Some Puzzles of Anaphoric Binding
and Levels of Control*
Shinji Saito

1. Perhaps the most notorious puzzle about the binding theory is the fact that there are some cases in which an anaphor can take a non-c-commanding antecedent. In (1a), for example, *John* can bind *himself* contained within the subject, in apparent violation of the usual c-command requirement on the antecedent-anaphor relation:

(1) a. [The picture of himself$_i$] pleased John$_i$.
    b. *[The picture of himself$_i$] pleased John's$_i$ sister.
    c. [A fear of himself$_i$] is John's$_i$ greatest problem.
    d. *[The picture of herself$_i$] shows [that Mary$_i$ is an excellent dancer]
    e. [The picture of herself$_i$] shows [Mary$_i$ to be an excellent dancer]

But as can be seen from (1b-e), when an anaphor is not c-commanded by the antecedent, there are special conditions on the binding relation. Some other conditions may also be required for the paradigms of (2) and (3) to account for the behavior of anaphors in this position.

(2) a. [Each other's$_i$ pictures] pleased the boys$_i$.
    b. *[Each other's$_i$ wives] murdered the men$_i$.
(3) a. [The picture of himself$_i$] pleased John$_i$. (=(1a))
    b. *Himself$_i$ pleased John$_i$.

Noting the grammaticality difference between (2a) and (2b), for example, Giorgi (1984) and Pesetsky (1987) assume that the c-command violation seen in (1a) is possible only when the object is assigned the θ-role Experiencer by the verb that θ-marks the subject. In (2a) *the boys*, the antecedent for *each other* embedded in the subject NP, is assigned the Experiencer θ-role by *please* as required, while in (2b) *the men* is not, and hence the sentence is ruled out.

Giorgi's (1984) and Pesetsky's (1987) approach to the anaphors in this position, however, seems to be dubious. First, as Pesetsky (1987) notes, there is an important empirical problem seen in (3) that this approach must deal with. As the paradigm in (3) demonstrates, the object of the Experiencer verb can bind an anaphor properly contained within the subject ((3a)), but cannot bind an anaphor which is the subject ((3b)). Given their approach as it is, (3b) can no longer be excluded as well as (3a). Examples like those in (1c,e) also pose a difficulty for their approach; both *John* and *Mary* are not assigned the Experiencer θ-role by any verb, but can be an antecedent of an anaphor embedded in the subject.

Furthermore, Giorgi's (1984) and Pesetsky's (1987) approach seems to predict the following example (4) is as well-formed as (2a). But this prediction is not correct:

(4) *[For each other$_i$ to win] pleased the boys$_i$.[1]

I assume that a correct theory of anaphors taking a non-c-commanding antecedent should account for this asymmetry, as well as the paradigms of (1)-(3).

In Saito (1986), I argued that a sentence as in (1a) is in fact a control construction. Compare the paradigm of (1) with the following paradigm of the normal control construction:

(5) a. [PRO$_i$ Washing himself$_i$] was important to John$_i$.
   b. *[PRO$_i$ Living by himself$_i$] depressed John's$_i$ sister.
   c. [PRO$_i$ Living by himself$_i$] would damage John's$_i$ health.
   d. *[PRO$_i$ Contradicting himself$_i$] will prove [that Mr. Jones$_i$ is a liar]
   e. [PRO$_i$ Contradicting himself$_i$] will prove [Mr. Jones$_i$ to be a liar]

There seems to be an apparent parallelism seen between the paradigm of (1) and that of (5). To account for the paradigm illustrated in (5), I presented the following control theory based on the θ-domain condition as in Nishigauchi (1984):
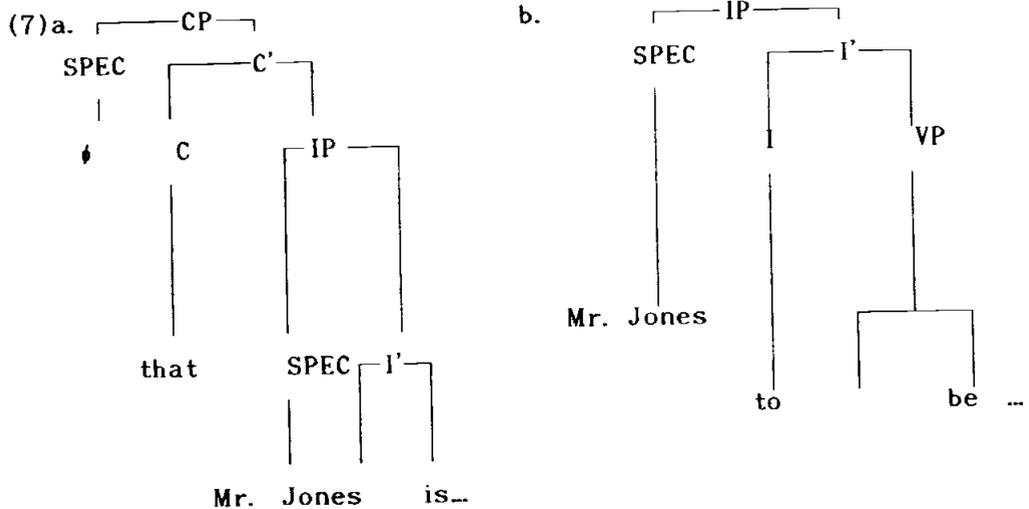
(6) α can control into S iff:

a. α is in the same θ-domain as this S, with the definition of

θ-domain as in:

γ is the θ-domain for α if γ is a minimal category-NP, S'

(or S)- that contains (i) α and (ii) a θ-assigner for α.

b. α is the specifier of β that is in the same θ-domain as this

S and is [-animate].[2]

In (5a) *John* is in the same θ-domain as the subject S, and hence controls the PRO. In (5b), on the other hand, *John* and the subject S are not in the same θ-domain, and hence the control relation cannot be established. If the phrase containing *John* as its specifier is [-animate] as in (5c), *John* can control the PRO. We assume that the object Ss in (5d) and (5e) take the structures below, following Chomsky's (1986a) version of X-bar theory:

(7)a.

    CP
SPEC ─── C'
  | C ─── IP
  ♦
         that   SPEC ─ I'
                 Mr. Jones   is...

b.

    IP
SPEC ─── I'
  | I   VP
Mr. Jones
         to   be ...

Two object Ss are both [-animate] in (5d) and (5e). But, as shown in (7), only *Mr. Jones* in (5e) is the specifier of the object S, controlling the PRO in the subject S as expected.

The assumption that controllerhood can be transferred only to its specifier position seems to receive support from the contrast below:[3]

(8) a. [PRO₁ killing himself₁ by hara-kiri] made Mishima's₁ books
more popular in France.

b. *[PRO₁ killing himself₁ by hara-kiri] made the books by Mishima₁
more popular in France.

As illustrated in (8), *Mishima* in the specifier position of *books* can
control into the subject S, while *Mishima* in the non-specifier position
cannot. The fact like this seems to show that there is a relation like
SPEC-head agreement in the sense of Chomsky (1986a) holding not only in CP
and IP but also in NP. We assume that when CP, IP or NP cannot be a
controller for some reason as in (5c, e) and (8), its controllerhood may be
transferred to its specifier by SPEC-head agreement (We are tacitly assuming
here that any category a agrees with itself and with its head.).

In Saito (1986) I argued that the control theory just reviewed in (6)
is also operative in examples which contain anaphors taking a non-c-
commanding antecedent. Our approach explains the mysterious behavior of
anaphors illustrated above. First of all, the parallelism observed in (1)
and (5) follows straightforwardly. And if the control theory is operative
within the NPs containing anaphors with a non-c-commanding antecedent, then
it follows that the anaphors must be contained within NPs with a head
assigning thematic relations, like *picture, fear*. Thus the discrep-
ancies observed in (2) and (3) are accounted for. The sentence in (2b) is
ruled out, because *wives* does not assign any thematic relations, and the
sentence in (3b) is out, because the anaphor is not embedded within the NP
which should be controlled into.

The asymmetry seen in (2a) and (4) is, however, still left unexplained.
In the following section we will go into the exact nature of control
relation within NPs and argue that within NPs, unlike within Ss, the control
and the binding theory apply at the level of argument structure, while
within Ss these theories apply at the level of syntactic structure where all
arguments in the argument structure must be realized, according to the
projection principle. In fact there is a good deal of evidence that within
NPs it is an implicit argument in the argument structure but not an explicit
one projected to the syntactic position that counts as a controllee or an
accessible SUBJECT defining a binding domain. In the course of the

discussion, then, the asymmetry between (2a) and (4) will be shown to follow as a consequence of this difference between NPs and Ss.

2. In the preceding section, we have argued that an anaphor taking a non-c-commanding antecedent is related to it by control relation. Our analysis of anaphors in this position , however, raises the question: how does the control theory apply within the picture noun phrase as in (2a), where the specifier position is filled and PRO cannot appear? There are, in fact, some pieces of evidence against the idea that PRO can appear in the specifier position of NP. Consider the following examples:

(9) a. [Pictures of himself$_i$] were important to John$_i$.
    b. [Pictures of him$_i$] were important to John$_i$.

Note that the meaning of these picture noun phrases is not what would be expected if the NPs had a PRO subject as in (9'a, b):

(9') a. [PRO$_i$ Pictures of himself$_i$] were important to John$_i$.
    b. [PRO$_j$ Pictures of him$_i$] were important to John$_i$. (i ≠ j)

In the case of *himself* in (9'a), the binding of the reflexive to the PRO subject would require that the PRO subject be coreferent with *John*, while in the case of *him* in(9'b)it would have to be disjoint. But this is not the case with (9'a, b). In either case the pictures can be John's pictures of himself or someone else's pictures of him, and hence there is no discernible contrast when using *him* or *himself*. This fact reveals that there is not an intermediate PRO linking *John* with *himself* or *him* in (9'a,   b).

   Furthermore, Williams (1985) argues that a putative control relation seen in (10) holds not between *they* and a PRO in the specifier position of *stories*, but between *they* and agent role in the argument structure of *stories*.

(10) They$_i$ told [stories about each other$_i$]

cf.*They_i told [stories about them_i]

In his terms, there is a linking between agent role of *tell* and agent role of *stories* like:

(10') They told [stories about each other]
    [AG_i,TH]   [AG_i,TH]

Williams' analysis receives support from the following examples:

(11) a. They_i told [each other's_i stories t_i]
     b. They_i told [yesterday's stories about each other_i]

The control relation observed in (10) remains unchanged in (11a, b), although the specifier position is filled and PRO cannot appear. This fact shows that control relations within NPs are not mediated by a PRO in the specifier position.

Williams (1985), moreover, observes that within NPs, unlike within Ss, not only subjects but also objects can be controlled, pointing out the following contrast:

(12) a. John_i underwent an operation.
                  [AG,TH_i]
     b. John_i performed an operation.
                  [AG_i,TH]

In (12a) *undergo* specifies association of *John* with theme role of *operation*, while in (12b) *perform* specifies with agent role.

Williams' (1985) arguments that within NPs the controllee is an implicit argument in the argument structure and that both subjects and objects can be controlled seem to be essentially correct, although some modifications might be required. (For further evidence in favor of Williams (1985), see Saito (1986).) Then we have:

(13) Within NPs the control theory applies at the level of argument

structure (that is, a controller into NP *sees* elements in the argument structure, but not the syntactic position.).

and we assume that one of the possible representations that (1a) takes is like:[4]

(1') a. [The picture   of   himself$_i$] pleased John$_i$.
       [AG,TH$_i$]

Here we express θ-marking in terms of feature sharing between a maximal projection and the implicit argument in the argument structure of the category that θ-marks it, following Stowell (1981).   In (1'a) *John* controls theme role with which *himself* is coindexed.   We refer to this relation as θ-*binding*.   Thus we have two types of binding relation as in:

(14) Two types of binding relation ── c-binding
                                   └─ θ-binding

C-binding is defined on the syntactic level and c-command restriction is crucial part of this relation, while θ-binding is defined on the basis of control relation, and hence θ-domain condition as in (6b) must be met.

Now let us turn to examples that seem to show that an accessible SUBJECT defining a binding domain is not in the syntactic position, but in the argument structure.   Consider:

(15) John$_i$ saw [Mary's picture of himself$_i$] (Mary=Possessor)

Oka (1986) and Saito (1986) observe that in (15) we find grammaticality only when *Mary* is understood to be the possessor of the picture.[5]   Thus in this case the anaphor *himself* in the picture noun phrase seems to be immune from the effect of Specified Subject Condition (SSC).   This grammatical judgement is consistent with the intuition reported in Nakajima (1984):

(16) Tom_i told Dick [Mary's story about himself_i]

Nakajima (1984) observes that *himself* in the picture noun phrase in (16) is not subject to the SSC and this sentence is completely grammatical. Note that in this case *Mary* in the specifier position is understood only as possessor just as in (15), but not as agent, because *tell* specifies association of *Tom* with agent role of *story*.

One might argue, then, that possessive NPs such as *Mary* in (15) and (16) do not count as accessible SUBJECTs, and hence do not define a governing category. But this claim is upended by examples like:

(17) a. They_i saw [cards from each other_i on my desk]

   b. *They_i saw [my cards from each other_i on my desk]

(Anderson (1984))

The contrast in (17) reveals that possessive NPs also act as accessible SUBJECTs.

We assume that *Mary* in (15) and (16) counts as an accessible SUBJECT as well at the syntactic level, but it is invisible at the level of argument structure. Hence we argue that it is at this level that the binding theory applies. Now let us assume that the representations of (15) and (16) are (15') and (16'), respectively:

(15') John_i saw [Mary's picture of himself_i]

$$[AG,TH_i]$$

(poss.) ... control ... θ-marking

(16') Tom_i told Dick [Mary's story about himself_i]

$$[AG_i, TH_i]$$

(poss.) ... control ... θ-marking
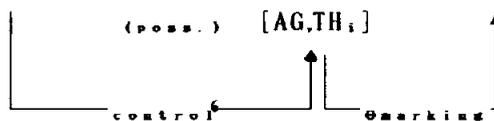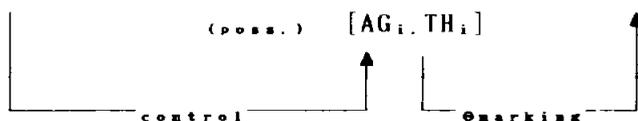
Let us consider the representation of (16'), to begin with. Williams (1985) introduces the following treatment of implicit arguments for the

binding theory, assuming that the binding theory *sees* the implicit arguments:

(18) An implicit argument c-commands X if the verb (or noun) of which it is an implicit argument c-commands X. If an implisit argument is coindexed with X and c-commands X, then it binds X.

We adopt his proposal. Then *himself* is properly bound by agent role which *Tom* controls, and hence the sentence is grammatical. This reveals that it is not *Mary* but agent role that is an accessible SUBJECT for *himself*. Thus we propose:

(19) Within NPs which have the the argument structure, implicit arguments can be an accessible SUBJECT when they are linked with syntactic positions and then define a governing category.

To account for the sentence in (15), we assume that only implicit arguments linked with syntactic positions are visible to the binding theoy. Let us turn then to the representation of (15'). In (15') we assume that the NP containing *himself* does not count as a overning category for the reflexive, because agent role which is unlinked cannot be an accessible SUBJECT for it. The matrix S, however, contains a governor of *himself* and a SUBJECT accessible to it (the matrix subject or AGR), and hence counts as the governing category for the reflexive in which it is θ-bound by *John*.

Within Ss, on the other hand, as Chomsky (1986b) points out, implicit arguments cannot be controlled.

(20) a. They$_i$ expected [PRO$_i$ to give damaging testimony]
     b. They expected [damaging testimony to be given]

In (20b) the passive involves no control and the giver(s) of testimony cannot be *they*. This fact shows that within Ss controllers must be syntactically designated elements as PRO and that unlike within NPs, implicit arguments in the argument structure cannot be a controllee.

Now let us turn to the asymmetry observed in (2a) and (4) in section 1.

To   repeat:

(2) a. [Each other's, pictures] pleased the boys,.
(4) *[For each other, to win] pleased the boys,.

So far we have argued that all of the examples in which an anaphor takes a non-c-commanding antecedent involve control relation. In (2a) *the boys* controls agent role of *pictures* with which *each other* is coindexed (θ-binding). The sentence in (4), however, cannot have any control relation, because within Ss only PRO can be controlled and implicit arguments cannot be controlled. Hence *each other* in (4) cannot be θ-bound, which causes the ungrammaticality. Thus it follows that it is the difference in choice of controllee between NPs and Ss which causes the asymmetry.

3. In section 2 we have seen, owing much to Williams (1985), that, unlike Ss, NPs do not have a PRO in the specifier position and that within NPs the control and the binding theories do not concern syntactic positions, but rather implicit arguments. Note, however, that we have paid attention only to picture noun type nominals like *picture*, *story*. And, in fact, there is some pieces of evidence that, unlike the picture noun type nominals, derived nominals such as *destruction*, *fear*, have a PRO in the specifier position. Consider the following paradigm discussed in Roeper (1986):

(21) a. John, enjoyed PRO, preparation of his funeral.
     b. John enjoyed his own funeral's preparation.

Roeper (1986) observes that in (21a) there is a clear reading that John prepared his funeral himself, while in (21b) the agent of *preparation* suddenly must be arbitrary. Thus there is no controlled reading for (21b). As Roeper (1986) notes, this fact is accounted for, if we posit a PRO in (21a) controlled by *John*.

Endo (1987) observes the similar fact:

(22) a. John gave Mary, a (PRO,) review of the book.
     b. *John gave Mary the book's review.

The sentence in (22a) is a causative *give*-sentence and involves a obligatory control construction.[7] Endo (1986) argues that if we assume that there is a PRO in (22a), then the ungrammaticality of (22b) follows straightforwardly, for preposing of *the book* erases PRO in the specifier position, thus PRO interpretation is broken up. This array of facts cannot be handled if we do not assume a PRO in the specifier of derived nominals.

Another argument for the presence of PRO in derived nominals comes from the contrast below:

(9) a. [Pictures of himself$_i$] were important to John$_i$.

(23) a. [A (PRO$_i$) fear of himself$_i$] is John's$_i$ greatest problem.

   b. [The (PRO$_i$) destruction of himself$_i$] was predestined to John$_i$.

As observed in section 2, in (9a) the pictures need not be John's pictures of himself. But in (23) a fear of himself and the destruction of himself must be John's fear of himself and John's destruction of himself, respectively. This fact also reveals that unlike in (9a), there is an intermediate PRO linking *John* with *himself* in (23a, b).

Furthermore, the claim that there is a PRO position in derived nominals like in Ss is bolstered by the following observation:

(24) a. PRO$_i$ Winning games requires PRO$_i$ losing games.

   b. Devotion to her country is devotion to his flag.

   c. Pictures of Mary are pictures of John's mother.

Lebeaux (1984) observes a peculiar restriction in the interpretation of PRO subjects appearing in both subject and object positions of a given verb. In (24a), for example, the reference of the two PROs must be identical. This linked reference phenomena, as pointed out by Safir (1984) and Jaeggli (1986), is also found with derived nominals, suggesting that derived nominals may have PRO subjects. Picture noun type nominals as in (24c), on the other hand, do not require identity of their understood subjects, unlike derived nominals. Thus we claim that agent role of derived nominals

involves a projection to the syntactic position, to the specifier position of the nominals, and hence is linked by PRO control, while agent role of picture noun type nominals is embedded in the argument structure, and hence is linked by implicit argument control.

If agent role of derived nominals, as we claim, is accessible only through PRO control, then our theory predicts that an anaphor in the subject position of derived nominals cannot take a non-c-commanding antecedent, just like an anaphor in this position of Ss. Indeed this is the case:

(25) a. ?The (PRO) destruction of each other's$_i$ oil fields was
reported by [Iran and Iraq]$_i$.
b. *Each other's$_i$ oil fields' destruction was reported by
[Iran and Iraq]$_i$.

Thus the contrast above provides further evidence for the claim that control relation must be established between an anaphor and its non-c-commanding antecedent.

4. In this paper we have observed three types of control relation, illustrated in (26):

(26)

	Level of control
Ss	syntactic control (PRO control)
derived nominals	subject....syntactic structure (PRO control) object....argument structure (implicit $\quad\quad\quad$ argument control)
picture nountype nominal	argument structure (implicit argument control)

(The claim that subjects and objects in derived nominals are controlled differently is already made in Roeper (1986). See Roeper (1986) for details.) And we have claimed that an anaphor taking a non-c-commanding antecedent is related to it by control relation, which is supported by the following paradigm, for example.

$\quad$ (4) *[For each other$_i$ to win] pleased the boys$_i$.

$\quad$ (25) b. *Each other's$_i$ oil fields' destruction was reported by
$\quad\quad\quad$ [Iran and Iraq]$_i$.

$\quad$ (2) a. [Each other's$_i$ pictures] pleased the boys$_i$.

Only in (2a) the control relation can be established, because agent role in the argument structure is controlled only in picture noun type nominals, as illustrated in (26).

$\quad$ Finally, one might raise a question: why can derived nominal have PRO subjects, while picture noun type nominals cannot?[8] We will not go into this problem in detail here, noting only the following fact. Derived

nominals can have action reading, while picture noun type nominals seem to have only product reading. It seems that only nominals on action reading can have a PRO position, like Ss. Then it follows that just like other non-derived nominals which also cannot have PRO subjects as in (27),

(27) *John read [PRO book]

picture noun type nominals, which can assign thematic relations, but have only product reading, do not have PRO subject.[9]

NOTES

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[1] Consider the following paradigms:

(i) a. They$_i$ expected that each other's$_i$ pictures would be on sale.
 b. Each other's$_i$ pictures pleased the boys$_i$. (=(2a))
(ii) a. They$_i$ expected that for each other$_i$ to come would be possible.
 b. *For each other$_i$ to win pleased the boys$_i$. (=(4))

Some recent studies (cf. Bouchard (1984, 1985) and Lebeaux (1985)) seem to assume that there are two types of anaphors. For example, Bouchard (1984, 1985) assume that anaphors like those in (i) and (ii) are *false anaphors* in that they are in fact syntactic pronouns and thus, unlike pure anaphors, do not bear a specific relation to their antecedents. A pure anaphors must be bound in a local domain and must be bound by a c-commanding antecedent as in (iii), but *a false anaphor* need not:

(iii) a. *They$_i$ expected [that Mary hates each other$_i$]
 b. *Their$_i$ wives loved each other$_i$.

But this approach makes an incorrect prediction in the case of (iib). *Each other* in this position is *a false anaphor* and can take its antecedent outside the local domain ((iia)), but cannot take a non-c-commanding antecedent.

[2] We assume here that only [+animate] can be a controller in this domain for some unknown reason.

[3] Our present analysis assumes that sentences like those in (8) do not contain a small clause.

[4] There is another possible representation in which *John* controls agent role of *picture* as in:

(i) [The picture of himself$_i$] pleased John$_i$.
[AG$_i$,TH$_i$]
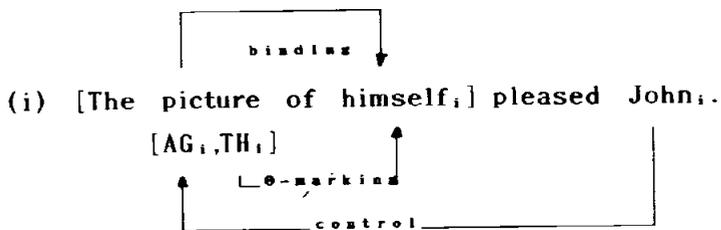
In this case, unlike in (1a), the picture must be John's picture of himself. Thus (1a) has two possible representations with different meanings. We will shortly turn to how agent role of *picture* binds *himself* in (i).

[5] Endo (1987) observes that the same phenomena are seen in Japanese (i) and in Spanish (ii) as well:

(i) a. *Karera wa Mearii no otagai no shashin o mita. (Mearii=agent)
        they   Mary   each other pictures saw
    b. Karera wa Mearii no otagai no shashin o mita. (Mearii=poss.)
(ii) a. *Ellos compraron el retrato de los unnos y los oeros
         they bought   the portrait   of   each   other
         de Juan. (Juan=agent)
         of   John
     b. Ellos compraron el retrato de los unnos y los oeros de Juan.
        (Juan=poss.)

[6] Of course, the sentence in (15) may take another representation in which *John* controls agent role as in (16'):

[7] See Cattel (1984) for a detailed study of causative *give*-sentences.

⁸ On this matter, see Saito (1987).

⁹ It also seems to be the case with derived nominals which have product reading as in *the destructions in Rome were sad to see*. Furthermore, we assume that when the verb specifies association between its argument and the implicit argument of the embedded nominal as in (12b) in section 2 (repeated here as (i)), this nominal has product reading. Let us consider:

(i) John₁ performed an operation.
               [AGᵢ,TH]

(ii) John performed Mary's operation.

In (ii), despite the fact that *Mary* appears in the specifier position, *John* is understood as agent of the operation just as in (i), suggesting that there is no PRO in *operation*.

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