

Constraints on reciprocal scope

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Abstract: We explore constraints on reciprocal scope, showing that properties of the local antecedent of the reciprocal are crucial in determining the scope of the reciprocal. We survey bound and non-bound, collective, controlled and distributive antecedents, examining and rejecting or refining some previously proposed constraints on reciprocal scope. We also discuss logophoric antecedents, which to our knowledge have not figured in the literature up to now. Our findings provide overall support for a relational (rather than quantificational) treatment of reciprocal semantics.

Keywords: reciprocals, reciprocal scope, cumulativity, collectivity, distribution, control, logophoricity

1 Introduction

Complex sentences containing a reciprocal expression may be ambiguous, exhibiting a narrow scope reading which Heim et al. (1991) call a ‘we-reading’ and a wide scope ‘I-reading’:

- (1) Tracy and Chris thought they saw each other.
 - a. We-reading/narrow scope: Tracy and Chris each thought: “We saw each other”.
 - b. I-reading/wide scope: Tracy thought: ‘I saw Chris’, and Chris thought: ‘I saw Tracy.’

In the following we discuss a range of constructions where only one of the two readings is available. All of the cases have in common that properties of the *local antecedent* of the reciprocal (*they* in (1), as opposed to the ultimate antecedent *Tracy and Chris*) play a crucial role in fixing reciprocal scope.

This is important because there are, broadly speaking, two families of analyses

of reciprocity, in which the local antecedent of the reciprocal plays a very different role. Roughly speaking, on the *quantificational* view (Heim et al. 1991; Dalrymple et al. 1998, and more recently Sigurðsson et al. 2022; Paparounas and Salzmann 2023; Atlamaz and Öztürk 2023, among others), the reciprocal is (or contains) a quantifier that raises and binds the local antecedent position.

(2) Quantificational analysis, Heim et al. 1991:

[_S[_{NP}[_{NP} the girls₁] each₂] [_{VP} saw [_{NP} e₂ other]₃]]

By contrast, on the *relational* view (Sternefeld 1998; Beck 2001; Murray 2008; Dotlačil 2013; Haug and Dalrymple 2020, among others) the reciprocal is treated as a pronoun that is anaphoric on the local antecedent position. We represent anaphoric relations by means of an arrow (Higginbotham, 1985), and we label the arrow to indicate the requirements of the anaphoric relation. We assume three types of anaphoric relations: reciprocity (R), binding (=) and group identity (U). The reciprocal relation R requires (a) cumulative identity across situations but (b) distinctness in each situation.

(3) Relational analysis: [the girls] saw [each other]


Relational and quantificational theories make different predictions about the interaction of the reciprocal and its local antecedent in complex sentences. On the quantificational view, the (quantifier part of the) reciprocal can raise to the matrix clause (as it must to yield a wide scope reading) while binding the local antecedent in-situ in the embedded clause. Moreover, because the analysis involves distributive quantification, the quantificational analysis predicts that the reciprocal cannot scope at the same point or higher than an explicit distributor.

(4) *The girls thought that they saw each other*, quantificational analysis:

a. Narrow scope:

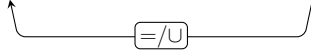
[[[the girls]₁ D] think [that [[[they]₁] **each**₂] [saw [e₂ other]₃]]]]

b. Wide scope:

[[[the girls]₁ **each**₂] think [that [[[they]₂] [saw [_{e2} other]₃]]]]]

On the relational view, the scope ambiguity with reciprocals is assimilated to another ambiguity involving binding (=) vs. group identity ($\cup$) in the interpretation of plural anaphors, following Williams (1991):

(5) [The girls] thought [that they would win]:

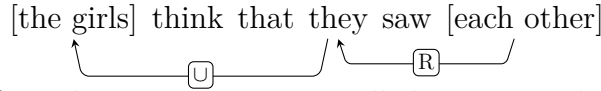


a. Each girl thought: “We will win.” (“narrow”/group identity, $\cup$)

b. Each girl thought: “I will win.” (“wide”/bound anaphora, =)

In this setting, narrow scope reciprocity is group identity ($\cup$) between *the girls* and *they*, with in-situ reciprocity:

(6) Narrow scope:



This informal representation is spelled out precisely in (7) in a plural dynamic logic by Haug and Dalrymple (2020), where anaphoric relations between discourse referents are represented as arrows connecting the anaphor to its antecedent: in this representation, the group identity reading which we informally label as $\cup$ in (6) is represented by means of an arrow relating groups ($\cup u_2 \rightarrow \cup u_1$), and reciprocity is a combination of group identity across situations ($\cup u_3 \rightarrow \cup u_2$) and noncoreference in each situation ($\partial(u_3 \neq u_2)$). In the narrow scope reading, the anaphoric relations between the discourse referents for *girls* ($\cup u_1$), *they* ($\cup u_2$), and *each other* ($\cup u_3$) are a part of the meaning of the subordinate clause.

$$(7) \quad \begin{array}{|l} u_1 \\ \hline girls(\cup u_1) \\ \hline think \left(u_1, \begin{array}{|l} u_2 \ u_3 \\ \hline \cup u_2 \rightarrow \cup u_1 \\ \cup u_3 \rightarrow \cup u_2 \\ \partial(u_3 \neq u_2) \\ see(u_2, u_3) \end{array} \right) \end{array}$$

In the wide scope reciprocal reading, *they* is bound (=) by *the girls*, and the reciprocal is interpreted *de re*, in the matrix clause. In this case the local antecedent must also be interpreted in the matrix clause for accessibility reasons, since the reciprocal is anaphoric on it. Crucially, the bound variables ($t_1, t_2 \dots$) denote individuals.

$$(8) \quad \text{Wide scope:} \\ \begin{array}{c} [\text{the girls}]_1 \text{ they}_2 [\text{each other}]_3 : t_1 \text{ think that } [t_2 \text{ saw } t_3] \\ \quad \quad \quad \leftarrow \boxed{=} \quad \quad \leftarrow \boxed{R} \end{array}$$

This corresponds to the analysis of wide scope reciprocity proposed by Haug and Dalrymple (2020) in (9), where the anaphoric relations are a part of the meaning of the matrix clause, and all three discourse referents u_1, u_2, u_3 appear in the universe of the main DRS.

$$(9) \quad \begin{array}{|l} u_1 \ u_2 \ u_3 \\ \hline girls(\cup u_1) \\ u_2 \rightarrow u_1 \\ \cup u_3 \rightarrow \cup u_2 \\ \partial(u_3 \neq u_2) \\ \hline think \left(u_1, \begin{array}{|l} \\ \hline see(u_2, u_3) \end{array} \right) \end{array}$$

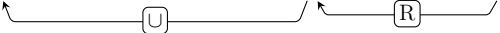
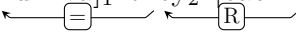
Notice that the representations of the wide scope reading, both the quantificational one in (4) and the relational one in (8)–(9), involves interpreting material that ap-

pears in the subordinate clause in the matrix clause. Because the wide scope reading (4) does not in fact report on a reciprocal thought, this is a necessary feature of any semantic representation of that reading, but it does raise the question of how this is achieved in the syntax-semantics interface. Quantifier raising is one possibility, but at least in the DRT tradition, there are other possibilities such as anaphoric resolution along the lines of van der Sandt 1992. In this squib, we want to remain non-committal about such issues and focus only on whether the end representations of the quantificational and relational theories are adequate, irrespective of how they arise.

In the following, we survey a range of constructions in which properties of local reciprocal antecedents affect scopal possibilities. Previous work on reciprocal scope fixing is scant, and so we begin with a discussion of constructions in which the scopal possibilities are equally predicted by quantificational and relational theories: cases in which the form of the local antecedent either enforces or resists a bound reading, thus enforcing either narrow or wide scope (Section 2), and cases in which the reciprocal predicate in the subordinate clause is conjoined with a necessarily collective predicate (Section 3). Section 4 discusses control constructions, which have previously been claimed to fix reciprocal scope; we show that the situation is more complicated than has been assumed in previous work, but that both the relational and quantificational accounts make the correct predictions for the relevant range of cases. We then discuss two constructions where only relational theories predict the facts correctly: the first involves the presence of a distributive operator (Section 5), and the second involves logophoricity (Section 6). Notably, we have encountered no cases in which the relational approach makes incorrect predictions about scoping possibilities for the reciprocal.

2 Bound and non-bound pronoun antecedents of the reciprocal

Semantically speaking, a reciprocal must take a plural antecedent:¹ otherwise, a reciprocal meaning does not make sense. In many languages, this is also reflected in a *morphosyntactic* requirement for the antecedent to be plural. However, some languages, such as Hungarian, have no such requirement: the antecedent of the reciprocal in Hungarian can be a syntactically singular null pronoun. This can happen, for example, when the matrix subject is a coordination of singular NPs; as discussed by Rákosi (2019), such subjects can optionally trigger singular agreement in Hungarian. Crucially, singular embedded clause subjects must be interpreted as bound (=), and so we obligatorily get a wide scope reading of the reciprocal.² This is predicted by both the relational and quantificational approaches.

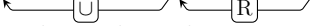
- (10) a. Péter és Éva az-t gondolja, hogy szereti egymás-t.
 Péter and Éva that-ACC think.3SG that love.3SG RECIP-ACC
 ‘Peter thinks that he loves Eva and Eva thinks that she loves Peter.’
- b. Narrow scope unavailable; singular null pronoun must be interpreted as bound:
 *[Peter and Eva] think that they love [each other]

- c. Wide scope available:

 [Peter and Eva]₁ they₂ [each other]₃ : t₁ think that t₂ love t₃

The opposite pattern has been reported for Japanese. Nishigauchi (1992) shows that the Japanese plural reflexive *zibun-tati* resists a bound reading and strongly favors a group identity reading (U); as expected, then, when it appears as the antecedent of a reciprocal in a subordinate clause, only a narrow scope reading is available. This is also predicted by both the relational and quantificational approaches.

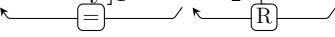
- (11) a. John to Mary ga [zibun-tati ga otagai o mi-ta to]
 and NOM self-PL NOM RECIP ACC see-PST that
 omow-ta
 think-PST

‘John and Mary thought that selves saw each other.’

- b. Narrow scope available:

[John and Mary] [self-PL [each.other] saw that] think


- c. Wide scope bound reading unavailable; plural reflexive must be interpreted as group coreference:

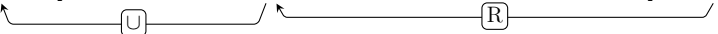
*[John and Mary]₁ self-PL₂ [each.other]₃: *t*₁ [*t*₂ *t*₃ saw that] think


3 Collectivity

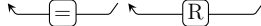
As noted by Tay et al. (2020), only a narrow scope reading is available when a VP containing a reciprocal is coordinated with a collective VP predicate.³ For example, the first conjunct of the VP in (12) is a collective predicate, and the interpretation of the second is contradictory (if they hope to play a single game of tennis) or at least pragmatically odd (they hope to play several games of tennis in which each defeats the other in at least one game).

- (12) The girls hoped that they would [meet at the tennis court] and [defeat each other].

- a. Narrow scope, available:

[the girls] hoped that they would meet and defeat [each other]


- b. Wide scope, unavailable:

[the girls]₁ they₂ [each other]₃ : *t*₁ hoped that *t*₂ would meet and defeat *t*₃


The wide scope reading requires a bound reading of the local antecedent in both the quantificational and relational approaches. Since the local antecedent denotes an individual, the wide scope reading does not make available a plurality for interpretation of the collective predicate *meet at the tennis court*.

4 Control and reciprocal scope

Reciprocal scope has been claimed to be fixed, at least in English, in (some) control constructions. Since Higginbotham 1980 it has been generally accepted that (13) only permits only a wide scope I-reading.

- (13) They wanted to visit each other.

However, Heim et al. (1991, 98–99) claim that control constructions allow narrow scope readings if the controller position is interpreted collectively, cf. (14).

(14) They decided to keep each other’s comments confidential.

According to Heim et al. (1991), (14) has two readings, one where the matrix verb is understood collectively and the reciprocal takes narrow scope, and one where the matrix subject is understood distributively and the reciprocal takes wide scope.

However, this claim is hard to verify or disprove for many verbs. It may be clear what the difference is between a joint decision and a sum of individual decisions, but it is much less clear what joint desire of a plurality entails over and above each member having the desire. Data from partial control (Landau, 2000; Haug, 2014) can yield important insights here, because in such configurations there is no requirement for the matrix subject to be plural, and yet PRO is semantically plural and therefore a possible antecedent for *each other* (15).⁴

- (15) a. I asked a girl who I liked if *she wanted to get to know each other better* and she said that she was already talking to someone else. <https://www.quora.com/I-asked-a-girl-who-I-liked-if-she-wanted-to-get-to-know-each>
 b. I vow to keep reminding you McDonald’s is unhealthy and to go get that mole checked, because *I want to live long, happy lives by each other’s side*. <https://www.theknot.com/content/real-couple-vows>

Although such examples are slightly incongruous and deviate from the norm, like most cases of partial control, they do occur in corpora. Strikingly, if we modify the attested examples by substituting well-known exhaustive control verbs such as *try* and *manage*, the sentences are much worse.

- (16) a. *I saw a girl I liked and tried to get to know each other better.
 b. *I try to live long, happy lives by each other’s side.

We conclude that the examples in (15) involve partial control. And yet, because the matrix argument is singular, a collective interpretation of the attitude verb is not possible. Hence the collective interpretation is not a precondition for a narrow

scope reading in cases of partial control.

This leaves one potential case of scope fixing in control constructions, namely obligatory wide scope in exhaustive control verbs where the controller is not interpreted collectively. As mentioned above, it is not always easy to tell apart collective and distributive interpretations of attitude verbs. But if we assume that collective intention requires that the individuals must at least be aware of each other's intentions, (17) forces a distributive reading for the matrix subject, and it does indeed seem to us that it only has a wide scope reading.

(17) Unbeknownst to each other, Tracy and Chris intended to help each other.

To sum up, it seems likely that partial control verbs always make available a narrow scope reading. Furthermore, if the matrix predicate is interpreted collectively, a wide scope reading is ruled out, and only a narrow scope reading is available. Finally, if there is exhaustive control and the controller is not interpreted collectively, only a wide scope reading is possible. These generalizations follow straightforwardly on both relational and quantificational accounts.

We now turn to an examination of constructions in which reciprocal scope possibilities are correctly predicted only by the relational approach.

5 Distributive operators

The presence of a distributive operator in the matrix clause has been claimed to constrain reciprocal scope: Heim et al. (1991, 86) claim that example (18a) is unambiguous, with only a narrow scope/contradictory reading, and that example (18b) is ungrammatical.

- (18) a. They each think they are taller than each other.
b. *They each examined each other. (judgement from Heim et al. 1991)

For them, this follows from the impossibility of applying a distributive operator (distributive *each*) to an already distributed noun phrase (*each* in the quantifica-

tional analysis of reciprocal *each other*). In such a structure, the innermost distributive operator would apply to a singular denotation, and it is a commonplace in the literature on distributivity that this is not possible (Champollion, 2016, 12).

In fact, however, simple corpus examples with *each of them* and distributive *each* as the antecedent of the reciprocal are plentiful.

- (19) a. *They each liked each other* but never said a word. <https://www.amazon.com/Ethan-Face-Off-Jillian-Quinn/product-reviews/1087114411?pageNumber=4>
 b. At the end of the ceremony, *they each kissed each other* as husband and wife. <https://rotaractppc.wordpress.com/2017/10/06/love-is-us-mass-wedding-p>
- (20) a. If there are 12 persons in a party and *each of them shakes hands with each other*, how many handshakes do happen in the party? <https://interviewmania.com/discussion/2343-aptitude-permutation-and-combination>
 b. Assertion: when a firefly hits a bus, *each of them exerts the same force on each other*. <https://brainly.in/question/17199475>

Such examples may seem odd, probably because the distributive operator seems not to do anything. This could lead to the assumption that the higher *each* is pleonastic, or perhaps even a spellout of *each* from *each other* after it has moved to the matrix clause. However, distributive *each* patterns differently from *each other* when it comes to licensing internal and external readings of *different*, as observed by Safir (2014, 98), citing unpublished work by Brasovaneau:

- (21) a. The men told each girl a different story.
 • internal reading available: a different story for each girl
 • external reading available: each girl heard a story that is different from some other salient story in the context
 b. The men told each other a different story. (external reading only)

Now, although the reciprocal itself does not licence the internal reading, examples where *each* modifies the reciprocal antecedent allow the internal reading for *different* to emerge. Example (22) is a constructed minimal pair corresponding to (21b) and shows that the internal reading emerges in the presence of ‘superfluous’ *each*.

The examples in (23) are naturally occurring examples of the internal reading:

- (22) The men each told each other a different story.
- (23) a. *We each gave each other a different perspective of life*, and that provided the balance and a good marriage and parenting needs <http://seward-concordia-neighborhood.blogspot.com/2016/07/>
b. they parallel one another and complemented one another other because *they each gave each other a different sort of intensity* at least how that's how I fell into that music. <https://thisthen.co/ahqz1/LrV313xP4KaYJiX0A6fewYA8wgB4jC12VBfHZRa0>

This shows that the *each* cannot be vacuous, and hence that it *is* possible to distribute on the reciprocal antecedent. Moreover, because we can get *each* even in simple sentences, we do not expect the presence of distributive *each* in the subordinate clause of a reciprocal sentence to lead to ungrammaticality or to force a wide scope reading, and indeed we get both narrow and wide scope with *each* in the subordinate clause.

- (24) Narrow scope:
- a. Callie was an obvious one, as they were extremely close and both accepted that *they each liked each other*, but they didn't do anything about it. https://bbo.fandom.com/wiki/Bryce_Bowman
b. I saw in some rants it says that they just flirted a little or made out and were in love but they already established the fact that *they each liked each other* before the [sic] kissed. <https://teal-drop.tumblr.com/post/143990820991/crown-spoilerseadrk>
- (25) Wide scope:
So many what ifs and in the end, they find out that *they each liked each other before*. But now, they each have their own lives to lead. <https://delightfuldramas.wordpress.com/category/reviews/architecture-101/>
[this looks like a crossed reading, actually]

Finally, because a distributor in the embedded clause does not force a narrow scope reading, there is no reason a distributor in the matrix should do so either, and we do indeed find examples with a structure like (18a) but with a wide scope reading. Notice that the distributor does not have to be *each*; (26b) shows an example with

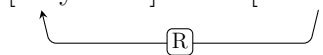
neither of them.

(26) Wide scope:

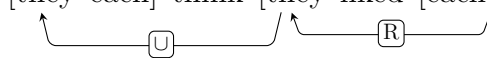
- a. While watching their movies, *they each realize that they miss each other*, make up and go to “Monkey Cars 3D” where the whole cast of So Random! and Chad is seen watching “Monkey Cars 3D”. [https://en.wikipedia.org/wiki/Sonny_with_a_Chance_\(season_1\)](https://en.wikipedia.org/wiki/Sonny_with_a_Chance_(season_1))
- b. And I’ll be back,” she reassured him, even though *neither of them wanted to admit that they enjoyed each other’s company* and, deep down, especially on her part, wanted to find out more about that wolf’s past. https://m.goodnovel.com/book/Eternal-Legacies-Serie-s-Vampire-rising_31000485388/32-Choices-and-mistakes_5064799

These patterns are problematic for the quantificational analysis, but the relational analysis predicts their acceptability, since *each other* can access the group denoted by the antecedent even if we distribute on the antecedent (Haug and Dalrymple, 2020, Section 2.3):

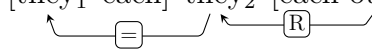
(27) a. *They each liked each other:*

[they each] liked [each other]


b. *They each think they liked each other*, narrow scope:

[they each] think [they liked [each other]]


c. *They each think they liked each other*, wide scope:

[they₁ each] they₂ [each other]₃: [t₁ think t₂ like t₃]


6 Logophoricity

In Wan (Mande), if the antecedent of the reciprocal is a logophor, only a narrow scope reading is available.⁵ Consider the following scenario: A hare comes to a forest and visits the animals that live there one by one, the hyena, the antelope, etc. The animals are worried about infighting in the forest and each says to the hare: “We [= the animals in this forest] will eat each other.” Now the hare comes back home and says: “All the animals say that they will eat each other.” In Wan, the hare can report this with (28).

- (28) wì mù tēŋ gé m̄ á ē ɔŋ l̄ lé
 animal PL all say LOG.PL COP REFL RECIP eat PROG
 ‘All the animals say they-LOG will eat each other.’ (logophor + reciprocal)

used. This is shown in (31).

- (31) wì mù é tē̄j gé dōō mō á wì dè̄j mù é tē̄j lō
 animal PL DEF all say QUOT LOG.PL COP animal rest PL DEF all eat
 lé
 PROG
 ‘All the animals say that they-LOG are going to eat all the rest of the ani-
 mals.’ (logophor, no reciprocal)

On the relational analysis, (31) differs crucially from (28) in that there is no reciprocal that “drags” its antecedent out of the embedded clause. On the quantificational analysis there is no such requirement, and the missing wide scope reading in (28) is unexpected. Further evidence for this is that the wide scope reading *can* be expressed with a reciprocal, but this requires an ordinary pronoun as in (32) rather than a logophor, as the representation in (29) predicts.

- (32) wì mù tē̄j tú gé à ȳ̄j lō lé
 animal PL all completely say 3PL RECIP eat PROG
 ‘They all say that they-3PL are going to eat each other.’ (reciprocal, no lo-
 gophor)

7 Conclusion

Despite sporadic claims about reciprocal scope fixing or scope disambiguation in previous literature, constraints on reciprocal scope are largely unexplored. Previous claims about wide scope readings in control constructions hold up, but only for exhaustive control, not for partial control. Claims about narrow scope only in cases of distribution on the antecedent do not hold up: we have shown that this is problematic for quantificational approaches. We have shed new light on reciprocal scope constraints due to the form of the antecedent of the reciprocal. Logophoric antecedents are narrow scope only (contra the quantificational approach), and the number (singular or plural) of the antecedent can also constrain reciprocal scope. Overall, our findings support the relational analysis of reciprocity and provide chal-

lenges for the quantificational analysis, though more work is needed. More generally, we have shown that the reciprocal antecedent plays a crucial role in licensing wide-scope readings, a fact that has to be accounted for in any theory.

Notes

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1. We thank György Rákosi for providing the data presented in this section and discussing them with us.
 2. Notice that an overt singular pronoun is not acceptable in (10). György Rákosi (p.c.) says that prodrop is preferred to overt pronouns in bound readings, and for some speakers prodrop is obligatory in very local binding configurations; we leave for future research the question of why the overt pronoun is unacceptable in such examples.
 3. We thank Yimei Xiang for bringing sentences like these to our attention.
 4. Naturally occurring examples were collected via web searches using Google wildcards.
 5. We are grateful to Tatiana Nikitina for providing the Wan data.

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