RESEARCH

The multi-valuation Agreement Hierarchy

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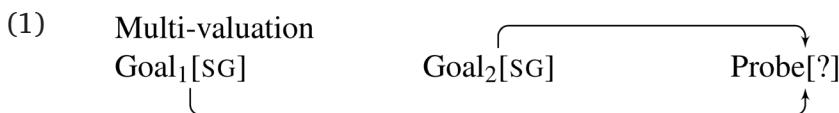
This paper investigates multi-valuation, i.e. cases where one probe agrees with multiple goals thus obtaining multiple feature values. Focusing on number agreement, I look at the cross-linguistic patterns on multi-valued Ns in the nominal Right Node Raising construction (Nominal RNR) reported in Belyaev et al. (2015); Harizanov & Gribanova (2015); Shen (2016) as well as multi-valued Ts in TP RNR construction reported in Yatabe (2003); Grosz (2009; 2015); Kluck (2009). I show that three types of languages are attested: languages like Serbo-Croatian that show singular marking on both multi-valued Ns and Ts, languages like Russian that show plural marking on both multi-valued Ns and Ts, and languages like English that show singular marking on multi-valued Ns and plural marking on multi-valued Ts. No language is attested that shows plural marking on multi-valued Ns and singular marking on multi-valued Ts. I use this 3/4 pattern to argue that multi-valuation shows the effect of the Agreement Hierarchy discussed by Corbett (1979; 2006) among others.

1 Introduction

Phi agreement has been one of the central research topics in generative grammar. Numerous research has made headway regarding the nature of the agreeing process and the inner structure of phi features. At the same time, the research has also inspired new questions and old questions to be looked at from a new perspective. This paper sets out to address two such questions: agreement with multi-valuation and the Agreement Hierarchy.

By multi-valuation, I refer to cases where one probe agrees with multiple goals and receives multiple values as is schematized in (1).

(1) Multi-valuation

$\text{Goal}_1[\text{SG}]$ $\qquad\qquad$ $\text{Goal}_2[\text{SG}]$ $\qquad\qquad$ $\text{Probe}[?]$

In this paper I focus on two types of multi-valuation: multi-valued Ns in the nominal Right Node Raising construction (Nominal RNR) in (2) and multi-valued Ts in the TP RNR construction in (3). Following previous research, I will argue that the head noun in (2) and the auxiliary (T head) in (3) are multi-dominated, and thus agree with two singular features at the same time.
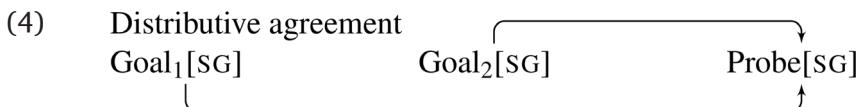
(2) a. This tall and that short **student**/***students** are a couple.

b. *Russian*
Etot vysokij i   tot nizkij **student/studenty**   para.
this tall   and that short student.SG/student.PL couple
'This tall and that short students are a couple.'

(3)   John's glad that Mary, and Bill's happy that Sue, **has/have** been to Cameroon.

As is shown in (2) the multi-valued Ns *student/students* can only be singular in English but can be singular or plural in Russian. In (3), the multi-valued Ts *has/have* can show singular or plural agreement in English. I will label the singular agreement as *distributive agreement* schematized in (4) and the plural agreement as *summative agreement* in (5).

(4)   Distributive agreement
Goal$_1$[SG]   Goal$_2$[SG]   Probe[SG]

(5)   Summative agreement
Goal$_1$[SG]   Goal$_2$[SG]   Probe[PL]

The empirical contribution of this paper lies in the cross-linguistic distribution of the two agreement patterns across the two targets. Although previous research has noted both agreement patterns on both multi-valued targets, no one has yet compared targets within and across languages. The current paper surveys a dozen languages and observes a novel typological gap: no languages show summative agreement on the multi-valued Ns and distributive agreement on the multi-valued Ts.

   On the theoretical side, this paper makes the connection between multi-valuation and hybrid noun agreement via the Agreement Hierarchy. I propose that multi-valuation is another subcase of the Agreement Hierarchy, which opens up new possibilities for a formal account for the Hierarchy. In particular, I will argue that distributive agreement in multi-valuation results from agreeing with the morphological feature and summative agreement results from agreeing with the semantic feature.

   The outline of the paper is as follows. Section 2 focuses on two multi-valued probes: multi-valued Ns and multi-valued Ts. I show that two agreement patterns are observed across languages on both targets. In Section 3, I compare the multi-valued Ns and Ts in each language and show that the distribution of the two multi-valuation agreement patterns is not free. Section 4 links multi-valuation with the Agreement Hierarchy discussed by Corbett (1979; 2006) among others.

2 Multi-valued probes

2.1 Multi-valued Ns

In this section I discuss Nominal RNR as a case of multi-valued Ns. Right Node Raising constructions (RNR) are cases where the conjuncts share the rightmost portion of the structure. In (6a) for example, the object *apples* is shared by the two conjoined sentences.[1]

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[1] See Citko (2017) for an overview of RNR. See also Moltmann (1992); Wilder (1999); Hartmann (2000); Citko (2005); An (2007); Gračanin-Yuksek (2007) among many others for various analyses of RNR.

(6)   a.   John likes, but Mary hates, **apples**.
        b.   John likes apples but Mary hates apples.

Nominal RNR refers to cases where two DPs share one noun. The intended interpretation of (7a) is in (7b) and *student* is shared by the two DPs. I will label the shared element the *pivot* and the pivot will be in bold throughout the paper.

(7)   a.   This tall and that short **student** are a couple.
        b.   This tall student and that short student are a couple.

Although the conjoined DPs refer to two individuals when both of the DPs are singular, the pivot must be singular in English. The plural pivot in (8) is unacceptable.

(8)   *This tall and that short **students** are a couple.

This is true for different kinds of DPs in (9). Note that the presence of the number marking in the remnant in the DPs is not necessary for the pivot to be singular. In (9d–e), *John's tall, Mary's short, his tall* and *her short* are not overtly marked as singular. Yet when the conjoined DPs refer to two individuals, only the singular pivot is possible. The intended reading is controlled by the use of the predicate *are a couple*.

(9)   a.   This and that **student(*s)** are a couple.
        b.   A tall and a short **student(*s)** are a couple.
        c.   One tall and one short **student(*s)** are a couple.
        d.   John's tall and Mary's short **student(*s)** are a couple.
        e.   His tall and her short **student(*s)** are a couple.

Note also that strings like *John's tall and Mary's short students* themselves are acceptable in (10) when referring to more than two individuals. Since the focus on the current paper is the noun which is valued by multiple singular features, I will leave the reading in (10) aside.

(10)   John's tall and Mary's short **students** know each other.

2.1.1 Multi-dominance analysis for Nominal RNR
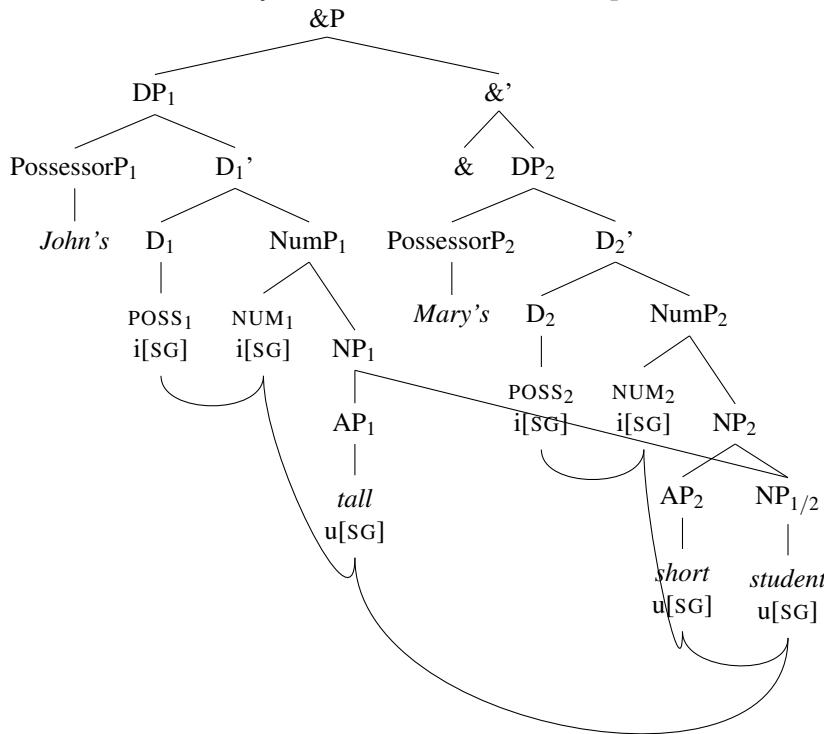
Shen (2016) argues for a multi-dominance analysis for Nominal RNR. I follow this analysis and illustrate the derivation in (11). Following Ritter (1991); Heycock (2005); Landau (2016) among others, the NUM head comes with an interpretable number value and takes the NP as its complement. Other elements in the DPs such as the D head, the noun, and the adjectives agree with and get valued by the NUM head via Agree following Baker (2008). In Nominal RNR, the pivot noun (*student* in (11)) is *structurally* shared by the two DPs via multi-dominance, i.e. it simultaneously merges with the AP in each DP.[2] As a result, the multi-dominated pivot gets two singular values from the two conjuncts, i.e. the pivot is multi-valued.[3]

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[2] For discussion on multi-dominance see Moltmann (1992); Wilder (1999); Citko (2005); Gračanin-Yuksek (2007).

[3] Note that in the derivation, the noun receives its values from the APs which in turn are from the NUM heads. An alternative derivation where the pivot noun gets its values directly from the NUM heads is equally plausible.

(11)　　John's tall and Mary's short **student** are a couple.

&P

DP$_1$　　　　&'

PossessorP$_1$　D$_1$'　　　&　DP$_2$

John's　D$_1$　NumP$_1$　PossessorP$_2$　D$_2$'

POSS$_1$　NUM$_1$　　　*Mary's*　D$_2$　NumP$_2$

i[SG]　i[SG]　NP$_1$

AP$_1$　　　　POSS$_2$　NUM$_2$　NP$_2$

i[SG]　i[SG]

tall　　　　　　　　　AP$_2$　NP$_{1/2}$

u[SG]

short　*student*

u[SG]　u[SG]

One necessary component of the analysis is that the DP internal agreement (among the NUM head, the determiner, the adjective, and the noun) is a result of the Agree operation just like subject-verb agreement. I make this assumption following Cinque (1994); Carstens (2000); Collins (2004); Danon (2011); Toosarvandani & van Urk (2014); Landau (2016) among others.[4] In the upcoming sections, I will draw a cross-linguistic generalization regarding multi-valuation with respect to DP internal agreement and subject-verb agreement. A generalization of this type would be very surprising if the two kinds of agreement are derived from distinct mechanisms.[5]

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[4] It is worth noting, however, that the nature of the DP internal agreement is currently under debate. There is another type of analysis that assumes two separate mechanisms for the DP internal agreement and subject-verb agreement. See Giusti (2008); Norris (2014); Polinsky (2016) for detailed arguments. I cannot get into the details of this ongoing debate here and will assume the Agree-based analysis for DP internal agreement throughout this paper.

[5] As one reviewer pointed out, Norris (2014) recently put forward two arguments against the Agree analysis of DP internal agreement (traditionally labeled as nominal concord). First, he shows that the participial adjectives in Estonian must show concord with the head nouns that they modify in (ia) but cannot show concord with the argument the adjectives themselves take inside the AP in (ib). Norris concludes that the participial adjectives cannot be a syntactic probe.

(i)　a.　Ema　　pragas　[kõiki　kooke　söövaØ]　poisi　　läbi.
　　　　　mother　scold　all.PL　cake.PL　eat-**SG**　boy.**SG**.ACC　through

　　b.　*Ema　　pragas　[kõiki　kooke　sööva-d]　poisi　　läbi.
　　　　　mother　scold　all.PL　cake.**PL**　eat-**PL**　boy.SG.ACC　through
　　　　　'Mother scolded the boy eating all the cakes.'
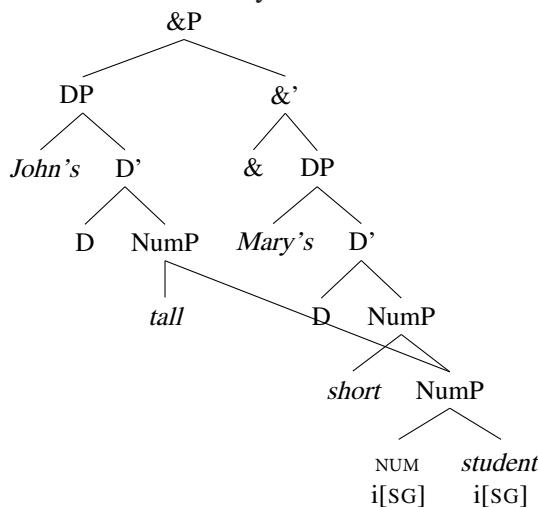
Second, Norris shows that if a possessor intervenes between a higher demonstrative and a lower noun, the demonstrative still shows concord with the head noun in (iia) and not with the intervening possessor as in (iib). The lack of intervention effect indicates that the concord in (ii) is different from the subject-verb agreement.

(ii)　a.　see-Ø　　　andme-te　　hulk
　　　　　this-**SG**.NOM　data-PL.GEN　amount.**SG**.NOM

Apart from multi-dominance, RNR is alternatively analyzed as across-the-board movement (ATB) or ellipsis. Shen (2017a) lays out arguments against the ATB movement account for Nominal RNR from island insensitivity and mismatch cases. Shen (2017b) argues against the ellipsis analysis for Nominal RNR in English, German, Spanish, Italian, Serbo-Croatian, and Dutch. The arguments come in two different kinds: 1. Nominal RNR is shown to be available in environments where ellipsis is ruled out across languages; 2. Nominal RNR is shown to be unavailable in environments where ellipsis is in general licensed. The ban on ellipsis in nomnial RNR can be subsumed under the Backward Anaphora Constraint (Langacker 1969; Barros & Vicente 2009). I refer readers to those papers for the details of the arguments.

A reviewer pointed out there is an alternative multi-dominance construction in (12). In (12) the NUM head sits below the adjectives and is shared by the two DPs along with the head noun. Since both of the DPs are singular, the NUM is specified as [SG]. The noun gets the SG value from the NUM head thus deriving the singular pivot in (12). Crucially, the structure in (12) does not involve multi-valuation of the number feature on the head noun. If this is the right structure for Nominal RNR, then Nominal RNR cannot be used to investigate multi-valuation as I claimed above.

(12)   John's tall and Mary's short **student**

Here I list two reasons why the structure in (11) is superior for Nominal RNR to (12). First, when the two sharing DPs are different in number values (i.e. a mismatch between two sources), the pivot noun shows closest conjunct agreement in English amongst other languages as in (13). Since there is only one NUM head in (12), the mismatches in (13) are predicted to be ungrammatical, contrary to fact.[6]

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  b. nee-d andme-te hulk
    this-**PL**.NOM data-**PL**.GEN amount.SG.NOM
    'this amount of data'

Although nominal concord in Estonian above shows distinct behavior from garden variety subject-verb agreement, the Agree analysis of nominal concord can account for (i) and (ii). In fact, Norris (2014) contends that there are ways that such facts could be adopted based on a modified version of Bejar & Rezac (2009) and the timing of spell-out (see Norris 2014: 123, fn14). It is thus fair to say that the debate over the nature of nominal concord is ongoing and no consensus has been reached.

[6] Thanks to an anonymous reviewer for pointing this out. Note that the arguments against the ellipsis analysis in Shen (2017b) still hold in the mismatch cases in (13).

(13)   a.   **This** tall and **those** short **students/*student** know each other.
         b.   **These** tall and **that** short **student/*students** know each other.

Second, in the next subsection we will show that the pivot noun in Nominal RNR can be plural in languages like Russian while each DP contains a singular-marked adjective, see (22b). This pattern essentially involves a mismatch between the pivot and both of the sources. Again, given that (12) only has one NUM, such mismatches are not predicted to be possible, contrary to fact.

2.1.2 Distributive agreement and summative agreement on multi-valued Ns

Having established that Nominal RNR involves multi-valued Ns, we look into the agreement patterns. As is noted above, in English when two singular DPs share one pivot noun, the noun is necessarily marked as singular as in (14). The same pattern is independently observed in Hindi in (15) by Belyaev et al. (2015). I label this pattern as *distributive agreement* which is schematized in (16): the probe shows distributive agreement when it gets multiple singular values and is marked as singular. Shen (2016) reports distributive agreement on multi-valued Ns in German, Dutch, Icelandic, Polish, Serbo-Croatian, and Slovenian.
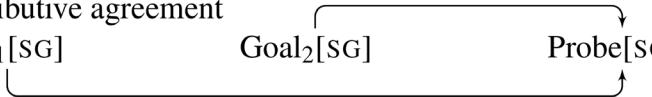
(14)   This tall and that short **student(*s)** are a couple.

(15)   *Hindi*
        yah   haraa   aur yah   piilaa   **jhandaa**
        this.SG green.SG and this.SG yellow.SG flag.SG
        'this green flag and this yellow flag' (2 flags total)

(16)   Distributive agreement
        Goal$_1$[SG]   Goal$_2$[SG]   Probe[SG]

Distributive agreement is not the only pattern observed on multi-valued Ns. Belyaev et al. (2015) notes that in Nominal RNR in (17) and (18), the pivot valued by two singular goals is spelled out as plural in Russian.

(17)   *Russia*
        vysokij i   xudoj **mužčiny**
        tall.SG and thin.SG man.PL
        'a tall man and a thin man'

(18)   Belyaev et al. (2015: (26))
        v Moskovskom   selskoxozjajstvennom i   Kievskom
        in Moscow.ADJ.PREP.SG argricultural.PREP.SG and Keiv.ADJ.PREP.SG
        politexničeskom   **institutax**
        polytechnic.PREP.SG institute.PREP.PL
        'at the Moscow Agricultural and the Kiev Polytechnic Institutes'

Harizanov & Gribanova (2014; 2015) observe that in Bulgarian, when two singular adjectives modify one noun, the noun can be marked as plural as in (19). See also discussion in Arregi & Nevins (2013).

(19)   *Bulgarian*
        a. bălgarsk-i-ja   i   rusk-i   **narod-i**
            Bulgarian-SG.M-the and Russian-SG.M nation-PL
            'the Bulgarian nation and the Russian nation'
        b. părv-a-ta   i   posledn-a **stranic-i**
            first-SG.F-the and last-SG.F   page-PL
            'the first page and the last page'

However, note that the sentences in (19) involve only one definite marker on the first adjective, which is not strictly parallel to the Nominal RNR construction that we have been discussing e.g. in (14). The sentences in (19) can be analyzed as a conjunction of two adjectives instead of a multi-dominance construction (Arregi & Nevins 2013). Under such analysis, (19) would not involve multi-dominance structure, thus would not be a case of multi-valuation.

   In cases where each conjunct includes one definite marker and an adjective as in (20) which is more parallel to the Nominal RNR cases discussed above, my consultants found the singular pivot in (20a) much more acceptable than the plural pivot in (20b).

(20)   a. ?parva-ta   i   posledna-ta **stranic-a**
            first.SG-DEF and last.SG-DEF   page-SG

        b. ?*parva-ta   i   posledna-ta **stranic-i**
            first.SG-DEF and last.SG-DEF   page-PL
   'the first page and the last page'

In (21), each source contains a demonstrative and an adjective, making the analysis of conjoined sources invalid, the singular pivot is degraded but accepted while the plural pivot is completely out. In light of these data, I conclude that multi-valued Ns in Bulgarian show distributed agreement.
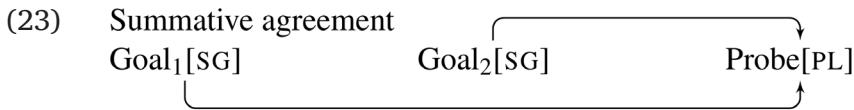
(21)   a. ?Tazi pyrva i   onazi posledna **stranic-a** lipsvat ot   knigi-te.
            this first and that last   page-SG   miss   from books-DEF
        b. *Tazi pyrva i   onazi posledna **stranic-i** lipsvat ot   knigi-te.
            this first and that last   page-PL   miss   from books-DEF
            'This first page and that last page are missing from the book.'

As for Russian, the sentence in (17) from Belyaev et al. (2015) has the same confound as Bulgarian: the two singular adjectives could be conjoined, which means that it does not necessarily involve multi-valuation. However, in (22) each source contains a demonstrative and an adjective. The conjoined source analysis cannot be maintained since the sources involve non-constituents. Two out of my three Russian consultants found both singular and plural pivots acceptable. I take this as evidence that the multi-valued Ns can be plural in Russian.

(22)   *Russian*
        a. Etot vysokij i   tot nizkij **student**   para.
            this tall   and that short student.SG couple
        b. Etot vysokij i   tot nizkij **student**   para.
            this tall   and that short student.PL couple
            'This tall student and that short student are a couple.'

Following Grosz (2015), I label this pattern *summative agreement,* which is schematized in (23): the probe shows summative agreement when it gets multiple singular values and is marked as plural.

(23)   Summative agreement
        Goal$_1$[SG]   Goal$_2$[SG]   Probe[PL]

In this section, we have shown when the noun is valued by multiple singular features in Nominal RNR, languages differ in the number marking of the multi-valued element: English and Hindi among other languages show distributive agreement while Russian shows summative agreement.

2.2 Multi-valued Ts

Having discussed multi-valued Ns, we turn to another multi-valued target: T heads. Like Nominal RNR, the first case of multi-valued Ts involves Right Node Raising. Postal (1998); Yatabe (2003); Grosz (2009); Kluck (2009); Grosz (2015) observe that in the Right Node Raising constructions in (24), the verb *have* agrees with both singular subjects *Bill* and *John* and can show plural agreement, i.e. summative agreement.

(24)   Sue is proud that Bill$_{[SG]}$, and Mary is glad that John$_{[SG]}$, **have**$_{[PL]}$/**has**$_{[SG]}$ travelled to Cameroon.

Grosz (2015) observes that summative agreement on the T is seen in English, Western Armenian, Standard Gujarati, Hebrew, Italian, and Czech. On the other hand, Serbo-Croatian, Dutch, and Greek categorically ban plural agreement in these cases, allowing only singular agreement (see Kluck 2009 for experimental data from Dutch). (25) is an example of summative agreement in Italian and (26) shows an example of singular marked T in Slovenian.[7]

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[7] The acceptability of summative agreement in English (24) is subject to inter-speaker variation. Three experiments have been conducted by Yatabe (2003), Barros & Vicente (2011), and Grosz (2015). In Yatabe (2003) out of 23 speakers, 7 rated the plural agreement *OK*, 12 *?OK*, 3 *?**, 1 ***. Grosz (2015) reports the mean rating of plural agreement as 2.61 out of 5 (standard deviation, 1.31) and 2.65 for singular agreement (standard deviation, 1.40), a non-significant difference. Barros & Vicente (2011) report the mean rating to be 1.96 for the plural agreement and 2.07 for the singular agreement, also non-significant. Following Grosz, I take this result to mean that both singular and plural markings are acceptable. Different sub-groups of speakers have different preferences.

  A reviewer suggests that the agreement patterns in TP RNR might be a speech error resulting from some processing mechanism (similar to but distinct from the agreement attraction effects), given its inter-speaker variation and relatively low rating. Although this is an interesting suggestion, it has been argued against by Grosz (2009); Barros & Vicente (2011); Grosz (2015). Grosz points out that summative agreement behaves like canonical subject-verb agreement in every respect. In German, only nominative subjects can trigger agreement on the verb. While the nominative subjects in German long passives can induce summative agreement in (ia), the accusative objects in impersonal passives cannot induce it in (ib). Only the default singular agreement is possible. Note that (ia) and (ib) are different only in terms of the case marking on the DPs. According to Barros & Vicente (2011) this indicates that summative agreement is a genuine syntactic phenomenon.

(i)   *German*
       a.   [dass der   Traktor zu reparieren], und [der   Wagen zu verkaufen], versucht
             that the.NOM tractor to repair   , and the.NOM wagon to sell   , tried
             wurden/wurde.
             were/was
             '… that someone tried to repair the tractor and sell the wagon.'

(25)　*Italian* (Grosz 2015: (13d))
　　　Maria é felice che Gianni$_{[SG]}$, e　Sue é orgogliosa che Bill$_{[SG]}$,
　　　Maria is happy that Gianni,　　and Sue is proud　　that Bill,
　　　abbiano$_{[PL]}$ / **abbia**$_{[SG]}$　viaggiato in Australia.
　　　have.SUBJ.PST.3PL / .3SG travelled to Australia
　　　'Maria is glad that Gianni, and Sue is proud that Bill, have travelled to Australia.'
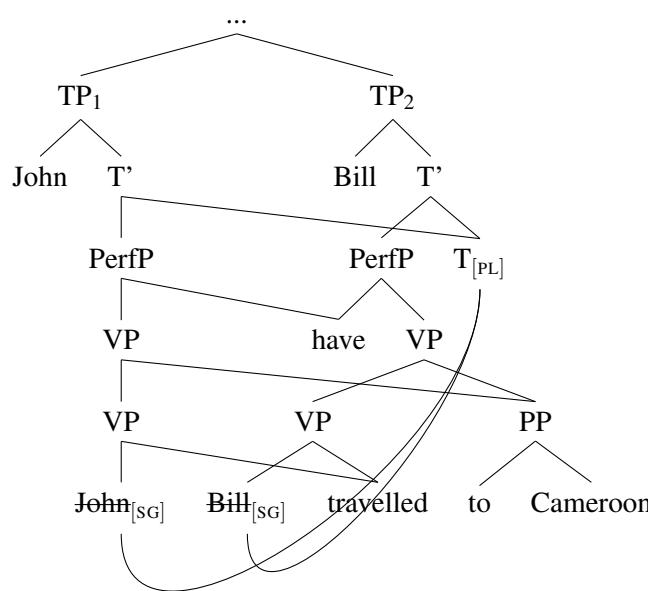
(26)　*Slovenian*
　　　Jure misli da Maja$_{[SG]}$, in　Boris verjame da　Sara$_{[SG]}$,
　　　Jure thinks that Maja,　　and Boris believes that Sara,
　　　potuje$_{[SG]}$ /***potujeta**$_{[DL]}$　na Kitajsko.
　　　travel.SG/*DL　　　to China
　　　'Jure thinks that Maja travels to China and Boris believes that Sara travels to China.'

Grosz (2015) argues for a multi-dominance analysis for summative agreement in (27) where the T merges with both PerfPs and agrees with both the embedded subjects. To distinguish this structure from Nominal RNR, I will label this construction as TP RNR. In (27), Grosz (2015) assumes an analysis where multiple elements are multi-dominated. What's important for the current purpose is that in this structure the T is shared and agrees with both the embedded subjects, thus multi-valued. As we have seen, the multi-valued Ts in English can be spelled out as plural.

(27)

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　　　b.　[dass den　　Traktor zu reparieren], und [den　　Wagen zu verkaufen], versucht
　　　　　that the.ACC tractor to repair　　, and the.ACC wagon to sell　　, tried
　　　　　wurde/*wurden.
　　　　　was/were
　　　　　'… that someone tried to repair the tractor and sell the wagon.'

Although it is not impossible in principle to come up with a processing mechanism that can account for (i), I cannot evaluate such theory without explicit details. It is also worth pointing out that processing effects like agreement attraction are present when the participants perform online tasks such as self paced reading and sentence completion or offline tasks while under time pressure (see Franck et al. 2002; Wagers et al. 2009; Keung 2017). In such tasks, the rate of agreement errors like attraction is around 3%–13% (Franck et al. 2002; Eberhard et al. 2005; Willer Gold et al. 2017). Data reported in the previous literature and from my consultants are all collected offline, with no time pressure. The acceptance rate is much higher than 13%. Consequently, I will keep assuming that the data reported in the current paper are results from grammar proper and not a processing mechanism.

As is noted in (24) and (25), singular marking on the T head is optionally available in English and Italian. For the singular marking observed in TP RNR, Grosz (2015) suggests two possibilities. First, it could be the case that while summative agreement results from multi-dominance, the singular marking results from ellipsis as in (28). The sentence starts out as two full conjoined sentences and the T' of the first conjunct gets elided. The consequence of this approach is that languages like English and Italian allow both multi-dominance and ellipsis (see Barros & Vicente 2011), whereas languages like Slovenian and Serbo-Croatian that only allow singular marking in TP RNR do not allow multi-dominance. In other words, only summative agreement in TP RNR involves multi-valuation. As two reviewers point out, one question for this approach is what decides whether a language allows multi-dominance or not.

(28)   Sue is proud that Bill$_{[SG]}$ ~~has$_{[SG]}$ travelled to Cameroon~~ and Mary is glad that John$_{[SG]}$ has$_{[SG]}$ travelled to Cameroon.

The second option is to assume that TP RNR in every language is a product of multi-dominance regardless of the agreement patterns. Different agreement patterns do not involve different structures of RNR but different agreement mechanisms. The implication of this approach for multi-valuation is that both the singular marking and summative agreement in TP RNR involve multi-valued Ts. The point of variation is how languages resolve multi-valued Ts with two singular values. Languages like English resolve the multi-valuation with summative agreement or distributive agreement, whereas languages like Serbo-Croatian resolve it only with distributive agreement.

  Grosz (2015) supports the second approach on two grounds: 1. in Serbo-Croatian, a language that only allows singular marking on T, multi-dominance has been independently argued for (see Gračanin-Yuksek 2007). If ellipsis is the source for singular marking and multi-dominance is the source for summative agreement, then languages like Serbo-Croatian should at least allow summative agreement, contrary to fact. The absence of summative agreement in Serbo-Croatian can be accounted for if multi-dominance can also generate singular agreement, like distributive agreement in Nominal RNR. 2. This option assumes a unified multi-dominance treatment of the TP RNR. One can assume that multi-dominance is available universally without having to worry about what conditions whether a language allows multi-dominance.

  In addition to these arguments, I provide another piece of evidence for the unified multi-dominance analysis of TP RNR. The kind of ellipsis that TP RNR would involve in (28) is called Stripping where an entire clause except one constituent (the subject in (28)) is elided. Stripping has been observed and discussed since the 70s (Hankamer & Sag 1976; Lobeck 1995; Merchant 2003; Wurmbrand 2017b). Previous literatures observe that Stripping is allowed in matrix clauses but not in subordinate clauses as shown in (29). From my survey, Stripping in the embedded clauses is banned across languages as found in Greek, Dutch, Serbo-Croatian, Slovenian, Italian, Icelandic, German, and Hungarian among others. I refer readers to Wurmbrand (2017b) for accounts for such restrictions on Stripping. It suffices for our purpose to show that the ellipsis required in TP RNR is banned in general.

(29)   a.   Merchant (2003: (1))
              Abby speaks passable Dutch, and BEN, too.
         b.   Merchant (2003: (21))
              *Abby claimed Ben would ask her out, but she didn't think that Bill (too).

Sentences in (29) involves forward Stripping, i.e. ellipsis in the second conjunct. Larson (2012) shows that Stripping is also banned in backward ellipsis. Barros & Vicente (2011); Larson (2012) use morphological mismatch and sloppy interpretation as diagnostics for ellipsis. For example in the VP ellipsis in (30), under the intended sloppy reading where Alice has negotiated Alice's salary and Bob is about to negotiate Bob's salary, the elided VP in the first conjunct contains the past form of the verb *negotiated* and the feminine possessive pronoun *her*. The antecedent in the second conjunct contains the infinitival form of the verb *negotiate* and masculine possessive pronoun *his*. The mismatching elements and the reference of the possessive pronouns *Alice* and *Bob* are in bold. Despite the mismatch between the antecedent and the elided material, the VP ellipsis is grammatical. Multi-dominance on the other hand has a hard time deriving the mismatch.

(30)   Barros & Vicente (2011: (15))
        Alice already has, and Bob is about to, negotiate his salary with the manager.
        '**Alice** already has **negotiated her** ~~salary with the manager~~ and **Bob** is about
        to **negotiate his** salary with the manager.'

Larson (2012) observes that in TP RNR, the same kind of mismatch is not available. Under the sloppy reading in (31), the elided T' contains the feminine possessive pronoun *her* referring to *Iris*. The possessive pronoun in the antecedent in the second conjunct is *his* referring to Daniel. If (31) could involve ellipsis, i.e. backward Stripping were possible in TP RNR, (31) is predicted to be grammatical like (30), contrary to fact. Note that (31) does not involve overt agreement on the pivot verb. The ban on Stripping in TP RNR is independent from agreement on the pivot.

(31)   Larson (2012: (13))
        *Alice is happy that **Iris** ~~can spell her name~~, and Claire is proud that **Daniel**, can
        spell **his** name.

Consequently, the shared T in English, be it singular or plural, results from a multi-dominance structure and involves multi-valuation.[8]

   Before ending this section, I want to point out that multi-valued Ts do not only exist in RNR constructions. Gluckman (2016) observes that in Nocte the verb agrees with both the subject and the object and the two agreement relations are realized as one morpheme on the verb (portmanteau). Interestingly, when the subject is 1st person singular and the object is 2nd person singular, the verb shows 1st person *plural* agreement. (32) shows that *-e* is 1st person plural marker. (33) shows that the 1st person plural marker is used on the verb in a sentence with no 1st plural argument but two singular arguments. The same pattern is found in Karuk (Hokan), Yimas (Papuan), Wayampi (Tupí-Guaraní), Mapudungun (S.A. isolate), Bolinao (Austronesian), Tongva (Uto-Aztecan), Anindilyakwa (Australian), Colloquial Ainu (Ishikari dialect). The agreement pattern is in (34).

(32)   Ni   roantang rang- ka -e.
        1PL always   ASP- go -1PL
        'We always go.'

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[8] It is important to note that the arguments here only indicate that the TP RNR construction with multi-valued Ts doesn't involve PF deletion/ellipsis. It does not make the claim that PF deletion/ellipsis operations are not involved in RNR constructions in general. There is ample evidence across languages that RNR does involve ellipsis/PF deletion in some contexts (see Hartmann 2000; An 2007). The general analysis for RNR is well beyond the scope of the current paper.

(33) Nga -ma   nang hetho -e.
      1SG -NOM 2SG   teach -1PL
      'I shall teach you.'

(34)
Subject[SG]   Object[SG]   T[PL]

Gluckman proposes that the plural marking in (33) is a *composed plural* by two singular arguments. The T head probes both the object and the subject, getting two singular values, i.e. multi-valuation. The multi-valued T in Nocte is spelled out as plural, i.e. summative agreement. The detailed derivation can be found in Gluckman (2016). What's relevant here is that the Nocte agreement pattern offers a non-RNR case of multi-valuation, which shows that multi-valuation is not restricted to Right Node Raising constructions but constitutes a more general phenomena. See Citko (2018) for summative agreement patterns with coordinated subjects in Polish.

In this section, I have shown that multi-valuation can also target T heads in TP RNR and composed plurality in Nocte, and that ellipsis is not a valid predictor of multi-dominance/valuation. Like the multi-valued Ns, T heads valued by multiple singular features can show distributive and summative agreement depending on the particular language and idiolect.

3 Cross linguistic distribution of multi-valuation agreement

In the previous section we saw that both summative agreement and distributive agreement have been observed on multi-valued Ns and Ts. A natural question to ask is whether the distribution of the agreement patterns in the multi-valuation context is free across targets or restricted in a certain language.

Crossing two multi-valued targets and two agreement patterns, there are four logically possible language types in Table 1. If the distribution is free, all four types should be attested.

Looking into the distribution, I conducted a cross-linguistic survey of multi-valuation on Ns and Ts. Multi-valued Ns are probed with Nominal RNR and multi-valued Ts with TP RNR. In each construction, the pivot is valued by two singular goals. The plural marking indicates summative agreement and the singular marking indicates distributive agreement. Combining the survey and the observations made in the previous literature (Arregi & Nevins 2013; Belyaev et al. 2015; Grosz 2015; Harizanov & Gribanova 2015; Shen 2016; 2017a; b), I summarize the cross-linguistic distribution of the two types of agreement below in Table 2.[9]

As can be seen from Table 2, the distribution of the agreement patterns is not free. Modulo cases where neither singular nor plural is acceptable, if the multi-valued Ts show summative agreement in a certain language, multi-valued Ns may show either distributive (e.g. English, Slovak) or summative agreement (e.g. Russian). However if the multi-valued Ts show

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[9] The cross-linguistic survey was conducted online or in person. I thank the following people for participating and sharing their native judgments. Brazilian Portuguese: Renato Lacerda; Dutch: Paula Fenger, Ava Creemers, Fenna Bergsma; English: Jonathan Bobaljik, Heidi Klockmann, Troy Messick, Emma Nguyen, Laura Snider, Lyn Tieu, Chantale Yunt; Finnish: Karoliina Lohiniva; German: Alex Göbel, Magdalena Kaufmann, Stefan Kaufmann, Susi Wurmbrand; Greek: Christos Christopolous; Hebrew: Hadas Kotek, Idan Landau; Hindi: Ava Irani; Hungarian: Dóra Kata Takács; Icelandic: Gísli Rúnar Harðarson; Italian: Pietro Cerrone, Roberto Petrosino, Sandra Villata; Polish: Marcin Dadan, Asia Pietraszko; Romanian: Vanessa Petroj; Russian: Ksenia Bogomelets, Vadim Kimmelman, Helen Koulidobrova, Pavel Koval, Nina Radkevich; Serbo-Croatian: Aida Talić, Neda Todorovic; Slovenian: Marko Hladnik, Adrian Stegovic; Slovak: Veronika Richtarcikova; Spanish: Gabriel Martínez Vera, Justin Royer, Francisco Torreira.

Table 1: Logically possible language types.

	multi-valued N	multi-valued T
Type 1	Distributive	Distributive
Type 2	Summative	Summative
Type 3	Distributive	Summative
Type 4	Summative	Distributive

Table 2: Distribution of summative and distributive agreement across targets and languages.

	multi-valued N	multi-valued T
Hungarian	Distributive	*
Brazilian Portuguese	Distributive	Distributive
Dutch	Distributive	Distributive
Finnish	Distributive	Distributive
Greek	Distributive	Distributive
Hindi	Distributive	Distributive
Icelandic	Distributive	Distributive
Polish	Distributive	Distributive
Serbo-Croatian	Distributive	Distributive
Slovenian	Distributive	Distributive
Romanian	Distributive	Distributive
English	Distributive	Distributive/Summative
German	Distributive	Distributive/Summative
Italian	Distributive	Distributive/Summative
Slovak	Distributive	Summative
Spanish	Distributive	Summative
Hebrew	Distributive/Summative	Distributive/Summative
Russian	Distributive/Summative	Summative

distributive agreement, multi-valued Ns must also show distributive agreement (e.g. Greek, Dutch) instead of summative agreement. In other words, there is monotonicity in multi-valuation agreement: singular-marked multi-valued Ts entail singular-marked multi-valued Ns. This observation is formulated as the distributive agreement generalization in (35).

(35)   Distributive agreement generalization: If the multi-valued Ts in a language exclusively show distributive agreement, the multi-valued Ns must also show distributive agreement and not summative agreement.

In terms of typology, three types of languages have been attested. Below I illustrate each type with data from two languages.

3.1 Type 1: Distributive agreement on multi-valued Ns and Ts

The first type of language shows distributive agreement on multi-valued Ns and Ts, modular cases where neither singular nor plural marking is possible on one of the agreement targets. This type of language includes Slovenian, Serbo-Croatian, Polish, Slovak, Icelandic, Dutch, Hindi, Romanian, Brazilian Portuguese, Spanish, Greek, Finnish, Hungarian, and Spanish. Below are examples from Slovenian and Icelandic.

Slovenian

(36)   Multi-valued Ns in Slovenian: distributive agreement
  a.   Ta   visok in   tisti majhen **fant**   sta par.
       this tall   and that short   boy.SG are couple

  b.   *Ta   visok in   tisti majhen **fanta**   sta par.
       this tall   and that short   boys.DL are couple
       'This tall boy and that short boy are a couple.'

(37)   Multi-valued Ts in Slovenian: distributive agreement
  a.   Jure misli da   Maja, in   Boris verjame da   Sara, **potuje** na   Kitajsko.
       Jure thinks that Maja, and Boris believes that Sara, travel   SG to China

  b.   *Jure misli da   Maja, in   Boris verjame da   Sara, **potujeta** na Kitajsko.
       Jure thinks that Maja, and Boris believes that Sara, travel.DL to China
       'Jure thinks that Maja travels to China and Boris believes that Sara travels
       to China.'

Icelandic

(38)   Multi-valued Ns in Icelandic: distributive agreement
  a.   Minn   hávaxni og   þinn   lágvaxni **nemandi**   eru sætt par.
       my.SG tall   and your.SG short   student.SG are cute couple

  b.   *?Minn   hávaxni og   þinn   lágvaxni **nemendur** eru sætt par.
       my.SG tall   and your.SG short   student.PL are cute couple
       'My student and your student are a cute couple.'

(39)   Multi-valued Ts in Icelandic: distributive agreement
  a.   Jón heldur að   María, og   Villi trúir   að   Súsanna, **hafi**
       Jon thinks that Maria, and Villi believes that Susanna, have.PRS.SUBJ.SG
       ferðast   til Kína.
       travelled to China

  b.   *Jón heldur að   María, og   Villi trúir   að   Súsanna, **hafa**
       Jon thinks that Maria, and Villi believes that Susanna, have.PRS.SUBJ.PL
       ferðast   til Kína.
       travelled to China
       'John thinks that Mary travelled to China and Bill believes that Sue travelled
       to China.'

3.2 Type 2: Summative agreement on multi-valued Ns and Ts

The second language type allows summative agreement on multi-valued Ns and Ts.
Russian is one example of this type. Both distributive agreement and summative agree-
ment is allowed on multi-valued Ns while only summative agreement is allowed on
multi-valued Ts.

Russian

(40)   Multi-valued Ns in Russian: distributive/summative agreement
  a.   Etot vysokij i   tot nizkij **student**   para.
       this tall   and that short student.SG couple

  b.   Etot vysokij i   tot nizkij **studenty** para.
       this tall   and that short student.PL couple
       'This tall student and that short students are a couple.'

(41)   Multi-valued Ts in Russian: summative agreement
        a. ??Ivan dumaet chto Masha, a   Vasya dumaet chto Dasha, **ezdil-a** v
            Ivan thinks   COMP Masha, and Vasya thinks   COMP Dasha, went-SG to
            Kitaj.
            China

        b.   Ivan dumaet chto Masha, a   Vasya dumaet chto   Dasha, **ezdil-i** v
            Ivan thinks   COMP Masha, and Vasya thinks   COMP Dasha, went-PL to
            Kitaj.
            China
            'Ivan thinks that Masha went to China and Vasya thinks that Dasha went
            to China.'

Hebrew
Hebrew is another example of this language type. One speaker I consulted accepted both
distributive agreement and summative agreement on both multi-valued Ns and Ts. The
other Hebrew speaker only accepted distributive agreement on both multi-valued Ns and
Ts. Although this individual variation is observed, it is shown that summative agreement
is allowed on both multi-valued Ns and Ts for at least some speakers.

(42)   Multi-valued Ns: distributive/summative agreement
        a.   **Ha-student**   ha-gavoha ha-ze   ve-ha-namux ha-hu   hem zug.
            the-student.SG the-tall   the-this and-the-short the-that are   couple

        b.   **Ha-studentim** ha-gavoha ha-ze   ve-ha-namux ha-hu   hem zug.
            the-student.PL the-tall   the-this and-the-short the-that are   couple
            'This tall student and that short student are a couple.'

(43)   Multi-valued Ts: distributive/summative agreement
        a.   Dina smexa she-Yosi, ve-Maya   ge'a   she-Dani, **nasa**
            Dina glad   that-Yosi and-Maya proud that-Dani travelled.PST.3SG
            le-ostralya.
            to-Australia

        b.   Dina smexa she-Yosi, ve-Maya   ge'a   she-Dani, **nas'u**   le-ostralya.
            Dina glad   that-Yosi and-Maya proud that-Dani travelled.PST.3PL to-Australia
            'Dina is glad that Yosi travelled to Australia and Maya is proud
            that Dani, travelled to Australia.'

3.3 Type 3: Distributive agreement on multi-valued Ns, summative agreement on multi-valued Ts

The third type of languages show distributive agreement on multi-valued Ns and summa-
tive agreement on Multi-valued Ts. English, Slovak, German, and Italian are included in
this type. Examples from English and Slovak are shown below.

English
(44)   Multi-valued Ns in English: distributive agreement
        a.   This tall and that short **student** are a couple.
        b.   *This tall and that short **students** are a couple.

(45)   Multi-valued Ts in English: distributive agreement and summative agreement
        a.   Sue's proud that Bill, and Mary's glad that John, **has** travelled to Cameroon.
        b.   Sue's proud that Bill, and Mary's glad that John, **have** travelled to Cameroon.

Slovak

(46)   Multi-valued Ns in Slovak: distributive agreement
        a.   Jeden vysoky a   jeden nizky   **student**   su parik.
              one   tall.SG and one   short.SG student.SG are couple

        b.   *Jeden vysoky a   jeden nizky   **studenti**   su parik.
              one   tall.SG and one   short.SG students.PL are couple
              'One tall student and one short student are a couple.'

(47)   Multi-valued Ts in Slovak: summative agreement
        a.   *Tána je pysná, ze   Franta, a   Vera je ráda, ze   Tom, **bude**
              Tanja is proud that Franta and Vera is glad that Tom will.3SG
              cestovat do Nigérie.
              travel.inf to Nigeria

        b.   Tána je pysná, ze   Franta, a   Vera je ráda, ze   Tom, **budou**
              Tanja is proud that Franta, and Vera is glad that Tom, will.3PL
              cestovat do Nigérie.
              travel.inf to Nigeria
              'Tanja is proud that Franta will travel to Nigeria and Vera is glad that
              Tom will travel to Nigeria.'

3.4 Type 4: Summative agreement on multi-valued Ns, distributive agreement on multi-valued Ts

This last type of language is not attested in the sampled languages.

   As is indicated in Table 3, out of the four logically possible patterns crossing two agreement targets and two agreement patterns in multi-valuation, only three are attested, i.e. a 3/4 pattern. As far as I am aware, this typological observation is novel. In the next section, I discuss a longstanding observation of another 3/4 pattern in hybrid noun agreement and propose that the typological observation in multi-valuation is a subcase of the Agreement Hierarchy.

   A brief remark on the sampling of languages. The claim that Type 4 languages do not exist is made based the relatively small pool of 17 languages. This might cause some concern regarding the robustness of the claim. Proving a negative universal like a typological gap can be tricky if possible at all. Ideally one would need to go through all the languages (dead, living, and emerging). Practically, one should test as many languages as possible.

   On the other hand, the nature of multi-valuation restricts the pool of candidate languages to a small subset. First, the candidate languages need to show number marking on nouns and verbs. This rules out languages like Chinese, Japanese, Korean among many others. Second, the candidate languages need to allow Nominal RNR and/or TP RNR. Languages that have agreement but do not allow Nominal RNR or TP RNR have to be excluded. On a practical level, since Nominal RNR and TP RNR constructions are generally not included in traditional grammars, native speakers have to be consulted with. According to WALS,

Table 3: Attested language types.

	multi-valued N	multi-valued T	
Type 1	Distributive	Distributive	Slovenian
Type 2	Summative	Summative	Russian
Type 3	Distributive	Summative	English
Type 4	Summative	Distributive	**not attested**

apart from the 17 languages reported here, most of the languages that show both nominal and verbal number markings are indigenous languages spoken in Africa, Oceania, or North and South America. We were not able to contact the speakers of these languages. The 17 languages reported in the survey are a result of these limitations. They include all eligible languages that the author have access to native speakers of. For now, we will proceed with the available evidence while keeping in mind that more languages should be surveyed.

In the next section, I argue for a link between the patterns discussed in this section and the Agreement Hierarchy, a long-standing set of generalization observed for hybrid noun agreement. I propose that summative/distributive agreement dichotomy is a subcase of morphological/semantic agreement.

4 Multi-valuation and the Agreement Hierarchy

4.1 Multi-valuation as a subcase of the Agreement Hierarchy

The 3/4 pattern observed on multi-valued Ns and Ts is also seen in other agreement phenomena. A series of work by Corbett (1979; 2000; 2006) observe a general implication relation among agreement targets when agreeing with hybrid nouns. Hybrid nouns can control both morphological agreement and semantic agreement. In (48) and (49), the hybrid noun *committee* in British English among other varieties can control singular or plural agreement on the verb and the personal pronoun. Note that (48b) and (49b) involve mismatches on different agreement targets: the demonstratives show morphological/singular agreement while the verb and personal pronoun show semantic/plural agreement.

(48) a. This committee has gathered.
      b. This committee have gathered.

(49) a. This committee offered itself to criticism.
      b. This committee offered themselves to criticism.

This effect is also observed in gender agreement in languages like German and Russian (Corbett 1979). In Russian, *vrač* 'doctor' is morphologically masculine but can refer to a female individual, i.e. semantically feminine. (50a–b) show that it is possible for the adjective and the verb to both show either masculine agreement or feminine agreement when referring to a female doctor. However, mismatch between the two targets can only be in one direction: it is possible for the adjective to be masculine and the verb to be feminine in (50c), but not the other way around in (50d).

(50)   Russian hybrid nouns: morphologically masculine, semantically feminine.
      a. Novyj   vrač   skazal.
          new.**M** doctor said.**M**

      b. Novaja vrač   skazala.
          new.**F** doctor said.**F**

      c. Novyj   vrač   skazala.
          new.**M** doctor said.**F**

      d. *Novaja vrač   skazal.
          new.**F** doctor said.**M**
          'The new female doctor spoke.'

Table 4 shows the general scheme between two targets: when the verb shows morphological agreement, the attributive element cannot show semantic agreement. For examples from other languages, see Corbett (2006).

Table 4: A 3/4 pattern in hybrid noun agreement.

attributive	verb	
morphological	morphological	attested
semantic	semantic	attested
morphological	semantic	attested
semantic	morphological	**not attested**

Table 5: Another 3/4 pattern in hybrid noun agreement.

verb	personal pronoun	
morphological	morphological	attested
semantic	semantic	attested
morphological	semantic	attested
semantic	morphological	**not attested**

The same pattern is observed on other agreement targets. Although verbs in English can show either morphological or semantic agreement, personal pronouns tend to show more semantic agreement than the verbs. In (51c), the auxiliary *has* is singular while the personal pronoun shows plural marking, both of which are controlled by *the government.* Mismatch in the opposite direction is impossible as is shown in (51d) where the auxiliary is plural and the personal pronoun is singular. The 3/4 pattern between the verb and the personal pronouns is summarized in Table 5.

(51)   Smith (2015: (17))
   a.   The government **has** offered **itself** up for criticism (with this policy).
   b.   The government **have** offered **themselves** up for criticism.
   c.   The government **has** offered ˀ**themselves** up for criticism.
   d.   *The government **have** offered **itself** up for criticism.

With evidence from a variety of constructions and languages in addition to the 3/4 patterns shown above, Corbett (1979) proposes the Agreement Hierarchy in (52).

(52)   attributive — predicate — relative pronoun — personal pronoun
         ← morphological agreement   semantic agreement →

Empirical work has shown that the Hierarchy effect holds for at least 3 levels: 1. the corpus level: the positions to the right of the Hierarchy are more likely to show semantic agreement and the positions to the left of the Hierarchy are more likely to show morphological agreement; 2. the sentence level: if a position shows morphological agreement, no positions to its left on the Hierarchy can show semantic agreement in the same sentence; 3. the language level: no languages show morphological agreement on a position X exclusively and semantic agreement on positions left to X.

Various work has been addressing different aspects of the Agreement Hierarchy effect. Corbett (1979; 2006) among others focuses mainly on the corpus level. Recent work by Smith (2015); Landau (2016) address the Hierarchy effects observed within one sentence. The language level of the Hierarchy is the least talked about, but see Wechsler & Zlatić (2003); Puškar (2017).

Now we can come back to multi-valuation and its relation with the Agreement Hierarchy. The Hierarchy is motivated by the 3/4 patterns in hybrid noun agreement shown in Tables 4 and 5. These pattens are homogeneous to the 3/4 pattern in Table 3 observed in multi-valuation: there is a monotonicity regarding two agreement patterns between two agreement targets. For hybrid noun agreement, the agreement patterns involved are morphological and semantic agreement. For multi-valuation, they are distributive and summative agreement. Although it is possible for both targets to show either agreement pattern across languages, the mismatch only goes one way. No language that shows morphological/distributive agreement on position X exclusively and semantic/summative agreement on positions left to X (i.e. the distributive agreement generalization (35)).

Thus I propose that multi-valuation, like hybrid noun agreement, is a case of the Agreement Hierarchy effect. If we align distributive agreement in multi-valuation with morphological agreement and summative agreement with semantic agreement, and add the N heads to the Agreement Hierarchy as in (53), the typological gap in multi-valuation in Table 3 is predicted: no language shows morphological agreement on multi-valued Ts and semantic agreement on multi-valued Ns, given that Ns are on the left of Ts in (53).

(53)   N — T

This proposal makes three additions to the Agreement Hierarchy in (52). First it adds multi-valuation as a subcase of the Hierarchy effect on top of hybrid noun agreement. As far as the author is aware, the discussion on the Agreement Hierarchy has been exclusively on hybrid noun agreement. The second addition is to add N heads as a position on the Hierarchy. When the Agreement Hierarchy was originally proposed, N was treated as the source of the gender and number features. Subsequent work has revealed that the NUM head and the small *n* are sources of number features (Ritter 1991; Kramer 2016; Landau 2016). Thus treating the noun head as one of the agreement targets is a natural move. The third aspect of the proposal is the alignment of distributive agreement with morphological agreement as well as summative agreement with semantic agreement.

4.2 Summative agreement = semantic agreement; distributive agreement = morphological agreement

This section argues for the connection between summative agreement and semantic agreement as well as that between distributive agreement and morphological agreement. Empirically, mismatches in distributive agreement are resolved as closest conjunct agreement (CCA) which is associated with morphological agreement, mismatches in summative agreement are taken care of by resolved agreement which is associated with semantic agreement.

Linking distributive agreement in multi-valuation with morphological agreement in the Agreement Hierarchy is a natural move. Morphological agreement in Corbett's sense involves a shared morphological number marking. In (54a) the demonstrative *this* involve morphological agreement with the noun *committee* because they are both marked as singular (as opposed to the plural verb *have*). In (54b), the multi-valued noun *student* also shows the same singular marking with *this* and *that,* despite the plural reference of the whole DP.

(54)   a.   This.SG committee.SG have.PL gathered.
        b.   This.SG tall and that.SG short **student.SG** have gathered.

Empirically, Corbett (1979) proposes that closest conjunct agreement (CCA) is a resolution of mismatch in morphological agreement. This is parallel to the CCA observed in

mismatch cases in multi-valuation in (55) (observed by Shen 2016). When two DPs are of different number values, the pivot shows the same marking as the closest conjunct.

(55)   a.   These.PL tall and that.SG short **student** have gathered.
        b.   *These.PL tall and that.SG short **students** have gathered.
        c.   This.SG tall and those.PL short **students** have gathered.
        d.   *This.SG tall and those.PL short **student** have gathered.

For languages that only allow distributive agreement in multi-valued Ts, the prediction is that CCA is also observed when the embedded subjects in two conjuncts mismatch in number. This prediction is borne out. To investigate agreement in RNR constructions in Dutch, Kluck (2009) did an acceptability judgment experiment with 28 native speakers of Dutch in a 5-point likert scale acceptability judgment task (1 being bad and 5 being good). The results show that closest conjunct agreement is used in mismatching cases. Although some of her examples involve relative clauses which are not the focus of the current paper, Kluck (2009) included the sentences in the survey in the appendix, which makes it possible to check the sentences relevant to our purpose. Sentences (10), (19), and (22) in her survey involve mismatching subjects and closest conjunct agreement on the T. The average ratings for these items are 3.6, 3.5, and 2.9 (on a scale of 1–5). I repeat her (19) below as (56). Her (3) and (18) involve mismatching subjects and a plural multi-valued T, and the average ratings for these two sentences are 2 and 2.6. I repeat her (3) below as (57). I follow Kluck's conclusion that CCA is used in mismatch cases of multi-valued Ts in Dutch, as is expected from the current proposal.

(56)   Anna beweerde dat **wij**, maar Steven zei dat **jij**,   het gas aan **had**
        Anna claimed   that **1PL** but   Steven said that **2SG**, the gas on   **have.SG**
        laten staan.
        let   stand
        'Anna claimed that we left the gas open, but Steven said that you left the gas
        open.' (average rating: 3.5/5)

(57)   Joke zei dat **wij**, maar Pieter dacht   dat **jij**,   de deur open **hadden**
        Joke said that **1PL**, but   Pieter thought that **2SG**, the door open **had.PL**
        laten staan.
        let   stand
        'Joke said that we left the door open, but Pieter thought that you left the
        door open.' (average rating: 2/5)

Linking summative agreement in multi-valuation with semantic agreement in the Agreement Hierarchy is also justified conceptually. Semantic agreement with hybrid nouns reflects not the morphological marking of the noun but the semantic reference. In accounting for summative agreement on multi-valued Ts, Grosz (2015) proposes that the reference feature on each embedded subject gets copied onto T as in (58a). If both embedded subjects have the same reference as in (58b), the plural agreement on T is ruled out. In other words, summative agreement in multi-valuation is linked to semantic reference.

(58)   a.   John's glad that Sue_1, and Bill's proud that $Mary_2$, **has/have**$_{1+2}$ been to
              China.
        b.   John's glad that his $mother_1$, and Bill's proud that his $wife_1$, **has**$_1$/***have**
              been to China.

Data from mismatch cases support this connection as well. Semantic agreement resolves mismatches by resolved agreement. This is indeed what we found in TP RNR in English, when the two embedded subjects are of different number values in (59), the shared T can show plural marking regardless of the order of the two subjects.

(59) a. John's glad that the twins.PL, and Bill's proud that Mary.SG, **have** been to China.
      b. John's glad that Mary.SG, and Bill's proud that the twins.PL, **have** been to China.

Furthermore, clear predictions are also made for Russian Nominal RNR, which allows both distributive and summative agreement in the context of mismatches. The summative/semantic agreement would generate plural pivots regardless of the order of the mismatching conjuncts. The distributive/morphological agreement generates the closest conjunct agreement pattern: singular pivots when the second conjunct is singular; plural pivots when the second conjunct is plural. Combining both types of agreement, it is predicted that the plural pivot is allowed in mismatches regardless of which conjunct is plural, and the singular pivot is allowed only when the second conjunct is singular. These predictions are borne out in (60).[10]

(60) Russian mismatches
      a. ?Eti   vysokije i   tot   nizkij   **student**   vstretilisj.
          these.PL tall.PL   and that.SG short.SG student.SG met
      b. Eti   vysokije i   tot   nizkij   **student**   vstretilisj.
          these.PL tall.pl   and that.SG short.SG student.PL met
          'These tall students and that short student met.'
      c. *Etot   vysokij i   te   nizkije **student**   vstretilisj.
          this.SG tall.SG and those.PL short.PL student.SG met
      d. Etot   vysokij i   te   nizkije **studenty** vstretilisj.
          this.SG tall.SG and those.PL short.PL students.PL met
          'This tall student and those short students met.'

4.3 Formal representation of semantic/morphological agreement

So far I have argued that summative agreement in multi-valuation is a case of semantic agreement and distributive agreement a case of morphological agreement. In this subsection I lay out one way to formally represent these two sets of agreement in both hybrid noun agreement and multi-valuation.

Following recent work (Pollard & Sag 1994; Wechsler & Zlatić 2003; Smith 2015; Landau 2016; Wurmbrand 2017a), I assume that the two types of agreement result from agreeing with two types of features. One type is labeled as *concord, uninterpretable,* or *morphological* features (u[ ]), whereas the other is labeled as *index, interpretable,* or *semantic* features (i[ ]). Both types of features can co-exist on one element. A probe can agree with either type of features. Morphological agreement is the result of agreeing with the morphological features and semantic agreement is the result of agreeing with the semantic features.

Since the NUM head is the source of the phi features, it is the NUM head that start with two types of features.[11] I assume that subject-verb agreement results from Agree between

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[10] The judgments reported here are from two of the three Russian native speakers that I consulted. The third speaker only allows CCA in mismatch cases. This is consistent with the judgment she provided for the matching Nominal RNR in (22) where she only allows a singular pivot.

[11] For now I assume a selectional relation between the NUM head and the noun it merges with: the hybrid NUM selects hybrid nouns to merge with. For example in English the NUM$_{u[\text{SG}],i[\text{PL}]}$ selects words like *government* but not *student.*

the D head (the phase head of the DP) and the T head. Since it is possible for T to show either semantic or morphological agreement, the D head also has two types of features. The D head gets its values from the NUM head via DP internal agreement.

For common nouns like *student,* the morphological and semantic features on the NUM head share the same value as in (61a). The noun gets the value from the NUM. Since the morphological and semantic features share the same value on NUM, we cannot tell what type of agreement occurred. Similarly, the D head gets the values from NUM as in (61b). At that point the T head agrees with the D head and gets its feature valued in (61c). Features that are active in the relevant agreement relation are in bold.

(61)   This student has arrived.
a. $[_{\mathrm{DP}}\ \mathrm{D}_{u[\ ],i[\ ]}\ \mathrm{NUM}_{u[\mathrm{SG}],i[\mathrm{SG}]}\ \mathrm{N}_{u[\ ]}]\ \mathrm{T}_{u[\ ]}$ initial stage
b. $[_{\mathrm{DP}}\ \mathrm{D}_{\boldsymbol{u[\mathrm{SG}]},\boldsymbol{i[\mathrm{SG}]}}\ \mathrm{NUM}_{\boldsymbol{u[\mathrm{SG}]},\boldsymbol{i[\mathrm{SG}]}}\ \mathrm{N}_{\boldsymbol{u[\mathrm{SG}]}}]\ \mathrm{T}_{u[\ ]}$ DP internal agreement
c. $[_{\mathrm{DP}}\ \mathrm{D}_{\boldsymbol{u[\mathrm{SG}]},\boldsymbol{i[\mathrm{SG}]}}\ \mathrm{NUM}_{u[\mathrm{SG}],i[\mathrm{SG}]}\ \mathrm{N}_{u[\mathrm{SG}]}]\ \mathrm{T}_{\boldsymbol{u[\mathrm{SG}]}}$ DP external agreement

Hybrid nouns are special in that their morphological feature and semantic feature have different values. For example in (62), the NUM head that selects the hybrid noun *government* has a singular morphological feature $u[\mathrm{SG}]$ and a plural semantic feature $i[\mathrm{PL}]$. In (62b) the D head gets its values from the NUM head and the head noun agrees with the singular morphological feature of the NUM head.[12]

(62)   this government
a. $[_{\mathrm{DP}}\ \mathrm{D}_{u[\ ],i[\ ]}\ \mathrm{NUM}_{u[\mathrm{SG}],i[\mathrm{PL}]}\ \mathrm{N}_{u[\ ]}]\ \mathrm{T}_{u[\ ]}$ (initial stage)
b. $[_{\mathrm{DP}}\ \mathrm{D}_{\boldsymbol{u[\mathrm{SG}]},\boldsymbol{i[\mathrm{PL}]}}\ \mathrm{NUM}_{\boldsymbol{u[\mathrm{SG}]},\boldsymbol{i[\mathrm{PL}]}}\ \mathrm{N}_{\boldsymbol{u[\mathrm{SG}]}}]\ \mathrm{T}_{u[\ ]}$ (DP internal agreement)

The T head, as before, agrees with the D head. In English it can either copy the singular morphological feature or the plural semantic feature from the D head. The former results in morphological agreement in (63) and the latter semantic agreement in (64). It is worth pointing out that the type of agreement depends on the type of feature on the *goal* in the Agree relation, not the *probe.* For example in (64), T shows semantic agreement because it is the semantic feature on D that gets copied. Whether T itself has morphological or semantic features is an independent issue. Here I follow the standard assumption that the phi features on T are morphological features.

(63)   This government has gathered.   morphological agreement
$[_{\mathrm{DP}}\ \mathrm{D}_{\boldsymbol{u[\mathrm{SG}]},i[\mathrm{PL}]}\ \mathrm{NUM}_{u[\mathrm{SG}],i[\mathrm{PL}]}\ \mathrm{N}_{u[\mathrm{SG}]}]\ \mathrm{T}_{\boldsymbol{u[\mathrm{SG}]}}$

(64)   This government have gathered.   semantic agreement
$[_{\mathrm{DP}}\ \mathrm{D}_{u[\mathrm{SG}],\boldsymbol{i[\mathrm{PL}]}}\ \mathrm{NUM}_{u[\mathrm{SG}],i[\mathrm{PL}]}\ \mathrm{N}_{u[\mathrm{SG}]}]\ \mathrm{T}_{\boldsymbol{u[\mathrm{PL}]}}$

Turning to multi-valuation, in Nominal RNR in (65), the pivot noun is shared by two DPs, thus agreeing with two NUM heads. As in the hybrid noun agreement, morphological agreement in multi-valuation results from copying the morphological features $u[\mathrm{SG}]$ from the two NUM heads onto the pivot noun in (66a). Semantic agreement results from copying the semantic features $i[\mathrm{SG}]$ as in (66b). Again the morphological and semantic agreement distinction depends on the relevant features on the goals, not the probe. Like

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[12] As a reviewer pointed out, the feature set-up of *committee* nouns needs to be more elaborated under the dual feature approach. One motivation is from *committees,* which also has an $i[\mathrm{PL}]$ like *committee,* but the plurality in *committee* and *committees* is distinct from each other. A full discussion of hybrid nouns goes beyond the scope of this paper, I refer readers to Elbourne (1999); Smith (2015).
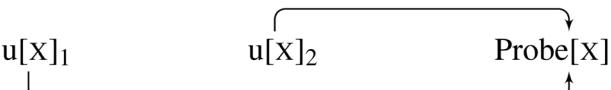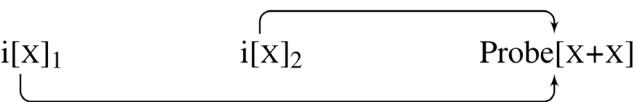
the T head, I assume that the relevant feature on the head noun is morphological in both (66a) and (66b). As a result, no difference in interpretations between (66a) and (66b) is expected.

(65)   this tall and that short **student**
        D NUM$_{u[SG],i[SG]}$ and D NUM$_{u[SG],i[SG]}$ N$_{u[\ ]}$

(66)   a.   D NUM$_{u[SG],i[SG]}$ and D NUM$_{u[SG],i[SG]}$ N$_{u[SG]}$ morphological
        b.   D NUM$_{u[SG],i[SG]}$ and D NUM$_{u[SG],i[SG]}$ N$_{u[SG,\ SG]}$ semantic

The difference between N$_{u[SG]}$ in (66a) and N$_{u[SG,\ SG]}$ in (66b) results from the feature arithmetic for morphological and semantic agreement in (67). In (67a) when two morphological features of the same value get copied onto one element, the result is the same as that value, e.g. when multiple singular morphological features get copied to a noun, the noun shows singular. In (67b) when multiple semantic features of the same value get copied onto one element, the result has to be calculated based on the values. For now I assume a simple addition operation where two or more instances of the singular value give out plural.

(67)   a.
        $u[X]_1$ $u[X]_2$ Probe[X]

        b.
        $i[X]_1$ $i[X]_2$ Probe[X+X]

In sum I propose that morphological/semantic agreement boils down to agreeing with morphological or semantic features in both hybrid noun agreement and multi-valuation. Different agreement patterns in multi-valuation result from distinct feature arithmetic when resolving multiple morphological/semantic agreement relations. The distributive agreement generalization in (35) thus can be rephrased as follows: if Ts in a language can only agree with morphological features, the Ns must also agree with morphological features and not semantic features. I will leave the sketch above as is for now, as it is beyond the scope of the current paper to hash out the detailed predictions stemming from this formalism.

4.4 *More on the Agreement Hierarchy*

It is worth noting that linking multi-valuation to the Agreement Hierarchy is not an explanation for the 3/4 pattern observed in multi-valuation. The Agreement Hierarchy in itself is a generalization of the cross-linguistic and cross-domain patterns observed in hybrid noun agreement, now also in multi-valuation. Given that hybrid noun agreement has been investigated in the context of the Agreement Hierarchy since the 70s, a natural move toward a formal account for the multi-valuation pattern is to borrow insights from the existing accounts for hybrid noun agreement. However, such previous accounts are concerned with the sentence level of the Hierarchy, and the multi-valuation Agreement Hierarchy operates on the language level.

   To elaborate, the Agreement Hierarchy has at least three levels: the corpus level, the sentence level, and the language level. I will leave the corpus level aside in this paper (see Corbett 2006). The sentence level of the Hierarchy which holds within individual sentences is stated in (68).

(68)   the Hierarchy on the sentence level: no sentence is such that position X shows morphological agreement and position Y (to the left of X on the Hierarchy) shows semantic agreement.

The Hierarchy effect in hybrid noun agreement can be observed on the sentence level as in (69), because multiple agreement configurations (attributive-noun, noun-verb, etc.) can be packed in one sentence.

(69)   the hybrid noun Agreement Hierarchy on the sentence level: there is no noun such that it triggers morphological agreement on position X and triggers semantic agreement on position Y (to the left of X on the Hierarchy) **in the same sentence**.

As is discussed above, multi-valuation on Ns require the Nominal RNR construction and multi-valuation on Ts require the TP RNR construction where the T agrees with two separate embedded subjects. These two constructions cannot be packed in one sentence in the relevant way. As a result, the multi-valuation aspect of the Agreement Hierarchy cannot be evaluated on the sentence level.

   On the other hand, the language level of the Hierarchy is stated in (70). Unlike the sentence level, it does not require packing multiple agreement configurations in one sentence. Instead it holds across different sentences in a language.

(70)   the Agreement Hierarchy on the language level: there is no language such that position X only allows morphological agreement, and position Y (to the left of X on the Hierarchy) allows semantic agreement in **this language**.

Both hybrid noun agreement and multi-valuation can be evaluated on this level as is stated in (71) and (72), both of which predict a typological gap.

(71)   the hybrid noun Agreement Hierarchy on the language level: there is no language in which there is a noun that must trigger morphological agreement on the position X and also triggers semantic agreement on position Y (to the left of X on the Hierarchy).

(72)   the multi-valuation Agreement Hierarchy on the language level: there is no language in which the multi-valued X must show morphological agreement, and multi-valued Y shows semantics agreement, given that Y is on the left of X on the Hierarchy.

The accounts proposed for the sentence level of the Hierarchy do not extend to the language level in an obvious way. For example, coupled with assumptions such as late merge of adjectives, Smith (2015) proposes that semantic agreement precedes morphological agreement and at the derivational stage where morphological agreement is activated, semantic agreement is no longer available. Although this approach can account for the Hierarchy effect in one sentence, it does not apply to different sentences.

   Landau (2016) proposes that the hybrid nouns like *be'alim* 'owner' in Hebrew are morphologically plural but semantically underspecified (decided by the context). The verbs must agree with the semantic features while the adjectives can agree with either semantic or morphological features (see also Wechsler & Zlatić 2003). Similar to Smith (2015), it is not clear how this approach would be extended to the language level of the Hierarchy. Furthermore it is not obvious how this approach carries over to multi-valuation, since the account depends on the special feature setup of hybrid nouns like *be'alim*. In multi-valuation, garden variety Ns and Ts suffice to demonstrate the Hierarchy effect.

Given the distinctions between the sentence level and the language level of the Hierarchy effects, the two levels may require distinct accounts. The language level of the Hierarchy has been rarely discussed in the previous literature. As far as I know, no formal approach has been proposed. The current paper frames the research question regarding the language level of the Hierarchy, leaving the formal account for future research.

To summarize, this section builds on the distribution of two agreement patterns in multi-valuation reported in Section 4 and previous empirical work on hybrid noun agreement and connects the two seemingly unrelated phenomena with the Agreement Hierarchy. I hope to have demonstrated that the alignment of summative agreement with semantic agreement and distributive agreement with morphological agreement are conceptually and empirically appealing. I propose that the Agreement Hierarchy, which has been discussed exclusively regarding hybrid noun agreement, also scopes over multi-valuation. I have also discussed different levels of the Agreement Hierarchy effects and whether existing accounts for hybrid noun agreement can be extended to multi-valuation.

5 Conclusion

In this paper I have surveyed a small but robust body of research on multi-valuation, cases where one probe agrees with multiple goals and gets multiple feature values. I use Nominal RNR as the case of multi-valued Ns and TP RNR as the case of multi-valued Ts. Following Grosz (2009); Kluck (2009); Grosz (2015); Shen (2016), I assume a multi-dominance analysis for both constructions. Two agreement patterns, distributive agreement and summative agreement, have been observed on these multi-valued probes. A cross-linguistic survey comparing multi-valued Ns and Ts reveals a typological gap: no language marks multi-valued Ns as plural when multi-valued Ts are marked as singular in that language. Based the parallel pattern in hybrid noun agreement, I propose that multi-valuation is a subcase of the Agreement Hierarchy effect. I argue that distributive agreement results from agreeing with morphological features and summative agreement results from agreeing with semantic features.

Treating multi-valuation as an Agreement Hierarchy effect opens up a set of research questions. I will list two here. First, if both hybrid noun agreement and multi-valuation involve the Agreement Hierarchy, one question to ask is whether the same target on the hierarchy shows the same type of agreement in the two constructions. Can an element show semantic agreement in hybrid noun agreement but morphological agreement in multi-valuation? The second research question involves the relative positions of attributive elements and nouns on the Hierarchy. Determiners and adjectives in multi-valuation-like constructions like *this man and woman are a couple* have been looked into by Corbett (1979); King & Dalrymple (2004); Heycock (2005); Villavicencio et al. (2005); Begović & Aljović (2015). However no comparison has been made between multi-valued As/Ds and Ns as of yet, and this may be an important direction for future work.

Abbreviations

1 = first person, 2 = second person, 3 = third person, ACC = accusative, ADJ = adjective, ASP = aspect, COMP = complementizer, DAT = dative, DEF = definite, DL = dual, F = feminine, GEN = genitive, INF = infinitive, M = masculine, NOM = nominative, PL = plural, PREP = prepositional case, PRS = present, PST = past, SG = singular, SUBJ = subjunctive

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Competing Interests

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