

Economy and Pronominal Binding*

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Abstract

This paper addresses three questions about crossover phenomena. First, why is the strong crossover effect stronger than the weak crossover one? Second, why do A-movement and scrambling not induce the crossover effect? Third, why does the weak crossover effect disappear with the aid of D-linking and focus particles like *even* and *only*? Building on Ruys' (1994) global economy analysis of weak crossover which involves comparison of competing derivations, I will provide a unified account of these problems. Furthermore, I propose to modify Ruys' original formulation and solve a problem with it by clarifying what kinds of derivations can compete with each other.

Keywords: variable binding, crossover, economy, strong/weak asymmetry, A/A'-asymmetry, repair particles, scrambling, D-linking

1. Introduction

Since Postal's (1971) seminal work, the crossover constraint on bound-variable construal of pronouns has been one of the controversial issues in generative grammar. According to the constraint, no operator like a *wh*-pronoun can move across a pronoun coindexed with it, as exemplified in (1):

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- (1) Who_i did {he_{*i}/ his_{?*i} mother} say Mary kissed t_i?

Compare (1) with the acceptable counterparts in (2), where no crossing of an operator and a coindexed pronoun is involved.

- (2) Who_i t_i said Mary kissed {him_i/ his_i mother}?

The crossover effect has been accounted for in various terms (e.g. Chomsky's (1976) leftness condition, Reinhart's (1983) c-command condition, and Koopman and Sportiche's (1982-1983) bijection principle, among others), and now it is standardly assumed that bound-variable construal of a pronoun is available if and only if the antecedent operator, or its trace, c-commands the pronoun from an A(argument)-position. In other words, an operator must 'A-bind' a pronoun in order to variable-bind it.

However, it remains to be answered why simply c-commanding from an A'-position does not suffice for pronominal binding in most cases and why in the cases of A-movement, an operator can move across a coindexed pronoun, as will be seen in section 2.2 (A/A'-asymmetry). Furthermore, as it turns out in section 2, there are kinds of systematic counterexamples to this account in which bound-variable construal is acceptable though operators never A-bind pronouns. Though some of these questions have been individually accounted for in the literature, this paper provides a unified account for all of them in terms of an economy condition on variable binding, adopting Ruys' (1994) global economy analysis of weak crossover, which involves comparison of interpretively identical derivations. I will argue that a pronoun can be bound by an operator only if the operator-variable chain is formed in the most economical way.

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This paper is organized as follows: In section 2, I will present empirical problems that any theories of crossover must account for: the asymmetry in acceptability between strong and weak crossover, the A/A'-asymmetry mentioned above, and the unexpected absence of the crossover effect with use of focus particles like *even* and *only*, of D-linked wh-phrases, and of scrambling in Japanese. In section 3, I will outline Ruys' (1994) theory and make some modification to it. In section 4, I will account for the data given in section 2 in terms of the economy condition. Section 5 is a conclusion.

2. Empirical Facts

2.1 Acceptability Gap between Strong and Weak Crossover

Since Wasow (1972), crossover phenomena have been known to consist of two subtypes regarding acceptability. One involves the configuration where the coindexed pronoun c-commands (the trace of) the antecedent in an A-position. Since this configuration induces severe unacceptability of bound construal, Wasow called it *strong* crossover, which is illustrated by (3a):

- (3) a. *Who_i did he_i say Mary kissed t_i?
 b. ?*Who_i did his_i mother say Mary kissed t_i?

On the other hand, as (3b) shows, when a pronoun is embedded in a constituent that c-commands (the trace of) its antecedent, bound construal becomes a bit easier, if not fully acceptable, to obtain. This is called *weak* crossover.

How to capture the difference in acceptability between strong and weak crossover remains an open question. Since strong crossover and weak crossover are identical in that the operator does not c-command nor precede the bound pronoun from an A-position, both Chomsky's (1976) leftness condition and Reinhart's (1983)

c-command condition would predict the same status for these constructions. On the other hand, they are assigned a distinct status under Koopman and Sportiche's (1982-1983) account, which is based on the bijection principle that stipulates that an operator in A'-position must locally bind exactly one variable; weak crossover violates bijection while strong crossover does not. Instead, strong crossover induces violation of the condition C. However, their account still leaves a question of why violation of bijection causes weaker degradation than that of condition C; they would have to simply stipulate so.

2.2 Absence of Crossover Effects in A-Movement

In contrast to A'-movement, A-movement does not induce weak crossover effect, as shown in (4), where *who* originates in the nonfinite clause and crosses over the coindexed pronoun contained in the experiencer argument to target Spec-TP, (and then string-vacuously moves to the Spec CP).

- (4) who_i seems [to his_i mother] to be t_i smart?
 (5)(??) who_i seems [to $himself_i$] to be t_i smart?

But, unlike (4), there is a disagreement on judgement on (5): some researchers judge it as good as (4) (cf. Aoun (1982), Hicks (2008) among others), while other authors (e.g. Postal (1971), Roberts (1991)) assign it a somewhat marginal status. Importantly, although (5) involves a configuration comparable to that of strong crossover in that a bound variable c-commands the trace of its antecedent, its status is distinctively better than that of strong crossover.

2.3 Repair Particles: *Only* and *Even*

It has been observed in the literature that weak crossover effects are repaired with use of focus particles like *only* and *even*, which Potts (2001) names *repair particles*, adjoined to the pronoun-bearing constituent crossed by the operator, as shown in (6) (see Wasow (1972), Postal (1993), and Potts (2001)).

- (6) a. Who_i did only his_i clients hate t_i?
 b. Who_i did even his_i clients hate t_i?

However, these particles do not repair the strong crossover effects as shown in (7).

- (7) a. *Who_i did only he_i (say Mary) hated t_i?
 b. *Who_i did even he_i (say Mary) hated t_i?

As noted in the survey conducted by Safir (2017), no account exists for the repair effect in (6). Since these sentences all involve the weak crossover configuration where operator movement crosses a bound-variable pronoun, the standard accounts based upon the leftness, c-command, or bijection conditions will have difficulties in dealing with this fact.

2.4 D-Linking

There is another factor in crossover effects observed by Wasow (1972), Culicover and Jackendoff (1995), and Falco (2007); when a wh-operator is interpreted as specific, or ‘D-linked’ in Pesetsky’s (1987) sense, the weak-crossover effect disappears. Compare the D-linked wh-question in (8b) to the non-D-linked one in (8a) which is marked with *the hell*:

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- (8) a.?*Who_i the hell do his_i students admire t_i?
 b.(?)Which famous professor_i do his_i students admire t_i?

However, strong crossover is still unacceptable even with a D-linked antecedent:

- (9) *Which famous professor_i did he_i say students admired t_i?

2.5 Scrambling

I assume a *wh*-pronoun in Japanese also covertly moves to the specifier of the CP headed by question particle *no*. Then, (10b) involves covert *wh*-movement crossing over the coindexed pronoun, yielding the weak crossover effect. On the other hand, (10a) does not involve a crossover configuration and allows for the bound construal.

- (10) a. Dare_i-ga soitu_i-no hahaoya-o aisiteiru no?
 who-NOM the.guy-GEN mother-ACC love Q
 ‘Who_i loves his_i mother?’
 b.*?Soitu_i-no hahaoya-ga dare_i-o aisiteiru no?
 the.guy-GEN mother-NOM who-ACC love Q
 ‘Who_i did his_i mother scold?’

Japanese is known to permit free word order via scrambling (Ross (1967)). I assume with Saito (1985) that scrambling is an instance of movement operation. As the contrast in (11) shows, scrambling an operator across a coindexed pronoun makes possible bound construal that is otherwise unavailable.

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- (11) a. *?Soitu_i-no hahaoya-ga dare_i-o aisiteiru no?
 the.guy-GEN mother-NOM who-ACC love Q
 ‘Who_i did his_i mother scold?’
 b. Dare-o_i soitu_i-no hahaoya-ga t_i sikat-ta no?

For one thing, it is due to this property that the literature has assumed that scrambling can be an instance of A-movement as far as clause-internal scrambling is concerned (cf. Mahajan (1989) and Saito (1992)); recall from section 2.2 that A-movement in English is immune from crossover. However, it remains to be seen why A-movement does not induce the crossover effects. Modeling scrambling as A-movement is just a stipulation, not an ultimate explanation.

3. Theoretical Framework

3.1 Ruys (1994): Global Economy Analysis

In this section, I introduce the analysis of weak crossover proposed by Ruys (1994), on which this paper is build. The guiding idea is based on consideration of global economy, which is suggested by Chomsky (1992: 48), who states that “given two convergent derivations D_1 and D_2 with the same LF output, both minimal and containing the same number of steps, D_1 blocks D_2 if its links are shorter.” According to this economy condition, a derivation should involve as short movement as possible. This sort of condition is invoked to account for the superiority effect in multiple wh-questions like (12):

- (12) a. Who said what
 b. *What did who say?

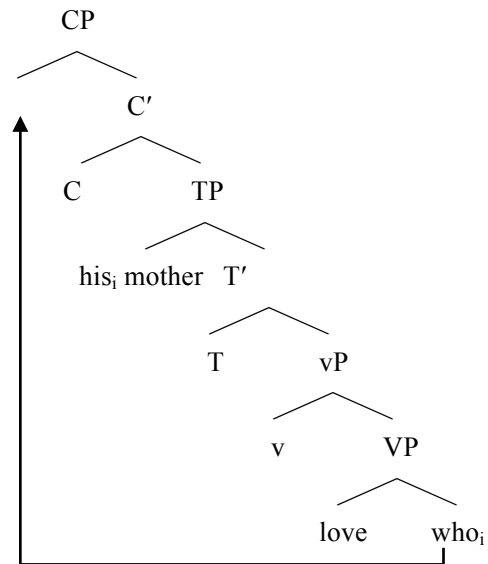
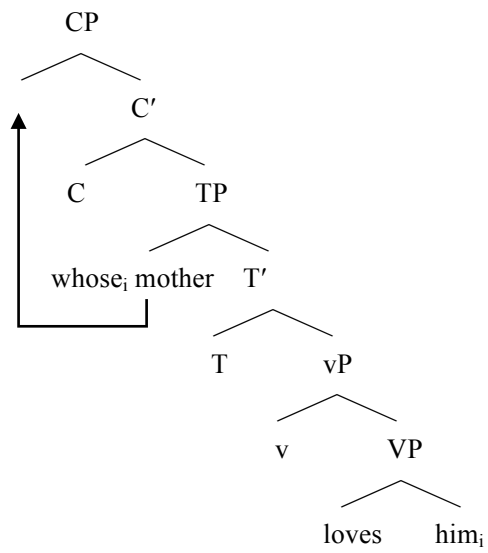
Both of these derivations will yield the interpretation “for whom x and what y, x said y.” Thus, they compete with each other, and the global economy condition prefers (12a) to (12b) since the former involves shorter movement than the latter.

Ruys (1994) tries to constrain pronominal binding in terms of this kind of global economy condition. He argues that a sentence obtains bound construal of a pronoun if its derivation involves the shortest movement of all the competing derivations. To be more concrete, suppose that we are to derive a sentence with the interpretation in (13):

(13) For whom x, x’s mother loves x

Depending on where the *wh*-operator and the bound pronoun are merged respectively, two competing derivations are possible. One, which is an instance of weak crossover, puts *who* in the object position and merges the pronoun with *’s mother* in the subject position as in (14a). The other has the base positions of them reversed as in (14b). The former involves a longer movement (from complement of VP to Spec-CP) than the latter (from Spec-TP to Spec-CP). Therefore, the global economy condition selects the latter as the most economical derivation, correctly barring the former weak-crossover derivation.

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(14) a. ?* who_i does his_i mother love?b. whose_i mother loves him_i?

3.2 What Counts as a Competing Derivation?

Ruys' (1994) analysis has been shown to derive the weak crossover effect. However, before moving on to see its consequences to the phenomena overviewed in section 2, I will solve a problem left unsettled in Ruys (1994); what derivations compete with each other for economy? Strictly speaking, as Ruys notes, Chomsky's (1992) original formulation in which derivations compete only if they share "the same LF" is problematic since, for example, *who said what* and *what did who say* have a distinct LF: if covert movement does not exist, different operators end up sitting in the Spec-CP in LF, or even if in-situ wh-phrases are assumed to undergo LF movement, they result in distinct adjunction structures.

Thus, Ruys then considers defining the class of competing derivations in terms of "interpretive equivalence (p.232)," under which *who said what* and *what did who say* can compete, and so can *who_i does his_i mother love* and *whose_i mother loves him_i*. However, as Ruys notices, interpretive equivalence alone would incorrectly have the parasitic gap construction (15a) compete with (15b) without a parasitic gap.

- (15) a. which book did you file without reading?
 b. which book did you file without reading it?

These derivations are interpretively equivalent; 'for which book x, you filed x without reading x.' In order to prevent them from competing with each other, the global economy condition needs to be more constrained. Conceptually, consideration of computational efficiency argues for restricting the class of competing derivation, as well.

Let us now consider what information is available to the global economy condition. To this end, it is suggestive to consider where in the language faculty the

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condition is operative. I assume the current framework of the Minimalist Program given in (16):

- (16) each language incorporates a mechanism that determines an infinite array of hierarchically structured expressions that are transferred for interpretation to two interfaces: the sensorymotor system SM for externalization, and the conceptual-intentional system CI for thought (broadly understood). (Chomsky (2013: 35))

Since the global economy condition must access to the interpretation of each derivation, I assume that it is operative at CI interface. Now it becomes clear what information the economy condition may employ: first, a semantic interpretation that a derivation yields; second, the hierarchical structure that leads to the interpretation handed from narrow syntax; third, the numeration for the derivation, i.e. the list of lexical items that constitute the structure. I argue that the global economy condition fully employs these pieces of information; the condition compares grammatical derivations that share the semantic interpretation (logical equivalence in Ruys' terms) and the numeration, and it assigns a different status to each derivation regarding to its movement length read off from the structure. Here, by *grammatical*, I mean those derivations that do not involve any syntactic or semantic violation. Given that, it can be confirmed that *who_i does his_i mother love* and *whose_i mother loves him_i* can actually compete because they are both grammatical and share the interpretation 'for whom x, x's mother loves x' and the numeration (C, T, v, V, MOTHER, HE, WHO, 's).¹ This assumption distinguishes well between (15a) and (15b); they are both grammatical and are interpretively equivalent but their numerations are different in whether they contain a null operator or a pronoun, so they do not compete with each other for economy.

Furthermore, since the global economy condition is operative at CI interface, it is predicted that a SM status of each derivation does not play any role in choice of competing derivation. Accordingly, derivations can participate in the competition for economy even if they violate any conditions at SM. This has a consequence to the paradigm in (17):

- (17) a. ?*A postman brings its_i addressee every letter_i.
 b. ??A postman brings every letter_i's addressee it_i.

(17a) has the deviance of weak crossover violation, which means in this framework that it requires a more economical grammatical derivation to rule out the sentence. However, a candidate derivation (17b) is also deviant. In fact, (17b) is bad regardless of the interpretation of the pronoun. The status of this sentence will be accounted for in terms of SM by postulating a prosodic constraint that denies the sentence final position to elements like pronouns that is phonologically too light (Zwicky (1986)). If the SM violation in (17b) prohibited it from competing for economy, (17a) would be the only grammatical derivation and be licensed vacuously, which is not the case.

In this subsection, I have articulated what kinds of derivations compete for the global economy condition. I have claimed that the economy condition compares those derivations that share the same numeration and semantic interpretation without involving any syntactic or semantic violation. In addition, I have argued that SM violations do not exclude any derivation from an economy competition.

4. Analysis

4.1 Three Models of Explanation

Let us return to the rest of the problems presented in section 2 and see how they are explained in the theory developed in section 3. Before analyzing individual cases, it may be helpful to make it clear in advance how we can account for the data.

We have three ways to deal with data: First, notice that the global economy condition introduced in the preceding section compares only *grammatical derivations*. As a result of that, each of them will be assigned a different degree of acceptability depending on its movement length. On the other hand, the condition pays no attention to ungrammatical derivations. Thus, the theoretical status of a *less economical* derivation is different from that of an *ungrammatical* derivation. It seems natural to assume that the former derivation is more acceptable if any than the latter one. This line of reasoning will be employed in the analysis of strong/weak asymmetry in section 4.2.

Second, since the theory gives a better status to a derivation if and only if it is more economical than any other *grammatical* competing derivation, those ‘exceptionally’ acceptable sentences can be proved to be allowed by showing that the sentence is in fact the most economical of all because an otherwise more economical one is actually ungrammatical on an independent ground. This kind of account will be exploited in discussion of A/A'-asymmetry in section 4.3 and the repair particles *even/only* in section 4.4.

Third, while the economy principle determines statuses of competing sentences in ordinary cases, there is a possibility that sentences that share numeration and interpretation do not compete with each other because economy consideration is suspended for certain reasons. In such a case, I argue, seemingly competing sentences will be acceptable at the same time because global economy constraint, which is suspended in this case, does not decide which to favor. This will be the kind

of account appealed to in the account of D-linking in section 4.5 and scrambling in section 4.6.

4.2 Strong/Weak Asymmetry

In this section, I will account for the strong/weak asymmetry of crossover. I argue that the deviance of a weak-crossover derivation is *weak* because such a derivation does not involve any syntactic nor semantic violation; it is only that it is ranked lower than another derivation with regard to the economy condition. On the other hand, the strong deviance in strong-crossover derivation is expected because such a derivation crashes in the first place; I will attribute the ungrammaticality of strong crossover derivation to the Condition C violation (Chomsky (1981), Koopman and Sportiche (1982-1983)). Suppose that we are to derive a sentence with the interpretation (18a) using the numeration (18b):

- (18) a. For whom x , x said Mary kissed x
 b. (C1, C2, T1, T2, v_1 , v_2 , say, kiss, WHO, HE, MARY)

Depending on the placement of WHO and HE, potentially two derivations in (19) would be available.

- (19) a. Who _{i} said Mary kissed him _{i} ?
 b. *Who _{i} did he _{i} say Mary kissed t _{i} ?

Assume that we treat traces of *wh*-phrases as R-expression for the purpose of binding theory in that they must not be A-bound (Chomsky (1981)). Then, the only convergent interpretation for (19b) will be not (18a) but (20), with y referential:

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(20) For whom x , y said Mary kissed x

Thus, strong crossover derivation is excluded as ungrammatical and it has no chance to even participate in an economy competition.

4.3 Absence of Crossover Effects in A-Movement



In this section, I will account for absence of crossover effects in A-movement by showing that the derivation involving crossing-over A-movement is in fact the only grammatical option to yield the intended construal. Consider the sentence (4), repeated in (21), which shows that A-movement is immune from weak crossover:

(21) who_i seems to his_i mother to be t_i smart?

This is interpreted as (22a) and consists of the numeration in (22b):

- (22) a. For whom x , x seems to x 's mother to be x smart?
 b. (C, T_{finite} , seem, to_{Prep} , $to_{non-finite}$, be, smart, MOTHER, WHO, HE)

Depending on where to put WHO and HE, the two derivations below may be available:

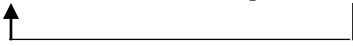

- (23) a. T seem to HIS_i MOTHER [to be WHO_i smart]

 b. *T seem to $WHOSE_i$ MOTHER [to be HE_i smart]


If we were concerned only with the length of movement targeting Spec-TP, (23b) with movement of the experiencer (or the genitive specifier of it, if left-branch

extraction were to be permitted) would appear more economical than (23a) with movement of the small-clause subject. However, such a derivation like (23b) would leave the unspecified Case value of the small clause subject, leading to violation of some variant of Case filter. Therefore, the derivation is excluded on the independent ground. Now (23a) has been found out to be actually the only derivation that can lead to the interpretation (21) from the numeration (22b). Thus, the sentence is licensed vacuously as the most economical and afforded the acceptable status.

The same account will be applied to (5), repeated here as (24), with its potential derivations given in (25) on the basis of the same numeration:

(24)(??)who_i seems to himself_i to be t_i smart?

- (25) a. T seem to HIMSELF_i [to be WHO_i smart]

- b. *T seem to WHO_i [to be HIMSELF_i smart]


First, consider (25b). If the experiencer *who* moved to Spec-TP, the small clause subject would fail to get its Case valued. Thus, this derivation is ruled out. On the other hand, the derivation (25a), which A-moves the small clause subject *WHO*, successfully gets Case of all the DPs valued.

However, recall that sentences like (24) are considered marginal by, for example, Postal (1971) and Roberts (1991). Therefore, some discussion is needed on this matter. Notice that the strong crossover effects originate from Condition C in tandem with the assumption that wh-traces are R-expression. Since A-traces are usually not treated as R-expression, we cannot appeal to the same reasoning as in the case of strong crossover. In fact, this seems to be on the right track because the

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sentence in question is not so bad in acceptability status as instances of strong crossover. The marginality should be traced to some other factor, namely, *reflexivity*. I assume that anaphoric pronouns are functioning as the reflexivizer in the sense of Reinhart and Reuland (1993). According to them, anaphors like *himself* apply to a two (or more)-place predicate to yield a reflexive predicate. This predicate in turn combines with a higher argument. In other words, an anaphor can be ‘bound’ by its antecedent only if they are co-arguments of the same predicate.

Now let us return to (24); *who seems to himself to be smart*. This involves a raising predicate: *seem*, selecting a proposition and an experiencer but not the raised subject as its arguments. Reasonably, an entity like experiencer and a propositional content cannot be coreferential in any sense. Furthermore, the raised subject and the anaphor are not co-arguments of *seem*, with the former selected by the embedded small clause predicate. Consequently, I argue, reflexivization fails in this case, resulting in the deviance observed for (24). For those who accept this sentence, I speculate that either the speakers reanalyze the structure as a complex predicate $\lambda x[x \text{ seem to himself}_x \text{ be smart}]$ that has been reflexivized by the anaphor or they have simply put on the kind of binding theory that requires an anaphor be bound in its local sentence; either way, the anaphor will be licensed by the subject raising to the matrix TP.

4.4 Repair Particles: *Only* and *Even*

Let us move on to the discussion of (6b) and (6c), repeated here as (26a) and (26b), respectively:

- (26) a. Who_i did only his_i clients hate t_i?
 b. Who_i did even his_i clients hate t_i?

These sentences are interpreted as follows:

- (27) a. For whom x , only x 's clients hated x .
 b. For whom x , even x 's clients hated x .

As we expect, (26a = (28a)) and (26b = (29a)) are the only derivations that yields the intended interpretation with the given numerations. The (b) examples in (28) and (29) are known to be bad due to focus intervention effect, which bans the configuration where *only* or *even*, known as focus-sensitive operators, c-commands a *wh*-phrase (Pesetsky (2000), Beck (2006), Kotek (2014), and Li and Law (2016), among others). Whatever explains the left-branch condition will exclude the (c) examples in (28) and (29) from the class of derivations competing with the (a) examples in (28) and (29).

- (28) a. Who_{*i*} did only his_{*i*} clients hate t_i ?
 b. *Only whose_{*i*} clients hated him_{*i*}?
 c. *who(se)_{*i*} did only t_i (?s) clients hate t_i ?

- (29) a. Who_{*i*} did even his_{*i*} clients hate t_i ?
 b. *Even whose_{*i*} clients hated him_{*i*}?
 c. *who(se)_{*i*} did even t_i (?s) clients hate t_i ?

Summarizing the last and the present sections, sentences like *who_{*i*} seems to his_{*i*} mother to be smart?* and *who_{*i*} did only/even his_{*i*} clients hate t_i ?* are grammatical because they are the only ways to convey the meaning they do. Potential alternatives to them are independently excluded from the economy competition due to the Case theory, the focus intervention effect, and the left-branch condition.

4.5 D-Linking

In this and the next section, we will employ the third strategy mentioned in section 4.1. To repeat, if crossover effects arise under the control of the economy principle, we predict that if economy principle is suspended for a reason, crossover effects are alleviated. Suspension of economy principle means that derivations do not compete with each other for the best status. This leads to another consequence that, unlike the cases in the last two sections, where the apparent weak crossover sentences are acceptable by the sacrifice of other potential competing derivations, multiple derivations for the same numeration give rise together to the same interpretation.

I propose to take D-linked *wh*-questions to bear out these predictions. They allow the crossover sentence in (31b) and the non-crossover variant in (31a) from the same numeration (30a) to yield the same interpretation (30b):

- (30) a. (C, T, v, V, which, famous, PROFESSOR, HE, STUDENTS)
 b. For which famous professor x , x 's students admire x ?
- (31) a. Which famous professor's _{i} students admire him?
 b.(?)Which famous professor _{i} do his _{i} students admire t_i ?

The question to ask is why the economy principle ceases to work in D-linked *wh*-questions. I speculate that the economy principle is rooted to the effort for making processing easier. Therefore, if D-linking on a *wh*-phrase plays a role in reducing computational load on parser engaged in filler-gap resolution between the *wh*-phrase and its trace, it provides a good reason to assume that D-linking helps suspend economy constraint.²

4.6 Scrambling

Lastly, let us discuss why scrambling, treated as a movement operation, does not induce crossover effect even if it moves an operator across a bound pronoun. Note that the derivation with scrambling in (32a) has an acceptable variant without scrambling in (32b), with the interpretation and the numeration in (33) shared by them.

- (32) a. Dare- o_i soitu $_i$ -no hahaoya-ga t_i sikat-ta no?
 b. Dare-no $_i$ hahaoya-ga soitu $_i$ -o sikat-ta no?
- (33) a. For whom x , x 's mother scolded x ?
 b. (C, T, v , V, DARE, HAHAOYA, SOITU)

The fact that these two sentences with the same numeration and interpretation are both allowed despite the difference in application of scrambling suggests that scrambling is immune from economy constraint just as D-linked *wh*-movement is.³ The question to ask is, then, why scrambling is free from the economy condition. To answer this question, let us consider why Japanese permits scrambling in the first place. Under Free Merge framework, nothing prevents, as well as requires, movement of object across subject. It will yield non-canonical word order that seems harder to process, but, as a matter of fact, it must be allowed as linguistic expression. However, I suspect that morphological Case-marker suffixed to nominals plays a role in reducing parsing cost for the scrambling construction.⁴ This position is supported by the deviance of scrambling of nominal without Case morphology:

- (34) Taro- \emptyset Hanako- \emptyset sikat-tat-te
 Taro Hanako scolded-C

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‘(They say) Taro/*Hanako scolded Hanako/*Taro.’

Case morphology in combination of voice of the predicate helps determine the thematic role of argument, while absence of Case morphology as in (34) leads to indeterminacy of thematic roles, forcing canonical SOV word order interpretation. Thus, Case morphology renders scrambling costless in parsing, also suspending economy condition in (32a).

Next, let us consider long-distance scrambling, an instance of scrambling that takes place across a clause boundary. The interaction of pronominal binding and long-distance scrambling is more complicated. That is, contrary to clause-internal scrambling that always licenses bound construal of a crossed pronoun, it depends on the type of the operator whether or not a crossed pronoun can be bound by an operator as a result of long-distance scrambling.

- (35) a. ?Dare_i-o soitu_i-no hahaoya-ga Hanako-ga t_i aisiteiru to
 who-ACC the guy-GEN mother-NOM Hanako-NOM love that
 omotteru no
 think Q
 ‘who_i does his_i mother think Hanako loves t_i?’ (Saito (1992: 109))
- b. ?Dare_i-mo soitu_i-no hahaoya-ga Hanako-ga t_i aisiteiru to
 Who-also the.guy-GEN mother-NOM Hanako-NOM love that
 omottei-nai
 think-not
 ‘His_i mother does not think that Hanako loves anyone_i.’
 (Adapted from Saito (1992: 109))
- c. *{Dono-hon-ni-mo/3-satu-no hon-ni}_i sono_i tyosya-ga
 which-book-to-also/3-CLS-GEN book-to its author-NOM

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Hanako-ga keti-o-tuketa to itta
 Hanako-NOM gave-criticism that said
 ‘Its_i author said that Hanako criticized {every book/three books}_i.’
 (Adapted from Saito (2005: 341))

(35a) and (35b) indicate that a wh-phrase like *dare* ‘who’ and a negative polarity item like *dare-mo* ‘anyone’ can be scrambled long-distance across a bound pronoun. On the other hand, (35c) shows that a universal quantifier and a numeral quantifier cannot variable-bind a pronoun crossed by long-distance scrambling. Note that clause-internal scrambling of a universal/numeral quantifier can license bound-variable construal of a crossed pronoun as in (36):

(36) {Dono-hon-ni-mo/3-satu-no hon-ni}_i sono_i tyosya-ga t_i
 which-book-to-also/3-CLS-GEN book-to its author-NOM
 sain-sita
 autograph-did
 ‘Its_i author gave his autograph on {every book/three books}_i.’

The case like (35c) has been taken in the literature to suggest that long-distance scrambling, unlike clause-internal scrambling, should be treated as A'-movement that does not feed pronominal binding (Saito (1992), Tada (1993) among others), with the unacceptability of (35c) analyzed in terms of weak crossover violation. However, this view leaves (35a) and (35b) unexplained; if long-distance scrambling in these sentences were A'-movement on a par with that in (35c), then (35a) and (35b) should have the same status as (35c) regarding to pronominal binding.

A question to ask is why the sentence (35c) is unacceptable under bound-variable construal. Is the long-distance scrambling of a universal/numeral quantifier

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sensitive to the economy condition that is suspended in the other cases of scrambling? I argue that the answer is no and what is relevant here is the scope condition on pronominal binding that requires that a bound pronoun should be inside the scope of the antecedent operator in LF. That is, clause-internal scrambling of any kind of operator and long-distance scrambling of a wh-phrase and a NPI are permitted to feed pronominal binding because the scrambled operator can take scope at the landing site in LF, while long-distance scrambling of a universal/numeral quantifier is not because the scrambled operator cannot take scope at the landing site in the first place due to undoing of the scrambling operation (radical reconstruction).⁵ Consider the following sentences:

- (37) Dare-mo-o/3-nin-no gakusei-o_i dare-ka-ga t_i aisiteiru
 everyone-ACC/3-CLS-GEN student-ACC someone-NOM love
 ‘Someone loves everyone/three students.’ ($\exists > \forall/3, \forall > \exists/3$)

- (38) {Dare-mo-o/3-nin-no gakusei-o}_i dare-ka-ga Taro-ga t_i
 everyone-ACC/3-CLS-GEN student-ACC someone-NOM Taro-NOM
 aisiteiru to itta (koto)
 love that said fact
 ‘Someone said that Taro loves {everyone/three students}.’
 ($\exists > \forall/3, * \forall/3 > \exists$)(Adapted from Saito (2005 347))

(37) involves clause-internal scrambling of a universal/numeral quantifier over an indefinite and scope ambiguity arises between $\exists > \forall/3$ and $\forall/3 > \exists$. The latter reading suggests that the universal takes scope over the indefinite from the landing site of scrambling in LF. However, (38), which scrambles the embedded universal/numeral over the matrix indefinite, does not allow for the $\forall/3 > \exists$ reading.

That suggests that universal/numeral quantifiers fronted by long-distance scrambled must undergo radical reconstruction in LF, as a result of which they do not take scope over the matrix clause but over the embedded clause. This property of universal/numeral scrambling explains why (35c) does not allow pronominal binding; the antecedent does not take scope over the bound pronoun in LF.

On the other hand, the contrasts in (39) and (40) suggest that LF reconstruction of the *wh*-phrase and the NPI is not obligatory;

- (39) a. Nani- o_i John-wa Mary-ga t_i tabeta ka siritagatteiru no
 what-ACC John-TOP Mary-NOM ate Q want.to.know Q
 ‘What does John want to know whether Mary ate?’
 (Takahashi (1994: 657))
- b. John-wa Mary-ga Nani-o tabeta ka siritagatteiru no
 *? ‘What does John want to know whether Mary ate?’
 ‘Does John want to know what Mary ate?’
- (40) a. Dare-mo Taro-wa Hanako-ga t aisiteiru to omottei-nai
 who-also Taro-TOP Hanako-NOM love that think-not
 ‘anyone $_i$, Taro does not think Hanako loves t_i ’
- b. ??Taro-wa Hanako-ga dare-mo aisiteiru to omottei-nai

If the *wh*-phrase reconstructed obligatorily, (39a) and (39b) would have the same LF where the *wh*-phrase takes scope in the embedded question, yielding the interpretation observed for (39b). However, (39a) allows for the matrix question reading, which is unavailable to (39b). Likewise, if (40a) reconstructed the NPI into the embedded clause, why is the sentence not as bad as (40b) due to clause-mate condition on NPI licensing? Therefore I conclude that *wh*-phrase and NPI can stay

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in the landing site in LF, as a result of which (35a) and (35b) satisfy the scope condition, a necessary condition for pronominal binding.

5. Conclusion

This paper has proposed to modify Ruys' (1994) global economy analysis of weak crossover by articulating the definition of the class of derivations that competes for economy; those that are grammatical syntactically and semantically and share the numeration and the interpretation, with their SM properties irrelevant. The theory offered a unified answer to problems about crossover phenomena: the strong/weak asymmetry, A'/A asymmetry, the effect of D-linking and repair particle, and absence of crossover effect in scrambling.

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Notes

1) I assume that nominals enter a derivation with its Case value unspecified and it is assigned in the course of derivation or at the interfaces. I capitalize nominals to show that their Case is not yet determined. In addition, note that (14a) and (14b) differ in

whether *do*-support occurs or not. I assume with Lasnik (1999) that *do* is inserted at PF and is not contained in the numeration.

2) This is actually what Goodall (2015) shows based on experiments, giving empirical support to this effect. In addition, ameliorating effect of D-linking is also supported by the fact that superiority effect in multiple wh-question is suspended when wh-phrases are D-linked, as in (i):

- (i) a. Which boy admires which girl?
- b. Which girl does which boy admire?

3) Note that even scrambling of a non-D-linked operator (i) is free from crossover effect, which suggests that the factors that makes economy consideration irrelevant are different between scrambling and D-linking.

- (i) a. Ittai dare_i-o soitu_i-no hahaoya-ga t_i sikat-ta no?
 on.earth who-ACC the.guy-GEN mother-NOM scolded Q
 ‘Whose mother on earth scolded him?’
- b. Ittai dare_i-no hahaoya-ga soitu_i-o sikat-ta no?

4) See Saito (2016) for the view that bearing a morphological Case-marker is the very property that makes scrambling available.

5) I leave for future research the question of why the long-distance scrambling of quantifiers/numerals are obligatory undone while that of wh-phrases and NPIs is not.

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