

NUMBER MATCHING IN SMALL CLAUSES: CAN WE AGREE ON CONCORD?*

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This paper examines a number matching requirement (NuMR) in binominal copular clauses as in (1), as well as conditions under which this pattern is restricted.

- (1) a. [Mary]_{NP1} is [a violinist in two orchestras]_{NP2}. NuMR
b. *[Mary]_{NP1} is [violinists in two orchestras]_{NP2}.
c. *[Mary and Jane]_{NP1} are [a violinist in two orchestras]_{NP2}.
d. [Mary and Jane]_{NP1} are [violinists in two orchestras]_{NP2}.

In (1), NP1 and NP2 must covary for number. In the cases we present here, the value of NP2 is dependent upon NP1, which has valued number features. Note that we use the terms ‘NP1’ and ‘NP2’ for convenience; no claim about the functional structure of the nominal is intended unless further specified.

In this paper we argue that NuMR is a reflex of feature valuation in syntax but that this operation should not be modeled as Agree. We identify the need for a mechanism distinct from Agree that gives rise to feature valuation/covariation in NuMR contexts. We suggest that this mechanism is a special case of a more widely attested operation, typically identified as concord. We call this mechanism Merge Concord (MC).

Section 1 establishes the distribution of NuMR, demonstrating that NuMR is not always observed. Section 2 argues that NuMR should not be modeled as Agree and introduces Merge Concord as an alternative valuation mechanism. Section 3 returns to the distributional patterns in section 1 and shows how the Merge Concord analysis accounts for the data splits. Section 4 entertains a possible unification between Merge Concord and nominal concord. Section 5 concludes.

1. Distribution of NuMR

We begin by revisiting the examples in (1) where there is a requirement for number matching between NP1 and NP2. Note that this requirement is not defeasible by the pragmatic context. For example, in (1b) Mary is a violinist in two orchestras, nonetheless a plural predicate ‘violinists’ cannot be used. The inadequacy of pragmatic context is reinforced by examples such as (2), in which the subject introduces multiple individuals

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into the pragmatic context but is morphosyntactically singular, as evidenced by the inflection on the copula. In this case, NP2 must also be singular.¹

(2) Each of the three boys is {a dancer/*dancers}.

Meanwhile, there are clauses in which NuMR does not arise at all (3). In these cases, NP1 and NP2 might happen to show the same number, but unlike (1) and (2) this is not structurally required but rather dependant on the context. In (3) we see contexts involving a platter of fruit that has been arranged to look like a face. For example, in (3a) one can imagine a single kiwi or several kiwis being placed to look like a nose. Both are possible, although NP1 remains singular (there is just one nose). In (3d) where NP1 is plural, NP2 can again be either singular or plural depending on whether berries have been used to form a single eye or both eyes of the face.

- (3) a. The nose is the kiwi/kiwis. No NuMR
 b. The banana is the eyebrow/eyebrows.
 c. The nostrils are the grape/grapes.
 d. The berries are the eye/eyes.

The question is why NuMR should arise in some contexts but not in others. One immediate hypothesis to consider is that this distribution depends on copular clause type; however, we will show that this is problematic. To begin, notice that the distribution of NuMR is in fact wholly independent of the presence or absence of a copula. We can replicate the contrast between (1) and (3) in reduced environments where NP1 and NP2 form a bare small clause:

- (4) a. They consider [Mary {a virtuoso/*virtuosos}]. NuMR
 b. They consider [Mary and Jane {*a virtuoso/virtuosos}].
 (5) a. The kids made [the {banana/bananas} the eyebrow]. No NuMR
 b. The kids made [the banana the {eyebrow/eyebrows}].

Even though NuMR appears to be independent of the inflectional structure introduced by the copula, it might nonetheless correlate with copular clause typology. It is traditionally observed that, in clauses like (1)/(4), NP2 is construed as a predicate (and the clause is said to be predicational), whereas in clauses like (3)/(5), NP2 is referential (and the clause is said to be equative). Typically, the distinction between these clause types is understood minimally in terms of the semantic types of NP1 and NP2. In predicational structures, NP2 (a property) is type <et> and NP1 (an individual) is type <e>. In equative structures, NP1 and NP2 are both type <e> (both individuals).

Though the distribution of NuMR in the above cases may seem to follow the predicational/equative divide, the correlation is problematic. The predicational/equative

¹ Some speakers also accept *Each of the three boys are dancers*. Here NP1 is morphosyntactically plural, evidenced by the agreement on the copula, and NP2 must be as well, reinforcing the NuMR pattern.

distinction in and of itself is highly contentious (Heggie 1988, Moro 1997, Adger and Ramchand 2003, Percus and Sharvit 2014).² Furthermore, in English we find that while NuMR is strongly identified with predicational clauses, there are non-canonical predicational clauses where NuMR is not observed.

(6) The proposals are {a problem/??problems}.³ No NuMR

Looking beyond English, the correlation with NuMR breaks down even in canonical predicational clauses, for example, Persian (7).⁴

(7) Persian No NuMR
 behtarin dust-aa-ye man daaneshju (hast)-and
 best friend-PL-EZ I student BE-3PL
 ‘My best friends are students.’

In sum, the conventional predicational vs. equative distinction is not adequate for understanding the split in the data with respect to number matching. On the one hand, while all NuMR cases are predicational, we also see predicational clauses without NuMR. On the other hand, cases without NuMR can be predicational or equative. Only one clear generalization emerges: there are no equatives that show NuMR. This is the point of departure for our analysis. We relate the presence/absence of NuMR to the feature structure of NP2 in such a way that rules out NuMR in equative structures but does not force it in predicational structures.

2. Agree vs. Merge Concord

We argue here that NuMR is the outcome of a feature valuation process distinct from Agree in that it occurs automatically when a syntactic object with an unvalued feature [_F] Merges with one that has a valued feature [F]. We call this Merge Concord, defined as in (8).

(8) Merge Concord:

- a. Take [XP YP] to be a structure created by Merge of [XP] and [YP] where the intersection of the sublabels of XP and YP is not null (i.e. there is at least one feature [F] that is a sublabel for each object)
- b. If one instance of [F] is unvalued [_F], then copy the value of [F] to [_F] as a reflex of Merge.

² Percus and Sharvit (2014) argue that in equative structures, just as in predicational ones, NP2 is never an individual. For them, NP2 in equatives is a set of properties characteristic of an individual: an individual concept.

³ Judgments on the use of the bare plural NP2 vary, a fact we return to below.

⁴ List of abbreviations: 1-3 = person; DEF = definite; EZ = ezafe; F = feminine; INDEF = indefinite; INE = inessive case; PL = plural; SG = singular.

There are three motivations for introducing a new valuation operation distinct from Agree: restriction of the set of features in the domain of the operation, locality considerations, and derivational timing problems. We will go through each of these in detail in the following sections. Note that we henceforth write [_F] to designate an unvalued feature that will be valued by Merge Concord rather than by Agree (Match and Value). We indicate Agree by writing [uF] for the probe.

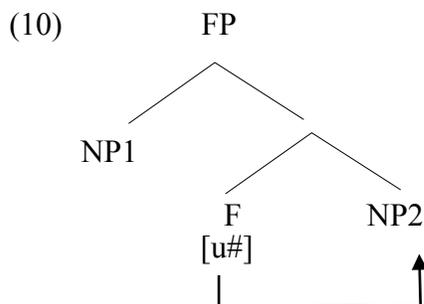
2.1 Restriction on the set of features

Person features never participate in this dependency. This is an inductive generalization, not one that is straightforward to demonstrate in an example set, but one that is generally well established (cf. Baker 2008). Notice that in (9), for example, there is number covariation between NP1 and NP2, but no such person covariation.⁵

- (9) a. She is the doctor.
 b. I am the doctor.
 c. They/we are the doctors.

2.2 Locality considerations

Modeling NuMR as Agree is problematic if we assume standard copular clause/small clause structures, two leading variants of which are schematized in (10) and (11).

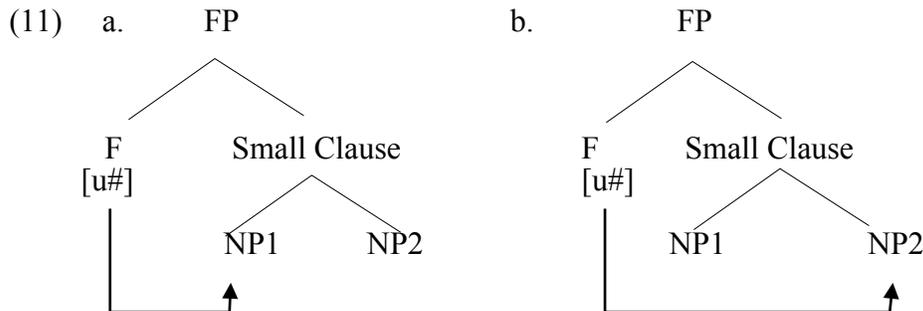


In (10), a functional category with a number probe [u#] is mediating the two nominals. In this configuration, NP1 is placed outside the search domain of the probe; therefore, the dependency between the two nominals cannot be explained.

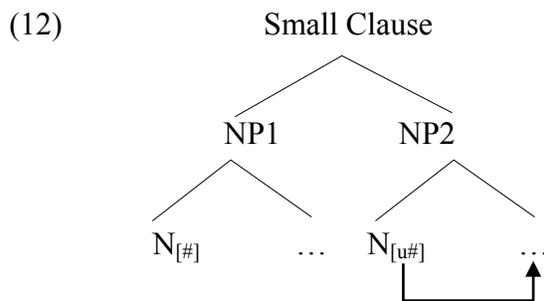
If, on the other hand, the number probe is placed above the two nominals, the derivation looks as in (11). In this configuration, NP1 is able to value the number probe (11a); however, since NP1 and NP2 are equidistant from the probe, it is possible for NP2 to value the probe as well (11b). This structure also introduces problems with respect to

⁵ This could be due to morphological restrictions on nominals bearing agreement. Baker (2008) would say this restriction is underlyingly due to the syntactic restriction that agreement for person can only be controlled by specifiers (his SCOPA principle) and only verbs license a specifier. We do not commit to an explanation here, but in future research we will pursue the possibility that this gap relates to the nature of Merge Concord.

the PF realization of the valued $[u\#]$ probe, which must ultimately be realized on NP2. Since NP2 is phrasal, standard mechanisms correlated with PF agglutination (e.g. head-movement, affix lowering) cannot be straightforwardly implemented. An additional complication is that in many cases it is possible for either NP1 or NP2 to raise-to-subject (Spec,TP). But even if NP2 raises it must combine with the valued $[u\#]$ probe at PF.⁶



The problem of localizing the PF realization of the $[u\#]$ probe on NP2 is most straightforwardly solved if we situate $[u\#]$ on NP2 itself. But this, too, gives rise to problematic locality configurations as schematized in (12), where the expected goal NP1 is not in the search domain of the probe. We cannot solve this by inverting NP1 and NP2, or raising the position of NP2—both dubious moves in themselves—because the search space is defined in terms of c-command. Note, too, that by the Earliness Principle, a probe on N would probe before merging into the larger small clause structure.



2.3 Derivational timing

One might also pursue a solution to the locality problems by invoking a more fine-grained set of operations that use projection/labeling to manipulate the position of the probe; however, such approaches face problems with derivational timing in these cases. In Bare Phrase Structure (Chomsky 1995, *inter alia*), the probe is formally identified as a (sub)label of a syntactic object, and a corollary of this idea is that projection is a necessary precursor to Agree. Exploring this avenue, one might consider whether

⁶ The F in (11) can be construed as either a Pred head introducing the small clause, or as a functional element higher up. Either way the same issues arise.

endocentric labeling of the small clause might ‘lift’ the probe to a higher domain via projection (cf. Bejar and Rezac 2009). If [u#] probe is introduced on the label of NP2, and NP2 is, in turn, what determines the label of the small clause, then the [u#] probe would likewise be a (sub)label of the small clause, a vantage point that might bring NP1 into its search domain (13). (Note that in (13) the projected sublabels [F] and [uF] are indicated as subscripts on the opening brackets; other sublabels, e.g. category features, are ignored here).

$$(13) \quad \begin{array}{l} \textit{step 1: Merge XP YP} \\ \textit{step 2: Label} \end{array} \quad \begin{array}{l} [\quad [_{[F]} \text{XP}] [_{[uF]} \text{YP}]] \\ [_{[uF]} [_{[F]} \text{XP}] [_{[uF]} \text{YP}]] \end{array}$$

However, symmetric [XP YP] structures are problematic for minimalist labeling algorithms, which rely on structural asymmetry to identify the label (Chomsky 2013, Adger 2013). Chomsky (2013) proposes two mechanisms for resolving the label in a symmetric [XP YP] configuration. One mechanism is Agree. If XP and YP are able to Agree prior to Internal Merge, then co-valuation of a feature [F] creates an intersecting property [F] shared by both XP and YP, which can serve as the label (e.g. Subject DP in Spec, TP). The other mechanism is extraction of one constituent, creating an asymmetry in the structure, with the result that the constituent that stays behind can unproblematically determine the label (e.g. Raising of small clause subject to Spec, TP). We cannot invoke the Agree solution because, in our cases, XP and YP are not able to enter into an Agree relation prior to Merge. Extraction is, on the surface, a promising possibility, since in copular clauses NP1 typically displaces to subject position. This would leave behind NP2 (with the sublabel [u#]) as desired, identifying it as the source of the small clause label and thereby ‘lifting’ [u#] to a higher occurrence. However, this does not solve our problem because, by virtue of having displaced to the subject position, NP1 will again not be in the search domain of the lifted [u#], as in (14).

$$(14) \quad \begin{array}{l} \textit{step 1: Merge XP YP} \\ \textit{step 2: Displace XP} \\ \textit{step 2: Label} \end{array} \quad \begin{array}{l} [\quad [_{[F]} \text{XP}] \quad [_{[uF]} \text{YP}]] \\ [\quad \quad \quad t \quad [_{[uF]} \text{YP}]] \\ [_{[uF]} \quad \quad \quad t \quad [_{[uF]} \text{YP}]] \end{array}$$

2.4 Merge Concord

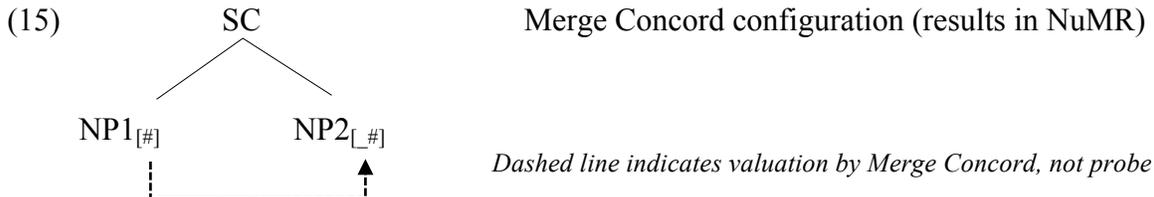
If the valuation operation underlying NuMR cannot be straightforwardly modeled as Agree (i.e. a probe-goal relation) then it must arise in some other way. The structure in (12) is suggestive of the solution: a salient difference between (12) and the structures in (10) and (11) is that in (12) the target and the controller in the valuation relation are sisters. We propose that in exactly this structural configuration (sisterhood), valuation can occur directly without being mediated by a probe which searches its c-command domain for a matching value. In other words, in [XP YP] structures, valuation can occur as a reflex of Merge. This is Merge Concord, with its definition repeated below from (8).

(8) Merge Concord:

- a. Take [XP YP] to be a structure created by Merge of [XP] and [YP] where the intersection of the sublabels of XP and YP is not null (i.e. there is at least one feature [F] that is a sublabel for each object).
- b. If one instance of a feature is unvalued [_F], then copy the value of [F] to [_F] as a reflex of Merge.

Let us look at (8) more closely. (8a) incorporates a sisterhood condition on Merge Concord as well as a requirement that the two syntactic objects entering into Merge Concord share at least one intersecting property [F], which must be part of their respective labels. (8b) stipulates that if one instance of [_F] is unvalued it will be valued by the other.^{7,8}

Applying the definition in (8) to the case of NuMR, if NP1 has valued number [#] and NP2 unvalued [_#] then Merge Concord will take place as a reflex of Merge.



3. Modeling the distribution of NuMR using Merge Concord

The distribution of NuMR will derive from the distribution of valued and unvalued [#], which we posit to be conditioned in various ways. We assume that if an NP has a valued [#] feature, then it is necessarily phasal. Here we follow Arsenijevic and Hinzen (2012), who identify referential NPs with a complete DP phase. We also follow Danon (2011), who argues that in order for phi-features in nominals to be accessible higher up in the syntax, the highest nominal projection (for example, D) must introduce a phi-probe that Agrees with (and so ‘gathers up’) the values of phi-features introduced on lower functional projections (for example, NumP). Otherwise, these phi-features should not be

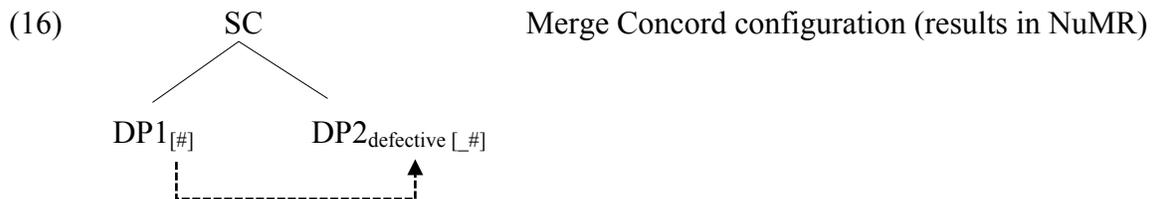
⁷ Note that Merge Concord only establishes a relation between the highest heads of XP and YP, for example between two [D] heads in a binominal copular clause. Also, if it happens that both highest heads of XP and YP introduce unvalued [_F] we take it that valuation will apply vacuously. We further suppose that vacuous valuation of [_F] can feed higher instances of Merge Concord, essentially pushing [_F] up the tree. If a higher occurrence of [_F] is valued, the value should populate the entire [_F] chain.

⁸ It is clear that more needs to be said on the question of what determines whether or not Merge Concord occurs. Minimally, we must address the empirical concerns that motivated Chomsky (2001) to argue against the possibility of Agree as a reflex of Merge. For example, Chomsky noted that the theory must block Agree as a reflex of Merge when an external argument first Merges in vP, otherwise it would control object agreement. Note that this is not in fact such a clear problem in theories like Bejar and Rezac (2009) which predict that v should always first probe its internal argument. Having done so, a probe on v would no longer be active when the external argument Merges. Nonetheless, more careful consideration of such scenarios is required.

visible to higher domains. On the additional assumption that Agree is an operation at the phase edge, then D must be phasal. This view is also supported by Heim (2008), who argues that phi-features on deictic expressions introduce presuppositions that constrain the range of possible referents. This view demands valuation prior to transfer; that is, referential nominals must be phasal. The key point here is that a nominal with valued [#] must be a phasally complete DP by the time it enters a larger structure. In all the cases we consider, NP1 is phasally complete and has valued [#], while the status of NP2 varies in ways we will explore below.

3.1 Deriving NuMR

We assume that if NP2 is not referential, then it is not phasally complete and cannot enter the small clause structure with valued [#]. Let us consider predicate nominals as the quintessential case of non-referential NP2. We identify the non-phasal status of a predicate nominal with its functional structure. It is often assumed that predicate nominals are not DPs, however Julien (2006) demonstrates that this is too simple, the evidence being that predicate nominals can be ‘big’ in ways that are normally construed as involving complete functional structure. We posit that some predicate nominals (though not necessarily all) are DPs, but that when they are DPs, D is defective. We further posit that defective D can introduce unvalued phi-features, but cannot value them. In such structures, the NP2 will be introduced into the small clause structure with unvalued [_#] and Merge Concord can occur, resulting in NuMR (16). This is how we analyze (1) and (4) (repeated below).



- (1) a. [Mary]_{NP1} is [a violinist in two orchestras]_{NP2}. NuMR
 b. *[Mary]_{NP1} is [violinists in two orchestras]_{NP2}.
 c. *[Mary and Jane]_{NP1} are [a violinist in two orchestras]_{NP2}.
 d. [Mary and Jane]_{NP1} are [violinists in two orchestras]_{NP2}.
- (4) a. They consider [Mary *virtuosos/a virtuoso]. NuMR
 b. They consider [Mary and Jane virtuosos/*a virtuoso].

3.2 Deriving the absence of NuMR

NuMR will not be observed in any configuration that deviates from (16). This can happen in numerous ways. Firstly, in some languages, canonical predicate nominals have such reduced functional structure (for example, a bare NP) that no number feature is introduced at all. This configuration is schematized in (17). This means there is no

NuMR even in predicational clauses. An example is Persian (7) (repeated below), in which a canonical NP predicate must be singular. Independent evidence for the reduced structure of Persian predicate nominals includes the impossibility of adding articles. Also, if pluralized, the nominal becomes referential (Ghameshi 2003, Hamedani 2011).

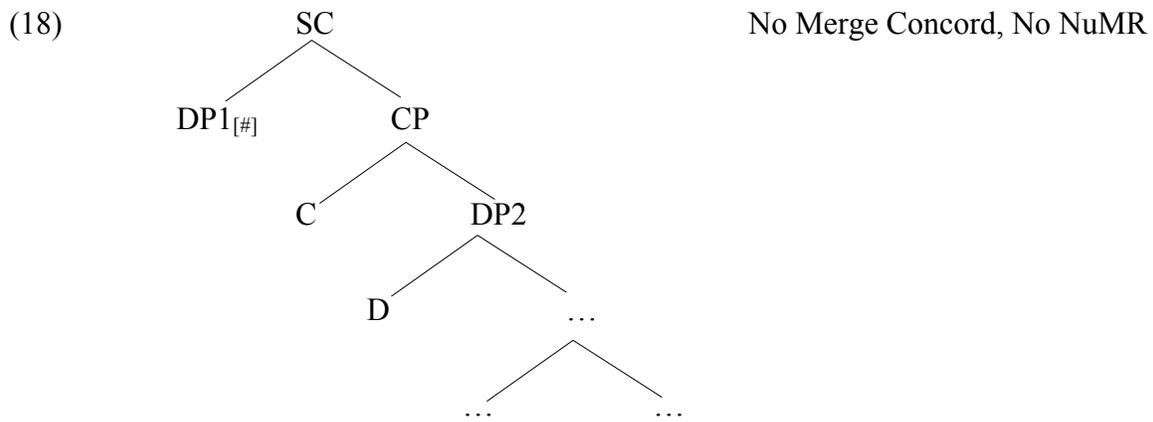


(7) Persian No NuMR

behtarin	dust-aa-ye	man	daaneshju	(hast)-and
best	friend-PL-EZ	I	student	BE-3PL

‘My best friends are students.’

Secondly, the NuMR pattern will be also be absent if NP2 has extra structure that results in suppression of the [_#] features, schematized in (18).



Kolhatkar et al. (2013) classify nouns like *problem*, *issue*, *situation* as shell nouns and observe that they have the distinctive property of taking propositional anaphoric/cataphoric antecedents, e.g. *the issue is [whether animal testing is cruel]* where *the issue* is cataphoric to the proposition in square brackets. Elsewhere, nouns of this sort have been argued to be concealed propositions (Bartošová and Kučerová 2015). Moltmann (1997:239) argues that plural inflection is categorically suppressed on concealed propositions. Her examples include uses of nouns like *election* where the noun refers not to the event of electing someone but to the proposition that somebody will be elected (19). This suppression of plural is consistent with what we observe with NP2s like *problem* in (6) where the singular has a concealed proposition interpretation.⁹

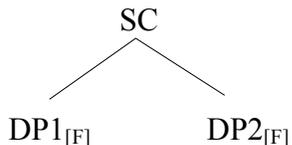
⁹ Members of this class of nouns seem to alternate between a concealed proposition and other guises where they refer to individuals or even events. When they are not concealed propositions, they can inflect for number:

- (19) John and Mary hoped for the election / # the elections of Bill and Sue.
 (i.e., John hoped for the election of Bill and Mary hoped for the election of Sue.)
 (Moltmann 1997:239).

- (6) The proposals are {a problem/??problems}. No NuMR

We suggest that shell nouns/concealed propositions contain additional structure as shown in (18), which either suppresses [_#] on D, or blocks transmission of the value further down in the DP structure thus blocking plural exponence. This is responsible for the non-canonical absence of NuMR in English predicate nominals of this sort.

Finally, matching will be obviated if NP2 is phasal and has valued [_#], schematized in (20). This is the case for the fruit plate examples (3) and (5) (repeated below), and assumed identity cases in general, where NP2 is referential.

- (20)  No Merge Concord (No NuMR)

- (3) a. The nose is the kiwi/kiwis. No NuMR
 b. The banana is the eyebrow/eyebrows.
 c. The nostrils are the grape/grapes.
 d. The berries are the eye/eyes.

- (5) a. The kids made [the banana/bananas the eyebrow]. No NuMR
 b. The kids made [the banana the eyebrow/eyebrows].

4. Merge Concord vs. concord

We suggest that Merge Concord in small clause structures may be nothing more than a special case of the same widespread feature sharing phenomenon seen in other domains, especially internal to nominals, traditionally referred to as concord. A full articulation of this proposal is beyond the scope of this paper, but we lay the groundwork here.

Norris (2014) nicely articulates the important differences between nominal concord and Agree. To summarize, nominal concord and Agree differ in the number of loci expressing agreement and the heterogeneity of syntactic relations between the target and the controller. In addition, the relationship between the origin of the features and the location of their expression differs between these two relations. While Agree results in

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- (i) The elections of Bill and Mary were observed by several international organizations.
 (Moltmann 1997:239)
 (ii) The problems are inflation and overspending.
 (iii) The proposals are our problems.

the expression of a relation between two distinct extended projections, concord expresses a relation between an extended projection and its members. Finally, there is a well-established link between agreement and case. No such link can be observed between case and concord. Let us see how NuMR patterns with respect to these differences.

4.1 Number of loci expressing the agreement

Whereas in Agree, there is typically only one exponent of the Agree relation (e.g. subject-verb agreement), in concord, there can be multiple exponents sharing the same feature. This contrast cannot be applied straightforwardly to our cases. One might look to complex predicate structures to draw a conclusion.

We note that the value assigned by NuMR can be transmitted downwards in NP2 (21) in a manner reminiscent of case concord (22).

(21) Spanish NuMR

- a. L-a-s pregunt-a-s son [un-a-s pregunt-a-s complicad-a-s]
 DEF-F-PL question-F-PL be.PL INDEF-F-PL question-F-PL complicated-F-PL
 ‘The questions are complicated questions.’
- b. L-a pregunt-a es [un-a pregunt-a complicad-a]
 DEF-F question-F be.3SG INDEF-F question-F complicated-F]
 ‘The question is a complicated question.’

(22) Estonian case concord (Norris 2014: 280)

- kõigi-s nei-s raske-te-s küsimus-te-s
 all.PL-INE these.PL-INE hard-PL-INE question-PL-INE
 ‘in all these hard questions’

4.2 Heterogeneity of syntactic relations between target and controller

Norris observes that whereas Agree strictly requires the probe to c-command the goal, in concord, features can be shared in a variety of structural configurations (e.g. specifier, adjunct). We suggest that it may be possible to reduce the heterogeneity of structural contexts identified by Norris to the symmetric [XP YP] structural requirement proposed here for Merge Concord.

4.3 Relationship between origin of features and location of their expression

With respect to the relationship between the origin of features and the location of their expression, there is a *prima facie* difference between our Merge Concord cases and nominal concord. Norris observes that, unlike Agree where feature sharing occurs between two distinct functional complexes, in nominal concord, feature sharing occurs within a single functional complex—that of the nominal. Our Merge Concord cases look more like Agree in this respect. However, if the distribution of concord reduces to

sisterhood relations involving symmetric [XP YP] structures as we suggest in 4.2, the fact of nominal concord appearing to be contained within the nominal functional complex might be epiphenomenal, a result of the [XP YP] structures with the relevant intersecting [F] and [_F] not being introduced after the highest projection is built.

4.4 Link with Case

Norris observes that whereas Agree is well known to be intimately related to licensing and Case assignment (as per George & Kornfilt 1981, *inter alia*), no such relation has been observed for nominal concord. The same can be said for our Merge Concord cases.¹⁰

4.5 A final point: Unification of nominal and clausal syntax

Crucially, Agree is not unattested in the nominal domain, possessor agreement being the paragon example. Rather, the nominal domain has both Agree and concord (or Merge Concord in our view). Our analysis of copular clause/small clause structures suggests that the nominal domain is not special in this regard, and that clausal domains likewise attest both Agree and Merge Concord. The approach laid out here suggests a further unification of nominal and clausal syntax, in the spirit of many proposals along these lines since Abney (1987).

5. Conclusion

In this paper, we have looked at binominal copular clauses and have accounted for the distribution of number matching across a variety of contexts. We have proposed that number matching occurs when NP2 has an unvalued [_#] feature which gets valued as a reflex of Merge Concord, an operation which occurs under sisterhood, that we argue must be available to the computation independently of Agree. Number matching does not occur under various conditions: if on NP2 there is no [_#] feature at all (Persian); if NP2's [_#] feature is concealed (shell nouns/concealed propositions); if the [#] feature on NP2 is already valued (assumed identity cases). We suggest that Merge Concord is the same mechanism that underlies more familiar cases of feature sharing known to be distinct from Agree, in particular nominal concord.

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¹⁰ The case on nominal predicates is sometimes analyzed as involving case matching (e.g. Maling and Sprouse 1995) but even if such analyses are correct for some languages, NP1 is not the Case assigner; rather the Case assigned to NP1 gets shared (perhaps bundled with number in a Merge Concord account).

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