Lack of c-command in coordinate structures: Evidence from binding

The syntactic structure of coordination has received considerable attention (Munn 1993, Kayne 1994, Progovac 1998, Chomsky 2020, 2021, a.o.) but nevertheless remains unsettled. One of the central questions involves c-command: in a coordinate structure, is there c-command between the conjuncts, and if so, what c-commands what? We argue that data from coordination of ≥3 conjuncts has been underappreciated in this area. In this study, we present novel Chinese, English, and Japanese data (i) from quantifier binding and (ii) from (regular and logophoric) reflexive licensing indicating a lack of c-command between conjuncts (Note: to save space, this abstract contains English data only, but our Chinese and Japanese data further support the generalizations illustrated with English here). Our data also reveal a previously unnoted (as far as we are aware) pattern in Q-binding and logophoric binding which we call *ramification effects*: the first conjunct (and only the first conjunct) can bind the i^{th} (i>2) conjunct only if it also binds the $(i\text{-}1)^{th}$ conjunct. We analyze the data with an extension of Chomsky's (2020, 2021) ordered sequence analysis of coordinate structures.

Coordinate structure with more than two conjuncts and lack of c-command:

Q-binding: C-command is well known <u>not to be a necessary condition</u> for Q-binding (Barker 2012, a.o.). We cannot conclude that a given pronoun is c-commanded by a Quantifier Phrase (QP) simply from the fact that a bound-variable reading (BVR) is available. Nevertheless, c-command by a QP is a *sufficient* condition for BVRs: there are no conditions under which both (i) a pronoun P is c-commanded by a QP and (ii) a BVR is unavailable for P. Therefore, although we cannot infer c-command by a QP from a possible BVR for a given pronoun, we *can* infer *lack of c-command* if a BVR is *not* available. Consider then (1).

(1) a. The board is discussing [each tutor$_i$, their$_i$ student, the course, and the textbook].
b. *... each tutor$_i$, the course, the textbook, and their$_i$ student
c. *... the course, each tutor$_i$, the textbook, and their$_i$ student
D.*... the course, the textbook,, each tutor$_i$, and their$_i$ student

We find that the first conjunct (C_1) being a QP licenses a BVR for a pronoun in C_2, but not for pronouns in C_3-C_n. Additionally, C_2 being a QP does not license a BVR for pronouns in C_3-C_n. We take this to indicate that C_1 does not c-command C_3-C_n, nor does any $C_{i>1}$ c-command any other $C_{j>i}$. The question whether C_1 c-commands C_2 remains unresolved, as we cannot infer c-command from the *availability* of a BVR in (1a). However, we argue that reflexive binding data can provide critical evidence on this question. **Regular reflexive binding:** Regular reflexive binding provides direct evidence that C_1 does not c-command C_2, confirming the conclusion that conjuncts do not c-command each other. We follow Charnavel (2020) in assuming that regular reflexive binding must obey classical Binding Condition A, and that regular reflexive binding is the only way to license inanimate reflexives (as opposed to animates, which can be licensed by *logophoric* binding (2a); we return to logophoric binding below). Therefore, inanimate reflexives (e.g., *itself* in English) clearly illustrate the role of c-command, as in (2b).

(2) a. The picture of himself$_i$ in Newsweek dominated John$_i$'s thoughts. (Charnavel & Bryant 2020)
b. *The picture of itself$_i$ on the back wall dominated the ballroom$_i$'s interior.

Thus, an inanimate reflexive is licensed iff it is locally c-commanded by its antecedent. Application of this principle to coordinate structures supports our conclusion from Q-binding, demonstrating lack of c-command among conjuncts as in (3), including lack of c-command from C_1 to C_2 (3a), and lack of c-command between other conjuncts (3b).

(3) a. *They couldn't stop thinking about [the castle$_i$, the painting of itself$_i$, and the book]
b. *... [the book, the castle$_i$, and the painting of itself$_i$]

Preliminary analysis: Many previous analyses postulate structures in which some conjuncts c-command others. In contrast, to capture the data above, we argue that a structure is required which precludes such c-command. To this end, we adopt the operation FORM-SEQUENCE (FSQ) from Chomsky's (2020, 2021) analysis of coordinate structures as ordered sequences. FSQ takes *n* elements $X_1...X_n$ as input and produces an *n*-ary sequence $\Sigma = \langle X_1...X_n \rangle$ as output. Importantly, the elements in Σ are syntactically unstructured with respect to each other. We thus assume the members of Σ do not c-command each other; coordinate structures derived by FSQ lack c-command relations between conjuncts. This captures the inability of QP conjuncts to bind pronouns in other conjuncts, as in (1b-d), and for the inability of inanimate conjuncts to license reflexives in other conjuncts, as in (3). However, this analysis does not immediately capture the possibility of Q-binding from C_1 to C_2, as illustrated in (1a). We analyze this possibility as a special case of *ramification effects*, which we describe in further detail below.

Ramification effects: We noted above that Q-binding is not possible from C_1 to $C_{i>2}$ (e.g. [1b]). However, further data reveal a more complex pattern. C_1 *can* bind $C_{i>2}$ if C_1 *also* binds C_{i-1}. Thus, C_1 can bind into C_3 iff it also binds into C_2 (as in [4a] vs. [4b]), and can bind into C_4 iff it also binds into C_3 (as in [5a] vs [5b]), etc. We refer to these restrictions on binding (previously unnoted, to our knowledge) as *ramification effects*.

(4) a.*Every boy scout$_i$, the scoutmaster, and his$_i$ mother
   b. Every boy scout$_i$, his$_i$ scoutmaster, and his$_i$ mother

(5) a. *Every student$_i$, their$_i$ teacher, the therapist, and their$_i$ advisor
   b. Every student$_i$, their$_i$ teacher, their$_i$ therapist, and their$_i$ advisor

The same effect can be found with logophoric binding (i.e. with animate binders). In appropriate contexts, an animate C_1 can license a reflexive in C_2 (6a). Logophoric reflexive binding into an additional conjunct $C_{i>2}$ is possible iff the preceding conjunct C_{i-1} is also bound ([6b] vs. [6c]).

(6) a. John$_i$, a picture of himself$_i$, and Mary   b. *John$_i$, Mary, and a picture of himself$_i$
   c. John$_i$, a picture of himself$_i$, and a book about himself$_i$

Note that, as with Q-binding, C_1 is the only potential binder; C_2 cannot license a reflexive in C_3, for example (e.g.,*John, Mary$_i$, and a picture of herself$_i$).

Extended analysis: These data raise two questions. First, why are Q-binding and logophoric binding possible between C_1 and C_2? Second, why does additional binding require ramification across conjuncts? We propose both questions are answered in an analysis of binding by conjuncts in terms of *sequence compression*, an extension of FSQ. Consider the case of Q-binding. If we assume Quantifier Raising (QR), the raised QP could bind into the coordinate structure from a higher position in the structure. In the case of binding from C_1 to C_2, a representation along the lines of (7a) is derived; the QP in C_1 raises and binds both its own trace and a pronominal variable in C_2. In the case of ramification effects, the raised QP binds variables in each conjunct from C_1 up to the rightmost bound C_i, as in (7b).

(7) a. ∀x … <$_{DP}$ <x, x's teacher>, the therapist>
   b. ∀x … <$_{DP}$ <x, x's teacher, x's therapist, … >, … C_n>

We describe this pattern in ramification effects with the generalization in (8).

(8) For coordination of *n* conjuncts C_1...C_n, a (raised) variable binder binds a variable in C_i iff it also binds a variable in each $C_{j<i}$.

Under this generalization, binding from C_1 to C_2 is the special case where the rightmost bound conjunct is C_2. If logophoric binding also involves variable binding (cf. Koopman & Sportiche 1989), then ramification effects under logophoric binding follow the same generalization in (8).

(9) a. OP_{LOG} … <$_{DP}$ <x, a picture of x>, Mary>
   b. OP_{LOG} … <$_{DP}$ <x, a picture of x, a book about x, … >, … C_n>

A potential solution to capture (8) involves re-application of FSQ internal to an already-formed sequence. Suppose that C_1 is the only conjunct that can contain a bound variable (cf. relevant discussion of first-conjunct effects in agreement, extraction, and selection in Munn 1993 and Bruening & Al Khalaf 2020, a.o.), and suppose that re-application of FSQ can compress additional elements into the privileged C_1 position (as shown in [7] and [9]). Assuming FSQ is subject to matching conditions, requiring conjuncts under FSQ to share a categorial or semantic property (here, a variable), we predict that the conjuncts with shared variables in (7) and (9) can be compressed into the first conjunct, thus enabling them to be bound by a variable binder that scopes over the whole coordinate structure. This offers us a unified analysis of all the binding and ramification effects mentioned above, including lack of both binding and ramification effects in regular reflexive binding (simply because there exists no relevant similar (raised) binder).