Covert reciprocals: a scope-based analysis of reciprocal alternations [*]

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Abstract

This paper argues that the class of predicates which participate in reciprocal alternations, like the seemingly 1-place predicate *hug* in *Jane and Mary hugged*, should in fact be analyzed as 2-place predicates with a covert reciprocal in object position. The main challenge for this analysis is that there seems to be truth-conditional differences between these covert reciprocals and the counterpart with an overt reciprocal. This paper will offer an alternative perspective on these seemingly lexical differences and reanalyze them in terms of scope, arguing that the differences can be systematically predicted once appropriate scope restrictions on covert reciprocals are established. To this end, I propose that covert reciprocals are simply reciprocals that have to be bound at the lowest possible scope position. I show that these seemingly 1-place predicates behave just like overt reciprocals, modulo the low-scope requirement, for example giving rise to homogeneity and non-maximality. I therefore argue that the inferences that they give rise to can only be accounted for systematically under a syntactic account that treats them as low-scope covert reciprocals.

1 Introduction

This paper is concerned with a class of verb alternations, termed reciprocal alternations (Levin, 1993; Winter, 2018). This alternation is exemplified in (1), where the seemingly 1-place predicate *date* in (1-a) is equivalent to the corresponding 2-place predicate with a reciprocal object (1-b) (and to the corresponding conjunction in (1-c)). One characterizing property of this alternation, which will be useful as we look at different types of predicates, is that the 1-place variant requires a plural subject, as shown by the infelicity of (2).

(1) a. Jane and Mary dated.
    b. Jane and Mary dated each other.
    c. Jane dated Mary and Mary dated Jane.

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(2) *Jane dated.

Given cases like (1), we can formulate two possible preliminary analyses of the logical relationship between the 1-place and 2-place variants of predicates which participate in reciprocal alternations. On the lexical ambiguity view, we can posit that there are two lexical items with the phonological exponent /date/, a 1-place and a 2-place predicate, which are connected by a logical relation (e.g. Winter, 2018). We can then give a general statement of the logical relationship between the two variants for all predicates which participate in the reciprocal alternation, as shown in (3). Of course, this type of approach raises theoretical and conceptual issues regarding how to formulate such a generalization over common phonological exponents, which I return to when discussing versions of the ambiguity view in more detail.

(3) Given two predicates $P_{\text{1-place}}$ and $P_{\text{2-place}}$ with the same phonological realization, where $P_{\text{1-place}}$ and $P_{\text{2-place}}$ participate in a reciprocal alternation, and given any two individuals, a and b:
$[\![P_{\text{1-place}}]\!](a \oplus b) \Leftrightarrow [\![P_{\text{2-place}}]\!](a)(b) \wedge [\![P_{\text{2-place}}]\!](b)(a)$

On this preliminary version of the lexical perspective, we would expect that the 1-place variant, exemplified in (1-a), is always truth-conditionally equivalent to the paraphrase with conjunction, exemplified in (1-c), where each conjunct has the two place predicates applying to the individuals (here Jane and Mary) in a different order.

Alternatively, one can posit a syntactic analysis of this alternation, following Hackl (2002), where what looks like a 1-place variant in (1-a) is in fact the same 2-place predicate in (1-b) and (1-c) but with a covert reciprocal in object position. On this preliminary version of this perspective, the LFs for the covert and the overt reciprocal are identical, with the only difference being whether or not the reciprocal object is pronounced. The truth-conditional equivalence between (1-a) and (1-b) is therefore predicted.

The simple versions of the syntactic and the lexical ambiguity approaches laid out above both face a challenge from predicates which participate in the same type of alternation, yet do not exhibit truth-conditional equivalence between the 1-place variant on one hand and the overt reciprocal and conjunctive paraphrases on the other. For example, the predicate *hug* in (4) seems to show the same pattern as *date* in (1), in that it has a 1-place and 2-place variant where the 1-place variant requires a plural subject. Furthermore, it is tempting to paraphrase (4-a) with the overt reciprocal in (4-c). Yet, (4-a) doesn't in fact have the same truth-conditions as (4-c) and (4-d).

(4) a. Jane and Mary hugged.
b. *Jane hugged.
c. Jane and Mary hugged each other.
d. Jane hugged Mary and Mary hugged Jane.

To see the relevant truth-conditional difference, consider the context in (5) from Winter (2018): in this context, the variant with no overt reciprocal (5-a) is not true, while the one with the overt reciprocal in (5-b) and the conjunction paraphrase in (5-c) are both true . A simple syntactic analysis where (5-a) involves a covert *each other* therefore incorrectly predicts that (5-a) and (5-b) are truth-conditionally equivalent. Similarly, as pointed out by Winter, a simple lexical ambiguity analysis along the lines of what is laid out in (3) also fails to predict this difference.

(5) Context: Jane hugged Mary while she was sleeping and then Mary fell asleep and Jane woke up and hugged her.

a. #Jane and Mary hugged.
b. Jane and Mary hugged each other.
c. Jane hugged Mary and Mary hugged.

Winter (2018) takes the data in (5) as evidence for a more involved ambiguity view where different types predicates give rise to different relationships between the 1-place and 2-place variants. In this paper, I argue for an alternative view on these differences in terms of scope and argue that these differences can therefore be captured within a syntactic account that treats the 1-place variants as covert reciprocals.

More specifically, the main goals of this paper are to (i) propose that differences between the 1-place variant and the overt reciprocal in contexts like (5) can be reduced to differences in scope-taking possibilities and (ii) argue for an analysis of (5-a) as a covert reciprocal which, unlike the overt counterpart, has to be bound at the lowest possible scope position. Covert reciprocals are therefore predicted to allow for a proper subset of the readings that overt reciprocals, which can be bound from any scope position, allow for. I show in section 3 that, given certain assumptions about clausal architecture, a range of cases like (5), where the overt reciprocal is true and the covert reciprocal isn't, correspond to contexts where only the reading where the reciprocal is bound above another scope-taking operator is true. Thus, the low-scope restriction on covert reciprocals explains why only the overt reciprocal is true in such contexts.

At this point, it is worth pointing out that the goals of this paper are modest, in that it will be beyond my scope to go through *all* differences between covert and overt reciprocals and analyze them in terms of scope. Rather, I will focus on a few case-studies like (5), propose a detailed scope-based analysis for them, and suggest that this perspective can be extended to further cases where the relevant scope-taking operators at play might be less well-understood.

Note that Heim et al. (1991) also characterize certain differences in truth-conditions between overt reciprocals and the seemingly 1-place counterparts in terms of differences in scope, in particular cases where the reciprocal is embedded under an attitude predicate like *say* (see Carlson (1998) for a more explicit discussion of this difference and the consequences for an analysis of the 1-place variants). Heim et al. observe that when reciprocals are embedded under a scope-taking predicate, they give rise to a certain type of ambiguity, depending on where the reciprocal takes scope. Consider the example in (6): the long-distance reciprocal reading, paraphrased in (6-a), can be informally characterized as having the reciprocity target the *saying*. For example, (6) is true in a context like (7), where neither of Mary and Jane said that the other person hugged them but they each said that they hugged the other person. On the other hand, in the low-scope reciprocal reading, paraphrased in (6-b), reciprocity targets the embedded verb *hug*.

(6) Jane and Mary said that they hugged each other.

a. **Long-distance reciprocal:** Jane said that she hugged Mary and Mary said that she hugged Jane.

b. **Low-scope reciprocal:** Jane and Mary said that Jane hugged Mary and Mary hugged Jane.

(7) **Context:** Jane said that she hugged Mary but that Mary didn't hug her back. Mary said that she hugged Jane but that Jane didn't hug her back.

Now, consider the 1-place variant in (8). Unlike the overt reciprocal counterpart in (6), (8) is not true in the context in (7). It therefore seems that the the 1-place variant can only have what we're referring to as the low-scope reading in (6-b). Heim et al. (1991) argue that this is because *each* in the overt reciprocal can take scope above *say*, allowing us to get the long-distance reciprocal reading. On the other hand, the 1-place variant in (8) only has the reading in (6-b), corresponding to the case where the overt reciprocal is bound below *say*.

(8) Jane and Mary said that they hugged.

I propose a principle that accounts for the scope difference between (6-a) and (8) while maintaining that (8) involves a reciprocal object, and then extend a similar strategy to cases where we see truth-conditional differences but where there is no evert scope-taking element, as in (5). For example, I argue that in (5), the overt reciprocal allows for a similar non-local reading, where the reciprocal is bound above aspect. On the other hand, the 1-place counterpart in (5) only has the reading corresponding to binding below aspect, thus explaining the truth-conditional difference.[1]

The rest of the paper is structured as follows. In section 2, I discuss in more detail Winter's (2018) lexical account and provide a preliminary version of the covert reciprocal approach that builds on Heim et al.'s analysis of reciprocals. In section 3, I lay out in detail the truth-conditional differences between overt and covert reciprocals and propose a modified syntactic analysis that derives these differences from an assumption that only covert reciprocals have to be bound at the lowest possible position. In section 4, I provide evidence for the syntactic approach and against the lexical one by showing that just like overt reciprocals, covert reciprocals give rise to homogeneity and non-maximality. These inferences are systematically derived under an analysis where overt and covert reciprocals have the same LFs (modulo the low-scope requirement) but require additional stipulations under the ambiguity approach. Finally, section 5 concludes.

2 Syntactic and lexical accounts of reciprocal alternations

2.1 The basic syntactic account

For the purposes of the paper, I will be assuming a decompositional account for overt reciprocals (Heim et al., 1991; Roberts, 1991). More specifically, I adopt (a slightly simplified version of) the implementation of this general approach from Sauerland (1998). Under this account, reciprocals involve covert operators which are interpreted above the predicate and responsible for distributivity and a *the other* DP in object position. This approach in particular, where

[1] Heim et al. assume that the variants without a covert reciprocal lack the long-distance readings due to them simply not being reciprocals but instead 1-place predicates. As outlined above, I argue here that they are in fact reciprocals that are bound locally.

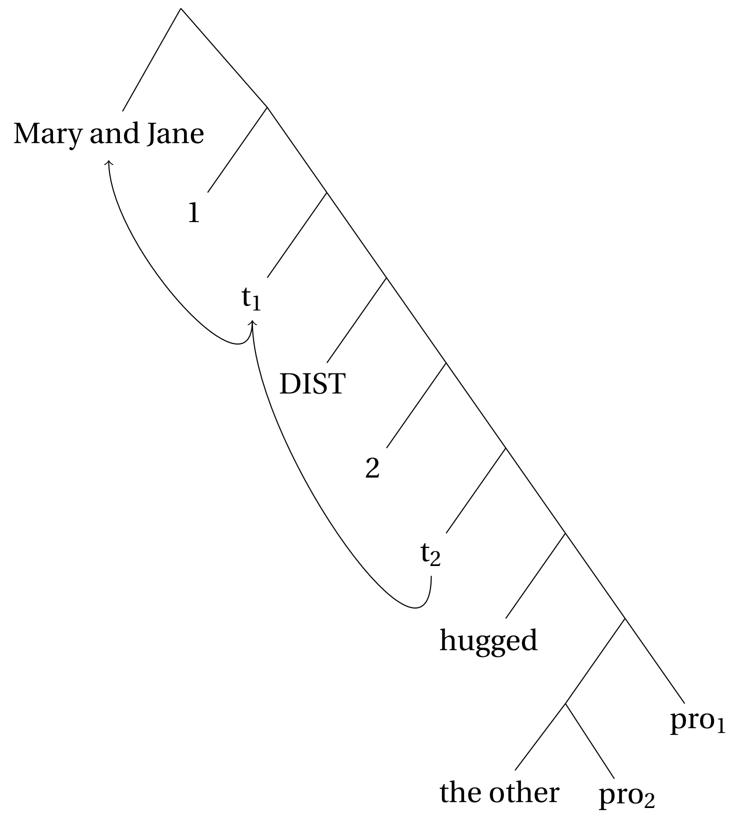
each other is treated as a definite DP, relies on certain parallels between the interpretations of reciprocals and predication involving a plural definite more generally (see Beck, 2001 for an extensive discussion of these parallels).

(9) a. Mary and Jane hugged each other.
b. Mary and Jane (each) hugged the other.

The LF for (9-a) under this approach is given in (10). The LF in (10) is generated as follows: (i) the subject DP *Mary and Jane* moves (as indicated by the lower arrow) and binds the first argument of *the other* (pro_2); (ii) the distributivity operator is inserted counter-cyclically between the initial landing site of *Mary and Jane* and the binder 2; (iii) the DP *Mary and Jane* moves again (as indicated by the higher arrow) and binds the second argument of *the other.* This results in the first argument of *the other* (the contrast argument) being interpreted distributively due to DIST, while the second argument (the range argument) is interpreted collectively.[2] The lexical entry for *the other* is given in (12), where it takes two (possibly plural) individuals as arguments and returns the individual which removes the first from the second. This is illustrated in the example in (12-c). The resulting truth-conditions for (10) are given in (13): (10) is predicted to be true if Mary saw Jane and Jane saw Mary.

[2]The LF in (10) uses a distributivity operator and not the pluralization operator *. For the simple cases discussed in this paper, this distinction will not matter, but see Sauerland (1998) for arguments that the pluralization operator is needed here. Sauerland (1998) assumes, following Schwarzschild (1996), that the pluralization operator * is in fact obligatorily present as the sister of every node of type $\langle e, t\rangle$. The LF in (10) therefore omits another * operator above the index 1. Note that the contribution of this operator would be trivial here: for the presupposition of $[\![$the others$]\!]$ to be met, t_1 has to be interpreted collectively.

(10)



(11) $[\![\text{DIST}]\!] = \lambda f_{\langle e,t\rangle}.\lambda x.\forall y[y \leq_{AT} x \rightarrow f(y) = 1]$

(12) a. $[\![\text{the others}]\!] = \lambda x.\lambda y.\ y \ominus x$, defined iff x<y
  b. $y \ominus x$ is the maximal individual z s.t. $z \leq y \wedge \neg\exists x' : x' \leq x \wedge x' \leq z$
  c. $[\![\text{the others}]\!](\text{j})(\text{j}\oplus\text{m}) = \text{m}$

(13) $[\![\text{Mary and Jane hugged each other}]\!] = 1$ iff
$[\![\text{Mary and Jane 1 } \text{t}_1 \text{ DIST 2 } \text{t}_2 \text{ hugged [the other } \text{t}_2\ \text{t}_1\ ]]\!] = 1$ iff
$\lambda y.\ ((\text{DIST}(\lambda x.[\![\text{hugged}]\!](x)(y \ominus x)))\ (y))\ (\text{m}\oplus\text{j}) = 1$ iff
$([\![\text{hugged}]\!](\text{m})(\text{j}) \wedge [\![\text{hugged}]\!](\text{j})(\text{m}))$

Now, the most straightforward version of the syntactic account is to simply assume that (14) has the same LF as the overt reciprocal in (13), with the only difference being that the reciprocal object is not pronounced. This would of course predict, incorrectly as we saw in the introduction, that (14) and the overt counterpart in (9-a) have the same truth-conditions. The goal of section 3 will be to propose a version of this syntactic account which can predict the relevant differences in truth-conditions between (14) and (9-a) as due to differences in the positions from which the two arguments of *the other* can be bound.[3]

[3]One thing to note at this point is that not all predicates which can take an overt reciprocal object also allow for a variant where the reciprocal object is not pronounced. For example, *saw* does not have a covert reciprocal variant (i-b). For the purposes of this paper, I will simply assume that the licensing of a covert reciprocal object is an idiosyncratic property of certain predicates. I will therefore set the question of why only certain predicates license this alternation aside and focus only on predicates where the covert reciprocal is licensed.

(i) a. Jane and Mary saw each other.

(14) Jane and Mary hugged.

2.2 Winter's lexical account

Winter (2018) argues that there are two types of predicates that participate in reciprocal alternations: (i) symmetric predicates, which exhibit "plain reciprocity" and (ii) non-symmetric predicates which exhibit "preferential reciprocity". Symmetric predicates are predicates where switching the order of their arguments does not affect the overall truth-conditions. This is illustrated for the symmetric predicate *date* in (15-a). These predicates, Winter argues, also exhibit the plain 'reciprocal' logical relationship between the 1-place and the two-place variants in (15-b) . On the other hand, there are predicates like *hug*, which participate in this alternation, yet are not symmetric (16-a). Winter shows that these predicates in general do not exhibit the simple reciprocal logical relationship between the 2-place and the 1-place variant (16-b), as I illustrated for *hug* in the introduction. This reciprocity-symmetry generalization is formulated in (17).

(15) a. Jane dated Mary $\Leftrightarrow$ Mary dated Jane.
b. Jane and Mary dated $\Leftrightarrow$ Jane dated Mary and Mary dated Jane

(16) a. Jane hugged Mary $\not\Leftrightarrow$ Mary hugged Jane
b. Jane and Mary hugged $\not\Leftrightarrow$ Jane hugged Mary and Mary hugged Jane

(17) **Reciprocity-Symmetry Generalization:** A reciprocal alternation between a unary-collective predicate P and a binary predicate R is plain if and only if R is truth-conditionally symmetric. (Winter, 2018)

Winter takes this generalization as evidence that the source of the reciprocal alternation is different for symmetric and non-symmetric predicates. He proposes that with symmetric predicates like *date*, the 2-place predicate is logically derived from the collective 1-place predicate as illustrated in (18). This predicts the these predicates are necessarily symmetric, since the sum operation $\oplus$ is commutative and the order of the two arguments in $[\![\text{date}_{2-place}]\!]$ therefore does not affect the truth-conditions.

(18) $[\![\text{date}_{2-place}]\!] = \lambda x.\lambda y.[\![\text{date}_{1-place}]\!]\ (x \oplus y)$

On the other hand, for non-symmetric predicates, Winter argues that they do not exhibit generalizable logical relationships between the 1-place collective predicate and the 2-place variant. Instead, he argues different types of predicates exhibit a variety of lexical relationships between the two variants. For example, as we saw in the introduction, predicates like *hug* seem to have a simultaneity requirement in their 1-place variant, where if Jane hugged Mary at one time and Mary hugged Jane at a later time, *Jane and Mary hugged* is not true. The inference in (19) therefore seems to hold for *hug*. On the other hand, with predicates like *divorce* and *break up*, the 1-place variant is true as long as the 2-place variant is true in one of the directions, as illustrated in (20-a). The analogous inference clearly doesn't hold for *hug* (20-b).

(19) Jane hugged Mary and Mary hugged Jane at the same time $\Rightarrow$ Jane and Mary hugged.

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b. *Jane and Mary saw.

(20) a. Jane broke up with Mary ⇒ Jane and Mary broke up.
b. Jane hugged Mary ⇏ Jane and Mary hugged.

This lexical analysis therefore built on the assumption that the relationship between the 1-place and 2-place predicates for non-symmetric predicates is not systematic and therefore has to be at some level encoded as part of the lexical meaning. If this is true, then it would constitute evidence against a syntactic account where there is no reason to expect that the relationship between the 1-place and 2-place variant depends simply on the lexical content of the predicate. In the next section, I argue that these differences between the covert and the overt reciprocals can in fact be characterized systematically. In particular, I show that the differences can be characterized in terms of differences in the scope of reciprocal binding. I argue that this allows us to maintain a modified syntactic analysis, where covert reciprocals are simply reciprocals which require local binding of the two arguments of *the other*.

For the purposes of evaluating whether the syntactic account can systematically predict the logical relationships between the 1-place and the 2-place variants, it is useful to categorize Winter's case-studies into two separate categories: (i) environments where the truth-conditions of the overt reciprocal differ from those of the 1-place variant and (ii) environments where the truth-conditions for the overt reciprocal and the 1-place variant are identical but differ from the paraphrase with conjunction. For example, the contexts with *hug* in (5) and with *kiss* in (21) are instances of the first type, where the 1-place variant is false (21-a) but both the overt reciprocal (21-b) and the conjunction (21-c) are both true. On the other hand, the cases where *break up* is true even though only one person broke up with the other are of the second type, where both the 1-place variant (22-a) and the covert reciprocal (22-b) pattern together, in contrast with the conjunctive paraphrase (22-c).

(21) **Context:** Mary kissed Jane on the arm and Jane kissed Mary on the arm.
a. #Jane and Mary kissed.
b. Jane and Mary kissed each other.
c. Jane kissed Mary and Mary kissed Jane.

(22) **Context:** Jane and Mary broke up and Jane initiated the break up.
a. Jane and Mary broke up.
b. Jane and Mary broke up with each other.
c. # Jane broke up with Mary and Mary broke up with Jane.

While cases of the second type will come up throughout the paper, especially in section 3 where I discuss further inferences that both covert and overt reciprocals give rise to, the main focus of this paper will be differences of the first type. This is because under the syntactic analysis which is outlined in section 2.1, the 1-place variants are taken to be reciprocals and not conjunctions. Therefore, the major challenge for this type of account are cases like (21), where what is claimed to be a covert reciprocal differs in truth-conditions from the overt counterpart. Cases like (22) on the other hand, while interesting in their own right, provide a puzzle that a general theory of overt reciprocals has to address and not a challenge for the covert reciprocal analysis per se, since covert and overt reciprocals pattern together.

3 A scope-based proposal for covert reciprocals

In this section, I will first propose a modified version of the covert reciprocal analysis outlined in section 2.1 and then return in section 3.4 to how the relationship between symmetry and plain reciprocity observed by Winter can be accounted for on this syntactic account. In particular, I propose that unlike overt reciprocals, where binding of the arguments of *the other* is free to occur from any position, covert reciprocals require this binding to occur as low as possible (23). I argue, using several case-studies, that the differences in meaning between overt and covert reciprocals, which at first sight seem to be lexical differences, can in fact be characterized systematically in terms of scope, as predicted by the principle in (23). These differences, which have to be stipulated for individual predicates under that lexical approach, therefore follow systematically under the scope-based approach.

(23) **Restriction on Covert Reciprocity:** The *each other* in a reciprocal can be elided only if the two arguments of *the other* are bound at the lowest possible positions.

As a starting point, in order to appreciate the impact of (23), let's observe that the principle in (23) straightforwardly captures the differences between overt and covert reciprocals for the cases that Heim et al. discuss, namely cases where the reciprocal is embedded under an attitude predicate. This differrence is illustrated with the context in (24), where only the overt reciprocal is true.

(24) **Context:** Jane said that she hugged Mary but that Mary didn't hug her back. Mary said that she hugged Jane but that Jane didn't hug her back.
   a. Jane and Mary said that they hugged each other.
   b. # Jane and Mary said that they hugged.

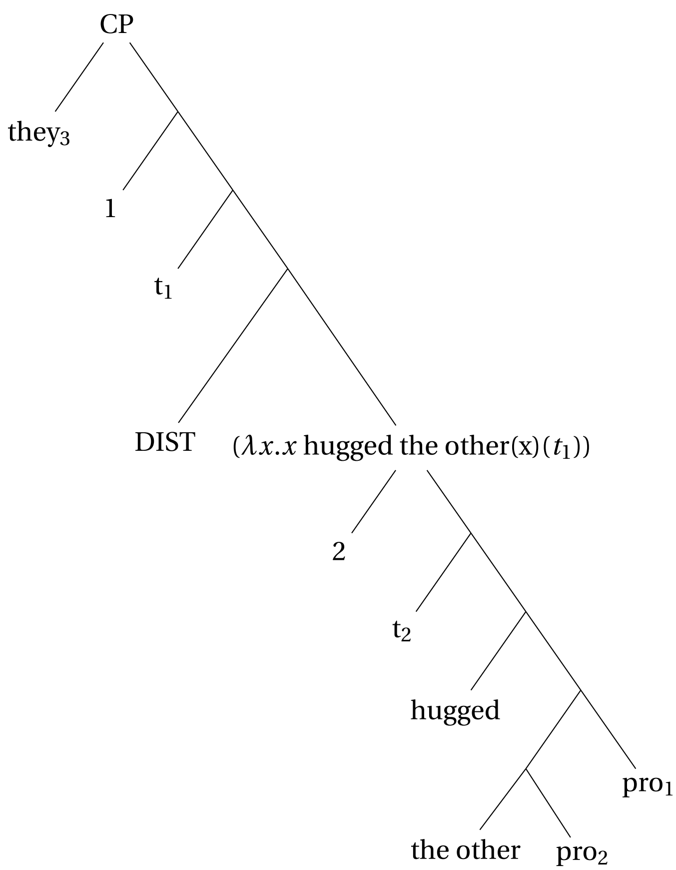
Heim et al. (1991) argue that overt reciprocals like (25) are ambiguous between a long-distance reciprocal reading in (25-a) and a low-scope reading in (25-b). The data in (24) can therefore be taken as evidence that covert reciprocals only have the low-scope reading in (25-b) (Carlson, 1998 a.o.). In what follows, I show that within the Sauerland (1998) implementation of the decompositional analysis, the LF where the arguments of *the other* are bound below *say* corresponds to the low-scope reading in (25-b), while the long-distance reading in (25-a) can be derived by binding the arguments of *the other* above *say*. The restriction in (23) then correctly predicts that the covert reciprocal only have the the reading in (25-b) and therefore is not true in the context in (24).

(25) Jane and Mary said that they hugged each other.
   a. **Long-distance reciprocal:** Jane said that she hugged Mary and Mary said that she hugged Jane.
   b. **Low-scope reciprocal:** Jane and Mary said that Jane hugged Mary and Mary hugged Jane.

In the low-scope reciprocal reading, the relevant predicate that needs to be reciprocated is *hug*, while for the long-distance reciprocal reading, reciprocity needs to target the *saying* predicate. In case of the low-scope reciprocal the relevant distributivity operator needs to apply to the predicate in (26-a) to ensure that the proposition embedded under *say* corresponds to *each of Jane and Mary hugged the other*. On the other hand, in the long-distance reciprocal, the relevant distributivity operator has to apply to the predicate in (26-b), which has *say* in its scope.

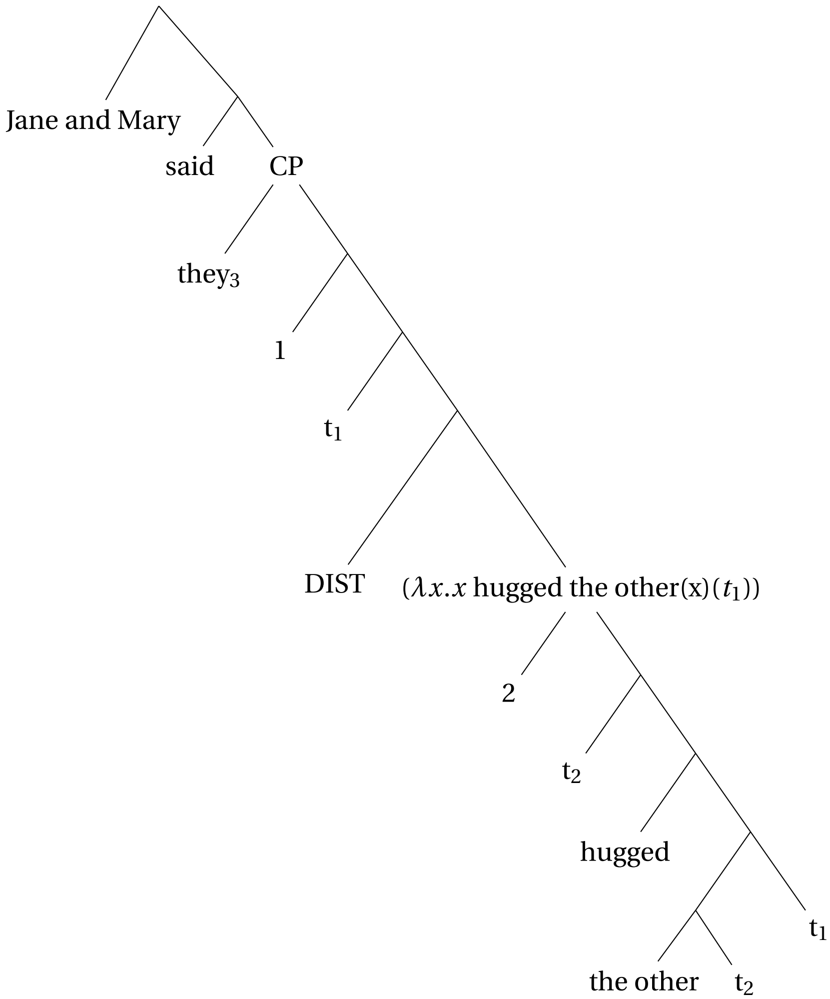
(26) a. Low-scope predicate: $\lambda x.x$ hugged the other(x)(t_1)
b. Long-distance predicate: $\lambda x.x$ said that x hugged the other (x)(t_1)

I will begin by showing that when both arguments of *the other* are bound below *say*, the operator that distributes to the atoms of *Jane and Mary* necessarily applies to the predicate in (26-a). To see this let's first consider the LF for the CP that is embedded under *say*. Here, since both arguments of *the other* are bound below *say*, DIST applies to the predicate in (26-a) and the proposition that ⟦say⟧ applies to is λw. they$_3$ hugged each other in w, as required to derive the low-scope reciprocal reading in (25-b), assuming that they$_3$ is either bound by or corefers with the DP *Jane and Mary*.



(27)

In (28-a), I give a full derivation and show in detail how the low-scope reading is derived. For concreteness, I assume here that *say* is a distributive predicate and therefore gives rise to distributive entailments. Furthermore, I assume that the subject of the embbedded clause (*they*) co-refers with *Jane and Mary*. The truth-conditions in (28-c), which correspond to the low-scope reading in (60-a) are derived.



(28) a.

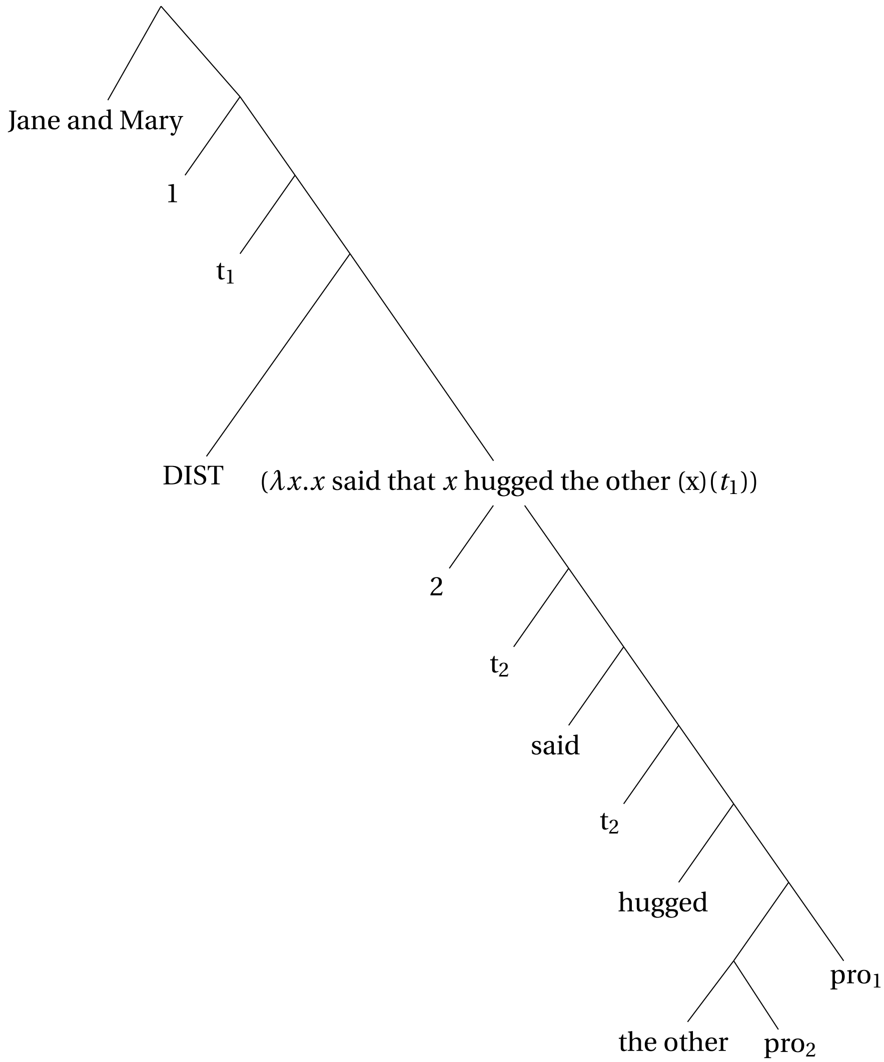
b. g(3)= j⊕m

c. $[\![(27)]\!]^{g,w}$= 1 iff $[\![\text{said}]\!]^{g,w}(\lambda w'.[\![\text{TP1}]\!]^{w'})(j \oplus m)$=1 iff
$[\![\text{said}]\!]^{g,w}(\lambda w'.[\![\text{TP1}]\!]^{w'})(j) = 1 \wedge [\![\text{said}]\!]^{g,w}(\lambda w'.[\![\text{TP1}]\!]^{w'})(m) = 1$ iff
$[\![\text{said}]\!]^{w}(\lambda w'.[\![\text{hugged}]\!]^{w'}(j)(m) = 1 \wedge [\![\text{hugged}]\!]^{w'}(m)(j) = 1)(j) = 1 \wedge$
$[\![\text{said}]\!]^{w}(\lambda w'.[\![\text{hugged}]\!]^{w'}(j)(m) = 1 \wedge [\![\text{hugged}]\!]^{w'}(m)(j) = 1)(m) = 1$ iff
(informal paraphrase) Mary said that Mary hugged Jane and that Jane hugged Mary and Jane said that Mary hugged Jane and that Jane hugged Mary

The long-distance reading, on the other hand, can be derived if we allow the arguments of *the other* to be bound above *say*. This is illustrated in the LF in (29-a). Notice here that DIST applies to the predicate in (26-b) and therefore we get that (29-a) is true iff Mary said that she hugged Jane and Jane hugged that she hugged Mary (29-b). The long-distance reading can therefore derived when we allow the arguments of *the other* to be bound above *say*, but not when they are bound below *say*.[4] Since in covert reciprocals, according to the restriction in (23), require the

[4]Note that the long-distance reading can be derived, under certain assumptions, if only the first argument of *the other* is bound below *say*, assuming that the lower distributivity operator is trivial and that there can be a higher distributivity operator that applies to the predicate in (26-b). Having this as an LF for covert reciprocals would still violate the condition in (97) and would give rise to the same truth-conditions as (29-a). For simplicity, I will therefore only consider LFs where both arguments of *the other* are bound together, relative to other scope-taking

arguments of *the other* to be bound below *say*, (23) correctly accounts for the fact that covert reciprocals only have the low-scope reading in (60-a).



(29) a.

b. $[\![\text{(29-a)}]\!]^w$=1 iff
$[\lambda y.((\text{DIST}(\lambda x.[\![\text{said}]\!]^w(\lambda w'.[\![\text{hugged}]\!]^{w'}([\![\text{the other}]\!](x)(y))(x))(x))(y))](j \oplus m)$=1 iff
$[\![\text{said}]\!]^w(\lambda w'.[\![\text{hugged}]\!]^{w'}(j)(m))(m) = 1 \wedge [\![\text{said}]\!]^w(\lambda w'.[\![\text{hugged}]\!]^{w'}(m)(j))(j) = 1$ iff
(informally) Mary said that Mary hugged Jane and Jane said that Jane hugged Mary.

We therefore see that the principle in (23) accounts for the differences in truth-conditions between overt and covert reciprocals under embedding predicates like *say*. In the rest of this section, I will extend this strategy to other cases discussed in Winter (2018) where there is no overt scope-taking element like *say*. I argue that nevertheless, these cases do involve a (covert) scope-taking element and just like with *say* above, give rise to a scope ambiguity in the overt reciprocal. On the other hand, in the covert reciprocal, only the low-scope reading is licensed, explaining the apparent differences in truth-conditions.

elements.

To see the general logic of how these differences will be derived, consider the schema in (30). Suppose that we have a two-place predicate P with a reciprocal object and a subject that denotes the plural individual a⊕b. Furthermore, suppose that we have a quantifier Q that quantifies over some argument of P and that the reciprocal binding can take place either above or below Q. When reciprocal binding takes place below Q, the quantifier outscopes the relevant distributivity operator and the quantifier therefore applies to the conjunction of P(a)(b)(..) and P(b)(a)(..), as shown in (30-a). On the other hand, when reciprocal binding takes place above Q, the relevant distributivity operator outscopes this quantifier and therefore the quantifier applies to each of the conjuncts P(a)(b)(..) and P(b)(a)(..) separately, as shown in (30-b). As a result of the restriction in (23), the covert reciprocal will only have the reading corresponding to (30-a) and therefore, given a quantifier which is not scopally commutative with conjunction, the difference in truth-conditions between (30-a) and (30-b) will result in a difference in meaning between the covert reciprocal and the overt counterpart.

(30) **General Schema:**

a. Low-scope distributivity: $Q(\lambda\alpha.P(a)(b)(\alpha) \wedge P(b)(a)(\alpha))$

b. High-scope distributivity: $Q(\lambda\alpha.P(a)(b)(\alpha)) \wedge Q(\lambda\alpha.P(b)(a)(\alpha))$

I will focus in the rest of this section on two such quantifiers that I argue are responsible for certain differences in truth-conditions between overt and covert reciprocals. The first is an existential quantifier over times, which I propose is contributed by perfective aspect. I show that scopal differences with respect to this quantifier derive the simultaneity requirement of covert reciprocals that was discussed above. In particular, the relevant schema as applied to this quantifier is given in (31). The covert reciprocal will only have the low-scope reading corresponding to (31-a), thus requiring that the two directions of the reciprocal to hold at the same time t. On the other hand, the overt reciprocal will also have a high-scope reading corresponding to (31-b), thus allowing for the two directions of the reciprocal to occur at different times.

(31) **Schema for simultaneity:**

a. Low-scope distributivity : $\exists t : P(a)(b)(t) \wedge P(b)(a)(t)$

b. High-scope distributivity: $\exists t : P(a)(b)(t) \wedge \exists t' : P(b)(a)(t)$

The second quantifier I propose is an analogous existential quantifier that quantifies over locations rather than times. I argue that this quantifier is responsible for a spatial overlap requirement that we see in the covert reciprocal with certain predicates. For example, consider the example in (55), discussed in Carlson (1998) and attributed to Leila Gleitmann. Here, in a context where Jane kissed Mary on one location (*Mary's arm*) and Mary kissed Jane on a different location (*Jane's arm*), the covert reciprocal is not true (55-a), while the overt counterpart is (55-b). I take this difference to be captured by the relative scope of reciprocal binding with respect to spatial quantifier I propose, as illustrated in (33). In particular, analogously to the temporal counterpart in (31), the covert reciprocal will only have the low-scope reading in (33-a), thus requiring that the two directions of the reciprocals to occur at the same location.

(32) **Context:** Mary kissed Jane on the arm and Jane kissed Mary on the arm (at the same time).

a. #Jane and Mary kissed.

b. Jane and Mary kissed each other.

(33) **Schema for spatial overlap:**

a. Low-scope distributivity : $\exists l : P(a)(b)(l) \wedge P(b)(a)(l)$

b. High-scope distributivity: $\exists t : P(a)(b)(l) \wedge \exists t' : P(b)(a)(l)$

Beyond these two cases which I discuss in detail below, there are more quantifiers that could give rise to potential scope differences between overt and covert reciprocals. For example, within the domain of possible worlds, we see what are arguably scope differences with respect to possibility modals, which are generally treated as existential quantifiers over worlds (34).

(34) Context: In a TV show, different contestants are sitting in different rooms. Contestants are allowed to talk through a microphone to another contestant to a different room, but once one contestant reaches out to another, the other one is not allowed to reply back or talk to them for the rest of the game. At this point, Mary hasn't talked to Jane and Jane hasn't talked to Mary.

a. Right now, Jane and Mary can talk to each other.

b. # Right now, Jane and Mary can talk.

We can also go beyond existential quantifiers and consider cases where it is less straightforward to see how scope differences with respect to distributivity give rise to the differences in truth-conditions. For example, within the temporal domain, we see also see truth-conditional differences with the imperfective, as shown in (35). If the imperfective was simply a universal quantifier over times, we would not expect to see these differences, since a universal quantifier would be scopally commutative with the distributivity operator, which is another universal quantifier. In particular, we would expect both (35-a) and (35-b) to be false in (35), since it is not true that at all times during the day, both Jane was hugging Mary and Mary was hugging Jane. The fact that the overt reciprocal is true in (35) raises questions about what kind of quantifier the imperfective denotes. Giving an analysis of the contrast in (35) is beyond the scope of this paper, but the hope is that once we have an understanding of how the reading in (35-b) arises, the differences between (35-a) and (35-b) can then be similarly accounted for in terms of scope.

(35) Context: All day today, Jane and Mary were alternating going to sleep and when one of them fell asleep the other would hug them.

a. # Jane and Mary were hugging all day.

b. Jane and Mary were were hugged each other all day.

The purpose of this section will simply be to investigate in detail the two relatively simple case-studies outlined above, where we can have a good understanding of the relevant ingredients that give rise to the truth-conditions for the overt reciprocals, and show that what looks like lexical differences between covert and overt reciprocals in those cases can be reanalyzed in terms of scope. I leave the exploration of further cases with different quantifiers for future work.

3.1 Covert reciprocals and simultaneity

The first case-study I consider is the simultaneity requirement that we observe with covert reciprocals with simple predicates like *hug*. Consider again the example in (36): while the overt reciprocal in (36-b) is true when Jane hugged Mary at one time and Mary hugged Jane at a different time, the covert counterpart in (36-a) isn't.

(36) Context: Jane hugged Mary while she was sleeping and then Mary fell asleep and Jane woke up and hugged her.

a. #Jane and Mary hugged.
b. Jane and Mary hugged each other.

I take (36) to show that covert reciprocals have a simultaneity requirement, while overt reciprocals do not. In particular, given a predicate R and two individuals A and B with a covert reciprocal of the form *A and B R'ed*, the event where *A Rs B* and where *B Rs A* have to occur at the same time. On the other hand, in the overt reciprocal variant, the two events could occur either at the same time or at different times. The same kind of truth-conditional difference can be seen with other predicates beyond *hug*, for example with *kiss* (37) and *talked to/spoke to* (38). This difference therefore demands a principled explanation.

(37) **Context**: Jane kissed Mary on the cheek while she was sleeping and then she fell asleep and Mary woke up and kissed her on the cheek.

a. # Jane and Mary kissed.
b. Jane and Mary kissed each other.

(38) **Context**: Mary was in a coma 2 weeks ago. John went to visit her and he was telling her some stories. Last week, Mary woke up from her coma, but John got into a coma. Mary went to visit him in turn and was telling him some stories.

a. John and Mary talked to/ spoke to each other.
b. #John and Mary talked/spoke.

I will argue that just like there were multiple scope positions from which the overt reciprocal could be bound when embedded under *say*, there are also multiple scope positions where the overt reciprocal can be bound here in the unembedded cases. In particular, all of the examples above have perfective aspect, which introduces an existential quantifier over times, and binding of the arguments of *the other* in the overt reciprocal can occur either above or below aspect.

I make the following assumptions about tense and aspect: (i) predicates like *hug* take a time interval as their first argument, in addition to the standard individual arguments; (ii) tense is referential, such that *Past* for example takes a contextually supplied time and presupposes that this time is before the utterance time (39-b) (Partee, 1973); (iii) I assume a simplified analysis of perfective aspect, where it existentially quantifies over points in time interval that tense picks out.[5]

[5] This simplified denotation for the perfective captures the main insights of the standard analysis where perfective places the event time as a subpart of the reference time (Bhatt and Pancheva, 2005). While it is standard to cash this out within event semantics (see Bhatt and Pancheva, 2005 a.o.), the lexical entry in (39-c) similarly ensures that the predicate P is true at some time within the reference time. For our purposes here, I will abstract away from the differences between the lexical entry in (39-c) and the more standard event-based analysis.

(39) a. $[\![\text{hug}]\!] = \lambda t.\lambda x.\lambda y.y$ hugged x at t

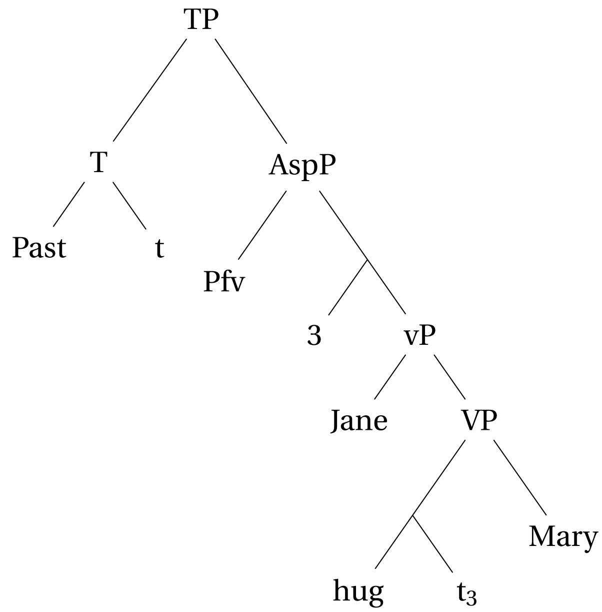
b. $[\![\text{Past}]\!]^c = \lambda t : t < t_c.t$

c. $[\![\text{Pfv}]\!] = \lambda P.\lambda t.\exists t' \in t : P(t') = 1$

To see how this works with a concrete example, consider (40). Predicate abstraction takes place below aspect, resulting in the necessary predicate of times for *pfv* apply to. The *t* that *Past* takes as an argument is a contextually specified time interval. $[\![\text{TP}]\!]$ is therefore predicted to be true iff John hugged Mary at some time within the contextually specified time interval.

(40) a. Jane hugged Mary.

b.

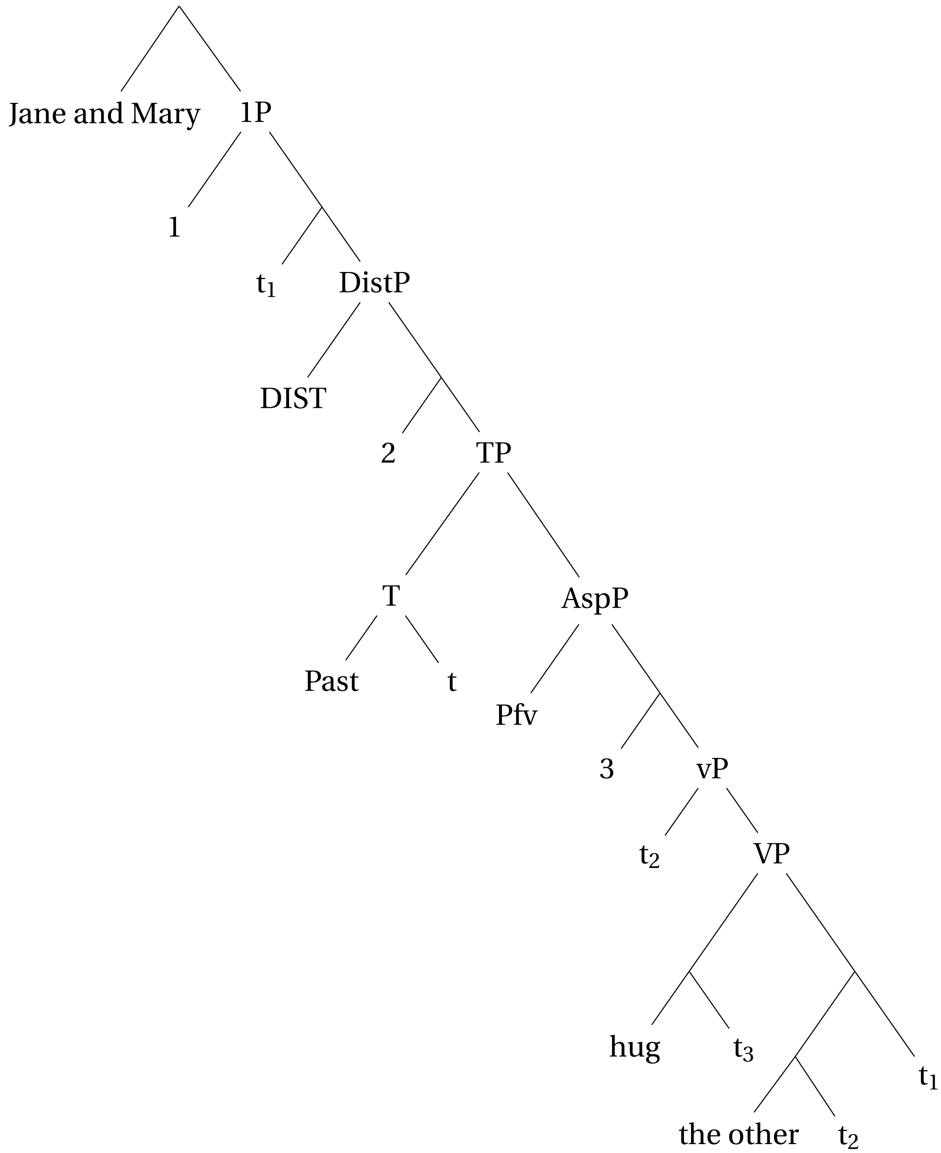


c. $[\![\text{TP}]\!]^c = 1$ iff $\exists t' \in t : [\![\text{hug}]\!](t')(m)(j) = 1$, defined iff $t < t_c$

Now, we can derive the possible LFs for the overt reciprocal in (41). Namely, just like with *say* above, I assume that the arguments of *the other* are free to be bound from any scope position. We therefore expect that there will be LFs corresponding to (41) where the reciprocal is bound below aspect and ones where the reciprocal is bound above aspect.

(41) Jane and Mary hugged each other.

I will begin with the LF with binding above aspect. Since tense does not involve any quantification, the relative scope of distributivity with respect to tense does not affect the truth-conditions. I therefore only consider the LF in (42-a), where *Jane and Mary* moves twice above tense to bind the arguments of *the other*. Under this LF the relevant distributivity to the individuals *Jane* and *Mary* takes place above the existential quantifier contributed by aspect, and therefore the truth-conditions in (42-c) are predicted.

(42) a. 

b. $[\![\text{TP}]\!]^c = 1$ iff $\exists t' \in t : [\![\text{hug}]\!](t')(t_1 \ominus t_2)(t_2) = 1$, defined iff $t < t_c$

c. $[\![(\text{42-a})]\!]^c = 1$ iff $\exists t' \in t : [\![\text{hug}]\!](t')(j)(m) = 1 \wedge \exists t'' \in t : [\![\text{hug}]\!](t'')(m)(j) = 1$, where $t < t_c$

We predict that (42-c) is true as long as Jane hugged Mary at some time and Mary hugged Jane at some time, within the contextually salient past time. The informal paraphrase in (43) makes clear how distributivity taking scope above aspect gives rise to this non-simultaneous reading.

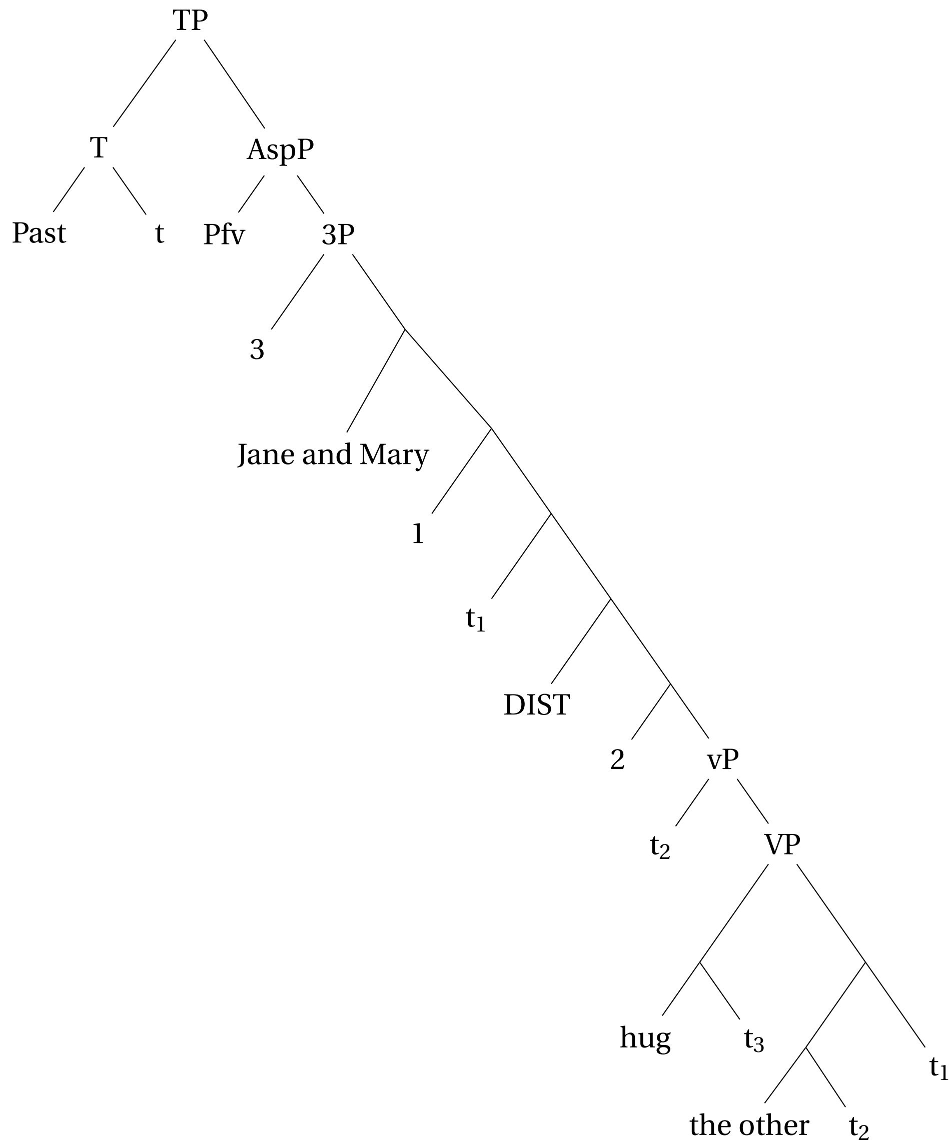
(43) **Non-simultaneous reading:** For each of Mary and Jane there is some past time such that they hugged the other at that time.

The LF where binding occurs below tense and aspect is given in (44-a).[6] Here, distributivity to

[6]Again, I only consider the LF here where both arguments of *the other* are bound below aspect. In fact, in this case if the second step of movement of *John and Mary* was to a position above aspect, we would still get the simultaneous reading.

Mary and *John* takes scope below the existential quantifier over times and therefore the resulting truth-conditions require that there is a time when both Jane was hugging Mary and Mary was hugging Jane. The predicted truth-conditions are given in (44-c): informally, (44-c) is true if there is some time within the past time interval such that Mary was hugging Jane throughout that time and Jane was hugging Mary throughout that time. We therefore have a distinct LF that only picks out the simultaneous reading of the reciprocal.

(44) a.



b. $[\![\text{3P}]\!] = \lambda t.[\![\text{hug}]\!](t)(m)(j) = 1 \wedge [\![\text{hug}]\!](t)(j)(m) = 1$

c. $[\![\text{TP}]\!]^c = 1$ iff $\exists t' \in t : [\![\text{hug}]\!](t')(m)(j) = 1 \wedge [\![\text{hug}]\!](t')(j)(m) = 1$, defined iff $t < t_c$

(45) **Simultaneous reading:** There is some past time such that each of Mary and Jane hugged the other at that time.

Given these assumptions above about the possible LFs for reciprocals, we can now see that the low-scope restriction on covert reciprocity straightforwardly predicts the truth-conditional differences between covert and overt reciprocals with respect to simultaneity. In particular, the overt reciprocals are ambiguous between the LF in (42-a) and (44-a) and therefore allows for a non-simultaneous reading. On the other hand, covert reciprocals only have the LF in (44-a), where the binding of the reciprocal arguments occurs as low as possible. Therefore, covert reciprocals are correctly predicted to only have the simultaneous reading.

There is independent evidence that overt reciprocals are in fact ambiguous between a simultaneous and possibly non-simultaneous LF, as I proposed in this section. Since the simultaneous reading is a special case of the non-simultaneous one, we have to embed the reciprocal in a downward-entailing environment in order to diagnose this ambiguity. Consider (46), where the reciprocal is in the restrictor of a universal quantifier.[7] Given the context in (46), the simultaneous reading, paraphrased in (46-a-i) is true. On the other hand, the possibly non-simultaneous reading, paraphrased in (46-a-ii) is not true, since Jane and Mary each hugged the other at some time, yet they didn't get a prize. Since the overt reciprocal in (46-a) is judged to be true in this context (under one reading), there has to be an LF corresponding to (46-a) that is only true when the hugging events were simultaneous.

(46) Context: There's a reality TV show observing couples after a fight. Couples 1-3 hugged and made up after the fight. Couple 4 was Jane and Mary. Jane hugged Mary after the fight but Mary didn't want to hug her back. Later when Jane was taking a nap, Mary went and hugged her. Couples 1-3 got a prize, but Jane and Mary didn't.
  a. Every couple who hugged each other the day of the fight got a prize.
    (i) **Simultaneous reading**: Every couple who hugged the day of the fight got a prize. (True)
    (ii) **Non-simultaneous reading**: Every couple whose members each hugged the other at some time got a prize. (Not True)

We therefore have evidence that overt reciprocals are ambiguous, as outlined above in this section. The truth-conditional differences with respect to simultaneity between covert and overt reciprocals then follow straightforwardly, given our low-scope assumption for covert reciprocals. I have therefore shown in this section that what looks like a lexical difference between covert and overt reciprocals can be systematically accounted for as a difference in scope-taking possibilities, given independently motivated assumptions about clausal architecture.

3.2 Simultaneity in inchoative predicates

In this section, I consider the behavior of a particular predicate, *fall in love*, with respect to the simultaneity requirement outlined in the last section. I show that if we assume that *fall in love* is a simple non-decomposable predicate, the analysis I proposed in section 3.1 does not predict the correct truth-conditions for the covert reciprocal. I propose that this is because *fall in love* is decomposable into the predicate *be in love* and an inchoative operator which picks out the time at which the predicate began to hold. I argue that this analysis is able to capture the peculiar behavior of this predicate with respect to the simultaneity requirement in terms of scope.

If we assume that *fall in love* is a non-decomposable lexical predicate, with the lexical entry

[7] The reason we can't use negation as the downward-entailing environment here is that the simultaneous and non-simultaneous reading collapse under negation due to homogeneity. I therefore use the restrictor of *every*, an environment where homogeneity does not have to project, which allows us to detect the ambiguity.

in (47-a), we predict the truth-conditions in (47-b) for the covert reciprocal with the simultaneity requirement, where Jane has to have fallen in love with Mary at the same time Mary fell in love with Jane. At first sight, this simultaneity prediction seems not to be borne out. Consider the context in (48): here the covert reciprocal in (48-b) is true even though Jane and Mary fell in love with each other at different times.

(47) a. ⟦fall in love (with)⟧= $\lambda t.\lambda x.\lambda y.$ y fell in love with x at t
b. ⟦Jane and Mary fell in love⟧=1 iff $\exists t' \in t$: Jane fell in love with Mary at t' and Mary fell in love with Jane at t' where t is a contextually salient past time.

(48) **Context:** Jane and Mary were friends, and Mary fell in love with Jane earlier this year. Jane wasn't interested in Mary at first, but she slowly fell in love with her and they've been dating for the past few months.
a. Jane and Mary fell in love with each other.
b. Jane and Mary fell in love.

Even though we don't see a simultaneity requirement in (48), there is still a truth-conditional difference between the covert and overt reciprocal with *fall in love*. Namely, the covert reciprocal requires overlap between the time when Mary was in love with Jane and when Jane was in love with Mary, but the overt reciprocal, as expected, places no such temporal restriction. This is illustrated in the context in (49), where the overlap requirement is not met and the covert reciprocal is not true, while the overt counterpart is.

(49) **Context:** Jane and Mary were friends, and Mary fell in love with Jane, but Jane wasn't interested in her. After Mary lost interest, Jane fell in love with Mary, but by that point Mary didn't love her back.
a. Jane and Mary fell in love with each other.
b. # Jane and Mary fell in love.

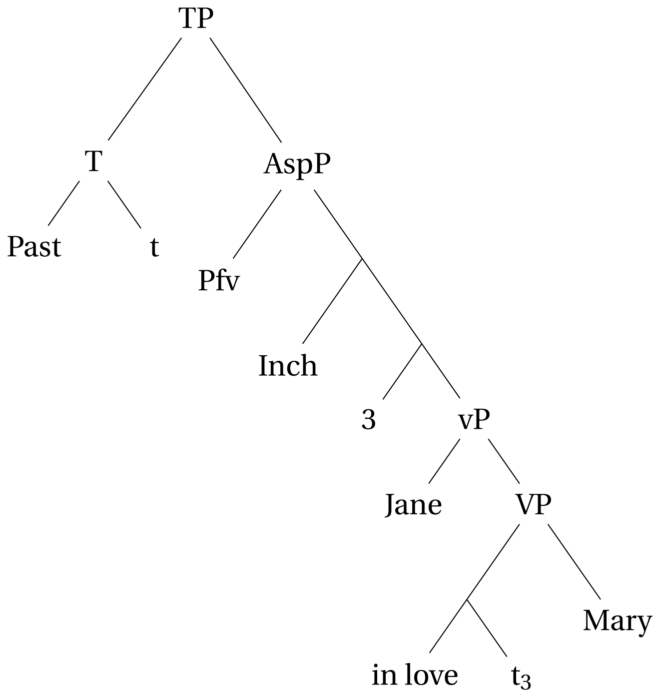
To summarize, the desired truth-conditions for the covert reciprocal can be paraphrased as in (50). I will argue that these truth-conditions are predicted if we decompose *fall in love* into the predicate *be in love* and an inchoative operator which modifies a predicate of times and picks out times when the predicate began to hold.

(50) *Jane and Mary fell in love* is true if Jane fell in love with Mary and Mary fell in love with Jane and the time intervals during which Jane was in love with Mary and Mary was in love with Jane overlap.

I begin by illustrating the analysis with a basic example in (51). The corresponding LF is given in (51-b) and the lexical entry for the inchoative operator *Inch* is shown in (52). ⟦Inch⟧ returns a predicate of times which is true of a time interval t if its argument is true at t and if leading up to t, its argument was false. The predicted truth-conditions for (51) are given in (52): (51) is true as long is there is some time within the past time interval such that Mary was in love with Jane at that time and leading up to that time, Mary wasn't in love with Jane. Under this analysis *fall in love* has an LF and corresponding truth-conditions similar to what one might readily assume for something like *started to be in love*, where *started* corresponds to the inchoative operator in (51-b).

(51) a. Jane fell in love with Mary.

b.



(52) $[\![\text{Inch}]\!] = \lambda f_{\langle i,t\rangle}.\lambda t. f(t) = 1 \wedge \exists t' : [\neg \exists t'' \in [t', t) : f(t'') = 1]$

(53) $[\![\text{Jane fell in love with Mary}]\!] = 1$ iff
$\exists t_1 \in t : [\![\text{in love}]\!](t_1)(m)(j) = 1 \wedge \exists t'[\neg \exists t'' \in [t', t_1) : [\![\text{in love}]\!](t'')(m)(j) = 1]$

We can now see how this analysis predicts the desired truth-conditions in (50) for the covert reciprocal. In the covert reciprocal, the binding of the reciprocal arguments has to occur below *Inch*. We therefore get the truth-conditions in (54) for *Jane and Mary fell in love.* (54) is true if there is a time within the past time interval t such that Jane was in love with Mary and Mary was in love with Jane at that time and leading up to that time it wasn't true that both Jane was in love with Mary and Mary was in love with Jane. This makes the correct predictions about (48) and (49). In (48) the time when Jane fell in love with Mary verifies the existential in (54): at that time each of Jane and Mary was in love with the other, and before that it wasn't true that each was in love with the other, since Jane wasn't in love with Mary. On the other hand, in (49), (54) is false, since there is not time when both Jane was in love with Mary and Mary was in love with Jane.

(54) $[\![\text{Jane and Mary fell in love}]\!] = 1$ iff $\exists t_1 \in t : [[\![\text{in love}]\!](t_1)(m)(j) \wedge [\![\text{in love}]\!](t_1)(j)(m)] \wedge$
$\exists t' : \neg \exists t'' \in [t', t_1)[[\![\text{in love}]\!](t'')(m)(j) \wedge [\![\text{in love}]\!](t'')(j)(m)]$

We therefore see that the apparently exceptional behavior of *fall in love* can be predicted once we assume an approporiate decompositional semantics for the predicate.

3.3 Spatial overlap requirement

Looking beyond the temporal domain, we can observe other differences between covert and overt reciprocals. One such case, presented in Carlson (1998) and attributed to Leila Gleitman, is given in (55). Here, the covert reciprocal in (55-a) is not true, while the overt counterpart is.

Note that this can't be reduced to the simultaneity requirement for covert reciprocals discussed in section 2.3. In particular, (55-a) remains not true in this context, even if the events of Mary kissing Jane and of Jane kissing Mary occur at the same time. In what follows, I will suggest that this difference is also due to a difference in scope but with respect to a quantifier over locations rather than over times.

(55) **Context:** Mary kissed Jane on the arm and Jane kissed Mary on the arm (at the same time).

   a. #Jane and Mary kissed.
   b. Jane and Mary kissed each other.

First, note that just like with the simultaneity requirement in section 3.1, there is evidence independent of (55) that the overt reciprocal is ambiguous between a reading which is true in (55) and one which, like the covert counterpart, is only true if Jane and Mary kissed each other on the mouth. To see this consider the context in (56). In this context, only the *kiss on the lips* reading is true, since Jane and Mary did in fact each kiss the other yet they didn't get a prize. Nevertheless, there seems to be a reading of (56-a) which is true in this context. This shows that the reading in (56-a-i) is in fact a possible reading for the overt reciprocal. As with the case of simultaeneity above, we therefore need an account of the ambiguity in the overt reciprocal.

(56) Context: There's a reality TV show observing couples after a fight. Couples 1-3 kissed after the fight. Couple 4 was Jane and Mary. After the fight, Jane kissed Mary on the arm and Mary kissed Jane on the arm at the same time. Couples 1-3 got a prize, but Jane and Mary didn't.

   a. Every couple who kissed each other the day of the fight got a prize.
      (i) **Kiss on lips reading**: Every couple who kissed the day of the fight got a prize. (True)
      (ii) **Kiss somewhere reading**: Every couple where each of them kissed the other got a prize. (Not True)

In section 3.1, I argued that there is an existential quantifier over time and that the scope of distributivity with respect to that quantifier determines whether we get a simultaneous or a non-simultaneous reading. I believe that the ambiguity evidenced by in (56), and by extension the truth-conditional difference exemplified in (55), can be accounted for in an analogous way, by extending this strategy to the spatial domain.

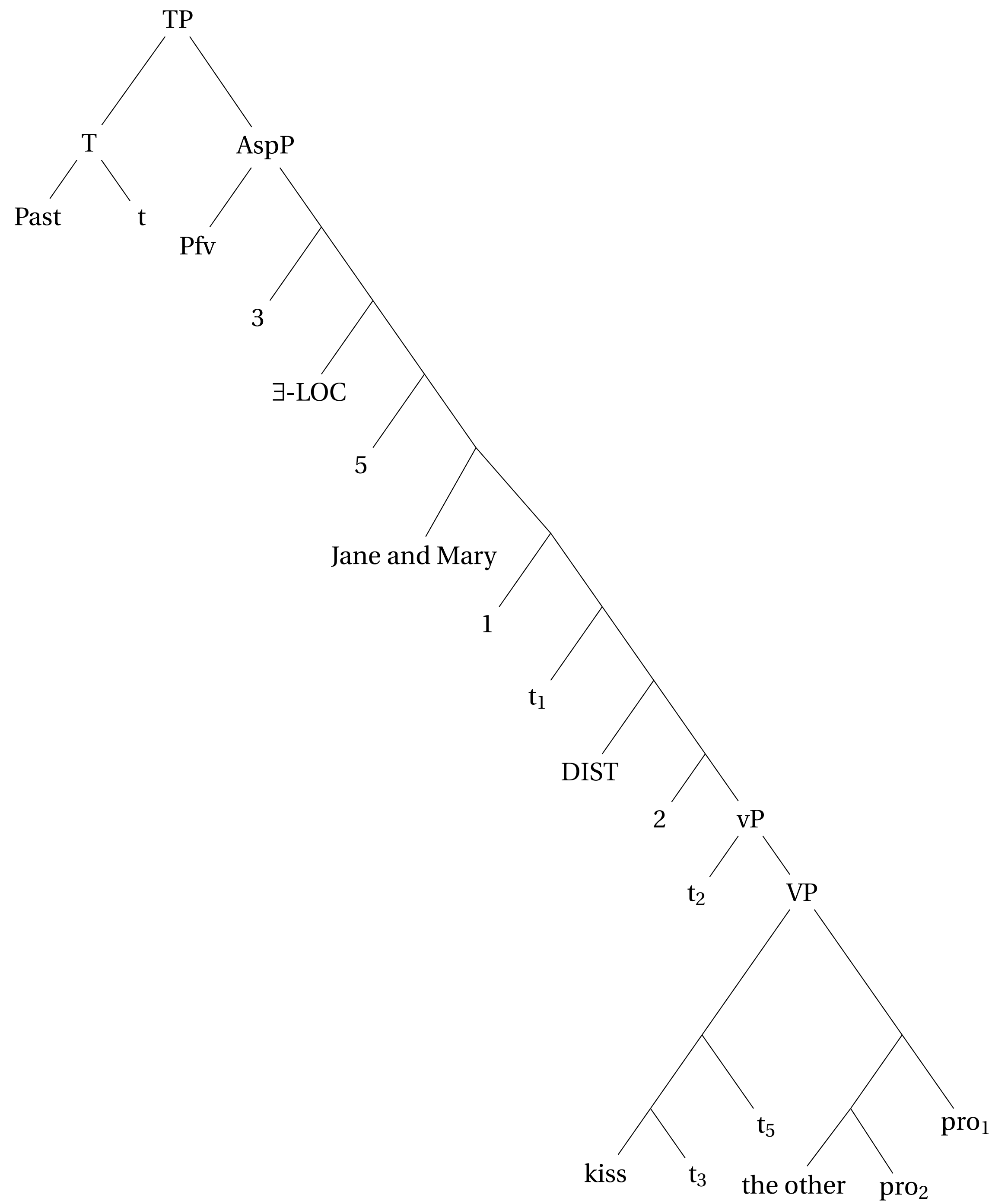
In particular, we can informally characterize the truth-conditional difference in (55) as follows: while the overt reciprocal allows the two kissing events to occur at different locations, the covert counterpart requires the two events to occur at the same location. It is reasonable to characterize the context in (55) as one where the two kissing events occur at different locations (one on Mary's arm and one on Jane's arm) and since the covert reciprocal requires spatial overlap, only the overt reciprocal is felicitous in this context.

To extend the strategy with aspect above, I propose that there is a similar existential quantifier that quantifies over locations rather than time intervals. I assume similarly that *kiss* takes a location argument in addition to the time interval argument and two individual arguments (57-a). Additionally, there is an existential quantifier over location (57-b). Now, in the covert reciprocal, distributivity will have to take scope below this existential quantifier over times and therefore we predict that the two events of Jane kissing Mary and Mary kissing Jane have to occur at the same location. This predicts that the covert reciprocal is not true in (55-a), while the overt counterpart is.

(57) a. $[\![\text{kissed}]\!] = \lambda t.\lambda l.\lambda x.\lambda y.y$ kissed x at time t at location l
b. $[\![\exists\text{-LOC}]\!] = \lambda P_{\langle l,t\rangle}.\exists l : P(l) = 1$

To see this in more detail, consider the LF in (58-a) with lowest binding, corresponding to the covert reciprocal. I assume for concreteness here that ∃-LOC takes scope below Aspect, but I leave it to future work to investigate the relative scope of these two quantifiers and whether there is independent evidence for a particular configuration. Both the existential quantifier over times contributed by the perfective and the existential quantifier over locations take scope above the relevant distributivity operator, and the truth-conditions in (58-b) are predicted for (58-a). Namely (58-a) is predicted to be true as long as Mary kissed Jane and Jane kissed Mary at the same time and the same location. Assuming that the *same location* requirement is met when Jane and Mary kiss on the lips and not when they each kiss the other's arm, the fact that the covert reciprocal is not true in (55) is predicted.

(58) a.



b. $[\![\text{(42-a)}]\!]^c = 1$ iff $\exists t' \in t\, \exists l : [\![\text{kiss}]\!](t')(l)(j)(m) = 1 \wedge [\![\text{kiss}]\!](t'')(l)(m)(j) = 1$, where $t < t_c$

I have therefore discussed three case-studies (simultaneity in simple predicates, simultaneity in complex predicates and the spatial overlap requirement) and showed that the low-scope restriction on covert reciprocals can account for the differences in truth-conditions between overt and covert reciprocal in all three of them, given reasonable assumptions about clausal architecture. So far, I have been focusing on predicates and contexts where we do see a truth-conditional difference between overt and covert reciprocals, but I have not touched on the question, featured prominently in Winter's proposal, of which types of predicates give rise to this difference. In the next subsection, I will turn to this question.

3.4 On the role of the predicate

In this subsection, I will show that my analysis given above predicts certain generalizations regarding which types of predicates give rise to apparent truth-conditional differences between covert and overt reciprocals. In particular, I show that for symmetric predicates, the high-scope and low-scope readings of the overt reciprocal will always be truth-conditionally equivalent and therefore the scope-based proposal given above correctly predict that there is no truth-conditional difference with the covert counterpart which only has the low-scope LF. I discuss the relationship between what the proposal here predicts and Winter's Reciprocity-Symmetry generalization. Furthermore, I argue that we also expect to see no truth-conditional differences when there are no covert quantifiers that bind arguments of the predicate. I show that this prediction is borne out with relational nouns, where event time and location do not factor into the truth-conditions in the same way as with verbal predicates like *hug* and *kiss*.

I will begin by discussing how symmetric predicates neutralize the apparent truth-conditional differences between covert and overt reciprocals. I argue that the account given in this section predicts the generalization in (59), which says that overt and covert reciprocals are always truth-conditionally equivalent when the predicate is symmetric.

(59) **Symmetry and Reciprocity:** Given a predicate R which takes two individual arguments (possibly in addition to a number of non-individual arguments) and allows for a covert reciprocal object: the covert and overt reciprocal are truth-conditionally equivalent if $\forall x, y, \alpha_1 ..., \alpha_n : \mathrm{R}(\alpha_1)(..)(\alpha_n)(\mathrm{x})(\mathrm{y}) \Leftrightarrow \mathrm{R}(\alpha_1)(..)(\alpha_n)(\mathrm{y})(\mathrm{x})$.

Note that since the account proposed here predicts that overt reciprocals are ambiguous, while covert reciprocals have only one of the readings of the overt counterpart (the lowest-scope one), the LF for the covert reciprocal will always be truth-conditionally equivalent to one of the LFs for the overt counterpart. What is therefore meant here by 'truth-conditionally equivalence' between the covert and overt reciprocal is that there is no situation where the overt reciprocal sentence has a corresponding LF which is true while the sentence with the covert counterpart has no LF which is true.

To derive this, consider again the general schema in (60) for the scope ambiguity that overt reciprocals give rise to in the presence of a quantifier Q that binds one of the arguments of the predicate P. Now, suppose that the predicate P is symmetric and therefore has the property defined in (61-a). We can then show that the low-scope and high-scope readings corresponding to (60-a) and (60-b) are equivalent for any such predicate. The derivation of this is given in (61), but more informally, since the two directions of the reciprocal are equivalent, the conjunction of the two directions is equivalent to one of the conjuncts regardless of whether it takes scope above or below the quantifier. We can therefore delete the second conjunct in both (60-a) and (60-b) without changing the truth-conditions. Therefore, (60-a) and (60-b) are equivalent for a symmetric predicate.

(60) **General Schema:**

a. Low-scope distributivity: $Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(a)(b) \wedge P(\alpha_1)(..)(\alpha_n)(b)(a))$
b. High-scope distributivity: $Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(a)(b)) \wedge Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(b)(a))$

(61) a. A predicate is symmetric iff $\forall x, y, \alpha_1..., \alpha_n : P(\alpha_1)(..)(\alpha_n)(x)(y) \Leftrightarrow P(\alpha_1)(..)(\alpha_n)(y)(x)$
b. Low-scope distributivity reading with a symmetric predicate:
$Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(a)(b) \wedge P(\alpha_1)(..)(\alpha_n)(b)(a)) = Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(a)(b))$
(since $P(\alpha_1)(..)(\alpha_n)(a)(b) = P(\alpha_1)(..)(\alpha_n)(b)(a)$ for any value of α_1)
c. High-scope distributivity reading with a symmetric predicate:
$Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(a)(b)) \wedge Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(b)(a)) = Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(a)(b))$
(Justification:$P(\alpha_1)(..)(\alpha_n)(a)(b) = P(\alpha_1)(..)(\alpha_n)(b)(a)$ for any value of α_1 and therefore $Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(a)(b)) = Q(\lambda\alpha_1.P(\alpha_1)(..)(\alpha_n)(b)(a)))$
d. The high-scope distributivity reading and the low-scope distributivity reading are therefore equivalent for an arbitrary choice of quantifier and arbitrary individuals a and b.

Now, we can conclude that with a symmetric predicate, all LFs for the overt reciprocal will give equivalent truth-conditions, regardless of where the reciprocal arguments are bound. The overt reciprocal will therefore not have a reading that is distinct from that of the covert reciprocal, which only has the lowest-scope LF. We have therefore derived the generalizaiton in (59). This generalization seems to hold in general, and is closely related to Winter's reciprocity-symmetry generalization, which I will discuss later in this section. For example, with *date*, a symmetric predicate, we don't see any truth-conditional differences between the overt and the covert reciprocal, both in the unembedded case (62) and under an attitude predicate like *say*.

(62) a. Jane and Mary dated.
b. Jane and Mary dated each other.

(63) a. Jane and Mary said that they dated.
b. Jane and Mary said that they dated each other.

Another case where we expect to see no truth-conditional differences between overt and covert reciprocals environments is when there are no quantifiers that bind arguments of the predicate with respect to which a scope ambiguity can arise in the overt reciprocal. For the purpose of illustrating this, let's assume that the only possible covert quantifiers are quantifiers over times and over locations, as outlined in section 2.1 and 2.3 respectively.

One potential candidate to see if the effects of these quantifiers can be neutralized is to look at stative predicates in the present tense, which do not depend on location. In what follows, I consider the predicate *is a confidante* which, just like *hug* and *kiss,* is non-symmetric and has a covert reciprocal variant. I show that, at least in the present tense, there is no truth-conditional difference between the overt reciprocal and the covert counterpart, which is expected because *confidante* will simply be a property that holds of an individual at the utterance time and will therefore not have any arguments that are bound by a quantifier over times or locations.

The relational noun *confidante* is clearly not symmetric. If Jane confides in Mary but Mary doesn't confide in Jane, (64-a) is true while (64-b) is not. In this environment, the truth-conditions for (64-a) for example simply depend on whether the property of being a confidante of Mary holds of Jane at the utterance time. It is therefore plausible to conclude that existential quantifiers over time or location do not play a role in deriving these truth-conditions. If this is true then we expect to see no truth-conditional differences between the overt and the covert reciprocal variants, and this is in fact what we observe. Consider the covert and overt reciprocal counterparts in (65-a) and (65-b). Here, there doesn't seem to be any truth-conditional difference between (65-a) and (65-b).

(64) a. Jane is a confidante of Mary.
 b. Mary is a confidante of Jane.

(65) Jane and Mary are more than friends..
 a. They are confidantes.
 b. They are confidantes of each other.

Note that since this predicate is not symmetric, when the scope ambiguity is due to an embedding predicate like *say*, where the potential ambiguity relates to whether the reciprocal targets the *saying* or the embedded predicate, we expect that the difference between overt and covert reciprocals will resurface. This is exactly what we observe. Consider the scenario in (66): here, only the long-distance reading of the reciprocal is true since each of Mary and Jane only said that they are a confidant of the other person. And indeed, the covert reciprocal in (66-a) is not true in this scenario, while the overt counterpart in (66-b) is.

(66) **Context:** Jane said that she is a confidante of Mary, but that she doesn't consider Mary a confidante of hers. Mary similarly said that she is a confidante of Jane but that she doesn't consider Jane to be a confidante of hers.
 a. #Jane and Mary said that they are confidantes.
 b. Jane and Mary said that they are confidantes of each other.

Additionally, even though in the present tense the predicate *confidante* does not depend on an existential quantifier over times or over locations, if there is an existential quantifier which quantifies over worlds, we expect the difference between covert and overt reciprocals to resurface. This is because the truth-values of (64-a) and and (64-b) clearly depend on the world of evaluation and therefore changing the scope of distributivity relative to an existential quantifier over worlds should effect the truth-conditions. This prediction is again borne out, as shown in (67).

(67) Context: In a game show, each contestant can choose a confidante, but once one contestant chooses another as a confidante, the other person can no longer choose them as a confidante.
 a. Jane and Mary can be confidantes of each other.
 b. # Jane and Mary can be confidantes.

We therefore see that while the truth-conditional difference between the overt and the covert reciprocal in certain non-symmetrical predicates like *confidante* can be neutralized in unembedded environments like (65), they resurface as expected when embedded under a predicate like *say* or in the presence of existential quantifiers over worlds like *can*.

There is a question here about how the generalizations outlined in this section, in particular the one regarding symmetry, relate to Winter's Reciprocity-Symmetry generalization. Recall that Winter argues that a predicate participates in a plain reciprocal alternation (where there are no truth-conditional differences between the 1-place variant and the conjunctive paraphrase) if and only if the predicate is symmetric (i.e. switching the arguments never changes the resulting truth-conditions). This generalization is restated in (68).[8] Note that this generalization is formulated as equivalence between the covert reciprocal (1-place variant) and a logical conjunction consisting of the binary predicate with the two arguments in both orders. As I discussed above, under the theory given here, what is relevant is the relationship between overt reciprocals and covert reciprocals, rather than the relationship between covert reciprocals and the conjunctive paraphrase. The generalization in (59) can therefore be seen as a variant of Winter's generalization that applies to the difference between covert and overt reciprocals.

(68) **Reciprocity-Symmetry Generalization:** Given a reciprocal alternation between a unary collective predicate P and a binary predicate R:
$\forall x, y : \mathrm{P}(x \oplus y) \Leftrightarrow \mathrm{P}(x)(y) \wedge \mathrm{P}(y)(x) \quad \text{iff} \quad \forall x, y : \mathrm{R}(x)(y) \Leftrightarrow \mathrm{R}(y)(x)$

While Winter's generalization is bi-directional, the generalization predicted in (59) regarding symmetry goes only in one direction. Namely, the account I propose does not predict that only symmetric predicates give rise to truth-conditional equivalence between overt and covert reciprocals. If we accept the conclusion above that we do in fact get truth-conditional equivalence in the present with *confidante* without symmetry, then the one-directional generalization in (59) is in fact the correct one for the relationship between overt and covert reciprocals. Note that since Winter's generalization relates to the conjunctive paraphrase and not the reciprocal, it is possible both that only the weaker generalization in (59) holds for equivalence between overt and covert reciprocals and that the generalization in (68) is correct regarding the relationship between the covert reciprocal and the conjunctive paraphrase. In fact, when we discuss non-maximality in section 4, we will see that both overt and covert reciprocals are expected to differ from logical conjunction in truth-conditions when the predicate is not symmetric, thus offering a different way to account for the other direction of Winter's generalization.

3.5 Interim conclusion

In this section, I argued for a version of the syntactic account for covert reciprocals, where covert reciprocals differ from their overt counterparts only in having to be bound as low as possible. Under this account, overt reciprocals are always ambiguous, depending on where the reciprocal is bound, while the covert counterparts simply pick out one of the readings of the overt reciprocals, namely the one with narrow-scope binding.

Before delving into further predictions of this approach, I would like to point out a generalization regarding all of the cases discussed in this section . Abstracting away from the details of the particular case-studies, an immediate prediction is that there will never be a context where the overt reciprocal is not true (on any reading), while the covert reciprocal is, since the covert reciprocal corresponds to one of the readings of the overt counterpart. This prediction seems to be borne out, at least in the cases discussed so far. In all of these cases, there are contexts where the overt reciprocal can be uttered felicitously while the covert counterpart can't, but there are no contexts where the converse is true. A purely lexical account where covert reciprocals are in

[8]Again, I'm focusing only here on pluralities of two individuals and assuming in (68) that x and y are atomic individuals.

fact 1-place collective predicates does not have a principled explanation for this generalization, since the 1-place and 2-place variants of the predicate are simply two different lexical items.

Note at this point that one might accept that the differences discussed in this section are due to scope but nevertheless formulate a modified lexical account that accepts that some of the differences between the 1-place variants on one hand and overt reciprocals and conjunctions on the other might be related to scope. In particular, the lexical account can maintain that the 1-place variants are collective predicates and assume that they relate to the 2-place variants as outlined in (69). Now, since this relation between the 1-place variant and the reciprocal conjunction is a lexical one, it will correspond to an LF where conjunction takes scope below all other operators. On the other hand, we would expect that in syntactic conjunction, conjunction can apply to higher nodes rather than to the predicate itself, giving rise to differences in truth-conditions between syntactic conjunction and the logical conjunction in (69).

(69) Given two predicates $P_{\text{1-place}}$ and $P_{\text{2-place}}$ with the same phonological realization, where $P_{\text{1-place}}$ and $P_{\text{2-place}}$ participate in a reciprocal alternation, and given two individuals, a and b:
$\forall l, t : [\![P_{\text{1-place}}]\!](t)(l)(a \oplus b) \Leftrightarrow [\![P_{\text{2-place}}]\!](t)(l)(a)(b) \wedge [\![P_{\text{2-place}}]\!](t)(l)(b)(a)$

For example, assuming that the only relevant quantifier is perfective aspect, an existential quantifier over times as above, this would predict that *Jane and Mary hugged* is true as long as there is a time when Jane hugged Mary and Mary hugged Jane at that time, as shown in (70-a). On the hand, in the case of syntactic conjunction, we can assume that conjunction targets AspP and therefore that the existential quantifier over times takes scope below conjunction. As a result the truth-conditions in (70-b) are predicted for syntactic conjunction. Under this lexical account, the truth-conditional difference between the 1-place variants and the conjunctive paraphrase with respect to simultaneity can therefore be predicted simply from the lexical generalization in (69).

(70) a. $[\![\text{Jane and Mary hugged}_{\text{1-place}}]\!] = 1 \text{ iff } \exists t' \in t : [\![\text{hugged}_{\text{1-place}}]\!](t')(j \oplus m)$
$= 1 \text{ iff } \exists t' \in t : [\![\text{hugged}_{\text{2-place}}]\!](t')(j)(m) \wedge [\![\text{hugged}_{\text{2-place}}]\!](t')(m)(j)$

b. $[\![\text{Jane hugged}_{\text{2-place}} \text{ Mary and Mary hugged}_{\text{1-place}} \text{ Jane}]\!] =$
$1 \text{ iff } \exists t' \in t : [\![\text{hugged}_{\text{2-place}}]\!](t')(j)(m) \wedge \exists t'' \in t : [\![\text{hugged}_{\text{2-place}}]\!](t')(m)(j)$

This type of account would be a lexical account that, unlike Winter's (2018) tries to maintain a systematic logical relationship between the 1-place and the 2-place variants for all predicates. Of course, since this account equates the 1-place variant with logical conjunction, this account will face problems in the cases discussed by Winter (2018) for example where the covert reciprocal patterns with the overt reciprocals but not with a conjunctive paraphrase.

In the next section, I present some additional data and argue that covert reciprocals, modulo the scope requirement, systematically pattern like overt reciprocals and unlike logical conjunction. In particular, I show that covert reciprocals exhibit homogeneity and non-maximality. I argue that these patterns are systematically predicted by the version of the decompositional account of reciprocals outlined in section 2 (Sauerland, 1998; Beck, 2000) and therefore take them to provide strong evidence that covert reciprocals are in fact reciprocals. While the lexical account can potentially postulate additional lexical rules to account for these inferences, I take the fact that covert reciprocals systematically give rise to the full range of readings that overt reciprocals give rise to as evidence that they are best treated as low-scope reciprocals, following the account proposed in this section.

4 Evidence for the syntactic account

On the account proposed in section 3, covert reciprocals only differ from overt reciprocals in requiring that the arguments of *the other* are bound at the lowest possible scope position. This analysis therefore predicts that, setting this requirement aside, covert reciprocals should give rise to the full range of inferences that overt reciprocals give rise to. In particular, Sauerland (1998) and Beck (2000) argue that reciprocals involve covert pluralization/distributivity operators and therefore exhibit phenomena associated with these operators in plural predication more generally. In this section, I discuss two such phenomena - homogeneity and non-maximality - and show how they follow from Sauerland's (1998) analysis which I outlined in section 2. I show that in both cases, covert reciprocals pattern with the overt counterparts, as predicted by the account proposed in section 3. I argue that this provides evidence against a lexical account which requires additional stipulations to account for the relevant inferences.

4.1 Homogeneity

The first case where we can see the contribution of pluralization operators in the LFs for covert reciprocals concerns the interpretation of reciprocals in downard-entailing environments. In particular, both overt and covert reciprocals give rise to homogeneity effects, just like plural definites more generally.

Plural predication gives rise to an apparent truth-value gap known as homogeneity (Fodor, 1970). This is illustrated in (71): neither (71-a) nor its negated counterpart in (71-b) is true in the context in (71), where only one of the two students smiled. Note that the counterpart with an overt *each* in (71-c) lacks homogeneity.

(71) **Context:** There are two students, Jane and Mary. Jane smiled but Mary didn't.
  a. # The two students smiled.
  b. # The two students didn't smile.
  c. The two students didn't each smile.

An analogous truth-value gap is observed with overt reciprocals (Krifka, 1996; Dotlačil, 2010; Kobayashi, 2021). This is illustrated in (72): neither (72-a) nor its negated counterpart in (72-b) seems to be true in the context in (72). I show below that this pattern is predicted if we assume following Sauerland (1998) that distributivity in (72-b) is due to a covert operator and not the *each* in *each other*. Note again that the counterpart here where distributivity is due to an overt *each* lacks homogeneity (72-c).

(72) **Context:** Jane hugged Mary while Mary was sleeping.
  a. # Jane and Mary hugged each other.
  b. # Jane and Mary didn't hug each other.
  c. Jane and Mary didn't each hug the other.

Both homogeneity with plural definites more generally and with reciprocals can be accounted for by assuming a truth-value gap in the denotation of DIST (Schwarzschild, 1993; Križ, 2015) . I start by illustrating how homogeneity works in the simple case in (71). I assume that DIST has the truth and falisty conditions given in (73) (Schwarzschild, 1994), where after DIST applies to a predicate, the resulting predicate is only false of a plurality if it is false of all atomic subparts of it. Now, assuming that DIST applies to ⟦smile⟧ in (71), this correctly predicts that *Jane and Mary smiled* is only false if neither Jane nor Mary smiled (74).

(73) For a distributive predicate P, DIST(P)(x)=
   a. 1 iff $\forall y \leq_{AT} x : P(y) = 1$
   b. 0 iff $\neg \exists y \leq_{AT} x : P(y) = 1$
   c. # otherwise

(74) ⟦DIST⟧(⟦smiled⟧)(m⊕j)=0 iff ⟦smiled⟧(m)=0 ∧ ⟦smiled⟧(j)=0

Abstracting away from the contribution of Aspect for the moment, we can now derive the truth-conditions for the negated reciprocal in (72-b). Again, assuming that negation simply switches truth and falsity this will correspond to the falsity conditions for the original LF given in (10). The predicted truth-conditions are given in (75): (72-b) is predicted to be true if neither Jane hugged Mary nor Mary hugged Jane. We have therefore derived the homogeneity effect with reciprocals by using independently motivated assumptions about the distributivity operator more generally.

(75) ⟦Mary and Jane hugged each other⟧= 0 iff
   ⟦Mary and Jane 1 t_1 DIST 2 t_2 hug [the other t_2 t_1]⟧=0 iff
   $\lambda y.$ ((DIST($\lambda x.$⟦hug⟧$(x)(y \ominus x)$)) (y)) (m⊕ j)=0 iff
   (⟦hug⟧(m)(j)=0 ∧ ⟦hug⟧(j)(m)=0)

In order to see the predictions of the account given in section 3 with respect to homogeneity, we have to derive the truth-conditions for the two LFs where distributivity takes scope above and below aspect. It turns out that the same falsity-conditions are predicted under both the simultaneous and non-simultaneous LF: they are both false iff there is no time when Jane hugged Mary and no time when Mary hugged Jane. To see this let's first start with the falsity-conditions for the non-simultaneous LF in (76). Here, distributivity takes scope above aspect, and the homogeneity gap in (73) therefore ensures that (76) is false iff for neither Jane or Mary is there a time when they hugged the other person.

(76) **Non-simultaneous LF**: ⟦Mary and Jane 1 t_1 DIST 2 Pfv 3 t_2 [[hug t_3] [the other t_2 t_1]]⟧=0
   iff $\lambda y.$ ((DIST($\lambda x. \exists t' \subseteq t :$ ⟦hug⟧$(t')(x)(y \ominus x)$)) (y)) (m⊕ j)=0 iff
   $\neg \exists t' \subseteq t :$ ⟦hug⟧$(t')(m)(j) = 1 \wedge \neg \exists t' \subseteq t :$ ⟦hug⟧$(t')(j)(m) = 1$

Deriving the resulting falsity-conditions for the simultaneous LF is less straightforward. Here, since the distributivity operator takes scope below the existential quantifier over times, we must ask how homogeneity projects from the scope of this quantifier. I will show below that the final truth-conditions in (77) are predicted if we assume, following Križ (2015), that homogeneity projects with a strong Kleene logic. In particular, this predicts that the simultaneous LF is false iff for neither Jane or Mary is there a time when they hugged the other person, just like the non-simultaneous counterpart in (76).

(77) **Simultaneous LF**[9]: $[\![$Pfv 3 [Jane and Mary] 1 t_1 DIST 2 t_2 [[hug t_3] [the other t_2 t_1]] $]\!] = 0$ iff $\neg\exists t' \subseteq t : \lambda y.\ (\mathrm{DIST}(\lambda x.[\![\mathrm{hug}]\!](t')(x)(y \ominus x))(y))(m \oplus j) = 1$ iff $\neg\exists t' \subseteq t : [\![\mathrm{hug}]\!](t')(m)(j) = 1 \wedge \neg\exists t' \subseteq t : [\![\mathrm{hug}]\!](t')(j)(m) = 1$

Strong Kleene gives us the projection pattern in (78) for a truth-value gap under a negated existential quantifier. (78) states that the negated existential is true iff for all individuals (in the restrictor of the quantifier), the potentially trivalent proposition resulting from applying the scope predicate to that individual is false. This derives the correct reading for simple cases of homogeneity under a negative quantifier like in (79): (79) is correctly predicted to be true iff *for all students x, x read the books is false* (i.e. x read none of the books). The same pattern is observed when the negated existential quantifier is a temporal quantifier, as with *never* in (80).

(78) Given x of type α and P of type $\langle \alpha, t \rangle$,
$[\neg\exists x : P(x)] = 1$ iff $\forall x : [P(x) = 0]$

(79) No student read the books.
≈ No student read any of the books.

(80) Mary has never read the books.
≈ There is no time when Mary read any of the books.

Given this rule for projection out of negated existential, we can now derive the final truth-conditions for (77). The simultaneous LF is predicted to be false iff for all times within the contextually specified time interval both *Jane hugged Mary* and *Mary hugged Jane* are false or equivalently that there is no time when Jane hugged Mary and no time when Mary hugged Jane, as represented in the truth-conditions in (77). We therefore predict that, under both the simultaneous and the non-simultaneous LFs, the negated overt reciprocal in (72-b) is only true if neither Jane hugged Mary nor Mary hugged Jane at any time within the contextually specified time interval. This therefore correctly derives that (72-b) is not true in (72) on both LFs.

Turning to covert reciprocals, since they only have the simultaneous LF, they are predicted to be false according to the falsity-conditions in (77). Assuming again that negation simply switches truth and falsity, we predict the truth-conditions paraphrased in (81) for covert reciprocals and their negated counterpart, with the truth-value gap given in (81-c).

(81) a. $[\![$Jane and Mary hugged$]\!]$ is true iff there is some past time such that each of Jane and Mary hugged the other.
b. $[\![$Jane and Mary didn't hug$]\!]$ is true iff there is no past time such that either of Jane and Mary hugged the other.
c. Neither is true iff (only one of Jane and Mary hugged the other) or (Jane hugged Mary at one time and Mary hugged Jane at a different time).

We can now test whether covert reciprocals do in fact have the predicted truth-value gap. Consider first the context where only one of Mary and Jane hugged the other in (82). As illustrated in (81-c), we expect that neither the covert reciprocal nor its negated counterpart is true in such

[9] I assume here, following Križ (2015), that homogeneity projects with a Strong Kleene logic.

a context. This prediction is borne out: both (82-a) and (82-b) are judged not to be true in (82). Another scenario where we predict a truth-value gap is given in (83), where the two hugging events occured at different times. Again, neither the covert reciprocal in (83-a) nor its negated counterpart in (83-b) is judged to be true here.

(82) **Context**: Jane hugged Mary while she was sleeping.

a. # Jane and Mary hugged.
b. # Jane and Mary didn't hug.

(83) **Context**: Jane hugged Mary while she was sleeping. Later, when Mary woke up and Jane was sleeping, Mary hugged Jane.

a. # Jane and Mary hugged.
b. # Jane and Mary didn't hug.

Note that for some speakers, the truth-value gaps in (71), (82) and (83) are not as sharp as what is reported above. Namely, these speakers somewhat accept (72-b), (82-b) and (83-b) in the given contexts. One possibility is that this is due to the availability of a non-maximal reading which would make (82-b) and (83-b) true here. Since it is expected that homogeneity comes hand-in-hand with non-maximality, the possibility of non-maximal readings must be controlled for when testing for homogeneity. I return to this issue at the end of section 4.2, but for now observe that in the judgements corresponding to the truth-value gap become sharper in the context in (95), which as I discuss in the next subsection is a context that blocks non-maximality.

(84) **Context:** Jane and Mary are a couple in a show. They have been fighting, so the game show said they will each get a prize if they hug the other person. Jane went and hugged, but Mary was still upset so she didn't hug Jane back. Someone, who is trying to report what happened, says:

a. **Covert reciprocal:**
   (i) #Mary and Jane hugged.
   (ii) #Mary and Jane didn't hug.
b. **Overt reciprocal:**
   (i) #Mary and Jane hugged each other.
   (ii) # Mary and Jane didn't hug each other.
c. **Overt each:** Mary and Jane didn't each hug the other.

We see that covert reciprocals, like overt reciprocals, give rise to a homogeneity truth-value gap, as predicted by the syntactic account proposed in section 2. Note that the lexical account is unable to account for this truth-value gap without positing additional lexical stipulations. In particular, under the lexical account, the 1-place variant of *hug*, $[\![\text{hug}_{1-place}]\!]$, is a collective predicate that is only defined when it applies to plural individuals. On the other hand, the relevant homogeneity gap relates the 1-place *hug* to the two-place counterpart applied to the atoms of the plurality j⊕m. Access to the two-place counterpart is thus needed to formulate that there is a gap in scenarios where only Mary hugged Jane and where only Jane hugged Mary. This truth-value gap therefore requires an additional lexical stipulation in the lexical account. The required stipulation to account for homogeneity is given in (85): the collective predicate is true of a⊕b if the 2-place variant is true of the atoms of a⊕b in both directions and false if the 2-place variant is false in both directions.

(85) **Homogeneity stipulation:**

a. $\forall l, t : [\![P_{\text{1-place}}]\!](t)(l)(a\oplus b)=1$ iff $[\![P_{\text{2-place}}]\!](t)(l)(a)(b)=1 \wedge [\![P_{\text{2-place}}]\!](t)(l)(b)(a)=1$

b. $\forall l, t : [\![P_{\text{1-place}}]\!](t)(l)(a\oplus b)=0$ iff $[\![P_{\text{2-place}}]\!](t)(l)(a)(b)=0 \wedge [\![P_{\text{2-place}}]\!](t)(l)(b)(a)=0$

The lexical account therefore requires additional stipulations to account for the truth-value gap that covert reciprocals exhibit. The syntactic account, on the other hand, straightforwardly accounts for this gap as the result of homogeneity. The presence of a homogeneity gap therefore provides additional evidence for the syntactic approach.

4.2 Non-maximality

Another phenomenon that has been argued to come hand-in-hand with homogeneity is non-maximality or exception tolerance (Brisson, 1998). In particular, given an appropriate context and QUD, a predicate can be true of a definite plural without being true of all subparts of it. Consider the example in (86): in this context, the predicate *laughed* is judged to be true of the plurality denoted by *the kids*, even though only 15 out of the 20 kids laughed. Note that the availability of non-maximality is dependent on the QUD (Malamud, 2012; Križ, 2016). In particular, a non-maximal reading is only available when worlds where the sentence is true on the maximal readings (i.e. where all of the kids laughed) are in the same cell of the QUD as the actual world (i.e. where only 15 of the kids were laughing and the other 5 were neutral). In other words, the maximal reading has to answer the QUD correctly. Given the context in (86), an answer of *all of the kids laughed* would answer the question with *yes*, and in the actual situation, where only 15 of the kids laughed and the other 5 were neutral, the answer to the QUD is also presumably *yes*. Therefore, this context allows for the desired non-maximal reading of (86).

(86) **Context 1:** There are 20 kids at the party. A clown was performing, and 15 of the kids were laughing and having fun, while the other 5 seemed neutral.

a. A: Was the clown show successful?
b. B: The kids laughed.

Note that given an alternative context in (87), where again 15 kids laughed, but the other 5 were crying, the definite plural is judged to not be true (87-b). This is expected given the QUD-sensitivity of non-maximal readings. Given the context in (87), the answer to the question in (87-a) is arguably *no*, since the 5 kids that were crying make it so that the show is considered unsuccessful. The desired non-maximal interpretation here therefore provides a different answer from the maximal one (that all of the kids laughed), which answers the question in the affirmative. Non-maximality therefore is unable to make (87-b) felicitous in this context, even though the same proportion of the kids laughed.

(87) **Context 2:** There are 20 kids at the party. A clown was performing, and 15 of the kids were laughing and having fun, while the other 5 got scared and started crying.

a. A: Was the clown show successful?
b. B: # The kids laughed. (adapted from Bar-Lev, 2020)

Now, the decompositional account of reciprocals predicts that, given an appropriate QUD and context, we should also see non-maximality with reciprocals. In particular, as we saw in section 2, the decompositional analysis creates the derived predicate in (88), where pro_2 is later bound by the subject. Now, supposing that the subject is *Jane and Mary*, the analogous non-maximal reading to (86-b) will allow the reciprocal to be true when the predicate in (88) is true of only one of Jane and Mary. The resulting non-maximal reading will make the reciprocal true when only one of Jane and Mary hugged the other (89).

(88) **Relevant Predicate:** $\lambda x.\ [\![\text{hugged}]\!](\text{x})([\![\text{the other}]\!](\text{x})(pro_2))$

(89) **Non-maximal reading of reciprocals:** Jane and Mary R'ed each other is true even though only one of Jane and Mary R'ed the other.

Beginning with overt reciprocals, we see that is prediction is borne out. Consider the context in (90), adapted from the experimental stimuli in Kruitwagen et al. (2017). Here, one possible QUD that one can infer is whether Jane and Mary had a positive interaction today. Even though it is false that Jane hugged Mary in this context, the overt reciprocal in (90-a) is felicitous here. We therefore see that reciprocals seem to have the non-maximal reading in (89) here. Note that given this QUD, we expect the non-maximal reading to be licensed here. The answer to the QUD here is arguably *yes* (that Jane and Mary did have a positive interaction), since Jane let Mary hug her. The maximal reading of (90-a) (that each of Mary and Jane hugged the other) also also answers the question with *yes*. The QUD given here therefore licenses a non-maximal reading that makes (90-a) true in this context.

(90) **Context 2:** Jane has been crying all day. Mary, her partner went and hugged her. Jane didn't hug Mary back but she let Mary hug her and was comforted by the hug.
Possible QUD: Did Jane and Mary have a positive interaction today?
  a. B: Mary and Jane hugged each other this morning.
  b. B': # Jane hugged Mary this morning.

As with the simple case with a definite plural in (87), altering the context can make the reciprocal not true, even if it remains true that Mary hugged Jane. Consider (91), for example. Here, instead of Jane accepting Mary's hug, she asked Mary to go away. Presumably here, the correct answer to the QUD is *no* (that Jane and Mary did not have a positive interaction). Therefore, the non-maximal reading can't be true in this context, since it would answer the question differently from the maximal one. I have therefore shown that the availability of a weaker reading for the overt reciprocal is sensitive to the QUD, as expected if these weaker readings are in fact due to non-maximality.

(91) **Context 1:** Jane has been crying all day. Mary, her partner, went and hugged her. Jane was still very upset and she asked Mary to go away.
Possible QUD:.Did Jane and Mary have a positive interaction today?
  a. # Mary and Jane hugged each other this morning.
  b. #Jane hugged Mary this morning.

Turning to covert reciprocals, if the analysis given in section 3 is correct, we expect that, just like overt reciprocals, they should give rise to non-maximality. Namely, a covert reciprocal like *Jane and Mary hugged* should be judged true in a scenario where only one of Mary and Jane hugged the other, given an appropriate QUD that licenses the non-maximal readings. This prediction is borne out. In particular, the data in (90) and (91) can be replicated with covert reciprocals, as shown in (92) and (93) . This shows that covert reciprocals give rise to a non-maximal reading which is sensitive to the QUD in the same way as the non-maximal reading with overt reciprocals.

(92) **Context 2:** Jane has been crying all day. Mary, her partner went and hugged her. Jane didn't hug Mary back but she let Mary hug her and was comforted by the hug.
Possible QUD: Did Jane and Mary have a positive interaction today?
Mary and Jane hugged this morning.

(93) **Context 1:** Jane has been crying all day. Mary, her partner, went and hugged her. Jane was still very upset and she asked Mary to go away.
Possible QUD:.Did Jane and Mary have a positive interaction today?
Mary and Jane hugged this morning.

These weaker readings of covert reciprocals have been observed experimentally in Kruitwagen et al. (2017). Winter (2018) uses this data as evidence for the lexical account, but I argued here that these weaker readings can in fact systematically be accounted for as due to non-maximality. Note that the lexical account again is unable to account for the non-maximality of covert reciprocals. This is because by definition, non-maximality allows for a predicate to be true of a plurality while being true of only a sub-part of it. Since the 1-place variant of *hug*, on the lexical analysis, can only apply to pluralities of cardinality 2 or greater, when the subject has cardinality 2, as in our examples above, there can be no non-maximality, since the predicate can't be true of a proper subpart of the plural individual that the subject denotes.

Another identifying property of non-maximality is that the exceptions can't be explicitly mentioned (Kroch, 1974; Lasersohn, 1999). This is illustrated in (94-a). Even in the context in (86), which in general licenses non-maximality, mentioning the exceptions as in (94-a) makes the sentence infelicitous. Now, if what we have in (90-a) and (92) are both instances of non-maximality, then we expect a similar pattern when the exception is mentioned. This prediction is borne out for both covert and overt reciprocals , as shown in (94-b) and (94-c). Even given the context in (90), where the covert reciprocal is felicitous, mentioning the exception (that Jane didn't hug his Mary back) makes the sentence infelicitous. This provides further evidence that what we see in (92) is in fact an instance of non-maximality.

(94) a. # The kids laughed, but 5 of them didn't.
b. # Mary and Jane hugged, but Jane didn't hug Mary.
c. # Mary and Jane hugged each other, but Jane didn't hug Mary.

To summarize, I have argued that covert reciprocals, just like overt reciprocals, allow for non-maximal readings, as expected if they have the same LFs as overt reciprocals. As with homogeneity, since the 1-place predicate *hug* on the lexical approach can't be true of atoms, there can be no non-maximality when the subject has cardinality 2. Under the lexical analysis, this non-maximal reading therefore has to be stipulated as part of the lexical entry for the 1-place collective predicate. The fact that non-maximality in covert reciprocals behaves analogously to non-maximality in plural predication more generally provides additional evidence for the syntactic approach.

Note at this point that non-maximality is only detectable with non-symmetric predicates like *hug*, since in this case non-maximality allows for *Jane and Mary hugged* to have a weakened reading where it is true when *hug* is only true in one direction (i.e. when Jane hugged Mary but Mary didn't hug Jane). Given a symmetric predicate, like *Jane and Mary dated*, since the two directions are equivalent, there can't be a weaker non-maximal reading. At this point, we can therefore derive the other direction of Winter's reciprocity-symmetry generalization, which states that if a predicate is non-symmetric it will not give rise to plain reciprocity. Since any non-symmetric predicate will in certain contexts allow for non-maximal readings, for any symmetric predicate R, there will be contexts/QUDs where *Jane and Mary R'ed* is true when only *Jane R'ed Mary* is true, thus making *Jane and Mary R'ed* not truth-conditionally equivalent to *Jane R'ed Mary and Mary R'ed Jane*. Non-symmetric predicates therefore in general do not exhibit truth-conditional equivalence between the covert reciprocal and the counterpart with logical conjunction.

We can now see how to sharpen our original homogeneity data from the beginning of this section, by blocking non-maximality, which can obscure the homogeneity effect. To do this, we need a QUD where both directions of the reciprocal are relevant. This will ensure that there is no non-maximality, neither in the positive case nor under negation. Consider the context in (95): here it is relevant whether Mary hugged Jane and whether Jane hugged Mary, and we get a clear homogeneity effect. Both (95-b-i) and (95-b-ii) are clearly not true in this scenario. Similarly, with the overt reciprocal, both (95-c-i) and (95-c-ii) are not true in this scenario. Note that again the counterpart with an overt *each*, which lacks homogeneity, is true here.

(95) **Context:** Jane and Mary are a couple in a show. They have been fighting, so the game show said they will each get a prize if they hug the other person. Jane went and hugged, but Mary was still upset so she didn't hug Jane back.

   a. Implicit QUD: Who is gonna get a prize?
   b. **Covert reciprocal:**
      (i) #Mary and Jane hugged.
      (ii) #Mary and Jane didn't hug.
   c. **Overt reciprocal:**
      (i) #Mary and Jane hugged each other.
      (ii) # Mary and Jane didn't hug each other.
   d. **Overt each:** Mary and Jane didn't each hug the other.

In this section, I have argued that covert reciprocals, just like their overt counterparts, give rise to homogeneity and non-maximality. I showed that these readings can be derived straightforwardly by the decompositional approach outlined in section 2. On the other hand, there is no reason to expect these systematic parallels between overt and covert reciprocals on the lexical analysis. I therefore take the data discussed in this section as providing strong evidence for the syntactic analysis of covert reciprocals given in section 3, where they only differ from the overt counterpart in having a low-scope restriction.

5 Conclusion

I have argued for a theory where LFs for sentences like (96) involve a covert reciprocal in object position. I provided evidence for a syntactic analysis along the lines of Heim et al. (1991) by showing that, just like with overt reciprocals, we can diagnose the presence of pluralization/distributivity operators in the LFs for covert reciprocals.

(96) a. Mary and Jane dated.
b. Mary and Jane hugged.

The one stipulated assumption that this analysis relies on is the restriction in (97) that requires covert reciprocals to be bound at the lowest possible scope position. I argued that this restriction is sufficient for explaining a range of readings we obtain with covert reciprocals, without appealing to lexical stipulations.

(97) **Restriction on Covert Reciprocity:** The *each other* in a reciprocal can be ellided only if the contrast and range arguments of *the other* are bound at the lowest possible position.

While proposing a fully worked out account of the source of the restriction in (97) is beyond the scope of this paper, there are interesting parallels between (97) and certain restrictions on implicit arguments more generally. In particular, it has been argued that existential implicit arguments must take narrow scope (Fodor and Fodor, 1980; Bhatt and Pancheva, 2017). For example, the predicate *eat* can surface with or without an overt object (98), and we can treat the counterpart without an overt object in (98-b) as having a covert existential object. Just like we saw with covert reciprocals, there are differences in truth-conditions between the overt and covert existential in (98-b). This is illustrated in (99). While (99-a), with the overt *something*, can have a reading where there is something specific that exactly half of the students ate, (99-b) lacks this reading. This can be explained if overt *something* can take scope above *Exactly half*, while covert *something* has to take narrow scope, as noted in Fodor and Fodor (1980).

(98) a. Jone ate the cake.
b. John ate (something).

(99) a. Exactly half of the students ate something. half>> something; something>> half
b. Exactly half of the students ate. half >> Something; *something >> half

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