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String-Vacuous Scrambling and Cyclic Linearization*

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1. Introduction

One of the central issues in current syntactic theory is how syntactic structure is mapped onto LF and PF. Chomsky (1995) proposes that at certain points of a derivation the operation *Spell-out* applies to the structure constructed so far, sending the relevant information to LF and to PF, respectively. Moreover, recent works (see, e.g. Uriagereka 1999, Chomsky 2000, 2001) put forward the idea that Spell-out cyclically applies within a single derivation. Assuming such a framework, Fox and Pesetsky (2003, 2005; henthforth F&P) develop a theory of the mapping between syntax and phonology, called *Cyclic Linearization*. In this theory, the notion of *Linearization Preservation* (LP) in (1) plays a crucial role.

(1) The linear order of syntactic units is affected by Merge and Move *within* a Spell-out Domain, but is fixed once and for all at the end of each Spell-out Domain. (Fox and Pesetsky 2003:2)

Put simply, LP demands that the outputs of Spell-out within a derivation be consistent with each other; otherwise the phonological component fails to convert them into a linear string, leading the derivation to a PF-crash.

The aim of this paper is to extend F&P's idea so as to include not only

phonological relations (i.e. linear ordering), but also semantic relations, focusing on scope relations among quantifiers. Especially, I argue that *Spelled-out Relation Preservation* (SRP) in (2) holds, which is an extension of LP.

(2) The semantic and phonological relations among syntactic units are fixed at the end of a Spell-out Domain, and once established, they must be preserved at the end of each later Spell-out Domain.

The idea is that if phonological relations are preserved in the way proposed by F&P, semantic relations are also expected to be preserved in a similar way, because Spell-out also includes the mapping between syntax and semantics. I argue that this expectation is fulfilled, by showing that SRP provides a solution to a problem regarding string-vacuous scrambling in Japanese.

This paper is organized as follows: In Section 2, I clarify the problem to be addressed. Section 3 briefly reviews F&P's Cyclic Linearization and Ko's (2007) analysis based on it. Then, I point out that their analysis provides a new perspective to the problem, though it is not enough to solve the problem. In Section 4, I argue that the problem can be solved by extending LP to SRP. Section 5 explores some implications of the proposal. Section 6 is a conclusion.

2. The Problem

Hoji (1985) discusses the two types of string-vacuous scrambling in (3).[1]

(3) a. *[… X_i … <𝕐> … t_i …], where <𝕐> = phonologically null

b. *[… X_i … Y_j … t_i … t_j …]

In (3a), X has been scrambled across a phonologically null element Y, while in (3b), overt elements X and Y have undergone scrambling, resulting in a crossing dependency. Both types of scrambling are string-vacuous in the sense that the resultant overt lexical string is identical to the original one.

Since Hoji (1985), it has been assumed that they are blocked somehow. For instance, Hoji (1985) posits the *Ban on String-Vacuous Scrambling* (BSVS):

(4) A syntactic adjunction operation cannot apply if it does not change the order of the overt lexical string. (Hoji 1985:352)

The intuition behind BSVS is clear because it prohibits the application of scrambling which does not affect the ultimate surface word order. Below, I review some empirical motivations for BSVS that Hoji (1985) provides.

Let us start with the first type. The relevant examples are given in (5).[2]

(5) a. *Kare-ga$_i$ Taroo-no$_i$ hahaoya-o semeta (koto)
he-Nom Taroo-Gen mother-Acc blamed
'He$_i$ blamed Taroo's$_i$ mother'

b. Taroo-no$_i$ hahaoya-o$_j$ kare-ga$_i$ t$_j$ semeta (koto)
Taroo-Gen mother-Acc he-Nom blamed
'Taroo's$_i$ mother$_j$, he$_i$ blamed t$_j$ '

c. *pro_i Taroo-no$_i$ hahaoya-o semeta (koto)
Taroo-Gen mother-Acc blamed
'pro_i blamed Taroo's$_i$ mother'

(5a) exhibits a Condition C violation. As shown in (5b), however, scrambling

remedies a Condition C violation. Then, the ungrammaticality of (5c), where *pro* replaces the overt subject *kare-ga* 'he', suggests that an object cannot be scrambled over the null subject. This is because if such a scrambling were possible, (5c) should be grammatical on a par with (5b), contrary to fact.

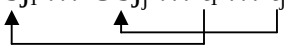
Let us turn to the second type in (3b). Although Japanese is a scope-rigid language, clause-internal scrambling changes scope interpretations, as originally pointed out by Kuroda (1971). The relevant examples are given in (6).[3]

(6) a. Dareka-ga daremo-o hihansita (koto)
someone-Nom everyone-Acc criticized
'Someone criticized everyone ($^{ok}\exists>\forall$, $*\forall>\exists$)'

b. Daremo-o_i dareka-ga t_i hihansita (koto)
everyone-Acc someone-Nom criticized
'Everyone$_i$, criticized loves t_i ($^{ok}\exists>\forall$, $^{ok}\forall>\exists$)'

In (6a) the subject unambiguously takes wide scope, whereas (6b), in which the object has been scrambled, is ambiguous. Thus, the generalization seems to be that a sentence becomes ambiguous once an object undergoes scrambling. Note that this implies that the structure in (7) is not available for a sentence like (6a).

(7) *[… $Subj_i$ … Obj_j … t_i … t_j …]



The object has been scrambled in (7), although it follows the subject at the surface structure. If the structure in (7) is available, it remains mysterious why (6a) is not ambiguous. Hence, the scope rigidity of SOV sentences like (6a) constitutes evidence for the idea that the second type of string-vacuous

scrambling is not possible.[4]

Although it is intuitively clear and empirically motivated, there is a problem regarding BSVS: Even if the first type of string-vacuous scrambling in (3a) can be restricted in a local manner, the second type in (3b) requires us to appeal to global economy (cf. Collins 1997). That is, we can restrict the first type of string-vacuous scrambling in a local way, given that the information that Y is non-overt is available at the point where X undergoes scrambling. On the other hand, in the second type of string-vacuous scrambling, each application of scrambling crosses an overt expression, as schematically shown in (8).

(8) a. Step 1: [Y_i … X … t_i …] b. Step 2: [X_j … Y_i …t_j … t_i …]

Thus, it is hard to exclude (8) by BSVS without look-ahead or backtracking.

Note, however, that if we can capture the contrast in (6) even though the derivation depicted in (8) is indeed available, the problem disappears. That is, if some independent mechanism accounts for the scope rigidity in SOV sentences and the scope ambiguity in OSV sentences without invoking global economy, BSVS does not have to be concerned with the second type of string-vacuous scrambling; what BSVS should do is to restrict the first type of string-vacuous scrambling in a local manner. In what follows, I explore this possibility, extending F&P's idea.

3. A Key to the Problem from Cyclic Linearization

In this section, I first review F&P's Cyclic Linearization and Ko's (2007) analysis based on it. Then, I point out that their theory provides a key to solving the problem, though further elaboration seems to be necessary for a full solution.

3.1. Cyclic Linearization

Adopting the idea of multiple Spell-out, F&P propose that each application of Spell-out establishes an ordering statement about relative orderings of syntactic units, adding it to an *Ordering Table*. The domain to which Spell-out applies is called the *Spell-out Domain*, roughly corresponding to Chomsky's (2000, 2001) *phase*. Since Spell-out applies multiple times, an Ordering Table of a particular derivation cumulatively receives ordering statements, which are eventually interpreted by PF. For instance, when Spell-out applies to the XP in (9), which consists of A, B, and C, an ordering statement A«B«C (where "«" means "precede") is added to an Ordering Table:[5]

(9) $[_{XP}$ A B C] Ordering Table: **A«B«C**

Note that under F&P's conception, all the elements within a Spell-out Domain, including the edge elements, are relevant to the ordering establishment. Moreover, F&P assume that movement out of a Spelled-out domain is possible.

With this in mind, let us consider the following two cases that are possible subsequent steps of (10).

(10) a. $[_{YP} \ldots A_i \ldots [_{XP} t_i$ B C]] Ordering Table: A«B«C **A«B«C**

b. $[_{YP} \ldots B_i \ldots [_{XP}$ A t_i C]] Ordering Table: A«B«C **B«A«C**

In (10a) the edge element of the XP, i.e. A, undergoes movement to the higher domain YP, while in (10b) the non-edge element, i.e. B, does so. When the YP gets Spelled-out, the Ordering Table of each derivation receives an ordering statement A«B«C and B«A«C, respectively.[6] Note that the ordering information

stored on the Ordering Table of (10a) is consistent, whereas that of (10b) is not. Claiming that established ordering information cannot be deleted in the course of a derivation, F&P argue that the step in (10b) leads the derivation to crash at PF: It fails to satisfy the contradicting requirements at the same time, because A cannot precede and follow B simultaneously. In effect, F&P's system forces the outputs of Spell-out within a derivation to be consistent; if not, the derivation crashes because of an ordering contradiction. Thus, F&P claim that LP in (1) follows as a consequence of their system.

Furthermore, F&P argue that their system explains why movement must proceed successive-cyclically. As we have seen in (10b) above, movement of a non-edge element induces an ordering contradiction. The contradiction, however, can be avoided if such an element moves to the edge of the XP before Spell-out, as in (11).

(11) a. $[_{XP}\ B_i\ A\ t_i\ C]$ Ordering Table: **B«A«C**

b. $[_{YP}\ \ldots\ B_i\ \ldots\ [_{XP}\ t'_i\ A\ t_i\ C]]$ Ordering Table: B«A«C **B«A«C**

Since B comes to precede A at the Spell-out of the XP via successive-cyclic movement, it is allowed to move further without inducing an ordering contradiction.

Based on their account of Holmberg's Generalization effect (cf. Holmberg 1999), F&P suggest that Spell-out Domains include CP and VP. Adopting their system, Ko (2007) argues that in languages like Korean and Japanese, *v*P constitutes a Spell-out Domain, based on the analysis of the well-known subject/object asymmetry in Numeral Quantifier (NQ) Floating, exemplified by the Korean examples in (12) and (13) (NQs and their host NPs are underlined).

(12) a. John-i maykcwl-lul sey-pyeng masiessta
John-Nom beer-Acc 3-Cl_{bottle} drank
'John drank three bottles of beer'

b. Maykcwl-lul John-i sey-pyeng masiessta
beer-Acc John-Nom 3-Cl_{bottle} drank

(13) a. Haksayngtul-i sey-myeng maykcwu-lul masietta
students-Nom 3-Cl_{person} beer-Acc drank
'Three students drank beer'

b. *Haksayngtul-i maykcwu-lul sey-myeng masietta
students-Nom beer-Acc 3-Cl_{person} drank

As shown in (12), an object and an object-related NQ can be separated by a subject, while the contrast in (13) indicates that an object cannot appear between a subject and a subject-related NQ (see, e.g. Kuroda 1980, Saito 1985, and Miyagawa 1989 for the same pattern in Japanese).

The grammaticality of (12b) can be accounted for if we assume that an NQ and its host NP form a constituent (see, e.g. Kuroda 1983, Sportiche 1988), and that scrambling can strand an NQ, as in (14a) below. Then, the puzzle is why (14b) is not allowed, where scrambling of a subject over the scrambled object strands an NQ. Note that (14b) gives rise to the surface order of (13b).[7]

(14) a. [Obj_i Subj [t_i NQ_{Obj}] …] (= (12b))

b. [$Subj_i$ Obj_j [t_i NQ_{Subj}] t_j …] (= (13b))

Ko (2007) argues that this puzzle can be solved if we assume that *v*P is a Spell-out Domain. Suppose that an object undergoes scrambling to the edge of

*v*P, and then Spell-out applies to the *v*P, as in (15a) below. Ko (2007) notes that the landing site of the object cannot be the position between the subject and the NQ, since they form a constituent. Furthermore, she claims that since the subject has already been on the edge of *v*P, it cannot be moved again to the edge. Hence, once the object is scrambled, the only available linear order is Obj«Subj«NQ_{Subj}. In order to derive the surface order of (13b), however, it is necessary to move the subject across the object in a later step, as in (15b).

(15) a. $[_{vP}\ Obj_i\ [_{NP}\ Subj\ NQ_{Subj}]\ [_{VP}\ t_i\ \ldots]]$ Ordering Table: **Obj«Subj«NQ_{subj}**

b. $[_{CP}\ \ldots\ Subj_j\ \ldots\ [_{vP}\ Obj_i\ [_{NP}\ t_j\ NQ_{Subj}]\ [_{VP}\ t_i\ \ldots]]]$

Ordering Table: Obj«Subj«NQ_{Subj} **Subj«Obj«NQ_{Subj}**

Thus, an ordering contradiction arises, inducing a PF-crash (the contradicting parts are put in boxes). That is, a sentence like (13b) results in a violation of LP.

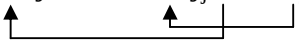
In this way, Ko's (2007) analysis solves the puzzle regarding the NQ Floating, combining the hypothesis that *v*P constitutes a Spell-out Domain with F&P's Cyclic Linearization.[8] In the rest of this section, I point out that this analysis provides a hint to the problem regarding string-vacuous scrambling.

3.2. A Key to the Problem of String-vacuous Scrambling

One of the interesting consequences of Ko's (2007) analysis is that because of LP, we can tell from the surface relative order of a subject and an object whether the object has been scrambled across the subject before Spell-out of *v*P. That is, if an object has been scrambled before Spell-out, it must precede a subject at the surface structure, and if the object has not, it must follow the subject; other possibilities necessarily results in an ordering contradiction.

Therefore, given Ko's (2007) system, the following structure is immediately ruled out, where an object has been moved before Spell-out of *v*P:

(16) *[$_{CP}$ … $Subj_i$ … [$_{vP}$ Obj_j t_i [$_{VP}$ t_j …]]]



Note that (16) instantiates one case of the second type of string-vacuous scrambling. Hence, the paradigm in (6), repeated as (17), seems to be captured:

(17) a. Dareka-ga daremo-o hihansita (koto)
someone-Nom everyone-Acc criticized
'Someone criticized everyone ($^{ok}\exists>\forall$, $*\forall>\exists$)'

b. $Daremo\text{-}o_i$ dareka-ga t_i hihansita (koto)
everyone-Acc someone-Nom criticized
'$Everyone_i$, someone criticized t_i ($^{ok}\exists>\forall$, $^{ok}\forall>\exists$)'

The fact that (17a) has an SOV order implies that the object has not been moved to the edge of *v*P before Spell-out. On the other hand, in (17b) the object precedes the subject. This in turn indicates that the object has been scrambled over the subject before Spell-out of *v*P. That is, surface relative order of a subject and an object corresponds to the presence/absence of object scrambling to the *v*P edge, given Ko's (2007) analysis. This seems to be a welcome result, because the generalization is that the scope ambiguity arises only if object scrambling takes place. That is, the ambiguity of OSV sentences can be captured.

This is not enough to account for the scope rigidity of sentences like (17a), however. Let us consider the following schematic derivation:

(18) a. $[_{vP}$ $Subj_{QP}$ $[_{VP}$ Obj_{QP} …]] Ordering Table: **$Subj_{QP}$«Obj_{QP}**

b. $[_{CP}$ …$Subj_{QPi}$ …Obj_{QPj} … $[_{vP}$ t_i $[_{VP}$ t_j …]]]

Ordering Table: $Subj_{QP}$«Obj_{QP} **$Subj_{QP}$«Obj_{QP}**

Suppose that an object stays *in situ* when Spell-out applies to *v*P, as illustrated in (18a). Thus, an ordering statement $Subj_{QP}$«Obj_{QP} is established. Then, suppose further that the object undergoes scrambling to the higher domain, followed by the scrambling of the subject over the scrambled object, as in (18b). When the CP in (18b) is Spelled-out, an ordering statement $Subj_{QP}$«Obj_{QP} is added to the Ordering Table. Since the linear orderings established so far are consistent, the derivation can converge, resulting in a SOV order. In (18b), however, the object has indeed undergone scrambling. Hence, nothing seems to prevent the SOV sentence from having the object wide scope interpretation, contrary to fact. The problem is that the system allows scrambling of an object *after* Spell-out of *v*P, as long as the ordering established at the Spell-out of *v*P can be retrieved, and nothing blocks the scrambled object in (18b) from taking wide scope.[9]

To sum up, I first reviewed F&P's Cyclic Linearization, from which LP follows, and Ko's (2007) hypothesis that *v*P is a Spell-out Domain. Then, I pointed out that although their system can restrict a sub case of the second type of string-vacuous scrambling, it cannot capture the scope rigidity of SOV sentences. In the next section, I propose a modification of their analysis, and illustrate how the modified system captures the scope rigidity of SOV sentences and the scope ambiguity of OSV sentences.

4. Proposal and Analysis

As we have seen above, the analysis which assumes LP solves only the half

of the problem; it fails to capture the scope rigidity of SOV sentences. In this section, I propose that a derivation is constrained by SRP in (2), repeated as (19) below, and provide an analysis of the scope facts based on it.

(19) The semantic and phonological relations among syntactic units are fixed at the end of a Spell-out Domain, and once established, they must be preserved at the end of each later Spell-out Domain.

SRP is an extension of LP in the sense that not only do phonological relations like linear ordering, but semantic ones are also subject to preservation, once established by an application of Spell-out.

Concentrating on scope relations among quantifiers, I propose that if a Spell-out Domain contains more than two quantifiers, a statement about their relative scope relations is uniquely established by Spell-out of the domain, and then it is added to a *Scope Relation Table*. As with much of an Ordering Table, a Scope Relation Table of a derivation cumulatively receives the results of the multiple application of Spell-out, which are eventually interpreted by LF. For illustration, let us consider the following configurations in (20).

(20) a. $[_{XP} \ldots Q_1 \ldots Q_2 \ldots]$ Scope Relation: $\mathbf{Q_1 > Q_2}$

b. $[_{XP} \ldots Q_{2i} \ldots Q_1 \ldots t_i \ldots]$ Scope Relation: $\mathbf{Q_1 > Q_2}$ or $\mathbf{Q_2 > Q_1}$

I assume, in line with Aoun and Li (1993), among others, that if a quantifier Q_1 c-commands another quantifier Q_2 or its trace, Q_1 can take scope over Q_2. Then, in (20a), where Q_2 has not been moved over Q_1, only the scope relation statement $Q_1 > Q_2$ (“>” means “take wide scope”) is established at the Spell-out

of XP.[10] On the other hand, in (20b), where Q_2 has been moved across Q_1, Spell-out of XP may establish either $Q_1 > Q_2$ or $Q_2 > Q_1$, but not both. In other words, in configurations like (20b), the system must decide which copies of Q_2 to use for scope relation establishment.[11]

Recall here that LP is not an independent principle, but a consequence of the system where the results of the multiple application of Spell-out cannot be deleted in the course of a derivation. I claim that SRP, as an extension of LP, also follows from this system, additionally assuming that established scope relations cannot be deleted, and that a derivation crashes at LF if a scope contradiction arises. A scope contradiction arises if a scope relation statement $Q_1 > Q_2$ has been established at a Spell-out point and then another one $Q_2 > Q_1$ is established at a later point; LF fails to interpret them properly because Q_1 cannot have wide and narrow scope with respective to Q_2 at the same time.

With this much as background, let us consider how the proposed system captures the scope facts. The relevant examples in (6) are repeated as (21).

(21) a. Dareka-ga daremo-o hihansita (koto)
someone-Nom everyone-Acc criticized
'Someone criticized everyone ($^{ok}\exists > \forall$, $^{*}\forall > \exists$)'

b. Daremo-o_i dareka-ga t_i hihansita (koto)
everyone-Acc someone-Nom criticized
'Everyone$_i$, someone criticized t_i ($^{ok}\exists > \forall$, $^{ok}\forall > \exists$)'

Let us start with the case of (21b), where an OSV sentence is ambiguous. Recall that in order to have the surface OSV order, an object has to be scrambled to the edge of *v*P before Spell-out under the system advocated here. Then, when

Spell-out applies to the *v*P, we have the following two possibilities, as in (22).

(22) a. $[_{vP}$ Obj_{QP} $Subj_{QP}$ $[_{VP}$ t_i …]] Ordering Table: **Obj_{QP}«$Subj_{QP}$**
Scope Relation: **Obj_{QP}>$Subj_{QP}$**

b. $[_{vP}$ Obj_{QP} $Subj_{QP}$ $[_{VP}$ t_i …]] Ordering Table: **Obj_{QP}«$Subj_{QP}$**
Scope Relation: **$Subj_{QP}$>Obj_{QP}**

In both cases, an ordering statement where the object precedes the subject is established, because traces are invisible for linear order establishment. On the other hand, by assumption they are visible for scope relation establishment. Thus, either Obj_{QP}>$Subj_{QP}$ or $Subj_{QP}$>Obj_{QP} can be established at this point. That is, a derivation of an OSV sentence is allowed to choose one of the two pairs of relations, which are shown in (22a) and (22b). Given SPR, then, the derivation which has chosen (22a) can converge only in an OSV order with object wide scope. Likewise, the derivation with the choice in (22b) converges only in an OSV order with subject wide scope. In this way, the proposed system captures the scope ambiguity of OSV sentences.

Meanwhile, the object must stay *in situ* when Spell-out applies to *v*P to derive the surface SOV order in (21a). Then, the derivation can have only one combination of ordering statements and scope relation statements, as in (23).

(23) $[_{vP}$ $Subj_{QP}$ $[_{VP}$ Obj_{QP} …]] Ordering Table: **$Subj_{QP}$«Obj_{QP}**
Scope Relation: **$Subj_{QP}$>Obj_{QP}**

Crucially, in the combination where a subject precedes an object, taking wide scope is the only possibility. Then, this ensures the scope rigidity of SOV

sentences, even if the following structure in (24) is derived in the later step.

(24) $[_{CP} \ldots \text{Subj}_{QPi} \ldots \text{Obj}_{QPj} \ldots [_{vP}\ t_i\ [_{VP}\ t_j \ldots]]]$

Note that the structure in (24) instantiates the problematic step in (18b) discussed in the previous section. That is, in (24) both the subject and the object undergo scrambling to the higher domain after the Spell-out of *v*P.

Then, at the Spell-out of CP in (24), we have two choices, as shown in (25).

(25) a. Ordering Table: Subj_{QP}«Obj_{QP}
Subj_{QP}«Obj_{QP}
Scope Relation: Subj_{QP}>Obj_{QP}
Subj_{QP}>Obj_{QP}

b. Ordering Table: Subj_{QP}«Obj_{QP}
Subj_{QP}«Obj_{QP}
*Scope Relation: Subj_{QP}>Obj_{QP}
Obj_{QP}>Subj_{QP}

In the case of (25a), an ordering statement Subj_{QP}«Obj_{QP} and a scope relation statement Subj_{QP}>Obj_{QP} are established at this point. They are consistent with those established at the step in (23). Hence, the derivation can converge, giving rise to the SOV order with subject wide scope. On the other hand, nothing blocks a scope relation statement Obj_{QP}>Subj_{QP} from being established at the Spell-out of CP as in (25b), since the object in (24) c-commands the trace of the subject. This choice, however, leads the derivation to crash at LF, because the Scope Relation Table of (25b) contains a scope contradiction. Therefore, the derivation of an SOV sentence cannot converge with object wide scope.

To sum up, I proposed to extend LP to SRP, and illustrated that the scope rigidity of SOV sentences and the scope ambiguity of OSV sentences can be explained by the system which assumes SRP and the hypothesis that *v*P

constitutes a Spell-out Domain. In a nutshell, in order to derive an SOV sentence, an object must not be scrambled across a subject before Spell-out of *v*P, and as a result, only the scope relation where the subject takes wide scope can be fixed at this point. Meanwhile, an object must be scrambled across a subject before Spell-out of *v*P to derive an OSV sentence; then, either scope relation becomes available. What is crucial is that not only linear ordering but also scope relations are subject to preservation, and this cannot be achieved without SRP.

Note that though a derivation is allowed to establish various combinations of ordering and scope relation statements, it can converge only if its outputs are totally consistent; otherwise it eventually crashes either at PF or LF because of a contradiction. Hence, we do not have to appeal to global economy to rule out undesirable derivations. Note further that the proposed analysis does not exclude the string-vacuous scrambling in question. Even if such a scrambling is possible, the scope facts can be explained. Therefore, the analysis enables us to make Hoji's (1985) BSVS free from the problem discussed in Section 2.

5. Implications

This section explores some implications of the proposed analysis for Double Object Constructions (DOCs), exemplified in (26).

(26) a. Taroo-ga dareka-ni daremo-o syookaisita (koto)
Taroo-Nom someone-Dat everyone-Acc introduced
'Taroo introduced everyone to someone ($^{ok}\exists>\forall$, $*\forall>\exists$)'

b. Taroo-ga daremo-o_i dareka-ni t_i syookaisita (koto)
Taroo-Nom everyone-Acc someone-Dat introduced
'Taroo introduced everyone to someone ($^{ok}\exists>\forall$, $^{ok}\forall>\exists$)'

Hoji (1985) claims that the order in (26a), where the indirect object (IO) precedes the direct object (DO), is the basic one, and the DO-IO order in (26b) is derived by so called Short-scrambling (cf. Tada 1993) of the DO. Note that the examples in (26) indicate two important facts: (i) The basic IO-DO order exhibits scope rigidity while the scrambled DO-IO order has scope ambiguity, and (ii) DO can follow a subject in DOCs even if it undergoes scrambling. In what follows, I make the two claims in (27) to accommodate these facts:[12]

(27) a. There is a functional projection FP between *v*P and VP in DOCs.
b. The FP constitutes a Spell-out Domain.

Let us start with the discussion of the structure of DOCs. Suppose that the IO and DO are generated within the same projection, which is a complement of the head *v*, as in (28a) below (cf. Hoji 1985, Larson 1988, among others).

(28) a. $[_{vP}$ Subj $[_{VP}$ IO $[_{V'}$ DO V]] *v*]
b. $[_{vP}$ DO_i Subj $[_{VP}$ IO $[_{V'}$ t_i V]] *v*]

In order to derive a linear order where the DO precedes IO, the DO must be scrambled to the edge of *v*P before Spell-out, as in (28b); otherwise an ordering statement in which IO precedes DO is established, making the surface DO-IO order impossible.[13] The Spell-out of *v*P in (28b), then, establishes only the ordering statement DO«Subj«IO. Consequently, the surface order of (26b) cannot be derived, because it necessarily induces an ordering contradiction between a subject and DO. That is, the availability of Short-scrambling itself argues against the structure in (28a) under the proposed system.

The problem discussed above is that there is no licit landing site for the scrambled DO to derive the required surface order. This problem can be solved if we assume the presence of an FP between *v*P and VP, as in (29a).

(29) a. [$_{v\text{P}}$ Subj [$_{\text{FP}}$ IO [$_{\text{VP}}$ DO V] F] *v*]

b. [$_{v\text{P}}$ Subj [$_{\text{FP}}$ DO$_i$ IO [$_{\text{VP}}$ t$_i$ V] F] *v*]

As shown in (29b), FP provides a licit landing site. As a result, an ordering statement Subj«DO«IO becomes available at the Spell-out of *v*P. Hence, the derivation can converge with the surface order of (26b).

Let us turn to the claim in (27b). As we have seen above, sentences with the IO-DO order exhibit the scope rigidity while those with the DO-IO order do not. This generalization is further confirmed by the following examples:

(30) a. Dareka-ni$_i$ Taroo-ga t$_i$ daremo-o syookaisita (koto)
someone-Dat Taroo-Nom everyone-Acc introduced
'To someone$_i$, Taroo introduced everyone t$_i$ (^{ok}∃>∀, *∀>∃)'

b. Daremo-o$_i$ Taroo-ga dareka-ni t$_i$ syookaisita (koto)
everyone-Acc Taroo-Nom someone-Dat introduced
'Everyone$_i$, Taroo introduced t$_i$ to someone (^{ok}∃>∀, ^{ok}∀>∃)'

(31) a. Dareka-ni$_i$ daremo-o$_j$ Taroo-ga t$_i$ t$_j$ syookaisita (koto)
someone-Dat everyone-Acc Taroo-Nom introduced
'To someone$_i$, everyone$_j$, Taroo introduced t$_j$ t$_i$ (^{ok}∃>∀, *∀>∃)'

b. Daremo-o$_i$ dareka-ni$_j$ Taroo-ga t$_j$ t$_i$ syookaisita (koto)
everyone-Acc someone-Dat Taroo-Nom introduced
'Everyone$_i$, to someone$_j$, Taroo introduced t$_i$ t$_j$ (^{ok}∃>∀, ^{ok}∀>∃)'

The a-examples, where IO precedes DO, exhibit scope rigidity, whereas scope ambiguity arises in the b-examples, where DO precedes IO.[14] This generalization fails to be captured if *v*P is the sole Spell-out Domain within the verbal projections. To see the problem, let us consider the structures in (32).

(32) a. $[_{vP}\ IO_i\ Subj\ [_{FP}\ DO_j\ t_i\ [_{VP}\ t_j\ V]\ F]\ v]$

b. $[_{vP}\ IO_i\ DO_j\ Subj\ [_{FP}\ t_i\ [_{VP}\ t_j\ V]\ F]\ v]$

(32a) gives rise to the surface order of (30a) and (32b) to that of (31a). Note that the DO c-commands the trace of the IO in both cases. Hence, nothing blocks a scope relation statement DO>IO from being established at the Spell-out of *v*P. Then, (30a) and (31a) are predicted to be ambiguous, contrary to fact.

If the FP is also a Spell-out Domain, as claimed in (27b) above, the problem can be solved. Let us consider the two configurations depicted in (33).

(33) a. $[_{FP}\ IO\ [_{VP}\ DO\ \ldots]]$ Ordering Table: **IO«DO**

Scope Relation: **IO>DO**

b. $[_{FP}\ DO_i\ IO\ [_{VP}\ t_i\ \ldots]]$ Ordering Table: **DO«IO**

Scope Relation: **DO>IO** or **IO>DO**

The DO must stay *in situ* to derive the surface IO-DO order, as in (33a). Then, Spell-out of FP unambiguously establishes a scope relation statement where IO takes wide scope. On the other hand, if DO has been scrambled, as in (33b), Spell-out of FP can establish either DO>IO or IO>DO under the proposed mechanism. Therefore, a derivation which eventually has the IO-DO order never converges with the DO wide scope interpretation, given SRP.

Summarizing this section, I explored the implications of the proposed analysis. I argued (i) that there is a functional projection FP between *v*P and VP, based on the availability of Short-scrambling, and (ii) that the FP constitutes a Spell-out Domain, based on the fact that the IO-DO orders exhibit the scope rigidity whereas the DO-IO orders do not.

6. Conclusion

In this paper, I proposed to extend Fox and Pesetsky's (2003, 2005) Linearization Preservation to Spelled-out Relation Preservation; the former requires the linear ordering established by an application of Spell-out to be preserved at later Spell-out points, and the latter requires not only linear ordering but also semantic relations to be preserved. Crucially assuming SRP, I provided an analysis that explains the difference between SOV and OSV sentences with respect to scope interactions. I also argued that the proposed analysis makes Hoji's (1985) Ban on String-Vacuous Scrambling free from the problem of global economy. Finally, I explored the implications of the analysis, claiming that in Double Object Constructions, there is a functional projection between *v*P and VP, which constitutes a Spell-out Domain.

Notes

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[1] For other types of string-vacuous scrambling, see, e.g. Saito (1994) and Takano (1996), among others.

[2] The sentence-final *koto* 'the fact that' is added to make the examples more natural. English translations provided for the examples are intended to show their rough structure, and the sentence final *koto* is excluded from them.

[3] Unlike clause-internal scrambling, long-distance scrambling does not affect the scope interpretation (see Tada 1993, among others). In this paper, I concentrate on clause-internal scrambling.

[4] One may suspect that the problem disappears if subject scrambling is impossible (Saito 1985, see also footnote 7), as Hoji (1985) assumes. The problem, however, still arises if the movement of a subject can be A-movement to Spec, TP from a *v*P-internal position. Through out this paper, however, I assume that subjects can be scrambled at least clause-internally, and use terms like "subject scrambling" or "scrambling of a subject" for ease of exposition.

[5] The notations used in this paper are rather simplified for the purpose of presentation. An ordering statement that is established at the current step will be indicated by boldface, and irrelevant elements will be omitted.

[6] Following F&P, I assume that traces are invisible to linear order establishment.

[7] To exclude structures like (13b), Saito (1985) claims that subjects cannot be scrambled. Ko (2007), however, argues against this hypothesis, providing evidence for the presence of subject scrambling.

[8] In Takita (in press), I provided an additional argument for the hypothesis that *v*P constitutes a Spell-out Domain, based on the account of Proper Binding Condition effect (Fiengo 1977) on scrambling (see Saito 1989, among others).

[9] In the NQ Floating cases which Ko (2007) originally discusses, this

scrambling-after-Spell-out problem does not arise. This is because if an object has not been moved to the *v*P-edge, an ordering statement Subj«NQ_{Subj}«Obj is established, while the Spell-out of CP with scrambling of the object after Spell-out of *v*P may establishes either Subj«Obj«NQ_{Subj} or Obj«Subj«NQ_{Subj}, inducing an ordering contradiction between the object and the subject related NQ. Hence, the problem I discuss in the text is specific to the string-vacuous scrambling. I would like to thank Mamoru Saito (p.c.) for bringing up this point.

[10] I indicate scope relation statements established at the relevant Spell-out by boldface, as in the case of ordering statements.

[11] Although I cannot address in this paper the question of whether Japanese has Quantifier Raising (QR, May 1977), I assume that even if the language has QR, it applies after Spell-out, and that the results of the application of QR must be consistent with those established by Spell-out, due to SRP.

[12] See Marantz (1993), Ura (1996), Takano (1998), McGinnis (2001), Pylkkänen (2002), Yatsushiro (2003), and references cited therein for similar proposals. I leave further examinations of the nature of the FP for future works.

[13] I assume that scrambling is not a tucking-in operation in the sense of Richards (2001), so that DO cannot be moved to the inner Spec of *v*P (see Takita 2008 for an argument for this assumption). I also assume an anti-locality constraint like (i) (see Saito and Murasugi 1999, Abels 2003, and Bošković 2005, among others), which restricts 'too local' movement (cited from Bošković 2005:16).

(i) Each chain link must be at least length 1, where a chain link from A to B is of length *n* if there are *n* XPs that dominate B but not A.

Given (i), the DO cannot be moved to the edge of VP because it crosses no XP.

[14] Hoji (1985) judges sentences like (31a) as ambiguous, though my informants find them unambiguous. I leave this judgment variation for future research.

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