On the Number-Gender (In)dependence in Agreement with Coordinated Subjects

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Abstract: This paper examines the availability of single-conjunct agreement in number and gender in Bosnian/Croatian/Serbian. Reported are the results of an experiment in which coordinated singulars are included, as well as disjunction and negative-concord conjunction, next to the typically examined conjoined plurals. The research shows that, contra the general assumptions in the literature (Marušič, Nevins, and Saksida 2007, Marušič, Nevins, and Badecker 2015, Bošković 2009) but in line with earlier research (Moskovljević 1983, Bojović 2003), single-conjunct agreement does occur with coordinated singulars, especially in gender, even if less frequently. This paper shows that (i) first-conjunct agreement in gender preverbally and even last-conjunct agreement postverbally are produced above error level, and that the availability of collective interpretations for the coordinated subject influences the acceptability of the different agreement patterns available, and (ii) number and gender agreement do not have to target the same constituent. The findings shed light on the relation between the features of number and gender with regard to the issues of their bundling and simultaneous agreement, where the experimental results suggest that, while number tends to agree in a pattern that fits either semantic agreement or agreement with the entire conjunction, gender prefers to target single members of coordination, the first or the last. We speculate that a degree of "attraction" obtains, whereby number may attract gender to agree with the entire conjunction or gender may attract number to agree with a single conjunct. The results are used to compare two analyses offered in the literature—Marušič, Nevins, and Saksida 2007/Marušič, Nevins, and Badecker 2015 and Bošković 2009—showing that our empirical findings are problematic for both, but give a certain advantage to Marušič and his co-authors.

1. Introduction

1.1. Single-Conjunct Agreement: Syntax and/or Its Interface with Phonology

Instances of single-conjunct agreement—agreement of the verb with only one member of a coordinated subject as illustrated in (1a)—have ignited intensive discussion in the recent literature (van Koppen 2005, Benmamoun, Bhatia, and Polinsky 2009, Bošković 2009, Marušič, Nevins, and Saksida 2007 [here-

Journal of Slavic Linguistics 24(1): 41–69, 2016.

after MNS 2007], Marušič, Nevins, and Badecker 2015 [hereafter MNB 2015], Bhatt and Walkow 2014, Franks and Willer-Gold 2014, Nevins 2014, Polinsky 2014, among others).[1]

(1) a. Pištaljke i zvona su se čuli/ čule/
whistle$_{F.PL}$ and bell$_{N.PL}$ AUX$_{PL}$ REFL heard$_{M.PL}$/heard$_{F.PL}$/
čula sve do reke.
heard$_{N.PL}$ all to river
'(The) whistles and the bells could be heard all the way to the river.'

b. Breza i topola su se videle/ %videli
birch$_{F.SG}$ and poplar$_{F.SG}$ AUX$_{PL}$ REFL seen$_{F.PL}$/ seen$_{M.PL}$
iz velike daljine.
from large distance
'A/the birch and a/the poplar could be seen from far away.'

Bosnian/Croatian/Serbian (BCS) is one of the languages in which the full array of theoretically available options of gender agreement with coordinated subjects is verified empirically. It displays agreement with the first conjunct (first-conjunct agreement, FCA), i.e., the feminine agreement in (1a), agreement with the last conjunct (last-conjunct agreement, LCA), i.e., the neuter agreement in (1a), agreement with all the conjuncts (when they are of the same gender, we refer to it as resolved agreement, RA), i.e., the feminine agreement in (1b), and default agreement (default gender agreement in BCS assigns the default masculine gender, typically when the conjuncts are mixed in gender but not only then; see (1b), abbreviated Def), i.e., the masculine agreement in both sentences in (1).

Examples involving singular conjuncts in (1b) triggering plural on the verb suggest that what we see is agreement with the entire conjoined subject. If one of the singular conjuncts is masculine or neuter, there is a consensus in the literature (Bošković 2009, Franks and Willer-Gold 2014) that the verb needs to show default masculine agreement because single-conjunct agreement is not available with singular conjuncts (for a different view, see Franks and Willer-Gold 2014, the corpus findings of Bojović 2003, as well as our experimental data in section 2).

While in the above examples it is not clear that LCA, neuter in (1a), is not actually second-conjunct agreement, this is easily resolved by the examples in (2).

[1] All the examples in the paper, unless specified otherwise, come from BCS.

(2) a. Daske, dleta, i čekići su ležale/??ležala/
bar$_{F.PL}$ chisel$_{N.PL}$ and hammer$_{M.PL}$ AUX$_{PL}$ lay$_{F.PL}$/ lay$_{N.PL}$/
ležali unaokolo.
lay$_{M.PL}$ around
'(The) bars, chisels, and hammers were lying around.'

b. Čekići, dleta, i daske su ležale/ ??ležala/
hammer$_{M.PL}$ chisel$_{N.PL}$ and bar$_{F.PL}$ AUX$_{PL}$ lay$_{F.PL}$/ lay$_{N.PL}$/
ležali unaokolo.
lay$_{M.PL}$ around
'(The) bars, chisels, and hammers were lying around.'

Both examples in (2) involve three-membered conjoined subjects, and a neuter-gender second conjunct. In both cases agreement with the second conjunct is a sharply degraded option compared to agreement with the first or last member.

Another source of controversy is the status of FCA in preverbal subjects, i.e., feminine in (1a–b) or (2a), which is reported as available by Puškar and Murphy (2015), Arsenijević (2015), and Willer-Gold et al. (this volume), and as ungrammatical by Bošković (2009) and Franks and Willer-Gold (2014: 93–94—but see also their fn. 4 on p. 110, which acknowledges 25% of speakers whose grammars allow preverbal FCA). Our experiment presented in section 2, as well as Willer-Gold et al. (this volume), show that this pattern is grammatical as LCA in preverbal subjects, even if less preferred in certain environments.

The theoretical interest in conjunct agreement has most prominently been motivated by the following considerations. FCA is something we expect in syntax under the assumption that syntax deals with hierarchical structures. The first conjunct is hierarchically the highest conjunct, hence also structurally most local to the verb. LCA, however, is not expected because in hierarchical terms it involves the lowest and so also hierarchically the farthest member of conjunction from the verb. In preverbal subjects, which is the only context in which LCA is reported to be grammatical, the last conjunct is also the one that is linearly the closest to the verb. This has prompted researchers like Benmamoun, Bhatia, and Polinsky (2009), MNS (2007), MNB (2015), Bhatt and Walkow (2014) among many others to consider linear proximity as a factor in single-conjunct agreement.

Both the diversity of analyses proposed for the phenomenon of single-conjunct agreement and the deep theoretical implications of those analyses (van Koppen 2005, Benmamoun, Bhatia, and Polinsky 2009, MNS 2007, MNB 2015, Bhatt and Walkow 2014, Nevins 2014, Polinsky 2014, among many others) testify to the high importance of this phenomenon for the theory of grammar. For instance, if one of the mechanisms involved in single-conjunct agreement

is agreement with the linearly closest member of coordination (MNB 2015 and the references therein), it implies that either syntax is sensitive to linear and not only to hierarchical relations or agreement is at least partially computed in the phonology (see Bobaljik 2008 for arguments that agreement may not be a matter of syntax at all).

However, whether any of the cases of single-conjunct agreement are driven by linear proximity rather than hierarchical relations is a matter of debate. And while Benmamoun, Bhatia, and Polinsky (2009), MNS (2007), MNB (2015), Bhatt and Walkow (2014), and Nevins (2014) provide arguments for such a view, Bošković (2009), Franks and Willer-Gold (2014), or Puškar and Murphy (2015), in particular based on BCS data, argue that what looks on the surface as agreement with the linearly closest conjunct derives in fact from purely syntactic relations. Bošković argues that apparent LCA with preverbal subjects results from the fact that the movement of the subject to the preverbal position interferes with agreement. The only conjunct immune to the movement is the lowest, resulting in LCA being the only pattern of agreement available with preverbal (i.e., moving) subjects. This generalization is disputed by Puškar and Murphy, who claim that FCA preverbally is grammatical. They also offer a purely syntactic analysis, in terms of the order of implementation of Merge, Move, and Agree, with both upward and downward agree available, yielding exactly the five options they report as attested: FCA, LCA, and Def preverbally, and FCA and Def postverbally. For reasons of space, we do not discuss these alternatives in more detail.

A final controversy involves the generally accepted view that in BCS single-conjunct agreement is only possible when the members of the conjunction are all plurals, as maintained by Bošković 2009, though see Franks and Willer-Gold 2014, among others.[2] As in all such cases, the agreement on the verb is also plural, making it impossible to verify whether the plural number agreement comes from the entire conjunction or from one of the conjuncts. Two questions emerge, one theoretical and one empirical. The empirical question is whether number agreement with a single conjunct is an available option, i.e., whether agreement in number in cases of single-conjunct agreement in gender is necessarily with the entire conjoined subject (as assumed by MNS 2007, MNB 2015, Bošković 2009), or possibly also with a single plural conjunct (as allowed in Franks and Willer-Gold 2014). The theoretical question is why the value of number affects the agreement of gender, and how strong this generalization is. Regarding the strength of the generalization that single-conjunct agreement is conditioned by plural conjuncts, there are claims in

[2] Bošković (2009: 461) generalizes: "Number specification also matters. In all of the above cases involving LCA/FCA, the individual conjuncts are plural. When the individual conjuncts are singular, regardless of the gender specification of individual conjuncts, the participle must be masculine."

the BCS literature that the generalization is not even correct. Moskovljević (1983) reports experimental research and Bojović (2003) reports corpus-based research which indicate that single-conjunct agreement is available with singular conjuncts both preverbally and postverbally. In Moskovljević 1983 this is for number only, while in Bojović 2003 it is for both number and gender. We take this as justification for conducting experimental research including this type of coordination. One of the goals of this paper is to use other types of coordinated subjects in which single-conjunct agreement is more acceptable with singular members of coordination, in particular disjunction and negative-concord conjunction, to test for both the possibility of a split between gender and number agreement (i.e., to attest uncontroversial cases of number agreement with the entire coordination and gender agreement with a single member) and the possibility of singular agreement in number with a coordinated subject. The inclusion of disjunction and negative-concord conjunction also introduces the issue of the availability of collective interpretations: while regular conjunction does allow for collective interpretations of the entire coordinated subject, these two types of coordination do not, as shown by combining them with the reciprocal predicates in (3).[3]

(3) a. Nisu se sapleli/ *videli dečak ili/ni
NEG-AUX$_{3PL}$ REFL tripped$_{M.PL}$/ saw$_{M.PL}$ boy or/nor
devojčica.
girl
'A boy or a girl didn't get tripped / *see each other.'
'Neither a boy nor a girl got tripped / *saw each other.'

b. Nisu se sapleli/ videli dečak i devojčica.
NEG-AUX$_{3PL}$ REFL tripped$_{M.PL}$/ saw$_{M.PL}$ boy and girl
'A boy and a girl didn't get tripped / see each other.'

[3] The role of the availability of collective and distributive interpretations has been the subject of many previous studies on agreement, but mostly with respect to agreement attraction (see Bock, Carreiras, and Meseguer 2012 for an overview and references). The possibility of a link between agreement attraction and linear patterns of agreement is an intriguing possibility. However, with respect to distributivity, the effects observed in agreement attraction are the inverse of those we report in section 2. Namely, while distributivity of the attractor in agreement attraction facilitates plural agreement, distributivity of the subject in conjunct agreement inhibits it and facilitates singular agreement on the verb. Moreover, while in attraction the agreement controller distributes over the attractor, in agreement with coordinated subjects the agreeing predicate distributes over the agreement controller. Therefore, in this paper we do not discuss the role of distributivity in agreement attraction. Works like Haskell and MacDonald 2005, showing that even in English disjunction facilitates single-conjunct agreement, are much more relevant.

In terms of agreement with coordinated subjects involving only singular members, our preliminary insights are that the availability of collective interpretations (+Coll, characteristic of the disjunction and negative-concord conjunction) yields a stronger degradation of single-conjunct agreement, while when it is not available (–Coll, characteristic of plain conjunction), single-conjunct agreement is mildly degraded or not degraded at all. Subjects involving disjunction additionally degrade plural-agreement patterns, which are typically unaffected in other types of coordination. These generalizations are scrutinized in the experiment reported in section 2.

(4) a. (?)[Nisu se sapleli]/ (?)[Nije se saplela] devojčica ili dečak.
NEG-AUX$_{3PL}$ REFL tripped$_{M.PL}$/ NEG-AUX$_{3SG}$ REFL tripped$_{F.SG}$ girl$_{F.SG}$ or boy$_{M.SG}$
'A boy or a girl didn't get tripped.'

b. [Nisu se sapleli]/ [Nije se saplela] devojčica ni dečak.
NEG-AUX$_{3PL}$ REFL tripped$_{M.PL}$/ NEG-AUX$_{3SG}$ REFL tripped$_{F.SG}$ girl$_{F.SG}$ nor boy$_{M.SG}$
'Neither a boy nor a girl got tripped.'

c. [Nisu se sapleli]/ ??[Nije se saplela] devojčica i dečak.
NEG-AUX$_{3PL}$ REFL tripped$_{M.PL}$/ NEG-AUX$_{3SG}$ REFL tripped$_{F.SG}$ girl$_{F.SG}$ and boy$_{M.SG}$
'A boy and a girl didn't get tripped.'

The main questions of concern in this paper are thus:

(i) Does the generalization that single-conjunct agreement is not available with singular members of coordinated subjects fully hold empirically, or is it just a tendency?

(ii) If single-conjunct agreement obtains with singular members of coordinated subjects, does it show the same patterns as with plural members, or does the singular number change the behavior of agreement gender as well (in addition to decreasing the likelihood of single-conjunct agreement)?

(iii) Does +/–Coll have a different effect on FCA vs. LCA, pre- vs. postverbally (if, as argued by MNS 2007, MNB 2015, LCA preverbally and at least partly also FCA postverbally are linearly driven patterns, and due

to their PF nature are expected to show different effects regarding a semantic phenomenon such as collective interpretations)?

(iv) Are there clear, uncontroversial cases of number and gender finding different syntactic constituents as controllers for agreement?

Research on the questions above crucially requires the inclusion of members of coordination in singular number. As already noted, singular members of coordination combined with agreement with a single member of coordination are observed to yield better sentences with disjunction and negative-concord conjunction (i.e., with –Coll coordination), which implies that the inclusion of –Coll coordination types is also beneficial.

1.2. Number and Gender: Mutual Relations and Interactions in Agreement

The questions stated in section 1.1. have consequences for some more general questions: What mechanism yields the effects of single-conjunct agreement? Is this effect purely syntactically derived or does it involve the phonology? Other general questions of grammar involved, such as how number relates to gender. Should number and gender be treated as one feature bundle in which gender is dependent on number (Picallo 1991, Antón-Méndez, Nicol, and Garrett 2002, Carminati 2005, Fuchs, Polinsky, and Scontras 2015, Kramer 2015) or as two independent features potentially heading two different functional projections (Ritter 1993, Carstens 2000, 2003)? This raises the question of the necessity of the split modeling of phi agreement, where (person and) gender and number probe for agreement separately and independently of each other (see Bejar 2003 and Rezac 2004 for a theoretical discussion, MNS 2007, Bošković 2009 for a discussion of South Slavic data).

The question of separate versus simultaneous probing of number and gender features, in this or in other terminological formulations, has been already discussed in traditional grammars. In relation to BCS it begins at least as early as Maretić 1899 (with respect to hybrid agreement), and receives a particularly detailed elaboration and analysis in Corbett 1983, 2002, etc., Wechsler and Zlatić 2003, Bošković 2009, 2010, among many others. MNS 2007 (followed in some aspects by Bošković 2009) proposes to analyze single-conjunct agreement in gender in combination with a plural number in examples such as (5), their (7), as the result of a complex sequence of computations.

(5) Včeraj so odšla/ *odšle [teleta in krave] na pašo.
yesterday AUX went$_{N.PL}$/ went$_{F.PL}$ calf$_{N.PL}$ and cow$_{F.PL}$ on graze
'Yesterday calves and cows went grazing.' Slovenian
(MNS 2007: 214)

The verb probes and finds the entire coordinated subject (the &P). The &P is specified as plural in number, but due to a clash between its members (neuter vs. feminine), it lacks gender specification. Number therefore agrees (gets valued), but gender does not (the beginning of the split). The verb probes for gender inside the coordination, but the first and the second conjunct are equidistant (the explanation is complicated and involves a "sister-to-&" relation, which equally applies to the specifier and to the complement of &). The tie-breaking criterion is then linear proximity, obviously in favor of the last conjunct in preverbal subjects and of the first conjunct in postverbal subjects. This completes the split, as number is copied from &P, and gender from the linearly closest conjunct.

As already noted, in configurations such as (5) it is impossible to determine whether the plural on the participle comes from the &P or from a single conjunct (e.g., that which values gender). Consequently, this surface pattern does not discriminate between bundled and separate treatments of the two features or between simultaneous and separate probing of number and gender.[4]

Different explanations can be offered as to why single-conjunct agreement is degraded with singular conjuncts (according to the literature it is ungrammatical). Also of interest is what happens with the controller of number agreement in cases where gender agreement is controlled by one member of the coordination. If number also agrees with a single member of coordination, then maybe there is a semantic requirement that number be plural (possibly strengthened by other semantic properties such as the availability of collective interpretations). If number agrees with the &P, there may be a condition that number on the controller (goal) of gender agreement must match the value already assigned to the number on the target (probe) of agreement. Since the single member of coordination is singular, the condition is violated. Each of these and other possible scenarios has its consequences for the issue of feature bundling and their simultaneous vs. separate agreement.

In this paper, we investigate single-conjunct agreement with singular members of the coordination and draw the consequences for the questions of bundling of number and gender and of their simultaneous or separate agreement.

[4] Bošković (2009: 464) argues that the analytical option of full (i.e., both gender and number) agreement with a single conjunct is proven unavailable by the ungrammaticality of this type of agreement with singular conjuncts (see example (6)). MNB (2015) report on an experiment on N.PL&F.SG conjunctions, and postulate a consistency principle which states that single-conjunct agreement in gender is conditioned by consistency in number. Against Bošković (and in principle consistent with MNB), our experiment shows that even with singulars the situation is not that clear, and that what is introduced as a consistency principle is rather a tendency for agreement in number and gender to match the values on one constituent.

1.3. The Question of Single-Conjunct Agreement in Number

As noted above, it is generally assumed in the literature on agreement with conjoined subjects in South Slavic that single-conjunct agreement is an option available only to gender, not to number. This assumption is backed by the ungrammaticality of examples like (6), intended to represent instantiations of the combination of LCA in number (attested for gender in preverbal subjects) and either LCA (neuter) or Def agreement (masculine) in gender.

(6) *Krave/ krava i tele je paslo/ pasao
cow$_{F.PL}$/ cow$_{F.SG}$ and calf$_{N.SG}$ aux$_{SG}$ grazed$_{N.SG}$/ grazed$_{M.SG}$
na livadi.
on meadow
'The cows/cow and the calf were grazing in the meadow.'

However, as Fuchs, Polinsky, and Scontras (2015: 2) point out, "gender stands apart from number, which is specified within a given eventuality: the number feature of a noun depends on its intended referent in a given use. Thus, number is tightly linked to event structure, the way that case is." In other words, number on the verb has consequences for the quantity properties of the eventuality with a description involving the conjoined argument: in terms of a collective involvement of a participant in the eventuality or its pluractional interpretation. Conjoined subjects imply one of these two options: a conjoined argument entails that the eventuality either is pluractional or involves collective participation. Thus, a semantic degradation could be the reason why, in a language with rich aspectual morphology such as South Slavic languages, conjoined subjects are degraded or bad with singular verbs. Singular agreement is not syntactically excluded; it only triggers semantic violations. This explanation also implies that with types of coordination which unlike conjunction do not allow for a collective interpretation, the agreement facts can be different.

Both MNS (2007)/MNB (2015) and Bošković (2009) argue that &P, the projection of the entire conjunction, computes number and takes the result of the computed number as its number-feature value. This value is always plural. This is another view that we want to subject to empirical testing. We also tackle the theoretical issue of the nature of the syntactic operation that computes number in the & head as well as the question of whether the generalization holds empirically.

According to MNS and MNB, other types of coordination like disjunction lack this capacity to compute number and remain unspecified for it. This view predicts that in disjunction numbers would behave exactly like gender in conjunction. In other words, both gender and number in disjunction involv-

ing mixed members should have all three agreement options available: Def agreement, FCA, and LCA. If all three options are available, all nine of their combinations should also yield well-formed sentences, including the combinations in (7) with single-conjunct agreement in number. But both sentences are ungrammatical. In fact, if any agreement pattern with coordinated subjects is absolutely impossible in BCS, then it is the one in (7b): single-conjunct agreement in number and default in gender. This is experimentally confirmed in section 2.

(7) a. *Poruke ili pismo nije isporučeno na vreme.
message$_{F.PL}$ or letter$_{N.SG}$ NEG-AUX$_{3SG}$ delivered$_{N.SG}$ on time
'(The) message(s) or (the) letter were not delivered on time.'
(LCA, both gender and number)

b. *Poruka ili pismo nije isporučen na vreme.
message$_{F.SG}$ or letter$_{N.SG}$ NEG-AUX$_{3SG}$ delivered$_{M.SG}$ on time
'(The) message(s) or (the) letter were not delivered on time.'
(LCA in number, Default in gender)

Disjunction and especially negative-concord conjunction are structurally nearly equivalent to conjunction in that they involve coordinated members in a hierarchical structure and offer the same "handles" besides the default: the first member, the last member, and a projection on top of the structure.[5] The minimal hypothesis is that they are structurally equivalent and that the differences pertain to the semantic contributions of the individual conjunction words. In the case of negative-concord conjunction, even the same conjunction word is used, only additionally marked for negative concord. Moreover, except for their facilitation of single-member-of-coordination agreement when the members are singular, illustrated in (8), our experiment reported in section 2 shows that they behave very similarly to conjunction regarding the status and relative quantitative distribution of Def, LCA, and FCA preverbally and postverbally.

(8) a. Ovu pesmu je otpevala žena ili dete.
this song AUX$_{3SG}$ sung$_{F.SG}$ woman$_{F.SG}$ or child$_{N.SG}$
'A/the woman or a/the child sang this song.'

[5] In line with our view of a structural equivalence of the Conjunction and the Disjunction Phrase, we continue the standard use of the label &P for a general Coordination Phrase.

(8) b. Nije nestala ni pištaljka ni zvono.
NEG-AUX$_{3SG}$ disappeared$_{F.SG}$ neither whistle nor bell
'Neither the whistle nor the bell disappeared.'

The facts in (7) and (8) show that number in South Slavic does not have to be plural when the subject involves coordination, and such examples call for a reassessment of the view that singular agreement in number with conjoined subjects is impossible.

It is important to note that while examples like (7) and (8) definitely present evidence that subjects consisting of coordinated singular nominal expressions do not necessarily trigger plural agreement on the verb, they do not present clear evidence for single-conjunct agreement in number. The data pattern may as well be a consequence of a different mechanism, e.g., of clausal coordination followed by clausal reduction, or a semantically agreeing zero pronoun on top of the coordinated structure verified at LF (Citko 2004, Arsenijević 2015). Due to its richer semantic contribution, it is generally much harder to determine the locus of the degradation effects with number agreement than it is with agreement in gender.

To briefly sum up, our investigation departs from the previous research on agreement with coordinated subjects in that (i) we test rather than assume the broadly accepted view that singular agreement is impossible with conjoined subjects (though see Moskovljević 1983, Bojović 2008), (ii) we test rather than assume the broadly accepted view that agreement with a single member of coordination is unavailable when the members are singular, (iii) we take into consideration other types of coordination besides plain affirmative conjunction, and (iv) we experimentally assess some controversial issues such as the grammaticality of FCA with preverbal subjects and of LCA with postverbal subjects (see Willer-Gold et al. this volume for a similar agenda). We expect these departures to provide an important new window into the mechanics of agreement with coordinated subjects.

1.4. The Main Theoretical Issues

As already mentioned, the goals of the paper is two: to test the relation between the features of gender and number in agreement (targeting the questions of their bundling and of their simultaneously undergoing agreement) and to test models provided in the literature for single-conjunct agreement phenomena in South Slavic. Two different analyses are examined, those of MNS 2007 and MNB 2015 and that of Bošković 2009. They are examined for their empirical reports as well as for their predictions in the domain of agreement with a single member of coordination when the members are singular, and when different types of coordination are involved.

These two goals are closely intertwined. As already pointed out, the two analyses both predict that agreement with a single member of coordination are ungrammatical when the members are singular. They also both predict that LCA postverbally is generally ungrammatical in BCS. They differ on the availability of FCA with preverbal subjects, with Bošković (2009) reporting that it is ungrammatical in BCS, while the analyses in MNS 2007 and MNB 2015 imply that it should be good in BCS just as it is in Slovenian. Their reports are summarized in (9).

(9) Agreement patterns reported by MNS and MNB and by Bošković

Phenomenon	MNS/MNB	Bošković
single-conjunct agreement in gender with singular conjuncts	Out	Out
singular agreement in number with conjoined subjects	Out	Out
LCA in gender postverbally	Out	Out
FCA in gender preverbally	Fine	Out
number computed in &P for conjunction	Yes	Yes

The two approaches differ in more general as well as in more detailed aspects. The most prominent general difference is that MNS (2007) and MNB (2015) treat LCA preverbally as an instance of closest-conjunct agreement in terms of linear proximity, hence taking place in its crucial components at the syntax-phonology interface. Bošković (2009) offers an analysis entirely in syntactic terms. This section provides a brief introduction to each analysis, without discussing their particulars in much detail.

MNS (2007) and MNB (2015) offer an analysis where the &P computes the value of number and may also compute the value of gender for the entire conjunction. When the verb probes, its number feature is valued as plural, and its gender feature may or may not be valued with the default masculine gender. If not, it may copy (i) the value of the syntactically closest conjunct (= FCA) or (ii) of the linearly closest conjunct (LCA preverbally and FCA postverbally). Postverbally, the last conjunct is neither syntactically nor linearly local, rendering postverbal LCA ungrammatical.

Bošković (2009) also has number computed by &P as plural, valuing the number on the verb. For gender, there are two options: the assignment of the default, which involves consideration of the interface conditions, irrelevant for the topics of interest in this paper, and probing into the conjoined subject, yielding single-conjunct agreement. With postverbal subjects, where the verb has no EPP feature, the probe finds the highest conjunct, and valuation

proceeds, yielding FCA. With preverbal subjects, where the verb has an EPP feature, agreement is conditioned on the pied piping of the valuing constituent. Due to the availability of two candidates for pied piping, a single conjunct or the entire conjunction, valuation fails, the features on the probed goals are deleted, and a new round of probing is initiated. This repeats until a complement of the conjunction head is probed which is not a candidate for pied piping and which therefore values the gender feature on the verb. This gives the preverbal LCA pattern. As pointed out earlier, Bošković claims that FCA preverbally is impossible in BCS, and thus the model correctly captures his data set.

Both the empirical generalizations advanced by these analyses (especially the availability of FCA preverbally, of LCA postverbally, and of single-conjunct agreement with singular conjuncts) and the predictions that they make are tested by the experiment reported below.

2. The Experiment

BCS was chosen as the language of the experiment, apart from practical reasons, because it presents a good testing ground for the targeted issues, since it has both single-member-of-coordination and default agreement patterns as well as both types of single: FCA and LCA. Moreover, the language has complex constraints on all the agreement patterns except for default agreement (see Bošković 2010 for one view of this complexity). Assessing the facts is made easier by the systematic and rich morphological marking of gender and number in BCS. Finally, BCS, together with Slovenian, which shows more or less the same agreement patterns, is one of the best-studied languages when it comes to single-conjunct agreement, and is therefore also where new empirical insights may have broad theoretical consequences.

2.1. Experiment: Design

We conducted a production experiment in BCS, using the portal Ibex Farm.[6] We used the experimental design developed by Willer-Gold et al. (this volume), in which the participant first reads out loud a model sentence involving a masculine singular noncoordinated subject (the screen displays a sentence such as that in (10a) and then is asked to read the sentence again, but with

[6] We express our gratitude to the administrators of Ibex Farm, in particular to its author Alex Drummond, for making our work considerably simpler.

a substitute subject provided on the screen (the screen displays a substitute subject, such as in (10b)).[7]

(10) a. Izbornu bitku je odlučio *duel*.
election battle AUX$_{SG}$ decided$_{M.SG}$ duel$_{M.SG}$

b. Substitution: afere ili saopštenja.
scandals$_{F.PL}$ or announcements$_{N.PL}$

'The duel/The scandals or announcements decided the election battle.'

The agreement pattern used by the participant in the pronounced sentence is coded as sg. or pl. for number and as FCA-SV, LCA-SV, FCA-VS, LCA-VS, or Def for gender. The empirical generalizations tested, as well as the analyses compared, predict different combinations of agreement patterns for number and gender to be produced, and with different relative frequencies.

The aim of the experiment was to investigate agreement in number and gender with coordinated subjects and the interaction of number and gender in production. It differs from the experiments conducted by Willer-Gold et al. in including singular members of coordination as well as disjunction next to simple conjunction. With this modification we encouraged the production of singular agreement in order to test the claim that number agreement with coordinated subjects is always plural, and enables investigation of the effects of the availability of collective interpretations (Coll). By involving the coordination of both singulars and of plurals, we also aimed to test the interaction of number and gender in agreement with coordinated subjects.

Independent variables were Coll (+ vs. –), ordering (SV vs. VS), and the grammatical number of the members of the coordination (pl. vs sg.).[8] There were two dependent variables. One was gender agreement, with levels FCA, LCA, and Def. The other was number agreement, with levels singular (sg.) and plural (pl.). The dependent variable of number agreement was only expected to vary in value with singular members of the coordination, since with plurals all the possible triggers of agreement were plural (&P, first conjunct, last conjunct). Finally, as our focus was on gender agreement and its interaction with number agreement, we also considered the interaction between the two dependent variables. In particular, in light of the bundling hypoth-

[7] In (10) and later examples with substitutions, the word to be replaced by the more complex NP will be italicized.

[8] The actual experiment had three levels for the variable of type of agreement: conjunction, disjunction, and negative-concord conjunction. Since the latter two levels are both non-collective and showed very similar effects, for the sake of simplicity we exclude negative-concord conjunction from the present report.

esis, i.e., the dependency of gender on number, we looked at the effect of the agreement in number on the pattern in gender. The experiment involved 32 stimuli with a factorial design (2×2×2, i.e., +Coll/–Coll x SV/VS x pl./sg.), with four items per condition. The items for each condition are illustrated in (11). As only the items with singular members of coordination are directly relevant for the present paper, we only report on those results, thus collapsing the design to 2×2: +Coll/–Coll x SV/VS. As the variable Coll is not of immediate relevance for the questions targeted by the discussion of the experiment in this paper, we only report on the +Coll level, which gives sharper contrasts (the tendencies are the same with –Coll, only the figures for single-member-of-coordination agreement in gender are marginally lower).

(11) Illustrative examples for each condition

a. ConjSVpl.:

Orden je izazvao incident.
medal$_{M.SG}$ AUX$_{3SG}$ caused$_{M.SG}$ incident$_{M.SG}$

Substitution: Medalje i odlikovanja
medals$_{F.PL}$ and honors$_{N.PL}$

'The medal/medals and honors caused the incident.'

b. ConjSVsg.:

Dogovor je bio prekršen.
agreement$_{M.SG}$ AUX$_{3SG}$ was$_{M.SG}$ violated$_{M.SG}$

Substitution: Zakletva i obećanje
oath$_{F.SG}$ and promise$_{N.SG}$

'The agreement/oath or promise was violated.'

c. ConjVSpl.:

Namučio ih je *zadatak*.
tortured$_{M.SG}$ he$_{ACC}$ AUX$_{3SG}$ task$_{M.SG}$

Substitution: vežbe i pitanja
exercises$_{F.PL}$ and questions$_{N.PL}$

'The task/exercises or questions gave them a hard time.'

d. ConjVSsg.:

Spasao ga je *autopilot*.
saved$_{3SG}$ he$_{ACC}$ AUX$_{3SG}$ autopilot$_{M.SG}$

Substitution: snalažljivost i iskustvo
adeptness$_{F.SG}$ and practice$_{N.SG}$

'The autopilot/adroitness and experience saved him.'

(11) e. DisjSVpl.:

Atentat je uplašio opoziciju.
assassination$_{M.SG}$ AUX$_{3SG}$ scared$_{M.SG}$ opposition

Substitution: Pretnje ili ubistva
threats$_{F.PL}$ or murders$_{N.PL}$

'The assassination/threats or murders scared the opposition.'

f. DisjSVsg.:

Šampanjac ga je dokusurio.
champagne$_{M.SG}$ he$_{ACC}$ AUX$_{3SG}$ knocked$_{M.SG}$

Substitution: Rakija ili vino
rakia$_{F.SG}$ or wine$_{N.SG}$

'The champagne/rakia or wine knocked him out.'

g. DisjVSpl.:

Izbornu bitku je odlučio *duel*.
election battle AUX$_{3SG}$ decided$_{M.SG}$ duel$_{M.SG}$

Substitution: afere ili saopštenja
affairs$_{F.PL}$ or notifications$_{N.PL}$

'The election battle was decided by the duel/affairs or notifications.'

h. DisjVSsg.:

Kasu je napunio *porez*.
cash register AUX$_{3SG}$ filled$_{M.SG}$ tax$_{M.SG}$

Substitution: taksa ili osiguranje
tax$_{F.SG}$ or insurance$_{N.SG}$

'The tax/tax or insurance filled the cash register.'

Thirty-eight subjects participated in the experiment, seventeen male and twenty-one female, with a mean age in the early twenties, all of whom were native speakers of BCS who had spent the past five years within the area of this language. The experiment was conducted at the University of Niš.

The two analyses we compare predict the total absence of number agreement in the singular and predict the absence of agreement with a single member of coordination in gender when the members are singular in number. The approaches differ on four predictions:

(12) Bošković (2009), unlike MNS and MNB, reports that FCA in SV is ungrammatical, thus predicting that it will not occur. This is falsified if FCA is produced in SV.

(13) MNS and MNB, unlike Bošković, can account for, and probably even predict, a combined effect of linear and hierarchical proximity. That is, only their account has some quantitative predictions, as they expect FCA in VS to be much stronger than either FCA or LCA in SV. The significant quantitative advantage of FCA in VS compared to both FCA and LCA in SV would support their analysis over Bošković's.

Finally, unlike, for example, Puškar and Murphy (2015), who assume split agreement in number and gender, Bošković and MNS/MNB consider number and gender to be bundled and simultaneously undergo agreement. The strong version of the simultaneous-agreement hypothesis, i.e., simultaneous checking of all phi features including both number and gender, predicts that both agreement in number and agreement in gender will always follow the same pattern: the combination of first-conjunct gender agreement with plural-number agreement not emerging if the first member of coordination is singular. This view goes well with the generalization found in the literature that single-conjunct agreement is only possible if the conjuncts are plural. However, MNS (2007)/MNB (2015) and Bošković (2009) weaken the simultaneous-agreement view by allowing for the possibility that the two features find different goals of agreement, as a consequence of &P being specified only for number. This results in the feature bundle being valued for number already at the probing of the top level of the coordinated subject and a continued probing deeper into the structure to value gender. Bošković additionally allows agreement in gender to fail and be repeated until it finds the appropriate goal.

This weaker view, in combination with their assumption that &P is always specified for plural number, predicts the absence of singular agreement in number with coordinated subjects. This prediction is falsified by our experiment, which gives a broader range of number-gender value combinations, as demonstrated in section 2.2. However, if the specification of plural number in &P is abandoned, i.e., in the even weaker version of the simultaneous-agreement hypothesis, an even quantitative distribution of the nine possible combinations of the two features and their goals is predicted. These combinations are given in the two tables in (14).

(14) Number-gender agreement combinations if &P is not necessarily specified for number

By pattern (all &Ps were F&N)		By corresponding values in exper.	
Number	Gender	Number	Gender
FCA	FCA	sg.	F
FCA	LCA	sg.	N
FCA	Def	sg.	M
LCA	FCA	sg.	F
LCA	LCA	sg.	N
LCA	Def	sg.	M
Def	FCA	pl.	F
Def	LCA	pl.	N
Def	Def	pl.	M

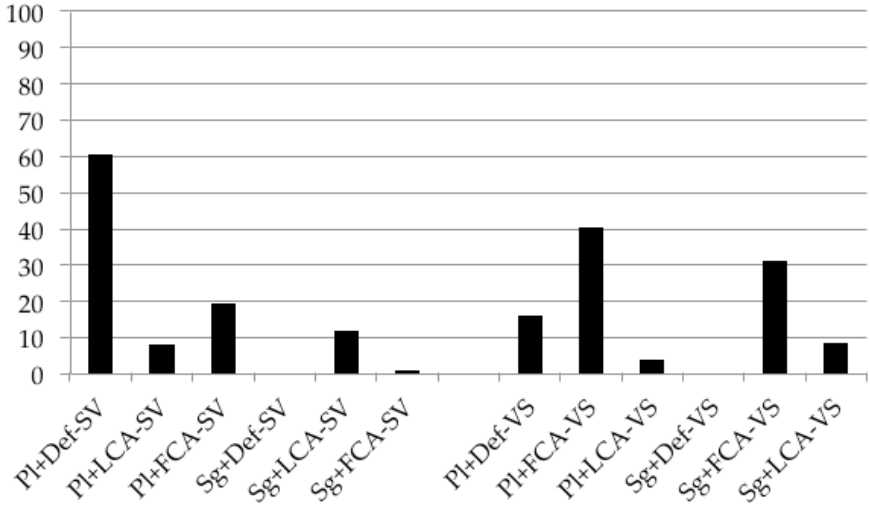
The table on the left gives all the possible combinations of agreement patterns for number and gender, and the one on the right explicitly specifies the values of these features for each of the combinations. The latter reveals that under this view, the sg. combinations are expected twice as often for each value of gender.

2.2. Results and Discussion

The figure in (15) on the following page presents the results of our experiment: production rates of the different patterns of agreement with coordinated singulars.[9]

[9] About two out of every three instances of sg. agreement were from disjunction and only one from conjunction conditions. Moreover, even though no statistically significant effect was attested, there might have been priming involved of sg. by the M.sg. model sentence subjects. However, an overall 1.65% of sg. agreement produced for pl. conjunct conditions is indicative of this effect and the general error rate. This suggests that the rates of production of sg. even in conjunction cannot be ascribed to error.

(15) Patterns of agreement with sg. members of coordination, in percentages



As the experiment only included stimuli with the members of the coordination sharing the value of number, the figure in (15), in which only the results for the items with all singular members of the coordination are given, collapses the values of number into sg. and pl., while presenting the results separately for the SV and VS conditions. We make the following observations based on these results:

(16) Gender agreement with a single member of the coordination is produced at a considerable rate, especially in VS (note that only the items with coordinated singulars are reported).

A sentence illustrating the condition ConjVSSg from (11):

Spasla	ga	je	snalažljivost	i	iskustvo.
saved$_{F.SG}$	he$_{ACC}$	AUX$_{SG}$	adeptness$_{F.SG}$	and	practice$_{N.SG}$

'His adroitness and experience saved him.'

The observation in (16) corrects the generalization that agreement in gender for a single member of the coordination is impossible with singular members. The source of the incongruence is probably that the descriptive reports in the literature are all based either on high-register written texts or on introspective judgments that the relevant patterns are suboptimal compared to the alternatives. In oral production, there is less time for filtering certain patterns,

and therefore all the grammatically well-formed patterns are produced. The validity of this explanation can be tested by manipulating time pressure.

Neither type of prediction is matched by the results. In particular the sg. patterns are represented twice as often as pl. patterns, as was predicted by the approach allowing for single-conjunct agreement in number, illustrated in (14) above. Nevertheless, some interesting observations can be made.

(17) FCA-VS is much stronger than both FCA-SV and LCA-SV.

The effect of number aside (i.e., the fact that both approaches report data sets where single-conjunct agreement with singular members are unacceptable), observation (17) favors MNS 2007 and MNB 2015 over Bošković 2009. While Bošković is unable to account for the quantitative pattern (though to be fair, it is not an intention of syntactic theories to account for quantitative distributions in the first place), in its strictest interpretation, MNS and MNB predict it. MNS and MNB consider FCA-SV and LCA-SV as resulting from two ontologically different strategies, FCA-SV relying on hierarchical relations, and LCA-SV on linear relations. When these two strategies independently favor the same outcome, as in the case of FCA-VS, we should expect a combined effect, i.e., a significant increase in frequency.

(18) FCA-SV is produced at relatively high rates (over 20% aggregate with Pl and with Sg), much more in combination with Pl than with Sg number.

A sentence illustrating the condition ConjSVSg from (11):

Zakletva	i	obećanje	su	bile	prekršene.
oath$_{F.SG}$	and	promise$_{N.SG}$	AUX$_{PL}$	been$_{F.PL}$	violated$_{M.PL}$

'The/a oath and the/a promise were violated.'

Observation (18) falsifies Bošković (2009), whose account of agreement is designed to rule out FCA-SV in gender while matching a weakened version of both MNS 2007 and MNB 2015. The facilitating effect of plural agreement in number is compatible with MNS's and MNB's view that FCA and Def in gender and pl. in number are all connected as a result from syntactic agreement, with LCA being a matter of PF.

(19) LCA-VS in gender is produced at rates which can hardly be ascribed to error.

A sentence illustrating ConjVSSg from (11):

Spaslo	ga	je	snalažljivost	i	iskustvo.
saved$_{N.SG}$	he$_{ACC}$	AUX$_{SG}$	adeptness$_{F.SG}$	and	practice$_{N.SG}$

'His adroitness and experience saved him.'

The observation in (19) presents a problem for all the accounts under discussion. Note that Willer-Gold et al. (this volume) also report production of this pattern in gender (between 1% and 5%, depending on the gender values of the conjuncts). The higher percentages attested in our experiment are probably a consequence of the disjunction and of the singular number of the members of the coordination.

(20) Sg. in number never co-occurs with Def in gender.

This observation suggests that a certain link obtains between number and gender features. This issue receives more discussion below, after the discussion of the table in (25).

(21) Pl in number is produced at a high rate in combination with gender agreement with a single member of the coordination.

A sentence illustrating the condition ConjSVSg from (11):

Zakletva	i	obećanje	su	bile	prekršene.
oath$_{F.SG}$	and	promise$_{N.SG}$	AUX$_{PL}$	been$_{F.PL}$	violated$_{F.PL}$

'The/a oath and the/a promise were violated.'

While experiments involving only plural members of the coordination are unable to test for uncontroversial cases of number and gender not agreeing with the same constituent, the ones reported in (21) clearly confirm that this is the case.

(22) Sg in number is produced at a considerable rate, especially in VS.

A sentence illustrating the condition ConjVSSg from (11):

Spasla	ga	je	snalažljivost	i	iskustvo.
saved$_{F.SG}$	he$_{ACC}$	AUX$_{SG}$	adeptness$_{F.SG}$	and	practice$_{N.SG}$

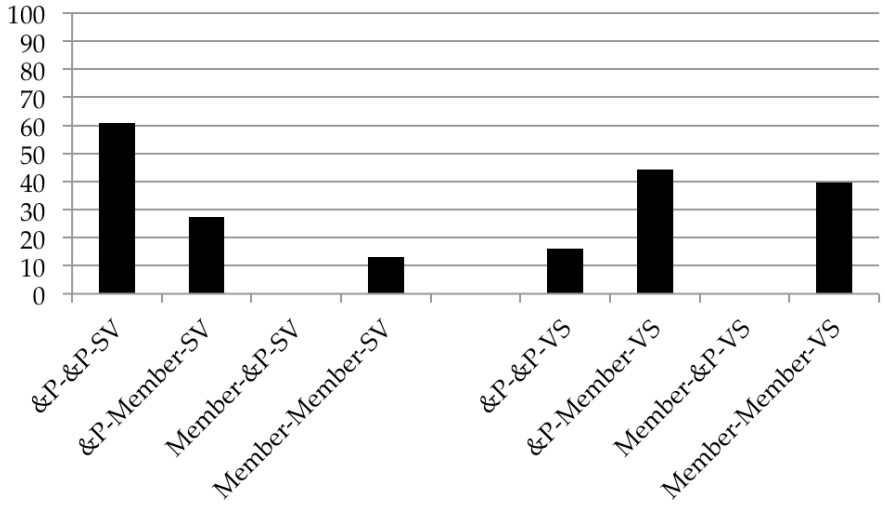
'His adroitness and experience saved him.'

The high rates of produced sg. agreement in number are probably due to the inclusion of disjunction, but sg. agreement was also produced in examples involving plain conjunction. It was also stronger in combination with

the patterns of gender agreement which are linearly the closest member (i.e., in LCA-SV and FCA-VS) than with those that cannot (Def, FCA-SV, LCA-VS).

A more telling representation of the predictions of the simultaneous agreement hypothesis is provided in (23).[10] Here we collapse FCA and LCA in gender to match the collapsed number and arrive at a figure which can be contrasted with the predictions of the hypotheses and analyses under discussion.

(23) Quantity distributions of value match types of number-gender per order, percentages



By simply observing (23), we can see that:

(i) The value of number which matches members (sg.) rather than the entire coordination (pl.) is produced to a considerable extent, especially in the VS order.

(ii) The distribution is not even. Since we collapsed FCA and LCA into Member, as in (14), even distribution would require Member-&P and &P-member to be twice as frequent as &P-&P, and Member-Member four times as frequent as &P-&P. This not what we see.

(iii) The combination of a match in number with a single member of coordination (sg.) and in gender with the entire coordination (Def) never occurred in either order (as was already observed in (20)).

[10] Read &P-Member-VS as: within VS, number matches &P, gender matches a single member.

(iv) VS facilitates single-member agreement for each feature.

Let us now consider the predictions of the strong and weak simultaneous agreement hypothesis, the hypothesis of split agreement, as well as of the weaker versions of MNS 2007, MNB 2015 and Bošković 2009. Recall that the strong simultaneous agreement hypothesis requires that number and gender on the verb always match the values on the same constituent, be it the entire coordination or one of its members. The weaker version is the one argued for by MNS (2007), MNB (2015), and Bošković (2009), where number always agrees with &P, and gender either also agrees with it (yielding Def) or agrees with the first or the last member. Their predictions, on the assumption that Def implies the matching of the value of gender on the verb with the value on the &P, are as follows:

(24) a. The strong hypothesis of simultaneous agreement predicts that the values of number and gender will always either match the &P or one of the members; it is falsified by the relatively large quantities of produced &P-Member combinations.

b. The weak hypothesis of simultaneous agreement predicts number will never match with a single member of the coordinated subject; this is falsified by the significant quantities of the Member-Member combination (almost 40% in VS).

c. The split agreement hypothesis predicts that all the combinations of matching will be represented in the results. This fails to explain the total absence of any Member-&P combinations (observation (20) above).

The two analyses considered are additionally rejected by the presence of LCA-VS in gender, which they all predict to be absent. The analysis of Bošković (2009) is also rejected by the strong presence of FCA-SV (nearly 20% of the relevant cases in our experiment and almost 5% in the one reported in Willer-Gold et al. this volume).

We summarize the insights with respect to the two analyses in their original form in (25). The consequences are worse for Bošković (2009), which is most directly falsified by the high rate of production of FCA-SV in gender. Finally, while MNS and MNB fare better than Bošković, they still encounter more problematic than supportive observations. Their analysis may be modified to account for some of the problematic issues without changing its core, namely by having the specification of number in &P only optional, or by handling number by some other means (in fact MNB's 2015 example (41) and the discussion around it are an explicitly provided window for this modification).

However, the production of the LCA-VS pattern is as hard to account for in their analysis as it is in Bošković's.

(25) Summary of the consequences of the main observations for the two analyses

Generalization	Bošković	MNS/MNB
No sg.+Def	Pro	Pro
Pl.+Single confirmed	Contra	Contra
Sg. confirmed	Contra	Contra
FCA-VS > FCA-SV, LCA-SV	Contra/Orthogonal	Pro
FCA-SV confirmed	Contra	Pro
LCA-VS confirmed	Contra	Contra

The figures in (15) and (23), and in particular the observations in (16–22) imply three conclusions, as guidelines for an alternative analysis: (i) Number tends to match the specification of the entire coordination, and gender is more prone to match that of a member.[11] (ii) The two features exhibit influence over each other in attracting each other to match the same constituent in their value. (The combination where number matches a member of coordination and gender matches the entire coordination never occurs because both of their features need to be attracted by each other, but neither required attractor is there.) (iii) The subject-verb order affects the balance between the two features' tendencies (VS facilitates matching with a member, the tendency of gender). This implies a degree of relatedness between number and gender, described above in terms of mutual attraction, but not exactly their simultaneous agreement, even in the weaker version. The attraction seems symmetric. (Note that MNS and MNB and Bošković predict it only from number towards gender, because in their view gender is never valued before number.)

Of the more interesting patterns in the results of the experiment presented in (15), we would like to point out the asymmetry between sg. and pl. agreement in number in combination with FCA-SV in gender. While FCA-SV is produced with great frequency in combination with plural agreement in number, it is almost absent in combination with singular number, as observed in (18). This may be explained in the following way (Badecker 2006 offers a similar view). Singular agreement in number is semantically unacceptable, as

[11] We talk about matching here rather than agreement, in order to avoid committing to the match necessarily coming from agreement between the two constituents, i.e., to leave open the possibility that the verb gets its features through some other mechanism (e.g., agreement with a null pronoun as in Citko 2004, Arsenijević 2015, or some kind of semantic agreement, however it may work).

it is not compatible with the semantic effects of a coordinated subject. As such, it may not be a product of the syntax, which feeds its information to LF. It may, however, emerge at the interface with phonology, e.g., via MNS's and MNB's linear proximity. In those cases, gender also agrees via linear proximity, and the hierarchical pattern of FCA-SV is inaccessible. Gender is more prone to phonological, linear agreement because its semantic effect is less prominent (but see Arsenijević 2016 for arguments that gender plays a bigger role in semantics than previously assumed). We leave a more extensive discussion for future work.

3. Conclusion

We have outlined a range of empirical questions which strongly affect theorizing about agreement with coordinated subjects, related to the availability of single-conjunct agreement and of singular-number agreement with coordinated subjects consisting of singular members. The empirical questions outlined strongly bear on two important theoretical issues: the best-fitting theoretical model for single-conjunct-agreement phenomena in BCS and the issue of feature bundling and separate vs. simultaneous agreement of number and gender.

The results of the experiment presented here clearly attest to the availability of single-member-of-coordination agreement with coordinated singulars (contra the broadly accepted consensus in the literature, e.g., Bošković 2009, Franks and Willer-Gold 2014, but in line with Moskovljević 1983, Bojović 2003), and unambiguously show that number and gender do not have to agree with the same syntactic node, a question that could not be answered based solely on coordinated plurals because the plural agreement may come either from the entire coordination or from any of the single members. There is, however, a tendency for the two features to match the values of gender and number of the same constituent, assuming that gender tends to agree with a single member of coordination and number with the entire coordinated subject. These observations strongly bear on the bundling hypothesis and on the hypothesis of simultaneous agreement of these two features, suggesting their weakening or full abandonment.

The experiment also confirms the availability of first-conjunct agreement with preverbal subjects, and even a substantial agreement with the last member of coordination in sentences with postverbal subjects. While the former observation favors MNS and MNB, the latter poses serious problems for both analyses assessed. Hence, even though the overall experimental results give a certain advantage to the analysis in MNS 2007 and MNB 2015 over Bošković 2009, it is only fair to conclude that they pose serious problems for both.

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Received: September 2015
Revised: March 2016