The Binding Constraints as Constraints on Coindexation

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The GB binding theory (GBBT)

- Binding constraints are purely formal (rule out certain SS or LF indexations).

  A: A reflexive must be co-indexed with a c-commanding local DP.

  B: A pronoun cannot be co-indexed with a c-commanding local DP.

  C: An r-expression must not be co-indexed with a c-commanding DP.

- Conditions A-C constrain possible interpretations only indirectly via implicit assumption that distinct indices (typically) map to distinct individuals.
- Within a model-theoretic framework we can understand this as a constraint on the global assignments which are appropriate in a given utterance context:

  (1) Non-injective global assignments are inappropriate.

- Challenges to the GB picture:
  - ▷ Lasnik's challenge from overlapping reference.
  - ▷ Reinhart's challenge from apparent exceptions to Conditions A/B.
  - ▷ Partee & Heim's challenge from multiple linking possibilities.
- Some of these challenges suggest that a radical revision of GBBT is in order.
- I propose that these can be addressed by adding the following constraint:

  (2) Injectivity Constraint (IC)
  An assignment g is appropriate for an expression Φ only if g is injective when restricted to the indices in Φ.

- In other words, we extend the GBBT's (implicit) constraint on global assignments to all assignments.
- Actually, IC by itself won't quite do the job. We'll also need:
  - ▷ Articulated H&K-style LFs[1] (λ-nodes etc.)
  - ▷ A slightly ad-hoc constraint.
  - ▷ An idea from Reinhart (2006).

H&K-style LFs

- Each DP starts out with a (freely-assigned) index.
- When a DP moves, a λ-node is adjoined immediately below the landing site, and single (arbitrary) index is chosen for the λ-node and the trace.
- Thus, a moved phrase is not necessarily co-indexed with its trace.
- Type e DPs may QR.
- I assume that QR targets either VP or TP.
- Examples:

  (3) John$_1$ thinks that he$_1$ is intelligent.
  (4) [$_{TP}$ John$_1$ [$_{TP}$ λ_2 [$_{TP}$ t_2 thinks he$_2$ is intelligent]]].
  (5) [$_{TP}$ John$_1$ [$_{TP}$ λ_1 [$_{TP}$ t_1 thinks he$_1$ is intelligent]]].
  (6) [$_{TP}$ [Every boy] [$_{TP}$ λ_2 [$_{TP}$ t_2 thinks he$_2$ is intelligent]]].
  (7) [$_{TP}$ [EB] [$_{TP}$ λ_2 [$_{TP}$ t_2 thinks [$_{TP}$ he$_2$ [$_{TP}$ λ_3 [$_{TP}$ t_3 loves his$_1$ mother]]].

1 Lasnik's challenge from overlapping reference

- Examples noted in Lasnik (1976) (and earlier Helke (1971), Postal (1966)):

  (8) a. *We like me.
  b. *I like us.
  c. *They like him. (where e.g. $[\![\text{they}]\!] = \textbf{John} \oplus \textbf{Bill}$ and $[\![\text{him}]\!] = \textbf{Bill}$)

- How can we handle these cases in GBBT, where each DP has exactly one index?
- *We* and *me* do not denote the same individual(s), so they presumably cannot have the same index.
- If *we* and *me* are contraindexed in (8a), there should be no Condition B violation.

[1] I.e., a the theory of LF representations along the lines of Heim (1998), Heim and Kratzer (1998).

- Even if we could somehow allow co-indexation in this configuration, that would just raise the question of why (9) violates Condition A:

  (9) *We like myself.

- Thus, the data in (8) appear paradoxical for the GBBT.

1.1 Putative solution 1: Go Direct

- The antecedents of Conditions B and C, respectively Chomsky's (1976, 241) (unnamed) rule of interpretation and Lasnik's (1976) Noncoreference Rule, are stated directly as constraints on interpretation.
- Chomsky and Lasnik formulated these constraints not in terms of non-coreference but disjoint reference.[2] Paraphrasing a bit:

  (10) Condition B (Direct Version)
  Interpret a pronoun as disjoint in reference from all local c-commanding DPs.

  (11) Condition C (Direct Version)
  Interpret an r-expression as disjoint in reference from all c-commanding DPs.

- Condition A, in contrast, was formulated in terms of coreference:[3]

  (12) Condition A (Direct Version)
  Interpret a reflexive as coreferential with a c-commanding DP.

- The rules in (10)–(12) handle the problematic data, but:
  - ▷ Direct compositionality is out the window.
  - ▷ It is not trivial to make the notions of "disjoint reference" or coreference precise.
- With regard to the second problem, Heim (2007) proposes the following definition of "covaluation" (a more semantically-savvy stand-in for coreference):

  (13) Covaluation (Heim 2007)
  Let α and β be occurrences of DPs of type e in an LF ϕ, and let C be a subjective context. Then β is covalued with α in ϕ and C iff for all $\langle \mathrm{w}, \mathrm{g}\rangle \in$ and all $\mathrm{g}' \supseteq \mathrm{g}$, $[\![\phi]\!]^{\mathrm{w},\mathrm{g}} = [\![\phi^{\alpha/\beta}]\!]^{\mathrm{w},\mathrm{g}'}$, where $\phi^{\alpha/\beta}$ is the result of replacing β by a copy of α in ϕ.

- However, it is not clear if defining covaluation using substitution works.
- E.g. why are *John* and *Mary* not covalued in (14)?

  (14) John_1 saw Mary_2 or the sky is blue or the sky is not blue.

- Fixing this problem by evaluating (13) locally is not trivial:

  (15) *Every boy [λ_1 [t_1 said that [he_1 [λ_2 [t_2 knows he_2 loves him_1]]]]].

- Plus, things get seriously *gross* if we try to adapt this idea to define overlapping reference (and hence disjoint reference).

1.2 Putative solution 2: Complex Indices

- Could we rescue the modular approach by enriching the system of indexation? (?Schlenker 2005)
- Works ok for a few simple cases:

  (16) *[John_1 and Mary_2]$_{\{1,2\}}$ like him_1.

- Unclear how to handle plurals with an infinite or unknown (to speaker) number of atomic parts (Schlenker 2005).
- Unclear how to interpret sets of indices compositionally (though see Schlenker paper).
- In the case of complex DPs, the required rules of index "percolation" appear to be rather complex and arbitrary, and duplicate the work of the semantics:

  (17) a. *[Each of [the boys]$_{\{1,2\}}$]$_{\{1\}}$ likes them$_{\{1,2\}}$.
  b. [Friends of [the boys]$_{\{1,2\}}$]$_{\{3,4\}}$ like them$_{\{1,2\}}$.

1.3 Are these really Condition B effects?

- Reinhart and Reuland (1993), Kiparsky (2002) note that overlapping reference is actually ok under a collective reading. It is blocked only under a distributive reading:

  (18) a. We elected me head of the committee.
  b. *We like me for different reasons.

[2] Lasnik's (1976) only named version of the rule is stated in terms of noncoreference (p. 12), but he restates it in terms of disjoint reference on p. 16.

[3] CHOMSKY DEFERS TO H TODO TODO. Chomsky and Lasnik (1993) propose a return to an indexless binding theory stated directly in terms of coreference / disjoint reference.

▶ With reflexives, on the other hand, overlapping reference is impossible under both distributive and collective readings:

(19) a. *We elected myself head of the committee.
b. *We like myself for different reasons.

Expositional assumption

$[\![\text{we}]\!] = \mathbf{you} \oplus \mathbf{me}$

▶ The availability of the collective reading in (18a) is easy enough to explain given GBBT. Since **you** $\oplus$ **me** is not the same individual as **me**, we can contraindex the two pronouns, as in (20a), and use the global assignment in (20b):

(20) a. We_1 elected me_2.
b. $\{1 \mapsto \mathbf{you} \oplus \mathbf{me}, 2 \mapsto \mathbf{me}\}$.

▶ The puzzle is then why the distributive reading is out in (18b).

▶ In fact, the distributive reading is *not* out in all Condition B contexts. Kiparsky (2002) notes that it becomes available in ECM configurations:

(21) a. I expect us to have good reputations.
b. We expect me to win for different reasons.

▶ Perhaps (18b) is not really a Condition B effect?

1.4 An analysis using IC

Assumption re distributive readings

Distributive readings are derived via a distributivity operator D that adjoins as the the sister of a λ-abstraction over individuals.

(22) $[\![\text{D}]\!] = \lambda \text{P}_{\text{et}} \,.\, \lambda x_{\text{e}} \,.\, \forall y \; (y \Pi x \wedge \text{atom}(y)) \rightarrow \text{P}(y)$

The λ-abstraction may be introduced via raising of the VP-internal subject to Spec,TP, or via QR.

We like me

▶ To derive a distributive reading, D attaches above the λ-node that binds the trace of the VP-internal subject:[4]

(23) $\text{We}_?$ [D [λ_1 [$_{\text{VP}}$ t_1 like $\text{me}_?$]]]

▶ We have the following indexation possibilities for *we* and *me*:

(24) a. *We_1 [D [λ_1 [$_{\text{VP}}$ t_1 like me_1]]] (*CondB)
b. *We_2 [D [λ_1 [$_{\text{VP}}$ t_1 like me_1]]] (*CondB)
c. *We_2 [D [λ_1 [$_{\text{VP}}$ t_1 like me_2]]] (*LexSem)
d. *We_1 [D [λ_1 [$_{\text{VP}}$ t_1 like me_2]]] (*IC)
e. *We_2 [D [λ_1 [$_{\text{VP}}$ t_1 like me_3]]] (*IC)

▶ (24a) and (24b) violate Condition B.

▶ (24c) derives a different unavailable reading: "We like ourselves" (or "I like myself"). This reading is presumably blocked by the lexical semantics of *we* and *me*. If *we* and *me* are co-indexed they must denote the same individual, but they cannot because one is singular and the other plural.

▶ Of more interest are (24d) and (24e), which derive the distributive reading and are not blocked by Condition B. We can just look at (24e), since the co-indexation of *we* and its trace in (24d) is of no consequence.

▶ Consider the denotation of D's sister in (24e):

(25) $[\![[\lambda_1 \; [t_1 \text{ like } \text{me}_3]]]\!]^{\text{g}} = \lambda x.[\![[t_1 \text{ like } \text{me}_3]]\!]^{\text{g}^{[1 \mapsto x]}}$

▶ D applies this function to every atom that is part of $[\![\text{we}]\!]$ (i.e. to **you** and to **me**, given our expositional assumption):

(26) Starting from global assignment $\{2 \mapsto \mathbf{you} \oplus \mathbf{me}, 1 \mapsto \mathbf{me}\}$
$(\lambda x.[\![[t_1 \text{ like } \text{me}_3]]\!]^{\{2 \mapsto \mathbf{you} \oplus \mathbf{me}, 3 \mapsto \mathbf{me}\}^{[1 \mapsto x]}})(\mathbf{me})$
$= [\![[t_1 \text{ like } \text{me}_3]]\!]^{\{2 \mapsto \mathbf{you} \oplus \mathbf{me}, 3 \mapsto \mathbf{me}, 1 \mapsto \mathbf{me}\}}$

▶ The assignment $\{2 \mapsto \mathbf{you} \oplus \mathbf{me}, 3 \mapsto \mathbf{me}, 1 \mapsto \mathbf{me}\}$ is non-injective when restricted to the indices contained in the constituent that is being evaluated (1 and 3).

▶ Thus, (24e) (and (24d)) are blocked by IC, and there is no way to encode the unavailable distributive reading.

[4] In rough outline I am following Link (1987), Roberts (1987), though Roberts argues against using QR to derive distributive readings of non-subject pronouns.

[5] Or, if *we* QRs, the same index as its trace.

**We like myself*

▶ We can start by ruling out a collective reading.

▶ Condition A forces *myself* to have the same index as *we*.[5] The question is therefore whether we can derive the collective reading with this indexation:

(27) We$_1$ like myself$_1$.

▶ Clearly this is impossible, since if *we* and *myself* are co-indexed they must have the same denotation, but the collective reading is derived if *we* denotes **you** $\oplus$ **me** and *myself* denotes **me**.[6]

▶ With regard to the distributive reading, we again have a number of possible indexations to consider:

(28)
a. *We$_1$ [D [λ_1 [$_{\text{VP}}$ t_1 like myself$_2$]]] (*CondA)
b. *We$_2$ [D [λ_1 [$_{\text{VP}}$ t_1 like myself$_3$]]] (*CondA)
c. *We$_2$ [D [λ_1 [$_{\text{VP}}$ t_1 like myself$_2$]]] (*LexSem)
d. *We$_1$ [D [λ_1 [$_{\text{VP}}$ t_1 like myself$_1$]]] (*LexSem)
e. *We$_2$ [D [λ_1 [$_{\text{VP}}$ t_1 like myself$_1$]]] (*LexSem)

▶ (28a)–(28b) violate Condition A.

▶ (28c) gives rise to the (unavailable) reading "We (each) like all of us together".[7] (28d)–(28e) both give rise to the (unavailable) reading "You like yourself and I like myself."

▶ These readings are incompatible with the first-person and/or singular presuppositions of *myself*. This is shown in more detail for (28e) in (29):

(29) $[\![(28e)]\!]^g = [\![D]\!]([\lambda x.[\![[t_1 \text{ like myself}_1]]\!]^{g^{[1\mapsto x]}}])([\![\text{we}_2]\!])$
$= (\lambda x.[\![[t_1 \text{ like myself}_1]]\!]^{g^{[1\mapsto x]}})(\mathbf{m}) \wedge (\lambda x.[\![[t_1 \text{ like myself}_1]]\!]^{g^{[1\mapsto x]}})(\mathbf{y})$
$= [\![[t_1 \text{ like myself}_1]]\!]^{g^{[1\mapsto \mathbf{m}]}} \wedge [\![[t_1 \text{ like myself}_1]]\!]^{g^{[1\mapsto \mathbf{y}]}}$
$= [\![\text{like}]\!]([\![\text{myself}_1]\!]^{g^{[1\mapsto \mathbf{m}]}})([\![t_1]\!]^{g^{[1\mapsto \mathbf{m}]}}) \wedge [\![\text{like}]\!]([\![\text{myself}_1]\!]^{g^{[1\mapsto \mathbf{y}]}})([\![t_1]\!]^{g^{[1\mapsto \mathbf{y}]}})$

▶ A point in favor of the present analysis is that it maintains a perfect complementarity between Condition A and Condition B.

▶ If Conditions A/B are stated directly as constraints on interpretation they cannot be perfectly complementary. Condition B blocks overlapping reference, whereas Condition A requires not overlapping reference but coreference.

▶ The same will apply to attempts to reformulate GBBT using complex indices. Condition B will block overlapping index sets whereas Condition A will require identical index sets.

Locality and the distributive reading

▶ Whence the contrast between (30a) and (30b)/(30c)?

(30)
a. *I like us for different reasons.
b. I expect us to give speeches for different reasons.
c. I expect that we will give speeches for different reasons.

▶ One possibility is that this has something to do with the co-argument/non-coargument distinction (Reinhart and Reuland 1993, Kiparsky 2002).

▶ On the present analysis we can give a different account.

▶ If there is "room" for the lower plural pronoun to QR to a position below the (trace of) the singular pronoun then IC is not violated:

(31) *[$_{\text{TP}}$ I$_1$ [λ_1 [us$_2$ [D [λ_2 [$_{\text{VP}}$ t_1 like t_2]]] (*IC)
(32) [$_{\text{TP}}$ I$_1$ [λ_1 [t_1 expect [us$_2$ [D [λ_3 [$_{\text{TP}}$ t_3 to give a speech]]]]]]]

▶ In more detail:

(33) $^{\text{A}}$[$_{\text{TP}}$ I$_1$ $^{\text{B}}$[λ_1 $^{\text{C}}$[t_1 expect $^{\text{D}}$[us$_2$ $^{\text{E}}$[D $^{\text{F}}$[λ_3 $^{\text{G}}$[$_{\text{TP}}$ t_3 to give a speech]]]]]]]
A, B: $\{1 \mapsto \mathbf{me}, 2 \mapsto \mathbf{you} \oplus \mathbf{me}\}$[1]
C, D, E, F: $\{1 \mapsto \mathbf{me}, 2 \mapsto \mathbf{you} \oplus \mathbf{me}\}$[2]
G: (evaluated with $3 \mapsto$ each atomic part of $[\![\text{us}]\!]$)
$\{1 \mapsto \mathbf{me}, 2 \mapsto \mathbf{you} \oplus \mathbf{me}, 3 \mapsto \mathbf{me}\}$[3]
$\{1 \mapsto \mathbf{me}, 2 \mapsto \mathbf{you} \oplus \mathbf{me}, 3 \mapsto \mathbf{you}\}$[4]

▶ Although assignment [3] is non-injective, it is injective when restricted to the indices in G. All the other assignments are injective, so IC is satisfied.

▶ This leaves us with the cases where the plural pronoun is higher than the singular one. Why is e.g. (34) ok?

(34) We [expect me give a speech] for different reasons.

▶ In this case, QRing the lower pronoun doesn't help, because e.g. the constituent [me ...] in (35b) will end up being evaluated under an assignment $\supseteq \{2 \mapsto \mathbf{me}, 3 \mapsto \mathbf{me}\}$, which is non-injective when restricted to $\{2, 3\}$.

(35)
a. We$_1$ [D [λ_1 [$_{\text{VP}}$ t_1 expect [$_{\text{TP}}$ me$_2$ to give a sp.]]] (*IC)
b. We$_1$ [D [λ_1 [$_{\text{VP}}$ t_1 expect [me$_2$ [λ_3 [$_{\text{TP}}$ t_3 to give a sp.]]] (*IC)

▶ This is a case where 1st/2nd-person pronouns behave differently from 3rd-person pronouns.

[6] Again, a reading where *we* and *me* do in fact have the same denotation is presumably out due to the lexical semantics of the pronouns.

[7] It is possible that (28c) also violates Condition A. Given the VP internal-subject hypothesis, it may be that the GC of the pronoun is the VP rather than the TP.

▶ When the plural pronoun is lower than the singular pronoun, we see the same pattern with the third person as we do in (30) with the first:

(36) John is a member of the conference committee.
a. *He likes them for different reasons.
b. He expects [them to resign for different reasons].
c. He expects [that they will resign for different reasons].

▶ However, when the singular is lower than the plural, the presence of a clause boundary (finite or non-finite) doesn't help much:

(37) John is a member of the conference committee.
a. *They like him for different reasons.
b. *They [expect him to give a speech] for different reasons.
c. *They [expect that he will give a speech] for different reasons.

▶ So far I've been assuming that indexical pronouns have indices just like regular pronouns. Revised assumptions:

▷ All pronouns (indexicals included) start out with an index.

▷ The index of an indexical is not required for its interpretation.

▷ Thus, an indexical may shed its index if an index-shedding procedure offers its services.

▷ One such procedure: move and delete index under identity with the index of the λ-node introduced following movement.

▶ We can now give essentially the same analysis for the [plural...singular] case that we did for the [singular...plural] case:

(38) *[$_{\text{TP}}$ We [D [λ_1 [me [λ_2 [$_{\text{VP}}$ t_1 like t_2]]] (*IC)

(39) [$_{\text{TP}}$ We [D [λ_1 [t_1 expect [me [λ_2 [$_{\text{TP}}$ t_2 to give a speech]]]]]]]

$^{\text{A}}$[$_{\text{TP}}$ We $^{\text{B}}$[D $^{\text{C}}$[λ_1 $^{\text{D}}$[t_1 expect $^{\text{E}}$[me $^{\text{F}}$[λ_2 $^{\text{G}}$[$_{\text{TP}}$ t_2 to give a speech]]]]]]]

A, B, C: $\{\}^{[1]}$
D,E,F: (evaluated with $1 \mapsto$ each atomic part of $[\![\text{us}]\!]$)
$\{1 \mapsto \textbf{me}\}^{[2]}$
G: $\{1 \mapsto \textbf{me}, 2 \mapsto \textbf{me}\}^{[3]}$
$\{1 \mapsto \textbf{you}\}^{[4]}$
G: $\{1 \mapsto \textbf{you}, 2 \mapsto \textbf{me}\}^{[5]}$

▶ Assignment [3] is non-injective but it is injective when restricted to the indices that appear in G.

▶ And (hedging a bit here), if (37c) is actually ok, we might put this down to referential pronouns also being able to shed their indices.

▶ Snag: we'll also predict "*I expect me ..." and "*We expect us" to be ok. E.g.:

(40) I [λ_1 [t_1 expect [me [λ_2 [t_2 . . .]]]]]

▶ Somewhat ad-hoc additional constraint to prevent this:

(41) Maximize coindexation
For any expression of the form [$_\Phi$ . . . α . . . β] (where α and β are DPs or DP traces), if α and β are not coindexed, then non-vacuously coindexing α and β must yield a different denotation for Φ.

▶ This constraint requires t_1 and *me* to be co-indexed in (40), but this gives rise to a Condition B violation.

Back to Condition A

▶ In attempting to give an explanation for why (38) is bad, there is always the danger of predicting (incorrectly) that (42) should be good:

(42) *We like myself
[$_{\text{TP}}$ We [D [λ_1 [myself [λ_2 [$_{\text{VP}}$ t_1 like t_2]]] (*IC)

▶ However, on the present analysis (42) is blocked simply because removing the index from *myself* makes it impossible for Condition A to be satisfied.

▶ Condition B, on the other hand, is trivially satisfied by any pronominal which has no index.

2 Reinhart's challenge

2.1 Reinhart's original examples

(43) *Condition C obviation*
Mary doesn't like John, Jane doesn't like John, . . .
only JOHN likes John.

(44) *Condition B obviation*
Mary doesn't like Bill, Jane doesn't like Bill, . . .
only BILL likes him (=Bill).

[8] Reinhart does not actually formulate a Condition C since she assumes that it follows from the semantics of lexical r-expressions that they cannot be interpreted as bound variables.

- On the analysis of Reinhart (1983), Grodzinsky and Reinhart (1993), these examples show that coreference is not constrained by Conditions B/C.[8]
- Coreference cannot be used in contexts such as (i) *John likes him* or (ii) *he likes John*, because variable binding must be used instead of coreference if it gives the same interpretation (Rule I), and replacing *him*/*John* in (i)/(ii) with variables bound by the subject derives the same interpretation.
- These examples also have a natural account within GBBT, if we add a slightly weakened formulation of IC.
- The following LFs are out, period:

(45) a. Only JOHN$_1$ likes John$_1$. (violates Condition C)
b. Only JOHN$_1$ likes him$_1$. (violates Condition B)

- However, by weakening IC slightly, as in (46), we can derive the coreferential interpretations from the contraindexed LFs in (47):

(46) Weak Injectivity Constraint (WIC)
An assignment g is appropriate for an expression Φ only if $g\restriction_{I(\Phi)}$ is injective or there is no re-indexation of Φ, Φ', and assignment g', such that $g'\restriction_{I(\Phi')}$ is injective and $[\![\Phi]\!]^g = [\![\Phi']\!]^{g'}$.
(where $I(\Phi)$ is the set of indices that appear in Φ)

(47) a. Only JOHN$_1$ likes John$_2$.
b. Only JOHN$_1$ likes him$_2$.

- The logic here is as follows:
  - ▷ In the absence of focus, $[\![[\text{John}_1 \text{ likes John}_1]]\!]^{\{1\mapsto \mathbf{John}\}}$ has the same denotation as $[\![[\text{John}_1 \text{ likes John}_2]]\!]^{\{1\mapsto \mathbf{John}, 2\mapsto \mathbf{John}\}}$. Since the former is a reindexation of the latter, the use of the non-injective assignment $\{1 \mapsto \mathbf{John}, 2 \mapsto \mathbf{John}\}$ is blocked by Weak IC.
  - ▷ However, [JOHN$_1$ likes John$_2$] and [JOHN$_1$ likes John$_1$] have different contrast sets under the aforementioned assignments:

(48) a. x likes John.
b. x likes x.

  - ▷ There is no reindexation of (47a) which, under an injective assignment, yields the same contrast set as the original.
  - ▷ If WIC is sensitive to the focus semantic value of an expression as well as its ordinary semantic value, we can explain IC is not violated in (47).
- Note that in contrast to the analysis of Reinhart (1983), Grodzinsky and Reinhart (1993), Weak IC does **not** allow us to sneak in a distributive reading for **We like me*.
- That is, the indexation in (49) is not permitted by Weak IC:[9]

(49) *We$_1$ [D [λ_1 [$_{VP}$ t_1 like me$_2$]]]

(50) Starting from global assignment $\{1 \mapsto \mathbf{you} \oplus \mathbf{me}, 2 \mapsto \mathbf{me}\}$
$(\lambda x.[\![[_{VP}\ t_1 \text{ like me}_2]]\!]^{\{1\mapsto \mathbf{you}\oplus\mathbf{me}, 2\mapsto \mathbf{me}\}^{[1\mapsto x]}})(\mathbf{me})$
$= [\![[_{VP}\ t_1 \text{ like me}_2]]\!]^{\{1\mapsto \mathbf{me}, 2\mapsto \mathbf{me}\}}$

- The reason for this can be seen in the last line of (50). There is a re-indexation and injective reassignment that yield the same denotation:

(51) $[\![[t_1 \text{ like me}_1]]\!]^{\{1\mapsto \mathbf{me}\}}$

- Thus, Weak IC blocks the evaluation of $[t_1$ like me$_2]$ under the non-injective assignment $\{1 \mapsto \mathbf{me}, 2 \mapsto \mathbf{me}\}$.

2.2 Heim's additional examples

- Heim notes that Reinhart's analysis in terms of coreference vs. binding can't quite be right, because what appears to be the same phenomenon can be duplicated using quantificational antecedents:

(52) a. *Every politician is worried that he voted for him.
b. Every politician is worried that only HE voted for him.

- It can't be that *him* is coreferential with *he* in (52b), so what is going on here?
- Heim (1998) proposes to solve this problem by replacing coreference with *codetermination*:[10]

(53) α and β are codetermined iff:
(i) $\alpha = \beta$,
(ii) either one of α or β binds the other via a λ-node,
(iii) α and β are coindexed, or
(iv) for some γ, α and γ are codetermined and so are γ and β.

- "Exceptional codetermination" is permitted if it permits an otherwise-inexpressible meaning to be encoded (same basic idea as Rule I).

[9] We should also check that it makes no difference if the indexicals shed their indices. The index on *we* makes no difference here. Similarly, if *me* were to QR to adjoin to VP or TP, the result would be essentially the same, but with the violation of IC triggerred by the trace of *me* instead of *me* itself.

[10] Heim's original definition (p. 234) is given in terms of "linking" and "colinking". I have substituted in the definitions of these relations (p. 231), adjusting them a bit because I am not using Heim's system of inner and outer indices.

▶ Could also tell a similar story using the semantic reformulation of codetermination given in Heim (2007) (see (13) above).

▶ From the present point of view, (52b) is problematic because we need some way of giving *him* and *he* different indices while getting the right interpretation. In the case of referential pronouns, we were able to give two referential pronouns different indices and yet have them pick out the same individual.

▶ Adapting an idea from Reinhart (2006), if we permit expressions to QR multiple times we can give a similar analysis for the bound pronoun cases:

(54) [EP] [λ_1 [t_1 [λ_2 t_2 is worried that only HE$_2$ voted for him$_1$]]]

▶ Since HE is focused:

(55) $[\![$[HE$_2$ voted for him$_1$]$]\!]^{\{2\mapsto \mathbf{John}, 1\mapsto \mathbf{John}\}}$
$\neq$
$[\![$[(only) HE$_1$ voted for him$_1$]$]\!]^{\{1\mapsto \mathbf{John}\}}$
(Assuming that domain contains a single politician, John.)

▶ When *he* is not focused:

(56) $[\![$[he$_2$ voted for him$_1$]$]\!]^{\{2\mapsto \mathbf{John}, 1\mapsto \mathbf{John}\}}$
$=$
$[\![$[he$_1$ voted for him$_1$]$]\!]^{\{1\mapsto \mathbf{John}\}}$

▶ So we still predict a Condition B effect in (52a).

3 Partee & Heim's challenge

▶ IC blocks binding over a coreferential DP:

(57) John$_1$[λ_2 [t_2 said that he$_1$ loves his$_2$ mother]]

▶ For this reason (like Fox's (2000) Rule H and Roelofsen's (2011) Free Variable Economy) it offers an account of Dahl's paradigm (Dahl 1973, 1974):

(58) John said that he loves his mother and Bill did too.
a. ... Bill said that B love's B's mother.
b. ... Bill said that J loves J's mother.
c. ... Bill said that B loves J's mother.
d. *... Bill said that J loves B's mother.

▶ Only one structure for reading (58d) that satisfies parallelism:

(59) John$_1$ [λ_2 [t_2 said that he$_1$ loves his$_2$ mother]]

and Bill$_3$ [λ_2 [t_2 did say that he$_1$ loves his$_2$ mother too]]

▶ (59) is blocked by IC (evaluation of [t_2 ...] in the first conjunct under $\{1 \mapsto \mathbf{J}, 2 \mapsto \mathbf{J}\}$).

▶ IC (like FVE and Rule H) also blocks structures such as the starred LFs in (60)–(65).

▶ These LFs were noted by Bach and Partee (1980), Higgenbotham (1983), Heim (1998, 2007) to be potentially problematic for the formulation of Condition B:

(60) Every boy knows that he said he likes him.

(61) *Every boy knows that he said he likes him.

(62) Every boy knows that he said he likes him.

(63) *Every boy knows that he said he likes him.

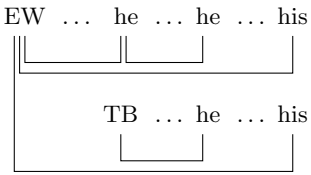
(64) *Every boy knows that he said he likes him.

(65) Every boy knows that he said that he likes him.

▶ But as Roelofsen notes, the "embedded Dahl paradigm" suggests (given the assumption that VP ellipsis is constrained by parallelism) that at least one of these LFs — (63) — is a possible structure:

(66) Every workman said he knows when he can take home his tools and the boss does too.
a. ... TB knows when **TB** can take home **TB**'s tools.
b. ... TB knows when **TW** can take home **TW**'s tools.
c. ... TB knows when **TB** can take home **TW**'s tools.
d. *... TB knows when **TW** can take home **TB**'s tools.

(67)



- But if (63) is in fact possible, we'll either have to:
  - Give up parallelism constraint on VP ellipsis (Roelofsen's choice).
  - Go back to putative solution 1 or 2 above.

4 Conclusion

- The (W)IC has the potential to address several significant problems with the GBBT while leaving its core in tact.
- We retain a simple statement of the binding constraints as constraints on co-indexing.
- Conditions A and B remain perfect mirror images of each other.

References

Bach, Emmon, and Barbara H. Partee. 1980. Anaphora and semantic structure. In *Papers from the Parasesion on Pronouns and Anaphora*, ed. Jody Kreiman and Almerindo E. Ojeda, 1–28. Chicago Illinois: University of Chicago.

Chomsky, Noam. 1976. Conditions on rules of grammar. *Linguistic Analysis* 2:303–351.

Chomsky, Noam, and Howard Lasnik. 1993. Principles and parameters theory. In *Syntax: an international handbook of contemporary research*, ed. Arnim von Stechow, W. Sternefeld, and T. Vennemann, 506–569. Berlin: Walter de Gruyter.

Dahl, Östen. 1973. On so-called sloppy identity. *Synthese* 26:81–112.

Dahl, Östen. 1974. How to open a sentence: Abstraction in natural language. In *Logical grammar reports*, volume 12. University of Götenburg.

Fox, Danny. 2000. *Economy and semantic interpretation*. Cambridge, Massachusetts: MIT Press.

Grodzinsky, Yosef, and Tanya Reinhart. 1993. The innateness of binding and coreference. *Linguistic Inquiry* 24:69–102.

Heim, Irene. 1998. Anaphora and semantic interpretation: A reinterpretation of Reinhart's approach. In *The interpretive tract (25)*, ed. Orin Percus and Uli Sauerland, 205–246. Cambridge, Massachusetts: MIT, Department of Linguistics.

Heim, Irene. 2007. Forks in the road to Rule I. In *Proceedings of NELS 38*, ed. M Abdurrahman, A Schardl, and M Walkow.

Heim, Irene, and Angelika Kratzer. 1998. *Semantics in generative grammar*. Malden, MA: Blackwell.

Helke, Michael. 1971. The grammar of english reflexives. Doctoral Dissertation. Doctoral dissertation, MIT.

Higgenbotham, James. 1983. Logical form, binding and nominals. *Linguistic Inquiry* 14:395–420.

Kiparsky, Paul. 2002. Disjoint reference and the typology of pronouns. In *Functional Syntax: Anaphora, Discourse, and Empathy*, 179–226. Chicago University Press.

Lasnik, Howard. 1976. Remarks on coreference. *Linguistic Analysis* 2:1–22.

Link, Godehard. 1987. Generalized quantifiers and plurals. In *Generalized quantifiers: Linguistic and logical approaches*, ed. P Gärdenfors, 151–180. Kluwer, Dordrecht.

Postal, Paul. 1966. A note on 'understood transitively'. *International Journal of American Linguistics* 32:90–93.

Reinhart, Tanya. 1983. Coreference and bound anaphora: A restatement of the anaphora questions. *Linguistics and Philosophy* 6:47–88.

Reinhart, Tanya. 2006. *Interface strategies*. MIT Press.

Reinhart, Tanya, and Eric Reuland. 1993. Reflexivity. *Linguistic Inquiry* 24:657–720.

Roberts, Craige. 1987. Modal subordination, anaphora and distributivity. Doctoral Dissertation, University of Massachusetts, Amherst.

Roelofsen, Floris. 2011. Free Variable Economy. *Linguistic Inquiry* 42:692–697.

Schlenker, Philippe. 2005. Non-redundancy: towards a semantic reinterpretation of binding theory. *Natural Language Semantics* 13:1–92.