Bound to Bind

Daniel Büring

V 9/2003

Abstract

Two familiar ideas in the theory of binding are explored: That semantic binding is preferred over coreference (Reinhart, 1983), and that (pronoun) binding seeks the closest antecedent (Fox, 2000). It is shown that both proposals, when combined, yield an alternative and arguably simpler approach to the co-binding facts discussed in Heim (1993), but that neither alone does (contrary to what is suggested in Fox (2000)). Then a unification of both ideas is proposed. Interestingly, the resulting system no longer entails one of Heim (1993)'s conclusions, namely that (co)reference must be marked by syntactic (co)indexing.

1 Introduction

This paper almost has a very simple plot: It shows that two conceptually related proposals, Fox (2000)'s *Rule H* and Grodzinsky and Reinhart (1993)'s *Rule I*, taken together, allow for a significant simplification of Binding Theory. Once combined with that simplified Binding Theory, it is demonstrated how they directly account for the *exceptional co-binding* data discussed in Heim (1993) without requiring the amendments to Binding Theory proposed there. Finally a unified formulation of Rules I and H is offered.

[0]Thanks to Danny Fox, Irene Heim, Chris Kennedy and the UCLA syntax/semantics group, especially Carson Schutze and Philippe Schlenker, for help and discussion, and to one anonymous LI reviewer for spending no less than 14 month on reviewing this paper.

What complicates things is that Fox (2000):ch4 claims Rule H to *be* Heim (1993)'s proposal. His discussion touches upon the binding data only in passing, but clearly presupposes the simplified version of Binding Theory mentioned above. However, contrary to Fox' claim, Rule H, though ingenious on its own right, is *not* the same as Heim (1993)'s proposal, neither in its internal workings, nor in its empirical effects, and indeed falls short of capturing all the relevant facts.

The purpose of this paper then is to set the historical record straight regarding the relation between the proposals in Heim (1993) and Fox (2000) and Grodzinsky and Reinhart (1993), to draw to the full light some significant consequences for the formulation of Binding Theory that are merely touched upon in Fox (2000), and to propose a modest reformulation of the existing proposals that provides a uniform, complete and coherent set of definitions.

2 Propositions I and H

Consider the following propositions regarding anaphoric relations between NPs:

(I) If an NP position can be interpreted as a bound variable, it must be.

(H) If an NP position is interpreted as a bound variable, it must be bound to the closest antecedent possible.

(I) bears a close resemblance to the 'pragmatic strategy' of Reinhart (1983):ch.7, esp. p.167, and *Rule I* of Grodzinsky and Reinhart (1993):79. It effectively prohibits coreference between c-commanding NPs, where by 'c-commanding NPs' I mean 'NPs one of which c-commands the other(s)'. Thus for a sentence like (1), it prohibits *her* from referring to Sabrina, hence co-referring with *Sabrina*. It can either refer to someone else, or be interpreted as a variable bound to *Sabrina* (the *bound variable reading*):

(1) Sabrina lost her keys.

To be sure, the choice between coreference and bound variable interpretation is semantically spurious in (1), i.e. both yield the same truth conditions. But as we will see, this is not always the case. Furthermore, certain aspects of the theory of binding and the theory of ellipsis are sensitive to the distinction. So bear with me, as I present the picture.

To become more precise about (I), it will be useful to introduce some notation. I will represent the three interpretive options for (1) by the syntactic representations in (2); such representations will be called *LFs*:

(2) a. Sabrina$_1$ lost her$_2$ keys (disjoint reference)

b. ∗Sabrina$_1$ lost her$_1$ keys (coreference)

c. Sabrina$_1$ β_2 lost her$_2$ keys (bound variable/semantic binding)

The notations in (2a) and (2b) are presumably familiar to the reader and straightforward to understand; I assume that if (and only if) two NPs bear different indices, any context will assign different referents to them.[1] The LF in (2c) represents the bound variable construal, or as I will also henceforth say: *semantic binding*. A *binder prefix*, β, is adjoined right next to (i.e. minimally c-commanded by) the *binder NP* (here *Sabrina$_1$*), binding the pronoun *her$_2$*. The interpretation of this prefix is given in (3):

(3) $\beta_{\mathrm{n}}\ \phi$ is interpreted as $\lambda x.\phi^{x/n}(x)$, where $\phi^{x/n}$ is the interpretation of ϕ with each occurrence of an NP indexed n in ϕ interpreted as x

Note that since *her$_2$* in (2c) functions as a bound variable, the choice of its index is actually irrelevant, as long as it is the same as that on β. Instead of (2c), I could have chosen, for example, (4) instead, with no semantic (or as we will see: syntactic) consequences; for perspicuity, I will avoid such semantically spurious re-use of indices, though:

(4) Sabrina$_1$ β_1 lost her$_1$ keys

The β-notation (inspired by Heim and Kratzer (1998)'s λ-prefix), is for all intents and purposes here, equivalent to the linking mechanism of Higginbotham (1983, 1987) (β= head of a linking arrow, NP-index = tail of an arrow), and the double indexing of Heim (1993) (β= outer index, NP-index = inner index). A β that c-commands a coindexed NP with no other coindexed βs intervening is said to *(semantically) bind* that NP. Derivatively, I

[1] To be sure, these are not Reinhart's notations, which wouldn't have any indices in (2a) or (2b); I will return to this issue in section 3.1 below.

will say that NP' (semantically) binds NP if NP' minimally c-commands a binder prefix that binds NP at LF. Thus, not just $\beta_{2/1}$, but also *Sabrina$_1$* binds *her$_{2/1}$* in (2c)/(4). If an NP' directly c-commands a coindexed NP, without intervening coindexed βs (or NPs), NP' is said to *(merely) syntactically bind* NP; this is the case in (2b).[2]

What (I) expresses, then, is that LF (2b), coreference, is ungrammatical because of the possibility of (2c), semantic binding/bound variable. The former is *blocked* by the latter.

Turning now to (H), a close kin of Fox (2000)' *Rule H*, this proposition regards sentences like (5). It requires the lowest pronoun *his* to be semantically bound by *he*, as in (5a), rather than to be *co-bound* with it, as in (5b):

(5) *Every boy* thinks that *he* lost *his* keys.

a. every boy β_1 thinks that he$_1$ β_2 lost his$_2$ keys. (transitive binding)

b. $*$every boy β_1 thinks that he$_1$ lost his$_1$ keys. (co-binding)

Again, the difference between transitive binding and co-binding has no discernible consequences in (5), but it will become important later on.

In the following three subsections, I will review the basic empirical arguments for (I) (subsection 3.1), for Heim (1993)'s extension and reformulation of (I) (subsection 3.2), and for (H) (subsection 3.3). I will then show in section 4 that (I) and (H), taken together, capture the effects of the Heim's proposal in a simple and elegant fashion. In section 5, following a brief demonstration of why (H) does not subsume (I), I offer a way of unifying the two.

[2] Using the β-prefix as done here builds the c-command requirement on binding into the very mechanics of semantic binding. This leaves open the question of how to account for so-called *indirect binding* as in *Every girl's father thinks she is a genius*, where *she* can be semantically bound, but is not c-commanded by *every girl*. As this question is orthogonal to the discussion here, I will not speculate on this issue, but see Tomioka (1997, 1999) and Büring (2001); Büring (to appear).

3 Basic Arguments

3.1 (I)

To understand the argument for a proposal like (I), it is first and foremost necessary to spell out what '…can be interpreted as…' in (I) means. The intention is that an NP must be construed as a variable bound by NP' if the resulting reading is the same as that of an LF where both NPs corefer. Thus (2b) is out because it has the same reading as (2c), but (2a) is of course possible. The following formulation from Grodzinsky and Reinhart (1993):79 achieves this effect:

(6) Rule I: Intrasentential Coreference
NP A cannot corefer with NP B if replacing A with C, C a variable A-bound by B, yields an indistinguishable interpretation.

Notably, Rule I in (6) doesn't always block coreference between c-commanding NPs, i.e. it doesn't generally prohibit mere syntactic binding in the sense of section 2; it does so only if the semantically bound alternative 'yields an indistinguishable interpretation'. (7) is an example where this is not the case:

(7) Only *Joel* voted for *his* proposal.

a. LF 1: Only Joel$_1$ voted for his$_1$ proposal (coreference)
b. Joel is the only individual with the property $\lambda x.x$ voted for Joel's proposal
c. LF 2: Only Joel$_1$ β_2 voted for his$_2$ proposal (semantic binding)
d. Joel is the only individual with the property $\lambda x.x$ voted for x's proposal

The proposition expressed by LF (7a), (7b), is different from the proposition expressed by LF (7c), (7d), where *Joel* semantically binds the pronoun. The former is true if everybody voted for his or her own proposal (hence no one but Joel voted for Joel's), but false if everyone voted for Joel's (and thus not for their own); the latter is false in the first scenario, but true in the second. Therefore, Rule I doesn't 'compare' the two, and (7c) doesn't block (7a).

This in and of itself still doesn't have empirical consequences: Rule I merely seems to say that a sentence has two LFs if these LFs yield different truth conditions, but not if they yield the same. However, Reinhart (1983) notes that exactly in circumstances where Rule I allows coreference among c-commanding NPs, the lower NP may violate Binding Conditions. Thus, alongside (7), we find (8), and alongside (9a), we find (9b):[3] his$_2$ mother

(8) Only Joel voted for Joel's proposal. (circumvents Condition C)

(9) a. Only *Joel* voted for *himself*.

b. Only *Joel* voted for *him/Joel*. (circumvents Condition B/C)

Notably, (8) and (9b), the examples that seem to violate Binding Conditions B and C, only have coreferent construals: No one but Joel voted for Joel('s proposal). Reinhart concludes that *if* two c-commanding NPs exceptionally corefer, licensed in spite of Rule I by a change in meaning of the whole sentence, Binding Theory doesn't 'see' these NPs, hence doesn't punish violations of the Binding Conditions.

Before going on, let us convince ourselves that (8) and (9b) are expected to be Binding Condition violations in the first place. If *only Joel* is a constituent, *Joel* doesn't c-command into the VP, so why should we expect this to be a Binding Condition B or C violation? While this reasoning might be valid, it is not sufficient to explain away the phenomenon in general. The more complicated *We only know that JOEL voted for Joel's proposal* has the same properties: On the reading where the two *Joel*s are coreferent (i.e. we don't know that anyone else voted for Joel('s proposal)), Binding Condition C can be circumvented. But in this case, there is clearly c-command between the two NPs. I will continue to illustrate the arguments using simpler examples of the *only NP* type for the sake of perspicuity, but all of them can be replicated using *only VP* examples instead.

[3] Note that it is irrelevant for this argument whether the actual *sentence* (9a) only has a bound variable reading (or whether any sentence does). If it does, this means that reflexives must be semantically bound in their Governing Category, otherwise it would appear to be sufficient that they are merely syntactically bound. In any case, if the coreferent reading is different from the bound one, *however the latter is expressed*, it is possible and Binding Conditions are circumvented.

This has the little-noticed consequence that Condition C circumventions are predicted to be possible even where the same, coreferential, reading could be expressed using a (non-reflexive) pronoun, without challenging Condition B. In other words, it is predicted that (8) is acceptable, circumventing Condition C, even though a coreferential, and hence synonymous, construal is possible for (7), namely (7a).

Returning to our main thread, then, why do exactly those NPs that exceptionally corefer circumvent Binding Conditions? Reinhart's proposal is that (co)reference, unlike semantic binding, is not signalled by indices, or anything else for that matter, in the representations at all. Within our little setting this would translate into:

(10) Every index must be bound by a β at LF.

Depending on your taste, unbound NPs would either be generated without an index, or their index must be deleted before LF. In any event, since referring NPs don't bear an index at LF, Binding Conditions cannot carp about them. The full argument then goes as follows: (i) In environments such as those with *only*, where binding and coreference yield different truth conditions, coreference among c-commanding NPs is exceptionally allowed; otherwise it is blocked. (ii) Referring NPs are not indexed in the syntax. Hence they cannot *a forteriori* invoke the Binding Conditions. (iii) Therefore, these coreferring NPs may (but don't always need to) appear to violate Binding Conditions; more aptly, they *circumvent* them.

In a slogan: Binding Conditions only regard semantically bound (hence indexed) NPs. If you see what appears to be a Binding Condition violation, it must be in one of those environments that allow for exceptional coreference (hence no indexing). If, in the same kind of environment, you see what appears to be an orderly bound pronoun, there will be bound/referential ambiguity at LF, which yields two distinguishable readings. Outside of these environment, there is no coreference among c-commanding NPs, and you won't see Binding Condition violations/circumventions at all.

3.2 The Exceptional Co-Binding Rule

3.2.1 Introducing Co-Binding

Irene Heim's starting point in the seminal Heim (1993) is that a strikingly similar kind of ambiguity may appear with two pronouns dependent on the same quantifier. For example (11) is ambiguous in a way similar to (7) between the readings expressed by LF (11a) and LF (11c):

(11) *Every man* is afraid that only *HE* voted for *his* proposal.

a. LF 1: every man β_1 is afraid that only he$_1$ voted for his$_1$ proposal (co-binding)

b. fear: 'No one else voted for my proposal!'

c. LF 2: every man β_1 is afraid that only he$_1$ β_2 voted for his$_2$ proposal (transitive binding)

d. fear: 'No one else voted for their own proposal!'

So far so good. Note that neither of these LFs invokes Rule I, because neither of them involves coreference. Next, Heim points out that the co-bound construal allows circumvention of Binding Condition B in a way similar to (9) (since we are dealing with co-bound NPs, no similar effects can be found with full NPs and Binding Condition C):

(12) *Every man* is afraid that only *HE* voted for *him*.

a. LF 1: every man β_1 is afraid that only he$_1$ voted for him$_1$ (co-binding)

b. fear: 'No one else voted for me!'

c. $*$ LF 2: every man β_1 is afraid that only he$_1$ β_2 voted for him$_2$ (transitive binding)

d. fear: 'No one else voted for themselves!'

Sentence (12) is claimed to be as acceptable as (9b), and, similar to it, isn't judged to have a reading like (12d), which corresponds to the (transitively) bound construal (12c).

It is clear what rules out LF 2, namely Condition B: *(only) he* binds *him* within its Governing Category. But LF (12a) involves indices on the pronouns, as well, and should thus invoke Binding Condition B, too.

Could we leave out the indices on *he* and *him*, the way Reinhart's proposal did for *Joel* and *Joel/him* in (9b)? No! Neither *he* nor *him* are referential NPs, they are semantically bound by *every man*; without indices, this dependency is not expressed.

Heim (1993) concludes that (12) and cases like it must be legitimized by a condition that allows Binding Theory to 'ignore' certain indices. She proposes such a condition, the gist of which is given in (13) (cf. Heim (1993):235):

(13) Exceptional Coindexing Rule (ECR):
NP_1 may (marginally) syntactically bind NP_2 in violation of Binding Conditions B and C, when the interpretation thus obtains is different from the one where NP_1 semantically binds NP_2.

By this rule, the coindexing in (12a) is sanctioned despite Binding Condition B, because it results in an interpretation different from that of (12c).

As Heim notes, the parallelisms between the ECR and Reinhart's Rule I are too strong to be accidental. We want to unify them, if we can. This, she points out, can easily be accomplished by giving up the assumption that (co)reference doesn't involve indexing (i.e. dropping (10)). If all NPs, referential or not, are indexed, our earlier (9b), for example, would get the LF in (14):

(14) only Joel_1 voted for Joel_1

Since this indexing, expressing coreference, yields a different meaning than an LF in which the second occurrence of *Joel* is replaced by a variable bound to the first (=LF (7c)), it is legitimate *despite Binding Condition C*, due to the ECR in (13). Exceptional coreference as discussed by Reinhart and exceptional co-binding as discussed by Heim are thus two instances of exceptional binding, regulated by just one rule, the ECR.

3.2.2 Co-Determination

It is worth noting that the discussion of Heim's proposal in the previous subsubsection has brought to light concrete reasons to adopt the asymmetric binding system introduced in section 2, which uses indices on NPs and the binder prefix β. To see this, reconsider the LFs 1 and 2 in (12a) and (12c). These differ only in whether one bound pronoun binds the other, or whether both pronouns are co-bound, schematically:

(15) a. co-binding: QNP $\beta_1 \ldots \text{pron}_1 \ldots \text{pron}_1$
b. transitive binding: QNP $\beta_1 \ldots \text{pron}_1\ \beta_2 \ldots \text{pron}_2$

A system like Reinhart's, in which NPs are either coindexed, or counter-indexed, or not indexed at all, cannot capture this distinction.

Unfortunately, richer, asymmetrical systems like Higginbotham (1983), Heim (1993), and the one introduced in the present paper, bring with them a complication for the formulation of Binding Conditions, in particular Binding Condition B. As an example, consider (16), which can have any of the LFs in (16a)–(16c):

(16) *Jeanne* thought *she* saw *her*

a. $*$Jeanne$_1$ β_2 thought she$_2$ β_3 saw her$_3$.

b. $*$Jeanne$_1$ β_2 thought she$_2$ saw her$_2$.

c. $*$Jeanne$_1$ β_2 thought she$_2$ saw her$_1$.

In (16a), *she* semantically binds *her*, in (16b) they are co-bound, and in (16b) the latter corefers with the semantic binder of the former. To predict stars in front of all of these LFs by Binding Condition B, we need a notion that encompasses all three relations.

Higginbotham (1983):404&406 (and Heim (1993):233f, following him) is well aware of this problem, and develops his definition of *antecedent* accordingly. We will follow Heim's nomenclature and introduce the notion of *codetermination*:

(17) Codetermination:
NP and NP' are *codetermined* if any of the following holds:

a. they are coindexed

b. one semantically binds the other

c. there is an NP" such that NP and NP" are codetermined and NP" and NP' are codetermined

(18) Condition B: A pronominal must not be codetermined with any c-commanding NP in its Governing Category.

Codetermination comprises any kind of anaphoric dependency available in the system used here. Accordingly (18) does in a system with asymmetric binding what the original Condition B did in a system with simple indexing only. It rules out, as the reader may verify for herself, all the LFs in (16).

3.3 (H)

A condition like (H) above has been invoked by Danny Fox in various works to account for a number of otherwise puzzling facts about ellipsis. In Fox (2000):ch4 he convincingly argues that, in our terms, co-binding is generally dispreferred to transitive binding: If NP_1 c-commands NP_2, which in turn c-commands NP_3, the only possible anaphoric relation between the three of them is transitive binding: NP_1 semantically binds NP_2, which semantically binds NP_3. In particular, NP_2 and NP_3 must not be co-bound (by NP_1). To enforce this, Fox (2000):115 proposes Rule H (italics in the original):

(19) Rule H
A pronoun, α can be bound by an antecedent, β, only if there is no closer antecedent, γ, such that it is possible to bind α to γ and *get the same semantic interpretation*.

Let me briefly illustrate the merits of Rule H regarding at what has come to be known as 'Dahl's puzzle' (cf. Fox (2000):ch.4).

We start by noting that among the many conceivable LFs that express a reading on which (20) below means 'John said that John likes his mother', Rule H only allows (20a); in particular, it excludes (20b):

(20) *John* said that *he* likes *his* mother.

a. John_1 β_2 said that he_2 β_3 likes his_3 mother

b. $*\text{John}_1$ β_2 said that he_2 likes his_2 mother

(20a) and (20b) again don't differ in truth conditions. But if (20) above serves as the antecedent for VP ellipsis, the impossibility of LF (20b) makes itself felt. Of the four conceivable sloppy/strict patterns, only three are attested:

(21) *John* said that *he* likes *his* mother. Bill did, too.

a. …say that John likes John's mother

b. …say that Bill likes Bill's mother

c. …say that Bill likes John's mother

d. *…say that John likes Bill's mother

The LFs for these readings are given in (22) below (assuming that $g(1)$=John):

(22) a. Bill_4 said that he_1 likes his_1 mother

b. Bill_4 β_4 said that he_4 β_5 likes his_5 mother

c. Bill_4 β_4 said that he_4 likes his_1 mother

d. $*\text{Bill}_4$ β_4 said that he_1 likes his_4 mother

The ungrammaticality of (21d)/(22d) follows if we assume the following condition on sloppy ellipsis:

(23) An elided pronoun P_e can be read sloppy only if it is semantically bound, and its relation to its binder B_e is structurally parallel to that between the corresponding pronoun P_a in the overt VP and its binder B_a

The pronouns *he₄* and *his₅* in (22b), *he₄* in (22c), and *his₄* in (22d) are all (trying to be) interpreted sloppily. Crucially, the relation between *he₄* and β_4 and *his₅* and β_5 in (22b) are parallel to those *he₂* and β_2 and *his₃* and β_3 in (20a). Likewise, the relation between *he₄* and β_4 in (22c) is parallel to that between *he₂* and β_2 in (20a). But the relation between *his₄* and β_4 in (22d) is *not* parallel to that between *his₃* and β_3 in (20a): *his₃* in (20a) is bound by the intermediate subject, while *his₄* in (22d) is bound to the matrix subject. Therefore, (23) is not met for LF (22d) with antecedent (20). The pertinent reading, (21d), is correctly ruled out by (23).

If we assume Rule H, that is. For note that *him₄* in (22d) *is* bound in parallel to *his₂* in (20b). If (20b) were allowed, so would be (22d), and the reading (21d) would incorrectly be predicted to be grammatical. In this way, the absence of (21d)/(22d), Dahl's original puzzle, is explained using Rule H. If this explanation is correct, and a lot more data discussed in Fox (2000):ch.4 make a convincing point that it is, this constitutes evidence for Rule H.[4]

[4]It is worth pointing out that (23) talks about sloppy readings only. No inverse condition requires that strict identity as found with *he₁* and *his₁* in (22a) and (22c) above requires a parallel referring pronoun in the overt VP. Thus, the clause containing the overt VP always has LF (20a), in accordance with Rule H. To allow coreference among c-commanding NPs just because they need to license a strict pronoun later on would wrongly predict that pronouns that 'antecede' strict readings can circumvent Binding Conditions (e.g. that *John likes him; Bill does, too* has a reading in which *him* can refer to John, since exceptional coreference is licensed by the need to license a referring pronoun in the elided VP). Instead, Fox (2000) introduces the notion of *referential value* to allow for strict identity readings.

4 Revisiting Heim (1993)

Let us now go back to the data discussed in Heim (1993) and see in which way they receive a simpler treatment using Rule H from Fox.

4.1 Codetermination Redux

Adopting Fox' Rule H provides a different, arguably more elegant way of enforcing Binding Condition B in a system that allows for asymmetric and transitive binding, illustrated in (16) above, repeated here:

(24) *Jeanne* thought *she* saw *her*

a. $*$Jeanne$_1$ β_2 thought she$_2$ β_3 saw her$_3$.

b. $*$Jeanne$_1$ β_2 thought she$_2$ saw her$_2$.

c. $*$Jeanne$_1$ β_2 thought she$_2$ saw her$_1$.

Crucially, (24b) and (24c) both violate Rule H: In (24b), *her* is semantically bound by *Jeanne*, even though binding it to the closer *she* would yield the same interpretation; in (24c), *her* is bound to *Jeanne* (albeit syntactically, a point I will return to below, see the discussion around (30) in subsection 5.1 below), again ignoring the closer *she*.

The only LF that obeys Rule H is (24a), which displays transitive binding. This LF, however, violates Binding Condition B in the most straightforward way: The pronoun *him* is directly bound by a β in its Governing Category.

Generally, since Rule H always forces the most local binding, it will always force that version of an anaphoric dependency that is the 'least favorable' to Binding Condition B. With it in place, we can dispense with the notion of codetermination and simply define Binding Condition B along the lines of (25):

(25) Condition B: A pronominal must not be coindexed with any c-commanding β in its Governing Category.

The simplification thus achieved is no small feat. We have the expressive richness of an asymmetrical binding system, yet a maximally simple notion of binding, and all this achieved by a rule that has its independent merits in the realm of ellipsis.

4.2 Exceptional Coindexing Rule Redux

Rule H, in tandem with the assumptions about Binding Conditions made in section 4.1 can also provide an alternative account to Heim's more complex cases of exceptional coindexing discussed in subsection 3.2. The task there, recall, was to explain why (12), repeated here as (26a) is acceptable, while (26b) is not:

(26) a. *Every man* is afraid that only *HE* voted for *him*.

b. * *Every man* is afraid that *he* voted for *him*.

c. LF 1: every man β_1 is afraid that (only) he$_1$ voted for him$_1$ (co-binding)

d. *LF 2: every man β_1 is afraid that (only) he$_1$ β_2 voted for him$_2$ (transitive binding)

The answer was this: In LF 1, *he* and *him* can be (exceptionally) coindexed if the reading thus obtained is different from the reading where *he* semantically binds *him*, as in LF 2. The readings are different with *only*, but not without. Therefore, LF 1 is available for (26a), but not for (26b).

Given Rule H and our re-simplified Binding Condition B in (25), the contrast in (26) can be derived without appeal to the ECR, as shown in Fox (2000):4.2: LF 1 does not violate BP B because *him*$_1$ is not bound within its Governing Category: there is no β there. It is subject to Rule H though, given that *him* is bound by the upstairs *every man*, rather than the closer *he*. This will be licit only if the reading obtained by this 'long-distance' binding is different from that obtained by local binding, which is the case if *only* is present, but not without it. Without *only*, (26d) yields an interpretation identical to that of (26c) and must be chosen by Rule H. But (26d) *does* violate Binding Condition B (β_2 is within *him*$_2$'s Governing Category); thus there is no grammatical LF for (26b).

This, again, is a formidable result. Rule H allows for simplifying the Binding Conditions. Together with these simplified Binding Conditions, Rule H accounts for the cases of exceptional co-binding, previously handled by the ECR.

There is rain on the parade, though. Rule H does not account for all the cases the ECR did. In particular, it leaves unaccounted for exactly those cases that motivated the original Rule I. I will turn to showing this immediately.

Before doing so, however, I would like to take a paragraph or two to correct a misattribution found in Fox (2000):ch.4.

As said above, the alternative account for cases like (26) is presented in Fox (2000):4.2. Surprisingly, however, it is credited to Heim (1993) (ibd.) as is Rule H itself (p.111). But that paper presents no such rule, nor does it argue for Binding Conditions such as (25) above; indeed, as I pointed out in 4.1, it meticulously develops a version of Binding Theory based on co-determination which directly blocks LFs such as (26c) and (16a–16c). Also, the ECR does not generally block non-local binding. It allows for an LF like that in (32), for example, which Rule H blocks:

(27) every man β_1 said that he_1 voted for his_1 proposal

The proposal in Heim (1993) only blocks co-determination where the co-determined NPs also violate Binding Condition B (and no meaning difference justifies that). It is thus very different from that in Fox (2000):ch.4, and Fox is too modest in attributing Rule H and its consequences to Heim: neither the simplification of the Binding Conditions nor the novel account to exceptional co-binding are found in that paper. Is Fox' system empirically equivalent to Heim's proposal, then? Here, as hinted at above, the answer is 'no'.

5 Unifying Rule I and Rule H

5.1 Why Rule H Doesn't Subsume Rule I

We saw in the previous section 4 that Rule H, together with a simple version of Binding Condition B handles Heim's more complex cases, such as (26). It fails, however, to derive the very simplest cases our discussion started out with. Consider the examples in (28) and (29), which should be simple Binding Condition violations:

(28) ∗*Sylvia* likes *her*.

a. ∗Sylvia_1 likes her_1

b. ∗Sylvia_1 β_2 likes her_2

(29) ∗*She* likes *Sylvia*.

a. $*\text{she}_1$ likes Sylvia_1

b. $*\text{she}_1\ \beta_2$ likes Sylvia_2

We don't have to worry about accounting for the stars in (28b)/(29b): These are Binding Condition B/C violations under even the simplest version of Binding Theory such as (25). But what of (28a) and (29a)? These do not violate the Binding Conditions, since they don't involve βs. They also don't violate Rule H, since no NP binds any other; they merely corefer. And even if we take mere syntactic binding to count as 'binding' in the sense of Rule H, *her* and *Sylvia* are very clearly bound to the closest antecedent available.

In order to rule out these cases, then, we have to adopt Reinhart's Rule I on top of Rule H. Rule I will force NPs to bind instead of corefer, where possible and semantically equivalent. This alone will take care of (28a) and (29a), which are thereby blocked by (28b) and (29b), respectively, which violate the Binding Conditions. Rule H will, subsequently in a manner of speaking, force all bound NPs to be *minimally* bound, accounting for Heim's more complex facts.

A similar, though less decisive case for the need to maintain Rule I alongside Rule H involves the more complex case (24). It was argued above that LF (24c) — *Jeanne*$_1$ β_2 *thought she*$_2$ *saw her*$_1$ — violates Rule H in that *Jeanne*, rather than *she*, binds *her*. This, however, presupposes that Rule H talks about semantic *or mere syntactic* binding. Although this is technically possible, it introduces an asymmetry into the theory in that Rule H talks about either syntactic or semantic binding, whereas the Binding Conditions crucially only regard the latter. A more parsimonious theory would seem to be one in which mere syntactic binding has no relevance at all. Adopting Rule I alongside Rule H allows just that. Now, (24c) is blocked by Rule I as an illicit case of coreference under c-command, while Rule H can be seen as talking about semantic binding only; the full paradigm is thus:

(30) a. $\text{Jeanne}_1\ \beta_2$ thought that she_2 talked about her_1 (*Rule I: *Jeanne — her*)

b. $\text{Jeanne}_1\ \beta_2$ thought that she_2 talked about her_2 (*Rule H: *Jeanne — her*)

c. $\text{Jeanne}_1\ \beta_2$ thought that $\text{she}_2\ \beta_3$ talked about her_3 (*Binding Condition B: *she — her*)

This concludes the argument: Rule H needs to be supplemented with Rule I to account for all the cases. Since the ECR handled all these cases on its own, it follows that Rule H alone is not equivalent to the ECR.

The conclusion of this paper, up to this point, then is this: All facts discussed so far can be handled by the simple Binding Conditions plus Rule H, plus, contrary to what seems to be suggested in Fox (2000), Rule I. The resulting system, however, although relatively simple, is subject to the same criticism Heim (1993):236 adduces against a system that has Rule I plus the ECR: Two rather similar looking and working pieces of machinery, Rule H and I, exist side by side.

The alternative, however, is (even) less attractive: To have the ECR, plus the more complex Binding Conditions, and still not have an account for the ellipsis data such as Dahl's puzzle (or: have Rule H in addition).

In the final section, I will suggest that Rule H and Rule I can indeed be collapsed into one, giving us a simple and parsimonious account of all the facts discussed.

5.2 Have Local Binding

A rule which subsumes Rules I and H under one roof is (31):

(31) Have Local Binding!
For any two NPs α and β, if α could semantically bind β (i.e. if it c-commands β and β is not semantically bound in α's c-command domain already), α must semantically bind β, unless that changes the interpretation

To understand the workings of (31), let us start with a simple case, formerly captured by Rule I:

(32) *Sylvia* likes *her.*

a. $*$Sylvia$_1$ likes her$_1$

b. $*$Sylvia$_1$ $\beta_2$likes her$_2$

c. Sylvia$_1$ likes her$_2$

Her$_1$ in (32a) is free within the c-command domain of *Sylvia*. Hence according to (31), the latter must bind it if no difference in interpretation results. Since *her* and *Sylvia* are coindexed, and since no elements like *only* are involved, the bound variable construal will have the same interpretation. Hence, by (31), (32a) is blocked by (32b).

As for (32b), however, it violates Binding Condition B since *her*$_2$ is bound within its Governing Category by β_2. Finally, *her*$_2$ is also free within *Sylvia*'s c-command domain in (32c), which means, again, that the latter should bind it, *if that doesn't change interpretation*. But this time, of course, since *her*$_2$ and *Sylvia*$_1$ are counter-indexed, the interpretation will be different from a bound variable construal, so (31), correctly, doesn't have (32b) block (32c).

Finally, (31), just as its predecessors Rule I and H, allows for exceptional coreference in *only* sentences such as:

(33) Only Sylvia likes her.

Here, binding *her* to *Sylvia* changes truth conditions, even relative to an LF where both are coindexed (hence coreferent), as discussed at length above. Therefore, coindexing as well as counter-indexing as well as binding are possible here.

It is worthwhile to note that the same results are achieved if we follow Reinhart (1983) and Grodzinsky and Reinhart (1993) in not indexing referring NPs at all, i.e. if we admit the following LF for (32):

(34) Sylvia likes her

Again, *her* is unbound within the c-command domain of *Sylvia*, which means that it has to be bound, unless the interpretation is different. So by whatever means we determine the actual reference of *her* and *Sylvia*, the one interpretation that is unavailable for LF (34) by virtue of (31) is the coreferent one.

This is an interesting result, because Heim's original argument for reintroducing indexing on referential NPs was to be able to handle coreference and co-binding by the same principle, the ECR. (31) in contrast subsumes both cases, indexing or not, as failure to have local semantic binding. Whether or not to index referential NPs is thus a question completely independent of the question of whether exceptional coreference and exceptional co-binding are two instances of the same phenomenon (as they arguably are).

Let us then turn, for the last time, to the more complex case involving three anaphorically related NPs:

(35) *Jeanne* thought *she* saw *her*

a. $*$Jeanne$_1$ β_2 thought she$_2$ β_3 saw her$_3$.

b. $*$Jeanne$_1$ β_2 thought she$_2$ saw her$_2$.

c. $*$Jeanne$_1$ β_2 thought she$_2$ saw her$_1$.

(35a), as before, violates Binding Condition B; (35b) violates (31), because *her$_2$* is free in the c-command domain of *she$_2$*, and hence must be bound by it, given that the interpretation will be the same because *she$_2$* and *her$_2$* are co-bound; this case used to be ruled out by Rule H, requiring minimal binding of *her$_2$*. Strikingly, (35c) is now ruled out for the exact same reason, since *her$_1$* is free in *she$_2$*'s c-command domain and will wind up being interpreted the same as a bound variable, given that it corefers with *she$_2$*'s antecedent; this used to be a Rule I violation. Add to that that *her$_1$* in (35c) would of course be possible if *Jeanne* had a different index, and that the binding pattern in (35b) would be possible if we replaced *she$_2$* by *only she*, and the parallelism to the simple case in (32) is perfect.

We have thus seen that (31) properly subsumes Rules H and I. As such, it allows us to maintain the simple formulation of Binding Condition B in (25), and generally do away with the notion of co-determination. It also affords a unified account of Reinhart's exceptional coreference cases and Heim's exceptional co-binding cases, as well as Dahl's puzzle and other eliminative puzzles of ellipsis, as shown in Fox' work. Finally, it is agnostic as to the question of whether or not coreference should be represented by coindexing in the syntax.

Appendix: Indistinguishable Interpretation

In the discussion above, I imported the notions '(in)distinguishable interpretation' and 'same/different interpretation' from the works discussed, leaving the exact definition of these notions aside (since it is orthogonal to the main point of the present paper). In this appendix, I will very briefly sketch a formal rendering of this notion and discuss some borderline cases brought up by the reviewers, in order to clarify how the notion is to be understood and eventually formalized.

If S is a declarative sentences, its Logical Form LF_S determines a truth value relative to an assignment $g \in G$ and a world $w \in W$ (where G and W are the sets of all assignments and all worlds, resepctively).[5] We will say that two sentences S_1, S_2 have indistinguishable interpretations relative to a set of world-assignment pairs $C, C \subseteq W \times G$, iff for all $\langle w, g \rangle \in C$, the truth value of LF_{S1} for w and g is that same as that of LF_{S2} for w and g. If LF_{S1} and LF_{S2} have indistinguishable interpretations relative to $W \times G$, they are synonymous.

For the simple cases of coreference discussed in the present paper, synonymy is a sufficient spell-out of 'indistinguishable interpretation'. Crucially, two LFs can be synonymous, and hence have indistinguishable interpretations, even if they have sub-constituents whose interpretations *are* different e.g. (2b) and (2c) (in which the sisters to the subjects denote different properties). Otherwise, no LF would ever block another.

In a more realistic setting we should take C to be something akin to the *context set* of Stalnaker (1978), i.e. a formal counterpart to the shared public committments of the participants in the conversation. We don't need to assume much about C, except that if all participants agree on who a definite NP refers to, NP denotes the same individual relative to every $\langle w, g \rangle \in C$, whereas if they don't — that is if one or more of them aren't sure who NP refers to, or if two or more of them disagree on who it does — there are at least two elements in C relative to which NP denotes different individuals.

Assume now that the notion of indistinguishable interpretation is always to be relativized to a context set C. That means that whether or not, say, (36a) and (36b) have indistinguishable interpretations depends, not on who the actual reviewer is, but on whether or not *the reviewer* denotes Zelda for all ⟨w,g⟩ in C. This appears to be a satisfactory account of 'accidental' (as opposed to 'intended' or 'presupposed') coreference, i.e. the fact that even if *the reviewer* in (36a) actually refers to Zelda, the utterance is acceptable when conveying a sense of uncertainty about this:[6]

(36) a. The reviewer knows Zelda's work suspiciously well.

b. The reviewer knows her/his (own) work suspiciously well.

[5]If S is structurally ambiguous, it has two LFs. I ignore this possibility here. The changes are straightforward.

[6]See Fiengo and May (1994), chapter 1, Grodzinsky and Reinhart (1993), section 2.3, Heim (1993), section 2.3, Büring (forthcoming), chapter 7, section 2 for more discussion.

On the other hand, two distinct definite NPs cannot be used to circumvent Binding Condition C effects if they denote the same individual in all worlds in C.[7] Thus (37) violates Have Local Biniding if it is known that Bill is Fido's owner (i.e. if *Fido's owner* denotes Bill for all ⟨w,g⟩ in C), because a bound pronoun should have been chosen instead of *Fido's owner*:

(37) Bill said that Fido's owner would pay for it.

Crucially, it is not claimed that *Bill said that Fido's owner would pay for it* and *Bill said that he would pay for it* are synonymous. Only that in certain contexts they have indistinguishable interpretations, and in such contexts (37) violates Have Local Binding.

The same applies to epithets. *Peter thinks that the bastard is smart* (a reviewer's example) violates Have Local Binding in all those contexts in which *the bastard* unequivocally refers to Peter, although of course *the bastard* and *Peter* are by no means synonymous.

Regarding pronouns, let us assume, following the tradition in dynamic semantics (e.g. Groenendijk and Stokhof (1991)), that indices represent discourse referents. If the identity of a discourse referent is uncertain, this means that the index corresponding to that discourse referent denotes one individual relative to some assignments in the context set C, but a different one relative to other assignments in C. Accordingly, LF (38) will violate Have Local Binding if $g(1) = g(2)$ for all $g \in C$, otherwise it won't. So if $g(2)$ is always Zelda, but $g(1)$ is sometimes Zelda, sometimes someone else we think may be the reviewer, LF (38) is fine:

(38) she$_1$ knows her$_2$ work suspiciously well

This should be enough to see how the present proposal fits in with the literature on various flavors of coreference. The account is by no means complete (it ignores the notorious problems around names, for example), but seems reasonable as far as it goes.

References

Büring, Daniel (2001). "A Situation Semantics for Binding out of DP." In *Hastings et al. (2001)*, 56–75.

[7] Where by 'worlds in C' I mean 'worlds in $\{w \in W \mid \exists g \in G[\langle w,g \rangle \in C\}$, and likewise by 'assignment in the context set C' I mean 'assignment in $\{g \in G \mid \exists w \in W[\langle w,g \rangle \in C\}$.

Büring, Daniel (forthcoming). *Binding Theory*. (draft version available at `http://www.linguistics.ucla.edu/people/buring/webpage/binding%20book/bookmain.html`). Cambridge University Press.

Büring, Daniel (to appear). "Crossover Situations." *Natural Language Semantics* .

Fiengo, Robert and Robert May (1994). *Indices and Identity*. Cambridge, Mass.: MIT Press.

Fox, Danny (2000). *Economy and Semantic Interpretation*. MIT Press.

Grodzinsky, Yosef and Tanya Reinhart (1993). "The Innateness of Binding and Coreference." *Linguistic Inquiry* 24(1):69–101.

Groenendijk, Jeroen and Martin Stokhof (1991). "Dynamic Predicate Logic." *Linguistics & Philosophy* 14:39–100.

Hastings, Rachel, Brendan Jackson, and Zsofia Zvolenski, eds. (2001). *Proceedings from Semantics and Linguistic Theory XI*, Ithaca. CLC.

Heim, Irene (1993). "Anaphora and Semantic Interpretation: A Reinterpretation of Reinhart's Approach." 205–246. SfS Report 07-93, Universität Tübingen. Published in Sauerland and Percus (1998).

Heim, Irene and Angelika Kratzer (1998). *Semantics in Generative Grammar*. Oxford: Blackwell Publishers.

Higginbotham, James (1983). "Logical Form, Binding, and Nominals." *Linguistic Inquiry* 14:395–420.

Higginbotham, James (1987). "On the Varieties of Cross-Reference." In A. Cardinaletti, G. Cinque, and G. Giusti, eds., *Constituent Structure. Papers from the 1987 GLOW Conference*, Annali di ca' Foscari. Rivista della Facoltà di Lingue e Letterature Straniere Dell' Univerità di Venezia, 123–142.

Reinhart, Tanya (1983). *Anaphora and Semantic Interpretation*. University of Chicago Press.

Sauerland, Uli and Orin Percus (1998). *The Interpretive Tract*. MIT Working Papers in Linguistics 25.

Stalnaker, Robert C. (1978). “Assertion.” In Peter Cole, ed., *Pragmatics*, vol. 9 of *Syntax & Semantics*, 315–332. New York: Academic Press.

Tomioka, Satoshi (1997). *Focusing Effects and NP Interpretation in VP Ellipsis*. Ph.D. thesis, UMass, Amherst.

Tomioka, Satoshi (1999). “A Sloppy Identity Puzzle.” *Natural Language Semantics* 7:217–241.

Linguistics Department
UCLA
Campbell Hall
Los Angeles, CA 90095
buring@humnet.ucla.edu