Object Control in Korean: Structure and Processing*

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1. Introduction

Control is a dependency between two argument positions where the referential properties of the overt controller determine the referential properties of the silent controllee (represented as a gap below), as in (1).

(1) Craig Venter$_i$ tried [___$_i$ to capture the code of life]
controller controllee

The controller can appear in the subject position as in (1) (subject control) or in the object position of the matrix clause, as in (2) (object control):

(2) Craig Venter persuaded investors$_i$ [___$_i$ to fund the genome project]
controller controllee

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Traditional analyses of control assume that such constructions are base generated with an invisible subject in the complement clause (or no subject at all, depending on a particular theory). More recently, an analysis of control has been proposed which subsumes control under A-movement and thus assimilates control to raising. The two structures are less unlike than they appear under the traditional view, differing only in whether or not the matrix position is thematic (as in control) or not, as in raising (Hornstein 2003).[1]

The derivational analysis of control has received strong support from the phenomenon of backward control. Under backward control, the referential identity of the silent matrix controllee crucially depends on the identity of the overt controller in the embedded clause. This phenomenon, where the silent controllee is structurally higher than the overt controller, is represented in the hypothetical English example below:

(3) Craig Venter persuaded ___$_i$ [investors$_i$ to fund the genome project]
controllee controller

Such a structure is incompatible with base generation (the silent element in the matrix clause is in violation of binding conditions and the distribution of PRO), and does indeed call for a movement analysis. A movement derivation of backward object control would look like (4b) (noncrucial details omitted). The difference between forward and backward control is simply in the choice of the link in the movement chain: the tail under forward control, the head under backward:

(4) a. [$_{VP}$ persuade investors [$_{CP}$ to [$_{TP}$ ~~investors~~ [$_{vP}$ ~~investors~~ fund the project]]]]

b. [$_{VP}$ persuade ~~investors~~ [$_{CP}$ to [$_{TP}$ ~~investors~~ [$_{vP}$ investors fund the project]]]]

While backward control has been found in a number of languages,[2] it is still possible that the attested cases can be accounted for by a different analysis than movement. What kind of analysis may be available? Many languages with purported backward control have null pronominal subjects and some also allow null pronominal objects. The presence of *pro*-drop suggests an alternative to the movement analysis: the silent element in the matrix clause may be a null pronominal co-indexed with the subject of the embedded clause. As long as the two positions are not in a c-command rela-

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[1] For earlier proposals that control and raising are not as distinct as they are made to be, see Bolinger (1961), Langacker (1995).

[2] Backward subject control has been attested in Tsez, Malagasy, and Circassian (Polinsky and Potsdam 2002, 2003, 2006). Backward object control has been attested in Brazilian Portuguese (Farrell 1995), Malagasy (Potsdam 2006), Japanese (Harada 1973, Kuroda 1978, Fujii 2004), and Korean (Monahan 2004).

tion, such co-indexation should be possible and, given the right semantic or pragmatic conditions, would yield the control interpretation (Dowty 1985, Jackendoff and Culicover 2003, among many others). The crucial difference between the two possible analyses then comes down to the difference between Obligatory Control with movement and Non-Obligatory Control with coerced coreference between two argument expressions.

This paper will compare the two analyses against a family of object control constructions in Korean. Korean is particularly relevant to the debate between the two approaches because it has subject and object *pro*-drop (Kim 2000) and shows an intriguing variation under object control.

In what follows, section 2 introduces the relevant object control structures. Section 3 presents the syntactic- and semantics-based analyses of Korean object control. Then the two analyses are compared using syntactic considerations (section 4) and processing evidence (section 5). Conclusions and general discussion follow in section 6.

2. Object Control in Korean

Object control in Korean involves the matrix verbs *seltukhata* 'persuade', *kwonyuhata* 'suggest' (and some others), and the complement clause headed by the complementizer -*tolok* (see Kim 1978, 1984 for evidence that it is a complementizer). The construction is illustrated in (5), with the missing argument represented again as a gap:

(5) Chelswu-ka Yenghuy-lul /eykey [__ tomangka-tolok] seltukhayssta
Chelswu-NOM Yenghuy-ACC/DAT run_away-COMP persuaded
'Chelswu persuaded Yenghuy to run away.'

The apparent controller, preceding the embedded clause, can be either in the accusative or dative case (we will not consider the dative in this paper). The construction shows all the relevant properties of obligatory control such as selectional restrictions, uniqueness of the controller, and sloppy interpretation under ellipsis (Monahan 2004).

This construction, which we will refer to as ACC1, alternates with two other constructions, illustrated in (6) and (7) below.

(6) Chelswu-ka [__ tomangka-tolok] Yenghuy-lul seltukhayssta
Chelswu-NOM run_away-COMP Yenghuy-ACC persuaded
'Chelswu persuaded Yenghuy to run away.' *ACC2*

(7) Chelswu-ka ___ [Yenghuy-ka tomangka-tolok] seltukhayssta
Chelswu-NOM Yenghuy-NOM run_away-COMP persuaded
'Chelswu persuaded Yenghuy to run away.' *NOM*

The second accusative construction (ACC2) differs from ACC1 in the order of the complement clause and the accusative DP. The construction in (7), referred to as NOM, has a silent object in the matrix clause, determined by the argument structure of the matrix verb. The reference of that object is determined by the overt nominative DP which, as shown by constituency tests, binding, and quantifier float, is a constituent of the embedded clause (Monahan 2004).

All three of these constructions are relatively rare: in the Sejong corpus of 10 million sentences, they occur only 233 times, of which ACC1 occurs 97 (41%), ACC2, 38 (16%), and NOM, 98 times (43%).

3. Two Analyses of Korean Object Control

The relationship between ACC1, ACC2 and NOM has been analyzed as either syntactic control or as semantic control. Under both analyses that have been proposed in the literature, the three constructions are viewed as derivationally related. For now, we will keep this as a working assumption and we will return to it in sections 4 and 6.

3.1. Syntactic Analysis

Under the syntactic analysis, which treats control as raising into a theta-position, the matrix and embedded DP form an A-chain. In both accusative constructions (ACC1, ACC2), the tail of the chain is deleted, instantiating forward control. In NOM, the head of the chain is deleted, thus instantiating backward control (Monahan 2004).

(8) ACC1
John [$_{VP}$ Mary$_{k}$-ACC [$_{CP}$ [$_{TP}$ __$_{k}$ [$_{VP}$ leave]]-$_{COMP}$] persuaded]
A-chain

(9) ACC2 (possibly scrambled?)
John [$_{XP}$ [$_{CP}$ [$_{TP}$ __$_{k}$ [$_{VP}$ leave]]-$_{COMP}$]$_{j}$ [$_{VP}$ Mary$_{k}$-ACC t_{j} persuaded]
A-chain

(10) NOM (the position of the gap uncertain)
John [$_{VP}$ __$_{k}$ [$_{CP}$ [$_{TP}$ Mary$_{k}$-NOM [$_{VP}$ leave]]-$_{COMP}$] persuaded]
A-chain

The difference between the two forward patterns may be due to scrambling. However, at this point it is not entirely clear which of the accusative constructions is basic and which, if any, is derived by scrambling. Frequency data above may suggest that ACC1 is basic (hence more common than the presumably scrambled version), but there may be many reasons for this distribution. Next, if frequency were taken seriously, it is somewhat puzzling that the presumably scrambled structure (ACC2) is so frequent. While scrambled OSV sentences occur in only about 1.5% of the Sejong corpus data, the ratio of ACC1 to ACC2 is about 2.5:1, which makes ACC2 inexplicably widespread for a case of scrambling.

In summary, at this point it is hard to rule out either direction of derivation (ACC1→ ACC2 and ACC2→ACC1), and it is possible that both constructions are base generated.

3.2. Semantic Analysis

The semantic analysis of control relies on the fact that Korean has subject and object *pro*-drop. This analysis assumes that the silent element in all three control constructions is a null pronominal. Then the overt DP is analyzed as being co-indexed with a null pronominal, via a meaning postulate (Agent-to-Agent). In those instances where the coindexation is impossible, the null pronominal is interpreted nonreferentially (Cormack and Smith 2002, 2004; see also Choe 2006 for a discussion).

According to this analysis, ACC1 is the basic structure, with the accusative DP in the specifier of VP, and the control complement adjoined to V' as shown in (11). The accusative DP c-commands the nominative DP in the embedded clause. The control interpretation is achieved by the meaning postulate which links the agent of the embedded proposition and the persuadee of the matrix (Cormack and Smith 2004):

(11) John $[_{VP}$ [Mary$_1$-ACC] $[_{V'}$ $[_{CP}$ $[_{TP}$ *pro*$_2$ leave]-COMP] persuaded]

Although Korean has object *pro*-drop, the structure in (11) is incompatible with the null pronominal in the specifier position coindexed with the embedded subject (12).

(12) *John $[_{VP}$ [*pro*$_1$] $[_{V'}$ $[_{CP}$ $[_{TP}$ Mary-NOM$_2$ leave]-COMP] persuaded]

The apparent violation of Condition C in (12) seems to be remedied by local scrambling (within the VP). Under such scrambling, the control complement appears in the specifier of VP, and the matrix DP adjoins to V':

(13) John $[_{VP}$ $[_{CP}$ $[_{TP}$ DP$_1$ leave]-COMP] $[_{V'}$ [DP$_2$-ACC] persuaded]

In this structure, either of the coindexed DPs can be expressed by a null pronominal. If the null pronominal appears in the embedded clause, the result is ACC2, if in the matrix, NOM:

(14) a. John $[_{VP}$ $[_{CP}$ $[_{TP}$ *pro*$_1$ leave]-COMP] $[_{V'}$ [DP$_2$-ACC] persuaded]
b. John $[_{VP}$ $[_{CP}$ $[_{TP}$ DP$_1$ leave]-COMP] $[_{V'}$ [*pro*$_2$-ACC] persuaded]

The control interpretation is crucially achieved by the meaning postulate; when a referential antecedent of the null pronoun is not available, *pro* can be interpreted arbitrarily (cf. Choe 2006).

4. Syntax or Semantics? Structural considerations

4.1. Scrambling

Cormack and Smith (2004) stipulate that local scrambling obviates the binding violation shown in (12). The data in Choe (2006) suggest that the accusative DP which follows the *tolok*-complement (as in ACC2) may have different binding properties than the preposed accusative DP in ACC1. Thus scrambling is a crucial analytical component of the semantic analysis.

There are at least two reservations about scrambling, one general, and the other specific to Korean. On a general level, many arguments in favor of scrambling can be shown to be empirically flawed or inconclusive (Fanselow 2001). Theoretically, the concept of A-scrambling conflicts with a number of accepted minimalist assumptions, and base generation of alternative orders may be a better solution (Fanselow 2001).

Even if we ignore this general reservation, something is rotten in the state of Korean scrambling. Researchers often assume that Korean scrambling is a copycat of Japanese scrambling, and the latter is reported to change binding conditions, including condition C (Nemoto 1991). In Korean, however, scrambling has an effect on A binding (Choi 2001) but not on condition C binding (Johnston and Park 2001). In relatively uncomplicated examples, which are expected to reproduce the effects found in Japanese, there is no change in condition C despite the difference in word order—in both (15a) and (15b), 'he' and 'Chelswu' must be disjoint:

(15) a. Yenghi-nun ku-lul Chelswu-uy pang-eyse mannassta
Yenghi-TOP him-ACC Chelswu-GEN room-at met
'Yenghi met him$_{i/*j}$ in Chelswu's$_j$ room.'

b. Yenghi-nun Chelswu-uy pang-eyse ku-lul mannassta
Yenghi-TOP Chelswu-GEN room-at him-ACC met
'Yenghi met him$_{i/*j}$ in Chelswu's$_j$ room.'

Thus the reliance on scrambling may be problematic, which makes things more difficult for the semantic analysis. To minimize this problem, one could pursue the possibility that ACC1 and ACC2 are both base generated. That still leaves unanswered the question of why the more exotic construction, NOM, must be based on ACC2, not ACC1. The syntactic analysis does not rely on scrambling: the A-movement relation between the overt controller and silent controllee holds regardless of the constituent order.

4.2. Embedded Subject Restriction

The syntactic and semantic analyses achieve the control interpretation by very different means. According to the syntactic analysis, if a matrix empty category c-commands a constituent of the embedded CP, only the embedded subject could be coindexed with it. On the other hand, according to the semantic analysis, since no c-command holds, the meaning postulate should allow for the embedded agent, regardless of its grammatical function, to be coindexed with the matrix object DP (cf. Monahan 2005).

Turning now to a sentence where the embedded subject is not an agent but a patient, we find that the syntactic analysis correctly predicts that this subject will form a dependency with the matrix object. On the other hand, the semantic analysis incorrectly predicts that the agentive argument (the by-phrase in (16)) will be co-indexed with the matrix argument.

(16) Tom-un $\_\__{j/*k}$ [Mary$_j$-ka Bob$_k$-ey uyhay chwuycay-toy-tolok] sel-tukhayssta
Tom-TOP Mary-NOM Bob-DAT interview-PASS-COMP persuaded
'Tom persuaded Mary to be interviewed by Bob.'
NOT: 'Tom persuaded Bob to interview Mary.'

4.3. Distributive Quantification

Distributive quantifiers provide another tool of distinguishing between the two analyses. In the syntactic analysis, distributive quantifiers should be possible in the embedded clauses. In the semantic analysis, true distributive quantifiers should be impossible because they would bind a pronominal (Monahan 2005). The syntactic analysis makes the right prediction:[3]

(17) Tom-un [ai-tul-i motwu-ka swukcay-lul ha-tolok] seltukhaessta
Tom-TOP child-pl-NOM every-NOM homework-ACC do-COMP persuaded
'Tom persuaded every child to do the homework.'

In summary, primary linguistic evidence based on c-command relations supports the syntactic analysis of Korean object control. If this analysis is on the right track, the three object control constructions can be accounted for in the following manner:

(18) a. DP-ACC [~~DP-NOM~~ V-tolok] persuaded ACC1
b. [~~DP-NOM~~ V-tolok]$_{(i)}$ DP-ACC (t_i) persuaded ACC2
c. ~~DP-ACC~~ [DP-NOM V-tolok] persuaded NOM
c′. [DP-NOM V-tolok] ~~DP-ACC~~ persuaded NOM

[3] Cormack and Smith (2004) account for these empirical facts by proposing that Korean lacks true quantifiers and uses indeterminate pronouns instead. At this point it is too early to tell if this is a viable approach.

As the discussion above shows, there are reasons to doubt the application of scrambling in (18b), which is why it is shown as hypothetical. The base position of the deleted head of the chain in the nominative construction is unclear, and we present both possibilities in (18c, c').

5. Syntax or Semantics? Processing considerations

5.1. Processing Predictions

The two analyses compared here make different predictions concerning the processing of the three constructions. In order to flesh out these predictions, let us revisit those components of the syntactic or semantic analysis that may have processing consequences.

First, research on scrambling/word order variation shows that scrambling imposes an additional processing load—this has been amply demonstrated for OSV sentences in Japanese (Mazuka et al. 2002; Ueno and Kluender 2003; Miyamoto and Takahashi 2002). Thus, scrambling has to be taken into consideration. Second, processing favors the order in which the filler precedes the gap (anaphora); the opposite, cataphoric, order, in which the gap precedes the filler, incurs a greater processing cost (Gordon and Hendrick 1997; Kazanina and Phillips 2004; Sturt 2003).[4] The two analyses apply these criteria in the following way:

	Syntactic analysis	Semantic analysis
ACC1	anaphora	base structure, anaphora
ACC2	cataphora	scrambling and cataphora
NOM	possibly cataphora (18c)	scrambling, anaphora

Table 1 Scrambling and anaphora in object control

The analyses then make different processing predictions for the three constructions. According to the semantic analysis, ACC2 should incur the heaviest processing cost because it shows both scrambling and cataphora. Only scrambling applies in NOM, which should therefore be faster than ACC2 but slower than ACC1. According to the syntactic analysis, ACC1 should be faster than NOM and ACC2. Given the uncertainties with the basic order of the overt DP and embedded clause, it is hard to make a direct

[4] Of course there are other considerations, for example, frequency. Assuming that the more frequent a construction, the faster it should be processed, ACC1 and NOM should not differ in terms of processing, and ACC2, which is less common, should impose a heavier processing load. This prediction is not borne out.

comparison between ACC1 and ACC2 or between ACC2 and NOM. The predictions are summarized below (> means 'slower than'):

Syntactic analysis	Semantic analysis
ACC2 > ACC1 (cataphora) NOM > ACC1 (cataphora?)	ACC2 > NOM > ACC1 (cataphora and scrambling)

Table 2 Predictions made by the two analyses

5.2. Reading Time Experiment

To test which analysis makes correct predictions, we conducted a reading time experiment with ACC1, ACC2, and NOM as target structures. An example sentence is given below.

Example: "The marketing department persuaded the leading actress to appear on a popular talk show to advertise the movie."

ku	yenghwasa-uy	hongpothim-i	yenghwa	hongpo-lul	wuyhay
that	production-GEN	marketing-dept-NOM	movie	advertising-ACC	for
W1	W2	W3	W4	W5	W6
"The marketing department ....to advertise the movie."					

Table 3 Opening frame

ACC1	heroine-ACC	popular	talk_show-to	appear-comp	persuaded
NOM	heroine-NOM	popular	talk_show-to	appear-comp	persuaded
ACC2	popular	talk_show -to	appear-comp	heroine-ACC	persuaded
	W7	W8	W9	W10	W11
"...persuaded the leading actress to appear on a popular talk show"					

Table 4 Target regions

5.2.1. Participants

Twenty-three native speakers of Korean participated in the experiment. At the time of study, subjects were undergraduate students, graduate students, or post docs at either Korea University or UCSD (17 males, 7 females; mean age 25). The subjects were compensated for their participation.

5.2.2. Materials

There were forty sets of sentences of three conditions: ACC1, ACC2, and NOM patterns. Sentences were pseudo-randomized and were split into four lists using a Latin-square design so that each subject would read only one condition per set. Seventy filler sentences were added to the list.

5.2.3. Procedure

The experiment was run on PsyScope. Stimulus presentation was word by word, self-paced, and non-cumulative. After the final word of each sentence, a yes/no comprehension question followed all the sentences including the fillers. There was a practice session with eight sentences before the experiment. A commercially available statistical package (JMP IN) was used for analyzing the data.

5.2.4. Results

The overall correct answer rate was 89%. Statistical analysis was conducted with control pattern as an independent variable and response to comprehension question as a dependent variable. There was no effect of pattern type ($F(2, 22)=0.92$, $p < 0.41$).

The overall reading time (RT) results are given in Figure 1. When analyzing the RTs, word by word statistical analysis was conducted only between ACC1 and NOM patterns. For a comparison with ACC2, whose word order did not match that of ACC1 and NOM, RTs between W7 and W10 were collapsed.

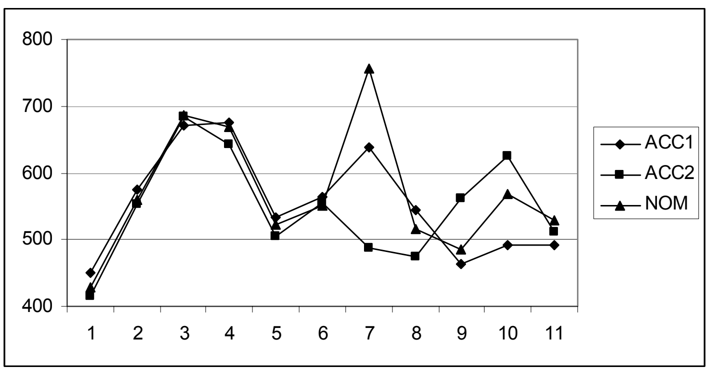

Figure 1 Reading time results

Both analyses correctly predicted NOM to be more difficult than ACC1; NOM was significantly delayed at W7 (757 vs. 639 ms), [$F(1, 22) =7.25$, $p < 0.013$], at W10 (567 vs. 493 ms), [$F(1, 22) =5.6$, $p < 0.027$] and at W11 (529 vs. 492 ms), [$F(1, 22) =4.6$, $p < 0.042$].

The statistical analysis of collapsed RTs from W7 to W10 showed a significant effect of control type [$F(2, 22) =3.86$, $p < 0.026$]. The effect, however, came solely from the difference of the NOM pattern (2195 ms) when compared to the ACC1 (2001 ms) and ACC2 patterns (2014 ms). Pairwise comparison showed that ACC1 and ACC2 did not differ from each other [$F(1, 22) = 0.37$, $p < 0.55$] but that NOM and ACC2 were significantly different [$F(1, 22) = 5.54$, $p < 0.026$]. At W11, there was just a marginal effect of control pattern [$F(2, 22) = 2.67$, $p < 0.08$].

5.2.5. Discussion

Both the syntactic and semantic analysis correctly predicted the NOM pattern to be more difficult to process than the ACC1 pattern. The semantic analysis did not fare well on the overall prediction: ACC2 was as fast as ACC1 and NOM was the only outstanding pattern that caused a significant delay. Recall that if scrambling caused processing difficulty for NOM, then ACC2 also should have been more difficult to process than ACC1. However, ACC1 and ACC2 did not differ from each other in the reading time experiment. This suggests that either scrambling does not cause processing difficulties (unlike other cases where it has been shown to do so) or the constructions in question are not related by scrambling. Only the NOM pattern differed from both ACC1 and ACC2: NOM > ACC1/ACC2. This general finding provides another argument against the semantic analysis, which predicted the order ACC2 > NOM > ACC1.

Beyond this result, however, neither analysis did particularly well. Recall that in formulating the predictions of each analysis, we anticipated deleterious effects of cataphora. The results do not support this prediction; in particular, ACC2, which is the clearest case of cataphora, did not show any reading time delay. At this point, we cannot offer a definitive explanation of this result, but we would like to point out a possible reason for it. In principle, cataphora seems more difficult because it requires the parser to hold in working memory an expression with no/minimal referential content and associate it later on with a more contentful expression. However, negative effects of cataphora (known primarily from English) can be offset by some other effect. What could that be? In a head-final language, there is a preference for putting longer constituents to the left of the shorter ones (Yamashita and Chang 2001); in the Korean control constructions, this would entail putting the embedded *tolok*-clause before the accusative DP (ACC2).

(19) a. DP-ACC [___ V-tolok] persuaded ACC1
anaphora ✓/short-before-long ×
b. [___ V-tolok] DP-ACC persuaded ACC2
cataphora ×/long-before-short ✓

If the long-before-short preference and anaphora preference cancel each other out, this would correctly predict that ACC1 and ACC2 should not differ in RTs—precisely the result obtained in this experiment.

What exactly then causes the significant slowdown in NOM? If the position of the gap is to the left of the *tolok*-clause, then the deleterious effects of cataphora may be felt and cannot be offset by the presence of an overt segment as in (20). This may account for the results of this experiment.

(20) ___ [DP-NOM V-tolok] persuaded NOM

Although this explanation is attractive and may help us solve the question concerning the position of the gap in the nominative construction, it is extremely tentative. Basing an entire structural account on this reading time result alone would be premature. More fine-grained experimental measures may provide us with a more definitive solution to the question of where the gap in NOM is located—before or after the embedded clause.

6. Conclusions

In this paper, we examined three Korean object control constructions with the complementizer *–tolok*: with the overt accusative controller in the matrix clause either preceding or following the embedded clause (ACC1, ACC2), or with the overt nominative controller in the embedded clause (NOM).

We considered two analyses that have been proposed to account for these constructions. In the semantic analysis, base generated *pro* is argued to be coindexed with the overt controller via a meaning postulate. In the syntactic analysis, an A-chain linking two thematic positions is proposed; in ACC1 and ACC2, the tail of the chain is deleted, while in NOM, the head undergoes deletion.

Structural considerations and processing evidence favor the syntactic analysis. This in turn means that Korean object control supports the growing body of empirical evidence for backward control and the theoretical approach to control as raising into a thematic position. If this approach is pursued, it is important to answer the following question: In an A-chain, what motivates the deletion of the head in some cases and the tail in others, resulting in the ACC-NOM contrast? Most other languages with backward control do not show the alternation as Korean does; rather, particular verbs occur only in the forward or only in the backward pattern. For other types of movement, it has been proposed that the choice is driven by phonological considerations (Bošković 2002; Nuñes 2004), but it remains to be seen if these considerations are sufficient to account for the ACC-NOM contrast in Korean object control.

Our processing findings cast doubt on the scrambling relation between the two constructions with the overt controller in the matrix clause (ACC1 and ACC2). On a more general level, the processing findings offer additional support to theoretical proposals rejecting scrambling as theoretically and empirically untenable (Fanselow 2001). With respect to Korean, assuming that ACC1 and ACC2 are both base generated, it is possible that only one of those constructions is actually Obligatory Control (ACC1), while the other instantiates Non-Obligatory Control. This would account for slight differences between ACC1 and ACC2 noted by some researchers (for example, Non-Obligatory Control examples in Choe 2006 all involve ACC2). If this possibility is on the right track, the syntactic and semantic approaches may both be needed—as long as their division of labor is done correctly.

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