

Crosslinguistic Variations with CSC Effects and Interpretations of Multiple Questions

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1. Introduction

It is a traditional generalization that while overt *wh*-movement exhibits both the ECP and bounding condition effects, *wh*'s-in-situ only exhibit the ECP effects; *wh*-arguments in-situ, which are always properly governed and thus exempt from the ECP, are free of island effects, as shown below (see, among others, Huang 1982):¹

- (1) a. Who likes [books that criticize who]?
- b. Who remembers [why we bought what]?
- c. Who thinks that [pictures of who] are on sale?
- d. Who got jealous [because I talked to who]?

It has been claimed, however, that in English, the coordinate structure constraint (CSC) (2) is operative with *wh*-arguments in-situ as shown in (3):

- (2) The Coordinate Structure Constraint (CSC)
In a coordinate structure, no conjunct may be moved, nor may any element contained in a conjunct be moved out of that conjunct (unless

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1. It should be noted that although overt extraction of a subject exhibits the ECP effects as shown in (i), *wh*-subjects in-situ do not, as shown in (ii) (see, among others, May 1985, Lasnik and Saito 1992, Tiedeman 1990):

- (i) *Who did you wonder why *t* bought the book?
- (ii) a. Who remembers why who bought the books?
- b. Who remembers whether who went to the movies?

(iia, b) are acceptable if the embedded *wh*-subject *who* is paired with the matrix *wh*-subject *who*. In other words, the *wh*-subjects in-situ do not exhibit any ECP effects on the matrix pair-list readings.

the same element is moved out of all the conjuncts).

- (3) a. *Who played [checkers and what]? (adapted from Ross 1967:89)
 b. *I wonder who wrote [which textbook and that novel]. (Bresnan 1975:37)
 c. *Which article [proves your theorem and defends what theory]? (Chomsky 1981:279)
 d. ?Who saw [John and who]? (Pesetsky 1982:611)
 (Fiengo, et. al. 1988:81)

One might argue that the "CSC effects" with *wh*-arguments in-situ like (3) cast doubt on the above traditional generalization. This paper argues, however, that the traditional generalization is on the right track; the CSC is not operative with *wh*-arguments in-situ, and the deviance of (3) should not be attributed to the CSC but to some other factors. Evidence for this view comes from crosslinguistic variations with the "CSC" effects with *wh*-arguments in-situ. Not all languages exhibit the "CSC" effects with *wh*-arguments in-situ; languages like Chinese and Japanese do not exhibit any "CSC" effects, as shown below:

- (4) Chinese
 a. Shei kanjian [Zhangsan he shei]?
 who saw Zhangsan and who
 'Who saw [Zhangsan and who]?'
 b. Na pian wenzhang [zhengming ni de fenxi he piping
 which Cl article prove you DE analysis and criticize
 shei de lilun]?
 who DE theory
 'Which article [proves your theorem and defends what theory]?'
 (5) Japanese
 a. Dare-ga [hon to nani]-o kaimashita ka?
 who-Nom book and what-Acc bought Q
 'Who bought [a book and what]?'
 b. Dare-ga [hon-o yonde nani-o shoomeishimashita] ka?
 who-Nom book-Acc read what-Acc proved Q
 'Who [read the book and proved what]?'
 (6) Who bought what?

In (4, 5), although one of the conjuncts is/contains a *wh*-argument in-situ, the result is acceptable. This crosslinguistic variation with the "CSC" effects cannot be accounted for by the CSC, since if the CSC were operative with *wh*-arguments in-situ, the CSC would constrain Chinese and Japanese *wh*-arguments in-situ, contrary to fact.

This paper proposes an analysis of the hitherto unnoticed crosslinguistic variations with the "CSC effects" based on an interplay between *wh*-in-situ/overt *wh*-movement languages and the "CSC effects." Specifically, it is shown that overt *wh*-movement languages like English, which have only pair-list readings of multiple questions, exhibit the "CSC effects" with *wh*-arguments in-situ, whereas *wh*-in-situ languages like Chinese and Japanese, which have both pair-list and single-pair readings, do not exhibit any "CSC effects." Organization of this paper is as follows. Section 2 explicates an analysis of interpretations of multiple *wh*-questions proposed by Hagstrom (1998) and further developed by Boskovic (2001; 2002). It is shown that Boskovic/Hagstrom's analysis gives an account of crosslinguistic differences with interpretations of multiple questions, *i.e.* while multiple questions in *wh*-in-situ languages have both pair-list and single-pair readings, those in overt *wh*-movement languages have only pair-list readings. Section 3 proposes an analysis of the crosslinguistic variations with the "CSC effects." I will argue that Goodall's (1987) parallel structure analysis of coordination coupled with Boskovic/Hagstrom's analysis of multiple questions enables us to account for the crosslinguistic variations with the "CSC effects." Section 4 investigates the "CSC effects" in French, arguing that they provide further support for our analysis. Section 5 makes concluding remarks.

2. Interpretations of Multiple Questions

Before turning to an analysis of the crosslinguistic variations with the "CSC effects," this section explicates interpretations of multiple questions. This paper adopts Boskovic's (2001) analysis of multiple questions, an extension of Hagstrom's (1998) analysis. Boskovic (2001; 2002) observes that multiple questions in overt *wh*-movement languages like English only have pair-list readings but not single-pair readings, as exemplified by (6) (Boskovic 2001:1):

- (6) Who bought what?

(6) can be answered by an exhaustive pair-list of persons and things they bought, such as the one in (7), but not by a single pair, *i.e.* a person and a thing which that person bought:

- (7) John bought beer, Mary bought milk, and Bill bought apple juice.

Multiple *wh*-questions in *wh*-in-situ languages like Chinese and Japanese, on the other hand, have both pair-list and single-pair readings, as shown in

(8, 9):

- (8) Dare-ga nani-o kaimashita ka?
 who-Nom what-Acc bought Q
 'Who bought what?' (adapted from Boskovic 2001:2)
- (9) Shei mai-le shenme?
 who buy-Perf what
 'Who bought what?'

Boskovic claims that this crosslinguistic difference with interpretations of multiple questions straightforwardly follows from Hagstrom's analysis of multiple questions.

Hagstrom (1998) gives an analysis of interpretations of multiple questions in *wh*-in-situ languages like Chinese and Japanese. He proposes that the semantic type of a multiple question with a pair-list reading and that of a multiple question with a single-pair reading differ. The latter is a set of propositions, which is of type $\langle p, t \rangle$ (where $\langle p \rangle$ is the semantic type of a proposition and $\langle t \rangle$ is the semantic type of a truth value). The semantic type of a single-pair reading, therefore, has the same type as that of a single *wh*-question. The semantic type of a multiple question with a pair-list reading, on the other hand, is a set of questions, *i.e.* a set of sets of propositions, which is of type $\langle \langle p, t \rangle, t \rangle$. This captures the intuition that the pair-list reading is a series of questions, the answers to which are provided in the response. For example, asking (6, 8, 9) under the pair-list reading is like asking *What did John buy? What did Mary buy? What did Bill buy?* Hagstrom assumes that every interrogative clause has a Q-morpheme. The Q-morpheme is an existential quantifier over choice functions, which is of type $\langle \langle c, t \rangle, p \rangle$, a function from a set of choice functions to propositions, where a choice function is defined as (10) (Hagstrom 1998: 130). Note that $\langle c \rangle$ is the abbreviation of $\langle \langle e, t \rangle, e \rangle$, the semantic type of a choice function, and $\langle e \rangle$ is the semantic type of an individual:

(10) Choice Function

A function *f* is a choice function if it applies to a (non-empty) set and yields a member of that set.

The Q-morpheme, an existential quantifier, originates in a clause internal position and then moves to the interrogative C by means of QR. There are two possible base positions of a Q-morpheme, *i.e.* a position adjoined to the lowest *wh*-phrase and a clause-peripheral position. A pair-list reading emerges when a Q-morpheme is adjoined to the lowest *wh*-phrase; only the

lowest *wh*-phrase is within the scope of the Q-morpheme. A single-pair reading emerges, on the other hand, when a Q-morpheme appears in a clause-peripheral position; all the *wh*-phrases (or their copies/traces) are within the scope of the Q-morpheme.

Let us first look at the pair-list reading of a multiple question, taking (8) as an example. Under Hagstrom's analysis, (8) is derived as shown in (11) when it has a pair-list reading:

- (11) a. [[Dare-ga nani-ka-o kaimashita] C
 who-Nom what-Q-Acc bought
 - QR ->
- b. [[Dare-ga nani-*t_i*-o kaimashita] C-ka;
 who-Nom what-*t_i*-Q-Acc bought -Q

In (11), the Q-morpheme *ka*, an existential quantifier over choice functions, is adjoined to the lowest *wh*-phrase *nani* 'what'. Then, it overtly moves to the interrogative C by means of QR, leaving a trace of type $\langle \langle e, t \rangle, e \rangle$, a choice function. The trace of Q, a choice function, takes *nani* 'what' $\langle e, t \rangle$, a set of individuals, as its argument, returning an individual $\langle e \rangle$, as represented below:

- (12)
- ```

 what-ti <e>
 / \
 what, <e, t> ti <<e, t>, e>

```

The chosen individual is in turn taken by the two-place predicate *kaimashita* 'bought'  $\langle e, \langle e, p \rangle \rangle$  as an argument, returning the composite expression *nani-*t<sub>ka</sub>*-o kaimashita* 'bought what', which is of type  $\langle e, p \rangle$ :

- (13)
- ```

      what-ti bought, <e, p>
     /      \
  what-ti <e>  bought, <e, <e, p>>
  
```

This composite expression has to take *dare* 'who' $\langle e, t \rangle$ as its argument. There is a semantic mismatch here, however, since *dare* 'who' is a set of individuals, but the composite expression *nani-*t_{ka}*-o kaimashita* 'bought what' has to take an individual, not a set of individuals, as its argument. This semantic mismatch is repaired by flexible functional application (Hagstrom 1998: 142):

(14) Flexible Functional Application

$[f a] =$ (where f and a are sisters)

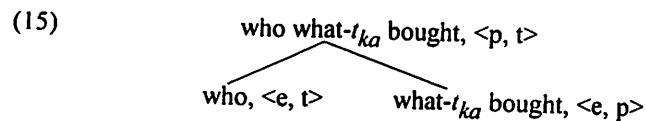
a. $f(a)$

b. $\lambda m \exists x. [m=f(x) \wedge a(x)]$

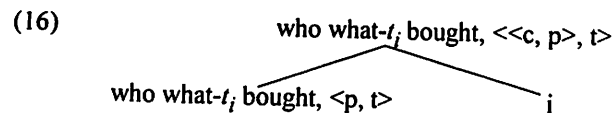
c. $\lambda m \exists g \exists x. [m=g(x) \wedge f(g) \wedge a(x)]$

whichever is defined.

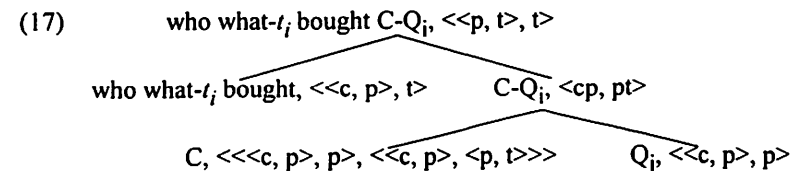
Flexible functional application receives a set of individuals instead of an individual. The repair is done by applying the function to each individual in the set of individuals, with the result collected into a set. This yields a set of propositions, which is of type $\langle p, t \rangle$:



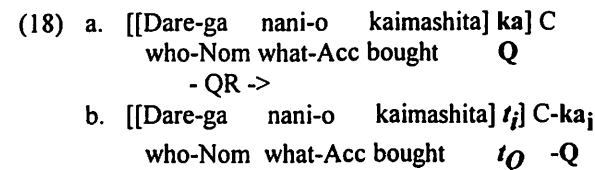
Following Heim and Kratzer (1998), Hagstrom assumes that a movement relation is interpreted as causing λ -abstraction over the scope of the moved constituent, which is represented by treating the index as having its own node in the tree. In (11), movement of the Q-morpheme *ka* is interpreted as causing λ -abstraction over its scope, i.e. *Dare-ga nani-*t_i*-o kaimashita*, which binds the trace of the Q-morpheme, the choice function variable. This yields a set of unsaturated propositions $\langle \langle c, p \rangle, t \rangle$, each of which requires a choice function:



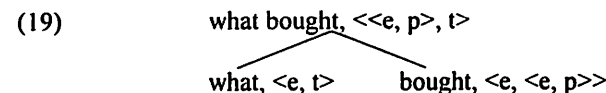
This set is composed with the complex C head $\langle \langle c, p \rangle, \langle p, t \rangle \rangle$, which consists of the Q-morpheme (type $\langle \langle c, p \rangle, p \rangle$) and the interrogative C (type $\langle \langle \langle c, p \rangle, p \rangle, \langle c, p \rangle, \langle p, t \rangle \rangle$). At this stage, we have a semantic mismatch again. The complex C head has to take an unsaturated proposition as an argument and turns it into a set of propositions. Its argument, however, is not an unsaturated proposition, but a set of unsaturated propositions. Flexible functional application repairs this mismatch, applying the function to each unsaturated proposition in the set of unsaturated propositions and yielding a set of sets of propositions, i.e. a set of questions:



Let us next look at the single-pair reading of a multiple question, taking (8) as an example. Under Hagstrom's analysis, (8) is derived as shown in (18) when it has a single-pair reading:



In (18), the Q-morpheme *ka*, an existential quantifier over choice functions, appears in the clause-peripheral position and then moves to the interrogative C. Since not only *nani* 'what' but also *dare* 'who' is contained within the choice function, *dare* 'who', a set of individuals, is reduced to one of its member before it propagates; a single-pair reading emerges. Let us look at an explicit derivation of (8). First, the two-place predicate *kaimashita* 'bought', which is of type $\langle e, \langle e, p \rangle \rangle$, takes *nani* 'what' $\langle e, t \rangle$, a set of individuals, as an argument with help of flexible functional application. The function applies to each individual in the set of individuals, which yields the composite expression *nani-o kaimashita* 'bought what' $\langle \langle e, p \rangle, t \rangle$ which is a set of properties:



Then, the composite expression takes *dare* 'who' $\langle e, t \rangle$, a set of individuals, as an argument. With help of flexible functional application, each property in the set of properties is applied to each individual in the set of individuals, which results in a set of propositions, one for each possible subject with each possible object:

- (20)
- ```

 who what bought, <p, t>
 / | \
 who, <e, t> what bought, <<e, p>, t>

```

Then, this is composed with the trace of the Q-morpheme, which is of type  $\langle\langle e, t \rangle, e \rangle$  (abbreviated as  $\langle c \rangle$ ). The trace of the Q-morpheme, which is a choice function, takes a set of propositions as its argument, returning a proposition with an unbound choice function variable. The trace of Q, a choice function, takes a set of propositions, as its argument, returning a proposition  $\langle p \rangle$ :

- (21)
- ```

      who what bought  $t_i$ , <p>
     /      |      \
  who what bought, <p, t>   $t_i$  <c>
  
```

Due to movement of the Q-morpheme *ka*, λ -abstraction, which binds the trace of the choice function variable, takes place, yielding an unsaturated propositions $\langle c, p \rangle$:

- (22)
- ```

 who what bought t_i , <c, p>
 / | \
 who what bought t_i , <p> i

```

This set is composed with the complex C head  $\langle\langle c, p \rangle, \langle p, t \rangle\rangle$ , which consists of the Q-morpheme and the interrogative C. This yields a set of propositions  $\langle p, t \rangle$ :

- (23)
- ```

      who what bought  $t_i$  Q $_i$ , <p, t>
     /      |      \
  who what bought  $t_i$ , <c, p>  Q $_i$ , <<c, p>, <p, t>>
  
```

Hence, multiple questions in *wh*-in-situ languages have both pair-list and single-pair readings.

Extending Hagstrom's (1998) analysis of multiple questions in *wh*-in-situ languages, Boskovic (2001) proposes an analysis of multiple questions in overt *wh*-movement languages. Let us next look at (6) (repeated here as (24)) as an example:

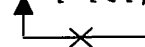
- (24) Who bought what?

Boskovic assumes that languages like English also have a Q-morpheme, though it is not overtly realized. Under his analysis, (24) is assigned either (25) or (26) depending on its interpretation:

- (25) Who [C [t_{who} bought what+Q]]



- (26) Who [C [Q [t_{who} bought what]]]



In both (25) and (26), the *wh*-phrase *who* overtly moves from the subject position to the Spec of C. In (25), the Q-morpheme is adjoined to the lowest *wh*-phrase *what*; this yields a pair-list reading. Note in passing that in overt *wh*-movement languages, the Q-morpheme is assumed to move to the interrogative C by means of QR at LF. In (26), on the other hand, the Q-morpheme appears in the clause-peripheral position. This would yield a single-pair reading. (26) is ruled out, however, since overt *wh*-movement of *who* to the Spec of C crosses the Q-morpheme, which is blocked by Rizzi's (1990) Relativized Minimality (RM) on the assumption that both the *wh*-phrase and the Q-morpheme have *wh*-features and hence the Q-morpheme interferes with *wh*-movement to the Spec of C. Hence, multiple questions in overt *wh*-movement languages have only a pair-list reading but not a single-pair reading.

To summarize this section, it was shown that Boskovic's (2001) analysis of multiple questions, which is an extension of Hagstrom's (1998) analysis, accounts for the crosslinguistic difference with interpretations of multiple questions, *i.e.* while multiple questions in *wh*-in-situ languages have both pair-list and single-pair readings, those in overt *wh*-movement languages have only pair-list readings. The next section argues that the crosslinguistic variations with the "CSC effects" straightforwardly follow if we assume Boskovic/Hagstrom's analysis of multiple questions coupled with Goodall's (1987) parallel structure analysis of coordination.

3. A Proposal

3.1. Parallel Structure Analysis of Coordination

Given this Boskovic/Hagstrom's analysis of multiple questions, let us return to the crosslinguistic variations with the "CSC effects" with *wh*-arguments in-situ. This paper adopts Goodall's (1987) parallel structure analysis of coordination, which claims that coordination is represented as a

union of phrase markers. Goodall assumes Lasnik and Kupin's (1977) theory of reduced phrase markers (RPM's), where phrase markers are represented as sets of strings. Lasnik and Kupin's analysis makes use of the following two universally defined vocabularies, *i.e.* N (a set of non-terminals) and Σ (a set of terminals). N and Σ are represented according to the following conventions (Lasnik and Kupin 1977: 175):

- (27) $a b c \dots$ single terminals (elements of Σ)
 $\dots x y z$ strings of terminals (elements of Σ^*)
 $A B C \dots$ single non-terminals (elements of N)
 $\dots X Y Z$ strings of non-terminals (elements of N^*)
 $\alpha \beta \gamma \dots$ single symbols (elements of $\Sigma \cup N$)
 $\dots \chi \psi \omega$ strings of symbols (elements of $(\Sigma \cup N)^*$)

A reduced phrase marker consists of a set of a string of terminals and monostrings, the latter of which is defined as below (Lasnik and Kupin 1977: 176):

- (28) ϕ is a *monostring* with respect to the sets Σ and N if $\phi \in \Sigma^* \cdot N \cdot \Sigma^*$

A monostring contains one non-terminal surrounded by strings of terminals, and thus enables us to identify a particular non-terminal. Lasnik and Kupin then define the following predicates (where $\phi = xAz$, $\phi \in P$, $\psi \in P$, and P is an arbitrary set) (Lasnik and Kupin 1977: 176-177):

- (29) y is $a^* \phi$ in P if $xyz \in P$
 (30) ϕ dominates ψ in P if $\psi = x\chi z$, $\chi \neq \emptyset$, $\chi \neq A$
 (31) ϕ precedes ψ in P if y is $a^* \phi$ in P and $\psi = xy\chi$, $\chi \neq z$

Based on these predicates, RPM's are defined as follows (Lasnik and Kupin 1977: 177):

- (32) P is an RPM if there exist A and z such that
 $A \in P$ and $z \in P$; and if $\{\psi, \phi\} \subseteq P$,
 either ψ dominates ϕ in P
 or ϕ dominates ψ in P
 or ψ precedes ϕ in P
 or ϕ precedes ψ in P .

According to this definition of RPM's, there are two requirements on RPM's.

First, RPM's must minimally contain a single non-terminal and a string of terminals. Second, every pair in the RPM must satisfy either a dominance or a precedence relation.

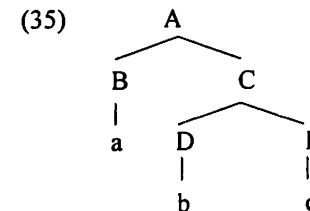
Let us consider the following set as an example (Goodall 1987: 8):

- (33) $\{A, Bbc, aC, aDc, abE, abc\}$

(33) satisfies the above two requirements and thus counts as a RPM. (33) satisfies the first requirement, since it contains a single non-terminal, *i.e.* A , and a string of terminals, *i.e.* abc . (33) also satisfies the second requirement. The pairs in (33) are listed below:

- | | | | | | | |
|------|----|-------|-------|----|-------|-------|
| (34) | a. | A | Bbc | i. | Bbc | abc |
| | b. | A | aC | j. | aC | aDc |
| | c. | A | aDc | k. | aC | abE |
| | d. | A | abE | l. | aC | abc |
| | e. | A | abc | m. | aDc | abE |
| | f. | Bbc | aC | n. | aDc | abc |
| | g. | Bbc | aDc | o. | abE | abc |
| | h. | Bbc | abE | | | |

(34a-e, i-l, n, o) satisfy the dominance relation while (34f-h, m) satisfy the precedence relation. Since (33) satisfies the above two requirements, it counts as a RPM. This RPM can be represented in terms of a tree as shown below:



Hence, this exemplifies objects which are trees as well as RPM's.

There are objects which are neither RPM's nor trees. Let us consider the following set as an example (Goodall 1987: 9):

- (36) $\{Bbc, aC, aDc, abE, abc\}$

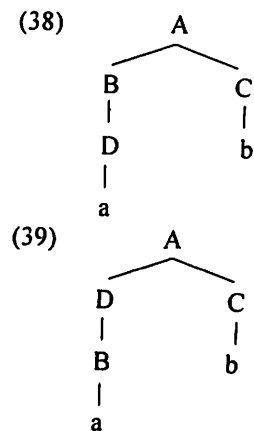
(36) does not qualify as a RPM, since it violates the requirement that it

should contain a single non-terminal. (36) cannot be represented as a tree, either (Goodall 1987: 10):



(37) is not rooted and thus is not a well-formed tree.

There are also objects which are trees but not RPM's. Both (38) and (39) are well-formed trees (Goodall 1987: 11):



In (38), B dominates D, but D does not dominate B. In (39), on the other hand, D dominates B, but B does not dominate D. RPM's cannot express this difference between (38) and (39). Both (38) and (39) are associated with the following RPM (Goodall 1987: 11):

(40) $\{A, Bb, aC, Db, ac\}$

In (40), Bb and Db dominates each other. In other words, there is no RPM where B dominates D but D does not dominate B, or D dominates B but B does not dominate D. Hence, under Lasnik and Kupin's theory of RPM's, there are objects which can be represented only by trees but not by RPM's, but there are no objects which can be represented only by RPM's but not by trees. In other words, the set of RPM's is a proper subset of the set of phrase

markers representable as trees. They argue that RPM's are empirically adequate for linguistic description and thus should be preferred over trees, since RPM's are more restrictive than trees.

Goodall (1987) has revised Lasnik and Kupin's theory of phrase markers, replacing the definition of RPM's (32) with (41) (Goodall 1987: 14):

(41) P is an RPM if there exist A and z such that $A \in P$ and $z \in P$; and if for $\varphi, \varphi \in P, \varphi \in \Sigma^*$, there exists y, such that y is $a^* \varphi$ in P.

The first part of (41) is the same as (32) in that it requires that RPM's should minimally contain a single non-terminal and a string of terminals. The second part of (41) requires that some portion of the terminal string should bear the *is a** relation to each monosting. In other words, a phrase marker is ruled out if there is a non-terminal which does not dominate any part of the terminal string. Thus, according to the revised definition of RPM's (41), each non-terminal node is dominated by the root node and dominates some part of the terminal string. Crucially, the revised definition of RPM's allows phrase markers which contain pairs of nodes for which neither a dominance nor precedence relation holds. These nodes exist in "parallel planes" within the same phrase marker. Such phrase markers are representable only by RPM's but not by trees. It should be noted that the revised definition of RPM (41) maintains the restrictiveness of the original version (32) regarding trees, but it is less restrictive than (32) regarding non-trees.

Goodall argues that evidence for this revised definition of RPM's comes from two domains of data, one of which is coordination. The phrase marker of coordination consists of two or more independently well-formed phrase markers. The phrase marker then contains two or more distinct terminal strings. Such a phrase marker is referred to as the "union of phrase markers," which indicates that the larger set is thought of as the union of two or more smaller sets. Let us consider (42) as an example:

(42) Jane and Alice saw Bill.

Under his analysis, the phrase marker for (42) contains the following two component sentences:

- (43) a. Jane saw Bill.
b. Alice saw Bill.

The phrase marker for (42), which is given in (45), is the same as the union

of phrase markers for (43a) and (43b), which are given in (44a) and (44b) respectively:

- (44) a. {S, NP₁ saw Bill, Jane VP, Jane V Bill, Jane saw NP, Jane saw Bill}
 b. {S, NP₂ saw Bill, Alice VP, Alice V Bill, Alice saw NP, Alice saw Bill}
- (45) {S, NP₁ saw Bill, Jane VP, Jane V Bill, Jane saw NP, Jane saw Bill, S, NP₂ saw Bill, Alice VP, Alice V Bill, Alice saw NP, Alice saw Bill}

Goodall assumes that non-terminals which dominate at least some of the same terminals are non-distinct. Non-terminals which do not share any dominated terminals, on the other hand, are distinct. In (45), the two S nodes are non-distinct. One S node dominates *Jane saw Bill* and the other dominates *Alice saw Bill*. Since the two S nodes both dominate *saw Bill*, they are non-distinct. The two VP nodes, the two V nodes, and the two object NP nodes are also non-distinct, since they dominate *saw Bill*, *saw*, and *Bill*, respectively. The two subject NP nodes, on the other hand, are distinct, since the one dominates *Jane* and the other dominates *Alice*. Since these distinct nodes do not dominate or precede one another, they exist in "parallel planes." The phrase marker for (42) is informally represented in (46), where only precedence relations are displaced:

- (46) Jane > saw Bill.
 Alice

In (46), neither of the conjoined elements *Jane* and *Alice* dominates or precedes the other and exists in "parallel planes," with all the non-conjoined elements, *i.e.* *saw Bill*, being non-distinct. The conjoined elements *Jane* and *Alice* are linearized in the PF component by the "linearization principle" (Goodall 1987: 23):

- (47) Given an RPM containing distinct terminal strings x_1, x_2, \dots, x_n , for each element y_i of x_i , y_i not an element of x_{i+1} , there is an element y_{i+1} of x_{i+1} , y_{i+1} not an element of x_i , such that y_i precedes y_{i+1} .

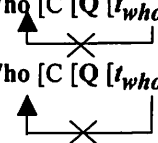
(47) says that when there are two distinct elements from two different strings, one of these must precede the other. In (45), we can take *Jane saw Bill* to be x_1 , and *Alice saw Bill* to be x_2 . Then, *Jane* is y_1 , and *Alice* is y_2 . Hence, *Jane* precedes *Alice*, which yields (42).

3.2. An Analysis of the Crosslinguistic Variations with the "CSC Effects"

Given the parallel structure analysis of coordination, let us consider the crosslinguistic variations with the "CSC effects" regarding *wh*-arguments in-situ. Let us first consider the "CSC effects" with overt *wh*-movement languages, taking (3d) (repeated here as (48)) as an example:

- (48) ?Who saw [John and who]?

Goodall claims that interpretation rules like those concerning the θ -theory and the binding theory apply independently to each of the component sentences. Then, it is plausible to assume that Boskovic/Hagstrom's interpretation rules of multiple questions also apply to each of the component sentences. Recall that under Boskovic/Hagstrom's analysis, the Q-morpheme either gets adjoined to the lowest *wh*-phrase, which results in a pair-list reading, or appears in a clause-peripheral position, which results in a single-pair reading. The latter option yields the following structures:

- (49) a. Who [C [Q [t_{who} saw John]]]?
 b. Who [C [Q [t_{who} saw who]]]?


(49a, b), however, are excluded by the RM, since *who* crosses over Q on its way to Spec-CP. Hence, neither (49a) nor (49b) counts as a component sentence of (48). When the Q-morpheme gets adjoined to the lowest *wh*-phrase, on the other hand, (48) contains the following two structures:

- (50) a. Who+Q [C [t_{who} saw John]]?
 b. Who [C [t_{who} saw who+Q]]?

In (50), the Q-morpheme is adjoined to the lowest *wh*-phrase, *i.e.* the subject *who* in (50a) and the object *who* in (50b). Although (50a) and (50b) receive pair-list readings properly, they cannot count as the component sentences of (48). This is because in (50a, b), the non-conjoined elements, *who+Q C t saw* in (50a) and *who C t saw* in (50b), are not non-distinct. In (50a), *who* has the Q-morpheme attached with it while in (50b), *who* does not have any Q-morpheme attached with it. Hence, there is no way of forming legitimate component sentences of (48); (48) is excluded and thus the "CSC effects" with *wh*-arguments in-situ in overt *wh*-movement languages follow.

Let us next consider the lack of the "CSC effects" with *wh*-arguments in-situ in *wh*-in-situ languages, taking (5a) (repeated here as (51)) as an example:

- (51) Dare-ga [hon to nani]-o kaimashita ka?
 who-Nom book and what-Acc bought Q
 'Who bought [a book and what]?'

Recall that the Q-morpheme *ka* either gets adjoined to the lowest *wh*-phrase or appears in the clause-peripheral position. The former option yields the following structures:

- (52) a. [Dare+*ka*-ga hon-o kaimashita] C
 who-Q-Nom book-Acc bought
 b. [Dare-ga nani+*ka*-o kaimashita] C
 who-Nom what-Q-Acc bought

In (52a, b), the Q-morpheme *ka* is adjoined to the lowest *wh*-phrase, *i.e.* *dare* 'who' in (52a) and *nani* 'what' in (52b). The Q-morpheme *ka* then moves to C, which yields (53):

- (53) a. [Dare+*t_{ka}*-ga hon-o kaimashita] C-*ka*
 who-*t_Q*-Nom book-Acc bought -Q
 b. [Dare-ga nani+*t_{ka}*-o kaimashita] C-*ka*
 who-Nom what-*t_Q*-Acc bought -Q

This would result in a pair-list reading. (53a, b), however, cannot count as the component sentences of (51), since the non-conjoined elements, *dare+t_{ka}-ga kaimashita C-ka* 'who-*t_Q*-Nom bought C-Q' in (53a) and *dare-ga kaimashita C-ka* 'who-Nom bought C-Q' in (53b), are not non-distinct. In (53a), *dare* 'who' has the trace of the Q-morpheme *ka* attached with it while in (53b), *dare* 'who' does not have any Q-morpheme attached with it.

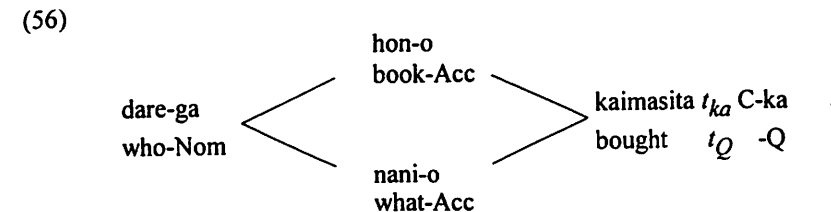
When the Q-morpheme *ka* appears in the clause-peripheral position, on the other hand, (51) contains the following two structures:

- (54) a. [[Dare-ga hon-o kaimashita] *ka*] C
 who-Nom book-Acc bought Q
 b. [[Dare-ga nani-o kaimashita] *ka*] C
 who-Nom what-Acc bought Q

The Q-morpheme *ka* then moves to C, which yields (55):

- (55) a. [[Dare-ga hon-o kaimashita] *t_{ka}*] C-*ka*
 who-Nom book-Acc bought *t_Q* -Q
 b. [[Dare-ga nani-o kaimashita] *t_{ka}*] C-*ka*
 who-Nom what-Acc bought *t_Q* -Q

(55a, b) can count as the component sentences of (51), as informally represented in (56):



In (56), the distinct elements, *i.e.* *hon-o* 'book-Acc' and *nani-o* 'what-Acc', do not dominate or precede one another and exist in "parallel planes," with all the non-conjoined elements, *i.e.* *dare-ga kaimashita t_{ka} C-ka* 'who-Nom bought *t_Q* C-Q' *aw Bill*, being non-distinct. Hence, (51) is acceptable; no "CSC effects" with *wh*-arguments in-situ in *wh*-in-situ languages follow.

To summarize, this section has first explicated Goodall's (1987) parallel structure analysis of coordination. It was then shown that the parallel structure analysis coupled with Boskovic/Hagstrom's analysis of multiple questions enables us to account for the crosslinguistic variations with the "CSC effects" with *wh*-arguments in-situ, *i.e.*, while overt *wh*-movement languages like English, which only allow pair-list readings of multiple questions, exhibit the "CSC effects," *wh*-in-situ languages like Chinese and Japanese, which allow both single-pair and pair-list readings of multiple questions, do not. The next section investigates the "CSC effects" with *wh*-arguments in-situ in French, arguing that it presents further support for our analysis of the "CSC effects."

4. Further Consequences

It has been observed that French can employ either the overt *wh*-movement or in-situ strategy in questions (see, among others, Aoun, Hornstein and Sportiche 1981, Boskovic 1998, Cheng and Rooryck 2000):

- (57) a. Tu as vu qui?
you have seen whom
'Who did you see?'
b. Qui as-tu vu?
whom have-you seen
'Who did you see?'

Boskovic (2001; 2002) observes that in-situ multiple questions like (58a) allow both single-pair and pair-list readings while overt *wh*-movement multiple questions like (58b) only allow pair-list readings (Boskovic 2001: 2):

- (58) a. Il a donné quoi à qui?
he has given what to whom
'What did he give to whom?'
b. Qu'a-t-il donné à qui?
what-has-he given to whom
'What did he give to whom?'

It is noteworthy that there is an interplay between the "CSC effects" with *wh*-arguments in-situ and the overt *wh*-movement/in-situ strategy in questions. As shown in (59a), overt *wh*-movement multiple questions exhibit the "CSC effects." In-situ multiple questions, on the other hand, do not exhibit any "CSC effects," as shown in (59b):

- (59) a. Jean a donné quoi à [Marie et qui] ?
John has given what to [Mary and who]
'What has John given to [Mary and who]?'
b. * Qu'est-ce que Jean a donné à [Marie et qui] ?
what John has given to [Mary and who]
'What has John given to [Mary and who]?'

This hitherto unnoticed asymmetry between the overt *wh*-movement and in-situ strategies with the "CSC effects" straightforwardly follows from the present analysis. (59a) can be accounted for on par with the lack of the "CSC effects" in *wh*-in-situ languages like Chinese and Japanese. (59b), on the other hand, can be accounted for on par with the "CSC effects" in overt *wh*-movement languages like English.

5. Conclusion

This paper has proposed an analysis of the hitherto unnoticed

crosslinguistic variations with the "CSC effects" based on an interplay between *wh*-in-situ/overt *wh*-movement languages and the "CSC effects." It was first shown that overt *wh*-movement languages like English, which have only pair-list readings of multiple questions, exhibit the "CSC effects" with *wh*-arguments in-situ, whereas *wh*-in-situ languages like Chinese and Japanese, which have both pair-list and single-pair readings, do not exhibit any "CSC effects." I have then argued that Goodall's (1987) parallel structure analysis of coordination coupled with Boskovic/Hagstrom's analysis of multiple questions enables us to account for the crosslinguistic variations with the "CSC effects."

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