On the "AMOUNT" Relativization and Its Relatives[*]

Shun'ichiro Inada
University of Tokyo / JSPS Research Fellow

shun_inada@yahoo.co.jp

1. Introduction

This paper considers the properties of the subordinate CPs in Japanese exemplified in (1). They are known as *Half* Relatives (Ishii (1991)). In (1) CPs modify the amount/degree expressions, such as *hanbun* 'half' and *bai* 'twice.'

(1)   a.   John-wa [DP[CP Bob-ga   yachin-ni tsukau] *hanbun*] -o   gyanburu-ni   tsukau.
           John-TOP   Bob-NOM   rent-for   use   half   -ACC gambling-for use
           'John uses for gambling half the amount Bob uses for the house rent.'
      b.   Mary-wa [DP[CP teisyu-ga   hitotsuki-ni   kasegu] *bai*]-o   hantsuki-de   kasegu.
           Mary-TOP   husband-NOM   one.month-in earn   double -ACC   half.month   earns
           'Mary earns in half a month double the amount her husband earns in one month.'

                                                                                    (Ishii (1991: 222))

In Ishii (1991), they are treated as an instance of the relative clauses involving the null-operator movement, because the amount/degree expressions modified by the relative clause in (1) are nominal.[1] The relative clause of this type shows comparative-like properties. Unlike other relative clauses, it modifies not an individual entity but an amount or degree. In the following, I will refer to the nominal element predicated with the relative clause as the "Head," distinguishing it from the "head" of the projection.

One might argue that the relative clause of this type is considered to be a counterpart of Carlson's (1977) amount relatives (ARs) in English. The two constructions are semantically similar. Both of them are potentially ambiguous between a restrictive relative (RR) reading and an amount relative (AR) reading.

(2)   *The interpretation of the DP which involves the relative clause*
      a.   It would take days to drink [DP the champagne they spilled that evening].   (Heim (1987: 38))
           (i)   the (same) amount of champagne that they spilled that evening   AR reading
           (ii) the very champagne that was spilled (on the floor)   RR reading

      b.   John-wa [DP Bob-ga yachin-ni tsukau hanbun]-o gyanburu-ni tsukau.   (Ishii (1991: 222))
           (i)   half as much money as Bob pays for the rent   AR reading
           (ii) the half of Bob's money that will be paid for the rent   RR reading

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[1] Ishii (1991) points out that the Japanese quantifiers, such as *hanbun* 'half,' are Q-quantifiers, which do not contain a head noun and express only the quantity. On the other hand, English quantifiers do not express just the quantity, but rather the whole DP including the head noun does. He argues that this difference explains why English does not have the relative constructions such as those corresponding to (1).

In (2), with a RR reading, the DP which involves the relative clause as a whole denotes the same entity as the relativized DP which is base-generated within the relative clause. Out of the the context, (2aii) and (2bii) are infelicitous. But in a certain context these RR readings are acceptable. On the other hand, with an AR reading, the relative clause CP denotes properties of amounts or degrees, and the DP which involves the relative clause is interpreted as denoting amounts or degrees, not individual entities.[2] Carlson (1977) claims that, in contrast to the RR reading in (3b), in (3c) the AR reading of the relative clause (3a) is obtained by the relativization of the degree operator *d*.[3]

(3) a. It would take days to drink [$_{DP}$ the champagne they spilled that evening].   \<Relatives\>
    b. they spilled THAT champagne that evening   : RR reading
    c. they spilled THAT MUCH (*d-many*) champagne that evening   : AR reading

(4) a. There are more women in high school than there are in college.   \<Comparatives\>
    b. There are THAT MANY (*d-many*) women in college

The relative clause with an AR reading is derived in the same way as the comparative construction in (4). Both the comparatives and the ARs involve A'-movement of *d* (or the phrase which involves *d*), and modify the amount/degree expressions.

However, the expressions modified by the relative clause of this type are not restricted to the amount/degree expressions. In Okutsu (1974) the overt Head-like amount/degree expressions, such as *hanbun* in (1), are considered to be one type of *Soutai Meishi* 'Relational Nouns (RNs).' Other types of the RN also function as apparent Heads which denote relative amount/degree. (RNs are italicized.)

(5) i) Temporal RNs   (Okutsu (1974))
    a. [[$_{CP}$ shokuji-o suru] *mae*]-ni 10pun hodo sanposuru.
        meal-ACC do front -at 10.minutes about take.a.walk
        '(he/she) takes a walk for 10-minutes before eating the meal.'
    b. [[$_{CP}$ sensou-ga owaru] 3kka *mae*]-ni haha-wa shinda.
        war-NOM ends 3.days front -at mother-TOP died
        'My mother had died 3 days before the war ended.'

    ii) Locative RNs   (Okutsu (1974))
    c. [[$_{CP}$ roujin-ga suwatteiru] *mae*] -de hato-ga mame-o tabeteiru.
        old.man-NOM is-sitting front -at pigeons-NOM beans-ACC are.eating
        'Pigeons are eating beans in front of the place where the old man is sitting.'

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[2] The ARs apparently have the same form as the RRs. Thus, the relative clause can be interpreted in either way: a RR reading or an AR reading.
(i) a. [Taro-ga katta hon (subete)]-o Hanako-wa utta.
        Taro-NOM bought book every -ACC Hanako-TOP sold
        'Hanako has sold the/every book(s) that Taro bought.'
    b. [Taro-ga katta hon (subete)]-o Hanako-mo katta.
        Taro-NOM bought book every -ACC Hanako-even bought
        'Hanako bought the/every book(s) that Taro bought.'
For instance, the relative clause in (ia) can have a RR reading because the common context facilitates it. It also can have an AR reading, as the ARs. On the other hand, the context forces the relative clause in (ib) to be interpreted as an instance of the ARs because it is quite unlikely that the same book (not the same title) can be bought by two different persons. However, it is possible to find some context to make the RR reading plausible. In this paper, I will refer to the relative clauses with the AR reading as the the ARs.
[3] Notice that I will discuss the issue relating to the identity requirement of the Head in section 4. (cf. Grosu and Landman (1998), McNally (2008)).

d. [[_CP_ akai bara-ga   oitearu] *mae*] -ni chiisana mushi-ga kite   tomatta.
     red rose-NOM is.put   front -at small   bug-NOM came.and sat.on
   'A small bug came and sat in front of the place where red roses were put.'

iii) Amount RNs = (1)   (Okutsu (1974), Ishii (1991))

e. John-wa [_DP_[_CP_ Bob-ga   yachin-ni tsukau] *hanbun*]-o   gyanburu-ni tsukau.
   John-TOP   Bob-NOM   rent-for use   half   -ACC gambling-for use
   'John uses for gambling half the amount Bob uses for the house rent.'

f. Mary-wa [_DP_[_CP_ teisyu-ga   hitotsuki-ni   kasegu] *bai*]-o   hantsuki-de kasegu.
   Mary-TOP   husband-NOM one.month-in earn   double -ACC half.month earns
   'Mary earns in half a month double the amount her husband earns in one month.'

Okutsu observes that the RNs are the nouns which denote a relative amount or degree. The CPs which modify them denote an amount or a degree (of some dimension), but not a specific entity, as we have seen in the AR reading above. Given the Okutsu's analysis, the *Half* relatives above can be analyzed as one type of the relative clause modifying the RN (hereafter RNRC).

Thus two questions arise. One question is concerned with whether the RNRC can be treated as a kind of relative clause. Consider the examples below. We would expect that (6a) and (7a) are derivationally related to the "reconstructed" sentences (6b) and (7b). The RNs of the (6a) and (7a), which are apparent Head-like phrases of the relative clause, would be interpreted in the base position within the relative clause.

(6)   a.   John-wa [_DP_ Bob-ga yachin-ni tsukau hanbun]-o gyanburu-ni tsukau.
           'John uses for gambling half the amount[= half as much money as] Bob uses for the rent.'
≠   b.   Bob-ga hanbun yachin-ni tsukau.
           'Bob uses the half (amount of the money) for the rent.'

(7)   a.   [_PP_[_CP_ sensou-ga owaru] 3kka mae ni] haha-wa shinda.
           'My mother had died 3 days before the war ended.'
≠   b.   Sensou-ga 3kka mae-ni owaru.
           'The war ended 3 days ago.'

However, the interpretation of the relative clause in the RNRC is not identical to that of "reconstructed" sentence. The relative clause of (6a) does not mean that the amount of money that Bob uses is a half of a certain amount, as the 'reconstructed' sentence (6b) means. Nor does (7a) mean that the war ended three days ago, as (7b) means. Instead, (7a) means 'three days before the war ended.' The RNs which function apparently as a Head of the RNRC cannot be identified as the gap within the relative clause. Moreover, the Head-like expression *mae-ni* 'in front of' in (7a) as a whole does not appear to be a noun, but a postposition. It can be considered to occupy the head of PP. But if this is the case, what does the "relative clause" modify?

The other question is related to the syntax and semantics of the temporal/locative phrase in Japanese. Okutsu (1974) claims that RNs in the temporal/locative PPs represent a point or a domain relative to some reference point. The typical examples are shown below.

(8)   a.   eki-no   *mae* -ni shoutengai-ga   aru.   (PLACE)
           station-GEN front-at shopping.district-NOM exist
           'There is a shopping district in front of the station.'
      b.   (sono) 5hun   *mae* -ni shokuji-o sumaseta.   (TIME)
           (that) 5.minutes front-at meal-ACC   finished
           '(I) finished the meal 5 minutes before that time.'

In the example (8a), the reference point in this locative PP is *eki* 'station.' In (8b), on the other hand, the reference point is determined by the DP involving the overt pronominal word *sono* 'that,' which is the point of time 5 minutes after he finished his meal. In other words, the reference point of PP is "signified" by the temporal/locative DP which occupies the complement position of PP, as illustrated in (9).

(9) $[_{PP}$ $[_{DP}$ so(PLACE/TIME)]-no   mae -ni]
              that   -GEN   front -at
        'before that time/in front of that place'

In the case of the subordinate CPs, how can they signify the reference point of the RNs?

Considering these two questions, this paper investigates the structure and derivation of the RNRCs. My claim is that the subordinate CP involved in the RNRC is a relative clause, though the RN modified by the relative clause is not the Head of the relative clause. The RNRC involves the Head which is distinct from the Head-like RN. The schema of the RNRC is illustrated in (10).[4]

(10) $[_{DP2/PP}$ $[_{DP1}$ $[_{CP}$ $[_{TP}$ … t_{DP} …] $[_{DP}$(Head)] C^0] $D1^0$] *RN* $D2^0/P^0$]   : RNRCs

The relative clause and the Head are internal to DP1, and the RNs are external to DP1.The Heads of the RNRCs can be covert. For example the Head of the amount type of the RNRC is AMOUNT, which is a phonetically null nominal in Japanese. These Heads are small nouns, which are considered to be semi-lexical items with functional meaning. They can be covert in various languages (Corver and Riemsdijk (2001), Kayne (2005)). The relativization of AMOUNT is illustrated in (11a).[5]

(11)   a. $[_{CP}$ [AMOUNT] $[_{TP}$ … [DP-no <AMOUNT>]…] $\emptyset_C$]   : Amount RNRCs in Japanese
         b. $[_{CP}$ [*d*-many N] *that*$_C$ $[_{TP}$ … <*d*-many N>…   ]]   : Amount Relatives
         c. $[_{CP}$ *d*-Op   *than*$_C$ $[_{TP}$ … [<*d*-many-x> Adj.]…]]   : Comparatives

(11b) and (11c) are the LF representations of the ARs and the comparatives in English. Both of them are the clausal modifier of the amount/degree. (11a) is considered to be an instance of the ARs because a variable left by A'-movement within CP is nominal as in (11b). It is also considered to be a comparative because what undergoes A'-movement is only the degree expression as in (11c).[6]

The organization of the paper is as follows. In section 2, I examine the internal structure of the temporal/locative PPs and argue that we cannot assign the appropriate interpretation to the RNRCs without postulating the covert Head. In section 3, I propose the Headed-relative analysis of the structure of both the temporal/locative RNRCs and the amount RNRCs. In section 4, I will discuss three consequences of the Headed-relative analysis.

2.   The Covert Head of RNRCs

In this section, I examine the internal structure of the temporal/locative PPs, based on the cartographic approach to the fine structure of the temporal/locative PPs. What is implicit in the cartographic approach is that

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[4] The derivation and structure of the RNRC will be further discussed in section 3.

[5] Within the relative clause CP, TP further raises to the higher Spec of CP, in the head-final languages with the word order of "relative clause CP-NP." Then the functional heads of DP layer merge with CP, to constitute DP.

    (i)   a. $[_{CP}$ (AMOUNT$_i$) $[_{TP}$ Bob-ga (AMOUNT$_i$) tsukau] C^0]

        b. $[_{DP}$ $[_{FP1}$ $[_{FP2}$ $[_{CP}$ $[_{TP}$ Bob-ga (AMOUNT$_i$) tsukau]   (AMOUNT$_i$) t_{TP} C^0] $F2^0$] $F1^0$] D^0]

[6] The direct translation of (11a) into English would yield an ungrammatical sentence, e.g., *the amount that he drank the champagne*.

semantic roles are localized in particular kinds of heads. The covert Head is motivated by the fine structure of the temporal/locative PPs. The fine structure of the temporal/locative PPs motivates the existence of the (covert) Head of the RNRCs distinct from the RN.

2.1. Previous Studies

2.1.1.   The Covert Temporal Operator in English Temporal PPs

Geis (1970) observes that the temporal PPs containing the subordinate CPs are ambiguous between two readings of the temporal PP.

(12)   a.   I saw Mary in New York [$_{PP}$ before [$_{CP1}$ she claimed [$_{CP2}$ that she would arrive]]].
       b.   I encountered Alice [$_{PP}$ after [$_{CP1}$ she swore [$_{CP2}$ that she had left]]].
       c.   I can't leave [$_{PP}$ until [$_{CP1}$ John said [$_{CP2}$ I could leave]]].
       d.   I haven't been there [$_{PP}$ since [$_{CP1}$ I told you [$_{CP2}$ I was there]]].

For example, (12a) may mean that I saw Mary in NY before she made the claim, or prior to "some time t that she alleged would be the time of her arrival. (Larson (1990: 170))" This does not mean, however, that all PPs containing subordinate CPs are ambiguous in the same way. The "lower" reading is not available with the following PPs containing *although, because, in case,* and *unless.*

(13)   a.   I still respect John [$_{PP}$ although [$_{CP1}$ he claims [$_{CP2}$ that he killed his mother]]].
       b.   I visited New York [$_{PP}$ because [$_{CP1}$ Mary dreamed [$_{CP2}$ that Max was there]]].
       c.   I won't visit New York [$_{PP}$ unless [$_{CP1}$ Bill promises [$_{CP2}$ Mary will be there]]].
       d.   I won't visit New York [$_{PP}$ in case [$_{CP1}$ Bill says [$_{CP2}$ Mary is there]]].   (Larson (1990: 173))

Note that the observed ambiguity does not depend on whether the relevant PP is a temporal PP or not, because the temporal PP headed by *while* does not show the ambiguity, either.

(14)   a.   I didn't see Mary in New York [$_{PP}$ while [$_{CP1}$ she said [$_{CP2}$ she was there]]].
       b.   I will be in Boston [$_{PP}$ while [$_{CP1}$ I promised [$_{CP2}$ I would be there]]].   (Larson (1990: 174))

Larson (1990) claims that the ambiguity in (12) patterns with that of the adverbial clause involving *when*, as illustrated in (15).

(15)   a.   [$_{CP1}$ when [$_{TP}$ she claimed [$_{CP2}$ she would arrive] t]]
       b.   [$_{CP1}$ when [$_{TP}$ she claimed [$_{CP2}$ she would arrived t]]]

The observed ambiguity comes from the structural difference concerning the position of the variable in the derivations in (15a) and (15b). Thus Larson takes (16) to be the LF of (12a), where the moved element is the empty operator of category NP generated in the adjunct position occupied by the bare-NP adverb *when*. Geis (1970) notes that the lower reading is not available when the extraction of the null operator from the lower position violates the island condition, as in (17).[7]

(16)   [$_{PP}$ before [$_{CP1}$ Op$_i$ she claimed [$_{CP2}$ t_i' that she would arrive t_i]]]

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[7] Chomsky (1986: 40) claims that the severity of the violation and the fact that it carries over to weak Subjacency violation in (i) suggests that it is an ECP effect, as in the case of adjunct extraction.
    (i)   I saw Mary in New York [before she asked [how to fix the car]].

(17) a. * I saw Mary in New York [PP before [CP1 Op she made the claim [CP2 that she had arrived *t*]]].
  b. * I haven't been in Paris [PP since [CP1 Op I told you the story [CP2 that I was there *t*]]].

Larson also claims that the null operator Op must be Case-marked. He proposes that the head P can Case-mark the Op in [Spec,CP1], assuming that the specifier position of the complement clause is the selection domain of P. It is worth noting that Larson's (1990) analysis of Case-marking is based on the fact about the Case-assigning property of P.

(18) a. {before, after, since, until}   ⎰ John arrived
                                          ⎱ that day
  b. while   ⎰ John slept
                                          ⎱ *that day
  c. {although, because, unless, in case} ⎰ Mary walked out on Max
                                            ⎱ *that fact/reason/eventuality

(18) indicates that the lower reading is available when the temporal P can select DP. Moreover, Larson notes that the Case condition he assumes is analogous to those holding in adverbial relatives as shown in (19).

(19) a. [DP the day [RC Op [I left *t*]]].
  b. [DP the way [RC Op [he spoke *t*]]].

2.1.2. The Fine Structure of Temporal/Locative PPs

Let us further consider the structure of the temporal/locative PPs. Watanabe (1993, 2008a,b) and Nomura (2008) investigate the structure of the temporal/locative PP and consider the semantic roles which functional categories of PPs bear, within the cartographic approach. Based on the vector-space semantics for the interpretation of the temporal/locative PPs (Zwarts (1997)), Watanabe (2008a,b) claims that each of the atomic information (semantic roles) of the vector-space semantics corresponds to the function of the functional heads of the temporal/locative PP, as illustrated in (20).

(20)

PP: Position of the vector

#P: Length of the vector

PnP: Direction of the vector
RP: Reference object of the vector
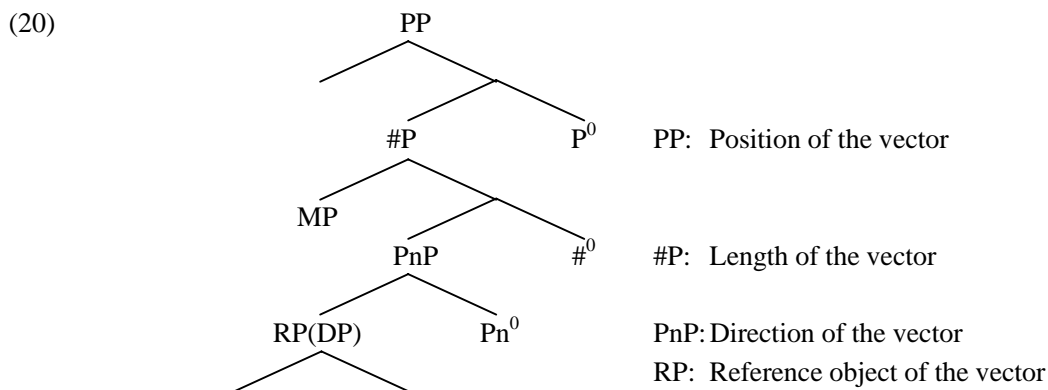
Let us look at the examples. The temporal/locative PPs in Japanese that involve RNs are repeated below.

(8) a. [PP eki-no *mae* –ni] shoutengai-ga aru.   (PLACE)
       'There is a shopping district in front of the station.'
  b. [PP (sono) 5-hun *mae* –ni] shokuji-o sumaseta.   (TIME)
       '(I) finished the meal 5 minutes before that time.'

As for the nominal property of the RN, Watanabe decomposes the complex P^0 such as *mae-ni* 'in-front-of' into two parts, Pn^0 and P^0. The position of the RN such as *mae* 'front' is a head of PnP, whose head Pn^0 is a "nominal core" of the functional layers of PP. The reference point of PP is signified by the complement of PnP: R(eference)P, which immediately dominates DP. It functions as the source of the temporal/locative vector. Then, #P, which is the functional projection above PnP, specifies the degree of Pn^0. The Measure phrase (MP) that numerically specifies the degree of Pn^0 as in (8'b) is thus located in [Spec,#P].

(8')   a.

```
                    PP
                   /  \
                 #P     P⁰
                /  \    -ni
              MP    \    at
              Ø    PnP    #⁰
                  /   \
            RP(DP)     Pn⁰
             /\        mae
          eki-no       front
        station-GEN
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b.

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                    PP
                   /  \
                 #P     P⁰
                /  \    -ni
              MP    \    at
            5-hun  PnP    #⁰
          5 minutes /  \
            RP(DP)     Pn⁰
             /\        mae
           TIME        front
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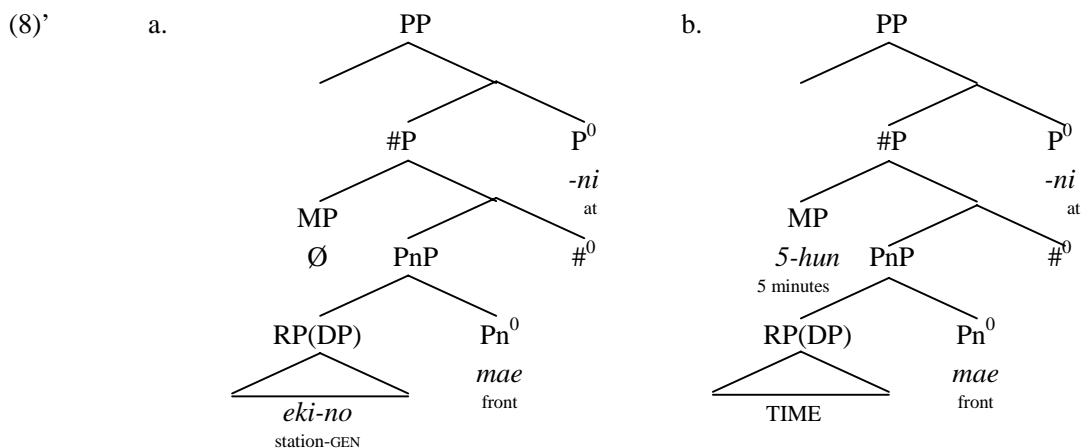
Notice that when RP is phonetically null, the position is considered to be occupied by the covert noun such as PLACE or TIME, as illustrated in (8'b), because DP is required in the projection of PP that signifies the reference point of PP for the temporal/locative interpretation.[8]

2.2. The Covert Head of the RNRC as the Covert Reference Point

Given the fine structure of the PPs in (20), the temporal/locative RNRCs in Japanese and the English temporal PPs can be analyzed in the same way. Larson has assumed that the complement CP of the English temporal PP involves a null operator movement, as shown in (21a). In order to express the reference point, however, we must have the (covert) temporal/locative DP which is located in the most embedded complement of the temporal/locative PP. The covert reference point DP is the covert Head of the RNRC, as shown in (21b). The subordinate CP headed by *before* in English is also analyzed as a Headed-relative, as illustrated in (21c).

(21)   a. $[_{PP} [_{P0}\text{before}]$ $[_{CP} Op_i$ [she would arrive t_i]]   ] :   English temporal PP
       b. $[_{PP}$ $[_{DP} [_{CP} \text{[sensou-ga } t_i \text{ owaru]}$ TIME_i]] $[_{P0}\text{mae-ni}]$] :   Temporal RNRCs
       c. $[_{PP} [_{P0}\text{before}]$ $[_{DP} [_{CP} \text{DAY}_i$ [she would arrive t_i]]]   ] :   English temporal PP

The Headed-relative analysis of the temporal/locative RNRC accounts for the selectional property of the head P in (18), without any additional assumptions. No special Case-marking mechanism is necessary for the null-operator in the specifier position of the English temporal PP because, in the Headed-relative analysis, the clausal complement of the temporal PP is reanalyzed as the DP containing the Headed relative clause.

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[8] Furthermore, Watanabe (2008a, b) and Nomura (2008) assume DimP, whose head assigns the information of dimension, representing, for example, whether PP is temporal or locative. In Japanese, Dim^0 can be overt.

   (i)   a.   eki-no   mae-no   *tokoro* -de
            station-GEN   front-GEN   place   -at
            '(at the place) in front of the station'
         b.   5-hun   mae-no   *toki* -ni
            5 minutes   front-GEN   time   at
            '(at the time) 5 minutes before'

3. The Headed-relative Analysis of the RNRCs

3.1. The Derivation and Structure of RNRCs

In the previous section, I have shown that the most embedded DP of the temporal/locative PP which functions as the reference point is the Head of the temporal/locative RNRCs. Then in the temporal/locative RNRCs, not the CP but the Head signifies the reference point of the PP, e.g., *before* [TIME]*, or *in front of* [PLACE]. The covert Head is also motivated by the scope construal of the temporal P in English. Based on the analysis of the temporal/locative RNRCs, we can say that there is a covert Head in the amount RNRCs. This noun functions as the restriction of the amount/degree RN, e.g., *half of* [AMOUNT]. Thus the temporal/locative RNRCs and the amount RNRCs both have their Heads, which are interpreted in the base position within the relative clause. The schema of the RNRC illustrated in (22) provides the answer to the questions raised in section 1.[9,10]

(22) a. $[_{DP2}$ $[_{DP1}$ $[_{CP}$ $[_{TP} \dots t_{DP} \dots]$ $[_{DP}$(Head)] t_{TP} $C^0]$ $D1^0]$ $RN(D2^0)]$: Amount

    b. $[_{PP}$ $[_{PnP}$ $[_{DP1}$ $[_{CP}$ $[_{TP} \dots t_{DP} \dots]$ $[_{DP}$(Head)] t_{TP} $C^0]$ $D1^0]$ $RN(Pn^0)$] $P^0]$: Temporal/Locative

Consider the examples repeated below.

(7a) $[_{PP}[_{CP}$ sensou-ga owaru] 3kka mae ni] haha-wa shinda.   : Temporal(/Locative)

    'My mother had died 3 days before the war ended.'

(6a)   John-wa $[_{DP}$ $[_{CP}$ Bob-ga yachin-ni tsukau] hanbun]-o gyanburu-ni tsukau.   : Amount

    'John uses for gambling half the amount Bob uses for the rent.'

The temporal RN *mae* 'front' in (7a) is external to the DP1. It is a head of PnP. The amount RN *hanbun* 'half' in (6a) is also external to DP1. The DP2 or PP selects DP1 as its complement. The subordinate CP, e.g., *sensou-ga owaru* in (7a), involves the covert semi-lexical noun TIME. With this covert noun, this subordinate CP is analyzed as being a relative clause. The amount RNRCs involve the relativization of AMOUNT, which is also the covert semi-lexical noun in Japanese.

(23) a. $[_{PP}$ $[_{DP1}[_{CP}$ [sensou-ga (TIME$_i$) owaru]   (TIME$_i$)   ] $D1^0]$ mae   -ni] : Temporal(/Locative)

    'before the war ends'

    b. $[_{DP2}[_{DP1}[_{CP}$ [Bob-ga (AMOUNT$_i$) tsukau] (AMOUNT$_i$)] $D1^0]$ hanbun -o]   : Amount

    'the half amount that Bob uses'

Under the promotion analysis of relative clauses, the Head raises to the [Spec,CP] of the relative clause. Then $D1^0$ merges with CP, projecting DP1.

In the amount RNRCs, the relativization of AMOUNT results in the AR reading of the relative clause, as illustrated in (24).

(24) a. $[_{CP}$ [AMOUNT] $\emptyset_C$ $[_{TP} \dots [<$AMOUNT$>$ of DP]$\dots$]]   : Amount RNRCs

    b. $[_{CP}$ [*d*-many N] *that*$_C$ $[_{TP} \dots$ $<d$-many N$>\dots$]]   : Amount Relatives

In (24a), the relative clause denotes an amount or degree, not a specific individual, because what undergoes

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[9] The temporal RNRCs and the locative RNRCs are the same type but they are different in the type of the dimension.

[10] As discussed above, TP raises to the higher Spec of CP, in the head-final languages with the word order of "relative clause CP-NP." Then the functional heads of the DP layer merge with CP, to constitute DP.

    (i)   a. $[_{CP}$ (AMOUNT$_i$) $[_{TP}$ Bob-ga (AMOUNT$_i$) tsukau] $C^0]$

        b. $[_{DP}[_{FP1}[_{FP2}$ $[_{CP}$ $[_{TP}$ Bob-ga (AMOUNT$_i$) tsukau]   (AMOUNT$_i$) t_{TP} $C^0]$ $F2^0]$ $F1^0]$ $D^0]$

A'-movement inside CP only denotes "amount." As I will discuss later, the highly productive system of the Japanese semi-lexical (covert) nouns allows the Japanese relative clauses with an AR reading or the temporal/locative PPs with the clausal complement to have the structure of the Headed relative clause with the semi-lexical (covert) Head.

Let us next consider the derivation of the DPs and PPs which involve the RNRCs. The internal DP1 is assigned genitive Case in (22a) and oblique in (22b). Consider first the case of PP. In the temporal PP (25a), RP is a covert noun TIME, while, in the temporal RNRC (25b), RP is DP containing the Headed relative clause. In the latter case, TIME is the Head of the relative clause. Both of RPs assign the reference point of PnP in the same way.

(25) a. [$_{PP}$ [$_{\#P}$ [$_{MP}$ 3kka] [$_{PnP}$ [$_{RP}$ TIME]   mae $_{PnP}$] $\#^0$$_{\#P}$] -ni $_{PP}$]
          3.days   front   -at

    b. [$_{PP}$ [$_{\#P}$ [$_{MP}$ 3kka] [$_{PnP}$ [$_{RP}$ [kyuuryou-o TIME$_i$ uketoru] TIME$_i$]   mae $_{PnP}$] $\#^0$$_{\#P}$] -ni $_{PP}$]

    c. [$_{PP}$[$_{RP}$([kyuuryou-o TIME$_i$ uketoru]) TIME$_i$] [$_{\#P}$ [$_{MP}$ 3kka] [$_{PnP}$ t_{RP} mae $_{PnP}$] $\#^0$$_{\#P}$] -ni $_{PP}$]
          salary-ACC TIME receive   3.days   front   -at
        'three days before (he) received his salary'

RP must move to the position higher than #P, that is, [Spec,PP], as in (25c). RP movement checks the oblique Case of RP.[11,12] Via the obligatory movement of RP for Case checking, the correct surface order is obtained.

The most embedded NP must move to [Spec,CaseP] for Case-checking, as shown in (26a). (cf. Watanabe (2008c))

(26) a. [$_{DP}$ [$_{CaseP}$ [$_{NP}$ hon]   [$_{\#P}$ [$_{MP}$ san] t_{NP} satsu$_\#$] -o/-ga$_{Case}$] D^0]
          book   three   CL   -ACC
        'the three books'

    b. [$_{DP}$ [$_{CaseP}$ [$_{CP}$[Hanako-ga kaseida] AMOUNT] [$_{\#P}$ [$_{MP}$ 100man] t_{CP} yen$_\#$] -o/-ga$_{Case}$] D^0]
          H-NOM   earned   a.million   CL   -ACC
        '(Lit.) a million yen that Hanako earned'

Also in (26b), the relative clause CP which involves the Head must move to [Spec,CaseP]. NP movement and the relative word order among the NP, MP, and the Case-particle will be further discussed in section 4.1.

3.2. Distribution of the Overt Head of RNRCs

Under the copy theory of movement, the Headed-relative analysis accounts for the distribution of the overt realization of the Head of the RNRC (cf. Nunes (2004)). The Head can be pronouns or the semi-lexical temporal word *toki* 'time,' as in (27a), or a common noun as in (27b). It can also be in-situ, as in (27c-d).[13,14]

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[11] There is a question as to whether the nominal phrase in RP is a fully projected DP or some smaller projection.
[12] The Case feature can also be checked via PnP movement.
    (i) [$_{PP}$ [$_{PnP}$ [$_{RP}$ [$_{IP}$ sensou-ga TIME$_I$ owaru] TIME$_i$] mae $_{PnP}$] [$_{\#P}$ [$_{MP}$ 3kka] t_{PnP} $\#^0$$_{\#P}$] -ni $_{PP}$]
        '3 days before the war ends'
Watanabe pointed out to me that in this case Dim^0 must have an overt element, which is the head of the functional projection in between #P and PnP, e.g., *sensou-ga owaru mae 3kka -no toki/ jiten -ni*. See Nomura (2008) for the detailed discussion about the interpretation of the locative/temporal PP in Japanese.
[13] When the Head is a proper name, the relative clause is non-restrictives, as shown in (i).
    (i) a. [$_{PP}$ [$_{PnP}$ [$_{RP}$ [$_{CP}$[$_{TP}$ sensou-ga t_i owaru] 8gatsu 15nichi$_i$-no]] mae] -ni]
        b. [$_{PP}$ [$_{PnP}$ [$_{RP}$ [$_{CP}$[$_{TP}$ sensou-ga 8gatsu 15nichi-ni owaru]   *e*   ]] mae] -ni]
           war-NOM August 15th -at end   front -at
        'before 15th August, when the war ended.'
[14] Inoue (1976) claims that the temporal/locative RNRCs are the pseudo-relative clauses. In my analysis they are the normal Headed-relatives because they must involve a nominal Head, which signifies the reference point of the

(27) a. [PP [PnP [RP [CP[TP kyuuryou-o t_i uketoru] **(sono) toki$_i$/so$_i$ -no**]] mae] -ni]
         salary-ACC   receive (that) time/that-GEN   front -at

  b. [PP [PnP [RP [CP[TP kyuuryou-o t_i uketoru] **getsumatsu$_i$-no**   ]] mae] -ni]
         salary-ACC   receive end.of.the.month-GEN front -at

  c. [PP [PnP [RP [CP[TP kyuuryou-o **sono toki**   uketoru] e]] mae] -ni]

  d. [PP [PnP [RP [CP[TP kyuuryou-o **getsumatsu-ni** uketoru] e]] mae] -ni]
       'before {that time/the end of the month} he receives his salary'

The relativization gives rise to the realization of the nominal Head of the RNRC in the peripheral position or in the base position within TP under the copy theory of movement.

Next let us consider the amount RNRCs. The Head can be the semi-lexical expression *gaku/ryou* 'amount' or the amount expression *100man yen* 'a million yen' as shown in (28a-b). It can be in-situ, as shown in (28c-d).

(28) a. [DP [DP[CP [TP Taro-ga t_i kaseidekuru] **gaku/ryou$_i$**]DP] **-no** hanbun-o DP]
         Taro-NOM   earns   amount   -GEN half-ACC

  b. [DP [DP[CP [TP Taro-ga t_i kaseidekuru] **100man-yen$_i$**]DP] **-no** hanbun-o DP]
         Taro-NOM   earns   a.million-yen   -GEN half-ACC

  c. [DP [DP[CP [TP Taro-ga **aru gaku/ryou(-o)** kaseidekuru] e]DP]   hanbun-o DP]
                           a.certain   amount(-ACC)

  d. [DP [DP[CP [TP Taro-ga **100man-yen(-o)**   kaseidekuru] e]DP]   hanbun-o DP]
       'the half amount of {the money/a million yen} that he earns'

Furthermore, the copies of the Head are sometimes pronounced both in its tail and its head position as in (29)-(30).[15]

(29) a. [PP [PnP [CP [TP kyuuryou-o **sono toki**   uketoru] **so-no**   ] mae] -ni PP]
           salary-ACC   that time   receives   that-GEN   front -at

  b. * [PP [PnP [CP [TP kyuuryou-o **getsumatsu-ni**   uketoru] **getsumatsu-no**] mae] -ni PP]
                       end.of.the.month-at   end.of.the.month-GEN

  c. * [PP [PnP [CP [TP kyuuryou-o **sono toki**   uketoru] **getsumatsu -no**] mae] -ni PP]

  d. [PP [PnP [CP [TP kyuuryou-o **getsumatsu-ni**   uketoru] **so-no**   ] mae] -ni PP]
       'before {that time/the end of the month} he receives his salary'

(30) a. [DP [DP [CP [TP Taro-ga **aru gaku-o**   kaseidekuru] **sono gaku**]DP]**-no** hanbun -o DP]
            T-NOM   that amount-ACC earns   that amount   -GEN half -ACC

  b. * [DP [DP [CP [TP Taro-ga **100man-yen(-o)** kaseidekuru] **100man-yen**]DP] **-no** hanbun -o DP]
                     a.million-yen-ACC   a.million-yen   -GEN

  c. * [DP [DP [CP [TP Taro-ga **aru gaku -o**   kaseidekuru] **100man-yen**]DP] **-no** hanbun -o DP]

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temporal/locative phrases.
[15] The Headed-relative analysis can account for the fact that in some cases the Head cannot be pronounced both in its tail and its head of the chain. In (30a) the semi-lexical amount expression *gaku* 'amount' is considered to be relativized and it yields the AR reading. In (30a) the Head in-situ is the pronounced copy of the Head. In my analysis the amount expression *100man yen* 'a million yen' in (30d) contains the semi-lexical expression *gaku* ([*gaku* [*100man yen*]] as a so-called "big DP"). In this case, only the amount expression *gaku* is relativized and it also yields the AR reading, with the copy of *gaku* unpronounced in the base position. The remnant part of the big DP, *100man yen* is only pronounced in-situ in (30d). If *gaku* is replaced with the covert noun AMOUNT, (28d) is obtained. On the other hand, in (30b) and (30c) the Head in [Spec,CP]is considered to be the big DP [*gaku* [*100man yen*]], with the unpronounced *gaku*. (30c) is ruled out because the copy is partially pronounced in the base position.

d. [$_{DP}$ [$_{DP}$ [$_{CP}$ [$_{TP}$ Taro-ga **100man-yen(-o)** kaseidekuru] **sono gaku**   ]$_{DP}$] **-no** hanbun -o $_{DP}$]
'the half amount of {the money/a million yen} that Taro earns.'

From (29) and (30), two generalizations follow. One is that the moved Head in the peripheral position must not be more specified than the Head in-situ, as in (29c) and (30c). Another generalization is that both of the copies in the peripheral position and its base position must not be fully pronounced, as in (29b) and (30b).[16] This result follows from the general constraint on resumption.[17]

3.3. More on the Overt Head

The relative clause of the amount RNRC has the structure (31a). With the RN *hanbun* 'half,' the RNRC as a whole has the structure of the partitives (31b), and is interpreted as "half of the amount."

(31) a.   [$_{CP}$ [$_{TP}$ … <AMOUNT> …] [AMOUNT] Ø$_C$]
      b.   [$_{DP}$ [$_{DP}$ [$_{CP}$ [$_{TP}$ … <AMOUNT> …] [AMOUNT] Ø$_C$]$_{DP}$] **-no**   hanbun-o $_{DP}$]
                                                                    -GEN half-ACC

If so, it is predicted that the covert nominal Head can be replaced with the common noun, and that it cannot be the proper name. This prediction is borne out as shown in (32) and (33).

(32) a. Jiro-wa [[[Taro-ga   kyoshitsu-de atta] gakusei]-no hanbun](-ni) koutei-de   atta.
          Jiro-TOP Taro-NOM   classroom-at saw student-GEN half -DAT playground-at saw
      b. Jiro-wa [[[Taro-ga gakusei-ni kyoshitsu-de atta]   ]   hanbun](-ni) koutei-de   atta.
                            student-DAT
          'Jiro saw half the numbers of the students at the playground as Taro saw in the class room.'

(33) a. # Jiro-wa [[[Taro-ga   kyoshitsu-de atta] Hanako]-no hanbun](-ni) koutei-de   atta.
                                                              Hanako-GEN
      b. # Jiro-wa [[[Taro-ga Hanako-ni kyoshitsu-de atta]   ]   hanbun](-ni) koutei-de   atta.
          Hanako-DAT
          (lit.) 'Jiro saw the half of Hanako at the playground as Taro saw in the class room.'

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[16] Kuroda (1999) and Hasegawa (2002) propose that Ishii's (1991) *Half* Relatives are head-internal relatives. Hasegawa proposes that the internal head is licensed via AGREE with the CP-external probe D^0, such as *hanbun* 'half,' the internal Head being given a theta-feature by its lexical governor of the matrix. However, the Head of *Half* Relatives are different from that of other head-internal relatives. Not only can it be pronounced internally, it can also appear in the peripheral position, or it can even be "doubly pronounced." Under the copy theory of movement and theory of resumption, the Headed-relative analysis can account for the distribution of the overt Head. Moreover, the analysis can handle the interpretative properties of the RNRCs with respect to the distinction between the RR reading and the AR reading, as will be further discussed in section 4. Notice that Kuroda observes the important distinction between *Hanbun* 'half' relatives and *Hanbun-no* 'half-GEN' relatives. See Kuroda (1999) for the detailed discussion.

[17] We have to consider what kind of nominal expressions can be licensed as a semi-lexical covert Head. The covert nouns, such as TIME, PLACE, AMOUNT, and KAZU 'number' are considered to be semi-lexical item because they do not have "rich" lexical meaning, but denoting only some abstract, not-fully-specified concept. Concerning the overt counterpart of the covert Heads of RNRCs, however, with the "not-fully-specified" aspect we cannot exhaust the full members of the semi-lexical items.

(i) a. [$_{DP}$ [$_{RC}$ [Bob-ga yachin-ni *e* tsukau] **gaku**]-no   hanbun] John -wa gyanburu-ni   tsukau.
             Bob-NOM rent-for   use   amount -GEN half   John-TOP gambling-for use
         'John uses for gambling half the amount Bob uses for rent.' (Ishii (1991: 222))
     b. [$_{DP}$ [$_{RC}$ [Bob-ga yachin-ni **(aru-itteino)-kingaku**-o   tsukau]] hanbun -o]
                      (a-certain)-money.amount-ACC

95

(33) is unacceptable because we cannot "meet" some proper part of Hanako in the actual world.[18,19]

4. Three Consequences of the Headed-Relative Analysis

4.1. The Restriction on the Type of the Determiner of the Head

The following three consequences follow from the Headed-relative analysis. Let us first consider the restriction on the determiner of the Head (Carlson (1977), Grosu and Landman (1998), McNally (2008) etc.). In English, ARs occur only with a limited range of determiners.

(35) a. Marv put [everything (that) he could] in his pockets.
   b. * Marv put [{some, each, many, four, most, etc.} thing(s) he could] in his pockets.

Some of the strong determiners can co-occur with ARs, whereas weak determiners never co-occur with them, as shown in (35).[20] In the amount RNRCs in Japanese, the types of the RNs that can occur are limited. The types of the RNs which can occur are different from those in the English ARs.

(36) a. Taro-wa [Hanako-ga   1nen-de kasegu {hanbun/?subete}]-o   1nichi-de tsukau.
      Taro-TOP Hanako-NOM 1.year-at earns half/all   -ACC 1.day-at use
      'Taro uses in one day the half/every amount of money that Hanako earns in a year.'
   b Taro-wa [Hanako-ga   1nen-de kasegu {100man/??hotondo}]-o   1nichi-de tsukau.
      Taro-TOP Hanako-NOM 1.year-at earns a.million/most   -ACC 1.day-at use
      '(lit.) Taro uses in one day one million/most of the money that Hanako earns in a year.'
   c * Taro-wa [Hanako-ga   1nen-de kasegu {takusan/kanari}]-o   1nichi-de tsukau.
      Taro-TOP Hanako-NOM 1.year-at earns many/many   -ACC 1.day-at use
      '(lit.) Taro uses in one day the many amount of money that Hanako earns in a year.'

The examples in (36) show that the amount RNRCs in Japanese are insensitive to the strong versus weak distinction of the determiners.

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[18] Note that in this case the relativization of the proper name itself is not prohibited, as shown in (i).
   (i)   Jiro-wa [[Taro-ga   kyoushitsu-de sakki   atta] Hanako] *(-ni) ima koutei-de atta.
         Jiro-TOP Taro-NOM classroom-at a.little.ago saw Hanako-DAT   now playground-at saw
         'Jiro saw Hanako at the playground just now, who Taro saw in the classroom a little while ago.'
[19] Given the Headed-relative analysis, the semi-lexical noun KAZU of the big DP [KAZU gakusei] is relativized.
   (i)   a. gakusei-no   kazu   b. *Hanako-no   kazu
            student-GEN number   Hanako-GEN number
            'the number of the students'
The big DP analysis of the Head is confirmed when we examine the interpretation of the (part of the) Head in-situ.
   (ii)   Jiro-wa [[(kyou ichinichi-de)Taro-ga   ringo-o   tabeta]]hanbun-o]neru mae-ni tabeta.
         Jiro-TOP today one.day-on Taro-NOM apple-ACC ate   half-ACC sleepbefore ate
   = a. # 'the half part of that same apple': [[Taro-ga   tabeta] *ringo*-o]   hanbun]
   = b. 'the half number of the apples': [[Taro-ga ringo-o tabeta] *kazu*-no]   hanbun]
                                                                number-GEN
   = c. 'the half weight of the apple(s)': [[Taro-ga ringo-o tabeta] *omosa*-no] hanbun]
                                                                weight-GEN
(ii) cannot be interpreted as the relativization of *ringo* 'apple,' i.e., Taro and Jiro ate the same apple and the mass of the part of the apple that Jiro ate is half the amount of the total mass of the apple, as in (iia). The possible interpretations (iib) and (iic) are obtained via the relativization of the semi-lexical noun involved in the Head.
[20] One example of the strong determiners that cannot co-occur with ARs is *most*. (Carlson (1977))
   (i)   a. * There is {the, that, this, Mary's, every, each, any} man in the Laundromat.
         b. * There are {all, most} men in the Laundromat.
         c. * Most men there were __ here disagreed

The Headed-relative analysis can account for the difference between English and Japanese. The Japanese RNRCs are derived via the relativization of the nominal Head, such as AMOUNT. The RN is not the Head and therefore, in order to combine the amount RN and CP, the semantic operator is not required. Any type of the RNs can freely occur in the amount RNRCs.

At this point, why is the occurrence of the determiners of the type in (36c) ruled out? The Headed-relative analysis predicts the type of the RNs which can co-occur with the RNRCs, if we adopt Watanabe's (2008c) analysis of the fine structure of DP. Let us first consider the structure of the DP containing the measure phrase in Japanese. Watanabe (2008c) claims that the three types of the word order in (37) are derived from the same base (37)', which means "the three books."

(37) a. [[hon]   [san   satsu]   -o]
          book   three CL   -ACC
      b. [san   satsu-no]   [[hon]   -o]
          three CL -LINK   book   -ACC
      c. [[hon]   -o]   [san satsu]
          book   -ACC   three CL
          'the three books'   (Watanabe (2008c: 517))

(37)'
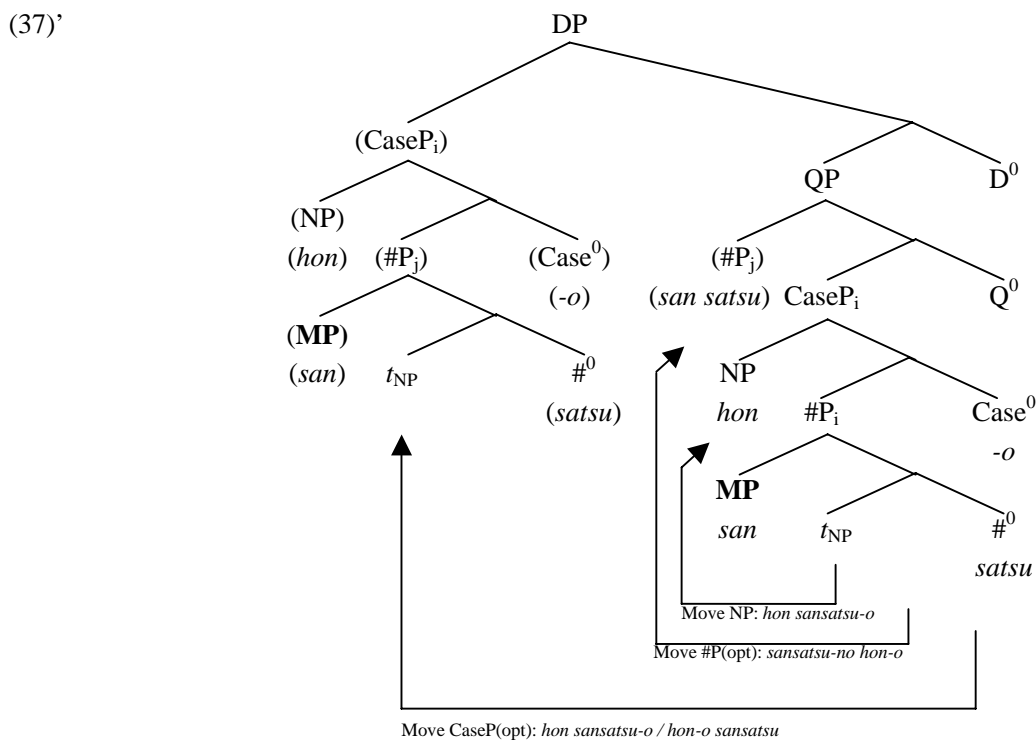
The most embedded NP *hon* 'book' obligatorily moves to [Spec,CaseP] to check the Case feature, yielding the word order (37a). Then, #P can optionally move to [Spec,QP], yielding the word order (37b). CaseP can move up to [Spec,DP] optionally. If it does after #P movement, the word order (37c) will be derived. If #P movement does not apply, the word order (37a) will be derived.

Let us next consider the DP containing vague quantity phrase (VQP). With VQP, such as *takusan* or *sukoshi*, however, the relative word order among NP, VQP, and the Case-particle does not pattern with (37), as illustrated in (38).

(38)　a.　* John-wa　hon　　　**takusan**-o　katta.
　　　　　John-TOP　book　　　many-ACC　bought

　　　b.　John-wa　**takusan**-no　hon-o　　　katta.
　　　　　John-TOP　many-LINK　book　　　bought

　　　c.　John-wa　hon-o　　　**takusan**　katta.
　　　　　John-TOP　book-ACC　many　　　bought

　　　　　'John bought many books.'　　　　　　　　　　　　　　(Watanabe (2008c: 525))

The word order in which VQP is followed by the Case-particle is unacceptable, as shown in (38a). Since NP movement to [Spec,CaseP] is obligatory, VQP must not be located under #P. In addition, the fact that the word order (38b) is acceptable indicates that the position of VQP is above CaseP. Watanabe (2008c) claims that VQP occupies [Spec,QP] and the relative order (38c) is obtained by CaseP movement.

　　　Based on the observations above, the restriction on the RNs of the amount RNRCs observed in (36) is considered to be syntactic. The obligatory NP movement yields the structure (39a) and CaseP movement yields the structure (39b). In this derivation, the Case-particle never immediately follows VQP.

(39)　　　　a.
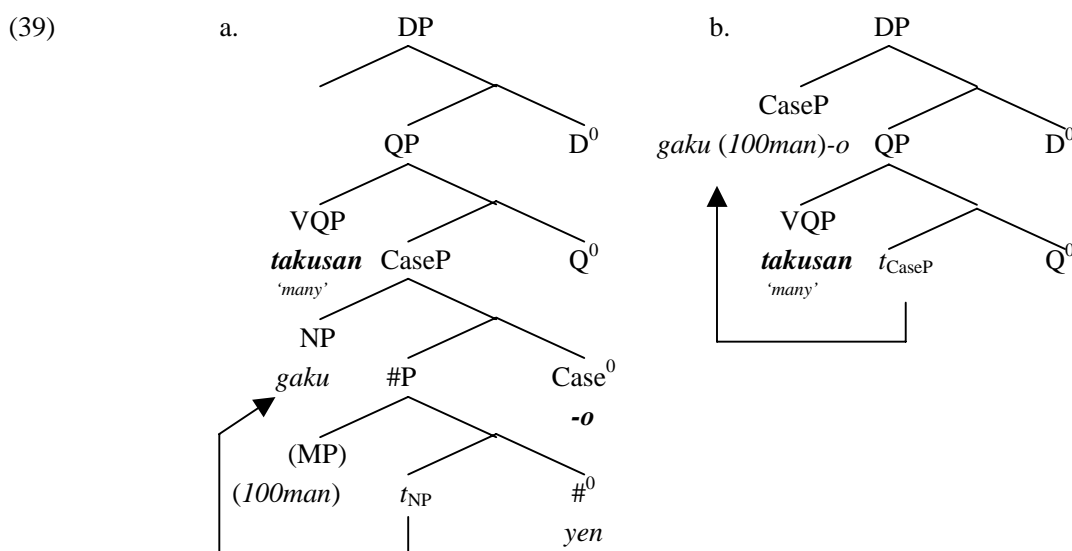
In the RNRC, the relative clause CP Headed by AMOUNT or *gaku* is substituted for NP *gaku* in (39). In this case the CP undergoes movement to [Spec,CaseP]. Therefore, when the RN of the RNRC is VQP, the same result obtains that the Case-particle never immediately follows VQP, as shown in (40a). On the other hand, when the RN is MP, such as *100man (yen)* 'a million (yen),' it is followed by the Case-particle, because MP occupies [Spec,#P], as shown in (40b).[21]

(40)　a.　[$_{DP}$ [$_{QP}$ [$_{VQP}$ **takusan**] [$_{CaseP}$ [$_{CP}$ Hanako-ga kaseida gaku] [$_{\#P}$　t_{CP}　$_{\#P}$]　**-o**　$_{CaseP}$] $_{QP}$]$_{DP}$]
　　　　　　　　　many　　　　　　　H-NOM　earnsed amount　　　　　　　-ACC

　　　b.　[$_{DP}$ [$_{QP}$　　　　　[$_{CaseP}$ [$_{CP}$ Hanako-ga kaseida gaku] [$_{\#P}$ **100man** t_{CP} **yen** $_{\#P}$] **-o**　$_{CaseP}$] $_{QP}$]$_{DP}$]
　　　　　　　　　　　　　　　　H-NOM　earned　amount a.million　yen　-ACC

The Headed-relative analysis of the RNRCs can account for the ill-formedness of (37c). The order is not

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[21] The word order "VQP - Case-particle" is not obtained, even after the optional CaseP movement applied.

(i)　a.　[$_{DP}$[$_{CaseP}$ [$_{CP}$ Hanako-ga kaseida gaku]　　　[$_{\#P}$　t_{CP}　$_{\#P}$]　**-o** $_{CaseP}$] [$_{QP}$ [$_{VQP}$**takusan**$_{VQP}$]　t_{CaseP}]]

　　　c.　[$_{DP}$[$_{CaseP}$ [$_{CP}$ Hanako-ga kaseida gaku] [$_{\#P}$**100man** t_{CP} **yen** $_{\#P}$] **-o** $_{CaseP}$] [$_{QP}$　　　　　t_{CaseP}]]

　　　b.　[$_{DP}$[$_{CaseP}$ [$_{CP}$ Hanako-ga kaseida gaku]　　　$t_{\#P}$　　**-o** $_{CaseP}$] [$_{QP}$ [$_{\#P}$**100man yen**$_{\#P}$] t_{CaseP}]]

derivable.[22,23]

4.2. The AR Reading vs. the RR reading

Consider the second consequence of the Headed-relative analysis. This analysis can account for the distinction between the AR reading and the RR reading in the amount RNRCs.

(42)   John-wa [$_{DP}$ Bob-ga yachin-ni tsukau hanbun]-o gyanburu-ni tsukau.
      (i)   half as much money as Bob pays for the rent   AR reading
      (ii)   the half of Bob's money that will be paid for the rent   RR reading

While the RNRCs have an AR reading when the relativized Head is only AMOUNT, as shown in (43), they yield a RR reading when the Head contains a determiner, quantifier, or measure phrases, as in (44).

(43)   a.   [$_{DP}$ [$_{DP}$[$_{TP}$ Hanako-ga t_i 1nen-de kasegu] **[AMOUNT]$_i$**] {hanbun/subete}   -o] 1nichi-de tsukau.
       b   [$_{DP}$ [$_{DP}$[$_{TP}$ Hanako-ga t_i 1nen-de kasegu] **[AMOUNT]$_i$**] {200man/??hotondo} -o] 1nichi-de tsukau.

(44)   a. ?? [$_{DP}$ [$_{DP}$[$_{TP}$ Hanako-ga t_i 1nen-de kasegu] **[AMOUNT{hanbun/subete}]$_i$**   ]   -o] 1nichi-de tsukau.
       b   [$_{DP}$ [$_{DP}$[$_{TP}$ Hanako-ga t_i 1nen-de kasegu] **[AMOUNT{100man/hotondo}]$_i$**]   -o] 1nichi-de tsukau.

The Head of the relative clause in (43) is the covert semi-lexical noun AMOUNT alone, while the Head in (44) is the DP containing AMOUNT and the amount expression. This Head DP itself forms the layered structure and its most embedded complement is AMOUNT. Since the amount expression is interpreted inside the relative clause in (44), a RR reading is obtained.

4.3. The Identity Requirement on the Head

Consider the third consequence of the Headed-relative analysis. Grosu and Landman (1998) observe that what the English ARs denote is not just the property of amounts or degrees, as shown in (46).[24]

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[22] The precise position of the promoted HeadNP is under discussion: [Spec,DP] in Kayne (1994) as in (43a), but [Spec,TopP] of the relative clause in Bianchi (1999), Aoun and Li (2003), and Inada (2007). In any case, the movement of the Head from within the raised DP seems to be counter-cyclic and hence should be motivated theoretically and empirically. In this paper, I leave this issue open and continue to illustrate the derivation as in (i).
    (i)   [$_{DP2}$ the [$_{CP}$ [$_{DP1}$ [$_{Head}$ book $_{NP}$] which t_{NP}]   C^0 [$_{IP}$ I read   [$_{DP1}$ ~~which~~ [$_{NP}$ ~~book~~]] yesterday]]]
  It is worth noticing that the Headed-relative analysis is based on the assumption that the relative clause CP occupies the complement position of #P. This is the standard assumption under the promotion analysis of the relative clause.
    (ii)   [$_{DP}$ [$_{QP}$ [$_{CasP}$ [$_{\#P}$ **[$_{CP}$ [$_{TP}$...] [$_{DP}$ HeadNP D^0] C^0]** #^{0}]Case^0]Q^0]D^0]: Japanese
Under the promotion analysis of relative clause in Kayne (1994), the relative clause CP is the complement of the D^0, as illustrated in (i). Given the fine structure of the Japanese DP as discussed above, this standard assumption can be reconsidered so that the relative clause is the complement of some nominal functional projection in the DP layer. The observations in this paper show that the position is the complement of #P in Japanese, as shown in (ii).

[23] The projection of the Head itself is also at issue. Inada (2008) has claimed that it is #P since the scope construal of the two quantifiers in (i) can be linked inversely.
    (i)   John will interview the *two* patients that *every* doctor would examine *e*.   (Aoun and Li (2003))
               (*two > every, every > two*)
    (ii)   [$_{DP}$ the [$_{CP}$ [$_{DP}$ [$_{FP}$ *two* patients] D^0 t_{FP}] that [$_{IP}$ *every* doctor would examine [$_{DP}$ ~~D~~^{0} [$_{FP}$ ~~*two* patient~~]]]]
The universal quantifier *every* cannot have scope out of the clause. Thus, to obtain the inverse linking, the projection of the promoted head, FP, must project #P at least, as illustrated in (ii). For the detailed discussion of the interaction between QR, the syntactic reconstruction (copy-interpretation), and the semantic wide-scope taking (choice function application), see Inada (2008).

[24] Grosu and Landman (1998) and McNally (2008) point out that the relativization out of existentials (which is also considered to be ARs) requires not only the identity-of-quantity but also the identity-of-individuals, as in RRs.

(45) a. It will take us the rest of our lives to drink as much champagne as they spilled that evening.
　　 b. It will take us the rest of our lives to drink as much *champagne* as they spilled *beer* that evening.

(46) a. It will take us the rest of our lives to drink [the champagne that they spilled that evening].
　　 b. # It will take us the rest of our lives to drink [the *champagne* that they spilled *beer* that evening].

In the ARs, the Head noun *champagne* must be interpreted internally and provides a sort on the degree. This is shown by the infelicity of (46b). Because the Head is *champagne*, the sort on the degree cannot be *beer* inside the relative clause. The identity-of-sort requirement is not imposed on the comparatives as in (45b).

　　While it is imposed on the ARs, the identity-of-sort requirement is not observed in the case of the amount RNRCs, as shown in (47) and (48).

(47)　　Gakusei-ga [[sake-o　　non-da] bai]　　biiru-o　　nonda.
　　　　student-NOM sake-ACC drank　　double　beer-ACC drank.
　　　　'The students drank twice as much beer as they drank sake.'

(48) a.　John-wa [[Mary-ga　hito-tsuki-ni *gengogaku*-no　hon-o　　　kau] bai] *kompyuutaa*-no
　　　　John-TOP Mary-NOM 1.month-at　　linguistics-GEN book-ACC　buys　double computer-GEN
　　　　hon-o　　　hantsuki-de　　kau.
　　　　book-ACC half.month-at　　buys
　　　　'John buys twice as many computer books in half a month as Mary buys linguistics books in one
　　　　month.'　　　　　　　　　　　　　　　　　　　　(Ishii (1991: 236); the judgment is mine)
　　 b.　John-wa　[[Mary-ga *mado*-o　　　aketa]　bai]　*doa*-o　　　aketa.
　　　　John-TOP　Mary-NOM window-ACC　opened　double　door-ACC　opened
　　　　'John opened twice as many doors as Mary opened windows.'　　　(Ishii (1991: 236))

(47) involves the sort on the degree *sake*, which is different from the sort of the Head *biiru* 'beer,' but it is acceptable. The sentences in (48) also involve the different sortal, even though they are acceptable.

　　The Headed-relative analysis accounts for the presence of the sortal which is different from the Head. The RNRCs in (47) and (48) have a covert Head, as illustrated in (49).

(49) a.　[DP [DP [CP *pro*　　[(AMOUNT) **sake**-o] nonda]　　　(AMOUNT)] bai]-no **biiru**-o]
　　 b.　[DP [DP [CP Mary-ga [(KAZU) **gengogaku**-no hon-o] kau]　(KAZU)] bai]-no **kompyuutaa**-no hon-o]
　　 c.　[DP [DP [CP Mary-ga [(KAZU) **mado**-o] aketa]　　　　　(KAZU)] bai]-no **doa**-o]
　　　　　　　　　　　　　number　　　　　　　　　　　　　number

As illustrated in (49), the presence of the different sortal in the Japanese amount RNRC does not cause the problem, because the sortal is not part of the Head. The Head is the semi-lexical covert noun. The relative clause in (47) has the covert Head AMOUNT as in (49a), and those in (48) have the covert Head KAZU as in (49b-c).[25]

　　(i)　　　　I read all the books there were on the table.
　　　　　　# 'When there were five books on the table and I read five books, but not those that were on
　　　　　　the table.'
If so, the identity requirement cannot distinguish ARs and RRs. It leads us to conclude again that they are the same construction, i.e., ARs in English are derived via restrictive relativization. The particular interpretative properties of ARs in English, such as the restriction on the type of the determiners, would come from the property of the relativized Head itself.
[25] As expected, when the degree word AMOUNT with the sortal on it as a whole is relativized (as in English ARs), the identity requirement (re)emerges. It is explicit when the Head includes the sortal is overtly relativized as shown in (i).

To sum up, the Headed-relative analysis of the RNRC accounts for why the overt (counterpart of the covert) Head can occur within the relative clause of this type, together with the copy theory of movement. This analysis can also account for the differences between the two semantically similar constructions, "AMOUNT" relatives in Japanese and amount relatives in English, that is, differences in the restriction on the type of the determiner and in the identity-of-sort requirement.

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(i)   * $[_{DP}[_{DP}[_{CP}$ Taro-ga t nonda] [(AMOUNT/ryou-no) **sake**]]-no **biiru**-o nonda.
          '(Lit.) (Someone) drank beer that Taro drank (the amount of) sake.'

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