Does scrambling in Japanese obey the Coordinate Structure Constraint?

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1 Introduction

In this paper, I demonstrate that scrambling in Japanese cannot be said to obey the Coordinate Structure Constraint (CSC), and argue that this fact favors the linearization-based theory of scrambling (Yatabe (1996)) over the standard, movement-based theory of scrambling (Harada (1977); Saito (1985)).

2 Three observations

I will begin by making three observations.

2.1 Observation 1

The examples in (1) and (2), which are both only slightly unnatural, show that the initial conjunct of a coordinate structure can be scrambled out of that coordinate structure.

(1)?[Kyôdai to] kanojo ga [Tôdai to] o
[Kyoto U. and] she NOM [Tokyo U. and] ACC
kurabeteru tte, shitteta? <6, 12, 8, 3>
is comparing that did you know
'Did you know that she is comparing Kyoto University and Tokyo University?'

(2)?[Kyôdai to] kanojo wa [Tôdai to] o
[Kyoto U. and] she TOP [Tokyo U. and] ACC
kurabete iru n da. <6, 16, 6, 1>
is comparing
'She is comparing Kyoto University and Tokyo University.'

The figures immediately following these examples and some of the examples below show the result of questionnaire surveys that I conducted in 2003. The notation $<m, n, o, p>$ means that, of the $m + n + o + p$ native speakers consulted, m people said the example was perfect, n people said it was slightly unnatural, o people said it was considerably unnatural, and p people said it was impossible. Each sentence was given 3 points for each speaker who said it was perfect, 2 points for each speaker who said it was slightly unnatural, and 1 point for each speaker who said it was considerably unnatural, and is shown here with no diacritic if it got more than 2.0 points on average, with '?' if it got 2.0 or less but more than 1.5 points on average, with '??' if it got 1.5 or less but more than 1.0 points on average, with '?*' if it got 1.0 or less but more than 0.5 points on average, and with '*' if it got 0.5 or less points. As indicated above, the status of sentences like (1) and (2) is radically different from that of an English sentence like **Who$_i$ does she always praise [t_i and John]?*, which involves extraction of the first conjunct and is completely ungrammatical.

(1) and (2) should be contrasted with examples like (3) and (4).

(3)?[Kyôdai to] kanojo ga Tôdai o
[Kyoto U. and/with] she NOM Tokyo U. ACC
kurabeteru tte, shitteta? <4, 13, 8, 4>
is comparing that did you know
'Did you know that she is comparing Kyoto University and/with Tokyo University?'

(4)?[Kyôdai to] kanojo wa Tôdai o
[Kyoto U. and/with] she TOP Tokyo U. ACC
kurabete iru n da. <8, 11, 7, 3>
is comparing
'She is comparing Kyoto University and/with Tokyo University.'

As the glosses indicate, (3) and (4) are arguably structurally ambiguous; the phrase *Kyôdai to* in these examples can be construed not only as a conjunct but also as a complement of the verb *kurabete(ru)*. On the other hand, (1) and (2) can only be analyzed as involving scrambling of a conjunct out of a coordinate structure; (1) cannot be anything but a scrambled version of the sentence *Kanojo ga* [[[*Kyôdai to*] [*Tôdai to*]] *o*] *kurabeteru tte, shitteta?*, and (2) cannot be anything but a scrambled version of *Kanojo wa* [[[*Kyôdai to*] [*Tôdai to*]] *o*] *kurabete iru n da.*

2.2 Observation 2

Examples like (5) show that a non-initial conjunct of a coordinate structure cannot be scrambled out of that coordinate structure.

(5)*[Tôdai] kanojo ga [Kyôdai to] o
[Tokyo U.] she NOM [Kyoto U. and] ACC
kurabeteru tte, shitteta?
is comparing that did you know

This example is intended to be a scrambled version of the sentence *Kanojo ga* [[[*Kyôdai to*] [*Tôdai*]] *o*] *kurabeteru tte, shitteta?*, and it is completely unacceptable.

2.3 Observation 3

The unacceptability of the following example indicates that a part of a conjunct cannot be scrambled out of that conjunct.

(6)*[Tanaka no] kore wa [saisho no hon to] [Suzuki no saigo no hon] da.
[Tanaka GEN] these TOP [first GEN book and] [Suzuki GEN last GEN book] is
'These are Tanaka's first book and Suzuki's last book.'

This is meant to be a scrambled version of *Kore wa* [[*Tanaka no*] *saisho no hon to*] [*Suzuki no saigo no hon*] *da*, and it is unacceptable, in contrast to a sentence like *Tanaka no kore wa saisho no hon da* 'This is Tanaka's first book', in which the genitive phrase *Tanaka no* is scrambled out of an NP but not out of a conjunct.

3 The CSC and the movement-based theory of scrambling

These three observations do not make sense in the standard, movement-based theory of scrambling. Observations 2 and 3 indicate that scrambling in Japanese is subject to the CSC, whereas Observation 1 shows that it is not. There does not seem to be a plausible way round this contradictory situation, as long as we adhere to the movement-based theory of scrambling.

It has been claimed by Harada (1977) and Tsujimura (1996) that scrambling in Japanese does obey the CSC as predicted by the movement-based theory; but their arguments for this claim are flawed.

Harada (1977) claims that the unacceptability of (7) shows that scrambling in Japanese respects the CSC. This example is intended to be a scrambled version of *Tarô ga okurimono o* [[*Hanako to Yoshiko*] *kara*] *moratta*, and is unacceptable.

(7)*Tarô ga [Hanako to] okurimono o Yoshiko kara moratta.
Tarô NOM [Hanako and] gift ACC Yoshiko from received
'Tarô received gifts from Hanako and Yoshiko.'

However, the low acceptability of this example could be due to the fact that the long-distance-scrambled phrase in this example (i.e. *Hanako to*) has been scrambled over a string that does not contain a grammatical subject (i.e. the string *okurimono o*). The acceptability of a sentence generally degrades when something is long-distance-scrambled over a string that does not contain a grammatical subject; this is illustrated by the low acceptability of the following example, taken from Saito (1985, p. 267, fn. 34). (Here I am using the term *long-distance scrambling* to refer to reordering of phrases that are not co-dependents of the same head.)

(8) ??John ga [sono hon o] minna ni [Mary ga motte iru to] itta. (koto)
John NOM [that book ACC] all DAT [Mary NOM has COMP] said (fact)
'(the fact that) John told everyone that Mary has that book'

This interpretation of the low acceptability of (7) receives support from the fact that, as shown in (9), it *is* possible to scramble the conjunct *Hanako to* out of the coordinate structure in a sentence like (7), as long as the string that it is scrambled over contains a grammatical subject.

(9)?[Hanako to] Tarô wa Yoshiko kara okurimono o moratta.
[Hanako and] Tarô TOP Yoshiko from gift ACC received
'Tarô received gifts from Hanako and Yoshiko.'

Tsujimura (1996, p. 207) argues that the unacceptability of the sentences in (10) and (11) shows that scrambling in Japanese obeys the CSC. (10) and (11) are meant to be scrambled versions of *Taro ga* [[*sushi to sashimi*] *o*] *tabeta*.

(10)*Sushi Taro ga to sashimi o tabeta.
sushi Taro NOM and sashimi ACC ate
'Taro ate sashimi and sushi.'

(11)*Sashimi o Taro ga sushi to tabeta.
sashimi ACC Taro NOM sushi and ate
'Taro ate sushi and sashimi.'

The unacceptability of these sentences do not invalidate the claims that I made in Section 2, either. The unacceptability of (10) can be interpreted as a consequence of the fact that what has been scrambled in this example (i.e. *sushi*) is in fact a part of the conjunct *sushi o* (see Observation 3). Likewise, the unacceptability of (11) can be seen as a consequence of the fact that what has been scrambled in this example is not the initial conjunct (see Observation 2).

Thus, the three observations in Section 2 pose a genuine problem for the movement-based theory of scrambling.

4 A linearization-based solution

On the other hand, the three observations above receive a natural explanation in the linearization-based theory of long-distance scrambling, proposed in Yatabe (1996). I will first explain the intuitive basis of the theory, and then go on to describe its details.

At the heart of the linearization-based theory of long-distance scrambling is the view that there is a theoretically significant parallelism between long-distance scrambling in a language like Japanese and extraposition in a language like English (see Yatabe (1993; 2001b) as well as Yatabe (1996)). This view is corroborated by the fact that extraposition in English is allowed to violate the CSC as in (12), just like long-distance scrambling in Japanese.

(12)?She was comparing Kyoto University today and Tokyo University. <0, 1, 0, 0>

(12) is a result of extraposing the conjunct *and Tokyo University* in the sentence *She was comparing Kyoto University and Tokyo University today*, and it is only slightly unnatural. The parallelism between (12) and

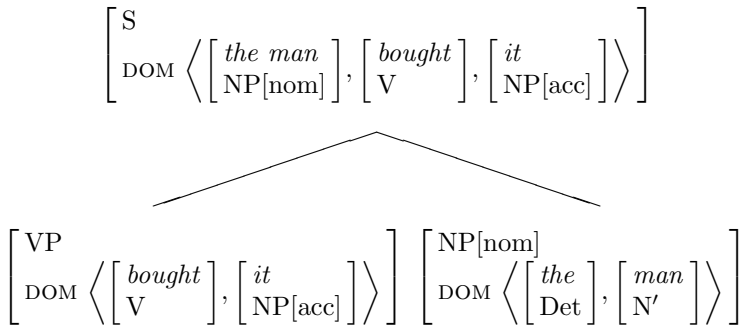

Figure 1: Total compaction of an NP

(1) lends plausibility to the linearization-based theory.

Since the theory of long-distance scrambling proposed in Yatabe (1996) builds on Kathol and Pollard's (1995) theory of extraposition, I will start by sketching Kathol and Pollard's theory.

In Kathol and Pollard's theory, the portion of a syntactic structure that determines grammatical dependency relations is represented by means of an unordered tree, that is, a tree with no specifications as to the ordering of its constituents. The information as to the linear order between the constituents is contained in what are called *order domains*, each of which is associated with a node in the unordered tree. An order domain is a list of *domain objects*, and is given as the value of the DOM feature. A domain object is very much like a sign; unlike a sign, however, it does not carry any information as to its internal morphosyntactic structure.

Let me take a concrete example. Figure 1 shows part of the structure assigned to the English sentence *The man bought it*. What is shown in this figure is an unordered tree. There is actually no linear precedence relation between the VP node and the NP node; I placed the VP node to the left of the subject NP node in order to underscore the insignificance of the apparent linear order between the two. The order domain (i.e. the DOM value) of the VP node consists of two domain objects, one that is pronounced *bought*, and the other one that is pronounced *it*. The order between these two domain objects *is* significant; it indicates that this VP is to be pronounced *bought it*, rather than *it bought*. Likewise, the order domain of the NP node tells us that this NP is to be pronounced *the man*, and the order domain of the S node tells us that the S node is to be pronounced *The man bought it*.

Let us take a closer look and see how the order domain of the S node is related to the order domains of the NP node and the VP node in Figure 1. The two domain objects in the order domain of the VP node are both integrated, unaltered, into the order domain of the S node. Notice that the domain object that is pronounced *bought* precedes the domain object that is pronounced *it* in the order domain of the S as well as in the order domain of the VP. This is a consequence of the constraint given in (13) (see Kathol (1995)).

(13) The Persistence Constraint:
Any ordering relation that holds between domain objects α and β in one order domain must also hold between α and β in all other order domains that α and β are members of.

Next, let us see how the order domain of the NP is related to the order domain of the S in Figure 1. The order domain of the NP node contains two domain objects, but this NP node contributes to the order domain of the S node only one domain object, which is pronounced *the man*. What is at work here is an operation called *total compaction*. (14) illustrates the way the total compaction operation takes a sign and turns it into a single domain object.

(14) Total compaction:

$$\left[\begin{array}{l}\alpha_0 \\ \text{DOM}\ \left\langle \left[\begin{array}{l}\beta_1 \\ \alpha_1\end{array}\right], \ldots, \left[\begin{array}{l}\beta_n \\ \alpha_n\end{array}\right] \right\rangle\end{array}\right] \Rightarrow \left[\begin{array}{l}\beta_1 \circ \cdots \circ \beta_n \\ \alpha_0\end{array}\right]$$

What is shown on the left of the arrow is the input to the operation; the input is a sign. The first line of a sign ("α_0" in this case) indicates its syntactic category; the second line ("DOM ...") shows what its order domain looks like. On the right of the arrow is shown the output of the operation; the output is a domain object. The first line of a domain object ("$\beta_1 \circ \cdots \circ \beta_n$" in this case) is a string that shows how it is pronounced. (The small circle is an operator that concatenates strings.) The second line of a domain object ("α_0" in this case) indicates its syntactic category.

In Figure 1, the subject NP is totally compacted and produces a single domain object, which is pronounced *the man*. This resultant domain object is then placed in the order domain of the S.

The order between the domain object that comes from the subject NP and the domain objects that come from the VP is determined by a linear precedence statement that states that a V must follow its subject in English. Although domain objects coming from two or more daughter nodes can be stringed together in any order as long as they do not violate any constraints explicitly stated in the grammar, the order between the three domain objects is completely determined in this case, due to the Persistence Constraint and the linear

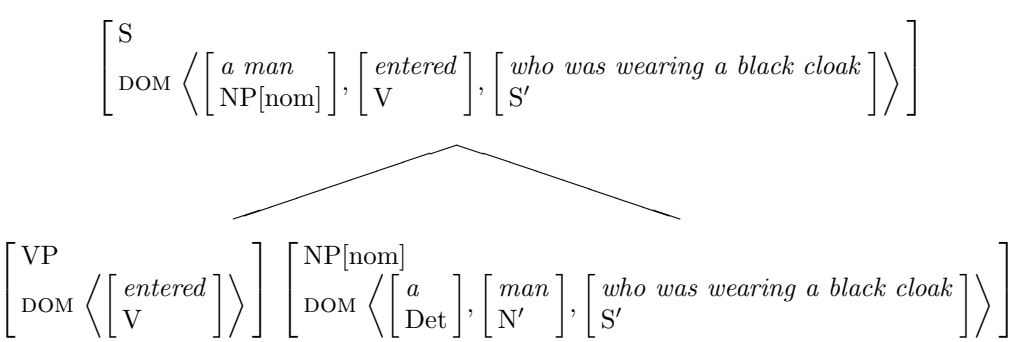

Figure 2: Partial compaction of an NP

precedence statement concerning subject NPs.

So far, we have seen two processes whereby the order domain of a given node can be integrated into that of its mother. First, a node can be totally compacted. Second, a node may undergo no compaction whatsoever. Henceforth I am going to describe the latter situation by saying that the node in question has been *liberated*. The VP in Figure 1 has been liberated.

Now, there is a third process allowed by the theory: a given node can be *partially compacted*. Partial compaction takes a sign and turns it into one or more domain objects, as opposed to total compaction, which always produces a single domain object. (As will become clear shortly, total compaction can be seen as a special case of partial compaction.) (15) and (16) illustrate the way the partial compaction operation takes a sign and turns it into one or more domain objects, which are to be placed in the order domain of the mother of that sign; again, the first line is the input and the second line is the output.

(15) Partial compaction (for head-first languages):

$$\left[\begin{array}{l}\alpha_0 \\ \textsc{dom}\ \left\langle \left[\begin{array}{l}\beta_1 \\ \alpha_1\end{array}\right], \ldots, \left[\begin{array}{l}\beta_n \\ \alpha_n\end{array}\right] \right\rangle\end{array}\right] \Rightarrow$$

$$\left[\begin{array}{l}\beta_1 \circ \cdots \circ \beta_i \\ \alpha_0\end{array}\right], \left[\begin{array}{l}\beta_{i+1} \\ \alpha_{i+1}\end{array}\right], \ldots, \left[\begin{array}{l}\beta_n \\ \alpha_n\end{array}\right]$$

$(1 \leq i \leq n)$

(16) Partial compaction (for head-last languages):

$$\left[\begin{array}{l}\alpha_0 \\ \textsc{dom}\ \left\langle \left[\begin{array}{l}\beta_1 \\ \alpha_1\end{array}\right], \ldots, \left[\begin{array}{l}\beta_n \\ \alpha_n\end{array}\right] \right\rangle\end{array}\right] \Rightarrow$$

$$\left[\begin{array}{l}\beta_1 \\ \alpha_1\end{array}\right], \ldots, \left[\begin{array}{l}\beta_{i-1} \\ \alpha_{i-1}\end{array}\right], \left[\begin{array}{l}\beta_i \circ \cdots \circ \beta_n \\ \alpha_0\end{array}\right]$$

$(1 \leq i \leq n)$

In (15), the DOM value of the sign that is fed to the operation as the input has n domain objects in it. Of those domain objects, the first (i.e. leftmost) i domain objects are bundled together and turned into a single domain object, while the remaining domain objects, if any, are left out of the bundle and continue to be separate domain objects. (16) is a mirror image of (15); of the n domain objects in the input, the last (i.e. the rightmost) $n - i + 1$ domain objects are bundled together and turned into a single domain object, whereas the remaining domain objects, if any, are left out of the bundle and continue to be separate domain objects.

Various types of extraposition constructions result when an expression is partially compacted and surfaces as a discontinuous constituent. Figure 2 shows how the English extraposition construction can be generated via partial compaction. Here, the subject NP has been partially compacted. The relative clause has been left out of the bundle and appears in the sentence-final position. What puts the relative clause in this particular position is an English-particular linear precedence statement, which I will not formulate in this paper.

I assume that the compaction operation is applied in accordance with the constraints given in (17) (see Yatabe (2001a)).

(17) a. In a head-complement structure whose head is verbal, the head is liberated and the non-head is partially compacted.
b. In a head-adjunct structure whose head is verbal, the head and the adjunct are both partially compacted.
c. In a head-marker structure, the head and the marker are both liberated.
d. In a coordinate structure, each of the conjuncts is totally compacted.

I also assume that complementizers and case particles are markers and thus subject to (17c) in Japanese.

Sentences involving long-distance scrambling are automatically generated, unless we posit in the grammar of Japanese a linear precedence statement that specifically prohibits long-distance scrambling. In what follows, I assume, for the sake of simplicity, that Japanese syntax has only two linear precedence statements: one that requires heads to follow their dependents (i.e. complements and adjuncts), and another one that requires markers to follow what they mark. Figure 3 shows how sentence (18) is generated in this theory.

(18) [Ano mura ni] Ken wa Naomi ga sunde iru
[that village DAT] Ken TOP Naomi NOM lives
to omotte iru. <14, 14, 1, 0>
COMP thinks
'Ken thinks that Naomi lives in that village.'

At the bottom of the unordered tree shown in Figure 3, we have a head-marker structure with a VP functioning as a head and a complementizer functioning as a

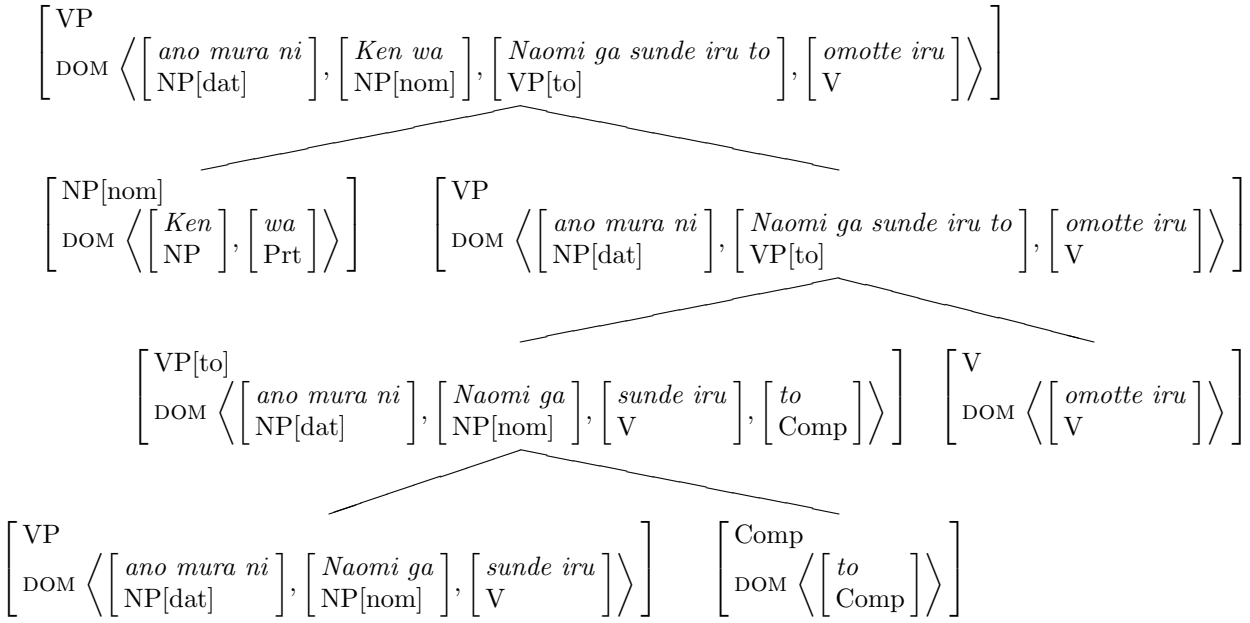

Figure 3: Long-distance scrambling via partial compaction

marker. (Note that what I call a VP here is in fact a complete clause; I am using the term *VP* to refer to all phrases in Japanese that are headed by a verb.) The VP and the complementizer are both liberated, and the order domain of the VP[to] ends up containing four domain objects. When this VP[to] then combines with the V *omotte iru* to produce a VP, the V is liberated while the VP[to] is partially compacted; the first element in the order domain of the VP[to] escapes the compaction and continues to be a separate domain object. The topmost local subtree in the figure is a head-complement structure that combines this VP and a subject NP. The VP is liberated, and the subject NP is partially (in fact totally) compacted. The domain object that comes from the subject is allowed to be anywhere in the order domain of the topmost VP, as long as it does not follow the domain object corresponding to the V *omotte iru*. Hence it is perfectly legitimate for that domain object to be immediately preceded by the domain object corresponding to the phrase *ano mura ni*, which is syntactically a part of the embedded clause.

We are now in a position to examine whether and how the linearization-based theory of scrambling can cope with the types of facts that pose a problem for the movement-based theory. It turns out that the three observations we made in Section 2 all conform to the predictions of the linearization-based theory.

Figure 4 shows how the proposed analysis generates the embedded clause in example (1) and thus correctly captures the fact that a conjunct can be scrambled (Observation 1). Note that the overall structure of this figure is almost identical to that of Figure 3. The accusative NP (NP[acc]), which corresponds to the VP[to] in Figure 3, has an order domain containing three domain objects: two domain objects that are produced when each conjunct undergoes total compaction in accordance with (17d), and another domain object corresponding to the case particle *o*. This accusative NP undergoes partial compaction when it is combined with the verb *kurabeteru*; at this point, the domain object corresponding to the first conjunct escapes compaction and continues to be a separate domain object. In the order domain associated with the top VP node, the domain object that comes from the nominative NP is allowed to show up anywhere, as long as it does not follow the domain object corresponding to the verb. Therefore it is allowed to show up immediately after the domain object corresponding to the first conjunct *Kyôdai to*, thus giving rise to a sentence in which a conjunct has been scrambled.

The fact that a non-initial conjunct cannot be scrambled (Observation 2) is a consequence of the Persistence Constraint, given in (13), which entails, roughly speaking, that a string α can be scrambled out of an expression β only if α constitutes the left periphery of β. Likewise, the fact that a part of a conjunct cannot be scrambled out of that conjunct (Observation 3) is a consequence of (17d), which requires that each conjunct should be totally compacted; when a phrase α undergoes total compaction, it becomes impossible for expressions contained in α to be detached from α.

Thus, the observations we made in Section 2 are all correctly predicted by the linearization-based theory.

5 The status of island constraints

As has been noted by Harada (1977) and Saito (1985), scrambling in Japanese does appear to obey the Complex NP Constraint, just like topicalization and relativization in English. Does this mean that the

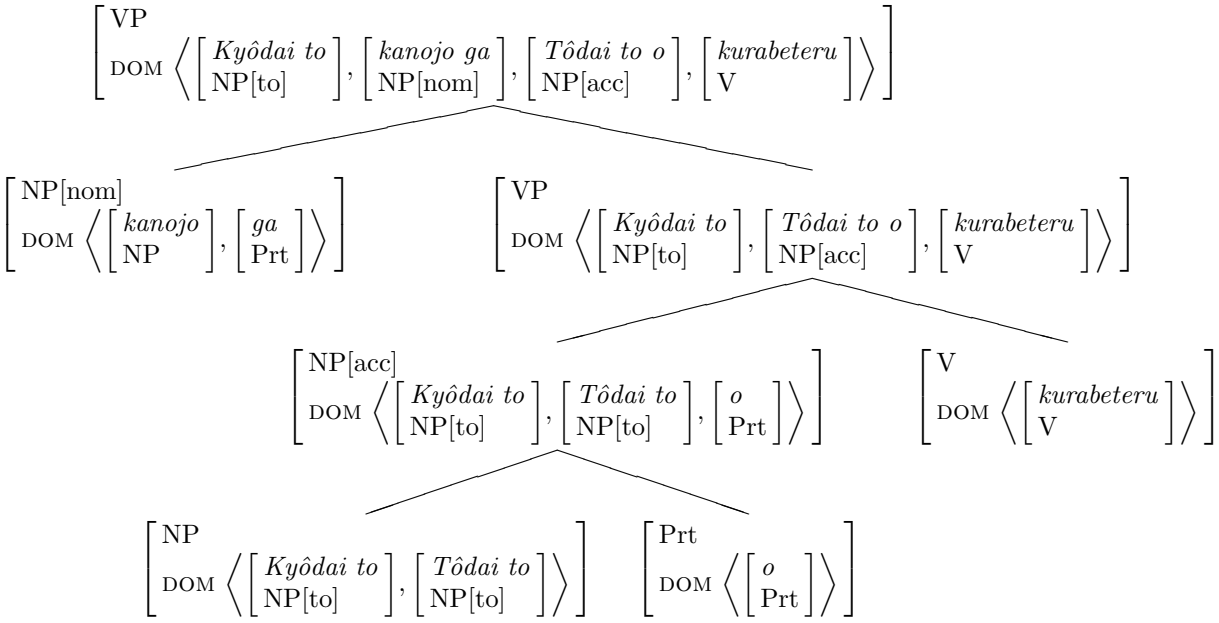

Figure 4: Scrambling of a conjunct

movement-based theory of scrambling is on the right track after all? It does not; there are reasons to believe that the Complex NP Constraint is in fact not a syntactic constraint and hence is irrelevant in the present context (see Kluender (1998)). The CSC, on the other hand, seems to be a genuinely syntactic constraint (see Pullum (1990, n. 8)). Some authors have argued that part of the CSC (e.g. the part that prohibits extraction of part of a conjunct) should be taken to be non-syntactic, but even those authors regard that part of the CSC that prohibits extraction of a whole conjunct as a syntactic constraint (Lakoff (1986, p. 161); Kehler (1996, p. 220)).

6 Conclusion

To conclude, the three observations described in Section 2 cast serious doubt on the movement-based theory of scrambling, and vindicate the linearization-based theory.

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