Chapter 17

Some notes on MaxShare

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MaxShare, a constraint on size of multi-dominated elements, was first proposed in Citko (2006) and later supported with independent evidence in Shen (2018). This paper discussses three aspects of MaxShare: 1. the specific formulations of MaxShare; 2. the restrictions on MaxShare; and 3. the alternatives to MaxShare.

1 MaxShare: A size constraint on sharing

Multi-dominance, or structural sharing, has been proposed to account for a variety of constructions including across-the-board movement (ATB), right node raising (RNR), gapping, and parasitic gaps among others. On the other hand, how to restrict such an operation is much less discussed in the literature (but see Gračanin-Yuksek 2007).

This paper discusses a constraint on the *size* of multi-dominated/shared elements, MaxShare, which was first proposed in Citko (2006) and later supported by independent evidence in Shen (2018). This section summarizes MaxShare and its motivating evidence.[1] Section 2 compares two different formulations of MaxShare. Section 3 discusses how to restrict MaxShare. Section 4 discusses potential alternative analyses to MaxShare. Section 5 summarizes the discussion and directions for future research.

[1]It is well beyond the scope of this paper to discuss whether multi-dominance is the right analysis for all the phenomena that it has been claimed to account for. I will largely restrict the discussion to NP RNR and left branch extraction + ATB and leave the potential wider implication of MaxShare aside.

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1.1 MaxShare in across-the-board left branch extraction

Citko (2006) observes that while Slavic languages like Polish allow left branch extraction (LBE) of the nominal modifiers in (1a) and across-the-board movement (ATB) in (1b) independently, the combination of the two movements in (1c) is banned. I will label this movement ATB LBE.

(1) Polish

a. Którą$_i$ Jan przeczytał [t$_i$ książkę]?
which Jan read book
'Which book did Jan read?' (Citko 2006: ex. 5a)

b. Ktora książkę$_i$ [Maria poleciła t$_i$] a [Jan przeczytał t$_i$]?
which book Maria recommended and Jan read
'Which book did Maria recommend and Jan read?' (Citko 2006: ex. 6a)

c. * Którą$_i$ Maria poleciła [t$_i$ książkę] a Jan przeczytał [t$_i$ książkę]?
which Maria recommended book and Jan read book
'Which book did Mary recommend and John read?' (Citko 2006: ex. 7a)

Note that in (1c), the head nouns in both objects are identical (*book*). Curiously, when the head nouns in the objects are distinct, ATB LBE is allowed, as is shown in (2).

(2) Ile$_i$ Maria napisała t$_i$ książek a Jan przeczytał t$_i$ artykułów?
how-many Maria wrote books and Jan read articles
'How many books did Maria write and how many articles did Jan read?' (Polish, Citko 2006: ex. 10a)

Citko (2006) assumes that ATB moved elements are necessarily base-generated using multi-dominance. As is shown in Figure 1 for (1c) and Figure 2 for (2), the DP modifiers, *how many* and *which*, are simultaneously merged with both object nouns, and then moved to the Spec,CP position.

The contrast between the two derivations above needs to be accounted for: (1c) is not accepted while (2) is OK. The relevant difference is whether the nouns in the object DPs are identical or distinct. When they are distinct in (2), the sentence is OK; when they are identical in (1c), the sentence is out. To rule out the

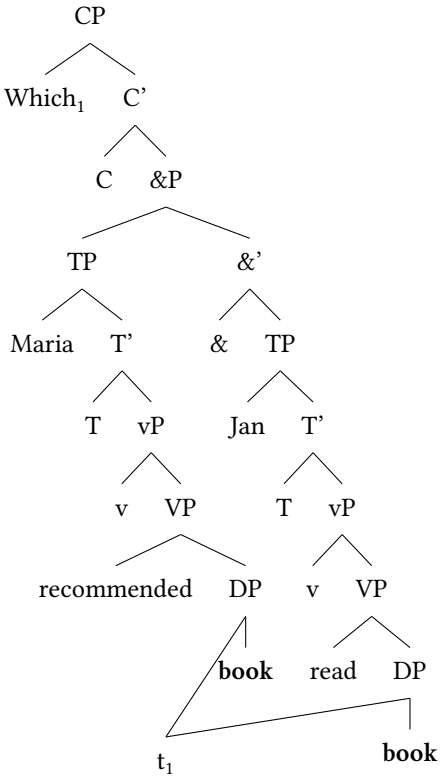


Figure 1: Structure of (1c): *

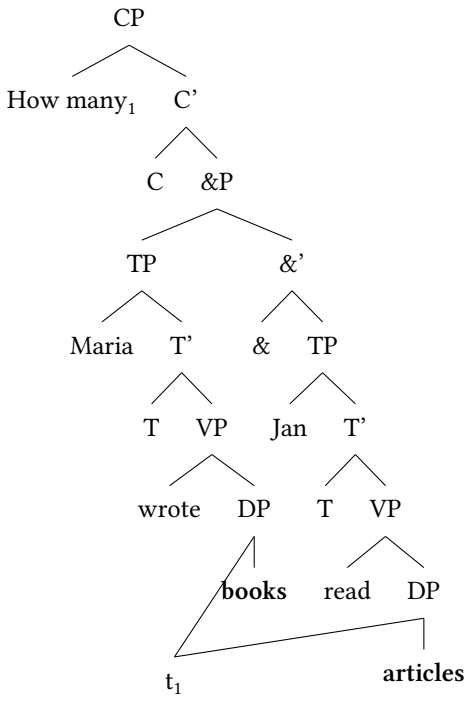


Figure 2: Structure of (2): OK

structure in Figure 1 and retain the structure in Figure 2, Citko (2006) proposes a constraint on multi-dominance structures where the shared material must be maximized. The structure with less shared material is ruled out if an alternative structure with more shared material is available. Regarding the pattern at hand, the structure in Figure 1 where only *which* is shared is compared with the alternative in (3) where the entire object *how many books* is shared with *how many* moving away. Given (3), the structure with less shared material in Figure 1 is ruled out. As predicted by this constraint, the sentence in (3) is indeed better than (1c).[2] Note that the structure in Figure 2 is not ruled out since the head nouns are distinct thus the whole DP cannot be shared.

[2]Citko (2006) assumes that the sentence in (3) involves the movement of *books* to a higher position. This is to keep in line with the linearization constraint of sharing which states that all shared elements must be moved to a non-shared position to be linearized (see also Gračanin-Yuksek 2007). I do not follow this assumption that the noun *books* moves in (3) as many other linearization algorithms (e.g. Wilder 2008, de Vries 2009, Gračanin-Yuksek 2013) can linearize shared materials in situ.

(3) ? Ile$_i$ Maria poleciła a Jan przeczytał t$_i$ książek?
How-many Maria recommended and Jan read books?
'How many books did Maria recommended and how many books did Jan read?' (modified from Citko 2006: p. 238, 26b)

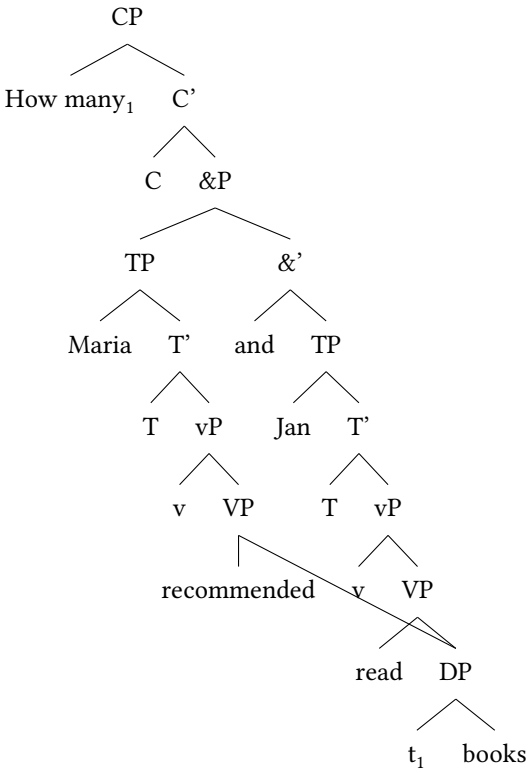


Figure 3: Share element maximized: How many books

I will label this constraint of maximizing shared materials MaxShare. Before moving on to the formulation of MaxShare, the next section discusses an independent piece of evidence for this constraint.

1.2 MaxShare in NP right node raising

In addition to ATB LBE, another case of MaxShare is independently observed in NP RNR. Shen (2018) discusses number marking on the head noun which is shared by two singular DPs as is shown in (4). For (4a–4c), the head noun must be

singular despite the subject refers to two individuals. For (4d), on the other hand, the singular head noun is not available. This contrast is the focus of Chapter 2 of Shen (2018).

(4) a. This and that student are a couple.
b. This tall and that short student are a couple.
c. John's tall and Mary's short student are a couple.
d. * John's and Mary's student are a couple.[3]

Shen proposes that the singular noun in (4a–4c) results from a multi-dominance structure in Figure 4. The number feature within a DP is assumed to originate on the NUM head and get copied onto other elements including nouns and determiners. When the noun is shared by two singular DPs, it gets two [SG] values, which, in languages like English, is spelled out as singular.[4]

On the other hand, the fact that *John's and Mary's* does not allow the shared noun to be singular in (4d) indicates that the multi-dominance structure is not available under possessive DPs. Figures 5 and 6 illustrate what the structure would look like under the intended dual student reading. In Figure 5, the noun is shared and the NUMP is shared in Figure 6.

Similar to Citko, Shen proposes a MaxShare constraint on the size of the shared element to rule out the structures in Figures 5 and 6. The constraint is as seen in (5) where *sharable* is defined as non-distinct.

(5) MaxShare: XP can be shared only if there is no YP such that YP dominates XP and YP is shareable, if the XP sharing structure and the YP sharing structure have identical interpretations.

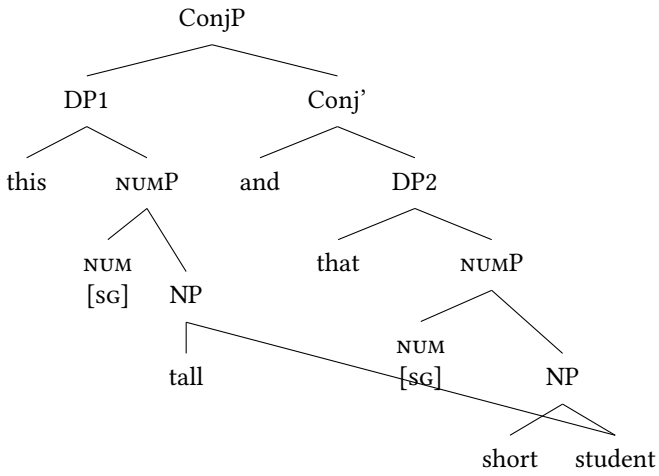
Shen claims that according to (5), the potential alternative structure in Figure 7 where the Poss' is shared rules out the structures in Figures 5 and 6. As one can see, the shared constituent in Figure 7, Poss', properly contains the ones shared in Figures 5 and 6.[5]

[3]Note that the only relevant reading here is the one with two students. This is accomplished by the use of the predicate *are a couple*. As a reviewer correctly noted, the singular head noun under possessive DPs is OK when referring to one single student: *John's and Mary's student is tall*.

[4]Other languages of this type include German, Dutch, Icelandic, Slovenian, Polish, Bosnia-Serbia-Croatian and so on. Bulgarian and Russian are different in this aspect. See Shen (2019) for discussion regarding this variation. I will focus on the English type of languages here.

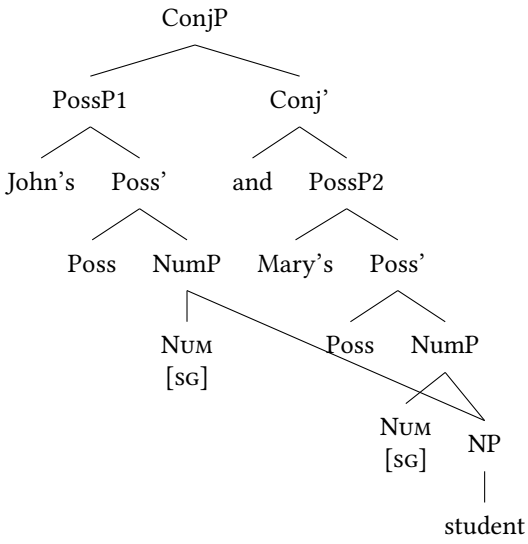
[5]The readers will notice that (i) is OK where the head noun is plural under possessive DPs. Shen (2018) argues that (i) involves a structure with a single DP with the conjoined possessors in its specifier position with a plural NUM head. See Section 4.1 for discussion and Shen 2018 for more details.

(i) John's and Mary's students are a couple.



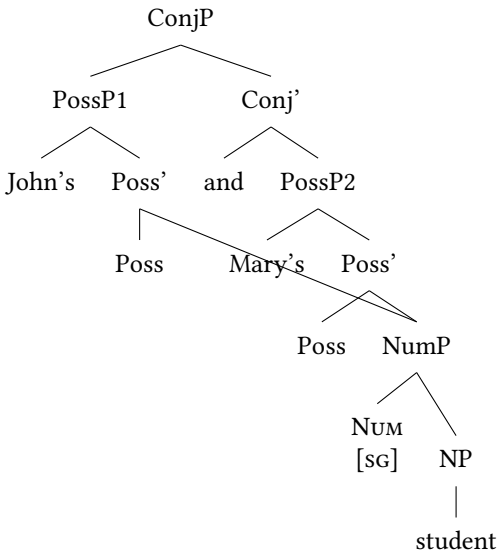
This tall and that short student

Figure 4: Multi-dominance structure for NP RNR



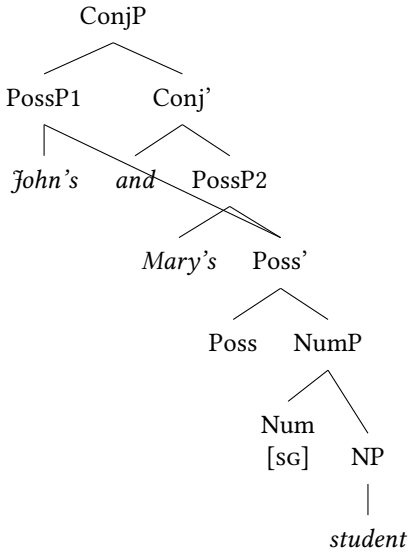
*John's and Mary's student

Figure 5: Candidate structure 1: MaxShare not satisfied



*John's and Mary's student

Figure 6: Candidate structure 2: MaxShare not satisfied



*John's and Mary's student

Figure 7: Candidate structure 3: Agree constraint violated

Note that although the structure in Figure 7 does not violate MaxShare, it must be ruled out as well since the string *John's and Mary's student* is not acceptable under the dual student reading. Shen (2018) proposes that the structure in Figure 7 is ruled out by an independent requirement on sharing: the Agree constraint, which requires the head of the shared element (Poss in Figure 7) agrees with the remnants (*John's* and *Mary's*). Since there is no agreement between the possessors and the Poss' or the Poss head, the structure in Figure 7 is ruled out. I will follow this analysis here (see brief discussion in Section 4.1). In sum, NP RNR in English and ATB LBE in Polish among other languages show supporting evidence of MaxShare, a constraint limiting sharing based on the size of the shared elements.

2 A note on the formulations

Having established the empirical motivations for a MaxShare constraint, this section discusses its different formulations.

The notion of *size* in the formulation proposed by Shen (2018) in (5) is defined in terms of domination. A derivation with a shared XP is compared with derivations where XP's mother or daughter nodes are shared. This formulation can account for both patterns discussed above: for ATB + LBE movement in Polish, derivations with a shared *how many* and its mother node *how many books* are compared; for NP RNR, derivations that share a NP, its mother node NUMP, and the mother node of NUMP, Poss', are compared. I will label this formulation as the *dominance* MaxShare.

Citko (2006), on the other hand, offers a more derivational conception of MaxShare. According to her, MaxShare follows from a general economy principle. The derivations being compared are restricted by their numerations: given two numerations with the same set of lexical items, the numeration where a given lexical item is selected fewer times is more economical. For example, (6) illustrates the numerations involved in Figure 1 and (3) with English translation. Each numeration include the set of items that are used in the derivation and the indexes indicate the number of times that each item is selected. The only difference between them is that *books* is selected twice in (6a) and only once in (6b). (6b) is more economical and (6a) is blocked as a result. The pattern in NP RNR can also be accounted for in this manner, see Shen (2018: 104). I will refer to this formulation as the *numeration* MaxShare.

(6) Competing numerations

a. Numeration for Figure 1 = {how-many$_1$, Maria$_1$, Jan$_1$, recommended$_1$, read$_1$, **books**$_2$, and, T$_2$, v$_2$, C}

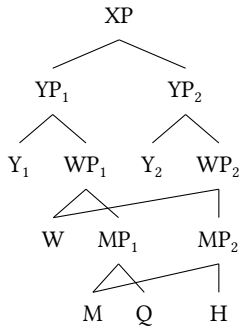
b. Numeration for (3) = {how-many$_1$, Maria$_1$, Jan$_1$, recommended$_1$, read$_1$, **books**$_1$, and, T$_2$, v$_2$, C}

Both the dominance and the numeration formulation can account for the data presented so far. But the two formulations make different predictions regarding *bulk* and *non-bulk* sharing. Specifically, the dominance MaxShare is only applicable to bulk sharing while the numeration MaxShare is compatible with both bulk and non-bulk sharing.

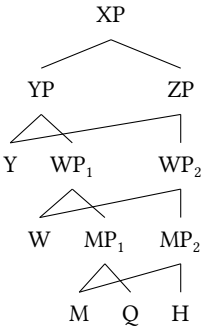
Gračanin-Yuksek (2007) introduces the distinction between bulk and non-bulk sharing.[6] Bulk sharing refers to structures where one constituent (including its daughter nodes and so on) is shared. All examples of ATB LBE and NP RNR we have seen so far involve bulk sharing. In ATB LBE, it is the object DP or the modifier of the DP that is shared whereas in NP RNR, it is the NP, NUMP or the Poss' node that is shared. On the other hand, non-bulk sharing refers to structures where multiple constituents that are not in dominance relation are shared. Take (7) for example (modified from Gračanin-Yuksek 2007: (14)). In this structure, two constituents (W and M) are independently shared. Neither dominates the other.

The case relevant to MaxShare is the comparison between (7), and (8) which involves non-bulk sharing of Y, W, and M. As one can see, (8) shares one more node (namely, Y) than (7) does. According to the numeration MaxShare, (7) should be ruled out given (8). However, since the share nodes do not dominate each other, the dominance MaxShare does not make predictions regarding (8).

(7) Y_1 W M Q Y_2 H



(8) Y W M Q H



In other words, the numeration MaxShare predicts that once one constituent is shared, all other shareable constituents must be shared as well, even these shareable constituents do not dominate each other. Here I discuss examples with ATB

[6] Gračanin-Yuksek (2007) proposes constraints on non-bulk sharing as well as linearization of sharing structure which I will leave aside here.

LBE and gapping. As is discussed above, ATB LBE has been argued to involve sharing. Similarly, the sole verb in gapping has been argued to be structurally shared by Citko (2011), but see Citko (2018).

The crucial contrast is shown in (9). The sentence in (9a) involves ATB LBE of *which* as well as gapping: the two conjuncts share the single verb *ordered*. The sentence in (9b), on the other hand, only involves ATB LBE of *which*. The verb is seen in both conjuncts. As we can see, (9a) is acceptable and (9b) is not.

(9) a. Jaką$_i$ Maria zamówiła t$_i$ kawę a Jan t$_i$ herbatę?
which Maria ordered coffee and Jan tea
'What kind of coffee did Maria order and what kind of tea did Jan order?'

b. * Jaką$_i$ Maria zamówiła t$_i$ kawę, a Jan zamówił t$_i$ herbatę?
which Maria ordered coffee, and Jan ordered tea
'What kind of coffee did Maria order and what kind of tea did Jan order?' (see Citko 2006: (28) for another example)

The structures are illustrated in Figure 8 with English translation.[7] In the structure for (9a) in Figure 8a, both the pre-nominal modifier and the verb are shared, the sentence is accepted. In Figure 8b for (9b), only one of the two shareable elements is shared, i.e. the pre-nominal modifier *which*, whereas the verb *ordered* which could be shared, is not.

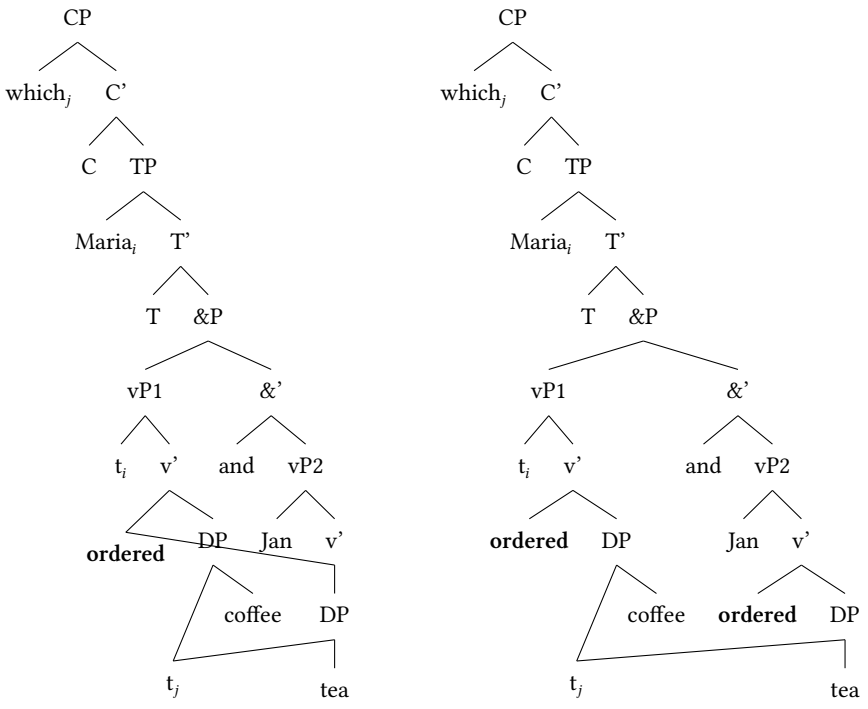
The numeration MaxShare correctly rules out the derivation in Figure 8b. The numerations of Figures 8a and 8b are shown in (10). They contain the same items but the verb *ordered* is selected once in (10a) but twice in (10b). Thus the numeration in (10b) is ruled out given the more economical numeration in (10a). On the other hand, the dominance MaxShare does not predict the contrast in (9), since Figure 8a does not involves sharing of a constituent that dominates the shared constituent in Figure 8b.

(10) a. Numeration for Figure 8a = {which$_1$, Jan$_1$, Maria$_1$, **ordered**$_1$, coffee$_1$, tea$_1$, and$_1$, T$_2$, v$_2$, C$_1$}

b. Numeration for Figure 8b = {which$_1$, Jan$_1$, Maria$_1$, **ordered**$_2$, coffee$_1$, tea$_1$, and$_1$, T$_2$, v$_2$, C$_1$}

Since sharing a phrase as a whole can be derived from sharing the terminal nodes within the phrase but not vice versa, bulk sharing can only generate a subset of

[7] The shared verb is assumed to move to a higher node in Citko (2011)'s proposal. Here I kept the verb at the shared position to better illustrate the fact that the verb is shared.



(a) Structure for (9a)

(b) Structure for (9b)

Figure 8: Structures for (9a) and (9b)

the structure generated by non-bulk sharing. In turn, the derivations that can be ruled out by the dominance MaxShare are a proper subset of those ruled out by the numeration MaxShare. The contrast in (9) indicates that the numeration MaxShare is more descriptively adequate than the dominance MaxShare.

So far I have been implicitly assuming that only one of the two formulations exists. There is preliminary evidence pointing to the possibility that both the numeration and the dominance MaxShare exist. This evidence comes from the distinct effects of violating the two types of MaxShare. Judgments seem to vary regarding the acceptability of the sentences in (9). One of Polish speaking informants commented that the sentence without gapping is not outright bad but "somewhat awkward because of the unnecessary repetition of the verb". Similarly, both of the English sentences in (11) are accepted by my English speaking informants. (11a) only involves ATB (sharing of *to whom*) while both ATB and gapping are present (11b) (sharing of *to whom* and *serve*). According to the numeration MaxShare, (11a) should be ruled out by (11b).

(11) a. ? To whom did some serve mussels and others serve swordfish? (ATB only)
b. To whom did some serve mussels and others swordfish? (ATB + gapping)

One possible explanation for the degraded but accepted status of (11a) and (9b), both of which violate the numeration MaxShare, is that the numeration MaxShare is a violable constraint and does not immediately cause a derivation to crash. On the other hand, the unacceptability in NP RNR in (4) (repeated here as (12)) is quite strong. Shen (2018) reports experimental results using judgments on a 7 point Likert scale from 45 participants and show that (12) which involves a MaxShare violation has a mean rating of 2.33 out of 7. Note that (12) violates the dominance MaxShare (and by entailment, also the numeration MaxShare).

(12) * John's and Mary's student came from the U.S. (2.33/7)

The difference between (11) and (12) points to an option where both the dominance MaxShare and the numeration MaxShare exist as independent constraints. Since both constraints are violated in (12) while only the numeration MaxShare is violated in (11a), the stronger penalty observed in (12) is expected. A another possibility would be that violating the dominance MaxShare invokes a stronger penalty than violating the numeration MaxShare. However distinguishing their effects is tricky since the former entails the latter.

So far we have seen that the numeration MaxShare is more powerful in terms of coverage than the dominance MaxShare, however, the former might be a weaker constraint in terms of its effects on acceptability. A further step along this line is to look at more cases which can be ruled out by the numeration MaxShare but not by the dominance MaxShare, in addition to the ATB + gapping case, and check whether the penalty on acceptability is weaker than the violations of the dominance MaxShare. I will leave this for future research.

3 A note on restricting MaxShare

Regardless of the two formulations I have been discussing, one issue that needs to be addressed is how to not block sentences with no sharing at all. We have seen that MaxShare allows sentences in (13) where the shared elements are maximized, and we have seen that MaxShare blocks sentences where some shareable elements are not shared.

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

b. Ile$_i$ Maria napisała t$_i$ książek a Jan przeczytał t$_i$ artykułow?
how-many Maria wrote books and Jan read articles
'How many books did Maria write and how many articles did Jan read?'

Following this pattern, one might expect sentences that share *no* potentially shareable element to be ruled out. For example, in (14a), nouns are present inside both conjoined DPs and in (14b), both wh-elements are present in the conjoined questions. This prediction is not borne out. Both of these sentences are perfectly acceptable, thus MaxShare must be restricted so that it does not block sentences of the form in (14).

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

b. Ile$_i$ Maria napisała t$_i$ książek a ile$_i$ Jan przeczytał t$_i$
how-many Maria wrote books and how-many Jan read
artykułow?
articles
'How many books did Maria write and how many articles did Jan read?'

This restriction is difficult to derive from the dominance MaxShare. One would have to stipulate that the structures being compared are restricted to ones that share at least one element. However, there is a way for the numeration MaxShare to account for this restriction.

In the implementation of the numeration MaxShare presented so far, the entire utterance including the conjunction phrase is assumed to share one numeration, as is illustrated above in (10). In order to account for (14), we need to further break down the derivation. In the multiple spell-out model proposed by Uriagereka (1999), Chomsky (2000), numeration, derivation, and spell-out occur in phases. Oda (2017) proposes that the &P and its conjuncts are phases to account for the cross-linguistic patterns of the coordinate structure constraint. As a result, each conjunct corresponds to a numeration (or a sub-array) and the comparison of numerations is restricted within phases. The combination of these assumptions correctly rules in sentences in (14) while maintaining the effect of MaxShare.

Take NP RNR for an example. In (15) where there is no sharing between the two conjuncts, each conjunct, being a phase, corresponds to a numeration. The &P also corresponds to a numeration which includes DP1, DP2, and the conjunction head *and*. In (16), on the other hand, since some elements are shared by the two conjuncts, the whole conjunction phrase has one numeration. Given that they

contain the same set of lexical items, Numeration1 and Numeration2 in (16) are compared and the second numeration is less economical since it involves the Poss head being extracted twice. Thus Numeration2 is ruled out. The crucial point here is that Numeration1 and Numeration2 are compared with each other and not with the numerations in (15), because none of the numerations in (15) contains the same set of lexical items as the ones in (16).

(15) [$_{\&P}$ [$_{DP1}$ John's student] and [$_{DP2}$ Mary's student]] are a couple.
Numeration$_{DP1}$: [John's$_1$, Poss$_1$, Num$_1$, student$_1$]
Numeration$_{DP2}$: [Mary's$_1$, Poss$_1$, Num$_1$, student$_1$]
Numeration$_{\&P}$: [and$_1$, DP1, DP2]

(16) [$_{\&P}$ John's and Mary's student] are a couple.
   a. Numeration1$_{\&P}$: [John's$_1$, Poss$_1$, Num$_1$, student$_1$, Mary's$_1$, and$_1$]
   b. Numeration2$_{\&P}$: [John's$_1$, Poss$_2$, Num$_1$, student$_1$, Mary's$_1$, and$_1$]

The claim here is that only the set of numerations that meet certain conditions are compared in terms of economy. One such condition is that these numerations must contain the same set of unique lexical items. They can, however, differ in the number of "copies" of the lexical items.[8]

4 A note on an alternative to MaxShare

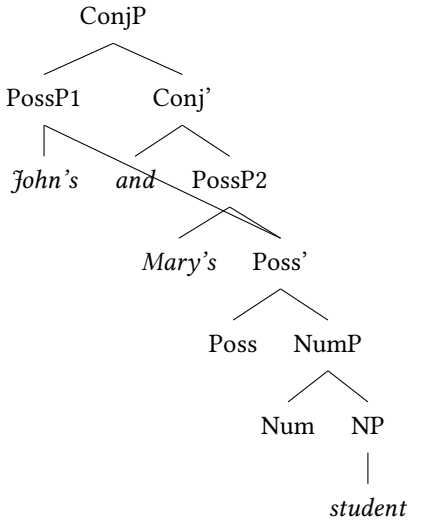
4.1 Ban on string vacuous multi-dominance in NP right node raising

This section explores an alternative to MaxShare to account for patterns of NP RNR. Evidence for MaxShare from NP RNR comes from the unacceptability of Figure 9. Shen (2018) argues that the singular marking on the shared noun requires multi-dominance and the unacceptability of Figure 9 indicates that a multidominance structure is ruled out. As mentioned above, the account proposed

[8]This restriction on MaxShare is by no means the only restriction. Shen (2018: Section 2.6.2) briefly discusses an interpretative restriction on MaxShare: the structures being compared must be of the same interpretation. The evidence is shown in (i). The sentence in (i) is ambiguous between (i.a) where *tall* is not shared, and (i.b) where *tall* is shared. If MaxShare does not care about interpretations, the interpretation in (i.a) should not be available since it involves a structure where less material is shared than in the structure that generates (i.b).

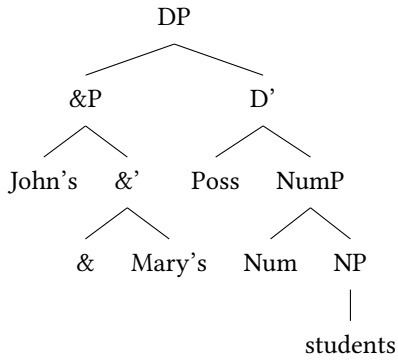
(i) The old and the young tall student are a couple.
   a. 'The old student and the young tall student are a couple.'
   b. 'The old tall student and the young tall student are a couple.'

in Shen (2018) involves two constraints on multi-dominance: one is MaxShare, and the other is an Agree requirement where the shared element and the sharing elements must agree. We have seen how MaxShare rules out structures that would generate Figure 9 in the discussion above. The Agree requirement rules out the structure that does not violate MaxShare. In the structure in Figure 9, the largest shareable constituent POSS' is shared in accordance with MaxShare, however, this structure is ruled out because there is no agreement relation between the possessors *John's* and *Mary's* and the shared POSS head.



*John's and Mary's student are a couple.

Figure 9: Candidate structure: Agree constraint violated, MaxShare satisfied



John's and Mary's students are a couple.

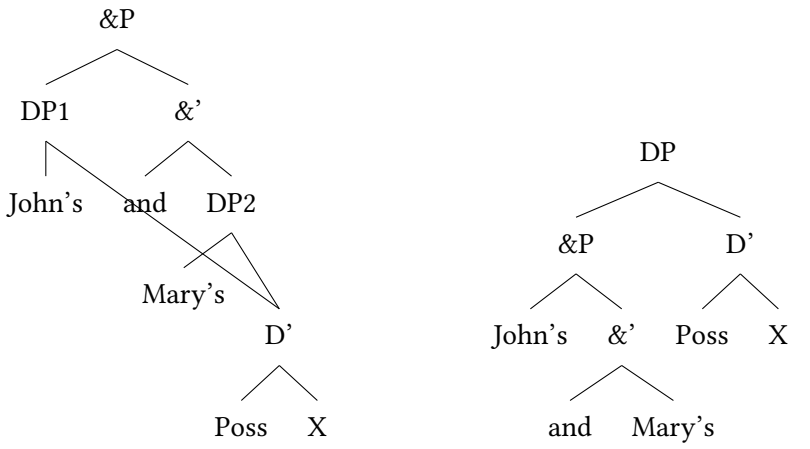
Figure 10: Coordinated possessor structure

Figure 9 contrasts with the sentence in Figure 10 where the head noun is plural. Shen (2018) argues that the plural noun indicates a different structure, illustrated below: *John's* and *Mary's* are conjoined in the Spec,DP position. No sharing/multidominance is involved.

The motivation behind the Agree requirement and MaxShare is to rule out Figure 9 independently from Figure 10. However, based on the contrast between the two sentences, one can imagine an alternative where it is the availability of the structure in Figure 10 that blocked the multidominance structure in Figure 9. I formulate the constraint in (17) and refer to it as the BAN.

(17) Ban on string vacuous sharing: A string cannot be parsed as multidominance if an alternative non-sharing parse is available.

The idea behind (17) is that the option of sharing can only be entertained if the string cannot be generated otherwise. From this perspective, sharing is used as a last resort operation. Let's see how the BAN in (17) can rule out Figure 9. In the string *John's and Mary's X*, there are at least two possible parses shown in Figure 11. Figure 11a is a parse with a shared X while Figure 11b involves conjoined specifiers and no sharing. The BAN in (17) states that the Figure 11a is ruled out since Figure 11b is available. Thus this constraint alone can replace both MaxShare and the Agree requirement.



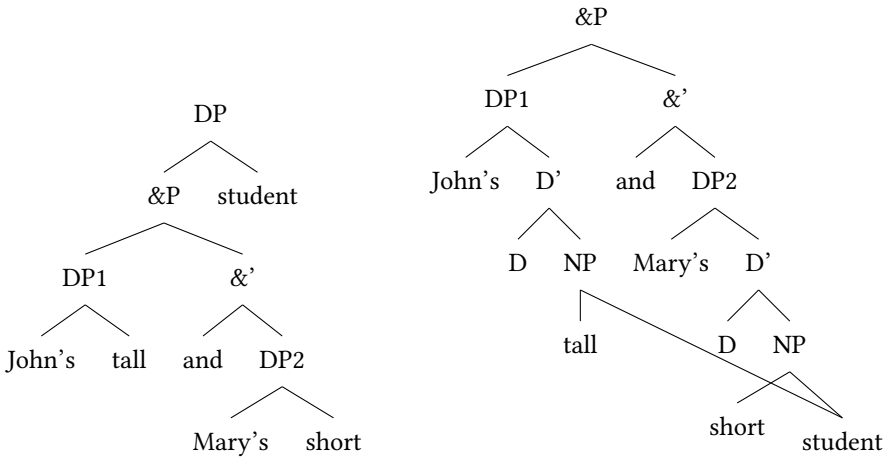
(a) Sharing X

(b) Conjoined specifier, no sharing

Figure 11: John's and Mary's X

The BAN predicts that sharing becomes available once the string cannot be generated otherwise. This prediction is supported by the phrase in Figure 12. The singular noun indicates that the head noun *student* is shared. This is expected since *John's tall* and *Mary's short* cannot be conjoined as is shown in Figure 12a because they do not form constituents (assuming that only constituents can be conjoined). In other words, the string cannot be generated without invoking sharing, thus sharing is available as is shown in Figure 12b.

A brief discussion of the alternative non-sharing structures is in order. The two structures being compared above include one sharing structure with coordinated DPs and the non-sharing structure with coordinated Spec,DPs. As it turns out, all the non-sharing structures to be considered in this section will involve



(a) No sharing structure ruled out

(b) Sharing structured ruled in

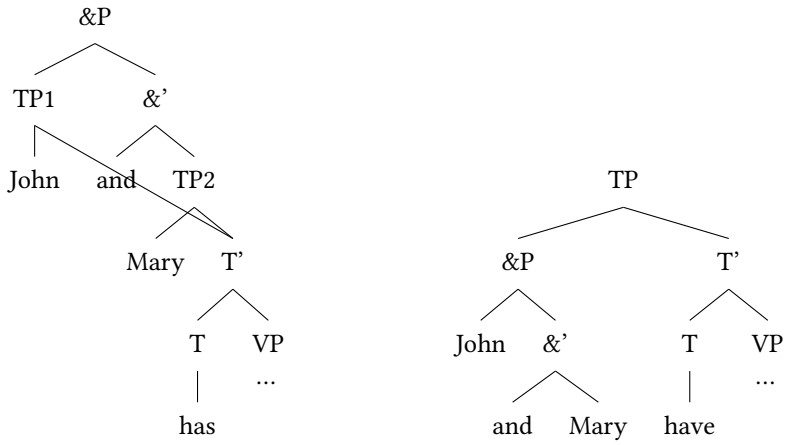
Figure 12: John's tall and Mary's short student are a couple.

conjunction of two smaller constituents than in the sharing structure. This is expected since in the sharing structure, the shared node is inside the conjuncts whereas in the non-sharing structure, it is outside the conjuncts. In the paper, I will restrict the broad term *alternative non-sharing parse* to this type of structure with conjunction of smaller constituents. Whether other non-sharing structures should/can be covered by the BAN in (17) is left for future research.

Based on its formulation, the effect of the BAN should be observed when two conditions are met: 1. a string that can be generated via sharing and a non-sharing structure; 2. a telltale indication of which structure is being used. In the case discussed above, the string of *John's and Mary's N* can be generated via sharing of the N or the conjoined possessor analysis. The telltale sign is the number marking on the noun: when the phrase refers to two individuals, sharing requires the noun to be singular and the conjoined possessor analysis requires the noun to be plural. As we saw in the case of NP RNR, the availability of the conjoined possessor structure (indicated by the plural noun) blocked sharing (as indicated by the unavailability of the singular noun).

Another case where these conditions are met is in Figure 13, which also has two potential structures. Figure 13a illustrates one where the T' is shared and Figure 13b illustrates one that does not involve sharing but the conjunction of the subjects. The telltale sign to differentiate the two structure is the number marking on the verb. According to Kluck (2009), Grosz (2015), and Shen (2019), the structure in Figure 13a is compatible with both the singular and the plural

auxiliary whereas the conjoined subject in Figure 13b requires the auxiliary to be plural. As is shown in Figure 13, only the plural auxiliary is available, which indicates that the sharing structure Figure 13a is ruled out while the non-sharing structure Figure 13b is ruled in. This is expected from the BAN.



(a) Sharing T', violating the BAN

(b) Conjoined specifier structure

Figure 13: John and Mary HAVE eggs for breakfast.

Like in NP RNR, once we modify the string so it cannot be generated by the non-sharing structure, the sharing structure becomes available. In (18), neither *John always* nor *Mary sometimes* form a constituent, thus conjunction structure in Figure 13b is impossible. Since the string can only be generated by sharing, it is predicted that the singular auxiliary becomes available, as is confirmed in (18).[9]

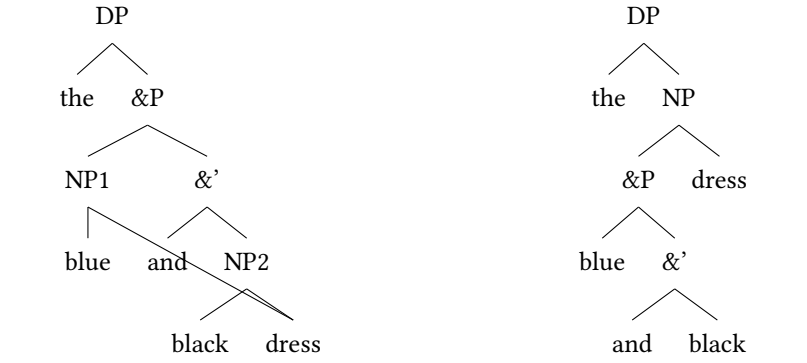
(18) ? John always, and Mary never, has eggs for breakfast.

The next example of the BAN I will present here also involves NP RNR but with a different telltale sign: interpretation. The string in Figure 14 can potentially be generated via a structure where *dress* is shared by *blue* and *black* shown

[9]What is curious is that the plural auxiliary in (i) is not acceptable. Although surprising under the sharing analysis, this does not immediately rule out this analysis. It is possible that the plural auxiliary under sharing is further restricted. This type of restrictions are discussed in Yatabe 2003, Grosz 2015, Belk & Neeleman 2018.

(i) * John always, and Mary never, have eggs for breakfast.

in Figure 14a or via a structure where *blue* and *black* are conjoined as shown in Figure 14b. The non-sharing structure with the singular noun must refer to a single dress that's both blue and black, whereas the sharing structure, also with the singular noun, must refer to two different dresses, one being blue and the other black. The absence of the two-dress reading indicates that sharing is ruled out while the non-sharing structure is available (indicated by the one-dress reading).



two dresses each with one color
(a) Sharing dress, violating the BAN

one dress with two colors
(b) Conjoined adjectives

Figure 14: The blue and black dress

The blocking nature of the BAN predicts there to be no overlapping distribution of the two structures: when the non-sharing structure is available, the sharing structure is blocked; only when the non-sharing structure is not available does the sharing structure emerge. This predicts complementary distribution of the two structures, i.e. one string cannot optionally show telltale signs for both structures. This is borne out for the cases we have seen in English. In a given string of NP RNR in (19), either the singular or the plural shared noun is allowed, but not both. The complementary distribution in NP RNR is also observed in all the languages reported in Shen (2018) including Brazilian Portuguese, Cypriot Greek, Dutch, English, German, Icelandic, Italian, Polish, Serbo-Croatian, and Slovenian, Spanish.

(19) a. John's and Mary's students/*student are a couple.
b. John's tall and Mary's short student/*students are a couple.

4.2 Can the ban on string vacuous sharing replace MaxShare

I have shown that the BAN can replace MaxShare and the Agree requirement in NP RNR. Now we look at whether it can replace MaxShare in the ATB LBE and gapping paradigm discussed in Citko (2006) and earlier in this paper.

First, let's look at the ATB LBE data in (20) (repeated from (1c) and (2)). Both sentences involve two conjoined TPs and one adjective shared by two NPs (indicated by the traces). There is no conceivable alternative structure that involves no sharing and a smaller conjunction site as discussed above. Thus, the BAN correctly does not rule out the sharing structure which made ATB LBE possible in (20a). However, this means that the BAN can not rule out the less acceptable (20b). An additional constraint like MaxShare is still needed.

(20) a. Ile$_i$ [$_{TP}$ Maria napisała t$_i$ książek] a [$_{TP}$ Jan przeczytał t$_i$ artykułow]?
how-many Maria wrote books and Jan read articles
'How many books did Maria write and how many articles did Jan read?'

b. * Którą$_i$ [$_{TP}$ Maria poleciła t$_i$ książkę] a [$_{TP}$ Jan przeczytał t$_i$ książkę]?
which Maria recommended book and Jan read book
'Which book did Mary recommend and John read?'

Second, ATB LBE + gapping discussed in (9) with English glosses repeated in (21). (21a) involves both ATB LBE of *which* and gapping whereas (21b) only involves ATB LBE. The sharing analysis of gapping involves conjunction of vPs and sharing of the verb (*ordered* in 21). Again, there is no alternative non-sharing structure with a smaller conjunction site. Similar to (20), the BAN correctly does not rule out (21a) but the less acceptable (21b) is not ruled out either.

(21) a. Which$_1$ Maria **ordered** t$_1$ coffee and Jan t$_1$ tea?

b. *? Which$_1$ Maria **ordered** t$_1$ coffee and Jan **ordered** t$_1$ tea?
(English glosses for Polish sentences in (9))

The positive note is that the BAN is compatible with the paradigm above in that it does not rule out the acceptable sentences; however, it also does not help accounting for (20b) and (21b). MaxShare as proposed by Citko (2006) is still needed and

cannot be replaced by the BAN. This result is not surprising, since the BAN only rules out a sharing structure in the face of a non-sharing one. What MaxShare accomplishes is choosing between two sharing structures, with one sharing more materials than the other. So far, I have shown that MaxShare can account for all the data in ATB LBE noted so far and part of the NP RNR paradigm, while the BAN can account for all the data in NP RNR but not ATB LBE. Considering both ATB LBE and NP RNR, MaxShare is needed plus either the Agree requirement or the BAN. The answer to "can the BAN replace MaxShare" is *no*. It turns out that it's not MaxShare that the BAN can potentially replace but the Agree requirement. With MaxShare independently motivated, now the question becomes whether to retain the Agree requirement as in Shen (2018) or to replace it with the ban on string vacuous sharing. I will leave this question for future research.

4.3 Another alternative

The BAN is by no means the only potential alternative to MaxShare. Another possible alternative that I do not have space to discuss here beyond several sentences is related to the contrast conditions on ellipsis proposed in Hartmann (2000, 2003), Féry & Hartmann (2005). Although the original proposals are meant for ellipsis, the phenomena the proposed conditions cover include RNR and gapping, largely overlapping with MaxShare. Hartmann (2000, 2003) argues that RNR is derived from phonetic deletion rather than multi-dominance, and that phonetic deletion requires the preceding materials to be contrastive. In addition, a *maximal contrast principle* in (22) is proposed for gapping, which is very similar in essence to MaxShare. I will group the various conditions proposed in these works and label them as *contrastive conditions*.

(22) The maximal contrast principle
In a Gapping construction maximize the number of contrasting remnant-correspondent pairs. (Hartmann 2000: p. 165, 43)

Assuming that ATB movements are subject to contrast conditions of the same nature, the contrast is required not only on the material preceding the shared element but also the materials following it to account for the ATB LBE data in (1) and (2) from Citko (2006). The interaction of ATB movement and gapping shown in (9) where one requires the other can be accounted for as well by applying (22) to ATB and gapping.

Regarding NP RNR, requiring the materials preceding the shared noun to be contrastive can correctly rule out Figures 5 and 6. However, something like the

Agree requirement or the BAN is still needed in addition to rule out the structure in Figure 7. Since *John's* and *Mary's* are contrastive, but as we have learned, sharing of the noun phrase following these contrasting elements is disallowed.

Further research is needed to thoroughly evaluate whether the contrastive conditions can replace MaxShare in general. For example, Hartmann (2000) proposes that the domain of application of the condition in (22) is the phonological phrase. It remains to be seen whether such restrictions are the same when the condition is applied to ATB and NP RNR. The full paradigm including ATB, gapping, and NP RNR can be accounted for by different combinations of the conditions/constraints discussed in this paper: MaxShare, the Agree requirement on sharing, and the two alternatives presented in this section. Pros and cons of each combination require careful investigation that goes beyond this paper.

5 Summary

This paper discussed three aspects of MaxShare: its formulation, its restrictions, and possible alternatives. We have seen that the numeration formulation of MaxShare is more empirically powerful in ruling out sentences and less stipulative regarding the motivation of such a constraint on sharing. At the same time, the effects of the numeration MaxShare seems less robust within or across languages than that of the dominance MaxShare. I have also shown that the effects of MaxShare need to be restricted within structures that involves sharing in the first place. Lastly, the ban on string vacuous sharing, a potential alternative to MaxShare, turns out to be successful for NP RNR but not for other cases of sharing.

In this paper, I was only able to scratch the surface of these issues, which all deserve more detailed, cross-linguistic research. One promising direction is on the locality of MaxShare, i.e. the domain within which MaxShare is enforced. MaxShare states that the shared materials within a domain must be maximized, in other words, if one element is shared in this domain, all other shareable elements must be shared as well. The locality question is how far the two shared elements can be for one to trigger the sharing of the other. The cases we have been looking at are limited in this aspect. In NP RNR, the domain of MaxShare is within two conjoined DPs: the sharing of the head noun triggered the sharing of the Poss head and the NUM head within the DP. In ATB LBE cases, the domain is within two conjoined matrix clauses: sharing of the adjective of the objects triggers sharing of the verb via gapping. We have not seen long distance triggering where, for example, the sharing of the *embedded* object forces gapping of the *matrix* verb. We also have not seen triggering across islands or other boundaries proposed in

the literature.[10] To address this question, one interesting project would be to look at the interaction of MaxShare, a constraint on size of shared constituents, and clausal complements of different sizes.

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[10] An assumption made in Section 4.1 is that numerations are evaluated phase by phase. It follows then that the MaxShare effects should be confined within phases. However, this is not compatible with the interaction of ATB of adjectives of the objects and the gapping of the verb discussed in Citko (2006).

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