

The Scope and Presupposition of the Additive Particle *-to**

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This paper investigates the scopal behavior of the Korean additive particle *-to*; specifically how the presupposition due to the additive particle interacts scopally with another quantificational element in the sentence, and how changes in word order due to scrambling affect the presupposition. In the course of this investigation, I identify three factors that affect the scope pattern of the *-to* phrase: scrambling, the kind of function in the preceding context, and the nature of the focused phrase, which leads to an ordering restriction between a referential expression and a functional expression. The analysis is composed of three elements, each of which is independently motivated. First, I argue, following Kripke (1990) and Heim (1992) among others, that the anaphoric approach to the additive particle is superior to the existential approach. Secondly, I claim that syntactic binding is not the only mechanism for variable binding. I show that semantic binding is also available, which is operative when we are dealing with functional dependencies. Finally, I propose two principles of economy that regulate reconstruction and type raising. Both operations are allowed only when they are motivated. The motivation of reconstruction is a change in truth-conditions. If reconstruction only affects presupposition, it is not licensed. Similarly, type raising is possible when it is motivated by the lexical entry of the additive particle, namely to avoid a type-mismatch.

Key words: scope, reconstruction, presupposition, additive particles, scrambling, discourse felicity, economy

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1. Introduction

This paper investigates the scopal behavior of the Korean additive particle *to*. The main concern of this paper is to examine how a definite NP combined with *-to* (e.g. *Mary-to*; henceforth *-to* phrase) behaves scopally in scrambling contexts; more specifically, how the presupposition due to the additive particle interacts scopally with another quantificational element in the sentence, and how changes in word order due to scrambling affect the presupposition.¹⁾

This investigation reveals that the scopal behavior of the *-to* phrase is distinct from that of QPs. The specific findings are the reconstruction and anti-reconstruction effects, the obviation of both reconstruction and anti-reconstruction effects in the context of a functional expression, and finally an ordering restriction between a referential expression and a functional expression. I present an account of this behavior that builds on the following three elements: the anaphoric view of the additive particle, semantic binding, and principles of economy. I argue that (i) the anaphoric view of the additive particle is superior to the widespread existential view, (ii) both syntactic and semantic mechanisms are available for variable binding, thus the presence of a bound variable in a dislocated position does not always imply syntactic reconstruction, and (iii) covert operations such as reconstruction and type raising are constrained by an economy principle.

This paper proceeds as follows. After presenting the core data in section 2, I put forward the proposal and analysis in section 3. Section 4 presents more puzzles that arise in the context of a functional expression, and provides an analysis that employs semantic binding and type raising. Finally, section 5 concludes the paper.

2. The Scope Puzzles

This section presents the scopal behavior of *-to* phrases in scrambling

1) The particle *to* is ambiguous between the additive meaning (*also*) and the scalar meaning (*even*) (Kim 1999 among others), and our discussion focuses on the additive meaning. The discussion also focuses on cases where *-to* is combined with a definite nominal. See Chung, Lee, and Nam (2002) for discussion about the particle combined with a classifier phrase.

contexts. Investigating the scope of additive particles amounts to investigating how the presupposition due to additive particles is affected by other quantificational elements. Thus we pay attention to the presupposition of the *-to* phrase.

There are two cases in which scrambling is relevant. Let us start with the first one, in which the *-to* phrase in the object position undergoes scrambling across the subject QP. Interestingly, scrambling of the *-to* phrase disambiguates an otherwise ambiguous sentence, as illustrated below.

- (1) a. **Motun** sonyen-i Mary-to coahanta.
 every boy-Nom Mary-also like
 '(Lit.) Every boy likes Mary-also.'²⁾
 (i) There is someone other than Mary who every boy likes.
(*also* > *every*)
 (ii) For each boy *x*, there is someone other than Mary who *x*
 likes.
(*every* > *also*)
- b. Mary-to_i [**motun** sonyen-i t_i coahanta.]
 Mary-also every boy-Nom like
 '(Lit.) Mary-also, every boy likes *t*'
 (i) There is someone other than Mary who every boy likes.
(*also* > *every*)
 (ii) *For each boy *x*, there is someone other than Mary who *x*
 likes.
(**every* > *also*)

Sentence (1a) is ambiguous. If the *-to* phrase takes scope over the QP *motun sonyen* 'every boy,' it is required that there is another person besides Mary that every boy likes. Let's call this a strong reading. By contrast, if the QP takes scope over the *-to* phrase, there is no such requirement. This reading allows each boy to like different people, as long as they all like Mary. We call this a weak reading. When the *-to* phrase is scrambled as in (1b), however, only the strong reading remains; the weak reading has disappeared. This contrast between the two sentences is reflected in their felicity in the context of a pair-list. Sentence (1a) can be appropriate when preceded by a list of pairs in which the

2) The additive particle *-to* directly follows the focused phrase, unlike its English counterparts *too* and *also*. Here I provide a literal translation to make clear that the particle forms a constituent with the focused phrase, although it is not grammatical in English.

first member (a boy) likes the second member (a girl), but (1b) cannot³. The pair-list does not meet the presupposition of the strong reading, and thus it cannot form a felicitous discourse with (1b).

The non-ambiguity of (1b) shows that the scrambled *-to* phrase does not undergo reconstruction to the trace position. This is puzzling under the following two assumptions: (i) the additive particle is a quantificational element (Horn 1969, Krifka 1998) and the *-to* phrase is defined as a QP, and (ii) scrambled QPs induce ambiguity (Hoji 1985, Ahn 1990), as illustrated in (2).

- (2) **Motun** sonyen-ul_i [nwukwunka-ka t_i coahanta.]
 every boy-Acc someone-Nom like
 '(Lit.) Every boy, someone likes *t*.'
 (i) There is someone who likes every boy. (*some* > *every*)
 (ii) For each boy *x*, there is someone who likes *x* (*every* > *some*)

When the object QP undergoes scrambling, the scrambled QP can but need not undergo reconstruction, thus the sentence becomes ambiguous. In the following discussion, I will refer to the non-ambiguity of (1b) as *anti-reconstruction effect* of the *-to* phrase.

Next we turn to the second case of scrambling where the object QP is scrambled across the subject *-to* phrase. Sentences in (3) exemplify the relevant case.

- (3) a. **Mary-to motun** sonyen-ul coahanta.
 Mary-also every boy-Acc like
 '(Lit.) Mary-also likes every boy.'
 (i) There is someone other than Mary who likes every boy.
 (*also* > *every*)

3) The discourse in (i) is felicitous thanks to the weak reading of (1a).

- (i) A: **Motun** sonyen-i nwukwu-lul coahapni-kka?
 every boy-Nom who-Accd like-Q
 'Who does every boy likes?'
 B: **Alex-ka** Becki-lul, **Christ-ka** Diana-lul **Edward-ka** Franny-lul coahapnita.
 Alex-N Becki-A Christ-N Diana-A Edward-N Franny-A like.
 'Alex likes Becki, Christ likes Diana, and Edward likes Franny.'
Kuliko **motun** sonyen-i **Mary-to** coahapnita.
 and every boy-Nom Mary-also like
 'And every boy likes Mary, too.'

- (ii) *For each boy *x*, there is someone other than Mary who likes *x*.
(*every > also)
- b. **Motun** sonyen-ul₁ [Mary-**to** t₁ coahanta.]
 every boy-Acc Mary-also like
 '(Lit.) Everyboy, Mary-also likes *t*'
- (i) There is someone other than Mary who likes every boy.
(also > every)
- (ii) *For each boy *x*, there is someone other than Mary who likes *x*.
(*every > also)

In (3a), the surface order determines the scope relation, in conformity with the scope-rigidity of Korean. Thus the *-to* phrase scopes over the QP, and only the strong reading is available. Since the weak reading is not possible, (3a) does not make a felicitous utterance in the context of a pair-list. In (3b), the QP has been scrambled, but the sentence is still unambiguous. That is, the weak reading is still unavailable. Therefore, (3b) is infelicitous in the context of a pair-list, as well.

The non-ambiguity of (3b) shows that the QP cannot take scope over the *-to* phrase. If the QP were able to take scope in its surface position, the weak reading would be possible. This is unexpected given that scrambled QPs can take scope in their surface position (see (2) above). The apparent generalization is that a QP undergoes obligatory reconstruction when scrambled across the *-to* phrase, but not when scrambled across other QPs. This asymmetry suggests that something about the additive particle triggers the reconstruction. In the following discussion, I will refer to this pattern as *reconstruction effect* of QPs.

3. Proposal

3.1. Ingredients

This section introduces two elements of the analysis, based on which I account for the two effects noted in the previous section. They are an anaphoric view of the additive particle and a principle of economy that regulates reconstruction.

Additive particles are often said to trigger an existential presupposition (Karttunen & Peters 1979). For instance, (4a) is said to presuppose (4b).

- (4) a. Mary-**to** Boston-ey salkoissta.
 Mary-also Boston-in live
 Mary_F lives in Boston, too.⁴⁾
 b. $\exists x[x / \text{Mary} \ \& \ \text{live_in_Boston} \ (x)]$

A closer look, however, tells us that the existential presupposition in (4b) is too weak to license the additive particle, and that something more specific is required (see Kripke 1990⁵⁾). The problem is the following: we all know that many people live in Boston, thus the presupposition in (4b) is trivially satisfied. We also know that cooperative hearers are able to add uncontroversial information to the conversational background. This is the process called *accommodation* (see Lewis 1979, Stalnaker 1972, von Stechow 2000, and Beaver 2001). Putting these two pieces together, it follows that if the presupposition of (4a) were simply (4b), its hearer would be able to accommodate this uncontroversial information, and sentence (4a) would be felicitous in almost any context. In particular, it will be felicitous even when no salient individual who lives in Boston is mentioned. This expectation, however, is not fulfilled. If uttered out of the blue, (4a) sounds odd and calls for further identification of the person in question (e.g. *Who else lives in Boston?*). This clearly contrasts with the presupposition of definite descriptions given in (5), where accommodation works as expected.

- (5) I am sorry that I am late. I had to take my daughter to the doctor. (von Stechow 2000: 3)

This sentence can be appropriately uttered even when the speaker does not explicitly mention that he has a daughter. The hearer would take for granted without much objection that the speaker has a daughter.

In reaction to this problem, an anaphoric view has been proposed, according to which the presupposition of additive particles is similar to that of pronouns in that both of them demand an antecedent in the context. This captures the fact that when uttered out of the blue, pronouns also resist accommodation. Heim (1992), in particular, assumes that

4) F-marking indicates phonetic prominence.

5) For more on this issue, see also Soames (1989), Asher and Lascarides (1998), van der Sandt and Geurts (2001), and Suzuki (2003) among others.

the additive particle is sort of like *in addition to x*, where *x* is an anaphoric element whose reference is disambiguated at LF by means of a referential index. Under this view, the presupposition of (6a) is represented as in (6b).

- (6) a. Mary- to_1 Boston-ey salkoissta.
 Mary-also Boston-in live
 Mary_F lives in Boston, too.
 b. $g(1)$ / Mary & live_in_Boston ($g(1)$)

Here the additive particle carries an index. The value of this index is determined by a variable assignment function g , which is in turn determined by the utterance context. The function g is a partial function from indices to individuals, and in this case includes index 1 in its domain. The presupposition of (6a) is now that $g(1)$ is not Mary and $g(1)$ lives in Boston. The value of the pronominal element (index) depends on the utterance context, which means without a context, the value is not determined. This explains why accommodation is difficult with additive particles.

Now turning to the particle *-to*, I propose a specific implementation of Heim's approach, and define the lexical entry of *-to* within this proposal. I argue that the particle *-to* takes a covert pronoun as an argument in addition to two overt ones (an individual and a predicate). This covert argument is an implicit pronoun that is provided by the context, and behaves just like an overt pronoun: it requires an antecedent; it can be free, bound, or E-type; and it induces a weak crossover (WCO) violation in certain configurations. The lexical entry of the particle *-to* is given in (7). Note that the particle is defined as a partial function to encode the presupposition. The part following the colon conveys the presupposition part, and the whole sentence is defined if and only if the presupposition is satisfied.

$$(7) \llbracket -to \rrbracket = \lambda x_e. \lambda y_e. \lambda P_{\langle e,t \rangle}. x / y \ \& \ P(x) = 1.P(y) = 1 \ (6)$$

After the particle takes two individual arguments, we get the *-to* phrase,

6) Compare this to the entry of the particle under the existential view, given in (i).

(i) $\llbracket -to \rrbracket = \lambda x_e. \lambda P_{\langle e,t \rangle}. \exists y [y / x \ \& \ P(y) = 1].P(x) = 1$

which is defined as a generalized quantifier of type $\langle et, t \rangle$ (see also Suzuki 2003). The *-to* phrase takes a predicate P , and the resulting sentence is defined if and only if the predicate holds of the covert argument x , which is different from the overt argument y . If defined, the sentence asserts that the predicate holds of the overt argument y .

Next we turn to an economy principle that regulates reconstruction. This is a modified version of Fox's (2000) Scope Economy, which is stated in (8).

(8) *Scope Economy*

Scope-shifting operations (SSOs) cannot be semantically vacuous.

(Fox 2000:3)

Fox argues that SSOs (e.g. *optional* QR and QL/reconstruction) can apply only if it affects semantic interpretation. If there is no such semantic effect, SSOs are not licensed. The two sentences in (9) illustrate a contrast due to this restriction.

- (9) a. A boy loves every girl.
 b. John loves every girl.

Sentence (9a) is ambiguous between surface ($a > every$) and inverse scope ($every > a$), where the inverse scope is the result of the QR that moves the object QP across the subject QP. Fox argues that this QR is licensed, since the inverse scope is semantically distinct from the surface scope. By contrast, sentence (9b), is not ambiguous, simply because there is only one scope-bearing element, namely *every girl*. Here the surface scope ($John > every$) and the inverse scope ($every > John$) are not distinct, and for this reason, QR of *every girl* across *John* is not licensed. Fox provides arguments for this claim on the basis of the scope facts in VP-Ellipsis, details of which we do not go into here. The crucial idea to keep in mind is that SSOs are licensed only when they have semantic effects, in particular effects on truth-conditions.

Here I propose following Fox (2000) that SSOs, especially reconstruction in our case, are licensed only when they lead to different **truth-conditions**. In particular, I argue that no reconstruction is licensed to change presuppositions. When a phrase is scrambled with a special purpose (other than changing truth-conditions), that phrase does not under-

go reconstruction at LF as long as the two representations (one with reconstruction and the other without reconstruction) have the same truth-condition. This position is fully faithful to the spirit of economy. Suppose that a phrase is overtly moved to induce a certain effect, e.g. to change context. If that phrase undergoes reconstruction, the effect of the overt movement is lost, but there is no gain in terms of truth-conditions, which is the intrinsic driving force of SSOs. In such a case, it is more economical not to reconstruct, everything being equal. The output effect, whatever that is, is valid, and the truth-condition remains the same.

In formulating this idea, I borrow from von Stechow (1999) a notion of entailment, which he calls Strawson-Entailment:

- (10) A proposition p Strawson-Entails a proposition q if and only if q is true in every possible world in which p is true and q has a truth-value.

The entailment under this notion is checked under the premise that the conclusion has a semantic value, i.e., truth-value. In order for a proposition to have a semantic value, its presuppositions must be satisfied; otherwise, the conclusion lacks a truth-value. The reasoning given in (11) exemplifies this relation.

- (11) A pug is a dog.
 Mary owns a pug.
 Mary is walking her dog.

∴ Mary is walking her pug.

One can easily check that this reasoning is valid. In every world in which Mary owns a pug and she is walking her dog, she is walking her pug. Next with the aid of Strawson-Entailment, we define Strawson-Equivalence. As equivalence is defined via entailment, so Strawson-Equivalence is defined via Strawson-Entailment. Specifically, Strawson-Equivalence is defined as mutual Strawson-Entailment of two propositions.

- (12) Propositions p and q are Strawson-Equivalent if and only if p Strawson-Entails q and q Strawson-Entails p . I.e., p and q have

if we compare the assertions and presuppositions of the weak and strong readings.

(16) The Weak Reading

- a. Assertion: Each boy likes Mary.
- b. Presupposition: Each boy likes someone other than Mary.

(17) The Strong Reading

- a. Assertion: Each boy likes Mary.
- b. Presupposition: There is someone other than Mary whom every boy likes.

As one can see, the two readings have different presuppositions, but have the same assertion. That is, the two readings are Strawson-Equivalent to each other. Since reconstruction only cares about assertion, reconstruction of the *to*-phrase cannot be licensed in (15).

Note that possible readings of the sentences containing the particle *-to* depend on which options (among free, bound, and E-type pronouns) are available for the pronominal within the additive particle. Now that the *-to* phrase in (15) has to be interpreted in the scrambled position, bound and E-type pronouns are ruled out in this configuration. The bound pronoun or the bound pronoun within the E-type pronoun cannot be bound by the subject QP in the scrambled position, which explains the absence of the weak reading. Naturally, a free pronoun is the only option available, which leads to the strong reading.

Next we turn to the reconstruction effect, which arises when a QP is scrambled across a *-to* phrase. We start with the sentence with the basic word order.

(18) **Mary-to** **motun** sonyen-ul coahanta.

Mary-also every boy-Acc like

'(Lit.) Mary-also likes every boy.'

- (i) There is someone other than Mary who likes every boy.

(*also* > *every*)

- (ii) *For each boy x, there is someone other than Mary who likes x.

(**every* > *also*)

As mentioned already, this sentence is unambiguous. It only allows the

strong reading. The account of this is straightforward. Among the three options that the pronominal within the *-to* phrase can take, only the free pronoun is a viable choice. Since the object quantifier cannot bind the pronominal in the subject position, both bound and E-type pronouns are ruled out. Assuming index 4 for the implicit pronoun, the sentence is defined iff $g(4)$ is not Mary and $g(4)$ likes every boy. If defined, the sentence is true iff Mary likes every boy.

The reconstruction effect arises when the object QP is scrambled across the *-to* phrase, as illustrated in (19).

- (19) **Motun** sonyen-ul₁ [Mary-**to** t₁ coahanta.]
 every boy-Acc Mary-also like
 '(Lit.) Everyboy, Mary-also likes t.'

(i) There is someone other than Mary who likes every boy.

(*also* > *every*)

(ii) *For each boy x , there is someone other than Mary who
 likes x . (**every* > *also*)

Since the scrambled QP can take scope in the scrambled position, we expect the weak reading in (ii) to be available in (19). Especially, under the principle of economy that I am arguing for, the QP must take scope in the surface position. The weak and strong readings are Strawson-Equivalent to each other, and thus there is no motivation for the QP to reconstruct. Here I argue that the lack of the weak reading in (19) is due to a WCO violation. In order for the weak reading to be possible, the pronominal element within the *-to* phrase must be either a bound or an E-type pronoun. Yet, both options trigger a WCO violation, since the QP undergoing scrambling crosses-over its bindee, namely the implicit argument of the particle. (See also Chierchia 1991, 1993, Büring 2004 for cases where implicit variables induce WCO violations.) Behind this reasoning lies an assumption that scrambling across the *-to* phrase is an A-bar movement. I assume that in the overt syntax, the *-to* phrase is in the spec of FocP or has already passed by that position, therefore, scrambling across this position becomes an A-bar movement. The schematic structures in (20) illustrate how this works.

- (20) a. [**every boy**₁ [[Mary-**to**-**x**₁] t₁ likes]]
 b. [**every boy**₁ [[Mary-**to**-the_R_**x**₁] t₁ likes]]

Variable binding is possible from c-commanding A-positions (Reinhart 1983, Büring 2004), and the scrambled QP in (20) does not qualify as an A-binder. Now that the two options (out of three) are ruled out, the only option remaining is the pronominal being a free pronoun, as shown in (21). Of course, this is not a WCO configuration.

(21) [every boy_{t1} [[Mary-to-y₃] t₁ likes]]

Sentence (19) under the structure in (21) is defined iff $g(3)$ is not Mary and $g(3)$ likes every boy. If defined, the sentence is true if Mary likes every boy. This is the strong reading. Notice that the strong reading is derived although the QP is interpreted in the scrambled position. A free pronoun is a referring expression, and as such there is no scopal interaction between the QP *motun sonyen* and the *-to* phrase. This shows that the scrambled QP need not undergo reconstruction in order for the strong reading to be available. The strong reading is not due to the obligatory reconstruction of the QP, but due to the implicit argument being a free pronoun.⁷⁾

At the same time, this case provides an argument against the existential view. Under the existential view, the reconstruction effect has to be stipulated since the existential view has no way to rule out the weak reading. This is another argument (in addition to the difficulty of accommodation) which shows that the anaphoric view is superior to the existential view.

4. Extension: Natural Functions and Discourse Felicity⁸⁾

4.1. More Puzzles

This section presents more puzzles that relate to the scope of the *-to* phrase. We first note that both reconstruction and anti-reconstruction effects are obviated in the context of a natural function which contains a bound variable. Then we turn to an ordering restriction between a refer-

7) Given this, the name *reconstruction effect* is a misnomer.

8) I borrow the term *natural function* from the literature on functional questions. I assume with Chierchia (1991) that natural functions are functions that have a corresponding functional expression, e.g. *his mother*.

ential expression and a functional term.

Let us start with the anti-reconstruction effect. If a uniform relation, i.e. a function, appears in the preceding context, the scrambled *-to* phrase seems to undergo reconstruction.

- (22) **Caki emeni-lul₁** [**motun** sonyen-i t₁ coahanta.]⁹⁾
 self mother-Acc every boy-Nom like
 '(Lit.) Self's mother, every boy likes t'
 Kuliko **Mary-to₂** [**motun** sonyen-i t₂ coahanta.]
 and Mary-also every boy-Nom like
 '(Lit.) And Mary-also, every boy likes t'
 'For each boy x, x likes x's mother, and x likes Mary_F, too.'

In the previous section, we noticed that if the *-to* phrase is scrambled, only the strong reading is available; thus the pair-list in the preceding context cannot satisfy the presupposition of the strong reading. What is surprising about (22) is that the same sentence becomes felicitous although the preceding context still does not provide a salient individual whom every boy likes. In the given context, each boy likes his own mother, so there is no one who is liked by every boy. The discourse should be infelicitous. The felicity of the discourse in (22) suggests, then, that the function *caki emeni* 'his mother' somehow can satisfy the presupposition of the strong reading.

We find a similar pattern with respect to the reconstruction effect, too. Although the scrambled QP seems to obligatorily reconstruct in (19), it seems to take scope in the scrambled position if the preceding context provides a function, as illustrated in (23).

- (23) **Motun** sonyen-ul₁ [**caki emeni-ka** t₁ coahanta.]
 every boy-Acc self mother-Nom like
 '(Lit.) Every boy, self's mother likes t'
 Kuliko **motun** sonyen-ul₂ [**Mary-to** t₂ coahanta.]
 and every boy-Acc Mary-also like
 '(Lit.) Every boy, Mary-also likes t'
 'For each boy x, x's mother likes x, and Mary_F likes x, too.'

9) The bound variable *caki* has another life as a 2nd person pronoun in colloquial speech, but the discussion in this section only cares about cases where *caki* is a bound variable.

Again, it is surprising that the discourse in (23) is felicitous. We noticed in the previous section that only the strong reading is available in the second sentence of (23). Thus in order for this sentence to be felicitously uttered, the preceding context should provide an individual other than Mary who likes every boy. The first sentence of (23) does not provide such an individual since each mother likes her own son. Thus this discourse is expected to be infelicitous. This shows that the functional term in the preceding context cancels the reconstruction effect, and that the function somehow meets the presupposition of the strong reading.

Next we turn to an ordering restriction that correlates with the nature of the focused phrase. In brief, a functional term can satisfy the presupposition of the *-to* phrase that contains an individual term, whereas an individual term cannot satisfy the presupposition of the *-to* phrase that contains a functional term. Thus the ordering between a functional term and an individual term affects discourse felicity.

In (22) and (23), we saw that the uniform relation in the first sentences seems to be able to satisfy the presupposition of the second sentences where an individual term is in focus. If a functional term is focused, however, an interesting contrast appears. It seems that an individual term in the preceding context cannot satisfy the presupposition of the *-to* phrase that contains a function. Consider the following discourses.

- (24) **Mary-lul₁** [**motun** sonyen-i t₁ coahanta.]
 Mary-Acc every boy-Nom like
 '(Lit.) Mary, every boy likes *t*.'
 #Kuliko **caki emeni-to₂** [**motun** sonyen-i t₂ coahanta.]
 and self mother-also every boy-Nom like
 '(Lit.) And self's-mother-also, every boy likes *t*.'
 'For each boy *x*, *x* likes Mary, and *x* likes *x*'s mother_F, too.'
- (25) **Motun** sonyen-ul₁ [**Mary-ka** t₁ coahanta.]
 every boy-Acc Mary-Nom like
 '(Lit.) Every boy, Mary likes *t*.'
 #Kuliko **motun** sonyen-ul₂ [**caki emeni-to** t₂ coahanta.]
 and every boy-Acc self mother-also like
 '(Lit.) And every boy, self's-mother-also likes *t*.'
 'For each boy *x*, Mary likes *x*, and *x*'s mother_F likes *x*, too.'

The discourses in (24) and (25) are not felicitous. Speakers find them incoherent, and suggest that the preceding context should contain a functional term, too. If the individual term in the first sentences is replaced by a functional term, the discourses become felicitous.

What is more interesting is that this ordering restriction holds only of scrambled sentences. There is no such restriction in sentences with base order. In (26), an individual term precedes a *-to* phrase that contains a function, but the discourse is still felicitous.

- (26) **Motun** sonyen-i **Mary**-lul coahanta.
 every boy-Nom Mary-Acc like
 'Every boy likes Mary.'
- Kuliko **motun** sonyen-i **caki emeni-to** coahanta.
 and every boy-Nom self mother-also like
 'Every boy likes his mother, too.'
- 'For each boy *x*, *x* likes Mary, and *x* likes *x*'s mother_F, too.'

Contrast (26) with (24).¹⁰ Once the scrambled phrases are back to their original positions, the infelicity has disappeared. This suggests that the *-to* phrase that contains a functional term triggers different presuppositions depending upon whether it is scrambled or not. Apparently, the requirement becomes stronger in the scrambled case.

4.2. Analysis

This section extends the proposal in section 3 to the cases presented in the above section. Combined with semantic binding and an economy principle on type raising, the proposal explains the data. Before presenting the analysis, I will briefly discuss semantic binding and the economy principle.

It is well known that a question like (27a) can be answered in three ways as given in (27b-d). (See among others Engdahl 1986, Cheirchia 1991, 1993)

¹⁰ If there is no scrambling in (25), the second sentence becomes ungrammatical due to a WCO violation. For this reason, we cannot construct a felicitous discourse that corresponds to the infelicitous discourse in (25).

- (27) a. Which woman does every man love?
 b. Mary
 c. His mother
 d. Alex, Becki; Chris, Diana; Edward, Franny.

The answers in (27b-d) are each called individual, functional, and pair-list answers. Of the three answers, we focus on the functional answer, and derive functional readings of questions from the tools available in analyzing questions in general (e.g. Karttunen 1977). One well-known proposal for this is due to Engdahl (1986) and Chierchia (1991, 1993), which propose that *wh*-phrases leave either a simple trace of type *e* or a complex trace that contains more than one variable. If *wh*-phrases leave a simple trace, we get the usual *wh*-questions that can be answered by individual answers as in (27b). By contrast, if they leave a complex trace, which contains a function variable, we obtain functional questions. For example, under the functional reading of (27a), the trace contains two variables. One is a functional trace of type $\langle e, e \rangle$, which is bound by the *wh*-phrase, and the other is an individual variable of type *e*, which is bound by the trace of the subject QP. The individual variable becomes an argument of the functional variable, and the variable complex itself is interpreted by Functional Application; thus the whole trace eventually comes out as type *e*, which can occur in argument positions. The question in (27a) under the functional reading is paraphrased as in (28).

- (28) Which woman-valued function $f_{\langle e, e \rangle}$ is such that every man *x* loves $f(x)$?

Now we move one step further, and turn to functional questions where the *wh*-phrase contains a bound variable, as shown in (29a).

- (29) a. Which relative of *his* did *every boy* invite?
 b. His mother/His grandfather/...

The bound variable in the *which* phrase seems to be bound by the subject QP *every boy*. The question here is how this is possible. Engdahl (1986) proposes that the bound pronoun in the restrictor of *which* can be bound in its surface position without undergoing reconstruction. In

(29a), everything remains the same as in (27a) under its functional reading except that a binder index is adjoined to the sister of *which*, which will be binding the variable.¹¹⁾

The same issue arises in specificational sentences, as well. Here again, variable binding is possible although the apparent binder does not c-command the bound variable (so called connectivity effects), as illustrated in (30).

- (30) a. The woman every man loves _____ is his mother.
 b. What every man enjoys most _____ is his summer vacation.

Sharvit (1999) and Cecchetto (2001) argue that variable binding in these sentences is possible thanks to the internal binding, which is made available by the presence of a functional dependency (see also Jacobson 1994). For example, sentence (30a) expresses identity between two functions: the function which maps every man to the woman he loves is the function which maps every man to his mother. Although it is not clear why functional dependencies make the internal binding possible, the data shows that syntactic reconstruction is not the only mechanism available for variable binding.

Next we turn to an economy principle on type raising. Following Partee and Rooth (1983), I argue that each expression is assigned the lowest type among possible alternatives unless there is a motivation to assign additional higher types. When necessary, type shifting, specifically type raising, is licensed and provides an adequate higher type meaning. Note that the type raising under consideration is a different kind from the well-known operation LIFT proposed in Partee (1986). Partee defines LIFT as a device which turns an individual (type *e*) into a generalized quantifier (type $\langle et, t \rangle$) by taking all of the sets that contain that individual. For example, LIFT turns *j* into $\lambda P.P(j)$. The type raising operation we adopt here is responsible for an alternation between type *e* and type $\langle e, e \rangle$. Specifically, it turns an individual into its functional interpretation so that an individual term like *Mary* can denote a function of type $\langle e, e \rangle$

11) Of course, there is another way to derive the variable binding here, namely syntactic binding based on the reconstruction of the restrictor of *which*. In the interest of space, we do not go into the discussion on this issue. See Engdahl (1986) and Heim (2001).

($\lambda x.Mary$), namely a constant function which maps all elements in the domain onto *Mary*. When multiple denotations are available for an expression, an economy principle dictates that the lower type be preferred to the higher type. I name this *Type Raising Economy*.

This economy principle can be overridden when a specific need arises for higher types. One motivation suggested in Partee and Rooth (1983) and Partee (1986) is the lexical entry of conjunction. Under the assumption that only expressions of the same type are conjoinable, type raising accounts for the conjoinability of lower and higher type expressions. The conjunctions in (31) illustrate such a case. In (31a), the type of an extensional verb ($\langle e, \langle e, t \rangle \rangle$) is raised to that of intensional verbs ($\langle \langle et, t \rangle, \langle e, t \rangle \rangle$). In (31b), an individual term is raised to be a generalized quantifier.

- (31) a. John needed and bought a new coat.
 b. Professor Jones and every student came to the party.

By contrast, if the two conjuncts have the same type, there is no need for type raising, in conformity with the economy principle. A similar remark is made in Engdahl (1986) with respect to mixed answers to functional questions, where functional terms are conjoined with individual terms.

- (32) a. Q: Who does every Frenchman admire?
 A: His mother and Juliette Binoche.
 b. Q: Who is the female star in *The English Patient*?
 A: Juliette Binoche.

The question in (32a) is a functional question, given the answer *his mother*. This means that *his mother* is of type $\langle e, e \rangle$, and thus *Juliette Binoche* should be of type $\langle e, e \rangle$ as well, given the conjoinability of the two. This is possible thanks to type raising. When there is no such a motivation, the same expression *Juliette Binoche* is assigned type e , as in a simple question like (32b).

Now I am proposing that the lexical entry of *-to* also motivates type raising. As can be seen in the lexical entry of the particle *-to* (see section 3.1), the lexical entry of the additive particle requires that the first two arguments of the particle *-to* have the same type (*Type Parallelism*). If the two arguments have different types, types are adjusted to satisfy

Type Parallelism, similarly to the conjunction case. Otherwise, the structure is not interpretable. Although type raising due to the additive particle looks just the same as the one due to conjunction, there is one difference between the two, namely directionality. In case of conjunction, both conjuncts have equal status. If one conjunct has a different type from the other conjunct, type raising takes place irrespective of the ordering between the two conjuncts. It does not matter whether the conjunct with the higher type precedes or follows the one with the lower type. This is not the case with the particle *-to*. Type Parallelism specifies that among the three arguments of the particle, the types of the first two should be equivalent. Now out of the two arguments, only the second one can undergo type raising to meet Type Parallelism. The first argument plays the role of a reference point, and is assigned the lowest type possible in conformity with the general economy principle.

Now we are ready to tackle the puzzles noted above. In the interest of space, we focus on the obviation of the anti-reconstruction effect, but extension to the reconstruction effect is straightforward.

- (33) **Caki emeni-lul₁** [motun sonyen-i t₁ coahanta.]
 self mother-Acc every boy-Nom like
 '(Lit.) Self's mother, every boy likes *t*'
 Kuliko Mary-to₂ [motun sonyen-i t₂ coahanta.]
 and Mary-also every boy-Nom like
 '(Lit.) And Mary-also, every boy likes *t*'
 'For each boy *x*, *x* likes *x*'s mother, and *x* likes Mary_F, too.'

The phrase *caki emeni* 'his mother' in (33) invokes a natural function, and this explains the seeming reconstruction of the *-to* phrase without adopting real reconstruction. In the first sentence of (33), *caki emeni* 'his mother' is interpreted as a function of type $\langle e, e \rangle$ (due to semantic binding). This function of type $\langle e, e \rangle$ becomes the first argument of the particle *-to*. In order to meet Type Parallelism, then, *Mary* in the second sentence of (33) undergoes type raising, again due to internal binding. It denotes a constant function, which maps all elements in the domain on to *Mary* ($\lambda x.Mary$). This type raising is licit since it has a motivation. Under this option, the discourse is informally read as follows.

- (34) The mother-function is a function f such that each boy x likes $f(x)$.
 The Mary-function is a function g such that each boy x likes $g(x)$ in addition to $f(x)$.

Since the first two arguments of the particle are functional terms, the entry of *-to* is adjusted to be compatible with that, as shown in (35). The superscript distinguishes this new entry from the previous one.

- (35) $[[\text{-to}^1]] = \lambda f_{\langle e, e \rangle} \lambda g_{\langle e, e \rangle} \lambda P_{\langle ee, t \rangle} f / g \ \& \ P(f) = 1.P(g) = 1$

Our final concern is the ordering restriction between a functional term and an individual term. When the *-to* phrase containing a functional term is scrambled, an individual term in the preceding context cannot satisfy the presupposition. One example is repeated in (36).

- (36) **Mary-lul₁** [motun-sonyen-i t₁ coahanta.]
 Mary-Acc every-boy-Nom like
 '(Lit.) Mary, every boy likes *t*'
 #Kuliko **caki-emeni-to₂** [motun-sonyen-i t₂ coahanta.]
 and self-mother-also every-boy-Nom like
 '(Lit.) And self's-mother-also, every boy likes *t*'
 'For each boy x , x likes Mary, and x likes x 's mother_F, too.'

The cases in (36) contrasts with the one in (33). This contrast illustrates how type raising is constrained by an economy principle. Given the principle that there is no type raising without a motivation, the infelicity of (36) straightforwardly follows. In the first sentence of (36), *Mary* is interpreted as an individual of type e . At this point, there is no motivation for type raising, and thus no type raising takes place. Then the second sentence follows, where the *-to* phrase contains a functional term, namely *caki-emeni* 'his mother,' which is interpreted as a function. Now that the first and the second arguments of the particle have different types, interpretation cannot proceed. The failure to satisfy Type Parallelism explains the infelicity of the discourse.¹²⁾

12) A reviewer presents an alternative account, in which the infelicity of (36) is due to the subject/topic-orientedness of the anaphor *caki*. Under this account, *Mary* in the first

Then, why is it that there is no ordering restriction of the same kind in sentences with a base order. The following example is repeated from (26).

- (37) **Motun** sonyen-i **Mary**-lul coahanta.
 every boy-Nom Mary-Acc like
 'Every boy likes Mary.'
- Kuliko **motun** sonyen-i **caki emeni**-to coahanta.
 and every boy-Nom self mother-also like
 'Every boy likes his mother, too.'
- 'For each boy *x*, *x* likes Mary, and *x* likes *x*'s mother_F, too.'

As in the previous cases, *Mary* in the first sentence has no reason to be a function. If *caki emeni* 'his mother' in the second sentence is a function of type $\langle e, e \rangle$, this discourse should incur a violation of Type Parallelism, and thus be infelicitous as (36). Contrary to this expectation, this discourse is perfect, which shows that *caki emeni* 'his mother' in the second sentence is not a functional term. This means that the phrase *caki emeni* does not have to be a function. If *caki* 'his' is interpreted as a bound variable, *Mary* in the first sentence can be an antecedent of a free pronoun within the *-to* phrase. Type Parallelism is satisfied, since both are of type *e*.

5. Concluding Remarks

This paper examined the scopal behavior of the *-to* phrase. I identified a few generalizations regarding the scope of the *-to* phrase; namely, the reconstruction effect of the QP, the anti-reconstruction of the *-to* phrase, the obviation of both reconstruction and anti-reconstruction effects in the context of a functional expression, and finally an ordering restriction

sentence functions as a topic, and as such it comes to bind *caki* in the following sentence. Thus the functional reading of *caki* becomes unavailable. If *caki* in the second sentence is referring to Mary, as this alternative account suggests, it is mysterious why the discourse is not felicitous in this context. If *caki emeni* is replaced by *Mary-uy emeni* 'Mary's mother,' the discourse becomes felicitous, and the same is expected for (36) when *caki* refers to Mary. This seems to weaken the alternative account. For issues related to the subject-orientedness, See Lee (1988) among many others.

between a referential expression and a functional expression. Each of these generalizations motivated elements of the proposed account. Specifically, the reconstruction effect motivates the anaphoric view of the additive particle; the anti-reconstruction effect motivates Reconstruction Economy; the obviation of both reconstruction and anti-reconstruction effects in the context of a functional expression motivates semantic binding; and finally, the ordering restriction and its absence in certain contexts motivates type raising economy.

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