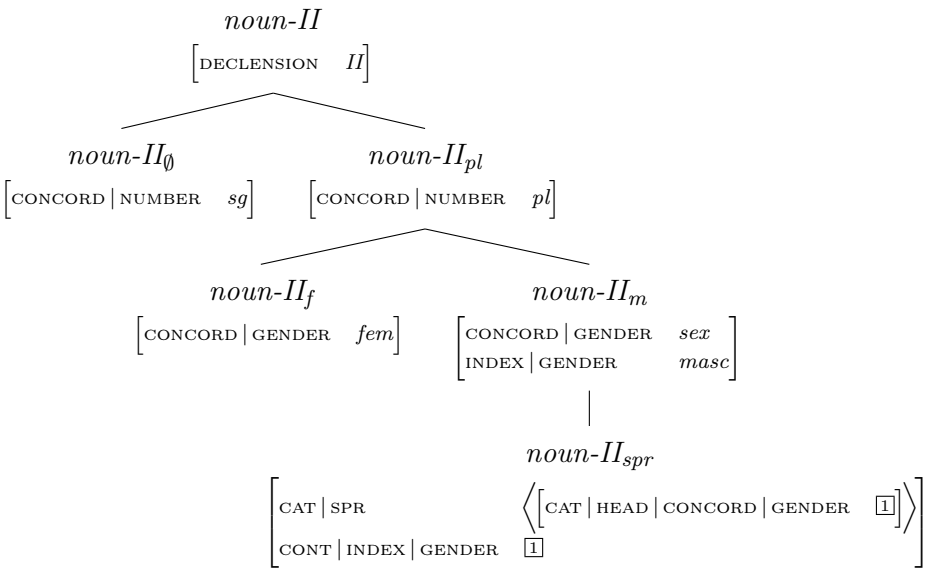


Figure 1: Revised version of the class II type hierarchy

takes priority over the supertype. Since CONCORD|GENDER is underspecified, the noun can combine with either feminine or masculine adjectives, ensuring the participle verb to bear masculine gender, since the type is constrained for INDEX|GENDER *masculine*.

With the subtype *noun-II$_{spr}$* of type *noun-II$_m$* the determiner comes into play. It is defined such that the CONCORD|GENDER of the specifier is bound to the INDEX|GENDER of the noun. Additionally, a default unification constraint is introduced on the type *word-noun*. By default it binds the CONCORD|GENDER value of the specifier to the CONCORD|GENDER value of the noun. This has the effect that nouns of all types except *noun-II$_{spr}$* trigger concord agreement with the specifier.

(6) *noun-word*:

$$\begin{bmatrix} \text{SPR} & \left\langle \left[\text{CAT} \mid \text{HEAD} \mid \text{CONCORD} \mid \text{GENDER} \quad /\,\boxed{1} \right] \right\rangle \\ \text{CONCORD} \mid \text{GENDER} & /\,\boxed{1} \end{bmatrix}$$

To summarize class II nouns of type *noun-II$_\emptyset$* produce an all masculine gender pattern in singular number as in (1a). This is achieved through the default unification constraint on *noun-word$_{ci}$* (2b) which binds the CONCORD|GENDER to INDEX|GENDER and INDEX|GENDER through the constraint on *noun-words$_{si}$* (2a) to the value of SEX. Since the gender of the specifier

is not defined the constraint on *noun-word* applies that binds the specifiers GENDER value by default to CONCORD|GENDER resulting in the lexical sign in (7). Recall that *noun-II*$_\emptyset$ is restricted to singular number ensuring that singular nouns of class II only trigger semantic agreement as shown in (4).

(7)
$$\left[\begin{array}{l} \textit{noun-II}_\emptyset \\ \\ \text{SYNSEM} \end{array}\right.\left[\begin{array}{l} \text{CAT}\left[\begin{array}{l} \text{CONCORD} \mid \text{GENDER } \boxed{1} \\ \text{SPR} \left\langle \left[\text{CAT} \mid \text{HEAD} \mid \text{CONCORD} \mid \text{GENDER } \boxed{1}\right] \right\rangle \end{array}\right] \\ \text{CONT}\left[\begin{array}{ll} \text{INDEX} \mid \text{GENDER} & \boxed{1} \\ \text{REST} \mid \text{GENDER} & \boxed{1}\ \textit{sex} \end{array}\right] \end{array}\right]\left.\vphantom{\begin{array}{l} \textit{noun-II}_\emptyset \\ \\ \text{SYNSEM} \end{array}}\right]$$

All feminine gender patterns as in (1b) can be derived with *noun-II*$_f$ nouns as represented by the lexical sign in (8). The type *noun-II*$_f$ is constraint for CONCORD|GENDER *feminine* and since the INDEX|GENDER is bound to CONCORD|GENDER through constraint on (2b) the participle verb bears feminine gender. The specifier bears feminine gender since again the constraint on *noun-word* (6) applies binding its GENDER value to the one of CONCORD.

(8)
$$\left[\begin{array}{l} \textit{noun-II}_f \\ \\ \text{SYNSEM} \end{array}\right.\left[\begin{array}{l} \text{CAT}\left[\begin{array}{l} \text{CONCORD} \mid \text{GENDER } \boxed{1}\ \textit{fem} \\ \text{SPR} \left\langle \left[\text{CAT} \mid \text{HEAD} \mid \text{CONCORD} \mid \text{GENDER } \boxed{1}\right] \right\rangle \end{array}\right] \\ \text{CONT} \mid \text{INDEX} \mid \text{GENDER } \boxed{1} \end{array}\right]\left.\vphantom{\begin{array}{l} \textit{noun-II}_f \\ \\ \text{SYNSEM} \end{array}}\right]$$

Mixed gender patterns as in (1b) and all masculine patterns in plural number such as in (1c) can be analysed with the type *noun-II*$_m$ and *noun-II*$_{spr}$. Both types are constraint for INDEX|GENDER *masculine* and underspecified for CONCORD|GENDER *sex* overwritting the default unification constraint on *noun-word*$_{ci}$ 2b, since in the YADU system subtypes take priority over their supertype. The constraint on *noun-word* binds the specifiers gender by default to CONCORD|GENDER. For sentences with a determiner and adjective such as (4) this has the result that both the determiner and adjective share the same gender as reflected by the lexical sign in (9). Furthermore, the underspecification of CONCORD|GENDER allows for feminine and masculine gender on both the determiner and adjective. Since the value of INDEX|GENDER is *masculine* ungrammatical sentences as indicated by the stared forms in (1c) can not be produces.

(9)
$$\begin{bmatrix} \textit{noun-II}_m & \\ \text{SYNSEM} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{CONCORD} \mid \text{GENDER } \boxed{1}\ \textit{sex} \\ \text{SPR} \left\langle \left[\text{CAT} \mid \text{HEAD} \mid \text{CONCORD} \mid \text{GENDER } \boxed{1} \right] \right\rangle \end{bmatrix} \\ \text{CONT} & \left[\text{INDEX} \mid \text{GENDER } \textit{masc} \right] \end{bmatrix} \end{bmatrix}$$

To derive sentences with a mismatch between the gender of the adjective and determiner, as shown in (4), type *noun-II*$_{spr}$ come into play. The lexical sign is shown in (10). The type *noun-II*$_{spr}$ is constraint such that the gender of the specifier is bound by INDEX|GENDER with the effect that the default unification on *noun-word* (6) does not apply. Thus, the determiner would bear masculine gender while the adjective is free of bearing masculine or feminine gender due to the underspecification of CONCORD|GENDER.

(10)
$$\begin{bmatrix} \textit{noun-II}_{spr} & \\ \text{SYNSEM} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{CONCORD} \mid \text{GENDER } \textit{sex} \\ \text{SPR} \left\langle \left[\text{CAT} \mid \text{HEAD} \mid \text{CONCORD} \mid \text{GENDER } \boxed{1} \right] \right\rangle \end{bmatrix} \\ \text{CONT} & \left[\text{INDEX} \mid \text{GENDER } \boxed{1}\ \textit{masc} \right] \end{bmatrix} \end{bmatrix}$$

This point is a possible weakness of this analysis since both *noun-II*$_m$ and *noun-II*$_{spr}$ can produce all masculine gender patterns in the plural. If type *noun-II*$_m$ is modified by a masculine adjective, the nouns CONCORD|GENDER resolves to *masculine* and through the default unification constraint on *noun-word* the specifier gender is also masculine. The type *noun-II*$_{spr}$ on the other hand defines specifier's *gender* as masculine. Hence, both types have a identical feature structure only differing in their structure sharing. This posits a challenge, since this type hierarchy then produces two solutions for those sentences. To work around this problem one could assume that the final linguistic representation need to have types that are maximal specific. That way semantic agreement patterns would be only derived by *noun-II*$_{spr}$.

3.1 Functor analysis

An alternative way to circumvent the problem of ambiguous solutions is to follow the functor analysis of the determiner. In contrast to the approach above based on Wechsler & Zlatić (2003), where determiners satisfy the object in the specifier list of the noun, determiners as functors attach to nouns like adjectives. They have a type *noun-word* as their value of the attribute SELECT and if satisfied resulting in a head-functor-phrase as shown in (11).

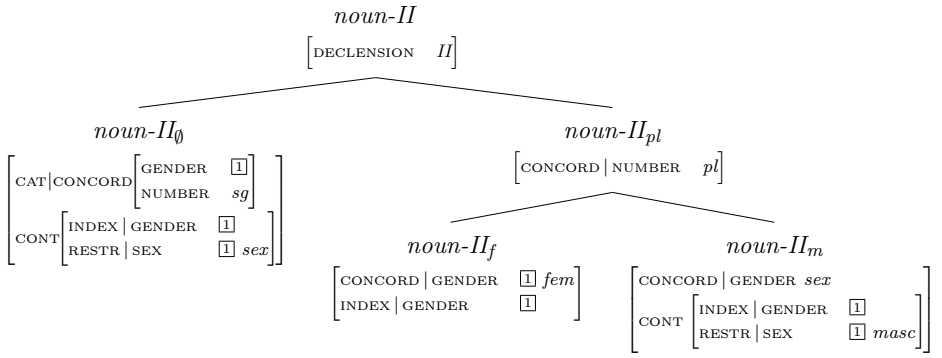


Figure 2: Revised version of the class II type hierarchy

(11) (Van Eynde 2020: 10)
head-functor-phrase ⇒ $\begin{bmatrix} \text{DAUGHTERS} & \left\langle \left[\text{SYNSEM}\,|\,\text{CAT}\,|\,\text{HEAD}\,|\,\text{SELECT}\ \boxed{1}\right], \text{X} \right\rangle \\ \text{HEAD-DTR}|\text{SYNSEM} & \boxed{1}\ \textit{synsem} \end{bmatrix}$

To derive the agreement patterns of BCS the type hierarchy of the type *noun-word* is revised such that it is striped of the default unification constraints as shown in Figure 2. Moreover, the subtypes of type *noun-II* are reduced to the three subtypes *noun-II*$_\emptyset$, *noun-II*$_f$ and *noun-II*$_m$. The type *noun-II*$_\emptyset$ is constrained for singular number as in its previous version. Additionally, it is defined such that the value of CONCORD and INDEX GENDER is shared with the value of the SEX attribute. The resulting lexical sign is the same as the one employing default unification in (2a). This ensures that only semantic agreement can apply for singular nouns.

Grammatical agreement, hence an all feminine gender pattern is achieved with the type *noun-II*$_f$ mimicking the default unification constraint in (2b), binding the value of INDEX|GENDER to the one of CONCORD|GENDER. The remaining type *noun-II*$_m$ is underspecified for CONCORD|GENDER *sex*. By sharing the value of the attribute SEX with INDEX|GENDER and additionally constraining it for *masculine* SEX, it is ensured that the participle verb agrees in masculine gender. With these mechanism semantic agreement patterns like the one in (1c). In order to derive patterns with a mismatch in gender between the adjective and determiner, as illustrated by the sentence in (4), further assumptions about determiners need to be made. (12) gives a simplified lexical sign for a masculine determiner. The object in the SELECT list is underspecified for CONCORD|GENDER, whereas INDEX|GENDER is bound by the CONCORD|GENDER of the determiner, which has the value *masculine*.

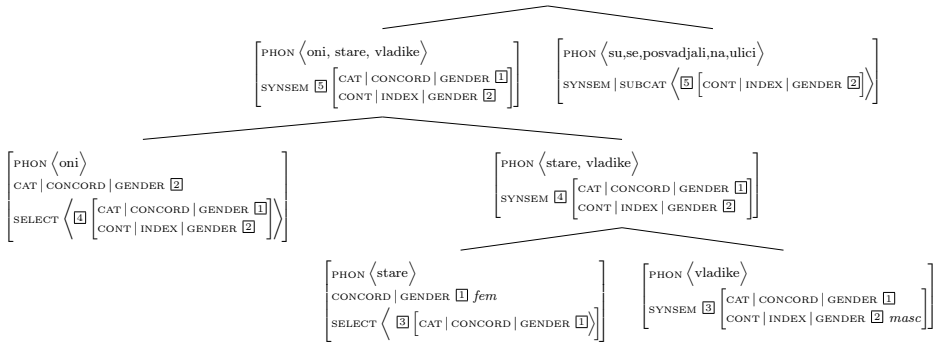


Figure 3: Derivation tree for mixed agreement pattern under the functor analysis for the sentence *Oni stare vladike su se posvadjali na ulici* 'Those old bishops argued on the street' (4).

(12)
$$\begin{bmatrix} \text{det} & \\ \text{CONCORD} \mid \text{GENDER} & \boxed{1}\ \textit{masc} \\ \text{SELECT} & \left\langle \begin{bmatrix} \text{CAT} \mid \text{CONCORD} \mid \text{GENDER} & \textit{sex} \\ \text{CONT} \mid \text{INDEX} \mid \text{GENDER} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

Underspecifying the concord gender of the selected item the determiner is able to attach to both feminine and masculine noun phrases. By sharing the same value between CONCORD|GENDER and the selected item's INDEX|GENDER , which resolves to masculine, a sentence with a verb bearing feminine gender is excluded. Making this assumption exclusively for masculine determiners in BCS is only possible because mixed agreement patterns in BCS can only be observed for male referring entities (Puškar 2018: 282).

The tree in Figure 3 shows a derivation for the sentence in (4). First, the the feminine adjective *stare* selects the noun *vladike* of noun type *noun-II*$_m$ which is underspecified for CONCORD|GENDER *sex*. Through structure sharing with the adjective's CONCORD|GENDER the noun's CONCORD|GENDER resolves *fem*, the subtype of *sex* in the gender type hierarchy. The resulting phrase saturates the object in the determiner's SELECT list, since it bears the INDEX|GENDER *masculine*. Lastly, the verb cluster has a object of type *noun* in its SUBCAT list. As it bears masculine gender the SUBCAT list can only be satisfied by an object, whose INDEX|GENDER is *masculine*.

The main advantage of the functor analysis is, that it does not rely on the usage of defaults, making this analysis easier to implement using a grammar development framework like TRALE (Penn et al. 2003). On the contrary, it mimics a DP-analysis by reverting the selector-selectee relationship of nouns and determiner/adjectives. On the other hand noun still projects its features and thus the NP analysis could still hold for the functor analysis.

The strength of the analysis that is based on Wechsler & Zlatić 2003 in comparison to the functor analysis is in fact the use of the default unification, since it could represent the actual usage of hybrid agreement by speakers of BCS. The other noun classes in BCS don't allow for a mismatch in gender and thus bear the same gender of INDEX and CONCORD, which is mapped by the default unification of those features. Furthermore, the default unification that binds the INDEX|GENDER to the SEX attribute is also applied for nouns of the other noun classes.

Both analysis have in common that they are not that easily transferable to other cases of mixed agreement such as found in Hebrew, Russian, Finnish and Chichewa. Those languages allow for a mismatch between to adjectives in the nominal domain (Landau 2016: 1004–1008). In BCS both adjectives need to bear the same gender Puškar (2017: 102).

Finally, it should be noted that the evidence for the hybrid agreement pattern heavily relies on the data provided by Puškar (2018) and Salzmann (2020). This raises the question on how the phenomenon of hybrid agreement is distributed throughout the speakers of BCS. A corpus study would certainly help to clarify the sparse data situation but is beyond the scope of this paper.

4 Conclusion

The analysis of hybrid agreement in BCS initially followed the approach of Wechsler & Zlatić (2003). They distinguish between grammatical and semantic gender, which are present in the feature structure under CONCORD and INDEX respectively. The analysis demonstrated that by adopting the default unification mechanism of Wechsler & Zlatić and extending their type hierarchy, a feasible analysis of BCS hybrid agreement could be accomplished with the noun serving as the head of the nominal phrase. The analysis was embedded within the framework of HPSG whereas the agreement mechanism of HPSG remains untouched. Exploring a functor analysis based on Van Eynde (2020) delivers also successful results. It was shown that minor changes to the type hierarchy and lexical entries could derive the agreement patterns of BCS. This approach is more efficient in implementation complexity and addresses the weaknesses of the other approach, such as ambiguous solutions with defaults. Most importantly the analyses refute Salzmann's claim that the phenomenon of hybrid agreement in BCS gives evidence for the DP-hypothesis. Therefore, Salzmann's argument cannot be used to favour either the NP or the DP hypothesis, and loses its epistemic value.

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