

Binding Dependencies in Ellipsis

Andrew Kehler and Stuart Shieber
Harvard University*

November 7, 1993

Abstract

It has long been known that relationships of binding and scope in the implicit meaning of an elided verb phrase (VP) depend directly on corresponding binding and scope relationships in the antecedent of the ellipsis. This squib concerns what the underlying cause of this dependency is: constraints that the antecedent binding relations place on corresponding binding relations in the elided VP, or, as has been recently proposed, the change in discourse state caused by binding relations in the antecedent. We present new examples that serve as a litmus test for the adequacy of the latter type of explanation of binding dependencies in elliptical constructions. Felicity intuitions on these examples demonstrate that these analyses are insufficiently constrained in the space of readings that they allow. On the other hand, we show that previous arguments for such analyses either fail to distinguish them from semantic analyses or are based on a confusion between the processes of parallelism determination and ellipsis resolution.

1 Introduction

It has long been known that relationships of binding and scope in the implicit meaning of an elided verb phrase (VP) depend directly on corresponding binding and scope relationships in the antecedent of the ellipsis. This squib concerns what the underlying cause of this dependency is. It has been previously assumed that this dependency is a result of constraints that the antecedent binding relations place on corresponding binding relations in the elided VP. Recent proposals, however, imply that the dependency is a result of the change in discourse state caused by binding relations in the antecedent. We examine arguments for and against the latter possibility, concluding that the evidence for does not

*Division of Applied Sciences, Harvard University, 33 Oxford Street, Cambridge, MA 02138; {kebler, shieber}@das.harvard.edu.

eliminate alternative semantic characterizations of the dependencies, whereas the arguments against are more robust.

Verb phrase ellipsis is exemplified by sentence (1):

- (1) John loves his mother, and Bill does too.

The stranded auxiliary in the second clause (henceforth, the *target* clause) marks a vestigial verb phrase, a meaning for which is to be recovered from another clause (henceforth, the *source* clause), in this case, the first clause.

The core phenomenon that we address concerns the space of possible readings of the target clause corresponding to the binding of the pronoun *his* in the source clause,¹ which exhibits the following dependency. If *his* refers extrasententially to some third person, say Chris—that is, if the source clause is taken to mean that John loves Chris’s mother—then the target clause must mean that Bill also loves Chris’s mother. That is, example (2a) only has the reading reflected by the indices shown in sentence (2b):

- (2) a. John_i loves his_k mother, and Bill_j does too.
b. John_i loves his_k mother, and Bill_j loves his_k mother too.

On the other hand, if the pronoun refers intrasententially to John so that the source clause is taken to mean that John loves his own mother (as in example (3a)), then the target clause is ambiguous between two readings. It might mean that Bill loves John’s mother (the so-called *strict* reading shown in (3b)) or that Bill loves his own (i.e., Bill’s) mother (the *sloppy* reading shown in (3c)).

- (3) a. John_i loves his_i mother, and Bill_j does too.
b. John_i loves his_i mother, and Bill_j loves his_i mother too.
c. John_i loves his_i mother, and Bill_j loves his_j mother too.

Notice that the two sets of readings are disjoint and depend crucially on the pronoun binding in the source clause.²

The dependency at issue, as exemplified above, is simply this: Binding relationships in the target depend on binding relationships in the source. The main question of this essay is what the nature of this dependency is.³ Various

¹By “binding”, here and elsewhere in the paper, we mean relationships of (perhaps extrasentential) coreference, and not merely the syntactic relation of binding familiar from linguistic theory.

²The choice of which particular one of the three readings was intended by the speaker is, of course, a pragmatic issue, and one that we will not be concerned with in this squib.

³Similar dependencies are found with respect to scoping relationships induced by quantifiers and other operators. For instance, in the following example no readings exist where the two quantifiers take different scopes in the two clauses (discussed by Dalrymple, Shieber, and Pereira (1991, Section 3.4.2)):

John gave every student a test, and Bill did too.

In this paper, we will be concerned solely with binding relationships, although certain of the arguments apply to scope relationships as well.

analyses have been presented in the literature, which we will characterize as belonging to one of two categories:

Source-determined: At some level of representation (i.e., surface syntactic, deep syntactic, or semantic), the binding relationships for the source are marked. The target is interpreted as if it were constructed with relationships determined in some uniform manner by those of the source clause at that level of representation.

In the case of *identity-of-relations* analyses (Sag, 1976; Williams, 1977; Klein, 1987; Gawron and Peters, 1990), the uniform manner is given by an identity condition on representations of VP meanings. For instance, the representation of the source VP meaning in example (2a) might be taken to be:

$$(4) \lambda x.love(x, mother(chris))$$

The strict and sloppy readings for example (3a) are taken to be correlated with an ambiguity in the meaning of the VP of the source clause, which can be stated either by (5a) or (5b).

$$(5) \text{ a. } \lambda x.love(x, mother(john)) \\ \text{ b. } \lambda x.love(x, mother(x))$$

In this case, the dependency between binding in source and target follows immediately from the identity condition.

In the *non-identity-of-relations* account due to Dalrymple, Shieber, and Pereira (1991), the uniformity is specified by the solving of a certain equation in which, roughly speaking, the meaning of the source sentence as a whole is equated with the meaning of the target VP as applied to the meanings of the elements in the source that are parallel to overt elements in the target. For sentence (2a), this identity is captured by the equation

$$(6) love(john, mother(chris)) = P(john)$$

which under suitable assumptions has one solution for the meaning P of the elided VP, namely that in (4). For sentence (3a), this identity is captured by the equation

$$(7) love(john, mother(john)) = P(john)$$

which under suitable assumptions has two solutions for the meaning P of the elided VP, namely those in (5).

In the equational account, the dependency between binding in source and target follows immediately from the parallelism condition. In the remainder of the paper, we will use this analysis as an exemplar of the source-determined class of analyses, and will assume familiarity with it.

Source-determined analyses have been widely proposed in the literature (Sag, 1976; Williams, 1977; Haïk, 1987; Klein, 1987; Gawron and Peters, 1990; Prüst, Scha, and van den Berg, 1991; Dalrymple, Shieber, and Pereira, 1991; Kehler, 1993).

Discourse-determined: The binding relationships in the target are determined exactly as those in the source are determined, by appeal to discourse principles and pragmatics. The ambiguity of sentence (1) is thus taken to follow from the ambiguity of the sentence

(8) Bill loves his mother.

in a discourse context in which John and perhaps Chris are already available pronoun antecedents.

The dependency between the source and target follows from the similarity of discourse state typically (but contingently) operative for the interpretation of source and target clauses, in light of the effects that the bindings in the source have on the discourse state under which the target is interpreted.

That binding relationships are discourse-determined is found (at least implicitly) in several recent analyses of ellipsis (Hellan, 1988; Kitagawa, 1991; Hardt, 1991a; Hardt, 1991b; Hardt, 1992a; Hardt, 1992b; Hardt, 1993).

Note that in the *source-determined* type of analysis, the dependency between the binding relations in the source and target clauses follows from the fact that the target clause relations are determined on the basis of the source clause relations. In the *discourse-determined* type of analysis, separate pragmatic resolution of binding relations is done in source and target; the dependency then results from the target being interpreted after the binding in the source has affected the state of the discourse model. Approaches that combine facets of both source- and discourse-determined analyses are also possible; we might call them *mixed* analyses. The purpose of this squib is to cover both old and new arguments that attempt to shed light on which of these alternatives best characterizes the interaction of binding and ellipsis.

We will review two previously proposed analyses of VP ellipsis interpretation, one that is a *discourse-determined* analysis and one that is a *mixed* analysis. (Where appropriate, we will refer to both discourse-determined analyses and mixed analyses as *discourse-based analyses*.) We will provide crucial examples that distinguish between these two analyses and source-determined analyses; these examples argue against the former types. We then turn to some arguments purporting to demonstrate the superiority of discourse-based analyses over source-determined ones and show that they are flawed.

2 A Discourse-Determined Analysis

The most explicit advocate of a discourse-determined approach to VP-ellipsis interpretation is Hardt. In a series of papers (Hardt, 1991a; Hardt, 1991b; Hardt, 1992b; Hardt, 1992a), Hardt has outlined an account of ellipsis under which binding (and presumably scope) relations are separately determined on the basis of a discourse model in source and target. In the system he describes, the meaning of an elided VP is taken to be a “property” in the discourse model (presumably introduced by the VP of the source clause), but one with uninstantiated variables standing proxy for the pronouns in the clause that it represents. These variables are copied into the target without the bindings they received in the source, and are resolved with respect to the discourse model active in the target:

Two copies of this VP, as antecedent and target in VP ellipsis, could allow the pronoun to refer to different entities, depending on the state of the current discourse model. (Hardt, 1992a, page 306)

Presumably, ambiguities in strict/sloppy readings result from having multiple possible referents for a pronoun that is copied to the target.

In Hardt’s account, much remains unsaid about the particulars of the discourse theory assumed. In earlier papers (Hardt, 1991a; Hardt, 1991b), he assumes the *Centering* model of Grosz, Joshi, and Weinstein (1983; 1986). In more recent papers (Hardt, 1992a; Hardt, 1992b), no details are provided concerning the discourse principles used to predict the correct strict and sloppy readings. Nonetheless, an explicit theory of discourse is not necessarily required to test the predictions of a discourse-determined analysis. We can merely make use of our native intuitions concerning the felicity of discourses *not* containing ellipsis. Such intuitions, we may assume, should follow from an optimal theory of discourse processing, and we may use them as a proxy for that theory.⁴

For instance, consider again sentence (1), embedded in a context to favor the binding of *his* in the source clause to Chris:

(9) Chris has a wonderful family. John loves his mother and Bill does too.

Whatever factors contribute to the binding of the overt *his* to Chris, together with the effect this binding itself may have on the discourse state, would affect the binding of the variable in the elided property as well. This can be seen by examining the unelided counterpart of this sentence pair:

(10) Chris has a wonderful family. John loves his mother, and Bill loves his mother too.

⁴This assumes, of course, that the same model of discourse is used in determining binding relations for both elliptical and nonelliptical clauses. If this is not the case, a discourse-determined analysis of ellipsis is unfalsifiable in any case.

Assuming that the middle clause in example (10) is taken to mean that John loves Chris's mother, it is infelicitous to interpret the final clause as meaning either that Bill loves John's mother or that Bill loves Bill's mother. Hardt notes this fact in discussing a similar example:

While [readings with the target pronoun switching reference] are ruled out by the alphabetic variance condition, the questionable nature of these readings can be explained without recourse to such a condition. Consider the non-elliptical counterpart of example [(9), given in (10)]. The [readings with the target pronoun switching reference] above would be no better, in the absence of deictic gestures or intonational emphasis. Therefore, these facts appear to reflect general constraints on the resolution of referential pronouns in context. (Hardt, 1991b, page 126)

We may presume a full theory of discourse would predict these facts, and whatever theory that is could then be used to predict the lack of the similar reading for the elliptical version (9).

Likewise, the correct predictions for the strict and sloppy interpretations of example (3a) seemingly result from Hardt's analysis. Assuming that *his* in the source is coreferential with *John*, the non-elided counterpart of example (3a) apparently displays an identical ambiguity:

(11) John_i loves his_i mother, and Bill loves his mother too.

Both *John* and *Bill* are salient enough that the referent of *his* in the target is ambiguous in exactly the manner required to yield both the strict and sloppy interpretations.

To summarize thus far, a purely discourse-determined analysis predicts that a sentence with ellipsis should display the same readings in a given context that the unelided form would in the same context. Examples such as those above demonstrate that a discourse-determined theory can explain at least some cases of dependencies between bindings in source and target clauses.

However, it is not the case that discourse constraints, from whatever theory, are enough to control the dependencies between bindings in source and target. In general, discourse principles for normal pronominal reference are more flexible than is consistent with the reference behavior exhibited by elliptical reconstructions. For example, consider the nonelliptical example (12a). This sequence of sentences is felicitous under the binding relations indicated. Its elliptical counterpart (12b), however, cannot be taken as having the meaning of (12a).⁵ Similarly, example (13b) cannot have the meaning provided by

⁵We use the '#' symbol to mark examples that are infelicitous under the intended interpretation.

the nonelliptical (and historically accurate) version (13a).⁶ Thus, a discourse-determined analysis of ellipsis resolution, unlike a source-determined one, makes the wrong predictions for the (b) examples in predicting that they can have the (a) meanings. This conclusion holds *regardless of the theory of discourse that we assume*; it relies only on intuitions concerning the (a) sentences, intuitions that any theory of discourse must respect.⁷

- (12) a. Mike Tyson will always be considered one of the greats of professional boxing. After one round with Spinks_{*i*}, Tyson_{*j*} beat him_{*i*}. Now people think that no one can beat him_{*j*}.
- b. # Mike Tyson will always be considered one of the greats of professional boxing. After one round with Spinks_{*i*}, Tyson_{*j*} beat him_{*i*}. Now people think that no one can.
- (13) a. The story of Lee Harvey Oswald will always be one of the most intriguing in U. S. history. When John Kennedy_{*i*} drove through Dallas, Oswald_{*j*} shot him_{*i*}. Some time afterward, Dallas nightclub owner Jack Ruby shot him_{*j*} in retaliation.
- b. # The story of Lee Harvey Oswald will always be one of the most intriguing in U. S. history. When John Kennedy_{*i*} drove through Dallas, Oswald_{*j*} shot him_{*i*}. Some time afterward, Dallas nightclub owner Jack Ruby did in retaliation.

Examples (12) and (13) demonstrate that pronouns within copied VPs are not as free to seek extrasentential referents as their unelided VP counterparts. Example (14) shows that this is also the case for intrasentential referents.

- (14) a. Every boy_{*i*} was hoping that Mary would ask him_{*i*} out, but the waiting is over. Last night at Bob's_{*j*} party, she asked him_{*j*} out.
- b. # Every boy_{*i*} was hoping that Mary would ask him_{*i*} out, but the waiting is over. Last night at Bob's_{*j*} party, she did.

⁶It should be noted that the readings given by the coindexing marked in (12a) and (13a) do not require (though they may allow) special stress on the pronoun in the final clause. Thus, postulating that elliptically reconstructed material operates as if unstressed does not help in solving the problem presented here.

⁷It might be argued that our use of a lead-in sentence to establish a particular discourse context is unfair. But the point of a discourse-determined analysis is just that the discourse context alone is sufficient to explain binding phenomena. Only in the presence of a particular discourse context — such as the one used in the explication of example (9) — does a discourse-determined analysis make a prediction. In the presence of such a claim, counterexamples must of necessity set up a discourse context and show that it is insufficient to explain the observed phenomena.

The reading where Mary asked out Bob at Bob’s party, while readily available in example (14a), is not available in its elided counterpart (14b). (Indeed, (14b) seems to be completely infelicitous under any reading.)

In his most recent work, Hardt (1993) further specifies the method by which the various binding possibilities are generated. He assumes that VP properties in the discourse model may have associated with them a set of assumptions that characterize the permissible bindings of unbound variables standing proxy for pronouns. The storage of the VP meaning in the discourse model is then freely ordered with the discharge of the pronoun binding assumption in the source. If the assumption is discharged first, later use of the property yields the strict reading. If the assumption is not discharged first, later use of the property leads to a meaning retaining the undischarged assumption, which picks up a referent when it is subsequently discharged. This allows for the sloppy reading (among others).

This analysis is similar to one proposed by Kitagawa (1991), except that Hardt assumes that the resolutions occur at a semantic level and Kitagawa at a syntactic level of representation. In both analyses, however, copied pronouns are not constrained from seeking an extrasentential referent, as long as discourse principles permit it.⁸ Therefore, the infelicity of examples (12b) and (13b) as well as example (14b) is problematic for both accounts.

In sum, while there is some degree of overlap between readings available for elliptical sentences and their non-elided counterparts, these examples show that this effect is not systematic, as the rules for ellipsis resolution are more strict than those governing pronominal reference in general.

3 A Mixed Analysis

Hellan (1988) describes an account of ellipsis resolution that is, in a certain sense, at the opposite end of the syntax-to-pragmatics spectrum from Hardt’s analysis. In Hellan’s system, syntactic material from the source is copied to the target. The binding of pronouns works much like in Kitagawa’s (1991) analysis:

On the *strict* reading of the target, ... the repeated occurrence of X [the copied representation] is treated as *fully evaluated*, i.e., with a referent assigned before the ‘repetition’... On the *sloppy* reading, ... the repeated occurrence of X is treated as *non-evaluated*, i.e., as not yet having been assigned a referent. In its repeated version in the second conjunct, this amounts to Z [the copied pronoun] being free to seek a binder... (Hellan, 1988, page 228)

⁸Although Kitagawa does not explicitly propose the use of discourse principles to reduce the overgeneration of his analysis, we have given it the benefit of this plausible interpretation. This holds also for our discussion of the analysis of Hellan in the next section.

Unlike the purely discourse-determined analyses, however, Hellan adds an additional constraint on binding in the sloppy case:

Then, after copying, [the pronoun] must find a binder; and for the copy inside S_2 [the target], this binder must necessarily be inside S_2 .
(Hellan, 1988, page 233)

Like Hardt's analysis, pronouns are free to seek binders according, presumably, to preferences dictated by a theory of discourse.⁹ Unlike Hardt's approach, this possibility is constrained to operating within the target clause. Hellan's approach is thus more restrictive in that the only extrasentential element that a copied pronoun in the target can refer to is the one to which it is bound in the source. However, since Hellan's approach is not purely source-determined, it does allow for greater freedom in determining the binding of a pronoun in the sloppy case. As a result, his analysis, like Hardt's, does not impose binding dependency constraints inherent in source-determined approaches in determining sloppy readings, relying instead on principles of pragmatics or discourse to guarantee appropriate dependencies between bindings in source and target.

Hellan discusses example (15), both in Norwegian and English paraphrase, as evidence for this extra freedom:

- (15) Jon skryter av søsteren sin, og Petter har hørt deg gjøre det samme.
Jon boasts of sister his, and Petter has heard you do the same.

He claims that the availability of two antecedents (*Petter* and *you*) in the target clause allow for two sloppy readings, paraphrasable as

- (16) a. Jon boasts of his sister, and Petter has heard you boast of your sister.
b. Jon boasts of his sister, and Petter has heard you boast of Petter's sister.

An oddity concerning the Hellan proposal is that the English correlate of the Norwegian example he gives, using VP ellipsis, does not appear to have both of the readings he would predict.¹⁰

- (17) Jon boasted of his sister, and Petter said that you did too.

While the reading where the referent of *you* boasted of his or her sister certainly exists, missing here is the reading where the referent of *you* boasted of Petter's sister. The case is analogous when ellipsis is not used, as in Hellan's original example:

- (18) Jon boasted of his sister, and Petter said that you did the same.

⁹See footnote 8 for a comment regarding the role of discourse principles in Hellan's analysis.

¹⁰Hellan also concedes that the judgment in the Norwegian sentence is "a bit delicate."

Again, the reading where the referent of *you* boasted of Petter’s sister appears to be missing. Interestingly, and contra a purely discourse-determined analysis such as Hardt’s, the missing reading is much more accessible when the target clause is not elided:¹¹

- (19) Jon boasted of his sister, and Petter said that George boasted of his sister too.

We now ask how the Hellan analysis fares in a litmus test using examples (12) through (14). As a result of his constraining the freedom of a pronoun to seek a binder via discourse principles to operate only within the target clause, his approach correctly predicts the unacceptability of examples (12b) and (13b) under the intended readings. However, his approach, like Hardt’s and Kitagawa’s, does not predict the unacceptability of example (14b) under the intended reading, because for that reading the binder exists in the target clause. Therefore, Hellan’s account appears to run into problems at the very point where the restrictions on binding in the target imposed by the binding in the source are relaxed, and reliance on discourse principles enters his account.

Thus, in examples that can distinguish a discourse-based analysis of binding dependencies from a source-determined one, the facts argue for the latter over the former. Discourse-based analyses exhibit a symptom of overgeneration. Hellan’s analysis, because of the more restrictive role of discourse principles fares better than Hardt’s analysis on this count, but both are subject to this weakness.

4 Purported Arguments for Discourse-Based Analyses

Given the difficulty of a discourse-based explanation for binding dependencies, one may wonder what such an explanation has to recommend it. Hardt has provided explicit arguments purporting to favor a discourse-based theory. In this section, we will show that these arguments do not in fact incriminate source-determined analyses as such; insofar as they cast doubt upon analyses, it is those source-determined analyses that derive target meaning on the basis of syntactic representations of the source that are indicted.

Hardt has presented two basic arguments to “[indicate] that no syntactic or logical form theory can account for the facts of VP ellipsis.” (Hardt, 1991a, page 25). First are cases in which there is no appropriate syntactic antecedent for VP ellipsis. This might be because the implicit relation in the elided VP is manifest in a gerund form in the source clause (20a), or is only evoked from the source clause by inference (20b), or because there is no syntactic antecedent at all (20c),

¹¹We substitute *George* for *you* in this example to keep the person of the pronoun constant. The elided version of example (19) is also missing the reading available here.

the context providing the appropriate meaning material. Also established are cases where the antecedent is nominalized (20d) or in a different mood (20e).

- (20) a. These planets were much bigger, nearly all capable of holding an atmosphere. But to the infuriation of scientists, for no known reason not all of them did. (Hardt, 1991a)
- b. Martha and Irv wanted to dance together, but Martha couldn't, because her husband was there. (Webber, 1978)
- c. I will if you do. (Chao, 1987)
- d. The trouble is in Britain that there are no initiators [of policy in Ministries] — people try to, but.... (BBC Radio 3, May 12, 1984, cited by (Cornish, 1986))
- e. A lot of this material can be presented in a fairly informal and accessible fashion, and often I do. (in text of (Chomsky, 1982))

Examples of this sort do argue against a purely syntactic notion of parallelism between source and target, but any analysis that takes semantic material as the appropriate source for determination of the meanings of elided material is on essentially equal ground in handling them. The examples therefore distinguish between syntactic analyses and semantic analyses, not between source-determined analyses and discourse-determined analyses. (Recall from the discussion in Section 1 (page 3) that source-determined analyses vary with respect to what level of representation is used as the basis for binding relationships in source and target.) In fact, Dalrymple, Shieber, and Pereira (1991, Section 5.1) discuss similar examples to those above in emphasizing that the appropriate notion of parallelism between a source and target may not be reflective of their syntactic structure alone. They take it to be one of the distinguishing features of their analysis that parallelism determination and ellipsis interpretation are separated.

The set of arguments based on these examples do not, then, get at the issue of where binding dependencies come from, but only at what level parallelism is manifest.

More to the point, however, is Hardt's second argument. Hardt points out examples in which pronouns "switch reference from antecedent to target"; in our terminology, the standard dependency between binding relations in source and target does not hold. This switching of reference, already exemplified in previous examples such as (15), is a capability that discourse-determined analyses permit, but that Hardt claims source-determined analyses do not. Of course, the examples in the previous sections show that this ability to switch reference is inappropriate in many cases, and that discourse principles are inherently incapable of appropriately controlling such switching. Nonetheless, it

bears considering the examples that Hardt proposes as showing this switching of reference.

Hardt gives as a central example (example (2) in (Hardt, 1992a)) the sentence given as (21a), which has a preferred reading paraphrasable as (21b).

- (21) a. Every boy in Bill’s class hoped Mary would ask him out, but a boy in John’s class actually knew that she would.
- b. Every boy_{*i*} in Bill’s class hoped Mary_{*k*} would ask him_{*i*} out, but a boy_{*j*} in John’s class actually knew that she_{*k*} would ask him_{*j*} out.

For the purposes of this discussion, the quantifiers in (21) can be replaced by proper nouns, as in (22). The arguments apply to this example just as well, and we will use the simpler version.

- (22) a. John hoped Mary would ask him out, but Bill actually knew that she would.
- b. John_{*i*} hoped Mary_{*k*} would ask him_{*i*} out, but Bill_{*j*} actually knew that she_{*k*} would ask him_{*j*} out.

Note that relative to the binding relationships in the portion of the source clause “Mary would ask him_{*i*} out”, the binding relationships in the corresponding target clause “she_{*k*} would ask him_{*j*} out” involve “switching reference” of *him* from *i* to *j*.

Hardt claims that (what we are calling) a source-determined account cannot model this switching of reference. His argument concerning the equational method goes as follows:

To set up the equation, it is necessary to determine the antecedent clause and the “parallel elements”, and DSP provide no method for making this determination. Typically, with VP ellipsis, there are two adjacent clauses, in which the second clause contains an elliptical VP. Then the first clause is the antecedent clause and the two subjects are the parallel elements. Applying this to the current example, we have “Mary would ask him_{*i*} out” as the antecedent clause, and “Mary” and “she” as parallel elements. The equation to solve is

$$P(\textit{mary}) = \textit{askout}(\textit{mary}, \textit{him}_i)$$

In this case, the desired solution,

$$\lambda x. \textit{askout}(x, \textit{him}_j)$$

is not a possible solution to this equation, according to the matching operation used by DSP. (Hardt, 1992a, page 307)

Of course, Hardt’s particular choice of parallelism between the two clauses is not the only one, nor is it the most natural one. While the elements *John* and *Bill* are not within the minimal clauses, they are parallel within the main clauses. Recognizing this parallelism, the equation to be solved is

$$P(\textit{john}, \textit{mary}) = \textit{askout}(\textit{mary}, \textit{john})$$

which has as a solution

$$P = \lambda y, x. \textit{askout}(x, y)$$

Applying to the parallel elements in the target, we derive the appropriate reading

$$P(\textit{bill}, \textit{mary}) = \textit{askout}(\textit{mary}, \textit{bill})$$

for the elided portion of the target.¹² Viewed in light of the parallelism between the main clause subjects, the sentence does not involve “switching of reference” at all, any more than any other sloppy reading of an elliptical clause does. Thus, while examples such as (22) were not directly addressed in work on the equational method, their analysis within the framework is straightforward.

The equational analysis for sentences of this sort is not the only source-determined analysis of the phenomenon. In fact, Prüst, Scha, and van den Berg (1991) previously noted examples such as these, for example, their (21) reproduced here,

- (23) Everyone told a man that Mary likes him, and everyone told a boy that Suzy does.

and provided analyses within their source-determined analysis of ellipsis. Hardt says

It appears that this account can accommodate the example [our (21a)], based on Prüst et al.’s requirement that if a pronoun p is bound to Q in the antecedent, the corresponding pronoun p' must be bound to a “structurally parallel” Q' in the target, where this is intended as matching syntactic and semantic structure. However, example [(24a)] indicates that the two quantifiers need not be in structurally parallel positions. Indeed, example [(24b)] shows that there is no requirement for a corresponding quantifier at all. (Hardt, 1992a, page 307)

¹²Hardt may be alluding to this analysis when he says that “an extended notion of parallelism might solve the problem” (Hardt, 1992a, page 307). In later work (Hardt, 1993), he notes that the absence of this reading “assumes that the parallel elements are the subject of the antecedent VP and the elliptical VP, although this is not required in the equational approach.” However, he states that allowing other parallel elements “would represent a radical departure for the equational approach, since the solution to the equation would no longer represent merely the elided material.” As it has never been possible to construe the solutions of ellipsis equations as representing merely the elided material (see, for instance, the solution to example (30b) given by Dalrymple, Shieber, and Pereira (1991)), it is hard to understand the nature of the “departure” in question.

- (24) a. Almost every boy in the class hopes Mary will ask him out,
but I know there are a few boys who hope that she won't.
- b. Every boy in Mrs. Smith's class hoped she would pass him.
In John's case, I think she will.

Hardt's argument that syntactic structural parallelism does not exhaust the possibilities for determining parallelism between source and target for the purpose of resolving ellipsis is true, and is an appropriate argument against Prüst et al.'s analysis, which relies on syntactic parallelism. However, this point is essentially independent of the "switching of reference" phenomenon; it is instead a return to the first argument discussed in this section.¹³ In example (24a), for instance, the two quantified NPs in question are in fact parallel at the *semantic* level, as they are both *agents* of parallel *hope* relations; therefore this case can be handled by the equational method in a manner similar to the analysis of example (22).

Example (24b) is perhaps more illuminating in that it shows a difference between the (structural) *identity* condition and the (pragmatically determined) *parallelism* condition that distinguish different source-determined analyses. As example (14) in Section 2 demonstrated, switching reference in VP ellipsis is (contra Hardt) not always possible with NPs embedded in preposed prepositional phrases, even when the non-elided form allows it. The nonpredicative *in ~ case* construction, however, can be seen as one that provides focus to an element that for semantic reasons cannot be put in a parallel syntactic (or thematic) role.¹⁴ Given the determination of the admittedly non-syntactic parallelism in (24b) between "every boy in Mrs. Smith's class" and "John", the same equational method of ellipsis resolution through equation solving applies.

Note that the sharing of prominence that licenses the parallelism in (24b) between these two elements is in marked contrast to the lack thereof in example (14). While in that example *Bob* is prominent enough for pronominal reference, it does not bear the focus required to license the parallelism necessary for the sloppy reading in the elided form. These examples, therefore, strongly support the view that binding relationships are determined by parallelism relationships, and not discourse context.

5 Remaining Problematic Cases

Although the arguments that Hardt presents do not provide evidence for a discourse-determined analysis or against a source-determined one, certain other cases problematic for a source-determined analysis exist.

¹³Note that Hellan's analysis also allows the correct readings for examples (24a) and (24b), therefore these cases do not distinguish Hardt's analysis from Hellan's more restrictive account.

¹⁴Other similar constructions — *regarding ~*, *as for ~*, *with respect to ~*, and so forth — all serve to mark a focussed element but are otherwise essentially devoid of meaning.

In Section 3 we presented Hellan’s Norwegian example, repeated below as (25), which he claims allows for the two sloppy readings given in (26):

(25) Jon skryter av søsteren sin, og Petter har hørt deg gjøre det samme.
Jon boasts of sister his, and Petter has heard you do the same.

- (26) a. Jon boasts of his sister, and Petter has heard you boast of your sister.
b. Jon boasts of his sister, and Petter has heard you boast of Petter’s sister.

Although not a case of VP ellipsis proper, it might be argued that Hellan’s example provides support for preferring a discourse-based analysis over a source-determined one, insofar as his judgments are correct. While, as we have noted, the English VP-elliptical version of this sentence does not appear to have the same ambiguity in sloppy readings, judgments vary for other similar cases. For sentence (27), a variant of one given by Kitagawa (1991), many speakers find the sloppy reading, in which Bill hands in his own paper, to be acceptable:

(27) John told Mary to hand in his paper before Bill does.

Example (27), assuming it has this reading, is problematic for most source-determined analyses because it necessitates that *Bill* be parallel to both *John* and *Mary*, a possible but unattractive prospect.

However, not all examples like (27) appear to be as felicitous under the sloppy interpretation. Example (28), for instance, seems to be less acceptable under the sloppy reading:

(28) John knows that Mary will give his son a job offer, and Bill will too.

That is, the reading under which Bill gives *his own* son a job offer appears much less readily available than the strict interpretation, if it is available at all. This is in marked contrast to the non-elided version, where both readings are available:

(29) John knows that Mary will give his son a job offer, and Bill will give his son a job offer too.

Thus, sentences of the sorts discussed in this section seem to be equally problematic for source-determined and discourse-determined approaches to binding determination. In light of this fact, we leave the existence of the relevant sloppy readings for examples (25) and (27), insofar as they exist, as a matter for future study.

6 Summary

We have presented new examples that serve as a litmus test for the adequacy of a discourse-determined explanation of binding dependencies in elliptical constructions. Felicity intuitions on these examples demonstrate that discourse-determined analyses are insufficiently constrained in the space of readings that they allow. On the other hand, we have shown that previous arguments for such discourse-determined analyses either fail to distinguish discourse-determined from semantic source-determined analyses or are based on a confusion between the processes of parallelism determination and ellipsis resolution.

Many aspects of VP ellipsis interpretation are governed by principles of pragmatics, such as determination of the appropriate source clause, determination of the parallelism between source and target, and determination of the intended reading of an elliptical clause with multiple interpretations. The dependencies of binding and scope, however, do not appear to be among these.

References

- Chao, Wynn. 1987. *On Ellipsis*. Ph.D. thesis, University of Massachusetts at Amherst, Amherst, Massachusetts.
- Chomsky, Noam. 1982. *Noam Chomsky on the Generative Enterprise*. Foris, Dordrecht, the Netherlands.
- Cornish, Francis. 1986. *Anaphoric Relations in English and French - A Discourse Perspective*. Croom Helm.
- Dalrymple, Mary, Stuart M. Shieber, and Fernando Pereira. 1991. Ellipsis and higher-order unification. *Linguistics and Philosophy*, 14:399–452.
- Gawron, Mark and Stanley Peters. 1990. *Anaphora and Quantification in Situation Semantics*, volume 19 of *CSLI Lecture Notes*. Center for the Study of Language and Information, Stanford, California.
- Grosz, Barbara J., Aravind K. Joshi, and Scott Weinstein. 1983. Providing a unified account of definite noun phrases in English. In *Proceedings of the 21st Annual Meeting of the Association for Computational Linguistics*, Cambridge, Massachusetts.
- Grosz, Barbara J., Aravind K. Joshi, and Scott Weinstein. 1986. Towards a computational theory of discourse interpretation. Unpublished manuscript.
- Haïk, Isabelle. 1987. Bound variables that need to be. *Linguistics and Philosophy*, 11:503–530.

- Hardt, Daniel. 1991a. A discourse model approach to VP ellipsis. In *Proceedings of the AAAI Symposium on Discourse Structure in Natural Language Understanding and Generation*, Asilomar, CA, November.
- Hardt, Daniel. 1991b. Towards a discourse level account of VP ellipsis. In *Proceedings of the Eastern States Conference on Linguistics*, pages 121–129.
- Hardt, Daniel. 1992a. VP ellipsis and contextual interpretation. In *Proceedings of the 14th International Conference on Computational Linguistics*, Nantes, July.
- Hardt, Daniel. 1992b. VP ellipsis and semantic identity. In Chris Barker and David Dowty, editors, *Proceedings of the Second Conference on Semantics and Linguistic Theory (SALT-II)*, Columbus, Ohio, July. Ohio State University Working Papers in Linguistics no. 40.
- Hardt, Daniel. 1993. *Verb Phrase Ellipsis: Form, Meaning, and Processing*. Ph.D. thesis, University of Pennsylvania. Institute for Research in Cognitive Science report 93-23.
- Hellan, Lars. 1988. *Anaphora in Norwegian and the Theory of Grammar*. Studies in Generative Grammar 32. Foris, Dordrecht, the Netherlands.
- Kehler, Andrew. 1993. A discourse copying algorithm for ellipsis and anaphora resolution. In *Proceedings of the Sixth Conference of the European Chapter of the Association for Computational Linguistics (EACL-93)*, Utrecht, the Netherlands, April.
- Kitagawa, Yoshihisa. 1991. Copying identity. *Natural Language and Linguistic Theory*, 9:497–536.
- Klein, Ewan. 1987. VP-ellipsis in DR theory. In Groenindijk and Stokhof, editors, *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*. Foris, Dordrecht, the Netherlands.
- Prüst, Hub, Remko Scha, and Martin van den Berg. 1991. A formal discourse grammar tackling verb phrase anaphora. Manuscript.
- Sag, Ivan. 1976. *Deletion and Logical Form*. Ph.D. thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- Webber, Bonnie Lynn. 1978. *A Formal Approach to Discourse Anaphora*. Ph.D. thesis, Harvard University, Cambridge, Massachusetts.
- Williams, Edwin. 1977. Discourse and logical form. *Linguistic Inquiry*, 8(1).