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Los Angeles

Distributivity in English and Japanese

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Linguistics

by

Mari Sakaguchi

1998
The dissertation of Mari Sakaguchi is approved.

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Timothy A. Stowell, Committee Chair

University of California, Los Angeles
1998
To my parents, Fukuko and Minoru Sakaguchi, 
and to Kong and Peter
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LIST OF ABBREVIATIONS

For the sake of consistency, the following abbreviations are used for Japanese.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>nom</td>
<td>nominative case marker</td>
</tr>
<tr>
<td>acc</td>
<td>accusative case marker</td>
</tr>
<tr>
<td>gen</td>
<td>genitive case marker</td>
</tr>
<tr>
<td>dat</td>
<td>dative case marker</td>
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<tr>
<td>top</td>
<td>topic marker</td>
</tr>
<tr>
<td>asp</td>
<td>the progressive aspect of the verb</td>
</tr>
<tr>
<td>pl</td>
<td>plural morpheme</td>
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<tr>
<td>cl</td>
<td>classifier</td>
</tr>
<tr>
<td>pres</td>
<td>present tense morpheme</td>
</tr>
<tr>
<td>past</td>
<td>past tense morpheme</td>
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<td>pass</td>
<td>passive morpheme</td>
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<td>cause</td>
<td>causative morpheme</td>
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<td>cop</td>
<td>copular</td>
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<td>cp</td>
<td>complementizer</td>
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<td>cond</td>
<td>conditional morpheme</td>
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<tr>
<td>pol.imp</td>
<td>polite imperative verb</td>
</tr>
<tr>
<td>Q</td>
<td>interrogative particle</td>
</tr>
<tr>
<td>self</td>
<td>the reflexive form</td>
</tr>
<tr>
<td>neg</td>
<td>negative morpheme</td>
</tr>
</tbody>
</table>
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ABSTRACT OF THE DISSERTATION

Distributivity in English and Japanese

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This thesis studies the syntactic and semantic properties of distributive quantifiers and reciprocal expressions in English and Japanese. The syntactic and scopal behavior of binominal and adverbial distributive quantifiers is accounted for in terms of the LF-feature checking approach proposed by Beghelli and Stowell (1997) (B & S), which was independently motivated to capture the scope relations of quantifier phrases (QPs).

I argue that both binominal and adverbial quantifiers undergo LF-feature checking of their distributive feature [+Dist] in the spirit of Chomsky’s (1995) minimalist framework. The present analysis utilizes the projections, Distributive Phrase (DistP) and Share Phrase (ShareP), where DistP c-commands ShareP, in B & S’s LF phrase structure. Scopal properties and reconstruction effects of binominal each discussed by Burzio (1986), Choe (1987), and Safir and Stowell (1988) are accounted for by using these two projections. Subject-orientation of adverbial each is captured by its being projected as the head of DistP. Adverbial each then attracts its c-commanding antecedent to the Specifier
position of DistP. Furthermore, the scopal difference between adverbial and binominal quantifiers is determined by the way these constructions utilize the ShareP projection.

I then show that although superficially similar to adverbial sorezore, a binominal quantifier sorezore exists in Japanese, which takes two QPs as its arguments. Binominal sorezore can be distinguished from adverbial sorezore by movement operations such as scrambling, passivization, and relativization of the object QP. Furthermore, binominal sorezore manifests scopal properties and reconstruction effects characteristic of binominal each.

It is proposed that binominal quantifier in English and Japanese, triggered by the [+plural] feature of its antecedent, moves to adjoin to the antecedent at LF. The adjunction makes the antecedent inherit the [+Dist] feature of the binominal quantifier. Then, the adjoined antecedent moves to the Specifier position of DistP, while the remaining non-adjoined QP moves to the Specifier position of ShareP.

Finally, I argue that reciprocal expressions such as each other and tagai have a [+Dist] feature, but differ from distributive quantifiers in terms of their ability to undergo successive-cyclic feature checking. Reciprocal expressions are assumed to undergo feature checking without using DistP or ShareP projections.
Chapter 1

Introduction

1.1. Introduction

Historically, the semantic properties of universal quantifiers such as every, each, and all have been a subject of research by logicians and philosophers for a very long time.\(^1\) In the framework of generative grammar in the late 1960s and the 1970s, quantifiers were extensively studied, especially by the generative semanticists such as Lakoff (1970), Postal (1974), Hudson (1970), Kroch (1974) and Dougherty (1969, 1974).\(^2\) Furthermore, formal methods to capture the semantic properties of quantifiers were developed by Montague (1974) and Keenan and Faltz (1978) during this period.

In the 1980s, works such as Gil (1982), Kempson and Cormack (1981), and Fodor and Sag (1982) discussed the scopal properties of quantifiers.\(^3\)

This thesis explores the semantic and syntactic properties of each. The universal quantifier each can appear in the following three types of constructions.

(1) The boys each lifted one piano. (adverbial each)
(2) Each boy lifted one piano. (determiner each)
(3) The boys lifted one piano each. (binominal each)

For the purpose of discussion, I will refer to each in (1) as “adverbial each”, the one in (2)...

\(^1\) See Vendler (1967).

\(^2\) In the 1970s, the following three constructions were transformationally related.
   (i) a. Each of two boys lifted one piano. (partitive)
      b. Two boys each lifted one piano. (adverbial)
      c. Two boys lifted one piano each. (binominal)

Dougherty (1969) argued that (ib) should be derived from (ia) by a Q-float-like operation. Postal argued that (ic) should be derived from (ia) by a transformation called Each-Shift.

\(^3\) Gil (1982) discusses structures corresponding to binominal each in a variety of languages. He uses the term "adnominal" to refer to both adverbial and binominal quantifiers and proposes a unified semantic analysis of binominal and adverbial each. See also Gil (1995) for typology of distributive quantifiers in various languages.
as “determiner each” and, the one in (3) as “binominal each”.

Each differs from other universal quantifiers such as every and all in that it can appear in the above three types of constructions.

For instance, all can appear as an adverbial as in (1’) and a determiner as in (2’), but cannot appear as a binominal as in (3’).

(1’) The boys all lifted one piano.
(2’) All the boys lifted one piano.
(3’) *The boys lifted one piano all.

The universal quantifier every can only occur as a determiner.

(1’”) *The boys every lifted one piano.
(2’”) Every boy lifted one piano.
(3’”) *The boys lifted one piano every.

The common semantic property of the three types of sentences (1), (2) and (3) is that they all have a distributive interpretation. Compare their meanings with the following sentence.

(4) The boys lifted one piano.

The sentence in (4) has two types of meanings. One is that the boys acted together as a group to lift one piano. This reading is called “the collective reading”. Another is that each of the boys lifted one piano. Each boy may possibly have lifted a different piano. This reading is called “the distributive reading”.

What is common in sentences (1), (2), and (3) repeated here is that they only have a distributive reading and do not have the collective reading such as the one that (4) has.

(1) The boys each lifted one piano. (adverbial each)
(2) Each boy lifted one piano. (determiner each)
(3) The boys lifted one piano each. (binominal each)

---

4 The name “binominal” comes from Safir and Stowell (1988). Binominal each takes two nominal expressions (DPs) as its arguments.
What are the basic semantic differences among these three kinds of each? Adverbial each and binominal each require that their antecedent QP the boys to be plural. Detailed semantic restrictions on the antecedent QPs and the object QPs in these constructions are discussed further in Chapters 2 and 3. On the other hand, in (2) determiner each requires boy to be singular.

Adverbial each in (1) has two possible (distributive) readings. One reading is true in a situation where each of the boys lifted a possibly different set of pianos. Another reading is true in a situation in which there is one piano that each of the boys lifted. These two readings differ in terms of “scope”. The first reading is the subject-wide scope reading informally expressed as (the boys each > one piano). This can be considered to express that each of the boys are distributed over one piano, so there can be as many pianos as the number of the boys. The second reading is the object-wide scope reading expressed as (one piano > the boys each). This expresses a situation in which there is one piano for each of the boys.

Determiner each also has these two types of scopal readings.

On the other hand, the binominal each sentence has only the subject-wide scope reading in which the number of piano varies with the number of the boys.

In Chapter 2 and Chapter 3 of this thesis, I will investigate how and why the scopal difference between adverbial each and binominal each arises.

A comparative question arises as to whether various kinds of distributive quantifiers, particularly, the three kinds of distributive quantifiers in (1), (2), and (3) exist in other languages. In Japanese, there are universal quantifiers such as dono N-mo (every N) and subete-no N (all N) and sorezore-no N (each N).

(5) Dono-gakusei-mo iti=dai-no piano-o motiage-ta.
    every-student-MO one=cl-gen -acc lift-past
    “Every student lifted one piano.”
(6) Subete-no gakusei-ga iti=dai-no piano-o motiage-ta.
   all-gen student-nom one=cl-gen -acc lift-past
   “All the students lifted one piano.”

(7) Sorezore-no gakusei-ga iti=dai-no piano-o motiage-ta.
   each-gen student-nom one=cl-gen -acc lift-past
   “Each student lifted one piano.”

The QP subete-no N (all N) in (6) differs from dono-N-no (every N) in (5) and sorezore-no (each N) in (7) in that subete-no N allows the collective reading. (6) can be interpreted as all the students acted together to lift one piano, whereas (5) and (7) cannot be interpreted as such. (5) and (7) can only be interpreted distributively: they can only mean every student lifted one piano.

The Japanese distributive quantifier that corresponds to English each is sorezore as shown in the following examples.

(8) Shoonen=tati-ga sorezore kono piano-o motiage-ta. (adverbial sorezore)
   boy=pl-nom each this piano-acc lift-past
   “The boys each lifted this piano.”

(9) Sorezore-no shoonen-ga iti=dai-no piano-o motiage-ta. (determiner sorezore)
   each-gen boy-nom one=cl-gen -acc lift-past
   “Each boy lifted one piano.”

(10) Shoonen=tati-ga sorezore iti=dai-no piano-o motiage-ta. (binominal sorezore)
    boy=pl-nom each one=cl-gen piano-acc lift-past
    “The boys lifted one piano each.”

Although sorezore in the adjunct position in (8) appears superficially similar to sorezore in (10), I will argue in Chapter 4 that binominal sorezore exists in Japanese. I will propose a number of syntactic tests to differentiate binominal sorezore from adverbial sorezore.

Distinction between singular and plural is unmarked in Japanese. However, adjunct sorezore in (8) and (10) seems to require explicit plural marking.

(8’) *Shoonen-ga sorezore kono piano-o motiage-ta. (adverbial sorezore)
   boy-nom each this piano-acc lift-past
   “*?The boy each lifted this piano.”

(10’) *? Shoonen-ga sorezore iti=dai-no piano-o motiage-ta. (binominal sorezore)
   boy=pl-nom each one=cl-gen piano-acc lift-past
   “*?The boy lifted one piano each.”
On the other hand, *sorezore-no N* in (9) is well formed when the N is singular.

In the next section, I will give a brief summary of previous work on adverbial quantifiers by Sportiche (1988) and Bobaljik (1995), among others. Then, in section 1.3, I will give a brief discussion of previous work on binominal *each*.

As the previous discussion shows, because *each* is a quantifier, proper understanding of the constructions in (1), (2), and (3) requires a theory of quantifiers. In section 1.4, I will give a brief overview of previous theories of scope. In section 1.4.2.3, I will reveal the outline of the theoretical framework within which this thesis is written. Finally, in section 1.5, the outline of the thesis is presented.

1.2. Previous work on adverbial *each*

In this section, I will review one of the influential analysis on floating quantifiers proposed by Sportiche (1988). He proposed that what looked like a floated quantifier was actually stranded by the movement of the antecedent. He adopted the VP-internal subject hypothesis and assumed that Infl was a raising category. His data is primarily in French, but he intends his analysis to be extendable to English. The following phrase structure is assumed.

(11)  
```
  IP
     /   \
(Spec, I) /  \I'
          /   \  
            /     \  
              /       \  
               /         \  
             NP*       VP
```

The VP-internal subject hypothesis assumes that subjects in French and English are base-generated in the position of NP* in (11) and they move to the Spec of IP position,
presumably for Case reasons. The distribution of French floating Q *tous* (all) is shown as follows:

(12) a. Les enfants (*tous) ont (tous) vu (*tous) ce film (tous).
    the children all have seen this movie
    "The children have all seen this movie."

b. Les enfants (*tous) verront (tous) ce film (tous).
    the children all see(future) this movie
    "The children will all see this movie."

Sportiche (1988) assumed that the subject *tous les enfants* (all the children) was base-generated under V° and that the NP *les enfants* moves out of the bigger constituent *[tous les enfants]* and strands the quantifier *tous*.

(13) IP

\[ I' \]
\[ ont \]
\[ XP \]
\[ NP** \]
\[ X \]
\[ vu \]
\[ [tous les enfants] VP \]

Bobaljik (1995) and Dowty and Brodie (1984) adopt the adverb view of floated quantifiers (Qs) in which the floated Qs are adjoined to the left edge of the VP. Bobaljik argues against Sportiche (1988)'s analysis. He compares the movement analysis with the adverb analysis.

One reason why there are problems in analyzing English floated Qs by movement analysis is that floated Qs do not appear in the position where the underlying subjects are expected. For instance, as Bobaljik (1995) pointed out, if one assumed that the subject

---

5 Karoda (1983, 1986) uses a similar idea to account for the distribution of numeral quantifiers in Japanese.
started out from the direct object position, it makes a wrong prediction. As shown in (14),
the floated quantifier after the verb is unacceptable in English.

(14) They (all) have (all) been arrested (*all).

I do not adopt Sportiche (1988)'s analysis for adverbial each because it is not
compatible with the NP-movement analysis of the passive without further stipulations, as
pointed out by Bobaljik (1995) and shown in (14).

If one assumes that the following representation (15) is the structure of the passive
sentence with an adverbial quantifier, the movement analysis generates many more
sentences than are allowed by the empirical data.

(15) IP
    \[\text{I'}
        \text{VP} \quad \text{were}
          \text{V'}
            \text{VP} \quad \text{NP}
              \text{arrested} \quad \text{they all}

The sentences in (16) as well as those in (17) are generated.

(16) a. They all/ each were arrested.
       b. They were all/ each arrested.

(17) a. *were arrested [they each]
      b. * were [they each], arrested t,
      c. *were they, arrested [t, each]
      d. *they, were t, arrested [t, each]

(17a), (17b) and (17c) may be excluded for Case-theoretic reasons. However, the reason
why (17d) is unacceptable cannot be accounted for by Sportiche (1988)'s analysis without
further stipulation.
Examples (17a), (17c), and (17d) show that the QP \textit{[they each]} must be pied-piped to the intermediate trace position. Then, either \textit{they} or \textit{[they each]} must move to the Spec of IP to get the Nominative Case. At the present moment, I cannot find any independent reasons why this obligatory pied-piping is required under the movement analysis.

My analysis of adverbial \textit{each} also differs from the analyses of Bobaljik (1995) and Dowty and Brodie (1984) in that mine utilizes a particular projection called DistP (Distributive Phrase), which is independently motivated to account for the scope of distributive quantifier phrases such as \textit{every boy} or \textit{each boy} by Beghelli and Stowell (1997). In Chapter 3, I will argue that adverbial \textit{each} is projected as a head of DistP and the plural feature of its antecedent is checked by the feature of adverbial \textit{each} at LF.

Motivation for this analysis comes from the fact that adverbial \textit{each} requires its antecedent to be in the subject position at Spell-Out as shown by the following examples.

(18) a. The three girls each visited John. (active)
    b. *John was each visited by the three girls. (passive)
(19) a. *John each visited the three girls. (active)
    b. The three girls were each visited by John. (passive)

In Chapter 4, I will adopt a similar analysis using DistP for Japanese adverbial \textit{sorezore}. On the other hand, Japanese numeral quantifiers (numeral plus classifier) such as \textit{i=ssatu} (one book) and \textit{huta=ri} (two people) are analyzed by movement analysis in the spirit of Sportiche (1988) because numeral quantifiers differ in their distribution and syntactic properties from adverbial \textit{each}.

1.3. Previous work on binominal \textit{each}

Syntactic properties of the binominal and adverbial distributive quantifier \textit{each} were investigated in Chomsky (1981)'s Government and Binding framework by Burzio (1986), by Safir and Stowell (1988) (S &S), and by Sutton (1944).
Binominal and adverbial each sentences are exemplified in (20) and (21):

(20) Three girls saw [one balloon each]. (binominal each)  
R-NP  
D-NP

(21) Three girls each saw one balloon. (adverbial each)

I will follow S & S in calling three girls in (20) the Range NP (R-NP) and QPs such as one balloon each the Distributing-NP. The R-NP expresses the range or the domain over which the D-NP is distributed.

As observed by Choe (1987) and Safir and Stowell (1988), the scopal properties of binominal sentences are restricted in that the R-NP always takes scope over the D-NP.

(22) Three boys read one book each.
(i) "Three boys each read a possibly different set of one book." (R-NP > D-NP)  
(ii) "There is one book such that three boys each read it." (#D-NP > R-NP)

For instance, (22) has only reading (22i) in which three boys takes scope over one book.

Safir and Stowell (1988) (S & S) discussed three basic generalizations about binominal each, listed in (23):

(23)a. The D-NP may not be a D-Structure subject.  
b. The structural relationship between the D-NP and the R-NP is clause-bound.  
c. Binominal sentences exhibit reconstruction effects.

Example (24) shows that the D-NP cannot be a subject in the base position:

(24) *[One interpreter each] visited the diplomats.  
D-NP  
R-NP

Example (25) illustrates that the relationship between the D-NP and the R-NP is clause-bound:

(25) Three boys said two girls saw one balloon each.

In (25), one balloon each can only take the embedded subject two girls as its antecedent, and not the matrix subject three boys.

In the following example in (26), each and the indefinite QP preceding it behave as though they are one unit. This is called a reconstruction effect. Burzio (1986) was the first
to observe reconstruction effects with binominal each sentences. He found reconstruction effects with A-movement as well as A-bar movement.⁶

(26) a. [One interpreter each] was assigned to the diplomats.
    b. Two candidates each were nominated for the award by the three professors.

Reconstruction effects with A-bar movement are shown as follows:

(27) How many books each did the students read?

Burzio (1986) analyzed binominal each as an anaphor which obeys Principle A of the Binding Theory proposed by Chomsky (1981). However, as S & S pointed out, binominal each does not have the same distribution as anaphors such as each other or themselves.

(28) a. The boys said that pictures of each other were on sale.
    b. The boys said that pictures of themselves were on sale.
    c. *The three boys said that one picture each was on sale.

(29) a. The boys consider each other to be fortunate.
    b. The boys consider themselves to be fortunate.
    c. *The three boys consider one picture each to be on sale.

Examples in (28) and (29) show that the distribution of binominal each is more restrictive than reflexive and reciprocal anaphors in these environments.

S & S (1988) consider two possible structures for binominal each: one in which each is in the Specifier position of NP as in (30), and another in which each is the head as in (31).

(30)  

```
  NP  
 /  
NP   each 
  |  |  
 two books  [N e]  [e]

(31)  
```

⁶ See Barss (1986) for discussion of reconstruction effects related with anaphoric binding.
(31) 
```
NP
   NP[spec e] [QP
   each [e]
```

two books

S & S further assumed that an anaphoric relation holds between the R-NP and the null complement NP after each.

In order to account for the generalizations in (23), S & S proposed that the binominal each-phrase undergoes movement out of the D-NP at LF and adjoins to IP. They consider the each-movement as a type of Quantifier Raising proposed by May (1977, 1985). Also the R-NP undergoes QR to bind the null object of each within the D-NP.

For instance, the LF representation of the binominal sentence the men each saw two women is as follows:

(32) 
```
IP
   NP[spec e]
   each [e]
```

Furthermore, S & S assume that binominal each-movement obeys the Subject Condition of Chomsky (1973).  

---

7 S & S's LF each-movement analysis can be regarded as a kind of precursor of the LF each-movement analysis proposed by Heim, Lasnik, and May (1991).

8 Subject Condition effects may be derived from more general principles such as Huang (1982)'s CED or Chomskyy (1986)'s Subjacency.
(33) a. *The boys consider [one girl each] to be foolish.
   R-NP          D-NP
   b. *Who do you believe [a sister of ___] to have left?

Thus, they regard the unacceptability of (33a) as similar in nature to the unacceptability of
(33b). They assume that reconstruction involves reconstructing the D-NP at LF into the
direct object trace position as in (34b).

(34) a. [Two interpreters each] seem [t_i to have been [t_i assigned t to the diplomats]].
   b. [e_i] seem [[e_i] to have been [t_i assigned [two interpreters each] to the
diplomats]]

Examples such as the following are excluded by the Subject Condition.

(35) a. *[Two women each] seemed to the men [[e] to have shot themselves.]
   b. *[Two women each] seemed [[e] to love the men].

The Subject Condition prohibits each to move out of the subject. In (34), the D-NP is
reconstructed into the direct object position as in (34b). Assuming that each-movement
takes place after reconstruction, each-movement from the direct object position does not
violate the Subject Condition. Thus, (34a) is acceptable.

On the other hand, in sentences (35a) and (35b), the D-NP is reconstructed into the
subject position. Each-movement from the subject position is blocked by the Subject
Condition. Therefore, (35a) and (35b) are unacceptable.

S & S point out that the reconstruction effect of A-bar movement of binominal each
differs from that of anaphors discussed in Barss (1986) in that binominal each does not
allow reconstruction into the intermediate trace position.

(36) a. *[How many books each] did the boys say he read t?
   b. *[Which pictures of himself] did John say Mary bought t?

S & S assume that binominal each-movement is not allowed to reconstruct from the Spec
of CP into a non-theta marked position. Thus, the LF representation of how many books
each did the girls say the boys read t? is shown in (37b):

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(37) a. [How many books each, did the girls say [t, the boys read t,]]?
b. [e, did the girls say [[(the boys) read [how many books each,]]]?

One remaining problem is how to account for the locality of binominal each-movement. S & S hoped to derive the locality of binominal each-movement from the dyadic nature of binominal each.

In this thesis, I will consider the properties of binominal each in terms of the scopal properties of quantifiers in general. My analysis differs from the previous analyses in that it uses projections such as DistP and ShareP at LF, which are independently motivated to account for the scopal interaction of QPs such as every boy or each man, among others.

1.4. Previous work on Theories of Scope

In this section, I will review May (1985)'s influential work on scope and the recent studies by Beghelli, Ben-Shalom, and Szabolcsi (1997), and Beghelli and Stowell (1997) which were triggered by the findings of diverse scopal behavior of QPs by Liu (1990).

1.4.1. Movement Theory of Scope - May (1977, 1985)

May's (1977, 1985) Quantifier Raising (QR) account of scope is so well known that it does not need an extensive summary. In this section, I will just give a brief summary of May (1985), highlighting what is common and what is different from the approach adopted in this thesis.

In May (1985: 5), scope is defined as a structural representation at LF as follows:

(38) The scope of $\alpha$ is the set of nodes that $\alpha$ c-commands at LF.$^{9}$

For instance, the following sentence with two QPs are accounted for by the application of a movement rule called QR which maps S-structure into LF.

---

$^{9}$ May adopts Aoun and Sportiche (1983)'s definition of c-command, which is defined as follows:
(i) $\alpha$ c-commands $\beta$ if and only if every maximal projection dominating $\alpha$ dominates $\beta$, and $\alpha$ does not dominate $\beta$. 

---

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(39) Every student read some book.

Furthermore, he assumes that QR is an adjunction operation and that the adjunction site is an A-bar position.

(40) a. [[[every student]_{2} e_{2} read [NP some book]]]
    b. [[s [some book]_{3} [s [every student] read e_{3}]]]

(40a) is derived by applying QR to the subject QP. (40b) is derived by applying QR to the object QP. Further application of QR to the in-situ QP in (40a) and (40b) yields (40a') and (40b') respectively.

(40a')
```
          S
         /\  
       /   
    S   /     S
    /\  /\  
  NP_{2}  S
      /\     
 every student /\  
  S     
  /\  
np_{3}  
      some book
```

(40b')
```
          S
         /\  
       /   
    S   /     S
    /\  /\  
  S   /     S
    /\  /\  
  np_{3}  S
      /\  
 some book /\  
  S     
  /\  
np_{2}  
      /\  
 every student /\  
  S     /\  
      
      
  VP  
    
  /\  
  read /\  
 e_{3} 
```

(40a') represents the reading in which for every student there is some book that he read. (40b') represents the reading in which there is some book that every student read.

Then, in Chapter 2, May (1985) goes on to revise his account and propose an ambiguous LF, which is the essential difference between May (1977) and May (1985).
"Scope Principle" is defined on an ambiguous LF representation.\(^\text{10}\)

(41) Scope Principle (May 1985: 34)
Members of \(\Sigma\)-sequences are free to take on any type of relative scope relation.

"A \(\Sigma\)-sequence" is defined as follows:

(42) a class of occurrences of operators \(\Psi\) is a \(\Sigma\)-sequence if and only if
for any \(O_i, O_j \in \Psi\), \(O_i\) governs \(O_j\)

Thus in (40b') **some book** and **every student** form a \(\Sigma\)-sequence and these two NPs may
take any type of relative scope position.\(^\text{11}\)

The intuition behind May's QR proposal is the desire to capture the parallelism
between syntactic movement such as \(wh\)-movement and the LF Quantifier movement
(QR). Thus, QR would be subject to so-called island constraints that apply to, for
others.)

(43) a. If John comes, Mary will leave.
    b. *Who if \(t\) comes, Mary will leave ?

For instance, (43b) shows that \(wh\)-extraction cannot occur from inside the conditional if-
clause which is an Adjunct Island. A similar restriction applies to the LF movement of
QPs.

(44) a. If every woman comes, John will be happy.
    b. #"For every woman if she comes, John will be happy."

\(^{10}\) Tyhurst (1990) argues against May for making the LF representation ambiguous, which makes
impossible to capture the entailment relationships at the level of LF.

\(^{11}\) See Liu (1990) for the arguments against the technical and empirical aspects of May (1985)'s approach.
Her main arguments are reviewed in the next section.
Ruys (1992) independently of Liu, also pointed out that the scopal behavior of indefinites is problematic
for the QR-approach.
The assumptions about QR are summarized as follows: First, QPs undergo movement at LF. This movement, QR, is a subcase of move alpha, operating in the mode of adjunction to the non-thematic XP position. Second, QR obeys the locality conditions on move alpha, e.g. Subjacency. Third, QR applies uniformly to all QPs. Fourth, neither QR nor any QP is landing-site sensitive. In principle, any QP can be adjoined to any XP. Typical adjunction sites are S, VP, PP and NP.

In this thesis, I will adopt Beghelli and Stowell (1997)'s approach to quantifier scope, which also assumes that QPs undergo movement at LF. However, this approach differs from May (1985)'s approach in assuming that the LF movement is a function of QP-types. QPs move to a designated landing-site, which accounts for their differential scope behavior. Furthermore, I will assume along with Beghelli and Stowell that scope ambiguities are disambiguated at LF, unlike the ambiguous LF approach of May (1985), so that scope relations are explicitly represented in the Logical Form.

1.4.2. Theories of Differential Scope
1.4.2.1. Liu (1990)

Liu (1990) showed that only a handful of QPs are as well-behaved as May's theory would predict, and made a valuable empirical contribution to the theory of scope.

She classified NPs in simple transitive sentences according to their scopal dependency in subject and object positions. The four types of NPs are summarized in (45).\footnote{According to Barwise and Cooper (1982) and Szabolcsi (1997), a generalized quantifier (GQ) is a semantic object that a QP can denote. It is defined as a set of property (a function).

A GQ is \textit{(monotone) increasing} iff \((A \in GQ \land A \subseteq B) \Rightarrow B \in GQ\).

For example, QPs such as \textit{every man}, \textit{some man}, \textit{John}, \textit{at least two men}, \textit{more than two men} denote increasing GQs.

A GQ is \textit{(monotone) decreasing} iff \((A \in GQ \land B \subseteq A) \Rightarrow B \in GQ\).

For instance, QPs such as \textit{no man}, \textit{not every man}, \textit{less than two men}, \textit{at most two men} denote decreasing GQs.

A GQ is \textit{non-monotonic} iff it is neither increasing or decreasing.

For instance, QPs such as \textit{exactly two men}, and \textit{John and nobody else} is non-monotonic.}

16
(45) Liu (1990:12)  
<table>
<thead>
<tr>
<th>induce dependency</th>
<th>depend on other NPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. individual-denoting NPs</td>
<td>no</td>
</tr>
<tr>
<td>B. universally quantified NPs;</td>
<td>yes</td>
</tr>
<tr>
<td>a certain; most</td>
<td></td>
</tr>
<tr>
<td>C. bare numeral, some proportional (more than 50 %)</td>
<td>yes</td>
</tr>
<tr>
<td>D. modified numeral, decreasing, proportional (less than 50%)</td>
<td>no</td>
</tr>
<tr>
<td>Examples with individual-denoting NPs (type A) are as follows:</td>
<td></td>
</tr>
</tbody>
</table>

(46) a. John saw no student.  
   b. That student likes most of the teachers.  
   c. No student saw John.  
   d. Most of the teachers like that student.

All the sentences in (46) are unambiguous. (46) shows that individual-denoting NPs such as John and that student do not induce scope-dependency and that they do not depend on other NPs for interpretation.

Examples with NPs of type B are illustrated as follows:

(47) a. Every student read two books.  
   b. A certain student read two books.  
   c. Most students read two books.

All the NPs underlined in (47) have the scope-independent reading. For instance, (47a) has an interpretation in which each of the students in a given domain read two books. The choice of the student does not depend on the choice of two books. So, the NP every student, when in the subject position, does not depend on other NPs for interpretation. Similar things can be said for a certain student and most students.

Examples with NPs of type C are shown as follows:

(48) a. Every student read some book.  
   b. Every student read two books.

NPs of type C such as some book and two books in (48) can induce scope-dependency. Both of the sentences in (48) have a reading in which the choice of the book depends on
the choice of the student. Thus, some book in (48a) and two books in (48b) can be scope-dependent on every student.

Examples with NPs of type D are illustrated as follows:

(49) a. At least two students answered no questions correctly.
    b. Two of the students read few than three books.

Neither (49a) nor (49b) has the object wide-scope reading. (49a) does not mean that there is no question that was answered correctly by at least two students. Similarly, (49b) does not entail that there are fewer than three books such that each of them was read by two of the students. Thus, NPs of type D such as no question and fewer than three books do not induce scope-dependency in the object position.

Scope-dependency is obtained only when the NPs of type D are in the object position as shown in the following examples.

(50) a. No student answered at least two questions correctly.
    b. Fewer than three students read two of the books.

The sentences in (50) are unambiguous. They only have subject-wide scope readings. Thus, in the subject position, the NPs of type D such as no question and fewer than three students are scope-independent.

Both (50a) and (50b) have a subject-wide scope reading. (50a) means that there are at least two students such that neither of them answered any question correctly. (50b) means that there are two students such that each of them read fewer than three books. Thus, NPs of type D such as no question and fewer than three books depend on other NPs.

Then, she groups the four types of NPs into two major classes: generalized-specific (G-specific) NPs and non-specific NPs. In (45), NPs in type D are classified as non-specific NPs. She regards the rest, namely, type A, B, C, as G-specific NPs.

(51)a. non-specific NPs (type D)
    (i) can depend on other NPs for scope interpretation
        (ii) cannot easily make the subject scope-dependent when they are in object position

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b. G(eneralized)-specific NPs (type A, B, C)
   (i) cannot be dependent on others and/or
   (ii) can easily make the subject scope-dependent when in object position

According to this classification, an NP will qualify as G-specific if it has at least one reading in which it can induce scope-dependency in the subject while it is in object position. The following summarizes the kind of NPs included in Liu's classification.

(52) Non-specific NPs
   at least two N, more than two N, between two and five N, exactly two N, few N,
   fewer than two N, no N, neither N

(53) G-specific NPs
   all the N, every N, each N, most of the N, majority of the N, some N,
   a (certain) N, the N, both, one/two/three (of the) N

Basic motivation for this classification comes from Liu's observation that G-specific NPs always give rise to scope-independent readings. She did not give an account for why this is so, but it is an intriguing generalization. A possible account of why it is the G-Specific NPs that always give rise to scope-independent readings is given by Beghelli, Ben-Shalom, and Szabolcsi (1997), which I will review in the next section.

According to her, each N is one of the G-specific NPs. She showed that not only some indefinite NPs, but also some G-specific NPs can be island-escaping.

(54) Charles bought half the dog biscuits which each shop had on display.

(54) may have a reading in which each shop in the relative clause has scope over the NP in the matrix clause (e.g. half the dog biscuits). In fact, she showed that island-escaping NPs are all G-specific, but not all G-specific NPs (e.g. most N) are island-escaping.

Furthermore, she observed that each N displays distributivity more consistently than every N in cases of interaction with wh-phrases. For instance, the subject/object
asymmetry with regards to the availability of pair-list readings observed by May (1985) is absent when the NP is \textit{each} $N$.

(55) a. What did \textit{every student} see?
   b. Every student saw an elephant.
   c. Mary saw a cat, Harry saw a rabbit and Susan saw a duck. (pair-list reading)

(56) a. Who bought \textit{everything} for Max?
   b. Oscar bought everything for Max.
   c. Mary bought him a tie, Sally a sweater, and Harry a piano. (pair-list reading)

With \textit{every N}, the wh-question can be answered with pairs as in (55c) when \textit{every N} is in the subject position, but not in the object position as in (56c). This asymmetry disappears when the wh-phrase interacts with \textit{each N}.

(57) a. What did \textit{each student} see?
   b. Each student saw an elephant.
   c. Mary saw a cat, Harry saw a rabbit and Susan saw a duck. (pair-list reading)

(58) a. Who reviewed \textit{each manuscript}?
   b. Harry reviewed each manuscript.
   c. John reviewed the first manuscript, Mary reviewed the second manuscript, and Bill reviewed the third manuscript. (pair-list reading)

As shown in (57) and (58), sentences with \textit{each N} allow pair-list readings even when \textit{each N} is in the object position.

Liu’s main contribution was to show that QPs systematically differ in their scope-taking abilities depending on their inherent semantic properties and that the patterns of ambiguities that arise are much more limited than May’s approach would predict.

\textbf{1.4.2.2. Beghelli, Ben-Shalom and Szabolcsi (1997)}

Beghelli, Ben-Shalom, and Szabolcsi (BBS) show how the notion of witness sets can be used to capture basic intuitions about scope, and how denotational semantic differences between NPs affect scopal patterns. They argue that the notion of scope should be factored into \textit{variation}, \textit{distributivity}, and \textit{maximality}.

\footnote{See Beghelli (1977) for more empirical coverage on pair-list readings and an account of pair-list readings in a theory of differential scope.}

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When one considers, for instance, the two types of scope readings in a sentence such as (59), one usually draws diagrams such as (60a) and (60b).

(59) Each boy lifted one piano.

(60a) \hspace{1cm} \text{boy} \quad \text{piano}

(60b) \hspace{1cm} \text{boy} \quad \text{piano}

(60a) captures the subject-wide scope reading of (59), whereas (60b) captures the object-wide scope reading of (59). (60a) shows \textit{variation}, while (60b) does not. BBS show that when one draws diagrams such as (60a) and (60b), one is using the notion of a witness set.

A witness set is defined in terms of the smallest set that a Generalized Quantifier (GQ) lives on by Barwise and Cooper (1982) as follows:

(61) a. A set \( W \) is a \textit{witness} of a GQ iff \( W \in \text{GQ} \) and \( W \subseteq \text{SL(GQ)} \), where \( \text{SL(GQ)} \) is the smallest set that the GQ lives on.
   b. A GQ \text{ lives on} a set of individuals \( A \) if, for any set of individuals \( X \), \( X \in \text{GQ} \text{ iff } (X \cap A) \in \text{GQ} \)

For instance, a witness set of the GQ denoted by \textit{each boy} is any set that contains every boy and no non-boys. BBS (1997: 31) propose that witness sets are used in defining scope readings as follows:

(62) To construct a situation that verifies the asymmetrical scope reading \( F > G \), pick a witness \( W_i \) of the wide scope quantifier \( F \). Using the relation denoted by the predicate, associate with each element of \( W_i \) a possibly different witness \( W_j \) of the narrow scope quantifier \( G \).
Let us consider, for example, the subject-wide scope reading (i.e. [[each boy]] > [[one piano]]) of (59) each boy lifted one piano.

\[
\begin{align*}
\text{W}_1 \text{ of } [[\text{one piano}]] \\
\text{W}_2 \text{ of } [[\text{one piano}]] \\
\text{W}_3 \text{ of } [[\text{one piano}]] \\
\text{W}_4 \text{ of } [[\text{one piano}]] \\
\end{align*}
\]

\[
\text{W}_1 \text{ of } [[\text{each boy}]]
\]

The object-wide scope reading (i.e. [[one piano]] > [[each boy]]) of (59) each boy lifted one piano is expressed by this approach as follows:

\[
\begin{align*}
\text{W}_1 \text{ of } [[\text{one piano}]] \\
\text{W}_1 \text{ of } [[\text{each boy}]]
\end{align*}
\]

(64) contains only one witness associated with the narrow scope quantifier [[each boy]].

There can be only one set that contains every boy and no non-boys. Thus, universally quantified QPs cannot induce variation (referential dependency) in the narrow scope position, which comes from the denotational meaning.

**Variation** is more precisely formulated by BBS (1997:49) as follows:
(65) For \( F > G \) to exhibit variation, there must be a model where \((F > G) (R)\) is true, but

for every witness \( w_1 \) of \( F \), for every \( x, z \in w_1 \),

for every witness \( w_2 \) of \( G \), for every \( y, v \in w_2 \),

\(<x, y> \in R \text{ and } <z, v> \in R\) \(\rightarrow\) \((<x, v> \in R \text{ and } <z, y> \in R)\)

That is,

(a) \( x \neq z \) within the same witness of \( F \)

and

(b) \( y \neq v \) that distinguish two witnesses of \( G \)

For example, for (59), the situation expressed by the following diagram should not hold if there is variation. In other words, whatever piano one boy lifted should not be the same piano that the other boy lifted when there is variation.

(66) \[
\begin{array}{ccc}
& & \\
& \text{boy} & \\
F & x & y \\
& \text{piano} & \\
& z & v \\
& & \\
G & & \\
\end{array}
\]

If the wide-scope taking quantifier does not have two distinct elements \( x \) and \( z \) in its witness, it cannot induce variation.

For instance, quantifiers such as \( \text{John, this boy} \) and \( \text{exactly one student} \) cannot induce variation because their GQ has a unique witness.

(67) \( \text{John/ This boy/ Exactly one boy read each book.} \)

In (64) \( (\text{the object wide scope reading of each boy lifted one piano}) \), \( F \) does not induce variation. \( F \) in (64) is one piano, which has a unique witness. Therefore, (64) does not have variation.
The narrow-scope taking quantifier G that cannot vary is the one that does not have two distinct witnesses. In (64), [\[ each \, boy \]] has a unique witness. If G "talks about" some fixed individuals, it cannot induce variation. This notion can be formalized using the notion of a principal filter as BBS (1997:49) shows:

(68) The quantifier G is a principal filter iff it is of the form \( \lambda P[ A \subseteq P] \), where A is non-empty, the properties (sets) that are elements of G are supersets of a particular set A. A, which is also the unique witness of G, is called its generator set.

Names, universally quantified NPs, conjoined NPs and definite NPs are regarded as denoting principal filters. For instance, the following sentences do not have the object-wide scope variation reading.

(69) A student read every book/ these two books/ LGB and Aspects.

In Chapter 3 of this thesis, I will show that adverbial each sentences allow QPs that denote principal filters in the object position, which gives rise to a non-covarying reading. This property differs from that of binominal each sentences, which obligatorily requires a covarying (referentially dependent) reading.

BBS also argue that scope should be factored into at least variation and distributivity.

(70) Three boys read more than two books.
   (i) "There are more than two books such that three boys read."
   (more than two books \( \succ \) three boys)
   (ii) "There are more than two books such that a possibly different set of three boys read each of them." (distributive object wide scope reading)

(70) has a object-wide scope reading in (i). But (70) does not easily have a distributive object-wide scope reading in (ii) where, each of three boys read each of possibly different sets of more than two books.

Finally, BBS show that the witness method in (49) only works for increasing quantifiers because for increasing quantifiers, the entailment relations do not change when
embedded in a larger environment. For instance, the subject-wide scope reading of two students \textit{read every book} holds true even in a situation where there are more than two students who read every book. On the other hand, for decreasing and non-monotonic quantifiers, this is not the case. Decreasing and non-monotonic quantifiers impose maximality conditions on the relevant situations. For example, the subject-wide scope reading of \textit{exactly one student read every book} is no longer true in a situation where there is more than one student who read every book.

The difference between increasing quantifiers, on the one hand, and decreasing and non-monotonic quantifiers, on the other, lies in the \textbf{maximality} condition.

(71a) a. Three men walk.

\[ \exists \ x \ [ x \in \text{THREE MEN} \ \& \ x \subseteq (\text{WALK} \cap \text{MAN})] \]

b. Fewer than six men walk.

\[ \exists \ x \ [ x \in \text{FEWER THAN SIX MEN} \ \& \ (\text{WALK} \cap \text{MAN}) \subseteq x] \]

c. Exactly one man walks.

\[ \exists \ x \ [ x \in \text{EXACTLY ONE MAN} \ \& \ (\text{WALK} \cap \text{MAN}) = x]\]

(71a) with an increasing quantifier states that the three men are walking men. (71b) with a decreasing quantifier and (71c) with a non-monotonic quantifier has a \textbf{maximality} condition stated as the number of all the walking men is fewer than six and the number of the walking man is exactly one, respectively.

BBS showed that the patterns of scopal dependency that Liu (1990) captured in terms of non-specific and G-specific NPs can be largely accounted for using witness sets. G-specific NPs included increasing QPs and those denoting principal filters. On the other hand, non-specific NPs are the ones that cannot be easily captured by the witness set method because they included increasing as well as decreasing and non-monotonic QPs. BBS pointed out that for the latter QPs a \textbf{maximality} condition was necessary.
1.4.2.3. Beghelli and Stowell (1997)

Beghelli and Stowell (1997) share with Liu (1990) and BBS (1997) the basic assumption that not all quantifiers are created equal. In their approach, QPs acquire their scope as a by-product of moving into syntactic positions at LF, where they can check some scope-independent morphological and semantic features. There are target scope positions for different QP-types.

QPs are classified into the following five major types:

(72) 1) Interrogative QPs (WhQPs) -what, which N (Their [+wh] feature is checked via Spec-Head agreement with the question operator Q.)

2) Negative QPs (NegQPs)- no one, no N

3) Distributive-Universal QPs (DQPs) - every N [Dist] [+Univ] (underspecified for Distributive), each N [+Dist]

4) Counting QPs (CQPs) - few, fewer than five, at most six (decreasing QPs) more than five, between six and nine, more(students) than (teacher) ) (cardinality expressions built by modified numerals)

5) Group-Denoting QPs (GQPs)- the students, all the students (definites) one student, three students, a student, some student, several students, many students (indefinites)

* indefinite NPs can be ambiguous between GQPs and CQPs.

B & S consider indefinite QPs such as some sheep/a sheep, and two men ambiguous between GQPs and CQPs. Scopally ambiguous sentences may undergo reconstruction freely. However, there is no reconstruction from RefP, DistP, or ShareP since QPs move to this position motivated by their semantic features. Also ShareP is projected only if DistP is projected.

Following is the phrase structure of these QPs at LF.

14 See Beghelli (1995:78) and Szabolcsi (1997) for this restriction on reconstruction. However, Tim Stowell argues that reconstruction from these positions may be necessary for complex QP expressions such as Which pictures of two girls did every boy like ?
(73) \[ \text{RefP (E)} \]

\[
\begin{align*}
\text{Spec} & \quad \text{CP} \\
\text{GQP} & \quad \text{AgrSP} \\
\text{Spec} & \quad \text{DistP (V)} \\
\text{Spec} & \quad \text{ShareP (E)} \\
\text{Spec} & \quad \text{NegP} \\
\text{Spec} & \quad \text{AgrOP} \\
\text{Spec} & \quad \text{VP}
\end{align*}
\]

(I put in a bold letter the projections that are especially important for my analysis of binominal and adverbial sentences.) The five types of QPs move to their designated scope positions in (73).

WhQPs move to the Spec of CP. NegQPs move to the Spec of NegP. DQPs such as every boy and each boy move to the Spec of DistP. CQPs such as few boys stay at the Case positions. GQPs may move to three positions: the Spec of RefP when they take the widest-scope, the Spec of ShareP when they are distributed over in a covariance reading, and the Spec of ArgXP. This is shown in the following phrase structure:

(73') \[ \text{RefP} \]

\[
\begin{align*}
\text{CP} & \quad \text{AgrSP} \\
\text{DistP} & \quad \text{ShareP} \\
\text{NegP} & \quad \text{AgrOP} \\
\text{every boy} & \quad \text{each boy} \\
\text{few boys} & \quad \text{VP}
\end{align*}
\]
B & S assume a checking theory of scope assignment in the minimalist framework.

DQPs need to check their [+Dist] features under agreement with a distributive operator \( \forall \) hosted in the head of DistP.

GQPs need to check [+group referent] feature with an existential operator \( \exists \) in either the head of ShareP or RefP.

CQPs do not have particular semantic features associated with them. They stay in their Case checking position. A GQP may be ambiguous between a CQP depending on whether it has a [+group referent] feature or not. If it does not have this feature, it stays in the Case-checking position.

In this way, B & S’s theory may capture scope relations in a more restrictive way than predicted in the theory of QR.

Furthermore, they distinguish two patterns of distributivity. Strong distributivity displayed by \textit{every} N and \textit{each} N, and Pseudo-Distributivity exhibited in GQPs such as \textit{all} N.

There are three diagnostic properties of Strong Distributivity:

(74) Strong Distributivity

1) DQPs headed by \textit{each/every} are Strong Distributors.
2) Strong Distributivity is obligatory.
3) Strong Distributivity can arise under an inverse scope construal, e.g. where the distributee is in Spec of AgrSP and the distributor is in Spec of AgrOP.
(A boy read each book.  \( \text{each N} > \text{a boy} \))

(75) Pseudo-Distributivity (Weak Distributivity)

1) Plural definite and indefinite GQPs (including QPs headed by \textit{all}) are Pseudo-Distributors.
2) Pseudo-distributivity is optional.
3) Pseudo-distributivity cannot arise under an inverse scope construal, e.g. where the distributee is in Spec of AgrSP and the distributor is in Spec of AgrOP.
(A boy read all the books.  \( ^*\text{all the books} > \text{a boy} \))
B & S proposed that pseudo-distributivity does not utilize the movement of the distributor to a targeted scope position such as Spec of DistP. It arises through the agency of a covert distributive element corresponding to the floated each.

1.5. Outline of the thesis

In this thesis, I will adopt B & S's approach to analyze binominal each and adverbial each sentences. Then, I will examine how their approach can be extended to account for similar sentences with distributive quantifiers in Japanese.

The issues I would like to address in this thesis are empirical. The goal is to examine how the approach that was motivated by scope relations in English works in Japanese and consider its cross-linguistic implications.

Chapter 2 discusses how the scopal difference between binominal and adverbial each is derived. It is proposed that the difference comes from the way these two constructions use the Spec of ShareP positions. Also an account of the subject-orientation of adverbial each sentences will be given.

Furthermore, I will examine the syntax and semantics of binominal each sentences in English. Contrary to what Beghelli (1995, 1997) assumed, I will propose that binominal each sentences exhibit an instance of Strong Distributivity and that they can be analyzed utilizing the Spec of DistP position. Motivation for this analysis comes from the obligatory distributive reading of binominal each sentences and their scope properties. The analysis assumes that each has a [+Dist] feature and undergoes feature-checking in the spirit of the Minimalist Program of Chomsky (1995).

In Chapter 3, I will present new data of Japanese binominal and adverbial sorezore which can be analyzed in terms of the LF movement of sorezore to the Spec of DistP position.
Finally, in Chapter 4, I will examine Distributivity in reciprocal sentences and propose a minimalist revision to Heim, Lasnik and May (1991)'s LF-movement analysis of English and Japanese reciprocals. Then, I will discuss the typology of [+Dist] movements at LF.
Appendix to Chapter 1
Distributivity and Plurality

0.1. Where does Distributivity come from?

In this section, I will review four different approaches to distributivity. One approach is proposed by Lakoff (1970) which derives distributivity by movements called Quantifier Lowering (or Quantifier Raising). The second approach derives distributivity from the nature of the predicate proposed by Bennett (1974). The third approach regards determiners as the locus of distributivity, which is represented by Scha (1981). The fourth approach derives distributivity from structural properties as in B & S (1997).

I will conclude that the first three approaches have shortcomings. However, B & S’s approach, which is basically a movement approach like Lakoff (1970) and May (1977, 1985), has a similarity with Scha’s approach in that it takes into consideration the lexical properties of the determiner QPs. In B & S’s approach, each QP has a designated landing site. In this sense, it is concluded that B & S’s approach can best capture generalizations about distributivity among the various approaches. In section 0.5, I will compare B & S’s approach with a pure lexical approach.

0.1.1. Distributivity as Quantifier Lowering

Lakoff (1970) discusses the idea that the following examples (1) and (2) are ambiguous between “group readings” and distributive readings which he calls “quantifier-readings”.

(1) That archaeologist discovered nine tablets.
(2) All the boys carried the couch upstairs.
In order to get distributive readings in (1) and (2), Lakoff proposes a movement rule called Quantifier Lowering. Group readings of (1) and (2) are captured by the QP being in-situ because Lakoff considers that the group reading does not involve scope of quantification.

According to this approach, as reviewed by Roberts (1990) and Landman (1996), sentences with two QPs such as (3) are predicted to have five readings under Lakoff's analysis.

(3) Three boys invited four girls.
   (i) [three boys]d [four girls]d
       "Three boys each invited each of four girls."
   (ii) [four girls]d [three boys]d
       "There are four girls such that each of them was invited by three boys."
   (iii) [three boys]d [four girls]g
       "Each of the three boys invited four girls as a group."
   (iv) [four girls]d [three boys]g
       "Each of the four girls are invited by three boys as a group."
   (v) [three boys]g [four girls]g
       "A group of three boys invited a group of four girls."

I followed Roberts (1990) in expressing the QPs with [ ]d to denote distributive readings and those with [ ]g to denote the group readings. (3i) and (3ii) are readings which are derived by moving two QPs via QL in a different order. (3iii) and (3iv) are readings which are obtained by moving one of the QPs. The QPs that stayed in-situ are construed as having the group reading. The reading in (3v) is obtained by not moving any of the two QPs.

Both Roberts (1990) and Landman (1996) agree that Lakoff's approach undergenerates.

Furthermore, Roberts mentions that Lakoff's account has problems capturing anaphor facts. Another more serious problem that Roberts raises involves the following example.

(4) Five insurance associates gave a $25 donation to several charities.
   (i) five insurance associates > several charities > $25
Roberts observes that (4) has a reading in which five insurance associates as a group take a distributive scope over several charities shown in (4i). In other words, each charity was given $25 by a possibly different group of insurance associates. Lakoff's approach would predict that if the subject five insurance associates has the group reading it must have a narrow scope with respect to the indirect object QP several charities. The claim of Roberts here is that group-denoting QPs may take scope over non-group-denoting QPs and that Lakoff's approach cannot accommodate this type of reading because distributivity is reduced to scope in his approach.

In my opinion, the reading (4i) is not a general case. The subject QP five insurance associates can denote groups of groups just as QPs such as five groups of boys, three workers unions, three PTAs, two computer companies can. For instance, the following example, which replaces five insurance associates with five boys, does not seem to have the interpretation that Roberts discusses.

(5) Five boys gave a $5 donation to several charities.

It seems that a certain type of common nouns which can denote a group of groups can induce the kind of reading in (4i) where the group-denoting QP takes scope over the other distributed QP.

Another empirical problem that Landman (1996) raises, which I agree with, is that inverse distributive scope reading in (3ii) and (3iii) are harder to get than other readings. However, nothing in Lakoff's approach predicts that (3ii) is harder to get than (3i).

0.1.2. Distributivity comes from the predicate

In this section, I will examine the approaches which derive distributivity from the nature of the predicates. Bennett (1974) propose that distributivity comes from the lexical properties of the predicate.
Bennett (1974) gives some examples of lexical items which require a group-readings as follows

(6) a. *John disperses.
    b. The committee disperses.
(7) a. *John walks together.
    b. The men walk together.
(8) a. *Mary is among John.
    b. Mary is among the unicorns.

The examples in (6) show that the predicate disperse requires a subject DP which denotes a group. (6a) is unacceptable because the DP John does not denote a group. (6b) indicates that the DP the committee denotes a group and that the group/ non-group distinction is not based on morphological plural marking but a semantic distinction. The examples in (7) show that the VP walk together requires a group-denoting subject. (8) shows that the head of the PP among requires a group-denoting complement.

Bennett followed Montague (1973) in assuming that both CNs (Common Nouns) and VPs are predicates and that the lexical entries of such elements specify which class (or classes) they belong to.

On the basis of examples like (6), (7) and (8), Bennett distinguished two classes of predicates, those which contain individuals in their extensions, and those which contain groups. For instance, the predicates such as gather and disperse are group-level category IVg, while predicates such as walk, eat, talk are individual-level category IV. An IVg takes only group-level CNg as an argument. The adverbial together is treated as IVg/IV, which takes an individual-level predicate to form a group-level predicate. The preposition among is AJ/Tg, which takes group-level complements. This is shown in (9):
(9) lexical items category
gather, disperse IVg
walk, eat, talk IV
John, Mary T
committee CNg/the= Tg (=t/IVg)
together IVg/IV
among AJ/Tg

(6a) is ungrammatical because John, which is of type T, cannot be the subject of a group-level predicate disperse, which is type IVg.

(6) a. *John disperses.
    b. The committee disperses.
(7) a. *John walks together.
    b. The men walk together.
(8) a. *Mary is among John.
    b. Mary is among the unicorns.

(7a) is ungrammatical because together of type IVg combines with walk of type IV to form walk together of type IVg, which requires a group-level NP. (8a) is ungrammatical because among, which is of type AJ/Tg does not combine with John, which is type T.

Comparing Bennett’s analysis with Lakoff’s analysis, the former will predict more readings than the latter. For instance, for the sentence in (3) three boys invited four girls, Bennett’s analysis predicts the following two readings that are not predicted by Lakoff’s analysis, besides the five readings from (3i) to (3v) in the previous section, which Lakoff does predict.

(3) Three boys invited four girls.
   (3vi) [three boys]g [four girls]d
   “Three boys as a group invited each of four girls.”
   (3vii) [four girls]g [three boys]d
   “A (possibly) different group of four girls was invited by each of three boys.”

The two readings that are not available in Lakoff’s analysis are ones in which the DP with the group reading takes scope over the DP which has the distributive reading. The example discussed in the previous section, which Roberts mentioned, (4) Five insurance associates
gave a $25 donation to several charities, actually has the group reading scoping over the DP which has the distributive reading.

As I have discussed in the previous section, the question is how general is the phenomenon of the group-denoting QPs taking scope over the individual-denoting (distributive) QPs. It might be only limited to cases where the group-denoting QP has the interpretation of the group of groups as in example (4).

The most obvious problem of Bennett’s approach is, as Bennett himself points out, proliferation of types. For example, the predicate applaud belongs to four different categories: IV/T, IVg/Tg, IV/Tg and IVg/T.

\[(10)\]
\[\begin{align*}
\text{a. John} & \text{ applauded Mary. (IV/T)} \\
\text{b. The committee} & \text{ applauded the mob. (IVg/Tg)} \\
\text{c. John} & \text{ applauded the mob. (IV/Tg)} \\
\text{d. The committee} & \text{ applauded Mary. (IVg/T)} \\
\end{align*}\]

\[(10')\]
\[\begin{align*}
\text{a.} & \quad \text{John} \quad \text{IV} \\
\text{John} & \quad \text{T (=t/IV)} \\
\text{applauded} & \quad \text{Mary} \\
\text{TV=IV/T} & \quad \text{T} \\
\text{b.} & \quad \text{the committee} \quad \text{CNg} \\
\text{Tg} & \quad \text{IVg} \\
\text{applaud} & \quad \text{Tg} \\
\text{IV/Tg} & \quad \text{the mob} \\
\text{CNg} & \quad \text{Mary} \\
\text{c.} & \quad \text{John} \quad \text{IV} \\
\text{John} & \quad \text{T} \\
\text{applaud} & \quad \text{Tg} \\
\text{IVg/Tg} & \quad \text{the mob} \\
\text{CNg} & \quad \text{CNg} \\
\text{d.} & \quad \text{Tg} \quad \text{IVg} \\
\text{Tg} & \quad \text{IVg/Tg} \\
\text{the committee} & \quad \text{Mary} \\
\text{CNg} & \quad \text{T} \\
\end{align*}\]

A majority of the predicates in English are like applaud in that they may take either individual or group-level NPs as objects or subjects, so Bennett’s approach gives rise to unnecessary redundancy in the lexicon.
Bennett's approach poses a problem for cases such as VP-coordination where group-level predicates and individual-level predicates freely conjoin. Roberts (1990) also noticed this problem.¹

(11) The boys met and talked.

In (11), meet is IVg, while talk is IV. Coordination is generally ruled out if constituents of a different category are conjoined together. So Bennett's approach would predict (11) to be unacceptable, but actually (11) is fine.

Furthermore, as Roberts (1990) points out, CNs such as committee also have a group of groups readings as follows:

(12) The committees met last week.

Since in Bennett's system plurality is distinct from group vs. individual level distinction, a group of groups reading for plural group nouns such as committee in (12) is not accounted for. To account for this, further type lifting of CNs would be necessary, which would cause more proliferation of types. As Roberts (1990) points out, deriving distributivity from the properties of predicates alone misses the important and systematic contributions of determiners and other adverbial elements like adverbial each.

0.1.3. Distributivity as Lexical Properties of Determiners

In this section, I will discuss Scha (1981)'s seminal work on distributive and collective readings. Scha (1981) treats distributivity as deriving from the lexical property of determiners.

Scha (1981) gets around the problem of proliferation of types that Bennett encountered by treating distributive predicates such as walk and collective predicates such as disperse as of the same types.

¹ Roberts (1990:93) uses Karina Wilkinson (p.c.)'s example instead of (11).
All common nouns, whether they are singular or plural, denote sets of singleton sets, rather than sets of individuals. Then, he follows Bartsch (1973) in deriving distributive readings from collective ones via meaning postulates pertaining to the predicate.

Thus, Scha’s system allows the generation of (13) meaning “For each boy, he disperses.”

(13) Each boy disperses.

Scha regards (13) as “semantically anomalous”, just as Colorless green ideas sleep furiously is.

I will show the determiners which he classifies as distributive and those which he classifies as collective as follows:

(14) Classification in Scha (1981)

distributive                      collective
(i) each, every, all              (i) all
(ii) a, some,                     (iii) six
    “empty determiner”            (iv) less than six
(iii) six
(iv) less than six                (v) the (+plural N)
    e.g. the boy                  e.g. the boys

For instance, the following sentence has two kinds of collective readings as Scha (1981:493) shows.

(15) Six boys gather.
    a. \exists u \{ u \subseteq BOYS \#(v) = 6 \} : GATHER[u]
    b. \# (U \{u \subseteq BOYS | GATHER[u]\})=6

(15a) is a familiar collective reading where v is the subset of the set of all boys (i.e. the union of the set of boy singletons) and the cardinality of v is 6. (15b) derives a reading that would be true in a situation in which two groups of three boys were each gathering.
As can be seen in (14), in his system, the boys are treated as having only a collective reading. One of the examples that Scha gives is the following:

(15’) The squares contain the circles.

He says that (15’) has a reading which is true in a situation where some squares contain the circles, but not all of the squares contain the circles. In other words, (15’) may have a non-distributive reading which cannot be derived by Bennett’s approach.

Another reason why he may like to treat the definite plurals as collective is the fact that the distributive reading of the definite plural DPs are harder to get in general. Native speakers of English agree that the distributive reading of the definite DP is harder to get than the numeral indefinite DP in the subject position.

(16) a. The students read two books. (“Each of the students read two books.”)
    b. Three students read two books. (“Each of three students read two books.”)

The subject wide scope distributive reading of (16a) seems harder to obtain than that of (16b).

In the object position, the inverse distributive reading of the definite DP is impossible as shown in (17):

(17)a. Three students read the books.
    (#"There are the books such that each of them three students read.”)
    b. Three students read two books.
        (“There are two books such that each of them three students read.”)

This may be the reason behind Scha (1981)’s treatment of the definite DPs as having only the collective reading.

The synonymous relations between (18a) and (18b), and between (19a) and (19b) are captured by means of a meaning postulate in (20).

(18) a. The boys walk.
        b. Every boy walks.

(19) a. The committee walks.
        b. Every member of the committee walks.
(20) meaning postulate:

\[ \text{WALK}[x] = (\#(x) \neq 0 \land \forall y \in X^*: \text{WALK}[y]) \]

Applying the meaning postulate in (20), we get \textit{the boys walk} is true if and only if there are boys and every boy singleton walks.

The use of the meaning postulate is not precisely extendable to transitive verbs because transitive sentences with two QPs display scopal ambiguity.\(^2\) Let us consider the following example:

(21) a. The boys ate a cake.
    b. Every boy ate a cake.

Both (21a) and (21b) are ambiguous between the distributive reading and non-distributive reading. Suppose for sentences such as (21a), the following meaning postulate would be used:

(22) \text{EAT}[x] = (\#(x) \neq 0 \land \forall y \in X^*: \text{EAT}[y])

Since the lexical meaning postulate (with \(\forall\)) necessarily takes narrow scope with respect to the existential of the object DP, it would only yield the object wide scope interpretation as follows:

(23) \exists z [ z \in \text{CAKE} \land \forall x \in \text{BOY}: \text{EAT}(x, z)]

"There is a cake such that every boy ate."

The distributive reading where \textit{boys} takes wide scope over \textit{a cake} (i.e. every boy ate a possibly different cake) cannot be obtained by the meaning postulate. In summary, it was shown that the distributive reading of the transitive sentences cannot be obtained by the meaning postulate approach because the transitive sentences are scopally ambiguous.

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\(^2\) This line of argument is found in Scha (1981), Roberts (1990), Tyhurst (1990), Lasersohn (1993) and Winter (1997).
Lexical meaning postulate would give only one type of interpretation, namely the universal narrow scope interpretation.

Another contribution by Scha (1981) is a semantic account of what is called a "cumulative reading".

(24) a. Five detectives solved six crimes.
     b. 500 Americans bought 3000 Japanese cars.

Both (24a) and (24b) have a cumulative reading. For instance, (24a) has a reading in which a total of five detectives solved a total of six crimes. Scha (1981) proposes to obtain this reading by a binary quantifier <five detectives, six crimes> (solved) which binds both of the argument slots of the transitive predicate in one swoop. According to Scha, cumulative readings are not reducible to unary quantifications.

The binary quantifier analysis of cumulative readings are often criticized as not compositional by Szabolcsi (class lectures) and not necessary by Roberts (1990). Roberts (1990) argues that we do not need to generate cumulative readings because they can be reduced to collective readings. For instance, the cumulative reading of (24a) can be derived from its collective reading (24a'):

(24a') A group of five detectives solved a group of six crimes.

Roberts' approach is appealing in terms of economy and in that we do not have to resort to binary quantification which is uncompositional and which requires independent justification.

However, Landman (1996) re-examines collective and distributive readings. He argues that cumulativity and distributivity are essentially the same phenomenon of semantic plurality. According to him, cumulative readings are plural readings like distributive readings, but unlike distributive ones in that they are scopeless.
One thing that Roberts (1990) and Landman (1996) agree about the cumulative readings is that they are scopeless. In the present thesis where B& S’s approach is adopted, cumulative readings are not represented in the phrase structure proposed. So, I do not have anything of special interest to say about cumulative readings at this point.

In this section, I have examined Scha (1981)’s important work as representative of an approach which derives distributivity as the lexical properties of determiners. It was shown that his approach avoids the problem of type proliferation encountered by Bennett’s approach by treating both individual-level and group-level predicates as of the same type.

0.1.3.1. The Semantics of Plurality

There are two ways to represent the semantic structure of plural NPs.

One is taken by Scha (1981) in which all CNs, whether singular or plural, denote sets of singleton sets of individuals rather than sets of individuals.

(25) \{John, Bill\}

\{John\} \{Bill\}

\phi

In this approach, the denotation of John is expressed by \{John\} and that of Bill as \{Bill\}. The denotation of John and Bill is expressed by a set of the disjunction of two individuals \{John, Bill\}. The type of the verb meet is \langle \langle e, t \rangle, t \rangle.\n
Another way to represent the plural is called “the individual sum” (i-sum) approach by Link (1983). In this approach, plural NPs denote individuals, just like singular NPs. For instance, the denotation of John and Bill is the i-sum of atomic individuals John (j) and Bill (b) expressed as another individual \(c \preceq j \lor b\). In Link’s approach, the verb meet is of type

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<c,t>.

It is beyond the scope of this thesis to explore the differences between these two approaches. I will leave open the question of which semantics for the plural is adopted. The present approach (B & S 's approach) seems to be compatible with either of these two approaches.

0.1.4 . Structural Approach to Distributivity -Beghelli and Stowell 1997-

Obviously, regarding distributivity as merely the property of scope, or the property of the predicate, or the property of the determiner, is not satisfactory since distributivity seems to be a complex phenomenon. In this section, I will examine an approach which derives distributivity from the structural property. Beghelli and Stowell (1997) 's approach is basically a movement approach like Lakoff (1970) and May (1977, 1985). It also has a similarity with Scha 's approach in that it involves the lexical properties of the determiner QPs. In B & S 's approach, scope positions are designated as a function of QP types. I will conclude that B & S 's approach can best capture generalizations about distributivity.

B & S 's approach assumes two types of distributivity: Strong distributivity and Pseudo distributivity. Strong Distributivity encodes the inherent semantic property of the DQP such as each boy and every boy (which comes from the semantic property of the determiner) into a structural position at LF since DistP c-commands ShareP in B & S 's phrase structure.

On the other hand, Pseudo distributivity is non-inherent, optional distributivity, but it is also encoded into structure, namely the structure of the silent distributive operator floated each. The following structure illustrates the distribution of silent each stipulated in Beghelli (1995:159) by studying the syntax of adverbial each.
All the Spec of AgrXP positions and the Spec of ShareP can be distributed by the silent adverbial distributor EACH. Crucially, the Spec of RefP cannot be distributed by the silent each.

In this section, I will consider an alternative to this approach of Pseudo Distributivity. Without assuming the distribution of silent each in (28), I will assume that the phrase structure of Strong Distributivity holds. A distributive operator may optionally adjoin to all the plural marked QPs (GQPs and CQPs) in the fashion of Heim, Lasnik, and May (1991). I will call this alternative approach the Distributive Operator approach and compare it with B & S’s approach.\(^3\)

Notice that the Distributive Operator approach has already the structural property (the phrase structure of B & S) built into it. However, this approach treats the distributivity of the plural QPs as non-structural.

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\(^3\) This approach should be distinguished from the adverbial distributive operator approach taken by Roberts (1990). The analysis of distributive operators operating on the QP causes problems because distributivity is a relational notion as Williams (1991) pointed out.
It will be shown that B & S’s approach is superior to the Distributive Operator approach precisely because the structural property of distributivity is taken into consideration.

The Distributive operator approach does not seem to have problems when a sentence has two QPs. Consider the following sentence.

(27) Three professors recommended four students.

There are four possible readings according to the Distributive Operator approach.

(28) a. [[Three professors]D] recommended four students. (three professors > four students)
    b. Three professors recommended [[four students]D] (four students > three professors)
    c. [[Three professors]D] recommended[[four students]D]
    d. Three professors recommended four students.

In (28), [[____]D] shows the QP that the distributive operator adjoined to. A QP without [[____]D] is interpreted collectively by default. (28a) is a representation of a subject-wide scope reading such as “there are three professors such that each of them recommended four students”. (28b) is a representation of an object-wide scope distributive reading such as “there are four students such that each of them was recommended by three professors.” (28c) is a branching (scope-independent) reading such as ‘there are three professors such that each of them recommended each of four students”. (28d) is a group reading such as “three professors together recommended a group of four students”.

The Distributive Operator approach seems to have a problem when a sentence has three QPs. The main problem of this approach is that when there are two distributive QPs one cannot tell which QP has distributor-distrubtee relationship with the remaining QP. In other words, one cannot tell which of the distributing QPs bears the Dist-Share relationship with the non-distributive QP.
Let us consider the following dative sentence from Tyhurst (1990)'s example, which has six possible readings.

(29) [Most dealers]1 showed [at least two forgeries]2 to [an undercover agent]3.

First, I will examine how (29) is treated by B &S's approach. It would have the following LF representation just after Case-feature checking.

(30) \[ \text{RefP} \]

The derivations of the the following readings are accounted for as follows:

(31) a. 1>2 >3 (QP2 reconstructs into VP-internal position. Others stay in-situ)

b. 1 > 3 > 2 (All the QPs stay in-situ)

c. 2 > 1 > 3 (QP2 moves to [Spec, RefP]. Others stay in-situ)

d. 2 > 3 > 1 (QP2 moves to [Spec, RefP]. QP1 reconstructs into VP-internal position)

e. 3 > 1 > 2 (QP3 moves to [Spec, RefP]. Others stay in-situ.)

f. 3 > 2 > 1 (QP3 moves to [Spec, RefP]. QP1 reconstruct into VP-internal position. QP2 remains in-situ.)
The derivation in (31a) may be a little problematic. If plural QPs such as at least two forgeries are allowed to move into the Spec of DistP, perhaps it does not need to reconstruct into the VP-internal position.

Next, let us consider how the dative sentence (29) is treated by the Distributive Operator approach. In (29), QP1 most dealers and QP2 at least two forgeries are plurals, so they can be adjoined to a distributive operator.

This yields the following four readings.

(32) a. [[Most dealers]1D showed [at least two forgeries]2 to [an undercover agent]3.
    
    b. [Most dealers] showed [[at least two forgeries] D] to an undercover agent.
    
    c. [[Most dealers]D showed [[at least two forgeries] D] to an undercover agent.
    
    d. Most dealers showed [at least two forgeries] to an undercover agent.

Notice that (34a) by itself is ambiguous. The QP1 most dealers may distribute over to either QP2 or QP3. So using B &S's phrase structure in (31) , QP3 an undercover agent may move to the Spec of ShareP. In this case, from (7a), 1>3> 2 scope reading is derived. Another reading that can be derived from (34a) is when QP2 at least two forgeries moves to the Spec of ShareP. In this case, 1> 2 > 3 scope reading is derived.

Similarly, three readings may be derived from (34b). First, depending on which QPs (QP1 or QP3) can move to the Spec of ShareP, the following two readings are derived: 2 > 3 >1 scope reading when QP2 is in the Spec of ShareP and 2> 1 >3 scope reading when both QP1 and QP2 stays in-situ. 3 > 2 > 1 scope reading is derived when the indefinite QP3 takes scope over the distributing QP2.

As for (34c), the relationship between QP1 and QP2 is scope-independent. However, QP3 may either move to the Spec of RefP or stay in-situ. When it moves, 3> (1, 2 ) reading is derived. When it does not move, 1>3 >2 scope reading is derived.
Finally, as for (34d) it does not show a scope-dependent reading because all of the QPs are interpreted as a group.

The point of comparing these two approaches is to show that the Distributive Operator approach, which is lexical in the core, still needs information from the structure such as Beghelli and Stowell’s phrase structure to derive all the possible readings of the sentence. This was clearly demonstrated in a ditransitive sentence because in a ditransitive sentence the Dist-Share relationship cannot be taken for granted as in the transitive sentence, but needs to be specified. It was not enough to only adjoin the distributive operator to the plural QP. QPs have to move to their respective positions to get their relative scope reading.

In this section, I examined the strength of the structural approach by comparing two approaches, B & S’s approach and the Distributive Operator Approach. It was shown that even in the sentence where there are only plural QPs and no DQPs such as every $N$ and each $N$, structural information is essential for the interpretation of distributivity.
Chapter 2
Adverbial each, Binominal each and Distributivity

2.1. Distributivity

In this section, I will clarify the notion of distributivity discussed in B & S (1997) which I will base my analysis on.

I adopt the following definition of the notion of distributivity by Beghelli (1997:358):

(1) Given a sentence S and a QP alpha in it, alpha has a distributive interpretation relative to a reading R of S iff alpha is able to induce co-variation between individuals in its domain (= restrictor set) and another (overt or silent) quantificational element under reading R.

In footnote 6, B discusses how his notion of distributivity differs from the standard notion in logical semantics. Namely, it crucially assumes that covariance plays a role.¹ B gives the following example involving plural numerical QPs to show the point.

(2) Four students lifted five chairs.

In considering the object-wide scope readings of (2), in principle, the following three kinds of readings are possible (theoretically).

(i) ‘There are five chairs such that each of them was lifted by a possibly different set of four students (where they acted individually or collectively)’ (distributive)
(ii) ‘There is a stack of five chairs such that it was lifted by four students (where they acted individually or collectively, but they surely lifted the whole stack on every lifting event)’ (collective)
(iii) ‘There are five chairs each of which was lifted by the same set of four students (who acted individually or collectively)’ (branching)

Among the three readings above, only (i) fits in with B’s definition of distributivity. (ii) involves the collective interpretation of the object NP. One reading of (iii) is called the branching reading. Another reading of (iii) is, what is standardly considered a distributive

¹ As discussed in Chapter 1, covariation can be captured in terms of witness sets in denotational semantics shown by the work of BBS (1997).
reading in logical semantics, where the object NP is distributed, but the subject NP is interpreted collectively.

2.2. Two Types of Distributivity

In this section, I will show how the distributive reading of sentences with QPs are accounted for in B & S’s framework.

The motivation for proposing two types of distributivity is empirical. Natural languages display both optional distributivity patterns and obligatory distributivity patterns as shown in the following examples.²

(3) a. Four boys lifted the table.
   b. *Every boy lifted the table together.

In B & S’s framework, (3b) is treated as an instance of Strong Distributivity, while (3a) is treated as Pseudo-Distributivity.

In B & S (1997) and Beghelli (1997), two types of Distributivity (Strong Distributivity and Pseudo-Distributivity) are characterized as follows: (B & S (1997: 91-94))

(4) Strong Distributivity (SD)
   a. QPs headed by each/every are Strong Distributors.
   b. Strong Distributivity is obligatory.
   c. Strong Distributivity can arise under an inverse scope construal, e.g. where the distributee is in Spec of AgrSP and the distributor is in Spec of AgrOP.
   (A boy read each book. each N > a boy)

(5) Pseudo-Distributivity (PD)
   a. Plural definite and indefinite GQPs (including QPs headed by all) are Pseudo-Distributors.
   b. Pseudo-distributivity is optional.
   c. Pseudo-distributivity cannot arise under an inverse scope construal, e.g. where the distributee is in the Spec of AgrSP and the distributor is in the Spec of AgrOP.
   (A boy read all the books. *all the books > a boy)

SD is accounted for by the following phrase structure at LF by B & S.

² I am in debt to Anna Szabolcsi’s Winter Semantics 1998 class for clarifying these notions.
The SD reading of the sentence Each boy read a book is accounted for as follows. The DQP each boy, after undergoing Nominative Case Checking in the Spec of AgrSP, moves from the Spec of AgrSP to the Spec of DistP. On the other hand, the GQP a book, after its Accusative Case checking, moves to the Spec of ShareP. The final LF representation looks as follows:

The sentence A boy read each book has two readings. A branching reading (non-distributive reading) and the object-wide scope reading. The object-wide scope reading is the distributive reading, which is accounted for by the DQP each book, after Accusative Case checking, moves to the Spec of DistP position because of its [+Dist] feature. In this approach, reconstruction occurs as freely as upward movement so long as each type of QPs moves to its designated positions.
The sentence such as All the boys read two books involves PD. In this case, the GQP All the boys cannot use the Spec of DistP position. Its optional distributive reading is captured by a covert distributive element corresponding to the adverbial floated each. The covert distributor occupies the following position at LF.

(9) Distribution of the silent each (Beghelli 1997:377)

According to Beghelli (1997:377), PD is accounted for in the following way:

(10)a. PD involves the use of a (silent) distributive adverbial each, which is distinct from the distributive operator in the head of DistP.
b. This adverbial is only available in AgrXP ($X=S$, $O$, IO) and in ShareP.
c. A GQP can antecede the adverbial if it has a trace in the Spec position of one of these projections (The GQP itself may have moved on to [Spec, RefP]).
d. The QP that serves as distributee in the PD relation must be within the c-command domain of the silent each at LF.

The distribution of the silent each is proposed based on the distribution of the overt adverbial each. In the next section, I will disagree with Beghelli (1997) in treating adverbial each as a case of Pseudo Distributivity. I claim that adverbial each sentences do
not exhibit Pseudo Distributivity. In this section, it is shown how sentences with PD are accounted for.

In the sentence *All the boys read two books*, the subject QP *all the boys*, after Nominative Case checking in the Spec of AgrSP, stays there and get distributed by the silent *each* which it c-commands. The object QP *two books* also stays in its Case Checking position, that is, in the Spec of AgrOP. Since the distributee *two books* is within the c-command domain of the silent *each*, it satisfies (10d), thus a PD reading is obtained.

(11)

![Diagram](image)

On the other hand, the sentence *A boy read all the books* lacks the object-wide scope distributive reading since the distributee *a boy* is not within the c-command domain of *each*, hence it does not satisfy (10d).

(12)

![Diagram](image)

The operation of DistP and the silent *each* can be demonstrated by the following example.

(13) Two men lifted every table.
   (i) "Each of two men lifted every table."
   (ii) "Two men together lifted every table."

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The sentence (13) has two kinds of subject-wide scope readings shown in (13i) and (13ii). Every table moves to DistP, while two men moves to RefP after checking its Nominative Case-marking at AgrSP as shown in (14).

(14) RefP
    \[\text{two men}_i\]
    \[\text{ArgSP} \quad \text{each} \]
    \[\text{DistP} \quad \text{every table}_j\]
    \[\text{AgrOP} \quad t_i \quad \text{lifted} \quad t_j\]

The silent each adjoined to AgrSP will distribute two men to yield the interpretation in (13i). Roughly, it would say "there is a set $X$ of two men such that each $x \in X$ lifted every $y \in \text{TABLE}". On the other hand, the collective reading in (13ii) is accounted for by not using the silent each. It produces "there is a set $X$ of two men such that $X$ lifted every $y \in \text{TABLE}$."

Thus, it was shown that the distinction between the distributive and collective reading was derived by the effect of the optional silent each. On the other hand, the distributive meaning of every table is obtained by DistP which is headed by a distributive operator $\forall$ in Dist$^e$. 

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2.3. Adverbial each and Distributivity

2.3.1. Adverbial each sentences show Strong Distributivity

In this section, I will show that adverbial each sentences exhibit Strong Distributivity, contrary to what Beghelli (1995, 1997) argues.

As discussed in the previous section, Beghelli (1995, 1997) assumes that adverbial each sentences display Pseudo-Distributivity. He assumes that adverbial each may appear in the positions specified as follows:

(15) Distribution of the silent each (Beghelli 1997:377)

However, like Sportiche (1988)'s analysis of adverbial each discussed in section 1.2, the structure in (15) overgenerates English adverbial each sentences. For instance, (15) would predict that adverbial each may appear below the object DP, but object-oriented adverbial each is unacceptable in English.

(16) a. *John visited the girls each.
    b. *John gave three apples each to Mary.

One reason why adverbial each sentences should be regarded as strongly distributive in the sense of B & S is that they are obligatorily distributive. Like binominal sentences as in (17c) and sentences with strong DQPs as in (17a), a collective reading is not allowed in adverbial sentences as shown in (17b).

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(17) a. *Every man lifted the table together. (DQP)
   b. *The boys each went home together. (adverbial)
   c. *The boys together bought [one balloon each]. (binominal)

Compare the sentences in (17) with (18) which displays optional distributivity:

(18) Four men lifted the table.

I claim that the obligatory distributivity of adverbial each can be derived by utilizing the Specifier Position of the DistP.

Another reason why adverbial each sentences show Strong Distributivity is that they do not seem to occur comfortably with other DQPs.

(19) a. ?*The boys each visited every student.
   b. ?*The boys each visited each teacher.

Examples in (19) are compatible with the analysis which assumes that adverbial each is in the head of DistP position. Examples in (19) are rendered unacceptable because the DistP position is already occupied.

One of the differences between binominal and adverbial each is that the object QP is never distributed by adverbial each. I will argue that this difference can be accounted for in B & S’s approach as follows: the binominal each-movement requires the D-NP with a trace of each to move to the Spec of ShareP, while adverbial each does not require the object QP to move to the Spec of ShareP. Instead, the object QP may move to the Spec of RefP, while the subject NP is obligatorily distributed by the adverbial each. Thus, the object-wide scope reading of the adverbial each sentence is obtained when the object QP moves to the Spec of RefP.
2.3.2. Subject Orientation of Adverbial each

In English, adverbial each has a position that is distinct from that of binominal each, as discussed in Safir and Stowell (1988). Binominal each appears in the post NP position, while adverbial each occupies the VP-initial position.

(20) a. They saw [three balloons each]. (binominal)
    b. They each saw three balloons. (adverbial)
    c. *They saw each three balloons.
    d. *They saw [three balloons] each.
    e. They have each seen three balloons.
    f. They each have seen three balloons.
    g. *They have seen each three balloons.

Even intransitive sentences without any DPs are allowed in adverbial each sentences as shown by (21):

(21) They each cried a lot.

Moreover, passive adverbial each requires the plural antecedent R-NP to be in the subject position at Spell-Out. Look at the following active-passive pair of adverbial each sentences.

(22) a. The three girls each visited John. (active)
    b. *John was each visited by the three girls. (passive)

(23) a. *John each visited the three girls. (active)
    b. The three girls were each visited by John. (passive)

(23a) shows that adverbial each does not allow its antecedent to surface in object position.

Subject-orientation of the adverbial each sentences is captured by the following proposal.3

(24) a. Adverbial each is base-generated in the head of DistP.
    b. The Spec of DistP, activated by the presence of adverbial each in the head, attracts QPs that have [+pl] features. Only QPs that c-command the DistP move to the Spec of DistP.
    c. Only QPs that finished Case-checking may move to the Spec of DistP.

---

3 I thank Tim Stowell for suggesting this analysis. Similar ideas are suggested in McCloskey (to appear), Aoun and Li (1989), Koopman and Sportiche (1991), and Cinque (1997).
According to (24), adverbial each has its feature checked in the position to which the movement is relativized. Unlike the movement of binominal each, in adverbial each sentences, each stays in-situ while the antecedent QP moves to the Spec of DistP position.

Let us examine how the proposal in (24) accounts for the examples in (22) and (23). The LF representation of (22a) The three girls each visited John, after Case-checking, is shown as follows:

(22a') AgrSP

[ The 3 girls ]

DistP

each

∃ e

ShareP

AgrOP

John

At LF after Nominative Case checking in the Spec of AgrS, the subject QP the three girls, attracted by the [+pl] feature of the head each, moves to the Spec of DistP at LF. Since the three girls does have the [+pl] feature it gets checked off and the derivation does not crash. On the other hand, the object DP John stays in the Spec of AgrOP position.

The LF representation of (22b) *John was each visited by the three girls is illustrated as follows:
The subject DP *John satisfies the structural condition for [+pl] feature checking, but it does not have the [+pl] feature, so the derivation crashes if it moves to the Spec of DistP. I assume, following Kural (1996), that the passive by-phrase gets structurally licensed by the Spec of ByP. However, the by-phrase is never in a position to get attracted by each. It is always structurally in a lower position than the Spec of DistP. Therefore, the by-phrase can never be the antecedent of adverbial each.

The LF derivation of (23a) *John each visited the three girls is accounted for, in basically, the same way.

After the Nominative Case checking of the subject DP John, the [+pl] feature checking of John causes the derivation to crash.

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The LF derivation of (23b) the three girls were each visited by John is well-formed because the subject QP the three girls successfully gets its [+pl] feature checked at the Spec of DistP as shown as follows:

(23b')

\[ \text{AgrSP} \]
\[ \text{DistP} \]
\[ \text{the three girls} \]
\[ \text{each} \]
\[ \exists e \]
\[ \text{by John} \]
\[ \text{ShareP} \]
\[ \text{ByP} \]

The agentive by-phrase by John moves from the VP-internal subject position to the Spec of ByP position. The Spec of ShareP position is occupied by the event argument.

In this section, I proposed an analysis of adverbial each that captures its subject orientation. It was the relativized movement analysis utilizing the DistP position. I assumed that adverbial each was in the head of DistP and attracts the c-commanding QPs to the Spec of DistP position.

2.3.3. Scopal differences between adverbial and binominal each

The differences in the possible readings that adverbial and binominal sentences may get stem from the semantic restriction on the QPs. The binominal object DP needs to be

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4 My analysis is similar in spirit to the proposal of Cinque (1997) in that an adverb (adverbial each) has its own functional projection. I leave open the question of whether every adverb has its own functional projection. My approach also differs from his in that the adverbial is in the head, while Cinque assumes that it is in the specifier position.
indefinite, while adverbial each does not have such a restriction.

Due to this semantic restriction, the following differences in scope behaviors are observed for binominal and adverbial sentences.

(25) Differences between adverbial and binominal each

<table>
<thead>
<tr>
<th></th>
<th>binominal each</th>
<th>adverbial each</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. indefiniteness</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>requirement on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the DObj</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. DObj &gt; DPsbj</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>3. covariance</td>
<td>obligatory</td>
<td>optional</td>
</tr>
<tr>
<td>reading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. possibility</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>of discourse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>referent for</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DObj</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the following sections, I will discuss the differences in (25) one by one.

2.3.3.1. Absence of indefiniteness requirement on the object QP

It will be shown later in section 2.4.4. that QPs in binominal sentences have semantic restrictions. Notably, the D-NP of the binominal sentences must be indefinite and cardinal. Thus, sentences in (26) are unacceptable because they contain definite QPs in the object position.

(26) (binominal)
    a. *They read [these books each].
    b. *They visited [John and Bill each].

On the other hand, adverbial each constructions allow definite QPs as well as indefinite QPs as observed in S & S (1988) and Sutton (1994). The range of QPs that adverbial each sentences allow is larger than those that are allowed by binominal each sentences.

(27) (adverbial )
    a. They each read these books.
    b. They each visited [John and Bill].

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c. They each cried a lot.

Even intransitive sentences without any DPs as in (27c) are allowed in adverbial each construction. The set of possible QPs in AgrOP position of the binominal may be described as the proper subset of the set of acceptable QPs in that position in adverbial each sentences.

The following chart summarizes the object QPs that are allowed as D-NP in binominal sentences:

(28) Semantic Restrictions on D-NPs of binominal sentences

<table>
<thead>
<tr>
<th>Allowed</th>
<th>Not allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>indefinite numeral QPs</td>
<td>*some Ns</td>
</tr>
<tr>
<td>(e.g. one book)</td>
<td>*certain Ns</td>
</tr>
<tr>
<td>modified numeral QPs</td>
<td>*most Ns</td>
</tr>
<tr>
<td>(e.g. at most 5 Ns, fewer than 5 Ns)</td>
<td>*all Ns</td>
</tr>
<tr>
<td>how many Ns</td>
<td>*definite QPs (e.g. these Ns)</td>
</tr>
<tr>
<td></td>
<td>*every N, *each N</td>
</tr>
<tr>
<td></td>
<td>*no N, *no Ns</td>
</tr>
<tr>
<td></td>
<td>*few Ns, *conjoined NP</td>
</tr>
</tbody>
</table>

Definite QPs such as these Ns and conjoined NPs (e.g. John and Bill) are not allowed to be D-NPs in binominal sentences. On the other hand, definite QPs are allowed in the object position of adverbial sentences as summarized in (29):

(29) Semantic Restrictions on the object QPs in adverbial each sentences

<table>
<thead>
<tr>
<th>Allowed</th>
<th>Not allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>indefinite numeral QPs</td>
<td>*every N, *each N</td>
</tr>
<tr>
<td>(e.g. one book)</td>
<td>*no N</td>
</tr>
<tr>
<td>how many Ns</td>
<td></td>
</tr>
<tr>
<td>modified numeral QPs</td>
<td></td>
</tr>
<tr>
<td>(e.g. at most 5 Ns, fewer than 5 Ns)</td>
<td></td>
</tr>
<tr>
<td>how many Ns</td>
<td></td>
</tr>
<tr>
<td>definite QPs</td>
<td></td>
</tr>
<tr>
<td>(e.g. these Ns, conjoined NPs, all the Ns)</td>
<td></td>
</tr>
<tr>
<td>few Ns</td>
<td></td>
</tr>
<tr>
<td>some Ns</td>
<td></td>
</tr>
<tr>
<td>certain Ns</td>
<td></td>
</tr>
<tr>
<td>most of the Ns</td>
<td></td>
</tr>
</tbody>
</table>
At this point, it is not clear why binominal each sentences have an indefiniteness requirement on the object QP and why adverbial each sentences lack the requirement. In my analysis, the indefiniteness requirement of the binominal correlates with what can move to the Spec of ShareP in B&S's phrase structure. It seems that only a certain class of indefinite QPs, and not definite QPs, can move to the Spec of ShareP to contribute to the covariance reading. Adverbial each sentences, on the other hand, allow the event argument to occupy the Spec of ShareP. This seems to correlate with the lack of indefiniteness requirement on the object DP and the relative freedom of what can appear in the object position of adverbial sentences.

Furthermore, I will briefly discuss semantic restrictions on the antecedent QPs. Semantic restrictions on the R-NP of binominal sentences are shown in the following chart.

(30) Semantic restrictions on the R-NP of binominal sentences
R-NPs that are allowed
    some Ns, several Ns
    many Ns, more than 5 Ns
    most Ns,
    which Ns, how many Ns
    they
    the men
    these men
    conjoined N

R-NPs that are not allowed
    *every N, *each N
    *no N, *few Ns
    *no Ns

"Ns" in the chart shows that they are plural nouns. Semantic restrictions on the antecedent of adverbial each are summarized in (31):

(31) Semantic Restrictions on the antecedent of adverbial each
allowed
    ?some Ns, several Ns
    many Ns, ??most Ns
    ?which Ns, ?how many Ns
    they
    these men
    conjoined N

not allowed
    *every N, *each N
    *no N, *no Ns, *few Ns

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There are attempts to relate the distribution of the types of antecedents to the of NP of the partitives as in (32). For instance, Sutton (1994) claims that the partitive and the R-NP of the adverbial each sentences are derived from the same structure.

(32) each of the men
    these men
    *some men
    *most men

However, this approach does not account for the so-called "partitive constraint" discussed in Larson and Segal (1995). In partitive NP such as in (32), only the definite plural QPs are allowed as of OP. This definiteness restriction is called "partitive constraint". Both binominal and adverbial each constructions allow indefinite as well as definite QPs as antecedents.\(^5\)

(33) a. Four boys saw two balloons each. (binominal)
    b. Four boys each saw these balloons. (adverbial)

Furthermore, assimilating the distribution of the antecedents of binominal or adverbial each to that of partitives does not make the right predictions for the pair-list readings as Anna Szabolcsi (p.c.) pointed out.

(34) a. What did each of the boys buy for the present? (partitive)
    b. What did the boys each buy? (adverbial)

(34a), which contains a partitive NP each of the boys, allows a pair-list answer such as Jim bought a toy-truck, Bob bought balloons, and Joe bought some flowers. On the other hand, (34b) does not allow such a pair-list answer. Thus, an account that assumes the same structure for adverbial each and the partitive each of N does not explain why one of

\(^5\) It seems that definite QPs rather than indefinite QPs are preferred as R-NPs in adverbial each sentences. But indefinite QPs are also acceptable.
them has a pair-list reading and one of them does not. I will leave open the question of how the antecedents relate to the partitive structure.

In this section, I discussed semantic restrictions on the object QPs as well as semantic restrictions on the antecedent of adverbial sentences. The absence of the indefiniteness requirement on the object QPs suggests that the object QP in adverbial sentences may not necessarily move to the Spec of ShareP.

2.3.3.2. Object-wide scope reading of adverbial each sentences

Adverbial each sentences as in (35), unlike binominal sentences as in (36), allow object-wide scope reading. (Other possible readings are not shown for simplicity.)

(35) Three boys each saw two balloons. (adverbial)
   a. “Three are two balloons such that each of them was seen by three boys.”
   (two balloons > three balls)

(36) Three boys saw two balloons each. (binominal)
   # a. “There are two balloons such that each of them was seen by a possibly different set of three boys.” (# two balloons > three boys)

This difference in scope-taking ability between binominal and adverbial sentences is accounted for as follows: later in this chapter, I will propose that in binominal sentences each moves to adjoin to three boys in ArgSP, which makes [[three boys]each] inherit a [+Dist] feature from each and this triggers R-NP to move to the Spec of DistP. After the binominal each movement, D-NP is left with a trace of each, which requires the D-NP to move to the Spec of ShareP as shown in (37):

---

6 Similarly, my analysis of adverbial each does not account for the absence of pair-list readings in adverbial each sentences. Explanation of pair-list readings along the line of Beghelli (1977) in terms of Strong Distributivity would not work because it would predict incorrectly that adverbial sentences have pair-list readings under the assumption that adverbial each is strongly distributive. I speculate that factors other than Strong Distributivity (perhaps the adjunct status of each) is responsible for the absence of pair-list readings in adverbial sentences.
On the other hand, the adverbial *each*, even if it moves from the adverbial position, does not require the object DP to move to the Spec of ShareP. After the Accusative Case checking, the object DP two balloons may move to the Spec of ShareP, in which case, the subject-wide scope reading is obtained. Alternatively, the object DP two balloons may move from the Spec of AgrOP to the Spec of RefP, in which case, the object-wide scope reading is obtained as in (38).

2.3.3.3. Covariance reading of adverbial *each* sentences

In this section, I will argue that some adverbial *each* sentences do not have a covarying distributive reading.

In section 2.3.3.1, it was discussed that adverbial *each* sentences allow in their object positions DPs that are not allowed as D-NP in binominal sentences. These DPs are definite QPs. Definite QPs semantically have a property of always talking about the same
individuals. I will show that this property of definite QPs induces adverbial each sentences to have a non-covarying reading. Consider the following adverbial sentence with two definite QPs.

(39) The two girls each read these books.
   (i) "Each of the two girls read these books."
   (ii) "Each of the two girls read a different set of these books."
   (iii) "There are these books such that each of the two girls read."

(39i) is the subject-wide scope reading of (39). However, (39i) is not the same as (39ii). So the subject DP The two girls is distributed over the same set of these books. Because the definite GQP these books denotes a principal filter, it cannot covary with the subject DP. Suppose these books are the particular three books indicated by *. The situation in which (39i) can be true is shown in the following diagram (40a).

(40) a. g    b
     *    *

On the other hand, (39ii) is true in the situation (40b). However, the reading (39ii) does not seem to exist among native speakers. The object-wide scope reading (39iii) is also true in (40a). This is what BBS (1997) call “the illusion of branching” induced by principal filters.

---

7 Universal and definite NPs always denote principal filters. The definition of a principal filter proposed by Barwise and Cooper (1982) is given in Szabolcsi (1997) as follows:
(i) A Generalized Quantifier (GQ) is a principal filter iff there is a set of individuals A such that A is not necessarily empty and for any set of individuals X

\[ X \in \text{GQ} \text{iff} A \subseteq X. \]

In other words, a principal filter is an increasing quantifier that has a unique witness W, where a set W is a witness of a GQ iff \( W \in \text{GQ} \) and \( W \subseteq \text{SL(GQ)} \), SL is the smallest set which GQ lives on.
The following adverbial each sentences also have non-covarying reading because of the semantic properties of principal filters such as John and Bill and the two girls.

(41) Two girls each visited [John and Bill].
(42) The two girls each read three books.

The DP John and Bill in (41) cannot be interpreted distributively.

When the two QPs in adverbial each sentences are bare indefinite numeral QPs, the sentences can be interpreted with covarying reading.

(43) Two girls each read three books.
(i) “There are two girls such that each of them read three (different) sets of books.”
(Two girls > three books)
(ii) “There are three books such that each of them was read by two (different) sets of two girls.”
(three books > two girls)

The fact that covarying reading of adverbial each sentences is very limited is surprising when the interpretations of the binominal sentences are compared. Binominal sentences always have a covarying reading.

In this section, I discussed that some adverbial each sentences may allow definite DPs as object DPs. Definite DPs have semantically the property of principal filters, which produce non-covarying readings of adverbial each sentences. The covariance reading of the adverbial each sentences is allowed only if the two QPs in the sentence are indefinite numeral QPs.

2.3.3.4. Possibility of Discourse Referent

In this section, it will be shown that binominal and adverbial sentences differ in their possibility to take a cross-sentential referent. I will use a test of cross-sentential anaphora discussed in Roberts (1990).

Roberts (1990: Chapter III) shows how distributivity affects the anaphoric potential of the DP.
(44) Four men lifted a piano. It was very heavy.

In (44), a piano cannot be referred to by the pronoun it when the first sentence is interpreted in its distributive reading.

(45) Each man lifted a piano. It was very heavy.

When (45) is interpreted as the object DP piano taking scope over the subject each man, the cross-sentential anaphora it is not allowed.

I will also use the cross-sentential anaphora to show the scopal differences between the binominal and adverbial each sentences.

The object DPs of the transitive adverbial sentences allow cross-sentential anaphora only in their object-wide scope reading as shown in (46):

(46) The boys each played with one balloon. It was a bright, yellow one. (adverbial)
     (one balloon > the boys each)

Thus, the ability of the adverbial each sentences to take a discourse referent for the object DP is correlated with their capability to allow object-wide scope reading, which was discussed in section 2.3.3.2.

On the other hand, the object DP in binominal sentences cannot be referred to using a singular pronoun it cross-sententially as shown as follows:

(47) The boys played with [one balloon, each]. It was a bright, yellow one.
     (binominal)

(47) shows that since binominal sentences obligatorily have a distributive covarying reading as discussed in the previous section, their object DP cannot be referred to by the pronoun it in the sentences that follow. (47) also indicates that the object DPs (D-NPs) in the binominal sentences are non-referential and therefore cannot take scope over the subject. If they could, it would be possible to refer to the object DP cross-sententially as in the case of (46).
In this section, it was shown that binominal and adverbial sentences differ in their ability to take cross-sentential anaphora. This is due to their differences in their scope-taking possibilities. Adverbial each sentences allow object-wide scope readings, while binominal sentences do not.

2.3.4. Distributing over Events

It is known that distributive QPs such as every N and each N may appear in the sentences without plural QPs.

(48) John lifted every desk.
    "For every desk, there is an event of John lifting it."

(49) John visited each friend.
    "For each friend, there is an event of John visiting him, or her."

In (48) and (49), DQPs such as every N and each take scope over an event (or time). For instance, (48) implies that there is more than one desk and that John lifted all the desks (in the context). Thus, the event of John's lifting of a desk took place as many times as the number of desks in the context.

In B & S 's approach, it is assumed that there is an event argument e à la Davidson (1967) that is originated in the VP-internal position. In (48), the DQP every desk moves to the Spec of DistP and e moves to the Spec of ShareP to get the distributive reading over the event.
On the other hand, binominal and adverbial sentences do not allow distribution over the event when the singular DP is the subject.

(51) a. *John bought [three balloons each] (binominal)
    b. *John each bought three balloons. (adverbial)

It is interesting to investigate in which environment the distribution over the event reading is allowed.

(52) Every student invited John.
    "For every student, there is an event of his, inviting John."

(53) Each student invited John.
    "For each student, there is an event of his, inviting John."

When the DQP such as every N or each N is the subject, the distribution over the event reading is allowed even when the object DP is singular as shown in (52) and (53).

(54) *[ One student each] invited John. (binominal)

The binominal sentence in (54) does not allow the distribution over the event reading in the same environment.

(55) [Three students] each invited John. (adverbial)
    "For each of three students, there is an event in which he, or she, invited John."
The adverbial each sentence as in (55) allows the distribution over the event reading when the object DP is singular, unlike the binominal sentence as in (54). This is because in canonical binominal transitive sentences, the subject DPs have to be plural and object DPs must be cardinal indefinites.

Now, let us look at passive sentences.

(56) Every desk was lifted by John.
     “For every desk, there was an event of John’s lifting it.”

(57) Each friend was visited by John.
     “For each friend, there was an event of John’s visiting him, or her.”

(56) and (57) show the distribution over the event reading of the passive sentences with DQPs.

(58) *[Three balloons each] was bought by John. (binominal)

(58) is unacceptable because the distributor three balloons each (i.e. the R-NP) is missing in the sentences. John cannot be the R-NP because it is not plural.

(59) Three balloons were each bought by John. (adverbial)

It is surprising that in adverbial each sentences the distribution over the event reading is present when the agent NP is singular as in (59). Notice that this is only possible when the subject DP at the Spell-Out is plural in the adverbial passive sentence. So (60a) is unacceptable.

(60) a. *One balloon was each bought by John. (adverbial passive)
    b. *John each bought three balloons. (adverbial active)

It can be concluded that binominal sentences do not have the distribution over the event reading when there is no other plural QPs as shown as follows:

(61) a. *John gave [one balloon each] to Mary.
    b. John gave [one balloon each] to the three girls. (binominal each)

In this section, it was shown that Strong Distributive QPs such as every N and each N
allow the distribution over the event reading even when there is no plural QP in the sentence, while binominal each does not allow this reading in this environment.

As for adverbial each sentences, they show subject-object asymmetry in the availability of the distribution over the event reading. That is, adverbial each sentences exhibit the distribution over the event reading when the object DP is singular as in (60), but not when the subject DP is singular as in (60b). This can be attributed to the nature of adverbial each, which distributes over a predicate rather than over an argument.

Furthermore, in passive sentences, unlike binominal each sentences, adverbial each sentences allow the distribution over the event reading when the agent NP is singular, on the condition that the subject DP (at Spell-out) is plural.

2.3.4.1. Covariation and Principal Filters

In this section, I will propose a hypothesis which says that the distribution over events reading is only available when there is no covarying interpretation. I will claim that binominal sentences, which have obligatory covariance reading, do not have the distribution over the event reading.

In the previous section, I discussed the distribution over the event reading of sentences with single QPs. In this section, the distribution over the event reading of sentences with two QPs is discussed.

In section 3.3.3., I discussed that some adverbial each sentences may allow definite DPs as object DPs. Definite DPs have semantically the property of denoting principal filters, which produce the non-covarying readings of the adverbial each sentences.

Let us consider the passivization of the adverbial each sentences again. Passivization is allowed only when the subject DPs of the passives are plural.
(62) (adverbial passive)
   a. *John is each visited by the two girls.
   b. These boys were each visited by the two girls.

(62a) is unacceptable because the subject John is not plural. The definite DPs these boys and the two girls denote principal filters in (62b). The two girls in (62b) does not distribute over these boys. The DP subject these boys denotes a principal filter, so it cannot induce variation. (62b) does not have a covarying reading, but has the distribution over the event reading as shown as follows:

(62b') “Each of these boys were visited (on a different occasion) by the same two girls.” = “For each of these boys, there is an event of the two girls visiting him.”

Notice that (62b') has “the recycling of the individual” property which is the mark of the distribution over the event reading. The same two girls do the visiting as many times as the number of these boys.

It was shown in (62') that definite QPs license the distribution over the event reading by denoting principal filters.

Let us consider if the distribution over the event reading is available when two indefinite QPs are used in adverbial each sentences.

(63) Two books were each read by three girls.
   (i) “There are two books such that each of them was read by three (different) sets of girls.” (two books > three girls)
   (ii) “There are three girls such that each of them read two different sets of books.”
        (Three girls > two books)

Take, for example, the subject-wide scope reading in (63i). (63i) may be paraphrased using the notion of an event as follows:

(63i') “For each of the two books, there is an event of three different girls reading them.”

However, (63i') is not a distribution over the event reading. In (63i'), the QP two books distributes an event into three different sub-events, but their agents are three different sets
of girls. In other words, there is no “recycling of the individual”. Thus, (63i’) is not a
distribution over the event reading.

The same point can be made for binominal each sentences.

(64) Three girls read two books each. (binominal)
(i) “There are three girls such that each of them read two different sets of books.”
(ii) “For each of the three girls, there is an event of her reading two different sets of
books.”

(64i) and (64ii) are paraphrases of each other. (64i) is not the distribution over the event
reading because for each of the three sub-events, the agents who did the reading are
different and the books that are read are different.

I have shown that binominal sentences do not really have the distribution over the
event reading. This is reflected in my analysis in the treatment of the Spec of ShareP. In
binominal sentences, an event argument never appears in the Spec of ShareP. Instead, the
D-NP moves to the Spec of ShareP position. As a consequence of this, in binominal each
sentences, the object DP cannot take scope over the subject DP.

A hypothesis about when the distribution over the event reading is available can be
informally stated as follows:

(65) The distribution over the event reading is only available when there is no covarying
interpretation.

In other words, the hypothesis (65) says that the distribution over the event reading is in
complementary distribution with the covarying reading.

The generalization in hypothesis (65) can be captured by B & S’s phrase-structure. In
B & S (1997)’s approach, it is assumed that the Spec of ShareP hosts the event operator
and that the event argument moves from the original VP-internal positions to the Spec of
ShareP. The assumption that the Spec of ShareP can host only one argument, that is,
either an event argument or a QP, captures the hypothesis (65).
In this section, it was shown that in order for the distribution over the event reading to exist the covarying reading should not be obtained.

2.4. Binominal *each* and Distributivity

The purpose of this section is to show how the syntactic properties of the binominal construction can be accounted for by the scopal theory of Beghelli and Stowell (1997).

I will argue that sentences with binominal *each* display Strong Distributivity in the sense of B & S (1997).
2.4.1. Scopal properties of binominal each sentences

Safir & Stowell (1988) were the starting point in clarifying the syntactic properties of the binominal construction in (66):^8

(66) The men visited [two women each].
    \hspace{1cm}R-NP \hspace{1cm}D-NP

As Choe (1987) shows, the D-NP in binominal each sentences cannot take scope over the R-NP. This, in fact, is the motivation behind his calling the D-NPs "anti-quantifiers".

(67) Three boys kissed two girls each.
   (i) "Three boys each kissed a possibly different set of two girls." three boys > two girls
       (R-NP > D-NP)
   (ii) "There are two girls such that each of them is kissed by a possibly different set of three boys." *two girls > three boys (*D-NP > R-NP)

---

^8 Burzio (1986) was the first to discuss this construction. In some Romance languages such as Italian, binominal quantifier and its antecedent R-NP show agreement. The following examples are in Italian from Burzio (1986: 198):

(i) a. I ragazzi (m.) comparono [un libro ciascuno (m.)].
   "The boys bought one book each."
   b. Le ragazze (fem.) comparono [un libro ciascuna (fem.)].
   "The girls bought one book each."

See also Tellier and Valois (1993) for binominal constructions in French. According to them, the French binominal quantifier chacun can appear in the postnominal as well as the prenominal position.

(ii) a. Les professeurs ont lu deux livres chacun.
    "The professors read two books each."
   b. Les professeurs ont lu chacun deux livres.
    "The professors read two books each."
   c. Les étudiants sont arrivés [pp avec chacun un livre].
    "The students arrived with one book each."

According to Manuel Español-Echevarria, Spanish and Greek have the following expressions of distributivity:

(iii) a. Los niños leyeron los libros de dos en dos. (Spanish)
    "The boys read the books of two in two"
    "The two boys each read two books."
   "There are two books such that each of them two boys read."
   b. Ta pedía diavasan ta vivlia dio-dio. (Greek)
    the boys read two books two
    "The two boys each read two books."
    "There are two books such that each of them two boys read."

Both (iia) and (iib) are ambiguous. These constructions are used productively with "one-one" and "three-three" but not "one three". More research needs to be done to clarify if these constructions have the syntax and semantics analogous to binominal each sentences.

77
For instance, (67) has a distributive reading in (i) where three boys each kissed a possibly different set of two girls. This is the wide scope reading of the subject NP. On the other hand, (67) lacks the reading in (ii) in which the object NP (the D-NP) takes scope over the subject NP. (67) does not have a reading where there are two girls such that each of them is kissed by a (possibly) different set of three boys.

In the next section, I will propose an analysis that captures this property of lacking inverse scope in the target landing site theory of B & S (1997).

2.4.2. Binominal each sentences show Strong Distributivity

Beghelli (1995, 1997) assumes a unified analysis of adverbial and binominal each in terms of Pseudo Distributivity. The distribution of silent adverbial each discussed by Beghelli (1997:376) is repeated and shown as follows

(68) Distribution of the silent each

Silent each is not generated in RefP. Consider the following binominal sentence.

(69) Two students read one book each.

Beghelli assumes that binominal each in (69) moves in a position where it can be anteceded by the distributor two students and c-commands the distributee one book. In
other words, he assumes that binominal each moves to a position where adverbial each may appear.

(70) 
```
AgrSP
     
DistP
     
two students
     
AgrOP
     
each
     
one book each
```

He gives two pieces of evidence to support his analysis. First, binominal each does not license a different N as in (71a). Second, subjects in binominal sentences cannot be marked as distributees by binominal each as in (71b).

(71) a. ??Five students read a different book each.
    b. *One student each visited five professors.

(71a) does not seem terribly bad. As for (71b), my analysis can account for its unacceptability without assuming B's uniform PD analysis. Furthermore, it is not clear how the differences between binominal and adverbial each are accounted for under B's uniform analysis. For instance, it is unclear how to explain the fact that adverbial each has subject-orientation, while binominal each does not and the fact that binominal each sentences show reconstruction effects, whereas adverbial each sentences do not.

I will propose an alternative analysis that treats binominal sentences as involving Strong Distributivity. Motivation for analyzing the binominal construction such as The boys read one book each as a case of Strong Distributivity (SD) comes from two facts. First, the binominal sentences use the quantifier each. Although categorically different from binominal each, the prenominal determiner each is considered as a canonical
distributor in B & S’s approach. Binominal each seems to play the same role as a distributor in the sentences. Thus, binominal sentences seem to satisfy the first criterion of SD in using each. Second, in this construction, the D-NP such as one book each is obligatorily distributed over the antecedent NP, meeting the second criterion of SD.

My proposal for the analysis of binominal sentences is as follows:

(72) a. Binominal each has [+Dist] and [+pl] feature. It adjoins to the right of the R-NP to check its [+pl] feature. The adjoinment makes the R-NP to inherit its [+Dist] feature. Each must adjoin to the R-NP which c-commands the D-NP after reconstruction.
   b. The adjoined R-NP [[The boys] each] moves to the Spec of DistP.
   c. The D-NP [one book] moves to the ShareP.

The movement of binominal each in (72a) triggers the movement of the R-NP in (72b), which is in the spirit of S &S (1988). (72b) and (72c) fits in with the target landing site theory of B &S (1997).

The binominal each-movement can be regarded as a type of phi-feature checking in the minimalist framework by Chomsky (1995). I assume that the binominal each-movement takes place after the Case-feature checking has been done. The order of various movements in my analysis is summarized as follows:

(72') 1. Case-feature checking (triggered by Case features)
       2. Binominal each-movement (triggered by [+pl] feature)
       4. Movement of the D-NP to the Spec of ShareP

The lack of inverse scope reading in the binominal construction can be captured without further mechanism. The binominal each-movement was triggered by the [+pl] feature of the antecedent. It must adjoin to the antecedent NP to check off the [+pl] feature. Then, the adjoinment inherits the [+Dist] feature from binominal each. The QP that has each adjoined must move to the Spec of DistP because of its [+Dist] feature. Under this analysis, only the QP that moves to the DistP gets the wider scope. Thus the D-NP one
book cannot have scope over the R-NP because it is not the QP that has the [+Dist] feature. It is the QP that binominal each has moved out of.

(73)

\[
\begin{array}{c}
\text{DistP} \\
\text{ShareP} \\
\text{[The boys each]} \\
\text{[+Dist]} \\
\text{one balloon t}
\end{array}
\]

In this section, I proposed that obligatory distributive interpretations of binominal sentences are accounted for by assuming that binominal each moves and that the R-NP with [+Dist] feature moves to the Spec of DistP in B & S’s phrase structure at LF.

2.4.3. Semantic Restrictions on the QPs in Binominal sentences

The fact that only restricted classes of QPs may occur as an R-NP in binominal sentences may provide the motivation for the binominal each-movement. The R-NPs are basically plural CQPs or GQPs in B & S’s framework. CQPs and GQPs do not move to the Spec of DistP in other circumstances. It is the [+Dist] feature of binominal each that forces the R-NP to move to the Spec of DistP position.

2.4.3.1. Semantic Restrictions on the R-NP

S & S (1988) use the semantic restrictions on the R-NP and the D-NP as a diagnostics to explore their syntactic properties. According to S & S, the R-NPs must be plural, and the D-NPs must be cardinal and indefinite. Sutton (1994) attempts to characterize and formalize these semantic restrictions on the NPs in the binominal construction and adverbial each construction.

The R-NPs in binominal each sentences, like in adverbial each sentences, must be plural. This rules out DQPs since they are morphologically singular in English. Examples are taken here from S & S (1988).
(74) *Every man / *Each man saw two women each.
Negative QPs and monotone-decreasing CQPs are excluded, too.

(75) *No men / *Few men saw two women each.
Here are some examples of plural GQPs and CQPs that are allowed in binominal sentences.

(76) Some men / Several men / Many men saw two women each.
Plural numeral CQPs, conjoined NPs and plural specific NPs are also allowed in this construction.

(77) a. Four men saw two women each.
    b. They / The men / These men saw two women each.
    c. [Bill and Joe] saw two women each.

WhQP may occur as an R-NP.

(78) a. Which men saw two women each?
    b. How many men saw two women each?

The answer to (78) has to have a plural subject, indicating that the subject QP is a distributor. Following Beghelli (1997), I assume that the WhQP in (78) is raised to CP first, and leaves a wh-operator in the CP position and then is reconstructed into the Spec of DistP position.

(78b) is a question used in the following situation. The speaker assumes the existence of some men who saw two women. For instance, in a situation where there are six men (A, B, C, D, E, F) and A saw two women, B saw three, C saw two, D saw two, E saw
two, and F saw four women, the answer to (78b) will be *Four men saw two women each.*

The semantic restrictions on the R-NP discussed in this section are summarized in the following chart.

(79) Semantic restrictions on the R-NP

<table>
<thead>
<tr>
<th>R-NPs that are allowed</th>
<th>R-NPs that are not allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>some Ns, several Ns</em></td>
<td><em>every N, each N</em></td>
</tr>
<tr>
<td><em>many Ns, most Ns</em></td>
<td><em>no N, few N</em></td>
</tr>
<tr>
<td><em>which Ns, how many Ns</em></td>
<td><em>no Ns</em></td>
</tr>
<tr>
<td><em>they</em></td>
<td></td>
</tr>
<tr>
<td><em>the men</em></td>
<td></td>
</tr>
<tr>
<td><em>these men, conjoined NPs</em></td>
<td></td>
</tr>
</tbody>
</table>

In this section, I discussed semantic restrictions on the R-NPs. Not all types of QPs may be the antecedent in the binominal *each* sentences. Only plural GQPs and CQPs may be the antecedent. These QPs cannot occur, in principle, in the Spec of DistP. These GQPs and CQPs are licensed to be in the Spec of DistP position by the adjunction of *each* to their right. This binominal *each* movement allows them to have [+Dist] feature.

### 2.4.3.2. Semantic Restrictions on the D-NP

D-NPs in binominal sentences must be cardinal and indefinite according to S & S (1988). They use a cardinal numeral expression such as *one N each* to explore the syntactic properties of the construction because such a D-NP is easily distinguishable from the R-NP which must be plural.

(80) The men saw *one jewel/two jewels each.*

Sutton (1994) notes that numeral expressions may be modified by expressions such as *at least, exactly, more than almost, at most, fewer than, approximately.*

Other QPs that are acceptable as D-NPs are indefinite GQPs.

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*I thank Aaron Broadwell for these intuitions.*
(81) The men saw several/many/a few jewels each.

The following GQPs are not allowed as D-NPs.

(82) *The men saw most/all jewels each.

Definite GQPs are not allowed.

(83) * The men saw some/certain/these men each.

NegQP along with monotone-decreasing GQPs are not allowed.

(84) *The men saw no/few jewels each.

WhQPs are allowed as D-NPs if they are how many Ns.

(85) a. [How many girls each] did the men see?
    b. * [Which girls each] did the men see?

For this reason, Sutton (1994) proposes that the D-NPs are amount phrases and gives the
semantic interpretation of binominal each accordingly.

The semantic restrictions on the D-NPs discussed in this section are summarized in the
following chart.

(86) Semantic restrictions on the D-NP
    the D-NPs that are allowed          the D-NPs that are not allowed
    indefinite numeral QPs             some Ns, certain Ns
    (e.g. one book)                    most Ns, all Ns
    modified numeral QPs               these Ns
    (e.g. at most, fewer than)         every N, each N
    how many Ns                        no Ns, few Ns, which N

Although I cannot tell the exact reason why only indefinite QPs are allowed as the D-NPs
in binominal sentences, this fact largely correlates with the QPs that can move to the
Spec of ShareP position in my analysis.

It is noted that although the D-NPs have to be indefinite, the group of D-NPs that are
allowed do not exactly coincide with the QPs that can occur in existential there-
constructions as Sutton (1994) points out.

(87) a. There are more boys than girls in the classroom.
b. *They saw more boys than girls each.

For instance, the expression more $N_1$ than $N_2$ is allowed in existential there-sentences, but not allowed in binominal sentences.

2.4.4. The Structure of binominal each

In this section, I will consider why binominal each occurs in the postnominal position.

S & S (1988: 432) consider two possibilities for the structure of the D-NP: one in which each is in the Specifier position as in (88a) and another in which each is the head of the QP as in (88b).

(88) a. 

```
NP
   /\   \\
 NP  NP
  /   \ /
 two books each
  \    \ \\
     N'
        [s,e] [NP e]
```

b. 

```
NP
   /\   \\
 NP  QP
  /   \ /
 two books [SPEC e] Q'
  \    \\
     [each] [NP e]
```

In both (88a) and (88b), the empty NP [NP e] was assumed because it was considered that the D-NP contains an anaphor which takes the R-NP as an antecedent. I will tentatively adopt (88b) as a structure for binominal each for the reason that it is easier to assimilate it to the internal structure of an AP, which S &S do.

(89) a. The boys bought one book each.

b. A man happy about his plans discussed his hopes.

c. A student willing to try is likely to succeed.

---

10 I left the labels of the category nodes unaltered as in the original paper in the LGB framework.
d. One man present complained about the food.

S & S (1988: 434) assume that the following is the structure of the postnominal adjectives.

(90) \[
\begin{array}{c}
\text{NP} \\
\text{NP} \\
\text{one man} \\
\text{Spec} \\
\text{PRO_i} \\
\text{present} \\
\text{t_i}
\end{array}
\]

They assume that postnominal adjectives such as present in (90d) are unaccusative in the sense of Perlmutter (1978). It is possible to assume that binominal each is also unaccusative as follows:

(91) \[
\begin{array}{c}
\text{QP_1} \\
\text{QP_2} \\
\text{two books} \\
\text{PRO} \\
\text{each} \\
\text{t}
\end{array}
\]

The following examples show that the D-NP one girl each behaves like the AP one student present in verb-particle constructions.

(92) a. The boys called up one girl each.
    b. *?The boys called one girl each up.

(93) a. The boys called up one student present.
    b. *? The boys called one student present up.

(92b) and (93b) are both ill-formed. This can be accounted for by assuming the parallel structure for one student present and one student each.

In this section, I proposed a structure for the D-NP in binominal each sentences that is in the spirit of S & S (1988).
2.4.5. Syntactic properties of binominal sentences

2.4.5.1. Binominal each-movement out of PP adjuncts

In this section, I will show that binominal each movement may take place in PP adjuncts so long as the c-command condition between the D-NP and the R-NP which was proposed in section 2.5. holds.

S & S (1988) and Sutton (1994) note that binominal each may occur in adjuncts as shown in the following examples:

(94) a. The children sneezed five times each.
    b. The boys were fired [for three reasons each].
    c. *John sneezed five times each.

(94a) and (94b) show that the antecedent R-NP may be the subject. (94c) is ill-formed because there is no plural antecedent for the D-NP.

Furthermore, the R-NP may be in the direct object position when the D-NP is the adjunct as shown as follows:

(95) a. John read two books for three hours each.
    b. Bob made Sam and Tom leave on two occasions each.
    c. John worked with Sue and Mo on two projects each.

I claim that binominal each-movement has taken place at LF in examples such as (94a), (94b), and (95) because these examples have an obligatory distributive interpretation.

Along with Jackendoff (1972), Andrews (1982), Larson (1988), and Stroik (1990), I assume that these adjuncts are dominated by the VP in the base position since these adjuncts semantically modify the action expressed by the verb. For example, I assume the structure of the adjunct to be as follows:

\[
\begin{array}{c}
\text{VP} \\
\text{PPadjuncts}
\end{array}
\]
As discussed in section 2.5, I assume that the binominal each-movement takes place at LF after Case-feature checking. It is also assumed that temporal PP-adjuncts do not have to check their Case-feature because they are an optional element in the grammar and they do not have Case-features to be checked.

For instance, the structure of (94a) the children sneezed five times each is shown as follows:\footnote{I leave open the question of whether some time adverbial DPs have an empty preposition in the base-position.}:

\begin{center}
\includegraphics[width=0.8\textwidth]{diagram.png}
\end{center}

In (97), the children moves from the Spec of VP position to the Spec of AgrSP to check its Nominative feature. Then, the binominal each-movement takes place since the children in the Spec of AgrSP c-commands the adjunct five times each, satisfying the structural condition for each-movement. After binominal each adjoins to the children, by the virtue...
of its [+Dist] feature, [[the children] each] moves to the Spec of ShareP.\footnote{This representation will eventually map into an interpretation which roughly says, "For each of the children $x$, there is an event of $x$ sneezing five times."}

In (97), the subject DP the children c-commands the D-NP five times each, satisfying the structural condition for each-movement. After binominal each adjoins to the children, by the virtue of its [+Dist] feature, [[the children] each] moves to the Spec of DistP and [five times t] moves to the Spec of ShareP.

The derivation of (97a) is summarized as follows:

\begin{enumerate}
\item Nominative Case checking of the children
\item Binominal each-movement
\item The movement of [[the children] each] to the Spec of DistP
\item The movement of [five times t] to the Spec of ShareP
\end{enumerate}

Similarly, when the object is the R-NP, the object c-commands the adjunct DP, so the structural condition for binominal each-movement is met. For instance, the LF representation of (95a) John read two books for three times each is shown as follows:

\begin{enumerate}
\item Nominative Case checking of the children
\item Binominal each-movement
\item The movement of [[the children] each] to the Spec of DistP
\item The movement of [five times t] to the Spec of ShareP
\end{enumerate}
After Accusative Case checking, two books in the Spec of AgrOP c-commands three times each, satisfying the structural condition for the binominal each-movement. Binominal each adjoins to two books and [two books] each, having inherited its [+Dist] feature from each, moves to the Spec of DistP. The D-NP [three times it] moves to the Spec of ShareP. The resulting representation will be interpreted roughly as, "for each of the two books, there is an event of John reading it for three times."

In this section, I showed that if one adopts the assumption that the PP adjuncts are dominated by the VP, the examples can be captured by binominal each movement.

2.4.5.2. Reconstruction effects of A-bar movement in binominal sentences

In this section, the reconstruction effect of A-bar movement in binominal sentences is accounted for by the binominal each-movement analysis proposed in section 2.5.

Three basic generalizations made by S & S (1988) that must be captured about binominal sentences are summarized as follows:

(100) a. The D-NP may not be in the subject position (unless it is moved by a syntactic movement).
    b. The structural relationship between the D-NP and the R-NP may not occur in a more deeply embedded clause than the R-NP.
    c. The structural relation between the R-NP and the D-NP exhibits reconstruction ("connectivity") effects.

In this section, I will discuss the reconstructions effects in (100c). It is known that binominal each sentences exhibit reconstruction effects ("connectivity" effects) discussed in Barss (1986) shown in the following examples:

(101) a. [How many books each] did the boys said that the girls bought __?
    b. *[How many books each] did the boys said that he bought __?

In (101a), only the girls, not the boys, can be interpreted as the antecedent of the D-NP how many books each. (101b) also shows that only the embedded subject, and not the
matrix subject, can be the antecedent of how many books each. (101b) is unacceptable because the embedded subject he is not plural.\textsuperscript{13}

How would the reconstruction effects in (100) be accounted for by binominal each-movement analysis?

There are two possibilities as to where each-movement takes place: (i) Each-movement may take place from the position at Spell-Out and each adjoins to the girls. (ii) The Wh-QP syntactically reconstruct into their base position and then, each-movement takes place. Then, [the girls] each moves to the Spec of DistP and [how many books t] moves to the ShareP.\textsuperscript{14}

There are reasons to think that (i) is not the right approach. If (i) were to be adopted, there would be no structural condition that binominal each satisfies when this movement takes place. In other cases, the binominal each-movement seems to obey the c-command restriction.

On the other hand, there are independent motivations for the reconstruction approach in (ii). It is known that Wh-QPs must reconstruct to the base position for reasons of anaphoric binding (Barss 1986):

(102) [Which picture of himself does Bill think John likes__?}

\textsuperscript{13} I thank Anoop Mahajan for suggesting this example to me.

\textsuperscript{14} Binominal sentences differ from adverbial each sentences in that the former exhibits reconstruction (connectivity) effects, while the latter does not. (I will discuss later the fact that this distinction also applies to Japanese binominal and adverbial sentences.)

The adverbial each sentences cannot be passivized if each does not have a c-commanding plural QP at Spell-Out.

(i) The men each bought one book. (adverbial)

(ii) a. *One book was each bought by the men. (adverbial passive)

b. These books were each bought by the men. (adverbial passive)

(iia) is ill-formed because one book, which c-commands adverbial each, is not a plural QP. On the other hand, (iib) is well-formed because these books is a plural QP.

In other words, the relationship between adverbial each and its antecedent is more "surfacy" than that of binominal each and its antecedent.
So, I will adopt the approach in (ii). The reconstruction effect of binominal sentences involving A-bar movement as in (102) suggests that the binominal each-movement takes place when the D-NP is reconstructed into the base position.

(103)a. [ _ ] did the boys said that the girls bought [how many books each].

b. [ _ ] did the boys said that [[the girls each] bought [ how many books t].

Then [[the girls each] moves to the Spec of DistP and [ how many books t] moves to the Spec of ShareP. This captures the scope relation between the R-NP and the D-NP, which does not change by syntactic movement.

(104)

```
DistP
  [[the girls each]
    ShareP
      how many books t
```

In (104), the R-NP the girls has wide scope over the D-NP how many books each.

In this section, I proposed that the reconstruction effect of binominal each sentences involving A-bar movement can be captured by reconstructing wh-QP into the base position.

2.4.5.3. Passives and Binominal each

In this section, I will present an analysis of passive binominal each sentences which adopts the base structure proposed by Kural (1996).

S & S (1988) made the following generalizations about the binominal sentences.

(105) a. The D-NP may not be in the subject position (unless it is moved by a syntactic movement.)

   c. The structural relation between the R-NP and the D-NP exhibits reconstruction ("connectivity") effects.\(^{15}\)

\(^{15}\) Burzio (1986) was the first to discuss these reconstruction effects of binominal each sentences in the Government and Binding framework.
Let us consider the following sentences.

(106) a. *[One student each] read [three books].
   D-NP                        R-NP
b. [One student each] was recommended by the three professors.\(^{16}\)
c. [One student each] seems to be recommended by the three professors.

(106a) shows that the D-NPs in binominal sentences are not acceptable when they appear in the subject position not involving syntactic movement. On the other hand, (106b) and (106c) show that the D-NP can be the subject of the passive sentence.

Why is (106a) ill-formed? I would like to adopt a structural account for why (106a) is unacceptable. In section 2.5, I proposed that the R-NP must c-command the D-NP for the binominal each-movement to take place. In (106a) the binominal each-movement is not possible because the three professors never c-commands one student each at any stage of the derivation (i.e. neither at the VP-internal base position or at LF).

It should be noted that the acceptability of the binominal sentences does not extend to A-movement in general. Compare (106b) and (106c) with the following examples involving raising verbs.

(107) b. [One student each] was recommended by the three professors.
c. [One student each] seems to be recommended by the three professors.
d. [One student each] is likely to be recommended by the three professors.

(108) c. *[One student each] seems to have visited the three professors.
d. *[One student each] was likely to have visited the three professors.

The contrast between examples in (107) and those in (108) indicates that the acceptability of (107c) and (108d) is not due to the raising verbs such as seem and be likely, but due to the passives. This contrast shows that reconstructing the QP to the subject position of the infinitival clause is not enough for the binominal each-movement to take place. In

\(^{16}\) Some speakers do not like the by-phrase to be plain definite plural QPs (without numerals) or bare plural QPs.
(i) a. ?*One student each was recommended by the professors.
b. ?*One student each was recommended by three professors.

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examples in (108), even in the subject position of the embedded clause indicated by \( t \), the R-NP (the three professors) would not c-command the D-NP (one student each). This suggests that the D-NPs in examples in (107) are reconstructed further down into their base positions. For this reason, I will adopt an analysis of the passive proposed by Kural (1996), which can capture the c-command relation between the R-NP and the D-NP at the VP-internal base positions.

Along the lines of Keenan and Timberlake (1985), Marantz (1985), Li (1990), Hoekstra and Roberts (1993), and Mahajan (1994), Kural (1996: 184) proposes that the passive by-phrase is base-generated in the Spec of VP position as follows:

\[
(109) \quad \begin{array}{c}
\text{VP} \\
\text{PP} \\
\text{by John} \\
\text{VP} \\
\text{PASS eat} \\
\beta \\
\text{the cake}
\end{array}
\]

(109) represents the structure of the cake was eaten by John. The motivation for positing the structure in (109) comes from the desire to capture the thematic relations and the fact that the passive by-phrase can serve as a controller.

(110) a. The ship was sunk by John, [\text{PRO} \text{to collect the insurance}].
    b. *The ship sank [\text{PRO} \text{to collect the insurance}].

Kural (1996:188) proposes the following phrase structure for passives within the feature-checking theory of the minimalist framework.
NomP can be regarded as AgrSP, and AccP may be regarded as AgrOP.

According to Kural (1996), the following movements take place:

(112) 1. The passive by-phrase moves to the Spec of the ByP to be structurally licensed.
2. PRO remains in situ at S-Structure, but it is head incorporated into the verbal complex at LF, following Baker (1988) and Koopman (1994).
3. The object DP moves to the Spec of AccP for structural licensing.
4. The argument in the lowest structural licensing position moves further to the Spec of NomP.

I would not adopt all of Kural's assumptions. Especially, I do not assume as in (112.3) that the object DP undergoes "morphologically vacuous" feature-checking to AccP before it moves to NomP.

The structure of (107b) [one student each] was recommended by the three professors is represented as follows:
After the Nominative Case-checking of one student each and the structural licensing of by the three professors, the DP one student each is reconstructed into its base-position. In this position, one student each is c-commanded by the three professors. Thus, each-movement takes place and binominal each adjoins to the three professors.

I assume that ByP is located below DistP and ShareP. After each-movement, [[three professors] each] moves to the Spec of DistP triggered by its [+Dist] feature and [one student] moves to the Spec of ShareP.

Even in these cases of syntactic reconstruction, the scope relation between the R-NP and the D-NP does not change.

(114) [Two students each] was recommended by the three professors.

\[
\begin{align*}
\text{D-NP} & \quad \text{R-NP} \\
(i) \quad \text{"Three professors each recommended two students". (R-NP > D-NP)} \\
(ii) \quad \text{" Each of the two students were recommended by the three professors."} \\
& \quad \text{(*D-NP > R-NP)}
\end{align*}
\]
(114) does not have a reading in which the D-NP two students has wide scope over the R-NP the three professors.

Independent motivation for reconstruction into the base position in the passive is not so overwhelming. I will present three arguments for reconstructing into the base position in passive.

First, it is known that the passive by-phrase can (but need not) take scope over the subject DP as shown as follows:

(115) Two students are nominated for the award by every professor.
   (i) “Every professor nominates possibly two different students for the award.”
       (every professor > two students)
   (ii) “There are two students that every professor nominates for the award.”
       (two students > every professor)

The preferred reading for (115) is the one in which the passive by-phrase scopes over the subject QP as in (115i).

Second, the behavior of the subject-oriented adverbs discussed in Jackendoff (1972) in binominal sentences suggest that the subject DP can be reconstructed.17

(116) John was reluctantly examined by the doctor.

The adverbs such as reluctantly in passive sentences are ambiguously interpreted in this position. It may be that John was reluctant or the doctor was reluctant.

(117) [[One boy] each] was reluctantly examined by the three doctors.

The majority of the native speakers that I consulted thought that the adverb reluctantly was ambiguous. Yet some speakers thought the adverb may only be understood as referring to the state of mind of the doctor.

According to Jackendoff (1972), many of these adverbs, when they function as manner adverbs, do not change their meanings under passivization.

(117’) a. The doctor examined John carefully/ carelessly.

17 This test was suggested to me by Manuel Español-Echevarria.
b. John was examined carefully/ carelessly by the doctor.

The interpretation of the adverb is unambiguous in both (117’a) and (117’b). They both mean that the manner that doctor examined John was careful/ careless.

(117”) One boy each was examined carefully/ carelessly by the three doctors.

In (117”), the adverb carefully/ carelessly is ambiguously interpreted as the manner of the three doctors. This shows that at least for some adverbs the passive by-phrase has to be the controller. It would be done with greater ease, structurally if the by-phrase c-commands the adverb at some point of derivation (in this case, at the base-position).

The third argument comes from the entailment relation with the locative PPs. Keenan (1980) discusses that the passive preserves the entailment relation with some type of locative PPs.

(118) a. John saw /attacked /signaled /roped Bill from the attic.
   b. |= Bill was in the attic.
   c. |= John was in the attic.

In (118), an active transitive sentence with a source locative PP from the attic has the subject-orientation for the locative PP. Thus, (118a) entails that the subject DP John was in the attic as in (118c), and does not entail that the object DP Bill was in the attic as in (118b).

The passive counterpart of (118) perserves this entailment relationship.

(119) a. Bill was seen /attacked/ signaled/ roped from the attic by John.
   b. |= Bill was in the attic.
   c. |= John was in the attic.

(119) shows that passivization does not change the entailment relationship. It was the by-phrase agent John that was in the attic and not the derived subject Bill.

Let us look at the case of object-orientation.

(120) a. John dragged/ pulled Bill from the attic.
   b. |= Bill was in the attic.
   c. |= John was in the attic.
(120) shows that with predicates such as drag and pull and the source locative PP, the sentence has object-orientation reading. (120a) entails that the object DP Bill was in the attic as in (120b). It does not entail that the subject DP John was in the attic.

Also in this case passivization does not change the entailment relationship.

(121) a. Bill was dragged/pulled from the attic by John.
   b. \( \models \) Bill was in the attic.
   c. \( \not\models \) John was in the attic.

Although the data is compatible with a semantic analysis and does not necessarily require a syntactic analysis, it suggests that the passive by-phrase plays an essential role in defining the entailment relationship. The mapping between the LF and the interpretation would be easier and done compositionally if the agent DP and the theme DP stayed in the same position in active and passive sentences as Kural (1996) assumes.

The first argument shows that in the passive, by-phrases may take scope over the subject in some cases, which indicates that the subject QP in the passive may (but not must) reconstruct into the VP-internal object position.

The second argument with the subject-oriented adverb indicates that the subject QP may (but not must) reconstruct into the object position. On the other hand, manner adverbs in post-verbal position must be interpreted as controlled by the by-phrase agent. This is captured easier if the structure proposed by Kural is adopted.

The third argument showed that passivization preserves the entailment relation with some locative PPs. It showed that the passive by-phrase is semantically an integral part of the argument structure of the predicate and lends support to the analysis proposed by Kural (1996).

In this section, I proposed that the D-NPs in the passive binominal sentences are reconstructed into their base-positions which is c-commanded by the by-phrase R-NP.
Furthermore, I attempted to provide independent support for the reconstruction in the case of the passive.

2.4.6. Binominal *each* in ditransitive sentences

2.4.6.1. Scope in Dative and Double Object Constructions

In this section, I will consider the scope interaction among three QPs in a simple sentence.

Various works on scope agree on the systematic difference in scope-taking possibilities between Dative and Double Object sentences. Tyhurst (1990: 37) reports that all six readings are possible in Dative sentences, while not all six readings are available in Double Object construction. His observation is consistent with Larson (1990) and Aoun and Li (1989)'s observation that in Double Object construction the direct objects cannot take scope over the indirect objects, which is found both in English and Chinese.

The Dative sentences discussed in Tyhurst (1990:36) are as follows:

(122) Most dealers\textsubscript{1} showed at least two obvious forgeries\textsubscript{2} to an undercover agent\textsubscript{3}.
    
    Every student, showed an original design\textsubscript{2} to three professors\textsubscript{3}.
    
    $$(Q\textsubscript{P}\textsubscript{1} \lor Q\textsubscript{P}\textsubscript{2} \rightarrow Q\textsubscript{P}\textsubscript{3})$$

a. 1 2 3
b. 1 3 2
c. 2 1 3
d. 2 3 1
e. 3 1 2
f. 3 2 1

The subject is expressed as $Q\textsubscript{P}\textsubscript{1}$, and the direct object is indicated as $Q\textsubscript{P}\textsubscript{2}$ and the indirect object as $Q\textsubscript{P}\textsubscript{3}$. As shown in (122), all six scope readings are available in Dative constructions.

As Tyhurst (1990:37) observes, not all six readings are possible in Double Object constructions.
(123) Most dealers, showed an undercover agent, at least two obvious forgeries.
Every student, showed three professors, an original design.

\[ (QP_1 \lor QP_2, QP_3) \]

a. \#1 2 3
b. 1 3 2
c. \#2 1 3
d. \#2 3 1
e. 3 1 2
f. \#3 2 1

He mentions additional examples which exhibit the same range of readings as (123) as follows:

(124) a. A protester brought every researcher two petitions.
    b. Two lifeguards lowered most survivors a lifejacket.
    c. Every librarian read at least two patrons most of the new regulations.
    d. Less than five companies mailed some citizens two free disks.

In his judgment, four of the six possible scope orderings are not available in the Double Object construction. (123a), (123c) and (131d) are the ordering in which the direct object takes scope over the indirect object. (*QP2 > QP3)

The lack of reading (123f) indicates that the direct object may not take scope over the subject. (*QP2 > QP1) Tyhurst gives the following simple examples where the indirect object is not quantified.

(125) a. Most children told Yolanda at least two stories.
    (most children > at least two stories > most children)
    b. An officer showed Ryan every picture of the suspect.
    (an officer > every pictures of the suspect, 
     *every picture of the suspect > an officer)

According to his judgment, only subject-wide scope reading over the direct object is available.

However, as an exception, when the direct objects are indefinite DPs, a wide scope reading for the direct object becomes available. The following are examples given by Tyhurst (1990:38) in which a wide scope reading for the direct objects is acceptable:

(126) a. Every officer has shown Wilson a picture of the suspect.
    (every officer > a picture of the suspect, a picture of the suspect > every officer)
b. No fewer than six realtors showed Carol two new houses in the Hollywood Hills.
(no fewer than six realtors > two new houses,
    two new houses > no fewer than six realtors)

I will assume the above observation made by Larson (1990), Aoun and Li (1989), and Tyhurst (1990) to be correct and try to derive the scopal difference between Dative and Double Object Constructions from their structure within B & S’s approach.

Let us look at the following examples:

(127) a. John assigned one student every problem. (DO, unambiguous)
       (one > every, *every > one)
  b. John assigned one problem to every student. (Dative, ambiguous)
       (one > every, every > one)

In the Double Object sentence (127a), the only possible reading is the one in which one student takes scope over every problem, which is the non-distributive reading. On the other hand, (127b) has both the distributive and the non-distributive reading. The distributive reading is the one in which every student takes scope over one problem.

Following Beghelli (1995: 158), I assume that in the Dative construction, the Dative Case checking of the prepositional phrase with indirect object is done at a position (B calls the Spec of AgrIOP) higher than the Spec of AgrOP (in which the Accusative Case of the direct object DP is checked). I will call the checking position of the Dative PP the Spec of AgrPP.
For instance, the scope ambiguity of the Dative sentence in (127b) *John assigned one problem to every student* is accounted for in this approach as follows: after Case-checking, the dative PP *to every student* moves from the Spec of AgrPP to the Spec of DistP and the direct object *one problem* moves from the Spec of AgrOP to the Spec of ShareP. This derivation will give the wide-scope reading for the universally quantified QP *every student* in which the problem varies with the number of the students.
The wide-scope reading for the direct object is derived as follows: the direct object *one problem* moves from the Spec of AgrOP to the Spec of RefP as in (129). On the other hand, the dative PP to *every student* has two choices: it may move from the Spec of AgrPP to the Spec of DistP or it may stay in-situ at AgrPP and get distributed by the silent distributive operator. Beghelli (1995) would take the latter choice. I will take the former choice. The head of DistP hosts the universal operator $\forall$ and the silent distributive operator will be translated as $\forall$ in the interpretation, so semantically it would turn out the same. My approach is to push the Strong Distributivity analysis as far as possible, and find out how far one can go.

In the structure of Double Object construction it is also assumed that the projection of AgrIOP is higher than that of AgrOP.\footnote{Beghelli (1995) does not use Double Object Construction (DOC) for testing distributive scopes presumably because it is known that DOC exhibits curious lack of scope ambiguities that are not present in Dative Constructions. He consistently uses Dative Constructions for discussion.} For instance, the structure of (127a) *John assigned one student every problem* is assumed to be as follows:

\begin{diagram}
\begin{center}
\begin{tikzpicture}
\node (RefP) {RefP};
\node (AgrSP) at (-2,1) {AgrSP};
\node (DistP) at (-4,2) {DistP};
\node (ShareP) at (-5,3) {ShareP};
\node (AgrPP) at (-6,4) {AgrPP};
\node (AgrOP) at (-7,5) {AgrOP};
\node (VP) at (-8,6) {VP};
\node (to\ every\ student) at (-5,2) {to every student};
\node (one\ problem) at (-7,3) {one problem};

\draw (RefP) -- (AgrSP);
\draw (AgrSP) -- (DistP);
\draw (DistP) -- (ShareP);
\draw (ShareP) -- (AgrPP);
\draw (AgrPP) -- (AgrOP);
\draw (AgrOP) -- (VP);
\draw (to\ every\ student) -- (ShareP);
\draw (one\ problem) -- (AgrPP);
\end{tikzpicture}
\end{center}
\end{diagram}
For Double Object Constructions some kind of structural constraint is needed to prohibit
the direct object from taking wider scope than the indirect object. In Beghelli (1995:161),
this might be treated as an instance of Pseudo Distributivity which is subject to the Case
hierarchy shown as follows:

(132) Hierarchy of Case positions

Subject > Indirect Object > Direct Object

There are reasons to believe that the lack of scope ambiguity in DOC comes from its
structure. The following observations made by Barss and Lasnik (1986:347-350) also
point in the same direction.

(133) Anaphor Binding
a. I showed John himself (in the mirror).
b. *I showed himself John (in the mirror).

(134) Quantifier Binding
a. I denied each worker, his, paycheck.
b. *I denied its, owner each paycheck.

(135) Weak Crossover
a. Which worker, did you deny his, check?
b. *Which paycheck, did you deny its, owner?
(136) Superiority
   a. Who did you give which book?\textsuperscript{19}
   b. *Which book did you give who?

(137) Each... the other
   a. I gave each man the other's watch.
   b. *I gave the other's trainer each lion.

(138) Polarity Any
   a. I gave no one anything.
   b. *I gave anyone nothing.

For lack of innovative ideas, I will simply stipulate as follows: \textsuperscript{20}

(139) Mapping Principle
   Direct object QP cannot scope over indirect object QP in the Double Object Construction.

In DOC (127a), John assigned one student every problem, the movement of the direct object to the Spec of DistP is prohibited by (139).

Let us consider how all the possible readings of (123) [Every student 1 showed [three professors 3 an original design 2 are derived.

\textsuperscript{19} Some (non-linguist) native speakers do not like sentence (136a). Instead, they offer the following sentence with the explicit dative Case marking.

(i) To whom did you give which book?

\textsuperscript{20} The Mapping Principle is also reflected in syntactic movements. Uran (1996) observes that some languages passivize both DO and IO, but most languages that cannot passivize both can passivize IO, but not vice versa.
Below I will briefly show the well-formed derivations and how the ill-formed derivations are blocked.

(141) a. # 1 2 3
   an original design cannot move from [Spec, AgrOP] to [Spec, ShareP] because it violates (139).
   b. 1 3 2
      (i) every student moves from [Spec, AgrSP] to [Spec, DistP]
      (ii) three professors moves from [Spec, Agr1OP] to [Spec, ShareP]
      (iii) an original design stays in AgrOP
            None of these movements violate (139).
   c. # 2 1 3
      an original design cannot move from [Spec, AgrOP] to [Spec, RefP] because it violates (139).
   d. # 2 3 1
      an original design cannot move from [Spec, AgrOP] to [Spec, RefP] because it violates (139).
   e. 3 1 2
      (i) three professors moves from [Spec, Agr1OP] to [Spec, RefP]
      (ii) every student moves from [Spec, AgrSP] to [Spec, DistP]
      (iii) an original design moves from [Spec, AgrOP] to [Spec, ShareP]
            None of the movements violate (139).
   f. # 3 2 1
      (i) three professors moves from [Spec, Agr1OP] to [Spec, RefP]
      (ii) every student moves from [Spec, AgrSP] to [Spec, DistP].
      (iii) an original design cannot move because it does not have a landing-site between [Spec, RefP] and [Spec, DistP].

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The reading in (141f) is especially interesting because it is ruled out directly as a consequence of B & S's phrase structure.

In this section, I showed that scope interactions in Dative and Double Object Constructions are accounted for in B & S's Target Landing-Site Approach if one assumes that Dative and DOC are structurally distinct as Aoun and Li (1989) and Larson (1990), among others, have shown.

2.4.6.2. Binominal each in ditransitive sentences

In this section, I will show that binominal sentences exhibit asymmetry in both Dative and DOCs, which can be accounted for by the binominal each-movement analysis proposed in section 2.5. and the assumptions made in the previous section about their structures.

According to S & S, R-NPs can be both direct and indirect objects in English binominal construction. However, a careful examination of the data reveals that R-NPs must be indirect objects in the DOC.

(143) a. John gave [three students] [one ticket each].
   b. *John gave [one student each] [three tickets].

(143b) with the D-NP as the indirect object is unacceptable.

On the other hand, Datives exhibit the following paradigm:

(144) a. John gave [one ticket each] [to three students].
   b. *John gave [three tickets] [to one student each].
(145) a. The UN assigned [one interpreter each] [to the diplomats].
   b. *The UN assigned [the interpreters] [to one diplomat each].
(146) a. John introduced [one girl each] [to the boys].
   b. *John introduced [the boys] [to one girl each].

As for the Dative examples, the unacceptability of the b-sentences are accounted for as follows:
(147) Dative

RefP
AgrSP

John
DistP
ShareP

AgrPP
AgrOP
to one boy each

two tickets

(147) shows the LF representation of *John gave two tickets to one boy each. After Case-checking at AgrPP to one boy each is not c-commanded by the R-NP two tickets. Thus, (147) does not satisfy the structural condition on the binominal each-movement. The binominal each-movement does not take place in (147) and the structure is ruled out as unacceptable.

On the other hand, John gave one ticket each to the two boys is acceptable because the direct object one ticket each is c-commanded by the AgrPP to the two boys, so the structural condition on the binominal each-movement is met as shown as follows:
The phrase structure adopted for Datives above predicts that D-NP may be an indirect object only in cases when the subject DP is the R-NP since the structural condition for the binominal each-movement is satisfied. This prediction seems to be born out. The following ditransitive sentence is acceptable.

(149)a. Three boys gave [a ticket ][to one girl each].
    b. Three boys gave [one ticket each] [to Mary].

The examples in (149) show that so long as the R-NP is the subject, since it c-commands either direct objectQP or indirect object QP, the D-NP can be either a direct object or an indirect object.

Furthermore, the phrase structure of the Dative predicts that when the D-NP is the indirect object, it can only covary with the subject QP and not with the direct object QP, which indeed seems to be the case.

(150) Five boys gave three tickets to one girl each.

(150) can only be interpreted as the number of girls varying with the number of boys and not with the number of the tickets.
Binominal Double Object Construction (143a) *John gave three students one ticket each has the following structure:

(151)  DOC

RefP

AgrSP

DistP

ShareP

AgrIOP

three students

AgrOP

one ticket each

VP

The derivation is as follows:

(152)  1. The binominal each-movement takes place because three students in [Spec, AgrIOP] c-commands one ticket each in [Spec, AgrOP]

2. [[three students each] moves from [Spec, AgrIOP] to [Spec, DistP] because of its [+Dist] feature.

3. [one ticket each] moves from [Spec, AgrOP] to [Spec, ShareP].

Let us consider the derivation of the ill-formed DOC such as (143b) *John gave one student each three tickets. It has the LF representation in (153) before each-movement:
In (153), one student each in [Spec, AgrIOP] does not c-command three tickets in [Spec, AgrOP]. Therefore, the binominal each-movement cannot take place. The unacceptability of (143b) is straightforwardly accounted for by the binominal each-movement even without the recourse to (132).

In this section, I showed that the syntactic properties of binominal ditransitive sentences (both Datives and Double Object Constructions) are accounted for by the LF phrase structure proposed for their scope relation and by the binominal each-movement. The binominal each-movement analysis is supported to the extent that it captures the scope relations and the syntactic properties of Datives and Double Object binominal sentences.

2.4.7. The clause-bounded property of binominal each

The last generalization that S & S (1988) made was that the relation between the R-NP and the D-NP is local.

(154) a. The boys said [that the girls read one book each].
    b. *The boys said that Mary read one book each.
The D-NP one book each in (154a) may only be distributed over the embedded subject the girls but not the boys in the matrix clause. Similarly, in (154b) one book each may not have the matrix subject the boys as its antecedent.

There are two ways to capture this locality. One is to impose a locality requirement on the binominal each-movement.

The other is to assume that the phrase structure of QPs allows in principle only the clause-bounded interpretation. The element in the Spec of DistP may only be semantically interpreted with the element in the Spec of ShareP which is in the same CP.

I will adopt the latter approach since it is known that, in general, scope relations of quantifiers are clause-bounded.\footnote{See B & S (1997), Farkas and Giannakidou (1996), and Beghelli (1995). The only problems in this approach and in movement approaches to scope, in general, are the indefinite QPs, which may scope out of the clause. See recent approaches using choice functions for these indefinite QPs by Reinhart (1997), Winter (1997), and Kratzer (to appear). This thesis does not particularly adopt the choice function approach.} Thus, in (154), even if binominal each may be able to adjoin to the boys in the matrix clause, there is not an element in the Spec of ShareP in the matrix clause that can be interpreted with [[the boys] each].

In this section, I claimed that the clause-bounded property of binominal each comes as the direct consequence of adopting the scopal phrase structure approach of B & S.
Chapter 3

Japanese Binominal Quantifier and Distributivity

In this chapter, I will argue that although superficially similar to the adverbial distributive quantifier sorezore, there exists a binominal quantifier sorezore in Japanese.

I will show in section 3.2. that binominal sorezore can be distinguished from adverbial sorezore by movement operations such as scrambling, passivization and relativization of the object DP.

In section 3.3, I will show that the object DP of binominal sentences can also be semantically differentiated from that of adverbial sentences if an object DP exists. Semantic restrictions on the antecedent NPs and the object NPs are discussed in this section.

In section 3.4, a movement analysis of binominal and adverbial sorezore is proposed. The minimalist account within B & S's phrase structure proposed in Chapter 2 for English binominal and adverbial quantifiers carries over to Japanese binominal and adverbial sorezore. In section 3.4.1, I will propose a test using anaphoric pronouns to distinguish indefinite NPs from definite NPs in Japanese.

In section 3.5, it is shown that binominal sentences in Japanese show reconstruction effects just like their English counterpart discussed in Chapter 2 (sections 2.4.5.2. and 2.4.5.3).

Finally, scopal properties of ditransitive binominal sentences are discussed in section 3.6.

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3.1. Distributive Quantifiers in Japanese

In Japanese, there are not only adverbal and binominal distributive quantifiers as in English, but also the argument distributive QP which can be case-marked.

(1) [Otoko=tati]-ga sorezore [huta=ri-no zyosei]-o aisi-teiru.] koto
en=pl nom each two=cl-gen women-acc love-asp fact
"The fact that the men love two women each." (binominal sorezore)

(2) [Huta=ri-no otoko]-ga sorezore [PRO uti-ni kaeroo to ] si-ta ] koto
two=cl-gen man-nom each home-to return cp do-past fact
"The fact that the two men each tried to go home." (adverbial sorezore)

(3) [ Huta=ri-no musume]-ga [sorezore-ga tadasii to ] iiha-tta ] koto
two=cl-gen daughter-nom each-nom right cp insist-past fact
"The fact that the two daughters insisted that each of them was right."
(case-marked sorezore)

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1 In this thesis, in order to do away with the effects of the topic marker wa, the example sentences are embedded in the frame of koto (the fact that ...).

Hajime Hoji has pointed out the existence of the postnumeral suffix zutu used as a distributive quantifier as in the following:

(i) [Otok=taichi-ga sorezore huta=ri-zutu zyosei-o hoomonsi-ta ] koto
man=pl-nom each two=cl-ZUTU woman-acc visit-past fact
"The fact that the men visited two women each."

Although the quantifier zutu is a very interesting research topic in itself, I will not pursue it in this thesis because of the facts shown by the following two examples that would complicate any analysis.

First, zutu can only be suffixed to the floated (non-argument) numeral:

(ii)a. "[San=nin-no zyosei]-ga [i=ssatu-no hon]-zutu ka-tta.
three=cl-gen woman-nom one=cl-gen book-ZUTU buy-past
"Three woman bought [one book]-ZUTU."

b. [San=nin-no zyosei]-ga [i=ssatu]-zutu hon-o ka-tta.
three=cl-gen woman-nom one=cl -ZUTU book-buypast
"Three women bought one book each."

(iiia) is unacceptable since zutu is suffixed to the NP that consists of the prenominal numeral modifier and a head N.

Second, zutu can occur independently without an antecedent NP as shown in the following example:

(iii) Taroo-wa [i=ssatu]-zutu hon-o ka-tta.
top one=cl- ZUTU book-acc buy-past
"Taroo bought one book on each occasion."

(iii) implies that there is more than one occasion in which Taroo bought one book. In (iii), there is no Range NP (R-NP) from which the numeral NP 'one paper' is distributed. In other words, zutu may be used as distributing (quantifying) over time (or event), and does not require a plural R-NP. Thus (ii) together with (iia) shows that zutu cannot be a binominal quantifier taking two overt arguments. The exact analysis of a quantifier such as zutu will be a topic for future research.
These three types of quantifiers differ in their clause-bounded property of taking antecedent QPs, which will be discussed in the later sections.

(1) and (2) show that both binominal and adverbial distributive quantifiers in Japanese appear between the subject NP and the object NP as an adjunct. Binominal quantifier sorezore is not a postnominal modifier as is its English counterpart. Japanese reciprocal expressions such as (o)-tagai (see Kitagawa (1986)) and -aw (in Nishigauchi (1992)) are studied in detail in generative literature. However, to my knowledge, none of the distributive quantifiers in (1), (2), and (3) are discussed extensively in generative literature.²

In the next section, I will discuss how binominal sorezore can be distinguished from adverbial sorezore. Case-marked sorezore in (3) is analyzed as a distributive anaphor in Chapter 5 because it differs from the two other quantifiers in that its interpretation is clausally-unbounded.

3.2. Syntactic properties that distinguish binominal from adverbial

In previous chapters in which I discussed English binominal and adverbial each, it was easier to differentiate these two quantifiers because they appear in different surface positions.

However, in Japanese, it is not obvious that the binominal quantifier exists for the

² Kitagawa (1986) briefly discusses in section 3.3.2. case-marked sorezore on par with reflexive anaphors. However, he never mentions binominal and adverbial sorezore. He regards case-marked sorezore as exhibiting subject/ object asymmetry, which I disagree with. My judgment differs from his in that case-marked sorezore lacks subject/object asymmetry. The example and judgment in (i) are Kitagawa’s. (i) [karera,-ga [ hutari,-ga sorezore,-o semeru to wa] omottemo minaka-ta ] koto they-nom two(people)-nom each-acc blame cp top think never-past fact “The fact that they, never thought that the two, blamed each (of them).”

Interviews with several native Japanese speakers at Notre Dame Seishin University reveal that case-marked sorezore may have matrix subjects as antecedents. This becomes even clearer when karera (they) in (i) is replaced by Taroo to Hanako (Taroo and Hanako).
following two reasons.

First, there is no surface difference between adverbial and binominal sorezore as shown as follows:

(4)[[Otoko=tati]-ga sorezore [hito=ri-no zyosei]-o aisi-teir-u] koto
   man=pl -nom each one=cl-gen women-acc love-asp-pres fact
   “The fact that the men love one woman each”

(5) [[Otoko=tati]-ga sorezore Hanako-o aisi-teir-u] koto
   man =pl-nom each -acc love-asp-pres fact
   “The fact that the men each love Hanako”

As shown in (4) and (5), the Japanese counterpart of adverbial and binominal each both appear between the subject DP-ga and the object DP-o.

Second, there are no obvious reasons to assume that binominal sorezore exists in Japanese.

So, I will assume first that the binominal quantifier is identical with the adverbial one in Japanese. Then, I will show that this assumption is wrong because there is some evidence that shows these two quantifiers appear in different syntactic structures.

In the following three sections, I will argue that binominal sorezore exists in Japanese independently of adverbial sorezore because otherwise one cannot account for the differences in acceptability between the sentences when one applies to them scrambling, passivization and relativization of the object DP.

3.2.1. Scrambling with sorezore

In this section, I will propose that scrambling of the object DP with sorezore provides evidence that binominal sorezore exists in Japanese.
First, let us suppose that the binominal quantifier is identical with the adverbial one in Japanese because they superficially appear in the same position, namely before the object DP.

(4) [[Otoko=tati]-ga sorezore [hito=ri-no zyosei]-o aisi-teir-u] koto
    man=pl  -nom each one=cl-gen women-acc love-asp-pres fact
   “The fact that the men love one woman each”

(5) [[Otoko=tati]-ga sorezore Hanako-o aisi-teir-u ] koto
    man =pl-nom each -acc love-asp-pres fact
   “The fact that the men each love Hanako”

However, when [sorezore DP-o] in (4) and (5) are scrambled to the clause-initial position as in (4’) and (5’), respectively, they differ in their acceptability.

(4’) [[sorezore [hito=ri-no zyosei]-o], [otoko=tati]-ga t_i aisi-teir-u] koto
    each one=cl woman-acc man=pl -nom love-asp-pres fact
   “The fact that [one woman each], the men love t_i”

(5’) *? [[sorezore Hanako-o], [otoko=tati]-ga t_i aisi-teir-u ] koto
    each -acc man =pl-nom love-asp-pres fact
   “The fact that [each Hanako], the men love t_i”

One cannot account for the difference between the following two sentences under the assumption that adverbial and binominal sorezore are identical in Japanese. If adverbial and binominal sorezore are identical, they should behave in the same way. However, (4’) and (5’) differ in their acceptability. Therefore, I will argue that binominal sorezore exists in Japanese independently of adverbial sorezore, and that their syntactic structures such as (4) and (5) differ.

The reason why (4’) is acceptable while (5’) is not can be accounted for by assuming that the object DP in (4’) forms a constituent with sorezore but the object DP in (5’) does not. I assume the following structure (4’’) for (4) and (5’’) for (5).
In (4'), scrambling with sorezore is possible because [sorezore DP-o] is a single constituent. On the other hand, in (5') sorezore and the DP Hanako-o do not form a constituent. Therefore, the object DP in (5') cannot be scrambled together with sorezore.

Scramblability of the object DP with sorezore in (4') is comparable to the reconstruction effects of English binomial each. I claim that Japanese has binominal sorezore distinct from adverbial sorezore and that Japanese binominal sentences exhibit reconstruction effects as in (4') just like English binominal sentences.

Notice that scrambling of the object DP without sorezore is possible for both structures.3

---

3 Scrambling of sorezore by itself to the clause-initial position produces marginally unacceptable sentences.

(i) ?* [Sorezore] otoko=tati-ga t [hito=ri-no zyosei-o] aisi-teir-u.
   each man=pl-nom one=cl-gen woman=acc love-asp-pres
   "?*(lit.) Each the men t love one woman"

(ii) ?* [Sorezore] otoko=tati-ga t Hanako-o aisi-teir-u.
   each man=pl-nom -acc love-asp-pres
   "?*(lit.) Each the men t love Hanako."
In this section, I argued that Japanese has binominal sorezore distinct from adverbial sorezore. Their distinct structures are revealed when scrambling of the object DP with sorezore is applied to them.

3.2.2. Passivization with sorezore

In this section, I will present another argument to support the claim that Japanese has binominal sorezore. The evidence comes from passivization.

Suppose adverbial sorezore and binominal sorezore are identical. The following pair of sentences are given again.
Passivization of (4) and (5) are shown in (6) and (7), respectively.

(6) [[Sorezore][hito=ri-no zyosei-ga] otoko=tati-ni ais-are-teir-u] koto
    each one=pl-gen woman-nom man=pl-by love-pass-asp-pres fact
    “The fact that one woman each is loved by the men” (direct passive)

(7) *[Sorezore] [Hanako-ga] [ otoko=tati-ni] ais-are-teir-u] koto (direct passive)
    man=pl-by love-pass-asp-pres fact
    “The fact that Hanako is each loved by the men”

(6) is the direct passive counterpart of the active sentence (4). Again, if adverbial sorezore and binominal sorezore are identical in Japanese, one cannot explain why (6) is acceptable, but (7) is not. Clearly the assumption that binominal and adverbial sorezore are identical in Japanese is wrong.

Putting aside past controversies, I assume here that the direct passive in Japanese is derived by movement, following Miyagawa (1989) and Nishigauchi (1993). I will further assume that (4) and (6) are examples of binominal sentences in Japanese. The subject NP hitori-no zyosei (one woman) in (6) is a D-NP. It cannot be an R-NP because only plural DPs can be R-NPs. Since it is not a plural DP, it can only be a D-NP.

Now compare (6) with (8):

---

4 Both -ni and -nivotte are the head of the agentive by-phrase in passive constructions. -Nivotte, which is morphologically further analyzable into smaller chunks, is a more literary and formal form than -ni. Since -ni is homophonous with the dative particle, -nivotte enhances the passive meaning more than -ni. -Nivotte is incompatible with certain verbs and gives translational (or artificial) flavor to the sentence. I take the position that the choice of -ni or -nivotte depends on the lexical choice of the verb and that either of them can be used as the head of the agentive by-phrase. In the other words, I will abstract away the difference between -ni and -nivotte by controlling them in the examples so that they would not affect the judgments of the binominal sentences.
(8) a.  [Hito-ri-no gakusha]-ga sorezore [huta-ri-no gakusei]-o osie-ta.
   one=cl-gen scholar-nom each two=cl-gen student-acc teach-past
   D-NP R-NP
   " *[One scholar each ] taught two students." (binominal active)

(6) and (8) illustrate that a D-NP cannot appear in the subject position unless it is derived by syntactic movement. The same generalization was made in English binominal sentences by S & S (1988) as discussed in section 2.4.5.

(5) and (7) are instances of adverbial sorezore. (7) shows that in adverbial sorezore sentences the object DP cannot be passivized with sorezore.

(5) [[Otoko=tati]-ga sorezore Hanako-o aisi-teir-u koto
   man=pl-nom each -acc love-asp-pres fact
   "The fact that the men each love Hanako"

(7) *[[Sorezore] [Hanako-ga] [otoko=tati-ni] aisi-are-teir-u] koto (direct passive)
   each -nom man=pl-by love-pass-asp-pres fact
   "*The fact that Hanako is each loved by the men"

(6) [[Sorezore][hito=ri-no zyosei-ga] otoko=tati-ni aisi-are-teir-u] koto
   each one=pl-gen woman-nom man=pl-by love-pass-asp-pres fact
   "The fact that one woman each is loved by the men"

The contrast between (6) and (7) in turn shows that only a cardinal indefinite NP can be a D-NP and that a definite DP such as Hanako in (7) is excluded as a D-NP of binominal sentences in Japanese. Semantic restrictions on the D-NP will be discussed more in detail in section 3.3.2.

In this section, I have shown that evidence from passivization gives support to the claim that Japanese has binominal sorezore.

3.2.3. Relativization of object DPs

In the previous two sections, I proposed two syntactic tests to differentiate binominal from adverbial sorezore in Japanese. Binominal sentences allow scrambling with sorezore
and passivization with *sorezore*. On the other hand, adverbal *sorezore* sentences do not allow these operations.

<table>
<thead>
<tr>
<th></th>
<th>binomial</th>
<th>adverbial</th>
</tr>
</thead>
<tbody>
<tr>
<td>scrambling with <em>sorezore</em></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>passivization with <em>sorezore</em></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>relativization of the object DP</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

In this section, I will discuss a syntactic property that sentences with adverbal *sorezore* have, but binominal sentences do not. Relativization of object DPs is such a property.

Let us consider the following sentences.

(10) *San=nin-no kyoozu-ga sorezore [i=ssatu-no hon-o] kai-ta.*
three=cl-gen prof-nom each one=cl-gen book-acc write-past
"Three professors wrote one book each."

(11) *San=nin-no kyoozu-ga sorezore gakusei-o home-ta.*
three=cl-gen prof-nom each student-acc praise-past
"Three professors each praised a student.

(10) can be scrambled with *sorezore* as in (10”), and passivized with *sorezore* as in (10”)

(10”) [Sorezore[i=ssatu-no hon-o]] [san=nin-no kyoozu-ga ] t kai-ta.
each one=cl-gen book-acc three=cl-gen prof-nom write-past
"(lit.) One book each, three professors wrote t."

(10””) [Sorezore[i=ssatu-no hon-ga]] [san=nin-no kyoozu-niyotte ] t kak-are-ta.
each one=cl-gen book-nom three=cl-gen prof-by write-pass-past
"One book each was written by three professors."

On the other hand, (11) cannot be scrambled with *sorezore* as in (11”), or passivized with *sorezore* as in (11”)

(11”) * Sorezore gakusei-o [san=nin-no kyoozu-ga ] t home-ta.
each student-acc three=cl-gen prof-nom praise-past
"(lit.) Each student, three professors praised t."

(11”) * Sorezore gakusei-ga [san=nin-no kyoozu-niyotte ] t homer-are-ta.
each student-nom three=cl-gen prof-by praise-pass-past
"(lit.) Each student was praised by three professors."
These two syntactic diagnostic tests tell us that (10) has binominal sorezore and (11) has adverbial sorezore.

The following sentences are produced by relativizing the object DP in (10) and (11), respectively.

\[(10'') *???[San=nin-no kyoozu-ga sorezore e kai-ta] [i=ssatu-no hon] 
  three=cl-gen prof-nom each write-past one=cl-gen book 
  "*One book each which three professors wrote"
\]

\[(11'') [San=nin-no kyoozu-ga sorezore e home-ta] [gakusei] 
  three=cl-gen prof-nom each praise-past student 
  "A student that three professors each praised"
\]

In (10''), the object DP i=ssatu-no hon (one book) in (10) is the head of the relative clause, while in (11''), the object DP gakusei (student) in (11) is realized as the head of the relative clause.

Using (10'') and (11'') in sentences does not change their acceptability.\(^5\)

\[(12) *???[San=nin-no kyoozu-ga sorezore e kai-ta] [i=ssatu-no hon]-wa omosiroka-tta. 
  three=cl-gen prof-nom each write-past one=cl-gen book-top interesting-past 
  "*One book each which three professors wrote was interesting"
\]

\[(13) [San=nin-no kyoozu-ga sorezore e home-ta] [gakusei]-wa Taroo-da. 
  three=cl-gen prof-nom each praise-past student-top -cop 
  "A student that three professors each praised was Taroo.”
\]

The difference in acceptability between (12) and (13) can be accounted for by the structural difference between binominal and adverbial sentences. In binominal sentences, the object DP, namely the D-NP, forms a constituent with sorezore. Therefore, it is difficult to relativize the object DP in binominal sentences. On the other hand, in adverbial sentences, the object DP does not form a constituent with sorezore, so it can be relativized. The

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\(^5\) As seen from the English glosses, English binominal each and adverbial each also behave differently when the object DP is relativized.
structure of binominal sentences and that of adverbial sentences are shown in (12') and (13'), respectively.\footnote{The difference can be accounted for by a constraint such as Chomsky's Subjacency or Huang's CED.}

(12')

\begin{itemize}
\item \textbf{OP}
\item \textbf{sorezore}
\item \textbf{OP}
\item \textbf{i=ssatu-no hon}
\item \textbf{(one=ci-gen book)}
\end{itemize}

(13')

\begin{itemize}
\item \textbf{DistP}
\item \textbf{sorezore (each)}
\item \textbf{AgrOP}
\item \textbf{gakusei (student)}
\end{itemize}

In this section, it was shown that binominal sentences and adverbial sentences differ in their acceptability when the object DP is relativized. In Japanese, binominal sorezore exists independently of adverbial sorezore because there are sentences in which the object DPs can be relativized and there are sentences in which the objects DPs cannot be.

3.2.4. The Structure of Adverbial sorezore

In this section, I will propose a structure for adverbial sorezore, based on its
interaction with floating quantifiers.  


I propose that floating Qs (Numeral Classifiers) involve DP-movement approach in the spirit of Sportiche (1988), while adverbial sorezore is treated as an adverb and is projected as the head of DistP.\(^7\)

The structure of adverbial sorezore is illustrated in the following LF representation:

(14) AgrSP
    ┌────────────────────┐
     │ DistP            │
     │                 ↘  │
     │ sorezore         │ AgrOP
     │                 ↘  │
     │                  │ VP

(14) is exactly parallel to the LF representation of adverbial each in English.

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\(^7\) I thank Matt Pearson for suggesting that I should look for the interaction with the phenomenon of the floating Qs.

\(^8\) I do not specifically argue for DP-movement analysis for English floated quantifiers such as all and each. As Bobaljik (1995) claims, these quantifiers may not be treated best in DP movement approach of Sportiche (1988). Kawashima (1994) convincingly shows that numeral floated Qs have a different distribution from floated Qs such as subete (all) in Japanese.

(i) Gakusei-ga sanzuu=nin subete ki-ta.
    student-nom 30=cl all come-past
    “30 students all came.”

(ii) *Gakusei-ga subete sanzuu=nin ki-ta.
     student-nom all 30=cl come-past
     “*30 all students came.”
Numeral classifiers (floating Q) can appear in an adverbiaal position outside the antecedent DP. Floated Qs may take subject DP or object DP as antecedents. I will call floated Qs that take subject DPs as antecedents “the subject-oriented Qs” and those that take object DPs as antecedents “the object-oriented Qs”.

(15) are examples of subject-oriented Qs.

(15) subject-oriented Qs
a. Gakusei-ga huta=ri hon-o ka-tta.
   student-nom 2=cl book-acc buy-past
   “Two students bought a book.”
   b. Huta=ri gakusei-ga hon-o ka-tta.
      2=cl student-nom book-acc buy-past
      “Two students bought a book.”

The following sentences are instances of object-oriented Qs:

(16) object-oriented Qs
a. Gakusei-ga hon-o ni=satu ka-tta.
   student-nom book-acc 2=cl buy-past
   “A student bought two books.”
   b. Gakusei-ga ni=satu hon-o ka-tta.
      student-nom 2=cl book-acc buy-past
      “A student bought two books.”
   c. Ni=satu gakusei-ga hon-o ka-tta.
      2=cl student-nom book-acc buy-past
      “A student bought two books.”

Subject-oriented Qs and object-oriented Qs may appear in the same sentence.9

(17) subject-oriented Qs and object-oriented Qs
   Gakusei-ga san=nin hon-o ni=satu ka-tta.
   student-nom 3=cl book-acc 2=cl buy-past
   “Three students bought two books.”

There are two alternative structures possible for floated Qs under the VP-internal subject hypothesis.

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9 Later in this section, I will discuss in more detail their precise distribution.
One is the split VP-hypothesis adopted by Bobaljik (1995), Koizumi (1995) and Ura (1996). According to the Split VP-hypothesis, the structure of floated Qs such as (17) is as in (18):

(18) the Split VP-hypothesis

\[
\begin{array}{c}
\text{AgrSP} \\
\downarrow \text{VP} \\
\downarrow \text{DP} \\
\downarrow \text{(student-nom three=cl)} \\
\text{G-ga san=nin} \\
\uparrow \text{AgrOP} \\
\downarrow \text{VP} \\
\downarrow \text{VP} \\
\downarrow \text{hon-o ni=satu} \\
\text{(book-acc two=cl)}
\end{array}
\]

Under the Split VP-hypothesis, the base-position of the subject DP is higher than the AgrOP as in (18).

Another possibility, in accordance with the VP-internal hypothesis, is the non-Split VP structure as follows:

(18') non-split VP structure

\[
\begin{array}{c}
\text{AgrSP} \\
\downarrow \text{AgrOP} \\
\downarrow \text{VP} \\
\downarrow \text{VP} \\
\downarrow \text{[G-ga sannin]} \\
\text{(student-nom three)} \\
\text{--} \\
\text{hon-o nisatu} \\
\text{(book-acc two)}
\end{array}
\]

Basically, both structures have merits and demerits.
One demerit of the Split VP structure is that it is not as easy to accommodate B & S’s approach as the non-Split VP approach. For instance, it is not clear where the position of DistP is relative to the base-position of the subject.

(19) AgrSP
     DistP could be here
     VP
     DistP could be here
     gakusei-ga hutari
     (student-nom two)
     AgrOP
     VP

On the other hand, the burden of the non-split VP-approach is that it cannot account for why the subject-oriented Q cannot occur below the object DP.

(20) subject-oriented Q
    *Gakusei-ga hon-o huta=ni ka-tta.
    student-nom book-acc 2=cl buy-past
    “Two students bought a book.”

According to the non-split VP approach, subject QP must pied-pipe and cannot strand the numeral classifier.  

---

10 It is not impossible to do so.

11 Why the subject QP has this property and why the object QP does not as shown in (20) is not clear to me at this point. This will be a future research topic.
I will adopt the non-split VP approach because it is more compatible with B & S's approach.

Now, let us consider the derivation of object-oriented floated Qs as shown in (21).

(21) obj-oriented Qs
a. Gakusei-ga hon-o ni=satu ka-tta.
   student-nom book-acc two=cl buy-past
   “A student bought two books.”

b. Gakusei-ga [t ni=satu] hon-o ka-tta.
   student-nom two=cl book-acc buy-past
   “A student bought two books.”

Derivation of (21a) is shown in (21’a):
From the VP-internal object position the DP [hon-o ni=satu] (book-acc two=cl) moves to the Spec of AgrOP to check its Accusative Case feature. The subject DP gakusei-ga (student-nom) moves from the Spec of VP to the Spec of AgrSP to check its Nominative Case feature.

Derivation of (21b) is shown in (21b').

The derivation of (21b) involves the following two types of DP-movement in the spirit of Sportiche (1988):

(21b”) 1) Movement of the object DP hon-o (book-acc) to check the Accusative Case feature.
   2) Movement of the remnant DP [t ni=satu] (two=cl) to adjoin to a position, lower than AgrSP and higher than AgrOP. (Scrambling)

There are three reasons for proposing two distinct analyses for floating Qs and sorezore. I will first outline the three arguments, and then present them one by one with examples.

(22) 1) Floating numeral Qs and adverbial sorezore have a different syntactic distinction. Subject-orientated numeral Qs cannot appear in a position lower than the object DP, but sorezore can.
2) Adverbial sorezore and floated Qs can co-occur in a simple sentence. If they were the same thing, they should be mutually exclusive.

3) There are some syntactic operations (e.g. relativization, topicalization, and wh-question) that do not license floated Qs, but do license adverbial sorezore.

First, floating numeral Qs and adverbial sorezore have a distinct syntactic distribution, as illustrated by the following examples. (Throughout the thesis, I will abbreviate floated numeral quantifiers as Q and the distributive quantifiers as DQ.)

(23) Distribution of subject-oriented floated Q (Q)

(Q) DP-ga (Q) DP-o (*Q) V (*Q)
(Q) gakusei-ga (huta=ri) hon-o (*Q) ka-tta (*Q)
    student-nom two=cl book-acc buy-past
    “Two students bought a book.”

(24) Distribution of adverbial sorezore (DQ)

(?DQ) DP-ga (DQ) DP-o (?DQ) V (*DQ)
(?DQ) san=nin-no otoko-ga (sorezore) hon-o (?DQ) ka-tta (*DQ)
    three=cl-gen man-nom each book-acc buy-past
    “Three men each bought a book.”

When one compares (23) with (24), subject-oriented Q (huta=ri) (two people) may not appear in the position lower than the object DP, while adverbial sorezore may appear in this position.¹²

The LF representation of the subject-oriented floated Q is shown in (23').

¹² It does not make sense to compare object-oriented Qs with adverbial sorezore because adverbial sorezore does not seem to have an object-orientation.

(i) a. *? Hanako-ga [san=satu-no hon-o] sorezore yon-da.
    -nom 3=cl-gen book-acc each read-past
    “*? Hanako each read three books.”

b. *? Hanako-ga [san=nin-no gakusei-o] sorezore keisatsu-ni uttae-ta.
    -nom 3=cl-gen student-acc each police-to appeal-past
    “*? Hanako each appealed three students to the police.”

    -nom 3=cl-gen student-dat each that-book-acc send-past
    “*? Chomsky each sent that book to three students.”

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(23') *Gakusei-ga, hon-o [t, huta=ri] ka-tta. (subject-oriented Q)
   student-nom book-acc two=cl'buy-past
   "*Student bought two, a book.

For reasons that are not clear, the subject DP [gakusei-ga] (student-nom) cannot not move out of the bigger constituent [gakusei-ga huta=ri] (two students) and strand the classifier [t huta=ri] (two people) in that position. The whole DP[gakusei-ga huta=ri] (two students) must pied-pipe to the Spec of AgrSP to check its Nominative Case-marking.

On the other hand, the LF representation of adverbial sorezore is shown in (24'):

(24') ?[San=nin-no otoko]-ga hon-o sorezore ka-tta.
   three=cl-gen man-nom book-acc each buy-past
   "?Three men each bought a book."
In (24'), the object DP hon-o (book-acc) has undergone scrambling (object shift) to a position lower than AgrSP but higher than DistP.

I argued that floating numeral Qs and adverbial sorezore should be treated differently because they have a different syntactic distribution. Subject-oriented numeral Qs cannot appear in a position lower than the object DP, but sorezore may.

The second reason for treating floated Qs and adverbial sorezore differently is that these two elements can co-occur in a simple sentence. If they were one and the same thing, they should be mutually exclusive.

The following sentence shows that adverbial sorezore can occur in a same sentence with a floated Q.

(25) subject-oriented floated Q and sorezore

Gakusei-ga huta=ri sorezore hon-o ka-tta
student-nom two=cl each book-acc buy-past
"Two student each bought a book."

The LF representation of (25) is shown in (25').
As mentioned in (25'), subject-oriented floating Qs must pied-pipe from the Spec of VP to the Spec of AgrSP.

Two occurrences of adverbial sorezore in a simple sentence is unacceptable as shown as follows:

(26) *? [San=nin-no gakusei-ga] sorezore hon-o sorezore yon-da.
   three=cl-gen student-nom each book-acc each read-past
   "*? Three students each read each a book."

The positions of the adverbial sorezore in (26) are acceptable positions if sorezore occurs in a different sentence as shown as follows:

(26') a. [San=nin-no gakusei-ga] sorezore hon-o yon-da.
   three=cl-gen student-nom each book-acc read-past
   "Three students each read a book."
b. [San=nin-no gakusei-ga] hon-o sorezore yon-da.
   three=cl-gen student-nom book-acc each read-past
   "Three students each read a book."

However, two sorezores occurring in the same sentence make it unacceptable.

If two floating Qs can occur in the same sentence, (25) would not show that sorezore is different from floating Qs. (25) might be regarded as a case in which two kinds of floating Qs huta=ri (two=cl) and sorezore show up in the same sentence.
Question arises as to whether two floated Qs may appear in the same sentence. Subject-oriented Qs (indicated as Qsubj) and object-oriented Qs (as Qobj) may appear together only in the following restricted environment.

(27) (Qsubj) DP-ga (Qsubj) / (Qobj) DP-o (Qobj) V
(san=nin) otoko-ga (san=nin)/(ni=satu) hon-o (ni=satu) ka-tta.

3=cl man-nom 3=cl / 2=cl book-acc 2=cl buy-past

"Three men bought two books."

When the subject-oriented Q and the object-oriented Q are next to each other, a big pause (intonation break) indicated by / in (27) is necessary between them. Other combinations are impossible in Japanese. The ill-formed sentences (28) to (32) below all mean "Three men bought two books". ("Three" is associated with "men" and "two" with "book".) They have the same numeration as the sentence in (27), but each element is in a different order. They clearly indicate that Q-float is not equivalent to a random mixing of lexical items.

(28) * DP-ga Qobj Qsubj DP-o V
* Otoko-ga ni=satu san=nin hon-o ka-tta.
man-nom 2=cl 3=cl book-acc buy-past

(29) * Qsubj Qobj DP-ga DP-o V
* San=nin ni=satu otoko-ga hon-o ka-tta.
3=cl 2=cl man-nom book-acc buy-past

(30) * Qobj Qubj DP-ga DP-o V
* Ni=satu san=nin otoko-ga hon-o ka-tta.
2=cl 3=cl man-nom book-acc buy-past

(31) * DP-ga DP-o Qobj Qsubj V
* Otoko-ga hon-o ni=satu san=nin ka-tta.
man-nom book-acc 2=cl 3=cl but-past

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The constraint on multiple floated Q-movement at Spell-Out seems to be that the subject DP with a trace and the object DP with a trace cannot move in such a way that their paths may overlap (either intersect or be nested) at any point of derivation.\textsuperscript{13} If it is assumed that the structure of (27) is shown as in (27'), then all (28), (29), (30), (31), and (32) may be ruled out by assuming that two floated Qs cannot occur at one landing site.

(27') a. Otoko-ga san=nin hon-o ni=satu ka-tta.
   man-nom book-acc 3=cl 2=cl buy-past
   "three men bought two books."

(27') b. Otoko-ga san=nin/ ni=satu hon-o ka-tta.
   man-nom 3=cl / two=cl book-acc buy-past
   "three men bought two books."

\textsuperscript{13} Both split VP-hypothesis and non-split VP hypothesis can capture this constraint. For example, according to the non-split VP hypothesis, (28), (31) and (32) are ruled out because they violate the pied-piping of the subject and (29) and (30) are ruled out because \text{[t ni=satu]} and \text{[t san=nin]} are moved to the same clause-initial position.
If floated Q and sorezore could appear in positions where the two floated Qs cannot co-occur (namely, in configurations indicated by (28) through (32)), then, it would be one piece of evidence that sorezore is not a kind of floated Q. Unfortunately, I could not find such an example because independently, subject-oriented floated Qs cannot occur in positions below sorezore as shown in the following example.

(33) subject-oriented floated Q and sorezore
(Q) Gakusei-ga (huta=ri) sorezore (*Q) hon-o (*Q) ka-tta.
student-nom two=cl each book-acc buy-past
“Two students each bought a book.”

However, by the same line of argument, in passive sentences, adverbial sorezore can appear in a configuration in which floated Qs cannot appear. (/ indicates an intonation break.)

(34) a. adverbial sorezore and floated Q
Sorezore / hon-ga ni=satu Hanako-ni okur-are-ta.
each book-nom 2=cl to give-pass-past
“Two books were each given to Hanako.” (passive)
b. two floated Qs
* San=nin / hon-ga ni=satu zyosei-ni okur-are-ta.
3=cl book-nom 2=cl woman-to give-pass-past
“* Three two books were each given to women.” (passive)
(34a) shows that adverbial sorezore can co-occur with a floated Q, while (34b) shows that two floated Qs cannot appear in the same structure as in (34a). The contrast between (34a) and (34b) suggests that the distribution of sorezore is different from that of the floated Q.

I have tried to show that adverbial sorezore is not a type of floated Q because sorezore and floated Q can co-occur in the same sentence.

The final reason why floated Qs and adverbial sorezore are treated differently comes from the fact that some syntactic operations (A-bar movements such as relativization, topicalization and wh-question) license only adverbial sorezore, but not floated Qs.

Bobaljik (1995) attributes to Deprez (1989) the observation that A-bar movement does not license floated Qs in English and German. Similarly, Japanese numeral floated Qs are not licensed by A-bar movement.

(35) subject-oriented Q-float
a. * [huta=ri hon-o ka-tta] gakusei
   2=cl   book-acc buy-past student
   "students who bought two a book" (relativization)

b. *Gakusei-wa huta=ri hon-o ka-tta.
   student-top 2=cl book-acc buy-past
   "As for students, two bought a book." (topicalization)

c. *Dono-gakusei-ga/ Nan=nin-no gakusei-ga huta=ri hon-o ka-tta-ka
   which-student-nom/ what=cl-gen student-nom 2=cl book-acc buy-past-Q
   "Which students/ How many students two bought a book?" (wh-question)

Examples in (35) show that the subject-oriented Q huta=ri (two=cl) cannot be stranded in a separate clause by relativization, topicalization or wh-question.14

On the other hand, adverbial sorezore is perfectly acceptable in the same environment.

(36) adverbial sorezore
a. [Sorezore hon-o ka-tta] [san=nin-no gakusei]
   each book-acc buy-past 3=cl-gen student
   "three students who each bought a book" (relativization)

14 McClosky (1997) argues that there is an Irish dialect of English that allows wh-question of this type. It is not known whether this dialect also allows relativization and topicalization.
b. [San=nin-no gakusei-wa] sorezore hon-o ka-tta.
   3=cl-gen student-top each book-acc buy-past
   "As for (the) three students, (they) each bought a book." (topicalization)

c. Dono-gakusei=tati-ga/ Nan=nin-no gakusei-ga sorezore hon-o ka-tta-ka.
   which-student=pl-nom/ what=cl-gen student-nom each book-acc buy-past-Q
   "Which students/ How many students each bought a book?" (wh-questions)

The contrast between examples in (35) and (36) shows that floated Qs are not licensed by
A-bar movement, while adverbial sorezore is. This clearly indicates that floated Qs and
adverbial sorezore should be treated differently.

So far in this section, I have presented three arguments that suggest that adverbial
sorezore is not a floating quantifier.

The first argument was that sorezore and the floated Q appear in distinct syntactic
positions.

The second argument was that sorezore and the floated Q were not mutually exclusive.
They may appear in the same simple sentence.

The third argument was that syntactic operations such as A-bar movement may license
adverbial sorezore, but not the floated numeral quantifier.

Next, let us consider where adverbial sorezore should be placed with respect to the
floating Qs. Example (33) repeated here shows that subject-oriented Q cannot appear
below sorezore.

(33) subj-oriented Q-float and sorezore
   (Q) DP-ga (Q) sorezore (*Q) DP-o (*Q) V(*Q)
   (Q) gakusei-ga (huta=ri) sorezore (*Q) hon-o (*Q) ka-tta (*Q)
      student-nom two=cl each book-acc buy-past
      "Two student each bought a book."
The position preceding the object D and occupied by sorezore in (33) is the canonical position for adverbs. I assume that sorezore may appear to the right of the object DP as in (37) when the object DP is scrambled to the left of sorezore. Thus, it is assumed that DP-movement (and scrambling) are all instances of leftward-movement.

(37) scrambling (object shift)

The positions of time adverbs and manner adverbs relative to the position of the adverbial sorezore give a further clue to its structure. The time adverbs such as kinoo (yesterday) cannot occur below the adverbial sorezore as shown by (38):

(38) Time adverb and adverbial sorezore

a. [kinoo san=nin-no gakusei-ga sorezore Hanako-o hoomonsi-ta] koto yesterday three=cl-gen student-nom each -acc visit-past fact "the fact that yesterday three students each visited Hanako"

b. [San=nin-no gakusei-ga kinoo sorezore Hanako-o hoomonsi-ta] koto three=cl-gen student-nom yesterday each -acc visit-past fact "the fact that three students each visited Hanako yesterday"
c. *[San=nin-no gakusei-ga sorezore kinoo Hanako-o hoomonsi-ta] koto three=cl-gen student-nom each yesterday -acc visit-past fact "*the fact that three students each yesterday visited Hanako"

d. *San=nin-no gakusei-ga sorezore Hanako-o kinoo hoomonsi-ta. three=cl-gen student-nom each yesterday visit-past "*Three students each visited yesterday Hanako."

Manner adverbs such as yukkurito (slowly) cannot appear above adverbial sorezore as shown in (39):

(39) Manner adverb and adverbial each

a. ?* [yukkurito san=nin-no gakusei-ga sorezore kuruma-o untensi-ta] koto slowly three=cl-gen student-nom each car -acc drive-past fact "?* the fact that slowly three students each drove a car."

b. ?*San=nin-no gakusei-ga yukkurito sorezore kuruma-o untensi-ta. three=cl-gen student-nom slowly each car -acc drive-past "?*Three students slowly each drove a car."

c. San=nin-no gakusei-ga sorezore yukkurito kuruma-o untensi-ta. three=cl-gen student-nom each slowly car -acc drive-past "Three students slowly each drove a car."

d. San=nin-no gakusei-ga sorezore kuruma-o yukkurito untensi-ta. three=cl-gen student-nom each car -acc slowly drive-past "Three students each drove a car slowly."

Examples in (38) and (39) show that the distribution of the time adverb kinoo (yesterday) and the manner adverb yukkurito (slowly) does not overlap in a sentence with adverbial sorezore.

The distribution of time adverbs and manner adverbs are accounted for if one assumes that time adverbs are adjoined above the DistP projection (i.e. the position of adverbial each) and manner adverbs are adjoined below the DistP projection.\footnote{Kawashima (1994) and Ura (1996) adopt similar positions for time adverbs and manner adverbs in the phrase structure of Japanese although they do not consider their positions relative to sorezore.}
(40) AgrSP  
  time adverb  
    DistP  
      3nin-no g-ga  
        (3 student-nom)  
          kinoo  
            (yesterday)  
    manner adverb  
      AgrOP  
        sorezore  
          (each)  
        yukkurito  
          (slowly)  
        kuruma-o  
          (car-acq)  
  VP

Cinque (1997) proposes a universal hierarchy of functional projections of adverbs. In his phrase structure, adverbs of past tense such as once (in the past) is projected higher than manner adverbs such as clumsily. Thus, English may very likely have a similar projection for time adverbs and manner adverbs.

In this section, I presented some evidence that shows that adverbiaal sorezore is not a floated Q. I proposed that floated Qs are generated by DPs moving out of the bigger QPs in the spirit of Sportiche (1988). On the other hand, adverbiaal sorezore was generated at the head of DistP position, parallel to what I have proposed for the English adverbiaal each.

3.2.5. The Structure of Binominal sorezore

In this section, I will show that the binominal quantifier sorezore behaves distinctly from adverbiaal sorezore in its interaction with floating quantifiers.

The following subject-oriented floating Qs in binominal sentences behave exactly on par with those in sentences with adverbiaal sorezore. (*Q indicates that floated Qs are not acceptable in this position.)

(41) Distribution of subj-oriented Qs in binominal sentences
  (Q) DP-ga (Q) sorezore (*Q) DP-o (*Q) V (*Q)
a. Otoko-ga san=nin sorezore [i=ssatu-no hon-o] ka-tta
   man-nom three=cl each one=cl-gen book-acc buy-past
   “Three men bought one book each.”

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(42) Distribution of subj-oriented Qs in adverbial sentences

(Q) DP-ga (Q) sorezore (*Q) DP-o (*Q) V (*Q)
(Q) gakusei-ga (huta=tri) sorezore (*Q) hon-o (*Q) ka-tta (*Q)
   student-nom two=cl each book-acc buy-past
   "Two student each bought a book."

Unfortunately, one cannot compare object-oriented numeral quantifiers in binominal sentences with those in adverbial sentences because adverbial sentences do not take numeral object DPs unlike binominal sentences.

(43) shows the distribution of object-oriented floating Qs in binominal sentences.

(43) Distribution of obj-oriented Qs in binominal sentences

(*Q) DP-ga (*Q) sorezore (Q) DP-o (Q) V (*Q)
(*Q) [San=nn-in-no otoko-ga] (*Q) sorezore (Q) hon-o [i=ssatu] ka-tta (*Q)
   three=cl-gen man-nom each book-acc one=cl buy-past
   "Three men bought one book each."

The distribution of object-oriented Qs in binominal sentences in (43) is more restricted than the distribution of object-oriented Qs in sentences without sorezore as in (44). (43) indicates that floated Qs cannot appear above sorezore.

(44) Distribution of obj-oriented FQs (Q)

(Q) DP-ga (Q) DP-o (Q) V (*Q)
(Q) Gakusei-ga (Q) hon-o (ni=ssatu) ka-tta (*Q)
   student-nom book-acc two=cl buy-past
   "A student bought two books."

Crucially, binominal sorezore c-commanding the DP object in (43) seems to have the effect of blocking the movement of [t_i=ssatu] (one=cl for books) further leftward, while in the sentence without binominal sorezore, the leftward movement of [t_ni=ssatu] (two=cl for books) is not blocked because there is no sorezore.

The fact the binominal sentences and adverbial sentences only differ in the distribution of object-oriented Qs suggest that they differ in the structures of [sorezore DPobj]. I suggest that in a binominal sentence [sorezore DPobj ] is a single constituent, while
adverbial sentence it is not. I assume that adverbial *sorezore* is the head of DistP, while binominal *sorezore* forms a constituent with the D-NP as in (45):

(45) a. adverbial *sorezore*  
\[
\text{DistP} \rightarrow \text{sorezore (each) \rightarrow AgrOP VP} \rightarrow \text{hon-o (book-acc)}
\]

b. binominal *sorezore*  
\[
\text{VP} \rightarrow \text{QP} \rightarrow \text{sorezore (each)} \rightarrow \text{hon-o ni=satu (book-acc two=cl)}
\]

(45') shows that the object shift of *hon-o* (book-acc) somehow prohibits the QP [t ni=satu] (two=cl for books) to be extracted out of the QP phrase.\(^{16}\)

(45') binominal  
\[
\text{QP} \rightarrow \text{sorezore} \rightarrow \text{hon-o} \rightarrow [\text{QP}] \rightarrow \text{t nisatu}
\]

I am not claiming here that Japanese binominal sentences are structurally ambiguous with adverbial sentences. For instance, in the following sentence the quantifier *sorezore* is binominal and not adverbial.

(46) San=nin-no gakusei-ga sorezore [i=ssatu-no hon-o] yon-da.  
\[
\text{three=cl-gen student-nom each one=cl-gen book-acc read-past}
\]
(i) "Three students read one book each." (three students > one book)  
(ii) "There is one book that each of the three students read."  
(#one book > three students)

\(^{16}\) As Anna Szabolcsi (pc.) pointed out, this may be similar to the pseudo-opacity effects of quantificational adverbs discussed in Obenauer (1984). The binominal *sorezore* may be behaving like *beaucoup* in blocking the movement.  
(i) * Combien as-tu beaucoup consulte de livre ?  
"How many books did you look up a lot?"
(46) has an unambiguously distributive reading in which one book varies with three students. It does not have the object-wide scope reading (46ii) in which there is one book that each of the three students read. Thus, Japanese binominal sentences are unambiguously distributive.

However, syntactic operations such as scrambling may change the scopal possibilities in binominal sentences.\(^\text{17}\) The following sentence (47) is an example of scrambling without sorezore.

\[47\] [I=ssatu-no hon-o] san=nin-no gakusei-ga sorezore t yon-da.
\quad one=cl-gen book-acc three=cl-gen student-nom each read-past
\quad (i) “Three students read one book each.” (three students > one book)
\quad (ii) “There is one book that each of the three students read.”
\quad (one book > three students)

(47) is ambiguous between the distributive reading as in (47i) and the object-wide scope reading as in (47ii).

On the other hand, adverbial sentences in Japanese do not have a covarying distributive reading.

\quad three=cl-gen student-nom each that book-acc read-past
\quad (i) “Three students each read that book.”

\quad three=cl-gen student-nom each this=pl book-acc read-past
\quad (i) “Three students each read these books.”

\(^{17}\) In the following binominal sentences, which typically exhibit reconstruction effects, only distributive readings are available.

\quad (i) [Sorezore [i=ssatu-no hon-o]] [san=nin-no gakusha-ga ] t kai-ta.
\quad each 1=cl-gen book-acc 3=cl-gen scholar-nom write-past
\quad “Three scholars wrote one book each.” (scrambling with sorezore)

\quad (ii) [Sorezore [i=ssatu-no hon-ga]] [san=nin-no gakusha-niyotte ] kak-are-ta.
\quad each 1=cl-gen book-nom 3=cl-gen scholar-by write-pass-past
\quad “One book each was written by three scholars.” (passivization with sorezore)

Neither (i) nor (ii) has object-wide scope readings.
(48a) only has an interpretation in which each of the three students read the same book. (48a) does not have a reading in which *sono hon* (that book) varies with the students. A similar thing can be said when the object DP is plural in adverbial sentences as in (48b). (48b) only has a reading in which *korera-no hon* (those books) are the same books that each of the three students read.

The distributive interpretation of (48a) does not change even when the object DP *sono hon-o* (that book) is scrambled.

(49) *[sono hon-o] san=nin-no gakusei-ga sorezore t yon-da.*
that book-acc three=cl-gen student-nom each read-past
(i) “Three students each read that book.”

Thus, it was shown that, unlike in English, Japanese adverbial sentences are unambiguous syntactically and semantically.

In this section, I argued that binominal sentences differ structurally from adverbial sentences.

### 3.3. Semantic properties that distinguish binominal from adverbial

Binominal and adverbial *sorezore* can be distinguished in two respects: they can be differentiated by their syntactic properties and they can be distinguished by the semantic restrictions on the QPs they take.

First, I will examine the semantic restrictions in the QPs of both constructions.

#### 3.3.1. Semantic Restrictions on the R-NP

Semantic restrictions on the R-NP of Japanese binominal and adverbial sentences are very similar to those of English. The R-NPs must be plural. In general, Japanese NPs are morphologically unmarked with respect to plurality.
The antecedent of binominal and adverbial sorezore must be interpreted as plural.

(50) a. *?[Otoko-ga sorezore [huta=ri-no zyosei]-o aisi-teiru ] koto
    man-nom each two=cl-gen woman-acc love-asp fact
    "*?The fact that the man love two women each." (binominal)

   b. *?[Otoko-ga sorezore uti-ni kae-tta ] koto
    man-nom each home-to return-past fact
    "*?The fact that the man each went home." (adverbial)

The oddity of (50a) and (50b) arises from the fact that the antecedent otoko (man) is not explicitly marked as plural. To avoid the oddity of (50a) and (50b), the R-NP otoko (man) has to be overtly marked with the suffix =tati as in (5) or explicitly modified by a numeral expression as in (51).

(51) a. [Otoko=tati-ga sorezore [huta=ri-no zyosei]-o aisi-teiru ] koto
    man=pl-nom each two=cl-gen woman-acc love-asp fact
    "The fact that the men love two women each." (binominal)

   b. [Otoko=tati-ga sorezore uti-ni kae-tta ] koto
    man=pl-nom each home-to return-past fact
    "The fact that the men each went home." (adverbial)

(52) a. [San=nin-no otoko-ga sorezore [huta=ri-no zyosei]-o aisi-teiru ] koto
    three=cl-gen man-nom each two=cl-gen woman-acc love-asp fact
    "The fact that the three men love two women each." (binominal)

   b. [San=nin-no otoko-ga sorezore uti-ni kae-tta ] koto
    three=cl-gen man-nom each home-to return-past fact
    "The fact that the three men each went home." (adverbial)

It is surprising that Japanese requires the antecedent of the plural NP to be marked plural,

---

18 The antecedent QPs seem to require overt plural-markings. A similar case can be shown where the reflexive zibun suffixed with =tati requires an antecedent with an overt plural marking:

    man-top self=pl-acc love-asp
    "The man loves themselves."

    man=pl-top self=pl-acc love-asp
    "The men love themselves."

(iia) is not acceptable in the reading where zibun=tati is a variable bound to otoko. It only has an interpretation in which zibun=tati refers to the speaker and others.
considering its optional marking of plurality in other cases. The obligatory plural marking on the antecedent suggests that there is something universal about anaphor-antecedent relationship that must be captured at LF.

3.3.2. Semantic Restrictions on the D-NP

In section 2.5.2, I discussed the fact that D-NPs of binominal each sentences have to be indefinite. Similar restrictions apply for the D-NPs of Japanese binominal sentences. Japanese DPs are unmarked with respect to definiteness. Demonstratives such as sono (that) or kono (this) are used in front of a noun like sono hon (that book) for overt marking of definiteness.

The GQPs that are not allowed as D-NPs in English binominal sentences are not allowed in Japanese binominal sentences.

(53) *The men saw most/all jewels each.

(54) *[Otoko=tati-ga sorezore [subete-no/ hotondo-no hon]-o ka-tta ] koto
man=pl-nom each all-gen/ most-gen book-acc buy-past fact
“The fact that the men bought [all/most of books each].” (binominal)

In Japanese, it is not obvious that the D-NP must be indefinite. Look at the following examples:

(55) [San=nin-no otoko]-ga sorezore [hito=ri-no zyosei]-o aisi-teir-u.
three-cl-gen man-nom each one=cl-gen woman-acc love-asp-pres
“Three men love one woman each.” (binominal)

(56) [San=nin-no otoko]-ga sorezore kono zyosei/Hanako-o aisi-teir-u.
three-cl-gen man-nom each this woman -acc love-asp-pres
“Three men each love this woman/Hanako.” (adverbial)

At first glance, both hito=ri-no zyosei (one woman) in (55) and kono zyosei/Hanako (this woman or Hanako) in (56) look like D-NPs. However, I claim that only the cardinal indefinite QP hito=ri-no zyosei (one woman) in (55) is a D-NP. The syntactic tests that are proposed in section 3.2 can be used to distinguish (55) from (56).
(55') Sorezore [hito=ri-no zyosei]-o [san=nin-no otoko]-ga t aisi-teir-u.
   each one=cl-gen woman-acc three-cl-gen man-nom love-asp-pres
   "(lit.) One woman each ,three men love t."

(56') *?Sorezore kono zyosei/Hanako-o [san=nin-no otoko]-ga t aisi-teir-u.
   each this woman -acc three-cl-gen man-nom love-asp-pres
   "*?(lit) This woman /Hanako, three men each love."

(55'') Sorezore [hito=ri-no zyosei]-ga [san=nin-no otoko]-niyotte ais-are-teir-u.
   each one=cl-gen woman-nom three-cl-gen man-by love-pass-asp-pres
   "One woman each was loved by three men."

(56'') *Sorezore kono zyosei/Hanako-ga [san=nin-no otoko]-niyotte ais-are-teir-u.
   each this woman -nom three-cl-gen man-by love-pass-asp-pres
   "This woman /Hanako was each loved by three men."

(55'')*??[[San=nin-no otoko]-ga sorezore e aisi-teir-u] [hito=ri-no zyosei]-wa
   three-cl-gen man-nom each love-asp-pres one=cl-gen woman-top
   siawase-da.
   happy-cop
   "*??One woman who three men each love is happy."

(56'') [[[San=nin-no otoko]-ga sorezore e aisi-teir-u] [kono zyosei/Hanako]-wa
   three-cl-gen man-nom each love-asp-pres this woman -top
   siawase-da.
   happy-cop
   "This woman /Hanako who three men each love is happy."

The contrasts in the pairs of sentences above indicate that in binominal sentences such as
(55) the object DP must be cardinal and indefinite. The contrasts also suggest that the
 distinction between definite DPs and indefinite DPs correlates with adverbal and
 binominal sentences.

The following chart shows which DPs I treat as definite and which DPs as indefinites
in Japanese.
(57) Indefinite DPs
san=satu-no hon
3=cl-gen book
"three books"
dareka “someone”
nan=satu=ka-no hon
what=cl=Q-gen book
"several books”
definite DPs
kono hon
“this book”
sono hon “that book”
ano hon
“that book over there”
Hanako
Hanako-to Taroo
“Hanako-to Taroo”

The distinction in (57) above is quite analogous to the distinction in English. Binominal sentences only allow a certain subset of indefinite DPs, namely the numeral expressions. On the other hand, the adverbial sorezore sentences allow definite DPs to be object DPs. Japanese quantifier sorezore functions as an adverbial, parallel to the function of adverbial each in English. Adverbial sorezore, unlike binominal sorezore, does not require a D-NP. This is illustrated in the following examples:

(58) [ Huta=ri-no otoko]-ga sorezore [PRO uti-ni kaeroon to] si-ta. (adverbial sorezore)
two=cl-gen man-nom each home-to return cp do-past
“The two men each tried to go home.”
(59)a. [[ Omnanoko=tati]-ga sorezore tanosii hitotoki-o sugosi-ta] koto
girl=pl-nom each fun time-acc spend-past fact
“The fact that the girls each had a fun time.”
b. *[Taroo-ga sorezore tanosii hitotoki-o sugosi-ta] koto
-nom each fun time-acc spend-past fact
“*The fact that Taroo each had a fun time.”

The structure of adverbial sorezore as in (56), (58), and (59) should be distinguished from the structure of binominal sorezore. The former does not require a D-NP while the latter needs a D-NP. As shown in (59), adverbial sorezore shares the semantic restriction of binominal sorezore in that its antecedent NP (i.e. the R-NP) has to be plural. It was also shown that the semantic restrictions on the D-NP in binominal sentences are similar in English and Japanese.

In binominal sentences, both R-NPs and D-NPs can be cardinal numeric expressions, but only D-NPs can have the cardinality of one since R-NPs must be plural. These
semantic restrictions on R-NPs and D-NPs will play a diagnostic role in determining the structures of binominal sentences as in S & S. In order to differentiate D-NPs from R-NPs, I will use sentences with D-NPs which have cardinal number “one” such as hito=ri-no zyosei (one woman) whenever the distinction is necessary.

3.4. The LF movement of sorezore

In this section, I will discuss how binominal and adverbial sorezore are analyzed following B & S’s approach. Binominal sorezore is analyzed as moving to adjoin to the R-NP, parallel to the each-movement analysis proposed in section 2.4.2. Adverbial sorezore is analyzed as occupying at the head of DistP. The crucial difference between binominal and adverbial sorezore is that the former uses ShareP as the position which the QPs move to, while the latter does not.

I assume that Japanese has the following phrase structure at LF in the spirit of B & S (1997):

(60) RefP (∃)
     /    /
    CP   AgrSP
         /    /
        DistP(∀) ShareP (∃)
              /     /
             ArgOP VP

I will leave the status and position of the NegP open in Japanese. More studies on the scope of negation have to be conducted before the analysis can be given.

The proposal for binominal sorezore is as follows:
(61)a. Binominal sorezore has [+Distributive] and [+plural] feature. It adjoins to the right of the R-NP to check its [+pl] feature. The adjunction makes the R-NP inherit its [+Dist] feature. Sorezore must adjoin to the R-NP which c-commands the D-NP.
b. The adjoined R-NP moves to the Spec of DistP.
c. The D-NP moves to the Spec of ShareP.

Let us consider the derivation of binominal sorezore in (62):

student=pl-nom each two=cl-gen book-acc buy-past
“The students bought two books each.” (binominal)

In (62), binominal sorezore moves to adjoin to the R-NP [gakusei=tati] (student=pl) to check its [+pl] feature. The adjoined R-NP [(gakusei=tati-ga) sorezore] ([(student=pl-nom) each]) has inherited the [+Dist] feature from sorezore. It moves to the Spec of DistP driven by the [+Dist] feature. The obligatory distributive reading of (62) is captured by $\forall$ in the head of DistP.

According to the structure of the binominal construction proposed in section 2.2.2, sorezore forms a constituent with the object DP. So the QP after the movement of sorezore contains a trace, which requires the whole QP [t [ni=satu-no hono-o] to move to the ShareP. This derives the obligatory distributive interpretation of the binominal sentences in Japanese in much the same way as that of English binominal sentences. The derivation is shown in the following representation:
\[(63)\]

```
( [[gakusei=tati-ga] sorezore] 
  ( [[student=pl-nom] each] ) 
)
```

The crucial difference between binominal and adverbial \textit{sorezore} is as follows:\footnote{This analysis is compatible with the one in which the event argument appears in the ShareP position.}

(64) a. Adverbial \textit{sorezore} is projected as the head of DistP.
    b. The Spec of DistP activated by the presence of adverbial \textit{each} in the head, attracts QPs that have [+pl] features. Only QPs that c-command the DistP moves to the Spec of DistP.
    c. Only QPs that finished Case-checking may move to the Spec of DistP.

(65) In adverbial \textit{sorezore} sentences, DPs do not move to the Spec of ShareP. The object DP in adverbial \textit{sorezore} sentences (if there is one) stays in ArgOP.

For instance, the following sentence (66) with adverbial \textit{sorezore} has the phrase structure in (67):

(66) [Kodomo=tati-ga sorezore Hanako-o aisi-teiru] koto

\[
\begin{align*}
\text{child=pl-nom} & \quad \text{each} & -\text{acc} \quad \text{love} & \quad -\text{asp} \quad \text{fact} \\
\text{“the fact that [children each love Hanako]”}
\end{align*}
\]
In Japanese, at Spell-out, the negation is always lower than adverbial sorezore. The following sentence (68) is unambiguous. It only has the reading where sorezore scopes over the negation.

(68) [ otoko=tati-ga sorezore nanimo kawa-naka-tta] koto 
  man=pl-nom each anything but-neg-past fact
  “the fact that the men each didn’t buy anything” (each > not)

The analysis of adverbial sorezore proposed in (64) captures its subject-orientation property. Sentences with adverbial sorezore also show subject-orientation like its English counterpart. This means that the surface behavior of adverbial sorezore can be captured as the head of DistP attracting the plural DP.

(69) a. [San=nin-no otoko-ga sorezore Hanako-o uttae-ta] koto (adverbial active) 
  three=cl-gen man-nom each 
  -acc sue-past fact
  “the fact that three men each sued Hanako”

b. *[ Hanako-ga sorezore [san=nin-no otoko-ni] uttaer-are-ta] koto 
  -nom each three=cl-gen man-by sue-pass-past fact
  “*the fact that Hanako is each sued by three men” (direct passive)

c. *[Hanako-ga sorezore [san=nin-no otoko-o] uttae-ta] koto 
  -nom each three=cl-gen man-acc sue-past fact
  “*the fact that Hanako each sued three men” (active)

d. [San=nin-no otoko-ga sorezore Hanako-ni uttaer-are-ta] koto 
  three=cl-gen man-nom each 
  -by sue-pass-past fact
  “the fact that three men were each sued by Hanako” (direct passive)
The examples in (69) show that the antecedent R-NP of adverbial sorezore has to be the subject DP at the Spell-Out. (69b) and (69c) are acceptable because the subject DP Hanako-ga at the Spell-Out is not plural.

In this section, the analysis of binominal and adverbial sorezore was proposed in line with B & S’s approach. It was proposed that binominal sorezore adjoins to the R-NP, then it moves to DistP. On the other hand, adverbial sorezore is at the head of DistP and attracts the plural QP that c-commands the DistP. The difference between the two constructions was that in binominal sentences, the other QP moves to ShareP, while in adverbial sentences it does not.

3.4.1. Which QPs Count as SharePs
-Anaphoric properties of indefinites in modal and conditional contexts

In this section, I will propose that in Japanese QPs which move to the Spec of ShareP (informally referred to as "indefinite NPs" in the literature) can be differentiated by their anaphoric properties in certain contexts.

The crucial difference between binominal and adverbial sorezore was that in the former the D-NP moves to ShareP. Superficially, the object DPs in both constructions occupy the adjunct position before the object NP. There are some syntactic tests to show that they are structurally distinct as shown in sections 3.2.1.- 3.2.3.

In this section, I will show that in Japanese indefinite DPs differ from definite DPs in their anaphoric properties. I will discuss the anaphoric properties of three types of NPs; common nouns such as isha (doctor), and proper names such as Taroo, and indefinite NPs such as dareka (someone), and plural numeral indefinite expressions.

Before discussing the anaphoric properties of these NPs, since I will use demonstrative pronouns as anaphoric expressions, their introduction is given in the
following. Japanese demonstrative pronouns have a three-way distinction expressed as ko-series, so-series, and a-series as described in Kuno (1973: Chapter 24):

(70) Demonstrative in Japanese

<table>
<thead>
<tr>
<th>ko-series</th>
<th>so-series</th>
<th>a-series</th>
</tr>
</thead>
<tbody>
<tr>
<td>kore 'this one'</td>
<td>sore 'that one'</td>
<td>are 'that one there'</td>
</tr>
<tr>
<td>koitu 'this guy'</td>
<td>soitu 'that guy'</td>
<td>aitu 'that guy there'</td>
</tr>
<tr>
<td>kono 'of this'</td>
<td>sono 'of that'</td>
<td>ano 'of that over there'</td>
</tr>
<tr>
<td>konna 'like this'</td>
<td>sonna 'like that'</td>
<td>anna 'like that over there'</td>
</tr>
<tr>
<td>koko 'here'</td>
<td>soko 'there'</td>
<td>asoko 'over there'</td>
</tr>
<tr>
<td>kotira 'this way'</td>
<td>sotira 'that way'</td>
<td>atira 'that way over there'</td>
</tr>
<tr>
<td>koo 'in this way'</td>
<td>soo 'in that way'</td>
<td>aa 'in that way over there'</td>
</tr>
</tbody>
</table>

The usage of these pronouns are described in Kuno (1973: 290) as follows:

(71) (i) The a-series is used for referring to something (at a distance either in time or space) that the speaker knows both he and the hearer know personally or have shared experience in.

(ii) The so-series is used for referring to something that is known personally to either the speaker or the hearer or has not been a shared experience between them.

(iii) The ko-series is used semianaphorically as if the object being talked about were visible and were at the speaker’s side. The hearer cannot refer to the same object by using the ko-series in spite of the fact that in ordinary demonstrative use of the ko-series, the same object can occasionally be referred to with ko by both the hearer and the speaker. Once the understanding is established between the two that both know the object well, the a-series takes precedence and the use of ko-series results in unacceptability.

In summary, a-series is used to refer to things about which the speaker and the hearer has shared knowledge. So-series is used to refer to things about which the speaker and the hearer do not have a shared knowledge. Ko-series is used to refer to things closer and better known to the speaker than the hearer.

In the following discussion, I will show that depending on the semantic type of the antecedent, different series of demonstrative pronouns are used to refer to nominal expressions in Japanese.

First, I will examine how common nouns are referred to in the modal context. Common nouns such as isha (doctor) differ from other nouns in that they can also be used as predicates as in (72):
(72) Watasi-wa isha-ni nari-tai.  
I-top doctor-to become-want  
"I want to be a doctor."

Notice that isha (doctor) in (72) is used with a modal expression -tai (want). In this context, isha (doctor) cannot be referential. It cannot be referred to with a pronoun such as kare (he) or sono-hito (that person).

I-top he-to that-person-to this-person-dat/ become-tai  
"#I want to be him/ that person/ this person/ that person over there."

Instead, one would say "I want to be such person/ that kind of person" using sonna (like that) or soo=iuu (such).

I-top that=kind=of-person-to / like=that-person-to become-want  
"I want to be that kind of /such person."

One might argue that isha (doctor) is referred to in this way because it is used as a predicate. So let us look at sentences in which a common noun is not used as a predicate. I will show that their anaphoric properties are distinct from those of proper names.

Cross-sententially an indefinite NP cannot be referred to by a pronoun unless an appropriate modal context similar to the previous sentence is established. Roberts (1990) discovered this phenomenon and called it "modal subordination". 20

(75) a. If John bought a book, he’ll be home reading it by now.  
b. #It’s a murder mystery!

The pronoun in (75b) cannot refer to a book in (75a). This fact has been known for a long time and is discussed in Jackendoff (1972) in the discussion of opacity in the modal context.

Roberts observed that when the modal context is created in the second sentence, it becomes possible to refer to the DP in the previous sentence by a pronoun as in (76).

---

20 I thank Tim Stowell for directing me to the existence of this phenomenon.
(76) a. If John bought a book, he’ll be home reading it by now.
    b. It’ll be a murder mystery.

In (76b), the modal context created by the existence of the auxiliary will makes it possible to refer to it by a pronoun.

I will show that modal subordination phenomenon also exists in Japanese common nouns.

(77) a. Hanako-wa isha-to kekkonsi-tagatte-ir-u.
     " Hanako wants to marry a doctor."
 b. Sono-hito-wa se-ga takaku-te kanemoti-de aru.
     "That person is tall and rich."

The common noun isha (doctor) in (77a) cannot be referred to by the pronoun kare (he) or sono-hito (that person) in (77b) in its non-specific interpretation. The following sentence is an example of modal subordination in Japanese.

(78) a. Hanako-wa isha-to kekkonsi-tagatte-ir-u.
     " Hanako wants to marry a doctor."
 b. Sono-hito-wa se-ga takaku-te kanemoti-de nakerebanaranai.
     "That person must be tall and rich."

The existence of the auxiliary nakerebanaranai (must) licenses isha (doctor) to be referred to as sono hito (that person) when isha (doctor) in (78a) is understood as a non-specific NP (not a particular doctor Hanako has in her mind).

In the following section, I will show that in a conditional context, the three types of NPs in Japanese (i.e. proper names, singular indefinite NPs and plural indefinite NPs) use distinct anaphoric devices for reference. As conditional sentences, I will use ones with -tara, which is sometimes called the perfective conditional by traditional grammarians.
This is because -tara is considered historically to have developed from the perfective -ta plus -ra. (See Kuno 1973: Chapter 13 and 14).\textsuperscript{21}

When proper names are in the antecedent clause of the conditional, they can be referred to by a zero pronoun, or ano-hito (that person over there) or kare (he), if that person is a male, as shown in the following example.\textsuperscript{22}

(79) Taroo-ga ki-tara, φ₁ / ano-hito₁-ni / kare₁-ni matu-yooni i-tte-kudasai.
       -nom come-cond that-person-dat he-dat wait -cp say-Te-pol.imp
       “If Taroo₁ comes, please tell φ₁/ him/ that person (you know)₁ to wait.”

The proper name Taroo in the conditional context in (79) cannot be referred to by the two other demonstrative pronoun series kono-hito (this person) or sono-hito (that person) as in (80):

(80) Taroo-ga ki-tara, #kono-hito₁-ni / #sono-hito₁-ni matu-yooni i-tte-kudasai.
       -nom come-cond this-person-dat /that-person-dat wait -cp say-Te-pol.imp
       “#If Taroo₁ comes, please tell this person/ that person₁ to wait.”

Now let us examine how a singular indefinite NP such as dareka (someone) in the antecedent clause of the conditional is referred to.

\textsuperscript{21} There are other conditional forms such as what Kuno calls assertive conditional -nara and -ba and -to forms, which I will not discuss here in detail. The semantic difference between tara and nara is that tara implies that the action expressed by the verb it is attached to is completed before the action of the consequent clause takes place. The following is an example in Kuno (1973).

(i) Asu Tokyo-ni iku-nara/*i-tara isshoni ture-te i-tte kudasai.
       tomorrow -to go-NARA/ *go-TARA together bring-TE go-TE pol.imp
       “If (you) are going to go to Tokyo tomorrow, please take (me) with (you).”

\textsuperscript{22} The anaphoric properties of NPs are generally not affected by the types of conditionals. The observation that I make holds for any kind of conditionals. The following shows that it holds for assertive nara-clauses.

(i) Asu Taroo₁-ni aw nara, φ₁ / ano-hito₁-ni /kare₁-ni yorosiku tutae-te kudasai.
       tomorrow -dat see NARA that-person-dat /he-dat best-regards tell-TE pol. imp
       “If (you) are going to see Taroo tomorrow, please give φ₁/that person (I know)/him my best regards.

(ii) Asu Taroo₁-ni aw nara, #kono-hito₁-ni / #sono-hito₁-ni yorosiku tutae-te kudasai.
       tomorrow -dat see NARA thia-person-dat /that-person-dat best-regards tell-TE pol. imp
       “#If (you) are going to see Taroo tomorrow, please give this person/that person my best regards.
(81) Dareka, -ga ki-tara, #ano-hito,-ni / #kare,-ni / #kono-hito-ni matu-yooni 
-nom come-cond that-person-dat he-dat /this-person-dat wait -cp 
i-tte- kudasai.
say-Te-pol.imp "If someone, comes, please tell that person (you know), / him, /this person, 
to wait."

(81) shows that dareka (someone) cannot be referred to using ano-hito (that person you 
know), a personal pronoun or kono hito (this person). Instead, a zero pronoun and sono-
hito (that person) can be used to refer to the indefinite NP dareka (someone) as shown as 
follows:

(82) Dareka, -ga ki-tara, φ / sono-hito,-ni matu-yooni i-tte-kudasi. 
-nom come-cond that-person-dat wait -cp say-Te-pol.imp "If someone, comes, please tell φ / that person to wait."

Hoji (1995) uses pronouns in the so-series such as soitu (that guy) to get the bound 
variable reading since in Japanese pronouns such as kare (he) cannot be bound by a 
quantified expression such as dare (who). (See also Saito & Hoji (1983), Katada 
(1991).) The use of the so-series seems to be related to Hoji (1995)'s observation.

The contrast of the anaphoric properties in the conditional context between proper 
names and indefinite singular NP is summarized in the following chart:

<table>
<thead>
<tr>
<th></th>
<th>(83) Taroo (proper name)</th>
<th>dareka (indefinite sg. NP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>kono-hito</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>sono-hito</td>
<td>#</td>
<td>OK</td>
</tr>
<tr>
<td>ano-hito</td>
<td>OK</td>
<td>#</td>
</tr>
<tr>
<td>zero pronoun</td>
<td>OK</td>
<td>OK</td>
</tr>
</tbody>
</table>

---

23 I will not commit myself as to whether the so-series pronouns are bound variables or E-type pronouns in the sense of Evans (1980). However, the fact that not all instances of the so-series pronouns are judged by the speakers to be acceptable as a bound variable reading suggests that they might be E-type pronouns.

24 Naguchi (1997) observed that English demonstrative pronouns exhibit a similar kind of phenomenon, which is not well-understood, with respect to the bound variable interpretation.

(i) a. Every boy, dates a girl who adores that boy.
   b. *Every boy, dates a girl who adores this boy.
As shown in the chart (83), proper names pick out a-series pronouns and indefinite singular NP pick out so-series pronouns for anaphoric purposes.

Let us examine semantically plural indefinite NPs in the conditional context. Specifically, I will examine bare numeral indefinite NPs and their floated counterparts.

(84) Gakusei-ga ni san=nin ki-tara, #sono-hito-ni matu-yooni i-tte-kudasai.
-nom two three=cl come-cond that-person-dat wait -cp say-TE-pol.imp
“If [two or three students], come, please tell [that person], to wait.”

In (84), sono-hito (that person) is not acceptable because of the plural requirement on the antecedent gakusei-ga ni san=nin (two or three students).\(^{25}\) In order for the sentences to be acceptable, explicit plural marking on the so-series pronoun is necessary as in (85):

(85) Gakusei-ga ni san=nin ki-tara, sono-hito=tati-ni matu-yooni
-nom two three=cl come-cond that-person=pl-dat wait -cp
say-TE-pol.imp
“If [two or three students], come, please tell [those people], to wait.”

The anaphoric properties of plural indefinite QPs such as gakusei-ga ni san=nin (two or three students) in (85) are summarized in the following chart.

<table>
<thead>
<tr>
<th>plural indefinite QP</th>
<th>OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>kono hito=tati (these N)</td>
<td>#</td>
</tr>
<tr>
<td>sono hito=tati (those N)</td>
<td>OK</td>
</tr>
<tr>
<td>ano hito=tati (those N that you know)</td>
<td>#</td>
</tr>
<tr>
<td>zero pronoun</td>
<td>OK</td>
</tr>
</tbody>
</table>

\(^{25}\) The examples in (83) and (85) have floated quantifiers, but changing them into prenominal numeral QPs does not affect the argument here.

(i) San=nin-no gakusei-ga ki-tara, #sono-hitoni matu-yooni i-tte-kudasai.
3=pl-gen student-nom come-cond that-person-dat wait -cp say-TE-pol.imp
“If [three students], come, please tell [that person], to wait.”

(ii) San=nin-no gakusei-ga ki-tara, sono-hito=tati-ni matu-yooni i-tte-kudasai.
3=pl-gen student-nom come-cond that-person=pl-dat wait -cp say-TE-pol.imp
“If [three students], come, please tell [those people], to wait.”

San=nin-no gakusei (three students) can be referred to by using sono-hito=tati (those people) but not sono-hito (that person) just like its floated counterpart.

162
Plural indefinite QPs pattern like the singular indefinite QP dareka (someone) in (83) except that the suffix =tati which indicates plurality is obligatorily required of anaphoric pronouns.

Embedded complement clauses have slightly stricter restrictions on anaphoric pronouns than conditional clauses.\(^{26}\)

The following sentence shows the anaphoric possibilities of proper names.

(87) Taro-o-ga Hanako-ni
    -nom -dat
    [ Ziroo-ga kare-o/#ano hito-o/#kono hito-o /#sono hito-o semeta] to i-tta.
    -nom he-acc/that man-acc this man-acc/ that man-acc blame-past cp say-past
    "Taro-o said to Hanako that Ziroo blamed him/*that man(you know)/ *this man
    /*that man."

Compare this with the anaphoric properties of definite QPs in the conditional context in (83).

(88)

<table>
<thead>
<tr>
<th>conditional</th>
<th>Taroo (definite QP)</th>
<th>embedded CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>kono hito (this N)</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>sono hito (that N)</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>ano hito (that N you know)</td>
<td>OK</td>
<td>#</td>
</tr>
<tr>
<td>kare (he)</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>zibun (self)</td>
<td>#</td>
<td>OK (if Taroo is a subject)</td>
</tr>
</tbody>
</table>

The definite QP Taroo cannot be referred to using ano hito (that person I know) in the embedded clause while this usage is possible in the conditional clause. In the conditional clause, it is not possible to refer to Taroo using the reflexive zibun (self), but it is possible in the embedded clause so long as Taroo is in the subject position; the reflexive zibun has a subject-orientation.

The following example shows the anaphoric properties of an indefinite singular QP in the embedded clause.

\(^{26}\) I thank Tim Stowell for the suggestion to test also in embedded complements.
(89) Dareka-ga Hanako-ni
    someone -nom -dat
    [Ziroo-ga *kare-o#/ano hito-o/#kono hito-o /??sono hito-o seme-ta] to i-tta.
    -nom he-acc/that man-acc this man-acc/that man-acc blame-past cp say-past
    "Someone said to Hanako that Ziroo blamed *him/*that man(you know)/
     *this man/?that man."

Although slightly degraded, it is possible also in the embedded clause to refer to dareka
(someone) using sono hito (that man).

The following chart compares the anaphoric properties of the indefinite singular QP in
the conditional and embedded contexts.

<table>
<thead>
<tr>
<th>(90)</th>
<th>dareka (indefinite sg. QP)</th>
<th>conditional</th>
<th>embedded CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>kono hito (this N)</td>
<td>#</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>sono hito (that N)</td>
<td>OK</td>
<td>??</td>
<td></td>
</tr>
<tr>
<td>ano hito (that N you know)</td>
<td>#</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>kare (he)</td>
<td>?*</td>
<td>?*</td>
<td></td>
</tr>
<tr>
<td>zibun (self)</td>
<td>#</td>
<td>OK (in subject position)</td>
<td></td>
</tr>
</tbody>
</table>

Lastly, I will examine the anaphoric properties of plural indefinite QPs in the following
example.

(91) Gakusei-ga ni san=nin Hanako-ni
    student-nom two three=cl -dat
    [Ziroo-ga zibun=tati-o/??sono hito=tati-o/#ano hito=tati-o #kono hito=tati-o
     -nom self=pl-acc/that person=pl-acc/that person=pl-acc this person=pl-acc
     seme-ta ] to i-tta.
    blame-past cp say-past
    "Two or three students said to Hanako
     that Ziroo blamed self=pl/??those people/#those people(you know)/#these people."

Although slightly degraded, sono hito=tati (those people) is still acceptable as referring to
gakusei-ga ni san=nin (two or three students).

The following chart compares the anaphoric properties of plural indefinite QPs in the
conditional clause and the embedded clause.
(92) \( \text{gakusei-ga ni san=nin} \) (two or three students) (indefinite pl. QP)  
conditional embedded CP
\( \text{kono hito=tati} \) (these N) # #
\( \text{sono hito=tati} \) (those N you know) OK ??
\( \text{ano hito=tati} \) (those N) # #
\( \text{zibun=tati} \) (self=pl) # OK
(in subject position)

The suffix \=tati in the pronouns seems to be required even with zibun (self) when the antecedent is plural.

The above examples show that indefinite and definite QPs show distinct anaphoric properties even in embedded clauses. Definite QPs such as Taroo can never be referred to using sono hito (that person), while indefinite QPs may be referred to with sono N (that N).

In this section, it was shown that proper names and indefinite NPs take different anaphoric pronouns in the conditional context and the embedded complement clause. Thus, I hope to have provided independent evidence that Japanese QPs can be distinguished as to what moves to the Spec of ShareP and what does not. Proper names such as Taroo do not move to ShareP while indefinite plural NPs move to ShareP.

3.5. Reconstruction effects in binominal sentences

In sections 3.2.1. and 3.2.2, it was shown that binominal sentences in Japanese exhibit reconstruction effects, at least for A-movement, similar to its English counterpart.

This implies that the D-NP of the binominal sorezore which is not in the base-subject position can be moved by syntactic movement to the subject position at Spell-Out.

(93) a. (active)
*Sorezore hito=ri-no gakusha-ga [huta=ri-no gakusei-o] osie-ta
each one=cl-gen scholar-nom two=cl-gen student-acc teach-past
"*[One scholar each] taught two students."
b. (direct passive)
[Sorezore][hito=ri-no tuuyaku-ga] gaikookan=tati-ni wariate-are-ta.
each one=cl-gen translator-nom diplomat=pl-dat assign-pass-past
"One translator each was assigned to the diplomats."
The fact that the D-NP may not be in the base-subject position, but can be at the subject position at Spell-Out may be used as a test for determining the structures of various constructions. The distinction between the adverbial and the binominal sorezore that was discussed in sections 3.2.1. and 3.2.2. was one instance of using that test.

The test also shows that the subject of the indirect passive construction in Japanese is not derived by movement. 27

(94) (indirect passive)

*[Sorezore] [hito=ri-no otoko-ga] Taroo-ni san=satu-no hon-o kak-are-ta.

each one=cl-gen man-nom -dat three=cl-gen book-acc write-pass-past

"*One student each was affected by Taroo’s writing two books."

Furthermore, it should be noted that subjects of psychological predicates also behave as if they were not derived by A-movement.

(95) *[Sorezore] [hito=ri-no gakuesi-ga] san=nin-no kyooju-o okor-ase-ta.

each one=cl-gen student-nom three=cl-gen professor-acc mad-cause-past

"*One student each maddened three professors."

In this section, I have argued that the reconstructing property of the D-NP of the binominal construction can be used as a test to determine the syntactic structure of various constructions.

3.6. Ditransitive binominal sentences in Japanese

In this section, I will show that Japanese binominal construction displays asymmetry between direct objects and indirect objects. Specifically, the R-NP must be an indirect object and cannot be the direct object.


-nom child=pl-dat each one=cl-gen coach-acc appoint-past

"Taroo appointed [to the children] [one coach each]."


-nom one=cl-gen child-dat each three=cl-gen coach-acc appoint-past

"*Taroo appointed [to one child each] [three coaches]."

27 I thank Tim Stowell for suggesting this test to me.
When the dative QP kodomo=tati-ni (to children) is the R-NP and the direct object QP hito=ri-no kooti (one coach) is the D-NP, the sentence is acceptable as in (96a). However, when the dative QP is a D-NP such as hito=ri-no kodomo-ni (to one child) and the direct object QP is an R-NP like san=nin-no kooti-o (three coaches-acc), the sentence becomes unacceptable as shown in (96b). The unacceptability of (96b) is not due to the fact that the D-NP is the indirect object. The D-NP can be an indirect object as shown as follows:

(97) [Huta=ri-no otoko-ga] sorezore [hito=ri-no zyosei-ni] tegami-o kai-ta.
    two=cl-gen man-nom each one=cl-gen woman-dat letter-acc write-past
    “Two men wrote a letter to one women each.”

Thus, the unacceptability of (96b) must be due to the fact that R-NPs cannot be direct objects in Japanese ditransitive construction.

The R-NPs can also be a Source DP as shown in the following example:

    -nom three=cl-gen friend-from each one=cl-gen book-acc receive-past
    “Taroo received from three friends one book each.”

These facts can be captured if it is assumed that indirect object DPs asymmetrically c-command direct object DPs at the LF. This finding is consistent with the findings that Hoji (1985) made when he discovered scope ambiguities that can be explained if this structure for ditransitive sentences is assumed in Japanese. See also Aoun and Li (1989) for similar facts in English Double Object Constructions.

The R-NP can be a direct object on the condition that the D-NP is an adjunct.

    -nom book-and notebook-acc each one=cl buy-past
    “Taroo bought one book and one notebook each.”

    -nom -and -acc each one=cl read-past
    “Taroo read LGB and SS one time each.”

The D-NP in (99a) is a floating quantifier i=ssatu (one=cl for books) that is a non-argument. The R-NP is [hon-to nooto-o] (book -and notebook-acc). The D-NP i=kkai
(one time) in (99b) is also an adjunct expressing the frequency of the event. They obey the semantic restrictions imposed on the D-NPs and R-NPs respectively.

The generalization seems to be that the R-NP only can be a direct object when the D-NP is a non-adjunct. This is because in structures like (99a) and (99b), the R-NP is able to \textit{c-command} D-NP at LF. In other words, the R-NPs as direct objects must asymmetrically \textit{c-command} D-NPs at LF. In Japanese, only adjuncts can be in a structural position that is \textit{c-commanded} by direct objects.
Chapter 4
Distributivity and Reciprocals

In this chapter, I will discuss reciprocals in English and Japanese in relation to distributivity. The question I would like to address is to what extent reciprocity is related to distributivity.

It is clear that an English reciprocal expression such as each other transparently uses each, and is semantically interpreted distributively. In fact, Heim, Lasnik and May (1991) proposed the LF each-movement approach to the reciprocal each other, as will be discussed in section 4.3. However, reciprocal expressions in other languages such as Japanese are not as transparent as in English. Japanese reciprocal expressions such as (o)-tagai and -aw are mono-morphemic and do not contain an explicit distributive morpheme inside.

In section 4.1, I will discuss how the analysis of binominal and adverbial quantifiers can be extended to reciprocals. It is concluded that while reciprocals have the [+Dist]-feature because of their distributive interpretations, they do not utilize DistP and ShareP projections. The reasons for this come from the interpretations of the reciprocals. They may have an antecedent outside the clause. Furthermore, the anti-reflexive nature of the object DP cannot be captured by the DistP/ShareP relation, which was originally proposed to capture covariance interpretations.

In section 4.2, I will briefly review a semantic approach to reciprocals by Langendoen and Dalrymple et al. (1994, 1998). In section 4.3, I will give an overview of a syntactic approach to reciprocals by Heim, Lasnik and May (1991). Their approach can be recast in terms of feature-checking in the minimalist framework. In section 4.4, a revision of their
approach is suggested. In sections 4.5 and 4.6, the Japanese reciprocal tagai is analyzed in terms of feature-checking. Furthermore, the interaction between tagai and the reciprocal verbal suffix -aw is discussed in section 4.7.

In section 4.8, case-marked sorezore is analyzed as a disjoint anaphor. Although it superficially looks like a distributive anaphor, it can take an antecedent unboundedly and does not display Principle B effects. Therefore, it is analyzed as obeying Principle A within the clause and Principle C outside the clause.

In section 4.9, I will discuss the typology of [+Dist]-feature movement by distributive quantifiers and reciprocals in this thesis.

4.1. Distributivity and Reciprocals

In this section, I will consider to what extent reciprocality is related to distributivity. Specifically, I will address the following two questions.

(1) a. Can reciprocals be analyzed by [+Dist] feature-checking?
   b. Can reciprocals be analyzed by using projections DistP and ShareP?

The first question (1a) is answered affirmatively. The reason is that the English reciprocal expression each other can be interpreted distributively. I will propose that the each-movement approach to each other by Heim, Lasnik and May (1991) can be regarded as a type of [+Dist] -feature checking, which is discussed in section 4.5.

The second question (1b) is answered negatively. I will not use projections DistP and ShareP for the analysis of reciprocals.

One reason why I do not adopt B & S’s approach to each other is the unbounded nature of each other compared with the clause-boundedness of binominal and adverbial each. Let us look at the following examples. (2) is a reciprocal sentence and (3) is a binominal sentence.
(2) John and Mary thought that they were taller than each other.
   (i) “John, thought he, was taller than Mary and Mary, thought she, was taller than
       John.” (“I” reading)
   (ii) “John, thought Mary was taller than him, and Mary, thought John was
         taller than her.” (“you” reading)
   (iii) "[John and Mary], thought they, were taller than each other.”
         ("we" reading, contradictory)

(3) John and Mary thought that they saw one balloon each.
   *(i) “John, thought he, saw one balloon each and Mary, thought she, saw one balloon
       each.” (*"I" reading)
   *(ii) “John thought Mary saw one balloon each and Mary thought John saw
       one balloon each.” (*"you" reading)
   *(iii) “[John and Mary], thought they, saw one balloon each.”
         ("we" reading)

First, one notices that the two sentences differ in the range of possible interpretations. The reciprocal sentence (2) allows clause-bound wide-scope “I” reading in (2i) and “you” reading in (2ii). The clause-bound “we” reading (2iii), indicated by #, is contradictory because of the nature of the predicate be taller than. (2iii) says that the subject DP John and Mary had a contradictory thought of them being taller than each other. On the other hand, in the binominal sentence (3), only the clause-bound “we” reading in (3iii) is available. Other readings such as “I” reading in (3i) and “you reading” in (3ii) are not acceptable because basically (3i) and (3ii) are non-clause-bounded readings.

Then, let us replace they in (2) and (3) with the girls.

(2') # John and Mary thought that the girls are taller than each other.

(3') John and Mary thought that the girls saw one balloon each.

Replacing the embedded subjects in the two sentences with subjects disjoint in reference to the matrix subjects makes the distinction between these two sentences even clearer. The contrast between (2') and (3') indicates that when the antecedent is restricted clause-internally, sentences with each other may be contradictory, while sentences with binominal each are not. This suggests that each other can extend its interpretation outside the clause,
while binominal each cannot. This clausally unbounded property of each other cannot be captured by the basic generalization predicted by DistP and ShareP. B & S assume that movements of quantifiers are clause-bounded. Unless this basic assumption is given up, each other cannot be analyzed using DistP and ShareP. Therefore, I chose not to adopt B & S's phrase structure for the analysis of the reciprocals.

Another reason for not adopting DistP and ShareP is that reciprocal expressions do not have the covariance interpretation of scope manifested by binominal sentences.

(4) Boys in the class read five books each.

(5) Boys in the class talked to each other.

(4) has a covariance reading in which the number of the overall books read in the class depends on the number of boys in the class. On the other hand, (5) does not have such a covariance reading. The number of the boys who talked in the class does not change in (5). This is due to the anti-reflexive nature of the object argument in reciprocal sentences.

At the present moment, I do not have any idea how to implement DistP and ShareP so that one can capture the anti-reflexive property of reciprocal sentences since DistP and ShareP are originally motivated to capture the covariance interpretation.

In this section, I discussed reasons why reciprocal sentences cannot be analyzed by utilizing DistP and ShareP. It was pointed out that reciprocal sentences differ from binominal sentences in that their interpretation may extend outside the clause and that the object DP of the reciprocal sentences has anti-reflexive property, which disallows them to have covariance readings.
4.2. A Semantic Approach to Reciprocals

In this section, I will review the pioneering work on the semantic interpretation of reciprocals by Langendoen (1978).\(^1\) His semantic approach can be viewed as an alternative to the syntactic approach by Heim, Lasnik and May (1991) discussed in section 4.3.

Langendoen discussed and compared six relations as candidates for the interpretation of the reciprocal. He also studied the entailment relationships among the candidates given the semantic property of the predicate used in the reciprocal sentences. I will not discuss all of the six relations, but focus on some of the main relations.

One of them is Strong Reciprocity defined as follows:

(6) Strong Reciprocity (SR)

\(|A| \geq 2 \text{ and } \forall x,y \in A \ (x \neq y \implies Rxy)\)

SR roughly says that every member of A is related directly by R to every other member. However, SR is too strong for the interpretation of the reciprocals in some cases when one considers examples beyond reciprocal sentences with antecedent QPs which denote a group with two individuals.

(7) John and Mary liked each other.

(7) is a typical example of a reciprocal sentence in which the antecedent of the reciprocal denotes a group with two individuals. However, when the antecedent denotes a larger group of individuals, as in (8), the judgment is less clear.

(8) a. The students in this class like each other.
   b. Willow School's fifth-graders know each other.

(8b) is an example from Dalrymple \textit{et al.} (1994) (henceforth abbreviated as DKMP(1994) taking the initials of all the four authors.) In the examples in (8), it is not clear whether

\(^1\) In this thesis, I will leave open the question of where these Semantic Conditions of reciprocals hold. It could feed into the LF representations of the reciprocal sentences.
(8a) is true in a situation in which one person in the group does not like the other, or whether (8b) is true in a situation in which one fifth-grader does not know the other. DKMP(1994) think it is false, but some English speakers might disagree.

The logical properties of the predicates seem to be relevant for the interpretation of the reciprocals. Consider the following sentences.

(9) #a. John and Mary are taller than each other.
    #b. John and Mary defeated each other.

Both (9a) and (9b) are contradictory because the predicate be taller than and defeat are asymmetric predicates. However, the point I want to emphasize is that (9a) and (9b) can be embedded in a clause with they as a subject.

(9') a. John and Mary thought they were taller than each other.
    b. John and Mary thought they defeated each other.

Thus, unacceptability of (9a) and (9b) has a completely different status compared with the unacceptability of *he is taller than each other.

(9") *John and Mary thought he is taller than each other.

Given the acceptability of (9a') and (9b') in embedded environment, sentences such as they are taller than each other and they defeated each other should not be ruled out on the basis of their semantic properties.

Asymmetric relations are characterized as follows:

(10) R is asymmetric iff $\forall x \forall y (Rxy \quad \rightarrow \quad \sim Ryx)$

Other logical properties of relations that are relevant are as follows:

(11) a. R is symmetric iff $\forall x \forall y (Rxy \quad \rightarrow \quad Ryx)$
    b. R is transitive iff $\forall x \forall y \forall z ((Rxy \& Ryz) \quad \rightarrow \quad Rxz)$

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2 Dalrymple et al. (1998) point out that examples in (9) are counterexamples to the Strongest Meaning Hypothesis, which states that a reciprocal expresses the strongest candidate meaning that is consistent with certain contextually given information.
c. \( R \) is antisymmetric iff \( \forall x \forall y (x \neq y \rightarrow (Rxy \rightarrow \neg Ryx)) \)

The relation expressed by the predicate be taller than in (9a) is transitive while defeat in (9b) is not transitive. The asymmetric property of the predicate seems to be what makes the reciprocal interpretation unacceptable. DKMP(1994) and Dalrymple et al. (1998) show that given the logical properties of the reciprocal predicate in (10) and (11) such as symmetricality and transitivity, the Semantic Conditions of reciprocals proposed by Langendoen (1978) and Kanski become logically equivalent to each other and reduces to a few cases. (See DKMP 1994: section 6.)

However, there are other well-formed examples of reciprocal sentences with asymmetrical predicates such as give \( x \) measles in (12) and \( x \) is on top of \( y \) in (13b).

(12) Mrs. Smith's third-grade students gave each other measles.
(13)a. Five players sat next to each other.
 b. They put the trays on top of each other.

In (12), it is clear that once a student gave measles to another student, he or she couldn't get it back from the person he or she gave it to. Nevertheless (12) could be true.

In (13a), sit next to is a predicate which is neither transitive or asymmetric. It is symmetric. Another property of sit next to is that it is "two-valued": a person can sit next to no more than two other people since the players have only two sides. Furthermore, the players sitting at both edge are clearly not sitting next to any person on one side. Still (13a) can be true.

In order to account for cases such as (12), as DKMP(1994) discuss, Langendoen's definition of Intermediate Reciprocity is used.

(14) Intermediate Reciprocity (IR)

\[ |A| \geq 2 \text{ and } \forall x, y \in A (x \neq y \rightarrow \text{for some sequence } z_0, \ldots, z_m A(x=z_0 \& Rz_0 z_1 \& \ldots \& Rz_{m-1} z \& z_m=y) \]

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IR roughly says that every member of A is directly or indirectly related to every other member by the relation R. Unlike Strong Reciprocity, Intermediate Reciprocity holds even when the relation is asymmetric as in the case of putting trays on top of each other as in (13b).³

DKMP propose that the following condition proposed by Kanski (1987) captures the relation expressed in the measles example in (12).

(15) Inclusive Alternative Ordering (IAO)
\[ \forall x \in A \ \exists y \in A \ (x \neq y \land (Rxy \lor Ryx)) \]

IAO roughly says that every member x of the set A takes part in the relation R as the first or the second argument, with some other member, but not necessarily in both argument roles.

(12) Mrs. Smith's third-grade students gave each other measles.

Thus, in (12), the student who gave the measles does not have to get it back from the one he or she gave it to. (12) is false in a situation where Mrs. Smith's class member didn't give measles to other members of the class.

Langendoen also discussed the interpretation of reciprocals of other sentences with plural NPs. In one of his footnotes, he discusses that some languages have sentences whose interpretation is ambiguous between a reflexive and a reciprocal such as French.

³ Neither SR or IR captures the semantic interpretation of complex anaphors such as each other's wives or pictures of each other. For instance, a sentence such as John and Bill hate each other's wives does not involve a direct anti-reflexive relationship as in the case of John and Bill hate each other.

See Tyhurst (1990) for extending the semantic condition on Reciprocity to the cases of complex anaphors under the Generalized Quantifiers Approach by Keenan (1987).

It is known that complex anaphors are less restrictive than simple anaphors in their syntactic distribution. At this point, I don't have an account of why this is so.

(iii) a. *Professor A and Professor B hoped that the NSF would fund each other.

b. Professor A and Professor B hoped that the NSF would fund each other's students.
(16) Les femmes se sont libérées.⁴

(16) can be interpreted as “The women freed themselves” or “The women freed each other”. The semantic interpretation of (16) that he proposes is as follows:

(17) \( (\forall x \in A) \ (\exists y, z \in A) \ (Rxy \land Rzx) \)

(17) roughly says that every member of the group A participates in the relation R both as the first and as the second argument of the sentence.

He says that (17) is derived from Weak Reciprocity defined as follows:

(18) Weak Reciprocity (WR)
\( \forall x \in A \exists y, z \in A \ (x \neq y \land x \neq z \land Rxy \land Rzx) \)

(18) roughly says that every member of the group A participates both as the first argument and as the second argument in the relation R.⁵ Without the anti-reflexive condition \( x \neq y \) and \( x \neq z \) in (18), WR is identical to (17). Therefore, in a language such as French, semantic interpretation for a reciprocal can be captured by (17).

Langendoen also discussed relations such as Partitioned Strong Reciprocity (PSR) and Partitioned Intermediate Reciprocity (PIR).

(19) Partitioned Strong Reciprocity (PSR)
There is a partition \( A_1, \ldots, A_n \) of A such that for all \( |A_i| \geq 2 \) and \( \forall x, y \in A_i \)
\( x \neq y \implies \neg Rxy \)

(19) means that Strong Reciprocity holds of disjoint subsets that cover the whole set A.

The definition of the Partitioned Intermediate Reciprocity (PIR) is as follows:

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⁴ See Sportiche (1994) for the account of agreement in these constructions.

⁵ DKMP (1994) reject WR as a candidate for the interpretation of the reciprocal sentences because they say that a good example attesting (18) is not found in English.
(20) Partitioned Intermediate Reciprocity (PIR)

There is a partition $A_1, \ldots, A_n$ of $A$ such that for all $i, |A_i| \geq 2$ and $\forall x, y \in A_i$

$(x \neq y \rightarrow \text{ for some sequence } z_0, \ldots, z_m \text{ } A(x = z_0 \& Rz_0z_1 \& \ldots \& Rz_{m-1}z \& z_m = y)$

The relation between PIR and IR is the same relation that holds between PSR and SR. The difference lies in the partitioning of the set $A$ into disjoint subsets. The question is whether one needs to partition to characterize the meaning of the reciprocal. I claim that as a semantic condition, one need not specify the partition because reciprocal expressions in languages in and by themselves do not specify what kind of partition should be made, as discussed in DKSP(1994). They show that the sentence such as the following can be partitioned in different ways depending on the context.

(21) Their grandparents knew each other.

They gave the following example from the New York Times.

(21') That heart debt is to the small-town society of her youth, which Bloodworth-Thomason describes as a “kind of microcosm of eccentric characters and Southern humor and familial love and extended family and everybody knows everybody and their grandparents knew each other.” (Italics are theirs.)

The reciprocal expression has a meaning which is true in a situation in which for each citizen of this town, his maternal grandparents knew his paternal grandparents, and vice versa.

Given a different context, the same reciprocal expression may require a different partition. The following example is from DKMP.

(22) Many years ago, arranged marriages were common in that town. As for the Smiths, their great-grandparents were complete strangers to each other when they got married. But that all changed 60 years ago; of course, their grandparents knew each other before they got married. (Italics are theirs.)

The reciprocal expression in (22) is true in a situation in which one’s maternal grandparents knew each other, and so did one’s paternal grandparents; and likewise for one’s wife’s maternal grandparents and paternal grandparents. They say (22) would be
false in a situation in which (21') is true, that is, one's maternal grandparents knew his paternal grandparents, which is not that right kind of partition. The semantics of reciprocals do not have to specify how to cut the pie.

A similar point can be made for Schwarzschild (1992)'s example:

(23) The prisoners on the two sides of the room could see each other.

He points out that (23) would be false in a situation in which there is an opaque shield across the room between two groups of prisoners. Even if the prisoners on the same side can see other prisoners, this is not sufficient to make (23) true in the intended reading.

In this section, I reviewed Langendoen (1978)'s approach to reciprocals. Examples are given to show that not all reciprocal sentences can be characterized by the Strong Reciprocity Condition although typical cases with the antecedent denoting two individuals involve SR. The Semantic Conditions on the interpretation of the reciprocal change depending on the semantic properties of the predicate in the sentence such as transitivity, symmetricality, and so on.

I also claimed that partitioning of the plural antecedent should not be included in the Semantic Condition because how to partition its denotation depends on the context.

4.3. A Syntactic Approach to Reciprocals
--- Review of Heim, Lasnik, and May (1991)---

In this section, I will give an overview of Heim, Lasnik, and May (1981)'s approach to reciprocals and plurals (henceforth HLM). In their approach, HLM reduces the semantics of reciprocals into syntactic component parts at LF: each-movement out of [each other], the trace of each obeying Principle A and the remnant [e other] obeying Principle C. Distributivity of the reciprocal is captured in their approach by each-movement, and the anti-reflexive condition (i.e. x ≠ y in Langendoen's approach) is
captured by Binding Principle C. HLM's each-movement can be regarded as a type of [+Dist]-feature checking, parallel to the binominal each-movement, in the minimalist framework by Chomsky (1995).

In section 4.4, I will propose a revision to HLM’s analysis based on the data of reciprocal interpretation outside the clause. I will also propose a minimalist version of the analysis of Japanese reciprocal tagai in the spirit of HLM in section 4.6.

HLM proposed a LF movement analysis for reciprocal sentences such as the following.

(24) The men liked each other.

In (24), for instance, HLM proposed that at LF each moves out of the NP [each other] and adjoins to the right of the antecedent NP the men. The LF-representation of (24) before the QR looks as follows:

(25) [[The men] each] liked [e other].

Furthermore, HLM proposed that the trace of each-movement (i.e. e in (20)) obeys Principle A of the Binding Theory, while [e other] obeys Principle C.⁶

The main features of HLM's analysis are briefly summarized as follows:

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⁶ In Chomsky (1981), the original version of the Binding Theory was defined as follows:

(i) Binding theory
   - Principle A. An anaphor is bound in its governing category.
   - Principle B. A pronominal is free in its governing category.
   - Principle C. A R-expression is free.

Obviously, the Binding Theory needs to be recast in the minimalist framework, perhaps, in terms of the theory of phi-feature checking. Notions such as “the governing category” must be redefined in the minimalist framework. To do so is beyond the scope of the present research. I will leave it for future investigation.
(26) a. At LF each is moved to adjoin to its “antecedent NP”.
b. the men each undergoes QR after each-movement.
c. [NP-e other] undergoes QR (after the Binding Theory Principle A has applied).
d. The trace of each is an anaphor which obeys Principle A.
   The remnant of each-movement [e other] is an R-expression which obeys Principle C.
e. The assumption is that the Binding Theory applies at LF after each-movement.
f. unbounded each-movement: Each-movement can be applied unboundedly as long as the trace of each has the local antecedent which satisfies Principle A.

Their proposal is interesting in that they wanted to capture the anti-reflexive condition by their syntactically tripartite analysis and by [e other] obeying Principle C.

As arguments for their analysis, they propose to solve two kinds of puzzles involving scopal ambiguity of reciprocal sentences; the grain puzzle and the scope puzzle.

The grain puzzle involves the following sentence:

(27) John and Mary told each other that they should leave.

HLM says that (27) is at least three ways ambiguous among the following interpretations:

(27') 1) “John told Mary that John should leave
       and Mary told John that Mary should leave.” (“I” reading)
2) “John told Mary that Mary should leave and
   Mary told John that John should leave.” (“you” reading)
3) “John told Mary and Mary told John, that John and Mary should leave.”
   (“we” reading)

Solving the grain puzzle involves coindexing of the pronoun they with three different parts of each other after each-movement at LF as shown in (23). Let us suppose, for the sake of exposition, that John and Mary is indexed 1, each is given index 2, and [each other] is given index 3.

(28) 1) [[John and Mary],1 each,2] told [e, other],3 that they,4,... (“I” reading)
2) [[John and Mary],1 each,2] told [e, other],3 that they,4,... (“you” reading)
3) [[John and Mary],1 each,2] told [e, other],3 that they,4,... (“we” reading)

In (28.1) the index of they agrees with that of each. In this case, the distributive reading of they (“I” reading) is obtained. In (28.2), the index of they agrees with that of the indirect
object NP [e other]. In this case, “you” reading is obtained. Finally, in (28.3) they is coindexed with [John and Mary], in which case “we” reading is obtained.

Solving the grain puzzle crucially involves tripartite analysis of each other. Otherwise, one cannot have three different coindexing of they. It should be noted that in a sentence without each other such as “John and Mary said that they should leave”, they is ambiguous between “I” reading and “we” reading, but does not have “you” reading. Thus, the fact that [e other] and each have distinct indices plays a role in HLM’s analysis. In other words, in order to derive the “you” reading, it is crucial that each and [e other] get distinct indices.

Another feature of HLM’s analysis is that collective reading and the distributive reading receive distinct indices.

The scope puzzle involves the interpretation of the following sentence:

(29) John and Mary think they like each other.
   (i) “John and Mary think they each like the other.” (narrow scope reading)
   (ii) “John thinks John likes Mary and Mary thinks Mary likes John.”
        (broad scope reading)

(29) is ambiguous between the narrow scope reading of each in which John and Mary both think each of them like the other and the broad scope reading in which John and Mary individually think he or she like the other person.

Solving the scope puzzle involves unbounded application of each-movement as follows:

(30) (i) [John and Mary]₁ think [[they]₁ [each]₂₁, like [e other]₃ (narrow reading)
   (ii) [[John and Mary]₁ [each]₂₁]₂ think they₂ like [e other]₃ (broad reading)

In both of the derivations in (30), one has to assume that the antecedent John and Mary inherit the index of each (or put it in another way, the index of each percolates up to the antecedent NP) after the adjunction. In (30i), the index of e and [[they] each] show that
they obey the Binding Principle A. In (30ii), the index of \textit{they} cannot be anything other than 2 to obtain the broad scope reading. In other words, the trace of \textit{each} (i.e. \textit{e}) has to satisfy locally the Principle A. This matches with the English speakers' intuition that one gets the broad scope reading of \textit{each} only when the pronoun \textit{they} is understood as the bound variable interpretation.

A question arises as to whether their treatment of [e other] as a R-expression is necessary. Whatever may be ruled out as a Principle C violation may also be ruled out as a Principle A violation by the trace of \textit{each} as shown as follows:

(31) *[[They]1 each 2] [think John3 like [e2 other]3

In (31), the indexing of John and [e other] violates Principle C. At the same time, the indexing of John and the trace of each violates Principle A.

However, it is not the case that whatever may be ruled out by Principle A is also ruled out by Principle C. That is, Principle C cannot rule out all the examples that Principle A can. HLM (1991:97)'s examples show this point:

(32) (=HLM's (110))
   a. *[[They]1 each2] [think that John and Mary like [e2 other]3]
   b. *[[They]1 each2] [think that John like [e2 other]3]
   c. *[[They]1 each2] [think that e like [e2 other]3]

All the examples in (32) are unacceptable because the coindexing of the trace of \textit{each} and the antecedent NP in the embedded clause violates Principle A. The coindexing of [e other] and the subject in the embedded clause obeys Principle C. These examples show that Principle A is necessary since one cannot rule these out by [e other] observing Principle C.

Furthermore, HLM show examples that are ruled out by the coindexing of the embedded subject NP and the matrix subject NP violating Principle C.

(33) (=HLM's (111))
   a. *[[They]1 each2] [think that John and Mary like [e2 other]3]
   b. *[[They]1 each2] [think that John like [e2 other]3]
Examples (33a) and (33b) are ruled out as a violation of Principle C. (33c) obeys Principle C, but the pronouns they and he must syntactically agree.

Williams (1991) notes that there is a problem about the unbounded nature of each-movement. For instance, HLM’s analysis will predict that the following sentence has a broad scope reading.

(34) John and Mary claimed that the coach said they would defeat each other in tomorrow’s match.

HLM claim that (34) has a broad scope reading of each such as the following “John claimed that the coach said John would defeat Mary and Mary claimed that the coach said Mary would defeat John”. The English speakers that I consulted said that they did not get this reading. They happen to agree with Lebeaux (1983)’s judgment. If these judgments are to be taken seriously, HLM’s system overgenerates when it comes to clause-external interpretation concerning each other.

In this section, I gave a brief overview of HLM’s LF-movement analysis of English reciprocal sentences with each other. I also reviewed their coindexing mechanism and pointed out an empirical problem with the unbounded movement of each.

In the next section, I will propose a revision of HLM’s analysis in the present framework.

4.4. Successive Cyclicity

In this section, I will examine whether each-movement of the reciprocal obeys island constraints and propose a revision of HLM’s analysis incorporating the notion of successive cyclicity. Furthermore, HLM’s analysis of each-movement at LF should be recast in terms of feature movement in the minimalist framework. I propose that each-
movement is triggered by the [+Dist] feature of each and that each-movement involves feature-checking.

The reciprocal expression each other in English exhibits the Adjunct Island effect and is an island in relative clauses as in mentioned in HLM (1991). However, as Langendoen (1978) and Lebeaux (1983) observed, some examples of each other in the wh-island is acceptable. The following chart summarizes the behavior of simple argument each other in islands.

(35)  
1. Adjunct Island  each other
2. Wh-Island  obeys
3. Relative clause  partially obeys

Here is an example of each other displaying the Adjunct Island effect.

(36) *Tom and Mary thought that if Chomsky recommended each other, Bill would get angry.

In (36) the reciprocal in the adjunct if-clause cannot take the matrix subject Tom and Mary as its antecedent.

In a wh-island, each other may take an antecedent in certain examples, as noted by Langendoen (1978) and Lebeaux (1983), but not in other examples.

(37)a. Tom and Mary wondered who recommended each other.
    b. *Tom and Mary wondered if Bill recommended each other.

At this moment, I don't have an answer as to why (37a) is acceptable compared with (37b). My speculation is that the wh-element in (37a) is interacting semantically and syntactically with each other. I will leave this for future research.

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7 The examples that Langendoen (1978) gives are the following:
   (i) The women knew what pleased each other.
   (ii) The women knew what each other wanted.
The following example shows that the reciprocal in the relative clause cannot take an antecedent outside it.

(38) *Tom and Mary criticized papers that Bill sent to each other.

It is possible to capture these cases of island effects by HLM’s approach because even though each-movement is possible unboundedly, the trace of each-movement violates Principle A. Therefore, the broad scope readings in (36), (38b) and (38) are ruled out. However, there are examples that show that HLM’s analysis is not restrictive enough.

(39)a. John and Mary claimed that the coach said they would defeat each other.
   *" John claimed the coach said he would defeat Mary and Mary claimed the coach said she would defeat John."

b. John and Mary said that Bill claimed that they were taller than each other.
   *" John said that Bill claimed he was taller than Mary and Mary said Bill claimed she was taller than John."

Most English speakers that I consulted agree that the examples in (39a) and (39b) do not allow the broad scope construal of the reciprocal. So, I claim that HLM’s analysis, as it stands, overgenerates the broad scope readings.

In order to overcome this problem, I propose that each-movement applies successive cyclicly. Here is the proposed analysis of each-movement in the minimalist framework.

(40) 1) each of each other has [+Dist] feature to check.
      It moves to adjoin to the plural DP to check off its feature.
      2) The remnant of each-movement [e other] stays in its Case-checking position.
      3) indexing convention: [+Dist] has an index distinct from [e other],
      4) the trace of each obeys Principle A.
      5) Feature-checking applies successive-cyclicly.

(40.1), (40.2), (40.3), and (40.4) preserve the spirit of HLM’s analysis although they are recast in the feature-checking analysis. What is new here is the claim that it applies successive-cyclicly as in (40.5). This claim is made based on empirical evidence.

Now, let us examine how the proposal in (40) accounts for the absence of the broad scope reading in (39a):
(39) a. John and Mary claimed that the coach said they would defeat each other.

The successive-cyclic application of each-movement forces each to adjoin to the subject in the intermediate clause the coach. [ [The coach] each] would yield an illegitimate LF representation and cause the derivation to crash because the coach is singular and does not have the [+Dist] feature that is to be matched and to be checked off by each. Thus, once the derivation has crashed, each cannot move on to get to the topmost subject John and Mary.

In this section, I examined the island effects of each other and proposed a minimalist analysis of each other in terms of feature-checking. Furthermore, based on the lack of broad scope reading when the QP in the intermediate clause is non-plural, I propose to introduce successive-cyclicality in the analysis.

4.5. Japanese reciprocal tagai

In this section, I will examine the syntactic properties of the Japanese reciprocal tagai.8 This reciprocal is very similar to the English reciprocal each other in that it occupies

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8 I will use tagai instead of o-tagai which is usually used in other papers. O= is an honorific prefix. O=tagai, as opposed to tagai, seems to induce subject-orientation.

(i) *Hanako-ga Taroo to Ziroo-ni [o=tagai-ga warui] to i-tta.
   -nom and -dat o=rec-nom bad cp say-past
   "*Hanako said to Taroo and Ziroo that each other are bad."

(ii) ?Hanako-ga Taroo to Ziroo-ni [tagai-ga warui] to i-tta.
   -nom and -dat e.o.-nom bad cp say-past
   "?Hanako said to Taroo and Ziroo that each other are bad."

In (i), o=tagai cannot take the indirect object DP as its antecedent, while (ii) is not bad. Since tagai is allowed in a larger environment, I will use tagai instead of o=tagai.
the argument position and it exhibits the island effects. It is relatively well studied in
the Japanese literature: Kitagawa (1986), Nishigauchi (1992), and Hoji (to appear). However, there are some disagreements as to its precise syntactic properties. I will make it
clear which judgments of mine diverge from the ones made in the other papers.

I will discuss later that tagai differs from the English each other in that it is mono-
morphemic and in that some of the broad scope readings available in English are not
available in Japanese.

It can be shown that the reciprocal tagai exhibits island effects as discussed in
Nishigauchi (1992):

(41)

<table>
<thead>
<tr>
<th>Adjunct Island</th>
<th>tagai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wh-island</td>
<td>obeys</td>
</tr>
<tr>
<td>Relative clause</td>
<td>obeys</td>
</tr>
</tbody>
</table>

Here is an example which shows that tagai displays Adjunct Island effects.

(42) *[Hanako-to Taroo-ga [[Chomsky-ga tagai-o suisensi-tara, minna-ga oko-ru to]
-adv   -nom   -nom  e.o.-acc recommend-cond all-nom angry cp pres
-omo-tta] koto
-think-past fact
"*the fact that Hanako and Taroo thought if Chomsky recommended each other, all the
people would get angry"

In (42) tagai in the adjunct conditional clause cannot take Hanako-to Taroo as its
antecedent.

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9 The argument tagai should be strictly distinguished from the adverb tagai=nij. (i) Ziroo-to Taroo-wa tagai=nij aite-o nagu-tta.
-adv   -nom   -nom   -acc other-acc hit-past
"Ziroo and Taroo each hit the other."

(i) is an example with the adverb tagai=nij. The object argument position is occupied by a disjoint
anaphor aite (the other). I will not talk about the adverb tagai=nij in this thesis.

10 For instance, Miyagawa (1997) makes a claim about scrambling based on the data using otagai which totally
diverges from my judgment. I will not discuss any further about this in this paper.
As for wh-island effects, *tagai* is similar to English in that in some cases it is acceptable and in some cases, it is not. As in the English case, *tagai* in wh-island is allowed when there is a wh-element in the clause.

(43) a. [*Hanako to Taroo-ga [dare-ga *tagai*-o suisensi-ta-ka] sira-nak-atta] koto
    and -nom who-nom e.o.-acc recommend-past-Q know-neg-past fact
    "the fact that *Hanako and Taroo* did not know who recommended each other"

b. *[*Hanako to Taroo-ga [Ziroo-ga tagai-o suisensi-ta-kadooka] sira-nak-atta] koto
    and -nom -nom e.o.-acc recommend-past-whether know-neg-past fact
    "**the fact that *Hanako and Taroo* did not know whether Ziroo recommended each other"

In (43a) *tagai* in the embedded wh-clause may take *Hanako to Taroo* as its antecedent. On the other hand, in (43b) *tagai* in the embedded clause with *dadooka* ("whether") cannot take the matrix subject as its antecedent. I will not speculate on why this is so. Clearly, more study has to be done in this area.

The following example shows that *tagai* in relative clauses cannot take an antecedent outside the clause.

(44) *[*Hanako-to Taroo-ga [ Ziroo-ga tagai-ni oku-tta] ronbun-o hihansi-ta] koto
    -and -nom -nom e.o.-dat send-past paper-acc criticize-past fact
    "**the fact that *Hanako and Taroo* criticized the papers Ziroo sent to each other"

In (44), the reciprocal *tagai* cannot take *Hanako to Taroo* as its antecedent.

As is discussed in Nishigauchi (1992), *tagai* in relative clause islands has a famous counterexample:

(45) [*Hanako-to Taroo-ga [ *tagai*-ga kai-ta ] ronbun-o hihansi-ta] koto
    -and -nom e.o.-nom write-past paper-acc criticize-past fact
    "the fact that *Hanako and Taroo* criticized the papers that each other wrote"

---

11 Unlike in English, *tagai* can appear as the subject of the embedded clause. The following sentence is acceptable.

(i) [*Taroo-to Hanako-ga [tagai-ga dare-o suisensi-ta-ka wasure-ta] ] koto
    -and -nom e.o.-nom who-acc recommend-past-Q forget-past fact
    "the fact that Taroo and Hanako forgot whom each other recommended."
It is obvious that this is a language-particular fact about Japanese.\(^\text{12}\) \((45)\) has a broad scope reading, meaning Hanako criticized the paper that Taroo wrote and Taroo criticized the paper that Hanako wrote.

Following Nishigauchi (1992), Sano (1991), and Sakai (1991), the fact that tagai may escape the relative clause island can be attributed to the analysis that there is a movement from the Spec of the subject DP in Japanese. Sakai (1991) claims that this correlates with ga/no case conversion effects in Japanese.

\((45')\) [Hanako-to Taroo-ga [tagai-no kai-ta] ronbun-o hihansi-ta] koto
-and -nom e.o.-gen write-past paper-acc criticize-past fact
"the fact that Hanako and Taroo criticized the papers that each other wrote"

The subject DP of the relative clause is the environment where ga/no conversion phenomenon applies. Instead of the nominative case (ga) marking in \((45)\), the genitive case (no) marking is also acceptable, which can be a diagnosis for the movement out of the DP.

Independently, Sano (1991) proposed that apparent island violations in case of topicalization and subjectivation can be accounted for if the movement from the Spec of the subject NP was motivated.

\((46)\) a. Sono sinsi-wa \([[[e] [e], ki-teir-u] yoohuku-ga yogyore-teir-u.\)
that gentleman-top wear-asp-pres clothes-nom dirty-asp-pres
"As for that gentleman, the clothes (he) wears is dirty." (Kuno 1973)

b. *Sono koin-wa [John-ga [e] [e], mora-tta] hito-ga arui-teir-u.
that coin -nom receive-past person-nom walk-asp-pres
"*As for that coin, the person who John gave (it) to is walking." (Sano 1991)

\(^{12}\) Independently, the English reciprocal each other is not acceptable as the subject of the tensed clause except in the wh-clauses.

(i) *John and Mary said that each other hated Bill.
   Compare (i) with Langendoen's example in the previous section:
(ii) The women knew what each other wanted.
This should be accounted for in the syntax of each other. In Japanese, the counterparts of (i) and (ii) are both acceptable.
(46a) is an apparent violation in topicalization island. (46b) is also an instance of topicalization. However, (46b) is unacceptable.

Comparing Sakai's analysis with Sano's, Sano's analysis seems superior because apparent island violations are not limited to the ga/no conversion environment.

I will assume Sano's analysis and claim that tagai in (45) has a broad scope reading because it has moved through the Spec of the subject DP. It can be shown that tagai has a broad scope reading exactly when the movement from the Spec position is possible.

"*the fact that Hanako and Taroo criticized the papers Ziroo sent to each other"

(45) [Hanako-to Taroo-ga [ tagai-ga kai-ta ] ronbun-o hihansi-ta] koto -and -nom e.o.-nom write-past paper-acc criticize-past fact 
"the fact that Hanako and Taroo criticized the papers that each other wrote"

In (45), the movement of tagai through the Spec of NP is possible. Therefore, (45) has a broad scope reading. On the other hand, the movement of tagai is not possible because it is blocked by the presence of Ziroo.

Given the ability of the subject NP to move through the Spec of DP in Japanese, the island effect in this language should be checked using positions which are not occupied by subjects such as in (44). (44) shows that the reciprocal tagai exhibits island effects in relative clauses except when it is in the subject position of the relative clause.

In this section, I showed that the Japanese reciprocal tagai also exhibits adjunct island effects, wh-island effects, and island effects in relative clauses, which indicates that the LF-movement has taken place.
4.6. An Analysis of tagai in terms of [+Dist] feature

In this section, I will introduce the scope puzzle and the grain puzzle in Japanese and make a proposal to solve them via feature-checking analysis of tagai.

The scope puzzle in Japanese is discussed in Nishigauchi (1992). I do not have any basic disagreements about the judgments. Although the main claim of his paper is not about (o)=tagai but the reciprocal verbal suffix -aw, he also suggested an analysis in the pre-minimalist framework in which (o)=tagai moves to adjoin to its antecedent at LF and its trace obeys the Binding Principle A. Here I am going to propose a different analysis for tagai. I will propose that the lexical item tagai itself does not move, and only the [+Dist] feature of tagai moves. This proposal is in the spirit of Chomsky (1995)’s proposal that in covert movement it is only sufficient for the features to move. Since English has a morphologically complex reciprocal each other, each of each other can be analyzed as having a [+Dist] feature. However, Japanese does not have a morphologically complex reciprocal like English each other. This is the reason why it is proposed that Japanese has a feature-movement.

Let us look at examples concerning the scope puzzle in Japanese. The Japanese reflexive zibun may occupy the subject position.\(^{13}\) When the antecedent of zibun is plural, the sentence has an obligatorily distributive reading as shown in (46b):

   and -nom self-nom e.o. bad cp say-past
   "Taroo, said that he is to blame and Hanako, said that she is to blame."

      and -nom self-nom e.o.-acc hate-asp-pres cp say-past
      "*Taroo and Hanako said self hated each other."

\(^{13}\) See Sakaguchi (1985) for the analysis of the anaphoric properties of zibun in the Government and Binding framework.

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However, the reflexive zibun cannot be the antecedent of the reciprocal tagai because tagai requires a plural antecedent. That is why (46b) is unacceptable. It is unacceptable for the same reason that the following sentence is unacceptable.

(47) * Ziroo-ga tagai-o nikun-deir-u.
    -nom e.o.-acc hate-asp-pres
" *Ziroo hates each other."

When zibun in (46b) is replaced by zibun=tati, the sentence becomes acceptable.

(48) Taroo to Hanako-ga [ zibun=tati-ga tagai-o nikunde-ir-u] to i-tta.
    -nom self=pl-nom e.o.-acc hate-asp-pres cp say-past
    "Taroo and Hanako said self=pl hated each other."
    (i) " Taroo and Hanako said they each hated the other." (narrow scope reading)
    #(ii) "Taroo said he hated Hanako and Hanako said she hated Taroo."
    (broad scope reading)

(48) has a narrow scope reading in which Taroo and Hanako said they each hated the other as in (48i). However, (48) lacks the broad scope reading where Taroo said he hated Hanako and Hanako said she hated Taroo.\(^\text{14}\)

In this respect, Japanese reciprocal sentences with zibun=tati as in (48) differ from the English reciprocal sentences with the pronoun they.

(49) John and Mary said that they hated each other.
    (i) "John and Mary said that they each hated the other." (narrow scope reading)
    (ii) "John said that he hated Mary and Mary said that she hated John."
    (broad scope reading)

It was discussed in section 4.3. that English reciprocal sentences with the pronoun they in the embedded subject position allow both narrow scope reading and the broad scope reading as in (49).

As discussed in Nishigauchi (1992), Japanese reciprocal sentences with tagai only allow the broad scope reading when a zero pronoun is in embedded subject position.

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\(^\text{14}\) I agree with Nishigauchi (1992) in the construal of (48).
(50) Taroo to Hanako-ga [e] tagai-o nikunde-ir-u] to i-tta.
    and -nom e.o.-acc hate-asp-pres cp say-past

(i) "Taroo, said he, hated Hanako and Hanako, said she, hated Taroo."
(broad scope reading)

The broad scope reading of (50) is only available when [e] is interpreted as referential to Taroo to Hanako.

In order to solve the scope puzzle in Japanese, I propose the analysis of the reciprocal tagai as follows:

(51) 1) The reciprocal tagai has [+Dist] feature. The movement of [+Dist] is a movement of features (as opposed to the movement of lexical items). It is only the features that move.

2) The lexical item tagai stays in-situ. Crucially, the Case-feature of tagai does not move from its Case-checking position.

3) indexing convention: [+Dist] has an index distinct from tagai.

4) Tagai obeys Binding Principle C.

5) Feature-checking applies successive-cyclicly.

Now, let us consider how the scope puzzle in (48) is accounted for by the proposal in (51).

(48) Taroo to Hanako-ga [zibun=tati-ga tagai-o nikunde-ir-u] to i-tta.
    and -nom self=pl-nom e.o.-acc hate-asp-pres cp say-past

   "Taroo and Hanako said self=pl hated each other."

(i) "Taroo and Hanako said they each hated the other." (narrow scope reading)

(ii) Tagai, said he, hated Hanako and Hanako, said she, hated Taroo."
(broad scope reading)

The narrow scope reading of (48) is accounted for in the following way. After the [+Dist] feature movement, the LF representation of (48) is shown as follows:

(48') (i) [T-to H]-ga [[zibun=tati]1+[Dist]2-ga [tagai]3-o ...

According to the indexing convention in (36.3), [+Dist] and tagai have a distinct index (2 and 3, respectively). The subject DP of the embedded clause [zibun=tati] is indexed 1, but the index of [+Dist] percolates up as assumed in HLM’s analysis. The LF representation (48i') obeys Binding Principle C. Therefore, (48i’) is well-formed.

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The absence of the broad scope reading of (48) is accounted for in the following fashion.

It is obvious that non-successive application of the [+Dist] feature-movement in (51.1) would not block the broad scope reading as shown as follows:

(48') (ii) [T-to H]1 [Dist]2-ga [[zibun=tati]1-ga [tagai]3-o...]
The LF representation in (48ii') obeys Principle C, thus incorrectly allowing the broad scope reading. Thus, the assumption in (51.5) is necessary to block the broad scope reading of (48).

(48'') (ii) [T-to H]-ga [[zibun=tati]1[+Dist]2-ga [tagai]3-o ...]
It can be said that feature-checking was completed at the embedded CP level. (Last Resort is satisfied.) [+Dist] is checked off. [+Dist] does not move outside the clause in (48'').

On the other hand, when the embedded subject is a zero pronoun as in (50), the broad scope reading is available because [+Dist] cannot be checked off by an empty category. Presumably the empty subject does not have any specific phi-features let alone [+Dist] to be checked off by the [+Dist] feature of tagai.

(50) Taroo to Hanako-ga [ [e] tagai-o nikunde-ir-u] to i-tta.
     and e.o.-acc hate-asp-pres cp say-past
     "Taroo said he hated Hanako and Hanako said she hated Taroo."
(broad scope reading)
(i) [T-to H]1-ga [[e]1[+Dist]2-ga [tagai]3-o ...] to i-tta.

Thus [+Dist] feature undergoes successive cyclic-movement. After this movement has been applied, the index of the embedded zero pronoun [e] is necessarily changed to the index of [+Dist]. This captures the fact that the embedded empty subject has to bear the same index as [[T-to H] [+Dist]] to get the broad scope reading.
The grain puzzle in Japanese is not as interesting as in the case of English. This is because Japanese lacks pronouns such as they that can be interpreted distributively or non-distributively.\footnote{The Japanese pronoun kare=ra (he=pl) can only be interpreted collectively. The antecedent of kare=ra must be plural.}

The following sentence with an empty embedded subject is at most vague.

(52) ?# Taroo-to Hanako-ga tagai-ni [(e) ayamaru-beki-da] to i-tta.
   -and -nom e.o.-dat apologize-should-cop cp say-past
   “?# Taroo and Hanako said to each other [(e) should apologize].”

The index of [e] cannot be determined without a context. For instance, given a context, the empty subject can refer to a singular person that is not Taroo or Hanako.

The “I” reading, “you” reading, and “we” reading are already lexically disambiguated by using the reflexive zibun, aite (the other), and zibun=tati (selves), respectively.

   -and -nom e.o.-dat self-nom apologize-should-cop cp say-past
   “Taroo and Hanako said to each other that self should apologize.”$^=$
   “T said to H that T should apologize and H said to T that H should apologize.”
   ("I" reading)

   -and -nom e.o.-dat the other-nom apologize-should-cop cp say-past
   “Taroo and Hanako said to each other that the other should apologize.”$^=$
   “T said to H that H should apologize and H said to T that T should apologize.”
   ("you" reading)

   -and -nom e.o.-dat self=pl-nom apologize-should-cop cp say-past
   “Taroo and Hanako said to each other that self=pl should apologize.”$^=$
   “T said to H and H said to T that they should apologize.” ("we" reading)

The anaphoric expressions in the embedded subject positions in (43) have the following lexical properties:

\footnotemark[15]
(54) 1) The reflexive *zibun* has to coindexed with the subject DP which has [+Dist].
2) *aite* has to be coindexed with Dative Case-marked DP.
3) The reflexive *zibun-tati* has to be coindexed with the plural subject DP.

The lexical properties in (54) together with the proposal in (51) produce the following LF representations for sentences in (53). I assume that [+Dist] has index 2 and *tagai* has index 3 and the matrix subject DP [T-to H] has index 1, for the purpose of exposition:


[+Dist] feature moves from *tagai* and adjoins to the matrix subject [Taro-to Hanako] to checks its [+Dist] feature. [ [Taro-to Hanako][+Dist]] has index 2 which is the same index as that of *zibun*.

Thus (53a′) is the LF representation of the “I” reading. Similarly, after [+Dist] feature movement, *aite* is coindexed with the reciprocal *tagai*. Thus (53b′) is the LF representation of the “you” reading. In (53c′), after [+Dist] feature movement, *zibun-tati* is coindexed with [Taro-to Hanako], which yields the “we” reading.

It should be noted that (53′a), (53b′), and (53c′) all obey Principle C and are well-formed as proposed in (51.4).

In this section, I showed that the scope puzzle and the grain puzzle in Japanese can be accounted for if it is assumed that the reciprocal *tagai* undergoes [+Dist] feature movement, while the lexical item *tagai* marks the Case-position with a different index. Japanese differs from English in that it has a feature movement without actually moving the lexical item in the sense of Chomsky (1995). On the other hand, in English it is the each of each other that has the [+Dist] feature and undergoes feature-checking. This analysis was motivated by the fact that Japanese has a mono-morphemic reciprocal, while
English has a complex reciprocal expression. Furthermore, it was shown that after the [+Dist] movement, the Japanese reciprocal is subject to Principle C, whereas the English reciprocal is subject to Principle A and Principle C.

4.7. The reciprocal verbal suffix -aw

In this section, I will discuss the syntactic properties of the reciprocal suffix -aw in Japanese. I will not present a concrete analysis, but will point out the problem involved in analyzing tagai in a sentence with -aw as a resumptive pronoun, as Nishigauchi (1992) claims.

Both tagai and -aw have a reciprocal meaning. It is difficult to tease out their difference in meaning, but tagai sounds better when the antecedent is a QP denoting two individuals.

(55) a. Taroo-to Hanako-ga tagai-o nagu-tta.
    -and   -nom e.o.-acc hit-past
    “Taro and Hanako hit each other.”

b. ? Sanjuu=nin-no otoko-ga baa-de tagai-o nagu-ttei-ta.
    30=cl-gen man-nom bar-at e.o.-acc hit-asp-past
    “Thirty men are hitting each other at the bar.”

Compared with (55a), (55b) with sanjuunin-no otoko (30 men) sounds awkward.

The antecedent of -aw does not have to be a QP denoting two individuals.

    -and   -nom hit-AW-past
    “Taro and Hanako hit each other.”

b. Sanjuu=nin-no otoko-ga baa-de naguri-aw-ttei-ta.
    30=cl-gen man-nom bar-at hit-AW-asp-past
    “Thirty men are hitting each other at the bar.”

Compared with (55b) being a little awkward, (56b) is perfect.
The situation in which (56b) is true can be diagrammed as follows. (I assume that o expresses individual denoting otoko(man). The number of o is reduced for simplification.):

(57)

In other words, (56b) can be true even in a case where Strong Reciprocity does not hold. (56b) is well-formed in a situation where not all the men have to hit any other one.

The reciprocal suffix -aw can be regarded as a valency changing intransitivizing suffix such as passive or causative. Not all verbs can take -aw as a suffix. Generally, only transitive verbs take -aw as a suffix. Intransitive verbs such as ik- (go), kaer- (return) and tuk- (arrive) cannot co-occur with -aw as shown in the following examples.16

    -and -nom school-to go-AW-past
    "*Taroo and Hanako went to school reciprocally."

    -and -nom house-from return-AW-past
    "*Taroo and Hanako returned from their house reciprocally."

    -and -nom station-at arrive-AW-past
    "*Taroo and Hanako arrived at the station reciprocally."

---

16 The following transitive sentence with overt object DP and -aw is well-formed.
(i) Taroo-to Hanako-ga Ziroo-o naguri-aw-tta.
    -and -nom -acc hit-AW-past
    "Taroo and Hanako hit Ziroo alternately."

However, -aw in (i) does not have the reciprocal meaning. In this usage, -aw means "alternately" or "one after another".

17 Exceptionally intransitive verbs found to take -aw are moturer-(entangle), karamar-(entwine):
    red thread-and white thread-nom entangle-AW-asp-pres.
    "A red thread and a white one entangle with each other."

(ii) Akai ito-to siroi ito-ga karami-aw-teir-u.
    red thread-and white thread-nom entwine-AW-asp-pres.
    "A red thread and a white one entwine with each other."
the initials of the three authors) propose the following comparative construction as a test
for transitivity.

(59) Tom despises Mary more than Bill.
    (i) “T despises M more than B despises M.” (subject comparison reading)
    (ii) “T despises M more than T depises B.” (object comparison reading)

The above sentence (59) is ambiguous between the subject comparison reading which
compares the subject’s action and the object comparison reading which compares the
object DP. DMP(1994) argues that the object comparison reading is only available when
the main clause before the comparative phrase (i.e. Tom despises Mary) contains an object
DP. They use this test to show that the reciprocal in Chichewa is an intransitivizing suffix.

I will apply this test to Japanese reciprocals tagaj and -aw. The following sentence
shows that ambiguity in comparative construction also exists in Japanese.

(60) Taroo-ga Ziroo-yori(mo) sono kyoozu-o sonkeisi-teir-u.
    -nom   -than  that professor-acc respect-asp-pres.
    “Taroo respects the professors more than Ziroo.”
    (i) “Taroo respects the professor more than Ziroo respects him.” (subj.c. r.)
    (ii) “Taroo respects the professor more than he respects Ziroo.” (object c. r.)

Now let us apply this test to a sentence with the reciprocal suffix -aw.

(61) [Taroo-to Ziroo]-ga [ Hanako-to Satoko]-yori nikumi-aw-tei-ta.
    -and   -nom    -and  -than hate-AW-asp-past
    “Taroo and Ziroo hated each other more than Hanako and Satoko.”
    (i) “Taroo and Ziroo hated each other more than Hanako and Satoko hated each other.”
    #(ii) “Taroo & Ziroo hated each other more than they hated Hanako & Satoko.”

(61) shows that the sentence with the reciprocal -aw behaves like an intransitive sentence
lacking the object comparison reading.

On the other hand, the argument reciprocal tagaj is ambiguous in the comparative
construction.
(62) [[Taroo-to Ziroo]-ga [ Hanako-to Satoko]-yori (o)tagai-o nikun-dei-ta.
   -and -nom -and -than e.o.-acc hate-asp-past
   “Taroo and Ziroo hated each other more than Hanako and Satoko.”
(i) “Taroo & Ziroo hated each other more than Hanako & Satoko.”
(ii) “Taroo & Ziroo hated each other more than they hated Hanako & Satoko.”

The argument reciprocal tagai can co-occur with -aw.

(63) [Taroo-to Ziroo]-ga tagai-o nikumi-aw-ttei-ta.
   -and -nom e.o.-acc hate-AW-asp-past
   “Taroo and Ziroo hated each other.”

The sentence with both tagai and -aw is ambiguous in the comparative test.

(64) [Taroo-to Ziroo]-ga [ Hanako-to Satoko]-yori (o)tagai-o nikumi-aw-ttei-ta.
   -and -nom -and -than e.o.-acc hate-AW-asp-past
   “Taroo and Ziroo hated each other more than Hanako and Satoko.”
(i) “Taroo & Ziroo hated each other more than Hanako & Satoko hated each other.”
(ii) “Taroo & Ziroo hated each other more than they hated Hanako & Satoko.”

By applying the test with a comparative construction, I showed that -aw counts as a non-argument. It behaves like an intransitivizing suffix. The reciprocal tagai in the object position acts like an object argument. When both tagai and -aw are in the comparative sentence, the sentence shows ambiguity because tagai is in the object argument position.

In the following, I will show that tagai is not a resumptive pronoun as Nishigauchi (1992) claims because it does not save the ill-formed sentences with -aw in some cases.

As discussed in Nishigauchi (1992), -aw is subject-oriented:

(65) *Taroo-ga [ Hanako-to Satoko]-o shookaisi-aw-tta.
   -nom -and -acc introduce-AW-past
   “*Taroo introduced Hanako and Satoko to each other.”

The antecedent of -aw has to be the DP subject in the same clause.

(66) [ Taroo-to Hanako]-ga [[Ziroo-to Satoko]-ga [e]-o nagu-tta] to ii-aw-tta.
   -and -nom -and -nom hit-past cp say-AW-past
   “Taroo and Hanako said to each other that Ziroo & Satoko hit someone.”

In (66), -aw can only refer to the action of [Taroo-to Ziroo] and it does not refer to the action of the embedded subject [Ziroo-to Satoko]. Thus, the interpretation of (66) is
“Taroo and Hanako said to each other that Ziroo and Satoko hit someone”, and not

“Taroo and Hanako said that Ziroo and Satoko hit each other.”

The following sentence is an example of -aw being suffixed to the embedded verb.

    -and    -nom   -and    -nom hit-AW-past cp say-past
    “Taroo and Hanako said that Ziroo & Satoko hit each other.”

In (67a), it is Ziroo and Satoko who engaged in a reciprocal activity, not Taroo and
Hanako. Thus, both (66) and (67a) is unambiguous.

    -and    -nom   -nom    -nom hit-AW-past cp say-past
    “*Taroo and Hanako said that Ziroo hit each other.”

(67b) shows that the suffix -aw on the embedded verb only has a local interpretation of
reciprocity which was blocked by the singular subject Ziroo.

Now let us consider the island violations of -aw.

    -and    -nom   -nom   -nom to send-AW-past paper-acc read-past
    “*Taroo and Hanako read a paper that Ziroo sent to each other .”

In (68), -aw in the relative clause does not have a plural local antecedent. So the sentence
is ill-formed.

The following sentence with the reciprocal tagai in the relative clause is also ill-formed
for the same reason.

    -and    -nom   -nom   e.o. -to send-past paper-acc read-past
    “*Taroo and Hanako read a paper that Ziroo sent to each other .”

Look at the following example with both tagai and -aw.

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18 As expected, -aw can attach to the matrix and embedded verb in the same sentence.
    “Taroo and Hanako said to each other that Ziroo and Satoko hit each other.”
   -and -nom -nom e.o. -to send-AW-past paper-acc read-past
   "*Taro and Hanako read a paper that Ziroo sent to each other."

If tagai can behave like a resumptive pronoun as Nishigauchi says, (70) should improve, but it does not. (70) is still ungrammatical.

Then, let us consider examples with -aw on the matrix verb.

   -and -nom -nom -to send-past paper-acc read-AW-past

(i) "Taro and Hanako read to each other a paper that Ziroo sent them"
(ii) ?*"T read to H a paper that Z sent to T and H read to T a paper that Z sent to H."

I think the broad scope reading (71ii) does not exist for (71).

   -and -nom -nom -to send-past paper-acc read-AW-past

(i) "Taro and Hanako read to each other a paper that Ziroo sent them"
(ii) ?*"T read to H a paper that Z sent to T and H read to T a paper that Z sent to H."

Again, I am not sure about the existence of the broad scope reading of (72).

In this section, the syntactic properties of the verbal suffix -aw were discussed contrasting its non-argument status with the argument reciprocal tagai. I have also shown that the resumptive pronoun-like behavior of tagai is observed only when -aw is suffixed to the matrix verb (and tagai is in the embedded clause). The reciprocal tagai does not save an island violation, contrary to Nishigauchi (1992), when -aw is attached to the embedded verb.

4.8. Case-marked sorezore as a distributive anaphor

In the previous sections, I assumed that reciprocal each other and tagai has [+Dist] feature like binominal and adverbial each. In English and Japanese, reciprocals differ from the binominal and adverbial quantifier in that they occur in Case-marked argument
position.\textsuperscript{19} I analyzed reciprocal each other and tagai as having [+Dist] feature, but not utilizing the DistP position proposed by Begaletti and Stowell. Instead, each other and tagai were subject to Binding Principles. In the following sections, I will introduce another distributive quantifier in Japanese which can be regarded as a case-marked argument and is analyzed as having [+Dist] feature and is subject to Binding Principle. It is called case-marked sorezore. Although morphologically case-marked sorezore looks like other distributive quantifiers binominal and adverbial sorezore, semantically it behaves more like an anaphor in that it has an interpretation that is clausally unbounded. In other words, case-marked sorezore shares more similarity with reciprocals than other distributive quantifiers. That is why it is included in this chapter.

\textbf{4.8.1. Non-locality of Case-marked sorezore}

In this section, it is shown that binominal sorezore and adverbial sorezore are clause-bound, while the case-marked distributive quantifier sorezore is not clause-bound. Case-marked sorezore appears in the argument position with obligatorily overt case-marking. It does not seem to have any counterpart in English.

\begin{quote}
\textbf{(73)} a. [San=nin-no gakusei-ga [sorezore-ga ka-tta] to i-ja tta] koto
three=cl-gen student-nom each-nom win-past cp insist-past fact
"The fact that three students insisted that each (of them) won"

b. [Taroo to Ziroo],-ga [Chomsky-ga sorezore,-o suisensita] to i-ja tta and -nom -nom each-acc recommend-past cp say-past fact
"The fact that Taroo and Ziroo said that Chomsky recommended each (of them)"

\textbf{c.} [Taroo to Ziroo],-ga [sorezore,-no ie-ga utukusii] to i-tta and -nom each-gen house-nom beautiful cp say-past
"Taroo said his house was beautiful and Ziroo said his house was beautiful."\textsuperscript{20}
\end{quote}

\textsuperscript{19} This is not to say that a reciprocal in any language is an argument. A lot of languages have non-argument reciprocals. According to DMP(1994), Chichewa is one such language. Japanese also has a verbal suffix -aw which can be considered as a non-argument.

\textsuperscript{20} Since English lacks the genitive form of each, sentences with the genitive sorezore-no are given non-literal translations in this thesis.
Thus, case-marked sorezore in (73) may take a nominative case-marker -ga as in (73a) or, an accusative case-marker -o as in (73b), or a genitive case-marker -no as in (73c).21 In all the examples in (73) case-marked sorezore takes the antecedent outside the clause. (73b), in particular, shows that the interpretation of case-marked sorezore does not display the Specified Subject Condition effect. That is, case-marked sorezore may take its antecedent across the Specified Subject Chomsky as in (73b). (73b) shows that case-marked sorezore can take its antecedent outside the clause and that its interpretation violates Specified Subject Condition.

The following examples illustrate that case-marked sorezore is marginally acceptable without a preceding antecedent.

21 The precise analysis of case-marked sorezore is beyond the scope of the present paper. Case-marked sorezore exhibits a reconstruction effect with Scrambling just like binominal sorezore.

(i) a. Taroo-to Ziroo-ga sorezore-o seme-ta.
   -and -nom each-acc blame-past
   "Taroo and Ziroo blamed each of themselves."
      each-acc and -nom blame-past
      "Each of themselves, Taroo and Ziroo blamed t."

(ii) a. Taroo-to Ziroo-ga sorezore-no hahaoya-o aisi-teir-u.
    -and -nom each-acc mother-acc love-asp-pres
    "Taroo and Ziroo each love their mother."
       each-gen mother-acc and -nom love-asp-pres
       "Each one's mother, Taroo and Ziroo love t."

Case-marked sorezore may also take an antecedent across the sentence boundary.

(iii) a. Hanako-to Yosiko-wa sorezore inu-o ka-teir-u.
    -and -top each dog-acc keep-asp-pres
    Sorezore-no inu-ga [Taroo-to Ziroo-ni] turete=ik-are-ta.
    each-gen dog-nom -and -by bring-pass-past
    "Hanako and Yosiko each have a dog. Each dog was taken by Taroo and Ziroo."
    b. [Taroo-to Ziroo]-wa nusumi-o hatarai-ta. Keisatu-wa sorezore-o betu-no tokoro-de taihosi-ta.
       -and -top theft-acc do-past police-top each-acc different-gen place-at arrest-past
       "[Taroo and Ziroo], committed a theft. The police arrested each, (of them) at a different place."
(74) a. [(go=nin-no gakusei-ga | sorezore-no ie-ni kae-tta] koto
five=cl-gen student-nom each-gen house-to return-past fact
"the fact that five students returned to each of their houses"

b. ?*[sorezore-no gakusei-ga] ie-ni kae-tta] koto
   each-gen student-nom house-to return-past fact
   "the fact that each student returned home"

(74a) is acceptable because sorezore has an antecedent gonin-no gakusei (five students).
However, (74b) is marginally acceptable without context.

A genitive case-marked sorezore is unacceptable with numeral QP, or any QP. It is also unacceptable with modified DP.

(75) *[Sorezore-no {go=nin-no otoko-ga/ subete-no otoko-ga / Taroo-no inu-ga}]
each-gen five=cl-gen man-nom/ all-gen man-nom / -gen dog-nom
ie-ni kae-tta.
   house-to return-past
   "*Each (five men/all men/ Taroo's dog) returned home."

(75) indicates that case-marked sorezore may be acceptable with only bare common nouns.

Furthermore, case-marked sorezore may take its antecedent outside the clause unboundedly as shown in (76).

(76) a. [Taroo to Ziroo]-ga [sorezore,-no ie-ga utukusii] to i-tta
   and -nom each-gen house-nom beautiful cp say-past
   "Taroo, said his house was beautiful and Ziroo, said his house was beautiful."

b. [Taroo-to Ziroo]-ga [Hanako-to Yosiko]-ga sorezore,-o hihansi-ta to] i-tta.
   -and -nom each-acc criticise-past cp say-past
   (i) "Taroo and Ziroo said that [Hanako and Yosiko] criticized each of themselves." 
   (ii) "[Taroo and Ziroo], said that Hanako and Yosiko criticized each of them."

In (76a), the antecedent of case-marked sorezore is the matrix subject. In (76b), both Taroo-to Ziroo and Hanako-to Yosiko can be the antecedent of case-marked sorezore. One reading of (76b) is (i) in which case-marked sorezore takes Hanako to Yosiko as its antecedent. (76b) also has a reading (ii) in which case-marked sorezore takes Taroo to Ziroo as its antecedent. In other words, case-marked sorezore can take an antecedent
unbounded like the Japanese reflexive zibun.  

On the other hand, both binominal and adverbal sorezore cannot take an antecedent outside the clause.

(78) [Taro-to Ziroo]-ga [cp [Hanako-to Yosiko]-ga sorezore-i-ta i=ssatu-no hon-o ka-tta -and -nom -and -nom each one=cl-gen book-acc buy-past to i-tta.]  
   cp say-past  
   "[Taro and Ziroo], said that [Hanako and Yosiko] bought one book each."  
   (binominal)

Among these three kinds of distributive quantifiers, only adverbal sorezore seems to have subject-orientation. At the present moment, I have no explanation for why this is so. The following examples show that case-marked sorezore does not have subject orientation.

(i) a. Hanako-ga [Taro-to Ziroo-o] sorezore-no heya-ni turete=i-tta. (case-marked)  
   -nom -and -acc each-gen room- to take=past  
   "Hanako brought Taro and Ziroo to each one's room."

   b. Hanako-ga san=nin-no otoko-ni [sorezore-ga baka-da] to i-tta. (case-marked)  
   -nom 3=cl-gen man-dat each-nom fool-cop cp say-past  
   "Hanako said to three men that [each of them is a fool]."

   c. Hanako-ga san=nin-no gakusei-ni [Chomsky-ga sorezore-o suisensi-ta] to i-tta. (case-marked)  
   -nom 3=cl-gen student-dat each-acc recommend-past cp say-past  
   "Hanako said to three students that Chomsky recommended each of them."

   The following examples show that binominal sorezore does not have subject-orientation either, as discussed in the previous section.

(ii) a. Hanako-ga san=nin-no gakusei-ni sorezore ni=ssatu-no hon-o oku-tta. (binominal)  
   -nom 3=cl-gen student-dat each 2=cl-gen book-acc give-past  
   "Hanako gave two books each to three students."

   b. Chomsky-ga go=nin-no gakusei-ni sorezore huta=tu-no ronbun-o kak-ase-ta. (binominal)  
   -nom 5=cl-gen student-dat each 2=cl-gen paper-acc write-cause-past  
   "Chomsky made five students write two papers each."

   The following examples show that adverbal sorezore alone has subject orientation.

(iii) a. "? Hanako-ga san=ssatu-no hon-o sorezore yon-da. (adverbal)  
   -nom 3=cl-gen book-acc each read-past  
   "? Hanako each read three books."

   b. "? Hanako-ga san=nin-no gakusei-o sorezore keisatu-ni uttae-ta. (adverbal)  
   -nom 3=cl-gen student-acc each police-to appeal-past  
   "? Hanako each appealed three students to the police."

   c. "? Chomsky-ga san=nin-no gakusei-ni sorezore hon-o oku-tta. (adverbial)  
      -nom 3=cl-gen student-dat each book-acc gave-past  
     "? Chomsky gave three students each a book."

   Unless the distributive action of the subject is emphasized, the above sentences are really strange.

22
In (78), those who bought one book each cannot be construed as Taroo and Ziroo. They can only be construed as Hanako and Yosiko. Thus, sentences with binominal sorezore cannot take their antecedents outside the clause.

Similarly, adverbial sorezore must have a local antecedent.

(79) [Taroo-to Ziroo]-ga [Hanako-to Yosiko]-ga sorezore-i-tta to
      -and -nom -and -nom each book-acc buy-past cp
      i-tta.]
    say-past
    "[Taroo and Ziroo], said that [ Hanako and Yosiko], bought one book each."
      (adverbial)

The antecedent of adverbial sorezore in (79) is the DP Hanako-to Yosiko. The DP Taroo-to Ziroo in (79) cannot be its antecedent.

Furthermore, case-marked sorezore does not observe any of the Island Constraints.

First, the following example shows that case-marked sorezore does not display the Adjunct Island effect.

(80) Yamada kyoozyu to Tanaka kyoozyu-wa [[ sorezore -ga suisenzyoo-o kake-ba]
      prof. and prof. -top each-nom recommend. letter-acc write-con
      Hanako-ga shuushoku-dekiru ] to omo-tta.23
      -nom get=a=job-can cp think-past
    "Professor Yamada and Professor Tanaka thought that if each (of them) write a letter of recommendation, then Hanako will be able to get a job."

Second, case-marked sorezore does not exhibit the Wh-Island effect as shown as follows:

(81) [ Hanako-to Taroo-ga [ dare-ga sorezore-o suisensita-ka] sira-naka-tta] koto
      -and -nom who-nom each-acc recommend-Q know-neg-past fact
    "the fact that Hanako and Taroo did not know who recommended each (of them)."

Third, case-marked sorezore does not exhibit Complex Noun Phrase Constraint either.

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23 Japanese conditional clauses cannot follow the main clauses, unlike English conditional clauses.

(i) *Hanako-ga shuushoku-dekiru [ Taroo-ga suisenzyoo-o kake-ba ].
      -nom get=a=job-can -nom recommend. letter-acc write-con
    "*Hanako can get a job if Taroo write a letter of recommendation."
(82) a. [Hanako-to Taroo-ga [ sorezore-ga kai-ta] ronbun-o hihansi-ta ] koto
    -and -nom each-nom write-past paper-acc criticize-past fact
    “the fact that Hanako and Taroo criticized the papers that each(0f them) wrote”

b. [Hanako-to Taroo-ga [[ sorezore-ga kai-ta] ronbun-o hihansi-ta] hito-ni a-tta ] koto
    -and -nom each-nom write-pst paper-acc criticize-pst person-dat see-pst fact
    “the fact that Hanako and Taroo met the person who criticized the paper that
each (of them) wrote”

On the other hand, binominal and adverbial sorezore observe these island constraints
because of their clause-boundedness.

The difference in clause-boundedness properties between binominal and adverbial
sorezore, on one hand, and case-marked sorezore, on the other, are summarized in the
following chart.

(83) | binominal | adverbial | case-marked |
    | sorezore | sorezore | sorezore |
    | argument/adjunct distinction | adjunct | Yes | Yes | argument No

In this section, it was shown that the interpretation of binominal and adverbial
sorezore is clause-bound, while case-marked sorezore may take a long-distance antecedent.

In the next section, I will propose a syntactic analysis which explains the difference
from that of arguments and adjuncts.

4.8.2. An Analysis of Case-marked sorezore

In this section, I will propose that the non-locality of case-marked sorezore can be
accounted for by an analysis which does not utilize the DistP projection, but in which the
argument sorezore is subject to the Binding Principles. I speculate that this property of
being subject to the Binding Principles comes from the argument status of case-marked
sorezore.
First, one might think that case-marked sorezore may be analyzed as “distributive each + empty pronoun” (like “each of them”) as its interpretation suggests. However, sentences with case-marked sorezore do not show Principle B effects.

(84) [Taroo-to Hanako]-ga sorezore-o seme-ta.
     -and -nom each.-acc blame-past
     “Taroo and Hanako blamed each of them.” =
     “T blamed T and H blamed H” (distributive case-marked sorezore)

If case-marked sorezore is analyzed as distributive “each + empty pronoun “, one would expect (84) to have a disjoint reading as a result of Principle B, such as “Taroo blamed Hanako and Hanako blamed Taroo”, but (84) does not have such as reading. Only reciprocal sentences would have such a reading. If sorezore is each + empty pronoun, (84) would not have had a reading in which sorezore may take the subject Taroo to Hanako as its antecedent. Thus, I will not take the “each + empty pronoun “ approach and propose the following alternative analysis:

(85) 1) Case-marked sorezore has [+Dist] feature. It adjoins to the antecedent QP to check its [+Dist] feature.
     2) The trace of sorezore marks the Case-checking position.
     3) The trace of sorezore bears the same index as [+Dist].
     5) The movement of [+Dist] is a unbounded movement.

Let us consider the interpretation of case-marked sorezore in a simple sentence. The comparison of its interpretation with that of the reciprocal is given in the following examples:

(84) [Taroo-to Hanako]-ga sorezore-o seme-ta.
     -and -nom each.-acc blame-past
     “Taroo and Hanako blamed each of them.” =
     “T blamed T and H blamed H” (distributive case-marked sorezore)

(86) [Taroo-to Hanako]-ga tagai-o seme-ta.
     -and -nom e.o.-acc blame-past
     “Taroo and Hanako blamed each other.” =
     “T blamed H and H Blamed T.” (reciprocal)
The reciprocal tagai in (86) is not only distributive, but it also requires the subject DP and the object DP to be disjoint in reference. On the other hand, the sentence with case-marked sorezore has only the distributive interpretation. Each member that is denoted by the antecedent does a reflexive action. Thus (84) has a reading in which Taroo blamed himself and Hanako blamed herself. In other words, the sentence with case-marked sorezore lacks the anti-reflexive condition of the reciprocal.

Let us consider how the interpretation of (84) is accounted for by the proposal in (84).

(84′) [[Taroo-to Hanako]1 [sorezore]2]-ga t2 seme-ta.

Case-marked sorezore moves to adjoin to the subject DP [Taroo-to Hanako]. The [+Dist] feature (indexed 2 here) percolates up to the adjoined phrase [[Taroo-to Hanako sorezore]. The trace of sorezore is also indexed 2. The LF representation (84′) obeys the Binding Principle A. It also captures the intuition that each of the denotation of [Taroo to Hanako] is distributed to itself because in (84′) the subject DP and the object DP has the same index 2.

Let us consider the interpretation of case-marked sorezore in a complex sentence:

(87) [[Taroo-to Ziroo]-ga [[ Hanako-to Satoko]-ga sorezore-o seme-ta] to omo-tta] koto -and -nom -and -nom each-acc blame-past cp think-past fact

"the fact that [T and Z]1 thought [H and S]2 blamed each of them1/2"

The sentence (87) is ambiguous. Case-marked sorezore (each of them) can refer to the matrix subject [Taroo to Ziroo] or the embedded subject [Hanako-to Satoko] as its antecedent.

When case-marked sorezore is adjoined to the embedded subject DP, (87) has the following LF representation.

(87′) [[T-to Z]-ga [[H-to S]-[sorezore]-3]-ga t3-o semeta] to omotta.
(87') satisfies Principle A and therefore is well-formed conforming to (85.4). (87') has the interpretation in which sorezore has the embedded subject [Hanako-to Satoko] as its antecedent.

When case-marked sorezore is adjoined to the matrix subject DP, (87) has the following LF representation:


(87'') satisfies Principle C (satisfying 85.4) since the trace of sorezore does not bear the same index as the embedded subject [H-to S]. (87'') gives the reading in which sorezore takes the matrix subject [T to Z] as its antecedent. It has a reading “T thought [H & S] blamed T and Z thought H & S blamed Z.”

Case-marked sorezore differs from the reciprocal tagai in that it does not exhibit Specified Subject Condition effects. Compare the following two examples:

(88) a. *[Taroo-to Ziroo]-ga [Hanako-ga tagai-o seme-ta] to omo-tta. (reciprocal)
    -and -nom -nom e.o.-acc blame-past cp think-past
    “* T and Z thought that H blamed each other.”

    b. [Taroo-to Ziroo]-ga [Hanako-ga sorezore-o seme-ta] to omo-tta. (distributive)
    -and -nom -nom each-acc blame-past cp think-past
    “ T and Z thought H blamed each of them.”

The reciprocal sentence (88a) displays SSC effects, while the sentence with case-marked sorezore (88b) does not. This difference can be accounted for by the way [+Dist] feature-checking is applied. In case of tagai (and each other), it is applied successive cyclicly. The derivation crashes when tagai adjoins to the embedded subject Hanako in (88a).

On the other hand, the sentence in (88b) has two independent derivations. One is the derivation in which case-marked sorezore adjoins to the embedded subject Hanako because Hanako does not have a [+Dis] feature to match with the [+Dist] feature of
sorezore. Thus (88b) does not have an interpretation in which sorezore takes Hanako as its antecedent.

The other derivation is the one in which case-marked sorezore adjoins to the matrix subject [Taroo-to Zirroo]. In this case, the [+Dist] feature is checked off and a well-formed LF-representation is derived.

In this section, I proposed an analysis for case-marked sorezore which does not utilize DistP projection. Furthermore, it does not assume the feature-movement analysis and crucially the indexing convention where the moved element has a trace distinct from the remaining element. Case-marked sorezore and its trace are coindexed. This captures the anaphor-like property of case-marked sorezore.24

4.9. Typology of [+Dist] movement

In this section, I will look at the analyses so far proposed in this thesis for binominal and adverbial quantifiers and the analyses for reciprocals in English and Japanese from the perspective of [+Dist] movement.

For the cases so far considered, there are basically two types of [+Dist] feature movement: one that utilizes DistP projection and one that does not. Those that undergo [+Dist] feature-checking without using DistP are anaphors that are subject to Binding Principles.

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24 Case-marked sorezore may take a long-distance antecedent like the reflexive zibun. It differs from zibun in that it may take non-subject as its antecedent. Thus, case-marked sorezore has less restrictive binding domain than zibun does.
<table>
<thead>
<tr>
<th>(89)</th>
<th>binominal</th>
<th>adverbial</th>
<th>reciprocal</th>
<th>case-marked sorezore</th>
</tr>
</thead>
<tbody>
<tr>
<td>restrictions on trace</td>
<td>[one book t]</td>
<td>None</td>
<td>each other</td>
<td>t must obey Prin. A in simple CP and Prin. C in complex CP.</td>
</tr>
<tr>
<td>moves to ShareP</td>
<td></td>
<td></td>
<td>tagai</td>
<td></td>
</tr>
<tr>
<td>restrictions on the movement</td>
<td>None</td>
<td>None</td>
<td>Successive cyclic application</td>
<td>unbounded</td>
</tr>
<tr>
<td></td>
<td>moves to [Spec, DistP]</td>
<td>moves to [Spec, DistP]</td>
<td>do not use DistP</td>
<td>do not use DistP</td>
</tr>
<tr>
<td>restriction on the antecedent QP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>what has [+Dist]</td>
<td>[[R-NP] each]</td>
<td>each</td>
<td>[[QP] each]</td>
<td>tagai</td>
</tr>
</tbody>
</table>

Both distributive quantifiers and reciprocals have the [+Dist]-feature. All the [+Dist] movement takes place after Case-feature checking because it is a type of phi-feature checking.

The [+Dist] movements of binominal and adverbial distributive quantifiers in both English and Japanese are restricted by utilizing DistP. Thus the clause-boundedness of these quantifiers are derived by the assumptions on B & S’s approach.

The [+Dist] movements of the reciprocals each other and tagai involve not only feature-checking, but are subject to the Binding Principles.

The distributive anaphor, case-marked sorezore is unique to Japanese. It shares with reciprocals the property of being subject to the Binding Principles.

It is tempting to consider that the two types of [+Dist] movement correlate with the categorial status of the quantifiers. For instance, binominal and adverbial quantifiers which uses DistP projection are non-arguments in English and Japanese. They are categorically either adverbs (adverbial each, adverbial sorezore, binominal sorezore) or adjectives (binominal each). While the reciprocals and case-marked sorezore are arguments.
However, this possibility of correlation can only be a speculation. There is a non-argument reciprocal verbal suffix -aw in Japanese which displays local properties. Some languages have reciprocal or reflexives as verbal suffixes. More research of these languages needs to be done to find out if the correlation can be established.

25 Chichewa, according to DMP(1994), has a reciprocal which is an intransitivizing verbal suffix. French se discussed in Sportiche (1994) may also share some properties with these reciprocal suffixes.
References


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