

Multiple Nominative and Form Sequence: A New Perspective to MERGE and Form Set*

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1 Introduction

Japanese exhibits multiple nominative constructions, as shown in (1) and (2):

(1) Possessive multiple nominative construction (possessive MNC) (Kuno 1973: 70-71)

Bunmeikoku-*ga* dansei-*ga* heikin-zyumyoo-*ga* mizikai.
Civilized.countries-Nom male-Nom average-life.span-Nom short-Pres
'It is in civilized countries that male's average life span is short.'

(2) Adjunct multiple nominative construction (adjunct MNC) (Tateishi 1991: 30, cf. Kuno 1973)

Ano ziko-*ga* takusan-no nihonjin-*ga* sinda.
that accident-Nom many-Gen Japanese-Nom die-Past
'It was in that accident that many Japanese died.'

(1) is an example of the so-called possessive multiple nominative construction (hereafter possessive MNC), where the possessive *ga*-phrase *bunmeikoku-ga* 'civilized countries' is interpreted as a possessor *no* 'of' of the following *ga*-phrase *dansei-ga* 'male' (Kuno 1973), and (2) is an example of the so-called adjunct multiple nominative construction (hereafter adjunct MNC), where the adjunct *ga*-phrase *ano ziko-ga* 'that accident' is interpreted as a postposition *de* 'at' of the following *ga*-phrase *takusan-no nihonjin-ga* 'many Japanese' (Tateishi 1991).¹

In the standard analysis in Japanese generative grammar, all *ga*-phrases in the MNC are analyzed as occupying multiple specifier or adjoined positions in one particular projection, such as Spec-TP or Spec-*v*P, whether it is possessive or adjunct (see Kuno 1973; Saito 1982; 2014; Fukui 1986/1995; Fukui and Speas 1986; Takezawa 1987; Kuroda 1988; Heycock and Lee 1989; Fukuda 1991; Tateishi 1991; Heycock 1993a, b; Ura 1993; Takahashi 1994; Ishii 1997; Namai 1997; Hiraiwa 2001; Vermeulen 2005; Yamada 2013; Narita 2014; Epstein, Kitahara, and Seely 2020). Thus, for example, under the standard analysis, the structure of

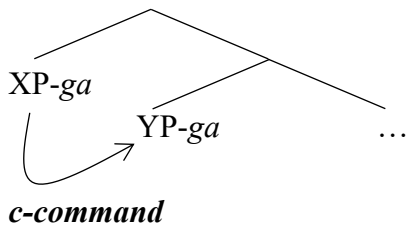
* We would like to thank Yuko Asada, Andreas Blümel, Noam Chomsky, Masayuki Ikeuchi, Norimasa Hayashi, Hisatsugu Kitahara, Andrew McInnerney, Takashi Munakata, Takanori Nakashima, Masashi Nomura, Satoshi Oku, Masayuki Oishi, Jun Omune, Marc Richards, Yosuke Sato, Jae-Young Shim, Yushi Sugimoto, Yoko Sugioka, Kensuke Takita, Shin-ichi Tanigawa, Takashi Toyoshima, and Asako Uchibori for valuable comments and helpful discussion. All remaining errors, are of course, our own. This work is supported by the Japan Society for the Promotion of Science under grant Scientific research C 19K00692.

¹ In the literature, it is reported that MNCs are also observed in languages such as Arabic, Brazilian Portuguese, Korean, Hebrew, etc. For more detailed differences between possessive multiple nominative constructions and adjunct multiple nominative constructions, see Vermeulen (2005) and references cited therein.

the sentence (2) is syntactically represented as follows, where XP represents the adjunct *ga*-phrase (*ano ziko-ga* ‘that accident’) and YP represents the argument-*ga* phrase (*takusan-no nihonjin-ga* ‘many Japanese’):

(3) **Standard analysis of the MNC**

{XP-*ga*, {YP-*ga*, { ...



As is clear from the structure above, an important consequence of the standard analysis is that there is a hierarchical structural relation between the MN phrases, and there is a formal c-command relation between them: XP-*ga* is structurally higher than YP-*ga*, and the former c-commands the latter, but not vice versa. In this paper, we examine in detail the structural relation between the MN phrases, presenting new empirical evidence that there is no formal c-command relation between them, contrary to the prediction of the standard analysis. Based on the evidence, we claim that the MNC be analyzed as a pure sequence, proposing that it is an instance of order-restricted flat-formation operation *Form Sequence*, which Chomsky (2019b/UCLA, 2020/LSJ, 2021b/WCCFL) proposes as one of the true components of Universal Grammar (UG) along with the order-free set-formation operation *MERGE*.

This paper is organized as follows. In Section 2, we will provide novel data showing that there is no formal c-command relation between MN phrases. In Section 3, we will propose to derive the MNC from Form Sequence, and explain the data provided in Section 2 and some peculiar properties of the adjunct MNC, which was previously not well understood. Furthermore, in this section, we will consider why the MNC is not allowed in English, exploring a Determinacy account for the impossibility of the MNC in English and its consequences. We will also scrutinize the properties of Form Sequence through a comparison with MERGE, pointing out that Form Sequence is just one of the possible cases of two general conditions that regulate the “simplest” combinatorial operation MERGE, and confirming that the sequence analysis of MNCs based on Form-Sequence is not ad hoc. Section 4 concludes, with a postscript to the prospect of Form Sequence.

2 Data

To examine in detail the hierarchical structural relation between the MN phrases, we focus on the adjunct MNC, putting aside the possessive MNC, because the word order of the *ga*-phrases in the possessive MNC can be freely altered by scrambling as pointed out by Tateishi (1991: 283). The free word-order property of the possessive MNC is exemplified in (4):

(4) **Possessive MNC (= (1))**

- a. Bunmeikoku-**ga** dansei-**ga** heikin-zyumyoo-**ga** mizikai.
Civilized.countries-Nom male-Nom average-life.span-Nom short-Pres
- b. Bunmeikoku-**ga** heikin-zyumyoo-**ga** dansei-**ga** mizikai.
- c. Dansei-**ga** bunmeikoku-**ga** heikin-zyumyoo-**ga** mizikai.
- d. Dansei-**ga** heikin-zyumyoo-**ga** bunmeikoku-**ga** mizikai.
- e. Heikin-zyumyoo-**ga** bunmeikoku-**ga** dansei-**ga** mizikai.
- f. Heikin-zyumyoo-**ga** dansei-**ga** bunmeikoku-**ga** mizikai.
'It is in civilized countries that male's average life span is short.'

Since the free word-order property in the possessive MNC hinders the verification of the height relation between the MN phrases, this paper will focus on the adjunct MNC.

According to Vermeulen (2005), the adjunct MNC has two interesting properties: (i) an adjunct *ga*-phrase can be replaced with a postposition, but cannot be replaced with a possessor; and (ii) an adjunct *ga*-phrase must precede an argument *ga*-phrase, and if the argument *ga*-phrase precedes the adjunct *ga*-phrase, the sentence becomes unacceptable. Thus, for example, in (5), where *ano mise-ga* 'that shop' is an adjunct *ga*-phrase and *gakusee-ga* 'student(s)' is an argument *ga*-phrase, the adjunct *ga*-phrase can be replaced with the postposition *de* 'at', but it cannot be replaced with *no* 'of' as in (6a), nor can it be preceded by the argument *ga*-phrase as in (6b):²

² Vermeulen (2005) claims that while a possessive MNC permits an indefinitely large number of *ga*-phrases, an adjunct MNC allows a maximum of two *ga*-phrases as shown in (i):

- (i) a. *Siken-mae-**ga** tosyokan-**ga** gakusee-**ga** benkyoo-suru.
exam-before-Nom library-Nom student-Nom study
Lit. 'It is in the library and it is before their exams that student study.'
- b. Siken-mae-**ga** gakusee-**ga** tosyokan-de benkyoo-suru.
exam-before-Nom student-Nom library-in study (Vermeulen 2005: 1331)

Because of this difference, some people may suspect that adjunct MNCs are special and different from general MNCs. However, there are cases where an adjunct multiple nominative construction allows more than two *ga*-phrases as shown in (ii) (Tateishi 1991: 311-2):

- (ii) a. Natu-**ga** kono kooen-**ga** hito-**ga** takusan iru.
summer-Nom this park-Nom people-Nom many be
Lit. 'It is the summer in the park that there are many people.'
- b. Natu-**ga** hokkaidoo-**ga** turu-**ga** takusan iru.
summer-Nom Hokkaido-Nom crane-Nom many be
Lit. 'It is the summer in Hokkaido that there are many cranes.'
- c. Natu-**ga** Fukuoka-**ga** zinzya-**ga** takusan tatteiru
summer-Nom Fukuoka-Nom shrine-Nom many stand
Lit. 'It is the summer in Fukuoka that many shrines are standing.'

Therefore, in this paper, we do not treat the adjunct MNC as a special construction, assuming that the number of *ga*-phrases can in principle appear infinitely in both possessive and adjunct MNCs.

(5) **Adjunct MNC** (Vermeulen 2005: 1330)

Ano mise-**ga** gakusee-**ga** hon-o yoku kau.
that shop-Nom student-Nom book-Acc often buy-Pres
'It is at that shop that students often buy books.'

(6) (Vermeulen 2005: 1351)

- a. Ano mise-**de**/***no** gakusee-**ga** hon-o yoku kau.
that shop-at/Gen student-Nom book-Acc often buy
- b. ***Gakusee-ga** ano mise-**ga** hon-o yoku kau.
student-Nom that shop-Nom book-Acc often buy

Example (5) meets the adjunct MNC properties as in (6), so it can be a genuine instance of adjunct MNCs.

In what follows, based on these properties of the adjunct MNC, we create relevant examples and inspect the structural relation between the MN phrases based on independently motivated syntactic tests, such as the order between *wh*-phrases (WHs) and negative polarity items (NPIs), Principle C of the Binding Theory, and variable binding facts. In the end, it will turn out that there is no hierarchical structural relation between the MN phrases, and there is no formal c-command relation between them, contrary to the prediction of the standard analysis.

2.2 Order of *wh*-phrases and NPIs

Aoyagi and Ishii (1994) make an observation about the order of WHs and NPIs in Japanese, showing that WH must not be c-commanded by NPI. Consider (7):

(7) **The c-command requirement on WH-NPI order** (Aoyagi and Ishii 1994)

a. **WH-NPI**

Dono gakusee-ga kudamono-o ringo-**sika** tabe-na-kat-ta no?
which student-Nom fruit-Acc apple-only eat-Neg-Past. Q
'Among fruits, which students ate only apples?'

b. **NPI-WH**

***Gakusee-ga** John-**sika dono** kudamono-o tabe-na-kat-ta no?
student-Nom John-only which fruit-Acc eat-Neg-Past. Q
'Among students, which fruits did only John eat?'

(7a) is acceptable because the *wh*-phrase *dono gakusee-ga* 'which students' in the subject position is not c-commanded by the NPI-phrase *ringo-sika* 'only apples' in the object position, satisfying the c-command requirement on the WH-NPI order. On the other hand, (7b) is unacceptable because the *wh*-phrase *dono kudamono-o* 'which fruits' in the object position is c-commanded by the NPI-phrase *John-sika* 'only John' in the subject position, violating the c-command requirement on the WH-NPI order.

With this c-command requirement in mind, we examine the structural relation between the MN phrases. To do so, let us first create a relevant example showing the properties of the adjunct MNC. Consider (8):

(8) **Adjunct MNC**

Kono huru-honya-**ga** gakusee-**ga** hon-o yoku kau.
 this secondhand.bookstore-Nom student-Nom book-Acc often buy-Pres
 ‘It is at this secondhand bookstore that students often buy books.’

In (8), *kono huru-honya-ga* ‘this secondhand bookstore’ is an adjunct *ga*-phrase, and *gakusee-ga* ‘student’ is an argument *ga*-phrase. As shown in (9a) and (9b), since the adjunct *ga*-phrase can be replaced with the postposition *de* ‘at’, but it cannot be replaced with *no* ‘of’, nor can it be preceded by the argument *ga*-phrase, (8) is identified as a genuine instance of the adjunct MNCs:

- (9) a. Kono huru-honya-**de/*no** gakusee-**ga** hon-o yoku kau.
 this secondhand.bookstore-at/Gen student-Nom book-Acc often buy-Pres
 b. *Gakusee-**ga** kono huru-honya-**ga** hon-o yoku kau.
 student-Nom this secondhand.bookstore-Nom book-Acc often buy-Pres

Then, to examine the relation between the MN phrases, let us consider the following examples in (10), the variants of (8) containing WHs and NPIs:

(10) **The c-command requirement on WH-NPI order in adjunct MNC**

a. **WH-NPI**

Dono huru-honya-**ga** ano gakusee-**sika** kyaku-**ga** hon-o kaw-ana-i no?
 which secondhand.bookstore-Nom that student-only customer-Nom book-Acc buy-Neg-Pres. Q
 Lit. ‘Which secondhand bookstore, only that student, customers buy books?’

b. **NPI-WH**

Huru-honya-**ga** kono tempo-**sika** **dono** gakusee-**ga** hon-o kaw-ana-i no?
 secondhand.bookstore-Nom this shop-only which student-Nom book-Acc buy-Neg-Pres. Q
 Lit. ‘Secondhand bookstores, only this shop, which students buy books?’

In (10a), the *wh*-phrase *dono huru-honya-ga* ‘which secondhand bookstore’ occupies the adjunct-*ga* position, and the NPI-phrase *ano gakusee-sika* ‘only that student’ occupies the argument-*ga* position, modifying the argument-*ga* phrase *kyaku-ga* ‘customers’. On the other hand, in (10b), the *wh*-phrase *dono gakusee-ga* ‘which student’ occupies the argument-*ga* position, and the NPI-phrase *kono tempo-sika* ‘only this shop’ occupies the adjunct-*ga* position, modifying the adjunct-*ga* phrase *huru-honya-ga* ‘secondhand bookstores’. Note that both sentences are acceptable. Under the standard analysis in (3), where an adjunct-*ga* phrase c-commands an argument-*ga* phrase, the acceptability of (10a) is predicted, since the *wh*-phrase in the adjunct

ga-position c-commands the NPI in the argument *ga*-position. The acceptability of (10b), however, remains a mystery. Since the *wh*-phrase in the argument *ga*-position is c-commanded by the NPI-phrase in the adjunct *ga*-position, the standard analysis predicts that (10b) is unacceptable, for the same reason as (7b), which is contrary to fact.

This observation leads us to expect that the c-command requirement on the WH-NPI order holds in multiple adjuncts, because they are standardly assumed to enter the derivation in the configuration with the structural height as in (3) (cf. Chomsky 1986). The expectation is fulfilled. Consider below:

(11) **The c-command requirement on WH-NPI order in multiple adjuncts**

a. **WH-NPI**

Dono youbi-ni gengogaku-no jugyo-sika gakusee-wa shussekishi-nakat-ta no?
 what day-Dat linguistics-Gen class-only student-Top attend-Neg-Past. Q
 Lit. ‘On what day, only linguistics class, students didn’t attend?’

b. **NPI-WH**

*Mokuyoubi-sika dono jugyo-ni gakusee-wa shussekishi-nakat-ta no?
 Thursday-only which class-Dat student-Top attend-Neg-Past. Q
 Lit. ‘Only Thursday, which class didn’t students attend?’

(11a) is acceptable because the *wh*-phrase *dono youbi-ni* ‘what day’ in the subject position is not c-commanded by the NPI-phrase *gengogaku-no jugyo-sika* ‘only linguistics class’ in the object position, satisfying the c-command requirement on WH-NPI order. On the other hand, (11b) is unacceptable because the *wh*-phrase *dono jugyo-ni* ‘which class’ in the object position is c-commanded by the NPI-phrase *Mokuyoubi-sika* ‘only Thursday’ in the subject position, violating the c-command requirement on the WH-NPI order.

Thus, the contrast between (10) and (11) shows that while there is a c-command relation among multiple adjuncts, there is no formal c-command relation among the MN phrases in the adjunct MNC. In fact, for some speakers, (10b) might not be considered perfectly acceptable, but what is important to us is that there is a clear contrast between (10b) and (11b) in acceptability, and the fact of (10b) is contrary to the prediction of the standard analysis. Under the standard analysis, (10b) should be unacceptable for the same reason as (7b) and (11b).

2.3 Principle C of the Binding Theory

In Japanese, an R(eferring)-expression is subject to Principle C of the binding theory, and cannot be coreferential to any constituent c-commanding it (Chomsky 1981; Whitman 1982; Saito 1983; Hoji 1985 among others). The contrast between (12a) and (12b) shows that R-expression must not be c-commanded by any antecedent:

(12) **Principle C of the Binding Theory** (Chomsky 1981; Whitman 1982; Saito 1983; Hoji 1985, a.o.)

a. ?[**Sono gakusei**_i-no sensei]-ga **soitu**_i-o seme-ta.

that student-Gen teacher-Acc guy-Nom criticize-Past

‘That student_i’s teacher criticized that guy_i.’

b. **Soitu_i-ga* [*sono gakusei_i-no sensei*]-o seme-ta.

guy-Nom that student-Gen teacher-Acc criticize-Past

‘That guy_i criticized that student_i’s teacher.’

(12a) is acceptable because the R-expression *sono gakusei* ‘that student’ within the subject position is not c-commanded by *soitu* ‘that guy’ in the object position; they can be coreferential with each other without violating Principle C of the Binding Theory. On the other hand, (12b) is unacceptable because the R-expression *sono gakusei* ‘that student’ within the object position is c-commanded by *soitu* ‘that guy’ in the subject position; they cannot be coreferential with each other due to a violation of Principle C.

With this c-command requirement in mind, let us consider the following examples in (13), the variants of (8) containing R-expressions, and examine the relation between the MN phrases in the adjunct MNC:

(13) Principle C in adjunct MNC

a. Kono tyoosa-ni-yoruto **sono huru-honya-ga** [**soko_i-o** kiniitteiru gakusee-**ga**] yoku hon-o kau.
 this survey-according.to that secondhand.bookstore-Nom there-Acc like student-Nom often book-Acc buy-Pres
 ‘According to this survey, it is the secondhand bookstore; that students who like that place; often buy books.’

b. ? Kono tyoosa-ni-yoruto **soko_i-ga** [**sono huru-honya_i-o** kiniitteiru gakusee-**ga**] yoku hon-o kau.
 this survey-according.to there-Nom that secondhand.bookstore-Acc like student-Nom often book-Acc buy-Pres
 ‘According to this survey, it is there; that students who like the secondhand bookstore; often buy books.’

In (13a), the R-expression *sono huru-honya* ‘that secondhand bookstore’ occupies the adjunct-*ga* position, while the pronoun *soko* ‘there’ appears within the argument-*ga* position. In (13b), the R-expression *sono huru-honya* ‘that secondhand bookstore’ appears within the argument-*ga* position, while the pronoun *soko* ‘there’ occupies the adjunct-*ga* position. Note that both sentences are acceptable even when they are interpreted as coreferential. Under the standard analysis in (3), where an argument-*ga* phrase is c-commanded by an adjunct-*ga* phrase, the acceptability of (13a) is predicted, but that of (13b) is a mystery. In (13a), since the R-expression *sono huru-honya* ‘that secondhand bookstore’ is not c-commanded by the pronoun *soko* ‘there’, the sentence does not violate Principle C of the Binding Theory, but in (13b) since the R-expression *sono huru-honya* ‘that secondhand bookstore’ is c-commanded by the pronoun *soko* ‘there’, this should be unacceptable as a violation of Principle C, for the same reason as (12b).

Again, as in the case of WH-NPI order, this observation leads us to expect that the Principle C effect holds in multiple adjuncts, as they are standardly assumed to enter the derivation in the configuration with the structural height as in (3). The expectation is fulfilled. Consider below:

(14) Principle C in multiple adjuncts

a. Kono kiroku-ni-yoruto **mokuyoubi_i**, [**sono-hi_i-no** subete-no jugyo-de] gakusee-ga tesuto-o uke-nakat-ta.

this record-according.to Thursday that-day-Gen all-Gen class-in student-Nom test-Acc take-Neg-Past

Lit. ‘According to this record, Thursday_i, in all classes of that day_i, students didn’t take a test.’

b. *Kono kiroku-ni-yoruto sono-hi_i [mokuyoubi_i-no subete-no jugyo-de] gakusee-ga tesuto-o uke-nakat-ta.

this record-according.to that-day Thursday-Gen all-Gen class-in student-Nom test-Acc take-Neg-Past

Lit. ‘According to this record, that day_i, in all classes on Thursday_i, students didn’t take a test.’

In (14a), the R-expression *Mokuyoubi* ‘Thursday’ is not c-commanded by *sono hi* ‘that day’; they can be coreferential without violating Principle C. In (14b), on the other hand, the R-expression *Mokuyoubi* ‘Thursday’ is c-commanded by *sono hi* ‘that day’; they cannot be coreferential due to a violation of Principle C. Thus, the contrast between (13) and (14) also shows that while there is a c-command relation among multiple adjuncts, there is no formal c-command relation among MN phrases in the adjunct MNC. In fact, for some speakers, (13b) might not be considered perfectly acceptable, but what is important to us is that there is a clear contrast between (13b) and (14b) in acceptability, and the fact of (13b) is contrary to the prediction of the standard analysis. Under the standard analysis, (13b) should be unacceptable for the same reason as (12b) and (14b).

Summarizing so far, if there is a hierarchical structural relation between the MN phrases, as in (3), and there is a formal c-command relation between them, (10b) and (13b) should be unacceptable because they violate the c-command requirements on the WH-NPI order and Principle C of the Binding Theory.

3 Analysis

3.1 MNC as an instance of Form Sequence

In the preceding sections, we have observed that there is no hierarchical structural relation between the MN phrases, and, in fact, there is no formal c-command relation between them, contrary to the prediction of the standard analysis. Now the question is what the theoretical apparatus that enables them to enter the derivation. Based on the empirical data above, we propose that the MNC be analyzed as a pure sequence, claiming the MN phrases be introduced into the derivation by *Form Sequence* which Chomsky (2019b/UCLA, 2020/LSJ, 2021b/WCCFL) defines as follows:

(15) Form Sequence

$\langle (&), X_1, \dots, X_n \rangle$

In (15), it is assumed that the presence of the coordinator & is optional, and if it is present, it usually appears before X_n in externalization (EXT). More specifically, according to Chomsky (personal communication), “*Form Sequence produces a pure sequence, yielding a flat structure where there is no formal c-command relation, but there is a strong tendency for a left-to-right counterpart.*” Along with the order-free set-formation operation MERGE, he recently emphasizes the necessity of Form Sequence, an order-restricted flat-formation operation, especially in order to generate unbounded unstructured sequences, such as *I met someone young, happy, eager to go to college, tired of wasting time, ...* (Chomsky 2019b/UCLA: 49), *John, Bill, my*

friends ... ran, danced, took a vacation (Chomsky 2020/LSJ), *John, Mary, the man who lives on the first floor, ...* (Chomsky 2021a: 8), etc. Although the definition of Form Sequence (15) is not uncontroversial, we assume here without discussion that Form Sequence is one of the basic operations in narrow syntax, playing an important role in enabling the MN phrases to enter the derivation.³

Under this proposal, the adjunct MNC is analyzed as having the representation below, where XP represents the adjunct *ga*-phrase and YP represents the argument-*ga* phrase; cf. (3):

(16) **Our analysis**

<XP-*ga*, YP-*ga*, ...>



no c-command relation

An important consequence of the proposed analysis is that XP-*ga* and YP-*ga* form a sequence where there is no formal c-command relation.⁴ Given this, we can easily solve the mystery of the standard analysis pointed out above, providing a principled account for why there seems no formal c-command relation between the MN phrases: in (10a, b) and (13a, b), there is no formal c-command relation between the adjunct-*ga* phrases and the argument-*ga* phrases in the first place, so there is no violation of the c-command requirements imposed on the WH-NPI order and Principle C of the Binding Theory.⁵

³ One of the unclear points in the definition of Form Sequence is that there is a difference in accessibility/extractability with Pair-Merge, even though they use the same operational notation, as in $\langle a, b \rangle$. In Pair-Merge, elements in $\langle a, b \rangle$ cannot be accessed or extracted, while in Form Sequence, elements in $\langle a, b \rangle$ can be. Chomsky (2021b/WCCFL) suggests that the reason why the elements in $\langle a, b \rangle$ formed by Form Sequence can be accessed and extracted is that Form Sequence is applied “after” set-Merge is applied to the elements a and b , forming $\{a, b\}$; this enables us to derive the accessibility/extractability in Form Sequence from the timing of operation. Alternatively, Goto and Ishii (2021) notice that $\langle a, b \rangle$ generated by Pair-Merge can set-theoretically be represented as in $\{a, \{a, b\}\}$ as an instance of hierarchical, asymmetrical, structures (Wiener 1914; Kuratowski 1921), suggesting that the inaccessible/nonextractability property of Pair-Merge can be attributed to a violation of *Determinacy*, which states that operations have to take place in a fixed and determinate manner (Chomsky 2019a: 270). See discussion below for *Determinacy*.

⁴ A similar idea is found in Sorida (2014), though no empirical evidence is presented in that paper.

⁵ One might wonder how our sequence analysis can capture the selectional relation between a nominative phrase and a predicate in the MNC. Let us consider (1) (repeated here as (i)) as an example:

- (i) **Bunmeikoku-ga dansei-ga heikin-zyumyoo-ga mizikai.**
 Civilized.countries-Nom male-Nom average-life.span-Nom short-Pres
 ‘It is in civilized countries that male’s average life span is short.’

In (i), what is short is *heikin-zyumyoo-ga* ‘average-life.span-Nom’ but not *bunmeikoku-ga* ‘civilized countries-Nom’ or *dansei-ga* ‘male-Nom’. In the standard hierarchical analysis, since the rightmost nominative phrase *heikin-zyumyoo-ga* ‘average-life.span-Nom’ forms a syntactic constituent with the predicate *mizikai* ‘short’, this selection fact can be captured. In our Form Sequence analysis, where *heikin-zyumyoo-ga* ‘average-life.span-Nom’ and *mizikai* ‘short’ do not form a syntactic constituent, a question arises how to capture this selection fact. Note in passing that this selection fact also remains unexplained under the hierarchical base generation analysis of the MNC, where the nominative phrases are base generated in their surface positions, since the word order of the *ga*-phrases in the possessive MNC can be freely altered as shown in (4). In (4e) (repeated here as (ii)), for example, what is short is still *heikin-zyumyoo-ga* ‘average-life.span-Nom’, which

3.2 Consequences

Given that the adjunct MNC is a sequence, it is predicted that the MN phrases do not form a syntactic constituent with another element outside of the sequence, and they cannot pass syntactic constituency tests. This prediction is born out. The first evidence comes from coordination facts, as the unacceptability of (17) shows:

(17) **Coordinated adjunct MNC** (Vermeulen 2005: 1356)

*Ano mise-**ga** [totemo ookiku] katu [gakusee-**ga** hon-o yoku kau].
that shop-Nom very big-Pres.Conj and student-Nom book-Acc often buy

Intended: ‘It is that shop which is very big and [it is at that shop that] students often buy books.’

(17) shows that the adjunct *ga*-phrase *ano mise-ga* ‘that shop-Nom’ cannot be followed by the coordinated predicate, where *totemo ookiku* ‘very big’ is coordinated with *gakusee-ga hon-o yoku kau* ‘students often buy books’ by the coordinator *katu* ‘and’. This fact looks curious given that the adjunct *ga*-phrase *ano mise-ga* ‘that shop-Nom’ can be followed by either *totemo ookii* ‘very big’ or *gakusee-ga hon-o yoku kau* ‘students often buy books,’ as in (18):

(18) a. Ano mise-*ga* totemo ookii.

that shop-Nom very big

‘That shop is very big.’

b. Ano mise-**ga** gakusee-**ga** hon-o yoku kau.

that shop-Nom student-Nom book-Acc often buy

‘It is at that shop that students often buy books.’

However, under our sequence analysis, (17) can be explained as follows: the argument *ga*-phrase *gakusee-ga* ‘student-Nom’ forms a sequence with the adjunct *ga*-phrase *ano mise-ga* ‘that shop-Nom’, as in $\langle \textit{ano mise-ga}, \textit{gakusee-ga} \rangle$, and does not form a syntactic constituent with *hon-o yoku kau* ‘often buy books,’ so (17)

does not form a syntactic constituent with *mizikai* ‘short’ in the base generation analysis, not the rightmost nominative phrase *dansei-ga* ‘male-Nom’, which forms a syntactic constituent with *mizikai* ‘short’:

(ii) Heikin-zyumyoo-**ga** bunmeikoku-**ga** dansei-**ga** mizikai.

average-life.span-Nom civilized.countries-Nom male-Nom short-Pres

‘It is in civilized countries that male’s average life span is short.’

We claim that our sequence analysis could capture this selection fact as follows. Let us assume that we can freely choose any nominative phrase within a sequence and associate it with the predicate *mizikai* ‘short’. We then have the following three possibilities: *heikin-zyumyoo-ga mizikai* ‘the average life span is short’, *bunmeikoku-ga mizikai* ‘civilized countries are short’, and *dansei-ga mizikai* ‘the male is short’. Among these three possibilities, only *heikin-zyumyoo-ga mizikai* ‘the average life span is short’ is semantically/pragmatically felicitous, with the other two being infelicitous; the selection fact in the MNC can be captured. We thank Hisatsugu Kitahara and Satoshi Oku for bringing our attention to this issue.

violates the condition that only syntactic constituents can be coordinated.⁶ Under the standard analysis, where *gakusee-ga* would form a constituent with *hon-o yoku kau*, it is not clear why (17) is unacceptable.

Second, it has been known that VP-fronting is possible in Japanese if *su* (*do*-)insertion applies and a focus particle like *sae* ‘even’ attaches to the verb in the fronted VP (Funakoshi 2020). Thus, in the example (19), VP-fronting is possible for the conditions are met:

(19) **VP-fronting**

[_{VP} Gengogaku-no jugyo-de gakusee-ga tesuto-o uke-sae] sensyuu t_{VP} si-nakat-ta.
 linguistics-Gen class-at student-Nom test-Acc take-even last week do-Neg-Past.
 Lit: ‘Last week, at linguistics class, students didn’t even take a test.’

However, note that in the adjunct MNC, even though the conditions are met, the relevant fronting is impossible, as shown in (20):

(20) **VP-fronting in adjunct MNC**

*[Gakusee-**ga** hon-o yoku kai-sae]_i ano mise-**ga** t_i su-ru.
 student-Nom hon-Acc often buy-even that shop-Nom do-Pres.
 Intended: ‘It is at that shop that students often even buy books.’

Under our sequence analysis, (20) can be explained as follows: the argument *ga*-phrase *gakusee-ga* forms a sequence with the adjunct *ga*-phrase *ano mise-ga* ‘that shop-Nom’, as in <*ano mise-ga, gakusee-ga*>, and does not form a syntactic constituent with *hon-o yoku kai-sae* ‘often even buy books’, so (20) violates the condition that movement only applies to a syntactic constituent. Under the standard analysis, where *gakusee-ga* would form a syntactic constituent with *hon-o yoku kai-sae*, it is not clear why (20) is unacceptable.

Another evidence is based on idiom chunk facts.⁷ There are subject idiom chunks which consist of a *ga*-phrase and its predicate in Japanese. In (21), for example, *asi-ga deru* ‘go over the budget’ and *~ga enzyoo suru* ‘be criticized’ have idiomatic readings:

(21) **Idiom chunk in adjunct MNC**

- a. Anime eiga-**wa/de** asi-**ga** deyasui.
 animation movie-Top/in foot-Nom come.out.easily
 ‘The cost of animation movies goes over the budget easily.’
- b. Kono itinen-**wa/de** sono kaisyu-no seihin-**ga** enzyoo sita.
 this one.year-Top/in that company-Gen product-Nom flame.did

⁶ This perspective may shed new light on non-constituent conjuncts such as *conjunction reduction*, *right node raising*, *gapping*, *pseudogapping*, *stripping*, etc. i.e., cases involving ellipsis that gives apparent non-constituent phrases or clauses by applying constituent-deletion. We leave for future research the question of whether and how Form Sequence is involved in these cases.

⁷ We thank Takashi Munakata for bringing our attention to idiom chunk facts.

‘For the last one year, that company's products have been criticized.’

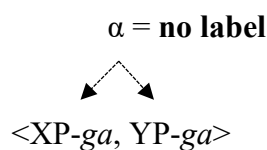
These idiomatic readings, however, disappear in the adjunct MNCs as shown in (22). (22a, b) only have their literal meanings, *i.e.*, the feet of animation movies come out easily and the products of that company have got flamed for the last one year, respectively, which are semantically/pragmatically infelicitous though syntactically well-formed:

- (22) a. *Anime eiga-**ga** asi-**ga** deyasui.
 animation movie-Nom foot-Nom come.out.easily
 Intended: ‘The cost of animation movies goes over the budget easily.’
- b. *Kono itinen-**ga** sono kaisya-no seihin-**ga** enzyoo sita.
 this one.year-Nom that company-Gen product-Nom flame.did
 Intended: ‘For the last one year, that company's products have been criticized.’

Under our sequence analysis, the unavailability of idiomatic readings in (22) can be explained as follows: the argument *ga*-phrases *asi-ga* ‘foot-Nom’ and *sono kaisya-no seihin-ga* ‘that company’s product-Nom’ form a sequence with the adjunct *ga*-phrases *anime eiga-ga* ‘animation movie-Nom’ and *kono itinen-ga* ‘this one.year-Nom’ respectively, as in $\langle anime\ eiga-ga, asi-ga \rangle$ and $\langle kono\ itinen-ga, sono\ kaisya-no\ seihin-ga \rangle$, and do not form a syntactic constituent with *deyasui* ‘come.out.easily’ and *enzyoo suru* ‘flame.do’, so (22) violates the condition that idiom chunks must form a syntactic constituent at some point in a derivation. Under the standard analysis, where *asi-ga* ‘foot-Nom’ and *sono kaisya-no seihin-ga* ‘that company's product-Nom’ would form a syntactic constituent with *deyasui* ‘come.out.easily’ and *enzyoo suru* ‘flame.do’ respectively, it is not clear why (22) do not have idiomatic readings.

Note that our sequence analysis (16) implies that the adjunct MNC that constitutes a sequence has no label, as is clear from the analysis of (20) where the label of VP is not shown. This is theoretically compatible with Chomsky’s (2013, 2015) *Labeling Algorithm* (LA), according to which an XP-YP structure is not labeled, since *LA by Minimal Search* for the XP-YP structure is ambiguous, locating the heads X, Y of XP, YP, respectively. As is clear from the structure (16), repeated below as (23), LA by Minimal Search for the MN-sequence is ambiguous because it is equidistant from α :

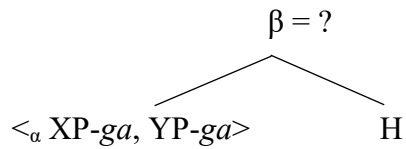
(23) **Minimal Search to the MN-sequence**



In (23), LA by Minimal Search, which is indicated by the dotted lines, locates the heads X, Y of *XP-ga*, *YP-ga*, respectively, so that the syntactic object α (MN-sequence) is not labeled due to the ambiguous Minimal

Search (Chomsky 2013, 2015a).⁸ Chomsky (2013, 2015a) argues that XP-YP structures have no label for the reason just mentioned, but he claims that H-XP-structures have a label of H because LA by Minimal Search can unambiguously locate the head H in the structure. Then is a label assigned when the MN-sequence is further merged with H? Consider (24), where α is merged with H, forming β :

(24) **Minimal Search to the MN-sequence with H**



Suppose $H = v$ (as there are previous studies assuming that MN phrases are merged with Spec- v , see above). If EA- vP cannot have a label (Chomsky 2013), β here should not be assigned a label, either, for the same reason, unless stipulated otherwise. Suppose $H = T$ without ϕ (cf. Saito and Fukui 1998).⁹ If T with “weak” agreement cannot serve as a label (Chomsky 2015a), and T in this case is taken to be such a weak T in the sense that Japanese is an “agreement-less” language, then it follows that β is not assigned a label in this case, either. Suppose $H = T$ with ϕ (INFL in Chomsky 2019/UCLA, 2020/LSJ, 2021/WCCFL). In this case, it might be possible to assume that β is labeled as $\langle \phi, \phi \rangle$ (cf. Chomsky 2013, 2015a). Here too, however, we would like to suggest that β is not assigned a label. This is because the relevant Agree configuration seems to be in a violation of the principle of *Determinacy*, to which we return below after we show an immediate consequence of the unlabelability of the MNC. These considerations lead us to the conclusion that the MNC has no label. Importantly, if the MNC has no label and if labels are required for further computations (Chomsky 2008; Hornstein 2009), it is predicted that MNC cannot appear in an embedded clause.¹⁰ This prediction is in fact borne out by (25), where the adjunct MNC (*ano mise-ga gakusee-ga yoku hon-o kau* ‘it is at that shop that students often buy books;’ see (5) above) is embedded in the *if*-clause, resulting in ungrammaticality (??/* judgements are Vermeulen’s):^{11 12}

⁸ Specifically, XP and YP stand for $\{X, \dots\}$ and $\{Y, \dots\}$, respectively, so XP-YP structure should be represented as $\{\{X, \dots\}, \{Y, \dots\}\}$. Here, we will use the notations XP and YP just for ease of exposition.

⁹ We may be able to interpret this as T having ϕ , but ϕ is inactive.

¹⁰ Note that all the MNCs we have seen above appear in a root clause. This implies that root clauses need not to be labeled (Goto 2012, 2013; Yasui 2014; Blümel 2017; Chomsky, Gallego, and Ott 2019; Miyagawa, Wu, and Koizumi 2019; Blümel and Goto 2020). In fact, this is an immediate consequence of the idea that labels are necessary for further computations in narrow syntax (Chomsky 2007, 2008; Hornstein 2009). To my knowledge, Goto (2013) was the first who noticed the exocentric property of the root clause in terms of LA, suggesting: “given that a label is required for further computations in narrow syntax [...], it follows that a label of the SO at the final stage of the derivation is unnecessary, just because computation terminates there.” (Goto 2013: 56-57) Incidentally, one might point out that the necessity of labeling for further computations is an unnecessary condition on MERGE. However, if we interpret it as not a condition on MERGE but rather on a condition on a representation formed by MERGE, such a worry will be unnecessary. Given that labels would be necessary to meet selectional requirement, it seems to be not so inappropriate to conjecture that a label is necessary for an embedded clause that is further selected by a matrix predicate.

¹¹ There are some speakers who judge (25) as totally acceptable.

¹² Note that multiple adjuncts do not have such a restriction, as shown below:

(25) **Embedded adjunct MNC** (Vermeulen 2005: 1335, fn. 7)

??/* Mosi ano mise-ga gakusee-ga yoku hon-o kau-naraba, Mary-wa John-ni matigatte hokano honya-o suisen-sita.
 if that shop-Nom student-Nom often book-Acc buy-Cond. Mary-Top John-Dat mistakenly other-Gen bookshop-Acc recommended
 ‘If it is at that shop that students often buy books, Mary has mistakenly recommended the wrong shop to John.’

Thus, the observation and analysis above confirm the Form Sequence analysis of the adjunct MNC. The contrasts between (10b) and (11b), between (13b) and (14b), and the unacceptability of (17), (20), (22), (23), and (25) can be explained by assuming that the MNC is a sequence as in (16). If it is analyzed as having the hierarchical structure as in (3), all these facts remain mysterious. The results are summarized in Table 1, where “?” means that it is not clear how the fact can be accounted for, while “✓” means that it can:

Table 1. Summary so far

	Standard hierarchical analysis	Our sequence analysis
WH-NPI order: (10b)	?	✓
Condition C: (13b)	?	✓
Coordinated MNC: (17)	?	✓
VP-fronting in MNC: (20)	?	✓
Idiomatic Readings: (22)	?	✓
Embedded MNC: (25)	?	✓

3.3 *MNC in English and Determinacy*

Let us consider why the MNC is not allowed in English. (26) is the English counterpart of Japanese (1):

(26) *Civilized countries, male, the average lifespan is short.

Given the discussion so far, nothing prevents the application of Form Sequence to generate a sequence as in *<civilized countries, male, the average lifespan>*, and there is nothing wrong with the structure remaining unlabeled as it appears in a root clause (see the discussion above). So we cannot attribute the unacceptability of (26) to the procedures of Form Sequence or LA; it must be attributed to something else.

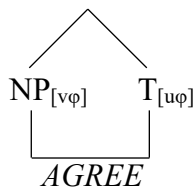
To accommodate the case, therefore, we suggest that Determinacy, which essentially states that rule application must be unambiguous, applies in determining the realization of ϕ -valuation externalization (EXT) (for relevant discussion on Determinacy, see Chomsky 1955/1975, 1964, 1973, 2013, 2019; Chomsky Gallego,

(i) Mosi mokuyoubi subete-no jugyo-de gakusee-ga tesuto-o uke-nakat-ta-naraba, ...
 if Thursday all-Gen class-in student-Nom test-Acc take-Neg-Past-Cond.
 ‘If students didn’t take a test on Thursday, ...’

The difference between (25) and (i) suggests that the adjunct MNC has a different structure from the multiple adjunct construction.

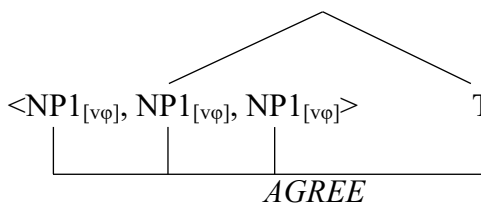
and Ott 2019; Goto and Ishii 2020a, b, c).¹³ Under this proposal, let us compare the typical AGREE configuration (27) and the AFREE configuration in the MNC (28):¹⁴

(27) **Typical AGREE configuration**



- ➔ unambiguous ϕ -valuation
- ➔ satisfying Determinacy

(28) **AGREE configuration in MNC**



- ➔ ambiguous ϕ -valuation
- ➔ violating Determinacy

In (27), T has $u\phi$ and NP has $v\phi$, being a probe and a goal, respectively. Since T c-commands NP, the relevant AGREE relation can be established. Note that in this configuration, when the actual ϕ -valuation takes place, its application is unambiguous: T can be ϕ -valued only by the single NP. Hence in (27), the realization of ϕ -valuation in EXT can take place without violating Determinacy. On the other hand, in (28), T has $u\phi$ and NPs have their own $v\phi$, being a probe and goals, respectively. Since T c-commands all the NPs, the relevant AGREE relations can be established with all the NPs. Note however that in this configuration, when the actual ϕ -valuation takes place, its application is ambiguous: T can be ϕ -valued either by NP1, NP2, or NP3. Hence in (28), the realization of ϕ -valuation process in EXT violates Determinacy.¹⁵ It is very important to notice that Determinacy applies even in Japanese, but In Japanese, there is no need to determine the realization of ϕ -valuation in EXT, so it applies vacuously and no Determinacy violation occurs

¹³ In passing, Chomsky (2021b/WCCFL) and Kitahara and Seely (2021) argue that Determinacy is a consequence of *Resource Restriction* (Fong, Berwick, and Ginsburg 2019) which is defined as follows:

(i) *Resource Restriction (RR)*

Accessibility increases by only one from WS to WS'.

In order to regulate accessibility, Chomsky-Kitahara-Seely assume that not only Minimal Search (MS) but also *Phase Impenetrability Condition* (PIC) play a crucial role. However, Goto and Ishii (2020a, b, c) point out that that approach has a look-ahead property or a redundancy between MS and the PIC regarding accessibility, trying to improve the whole system by minimizing the assumptions as well as maximizing the empirical coverage only by the PIC.

¹⁴ It is standardly assumed that an AGREE operation is necessary in order to deal with agreement phenomena of human languages (Chomsky 2000, 2001, 2004; Hiraiwa 2005; Chomsky, Gallego, and Ott 2019 among others), and the actual ϕ -valuation takes place by AGREE relating unvalued ϕ -features on a probe ($u\phi$) to valued matching ϕ -features of a goal ($v\phi$). The relevant AGREE relation is established when the goal is in the probe's c-command domain.

¹⁵ Based on the assumption that an $\{H, XP\}$ structure, where H a head and XP not a head, can be labeled H (Chomsky 2013), one might point out that the structure in (28) can have the label T, contradicting the argument above that the root does not need a label. So here, following Chomsky (2015), we assume that the TP structure has to be labeled as $\langle\phi, \phi\rangle$ via a Spec-Head Agreement between $T_{[u\phi]}$ and $NP_{[v\phi]}$, and that the "weak" T alone does not label the TP structure (see the discussion above). It follows from this assumption that the structure in (28) cannot have a label of T. Instead, it needs to be labeled as $\langle\phi, \phi\rangle$ via a Spec-Head Agreement with NPs. However, since there are multiple NPs, the structure results in a Determinacy violation.

in the MNC configuration in Japanese.^{16 17}

Above we have argued that multiple NPs are not allowed in English since T's ϕ -valuation realization process results in a Determinacy violation. However, if Form Sequence is one of the universal operations, multiple subjects should in principle be possible to appear around T even in English if they are non-NPs that do not involve ϕ -valuation with T. This expectation is borne out as shown in (29a-c):¹⁸

(29) **Multiple PPs**

- a. [After the meeting] [right at 2pm] works for you.
- b. [before 10 am] [on Saturday] sounds good to me.
- c. [under the stairs] [next to the fridge] is a good place to keep milk.

Note that the claim that the multiple PPs in (29a-c) are really located within the TP is confirmed by the fact that the sentences are still acceptable even when subject-auxiliary inversion takes place in interrogatives, as shown in (30a-c):

(30) **Subject-auxiliary-inversion in multiple PPs**

- a. Does [after the meeting] [right at 2pm] work for you?
- b. How does [before 10 am] [on Saturday] sound to you?
- c. ?Is [under the stairs] [next to the fridge] a good place to keep milk?

There is of course much more we have to consider, but we tentatively suggest here that these cases could be instances of Form Sequence.

3.4 *Sorting out the structure-building operations*

Since Form Sequence is recently formalized by Chomsky, some might concern a theoretical validity of the analysis based on it. In the following, we dispel the uneasiness by showing that Form Sequence is just one of the possible cases of two general conditions that regulate the “simplest” combinatorial operation MERGE.

In the (recent) minimalist framework (Chomsky 2019b/UCLA, 2020/LSJ, 2021b/WCCFL), MERGE is defined as follows:

¹⁶ Note that our analysis is also compatible with Saito and Fukui's (1998) claim that unlike English, Japanese lacks ϕ -features.

¹⁷ For other approaches to explain the difference between Japanese and English with respect to the possibility of the MNC in the recent framework, see also Epstein, Kitahara, and Seely (2020). Note incidentally that we do not exclude the possibility for a single probe to enter into multiple AGREE relations with multiple goals, as indicated in (28) (cf. Hiraiwa 2005). As argued above, the ultimate culprit lies in ϕ -valuation realization process in EXT, not in the AGREE relation-making process itself in syntax.

¹⁸ We thank Andrew McInnerney for the judgements. According to him, there seems to be variation in judgements on sentences such as (i) below involving locative PPs:

- (i) [Under the tree] [next to the trunk] [in front of the hollow] ran Terry.

$$(31) \text{ MERGE}(P, Q, WS) = WS' = \{\{P, Q\}, X_1, \dots, X_n\}$$

MERGE is an operation that maps WS to WS', proceeding in the following three steps: (i) selects P, Q from WS, (ii) forms {P, Q}, and (iii) add {P, Q} to WS'. It is important to note here that Step (i) indicates that MERGE is conditioned by binarity and Step (ii-iii) indicate that MERGE is not conditioned by order.¹⁹ Given the dichotomy between binarity restriction and order restriction, MERGE can be characterized as follows:

$$(32) \text{ MERGE} = [+binary, -order]$$

MERGE yields {P, Q} (order-free two-membered sets), or more precisely, “can yield” thanks to the [+binary, -order] condition. Significantly, the dichotomy allows us to expect other possible combinations. The possible cases are as follows:

- (33) a. [-binary, +order]
 b. [+binary, +order]
 c. [-binary, -order]

Operation (33a) characterized as [-binary, +order] yields <P, Q, R, ...> (order-restricted multi-membered sequences), Operation (33b) characterized as [+binary, +order] <P, Q> (order-restricted two-membered sequence), Operation (33c) characterized as [-binary, -order] {P, Q, R, ...} (order-free multi-membered sets). Recall that these are nothing but the instances yielded by the operations already available: FSQ, Pair-Merge, and “FORMSET FST,” respectively.²⁰ The patterns are summarized in Table 2.^{21 22}

Table 2. Structure-building operations

	MERGE	FSQ	Pair-MERGE	FST
binary	+	-	+	-
order	-	+	+	-
output	{P, Q}	<P, Q, R, ...>	<P, Q>	{P, Q, R, ...}

¹⁹ Chomsky 2021/WCCFL suggests that binarity follows from Resource Restriction RR.

²⁰ Chomsky (personal communication): “Suppose we have operations FORMSET FST and FORMSEQUENCE FSQ (the former universally available). Without further comment, they permit {X,Y} and <X,Y>, two-membered sets and sequences. Merge is a special case of {X,Y}, meeting further conditions. Since <X,Y> is asymmetric, it can be interpreted as adjunction, as in “young man.” That’s an interpretation of a structure already available, not a new operation.” Accordingly, in the following, we will call Form Sequence FSQ.

²¹ Chomsky (personal communication): “Looks quite convincing. I’m not sure it’s necessary to define pair-merge. Perhaps what’s needed is an optional special interpretation of two-membered sequences.”

²² It might be the case that MERGE is “the minimal case” of FST, while Pair-MERGE is “the minimal case” of FSQ. Thanks to Jae-Young Shim for bringing our attention to this interpretation.

What we want to say with this table is that FSQ and FST are by no means theoretically heterogeneous, but rather can just be one of the major structure-building operations characterizable in terms of the two general conditions. In fact, FSQ and FST are “freer” and “simpler” than MERGE and Pair-MERGE in the sense that they are free from binarity restriction. Furthermore, when it comes to FST, it is the “freest” and “simplest” operation among the four conceivable structure-building operations in the sense that it is immune from not only by binarity restriction but also by order restriction. If this is the case, it may be that FST is the most fundamental, general (default) structure-building operation, and other operations such as MERGE, Pair-MERGE, and FSQ can just be “special cases” of FST, meeting (all of or either of) the general conditions. Remarkably, this conclusion seems to be compatible with what Chomsky envisages (see footnote 20, personal communication).^{23 24 25 26}

²³ Although MERGE is generally assumed to be essential in forming asymmetrical hierarchical structures, it is very important to notice that “first” MERGE actually always yields a “flat” non-hierarchical structure such as FSQ does (cf. Oishi 2015). Given this similarity and the universal fact that any derivation starts with a flat structure, it might be possible to speculate that FSQ is a more general and fundamental operation than MERGE in that it is already part of the form of MERGE, playing a vital role in structure-building. If the basic word order between the verb V and its complement O is fixed among languages, and if FSQ is an order-restricted flat-formation operation that can substitute for the first MERGE yielding a flat structure, then it might be possible to eliminate some general algorithm that converts hierarchical relations between V and O into linear relations by attributing to the operational nature of FSQ (cf. Kayne 1994; also Oishi 2015).

²⁴ This particular characterization of the core structure-building operations provides a new perspective on the question of how hierarchical structures arise. Among others, according to Hornstein (2009), it is claimed that hierarchy emerges from labeling. But in our terms, it turns out that it emerges from binarity, and a structure obtained without following binarity is just a sequence produced by FSQ or a set produced by FST. In relation to this, it might be interesting to recall that despite the fact that there are striking similarities between birdsong and human language acquisition (see Miyagawa et al. 2014 and references cited therein), it is reported in the literature that birdsong does not contain the rich hierarchical structure characteristic of human language (Berwick et al. 2011a, b, 2012). For example, it is said that the song of the zebra finch has a limited set of “notes” that combine to form a sequence of syllables, syllables into motifs, and motifs into complete song “bouts”, in which there is no hierarchical structure. This indicates that the most important characteristic that separate birdsong from human language is binarity, and binary-unconstrained FSQ or FST are more primitive operations than binary-constrained MERGE or Pair-MERGE in that the properties that FSQ or FST show are observed in non-human languages as well, suggesting that FSQ and FST are sufficiently evolvable products in nature.

²⁵ Note that all of the four operations do not violate Resource Restriction that bans an increase of accessibility in computation (see footnote 13). In particular, FSQ and FST do not follow binarity and are applied to syntactic objects SOs in WS all at once (*i.e.*, it ends with 1 time application), so there is no derived process that involves an increase of accessibility in the first place. Therefore, both FSQ and FST can be regarded as a legitimate operation.

²⁶ It might be significant to postulate a more basic operation than FST. Let’s call the most basic syntactic operation that just puts SOs in WS into a relation *FORM*, and assume that *FORM* requires *Search* to determine its input, applying to the SOs selected by *Search* and producing an output that is in a set relation or in a sequence relation (for relevant discussion on an involvement of *Search* “before” Merge-application, see Chomsky 2014, 2015b, Goto 2016, and Kato et al 2016). Given this, not only MERGE, Pair-MERGE, FSQ, but also FST can just be “special cases” of *FORM*:

- (i) $WS = [\dots, P, Q, R, \dots]$
- a. $Search(WS: n=2) \rightarrow (P, Q) \leftarrow FORM(P,Q: -order) \rightarrow \{P,Q\}$ (two-membered set) (cf. MERGE)
 - b. $Search(WS: n \geq 2) \rightarrow (P, Q, R) \leftarrow FORM(P,Q, R: +order) \rightarrow \langle P,Q,R \rangle$ (three-membered sequence) (cf. FSQ)
 - c. $Search(WS: n=2) \rightarrow (P, Q) \leftarrow FORM(P,Q: +order) \rightarrow \langle P,Q \rangle$ (two-membered sequence) (cf. Pair-Merge)
 - d. $Search(WS: n \geq 2) \rightarrow (P, Q, R) \leftarrow FORM(P,Q, R: -order) \rightarrow \{P,Q,R\}$ (three-membered set) (cf. FST)

Thus, FSQ is not a new operation and it is just an instantiation of the structure-building operations already available, and hence the FSQ analysis of the MNC can have a certain amount of theoretical validity. Significantly, if FST is also available, it is natural to ask whether there are any empirical data showing that. In the next section, we suggest that the MNC may, in fact, be an instance of FST.

3.5 MNC as an instance of FST

It is well known that in Japanese a pronoun can be interpreted as a bound variable if it is c-commanded by a quantifier phrase QP (see, among others, Hoji 1990, 1995; Nishigauchi 1990; Hoji et al. 2013; Hoji et al. 2000; Ueyama 1998). Consider (34):

(34) Variable binding

a. **Toyota-sae_i-ga soko_i-no sitauke-o hihansihazimeta.**
 Toyota even-Nom its-Gen subsidiary-Acc began.to.criticize.
 ‘Even Toyota_i began to criticize its_i subsidiaries.’

b.*?**Soko_i-no sitauke-ga Toyota-sae_i-o hihansihazimeta.**
 its-Gen subsidiary-Nom Toyota even-Acc began.to.criticize.
 ‘Its_i subsidiaries began to criticize even Toyota_i.’

(Hoji et al. 2013: 107, a.o.)

(35) Variable binding

a. **Dono zidoosya gaisya_i-ga soko_i-no sitauke-o hihansihazimeta no?**
 which automobile company-Nom its-Gen subsidiary-Acc began.to.criticize Q
 ‘Which automobile company_i began to criticize its_i subsidiaries?’

b.*?**Soko_i-no sitauke-ga dono zidoosya gaisya_i-o hihansihazimeta no?**
 its-Gen subsidiary-Nom which automobile company-Acc began.to.criticize Q
 Lit. ‘Which automobile company_i did its_i subsidiaries begin to criticize?’

In (34a) and (35a), since the pronoun *soko* ‘its’ in the object position is c-commanded by the QP *Toyota-sae* ‘even Toyota’ and the *wh*-phrase *dono zidoosya gaisya* ‘which automobile company’ in the subject position respectively, satisfying the c-command requirement on variable binding, it can be interpreted as a bound variable. In (34b) and (35b), on the other hand, since the pronoun within the subject position is not c-

(i) is just a suggestion (among many other possibilities), and, for example, it does not say anything about how they interact. In relation to this, Chomsky (personal communication) says: “FST is a very general operation, the basis for almost anything. It has no further conditions. It is exemplified, though rarely (apart from its minimal case, binary set formation), e.g., in such structures a “John spent his life [on a farm in Iowa near a river...].” Apart from the binary case, FST is a step towards constructing sequences – necessary, because of the extraction possibilities. Merge has to meet the conditions on restricting the search space and language-specific conditions like theta theory.” This implies that there is a kind of fixed rule-ordering among the operations: FST→FSQ (cf. footnote 3). Furthermore, we need to clarify when and how Search is involved in other contexts, such as labeling, accessibility, and Internal MERGE IM. See Goto (2016) for a possibility that labelability of SOs may affect IM-Search, and also see Goto (2019) for a unified theory of IM-Search and Label-Search. We have to leave these important matters for future research.

commanded by the QP or the *wh*-phrase in the object position, violating the c-command requirement on variable binding, it cannot be interpreted as a bound variable.²⁷

With this c-command requirement in mind, we examine the structural relation between the MN phrases. To do so, let us first create a relevant example based on the properties of the adjunct MNC. Let us consider (36):

(36) **Adjunct MNC**

(Kazuaru mondai-no nakademo ...) kankyomondai-**ga** nihon-**ga** yoku hihansareru.
 many problem-Gen among environmental.issue-Nom Japan-Nom often be.criticized
 ‘(Among many problems), it is for environmental issues that Japan is often criticized.’

In (36), where *kankyou mondai-ga* ‘environmental issue(s)’ is an adjunct *ga*-phrase, and *nihon-ga* ‘Japan’ is an argument *ga*-phrase. As shown in (37a) and (37b), since the adjunct *ga*-phrase can be replaced with the postposition *de* ‘at’, but it cannot be replaced with *no* ‘of’, nor can it be preceded by the argument *ga*-phrase, (36) is identified as a genuine instance of the adjunct MNCs:

- (37) a. Kankyomondai-**de**/***no** nihon-**ga** yoku hihan sareru.
 environmental.issue-for/Gen Japan-Nom often be.criticized
 b. *Nihon-**ga** kankyomondai-**ga** yoku hihan sareru.
 Japan-Nom environmental.issue-Nom often be.criticized

Then, to examine the relation between the MN phrases, let us consider the following examples in (38), the variants of (36) containing pronouns that function as variables:

(38) **Variable binding in Adjunct MNC**

- a. **Kankyomondai-sae-ga** [**sorei-ni** mukanshinna nihon-**ga**] yoku hihan sareru.
 environmental.issue-even-Nom it-Dat indifferent Japan-Nom often be.criticized
 Lit. ‘Even environmental issues_i, Japan that is indifferent to them_i is often criticized.’

²⁷ The same pattern holds in multiple adjuncts:

(i) **Variable binding in multiple adjuncts**

- a. **Mainichi_i** [**sono_i** tugi-no hi](-ni) nisshi-o kai-teiru.
 every.day its next-Gen day(-Dat) journal-Acc write-Prog.Pres
 Lit. ‘Every day_i, its_i next day, (I/you/(s)he/they...) keep(s) a journal.’
 b. *[**Sono_i** tugi-no hi](-ni) **mainichi_i** nisshi-o kai-teiru.
 its next-Gen day(-Dat) every.day journal-Acc write-Prog.Pres
 Lit. ‘Its_i next day, every day_i, (I/you/(s)he/they...) keep(s) a journal.’

In (ia), *sono* ‘its’ is c-commanded by *mainichi* ‘every day’, so it can be construed as a bound variable to the antecedent, but in (ib), *sono* ‘its’ is not c-commanded by *mainichi* ‘every day’, so it cannot be construed as a bound variable to the antecedent.

- b. [**Soko**_i-de-no kankyoundai-ga] **nihon-sae**_i-ga yoku hihan sareru.
 there-at-Gen environmental.issue-Nom Japan-even-Nom often be.criticized
 Lit. ‘There_i, environmental issues, even Japan_i is often criticized.’

(39) **Variable Binding in Adjunct MNC**

- a. **Dono** kankyoundai-ga [**sore**_i-ni mukanshinna kuni-ga] yoku hihan sareru no?
 which environmental.issue-Nom it-Dat indifferent country-Nom often be.criticized Q
 Lit. ‘which environmental issue_i, the country that is indifferent to it_i is often criticized?’
- b. [**Soko**_i-no kankyoundai-ga] **dono kuni**_i-ga yoku hihan sareru no?
 there-Gen environmental.issue-Nom which country-Nom often be.criticized Q
 Lit. ‘There_i, environmental issues, which country_i is often criticized?’

In (38a) and (39a), the pronoun *sore* ‘it’ is contained in the argument-*ga* position, and can be interpreted as a variable bound by the QP *kankyoundai-sae* ‘even environmental issue(s)’ and the *wh*-phrase *dono kankyoundai* ‘which environmental issue’ in the adjunct-*ga* position respectively. This fact can be captured by the standard analysis. Under the standard analysis, since the adjunct-*ga* phrase is structurally higher than the argument-*ga* phrase, and the latter is c-commanded by the former, meeting the c-command requirement on variable binding, the pronoun in the argument-*ga* position can be construed as a bound variable. However, note that the acceptability of (38b) and (39b) cannot be captured by the standard analysis. In (38b) and (39b), the pronoun *soko* ‘there’ is contained in the adjunct-*ga* position and not c-commanded by the QP *nihon-sae* ‘even Japan’ or the *wh*-phrase *dono kuni* ‘which country’ in the argument-*ga* position, violating the c-command requirement on variable binding. The standard analysis would wrongly predict that the pronoun in (38b) and (39b) should not be able to function as a bound variable for the same reason as (34b) and (35b).

But it is more important to note that even under the FSQ analysis, neither (38-39a) nor (38-39b) can be explained. Under the FSQ, there is no c-command relation between the MN-sequence, there is no chance to meet or violate the c-command requirement on variable binding in the first place. The variable binding facts suggest that MNC may be an instance of FST. Under FST, (38) and (39) are analyzed as having the representation below; cf. (16):

(40) **FST analysis of (38-39)**

{[...pronoun...]-ga, [...QP...]-ga, ...}


mutual c-command relation

An important consequence of the FST analysis is that the MN phrases form a multi-membered set where there is a mutual c-command relation. Given this, we can solve the problem of the standard analysis and the FSQ analysis pointed out above. In both (38-39a) and (38-39b), since there is a mutual c-command relation between the MN phrases, being able to meet the c-command requirement on variable binding, the pronouns

can be interpreted as bound variables, whether it is in the adjunct-*ga* position or the argument-*ga* position. In fact, if the structural requirement on the WH-NPI order and Principle C of the Binding Theory is based on “asymmetrical” c-command rather than c-command, the WH-NPI order and Principle C facts can also be captured under the FST analysis as follows: since a relation established between the MN phrases in (10a, b) and (13a, b) is a mutual c-command relation but not an asymmetrical c-command relation, there is no room to violate the asymmetrical c-command requirements in the first place. FST yields order-free multi-membered sets, so under the FST analysis, the order restriction property of the adjunct MNC remains to be explained otherwise, but at the same time, it makes it possible to explain the free word-order property of the possessive MNC, repeated here as (41):

(41) **Possessive MNC (= (1))**

- a. Bunmeikoku-**ga** dansei-**ga** heikin-zyumyoo-**ga** mizikai.
Civilized.countries-Nom male-Nom average-life.span-Nom short-Pres
- b. Bunmeikoku-**ga** heikin-zyumyoo-**ga** dansei-**ga** mizikai.
- c. Dansei-**ga** bunmeikoku-**ga** heikin-zyumyoo-**ga** mizikai.
- d. Dansei-**ga** heikin-zyumyoo-**ga** bunmeikoku-**ga** mizikai.
- e. Heikin-zyumyoo-**ga** bunmeikoku-**ga** dansei-**ga** mizikai.
- f. Heikin-zyumyoo-**ga** dansei-**ga** bunmeikoku-**ga** mizikai.

‘It is in civilized countries that male’s average life span is short.’

Under these considerations, all of the Japanese MNCs could be instances FST, whether the adjunct MNC or the possessive MNC.

4 Conclusion

Based on the empirical evidence showing that there is no formal (asymmetric) c-command relation between the MN phrases such as the WH-NPI order, Principle C, and variable binding facts, we have argued that the MNC in Japanese be generated by FSQ or FST, and provided a principled explanation for the facts like the following: (i) the MNC cannot be coordinated, (ii) the MNC bans VP-fronting, (iii) the MNC does not allow an idiomatic reading, and (iv) the MNC cannot be embedded. Furthermore, in English we have argued that the multiple NP subjects are not allowed because the ambiguous T’s ϕ -valuation process results in a Determinacy violation, but the multiple PP subjects are allowed because ambiguous ϕ -valuation situation does not occur. Theoretically, through a comparison with MERGE, we have suggested that FSQ and FST are by no means theoretically heterogeneous, but rather they may be one of the major syntactic operations. We believe that the empirical and theoretical findings in this paper introduces a breath of fresh air into the long-standing tradition in the investigation of the MNC in Japanese, and can enhance the potential of the new structure-building operation FSQ and FST.

Let us conclude this paper with a brief postscript to the prospect of FSQ and FST. In the past, research on Generative Grammar has paid particular attention to hierarchical structures, and in particular, Minimalist

Program has often made full use of MERGE and Pair-MERGE to derive them. However, if flat structures are also a kind of observable linguistic expressions that human language is capable of producing, language research that makes full use of FSQ and FST may become more popular in the near future. In fact, before entering the Minimalist Program, there were several studies advocating flat structure analysis, but especially after the “X’ theory” was proposed, it seems that the theoretical possibilities of these studies were not pursued in depth due to the strong faith in the “binary Merge-only hypothesis”. However, now that FSQ and FST are being established theoretically, it may be that we don’t have to be so obsessed with just binary Merge anymore, and it may be worthwhile to re-examine the previous studies that proposed flat structure analysis (see Chomsky 1957, Neeleman, Tanaka, and van de Koot 2021 for coordination, Hale 1983 for non-configurational languages, Chomsky 1981 for double object constructions, Rudin 1986 for multiple WH-fronting languages, etc.). As evidenced in Section 3.4, given that MERGE is a special case of FST, we may now be at an important turning point from “MERGE-based Minimalist Program” to “FST-based Minimalist Program”. FST may become an important bridge between the past and the future.

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