

# No Argument-Adjunct Asymmetry in Reconstruction for Binding Condition C

Benjamin Bruening (University of Delaware) and Eman Al Khalaf (University of Jordan)

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## Abstract

The syntax literature has overwhelmingly adopted the view that reconstruction takes place in *wh*-chains for R-expressions contained within arguments but not within adjuncts to fronted *wh*-phrases. At the same time, this empirical picture has been questioned by various authors. We undertake a series of grammaticality surveys using Amazon Mechanical Turk in an attempt to clarify the empirical picture regarding reconstruction for Binding Condition C. We find absolutely no evidence of an argument-adjunct distinction in reconstruction for Binding Condition C. We suggest that those speakers who report such a contrast (linguists, primarily) are following a pragmatic bias, and not Condition C. While we do not find reconstruction of dependents of fronted NPs, we do find reconstruction of fronted PPs, which we suggest fall together with fronted predicates. The generalization we end up with is that when a predicate is fronted, it and the head of its complement reconstruct, but if an argument is fronted, only the head of the argument reconstructs.

## 1 Introduction

One of the most discussed topics in the area of connectivity or reconstruction effects in *wh*-movement has been a putative contrast between arguments and adjuncts regarding Condition C. Numerous authors have claimed that R-expressions contained within arguments of the moved phrase obligatorily reconstruct for Binding Condition C, but R-expressions contained within adjuncts do not. The following contrast is representative:

- (1) (Fox 1999, 164, (11))
  - a. ??/\* Which argument that John<sub>1</sub> is a genius did he<sub>1</sub> believe?
  - b. Which argument that John<sub>1</sub> made did he<sub>1</sub> believe?

This contrast was first presented in van Riemsdijk and Williams (1981) and further discussed in Freidin (1986), Barss (1988, 40), Lebeaux (1988), Chomsky (1993), Sauerland (1998), Fox (1999), Takahashi and Hulsey (2009), among many others. All of these references have taken the contrast to be well established, and have proposed various explanations for it.

At the same time, this empirical picture has been questioned by various authors. Bianchi (1995), Lasnik (1998), Safir (1999, 609), Kuno (2004), and Henderson (2007, 206–207) all suggest that this contrast is not as strong as it has been made out to be, or may even be non-existent. Our own observations over a number of years indicates that less than 20% of native English speakers feel that there is any contrast of this type. The vast majority freely permit coreference in examples like (1a), and many even find that to be the most salient interpretation for the pronoun.

Given this lack of clarity in the empirical picture regarding reconstruction for Condition C, we undertake a series of grammaticality surveys using Amazon Mechanical Turk. We find absolutely no evidence

of reconstruction for Binding Condition C in wh-chains in the larger population. In particular, there is no argument-adjunct distinction. We suggest that those speakers who report such a contrast (linguists, primarily) are following a pragmatic bias, which we attempt to spell out. However, we do find reconstruction for Condition C with fronted PPs, which we suggest fall together with fronted predicates. Arguments of fronted predicates obligatorily reconstruct (Huang 1993, Heycock 1995), but dependents of fronted arguments do not, whether they are arguments or adjuncts.

## 2 The Current Empirical Picture

In this section we present the types of examples that have been presented in the literature, in order to motivate the particular studies that we undertake.

Those authors who claim there is a contrast between arguments and adjuncts have presented examples of several different types. First, some authors claim there is a contrast with CPs that are either arguments of a noun or adjuncts to a noun, like the following:

- (2) (Fox 1999, 164, (11))
  - a. ??/\* Which argument that John<sub>1</sub> is a genius did he<sub>1</sub> believe?
  - b. Which argument that John<sub>1</sub> made did he<sub>1</sub> believe?
- (3) (Safir 1999, 589, (1a, 2a))
  - a. \* Which claim that Mary had offended John<sub>1</sub> did he<sub>1</sub> repeat?
  - b. Which claim that offended John<sub>1</sub> did he<sub>1</sub> repeat?

Safir (1999) says that he finds the contrast weak with CPs, but that the contrast is very sharp with PP arguments versus PP adjuncts. He presents examples like the following:

- (4) (Safir 1999, 589, note 1)
  - a. \* Which investigation of Nixon<sub>1</sub> did he<sub>1</sub> resent?
  - b. Which investigation near Nixon<sub>1</sub>'s house did he<sub>1</sub> resent?
- (5) a. \*? I always respect a journalist [whose depiction of Jesse<sub>1</sub>] he<sub>1</sub> objects to. (Safir 1999, 600, (29a))
  - b. I always respect a journalist [whose depictions on Jesse<sub>1</sub>'s talk show] he<sub>1</sub> objects to. (presumably grammatical for Safir)

Other authors have offered examples of PP arguments of nouns in contrast with PP (or CP) adjuncts, like the following:

- (6) (van Riemsdijk and Williams 1981, 201, (86))
  - a. ?? Which picture of John<sub>1</sub> did he<sub>1</sub> like?
  - b. Which picture that John<sub>1</sub> saw did he<sub>1</sub> like best?
- (7) (Lebeaux 1992, 212, (4))
  - a. ??/\* Which pictures of John<sub>1</sub> did he<sub>1</sub> like?
  - b. Which pictures near John<sub>1</sub> did he<sub>1</sub> look at?
- (8) a. \* Which corner of John<sub>1</sub>'s room was he<sub>1</sub> sitting in? (Takahashi and Hulsey 2009, 391, (5b))
  - b. Which corner near John<sub>1</sub>'s desk was he<sub>1</sub> sitting in? (presumably grammatical for Takahashi and Hulsey)

Additionally, Sauerland (1998, 2003) claims there is a difference between arguments and adjuncts in reconstruction for Condition C with relative clauses (Sauerland cites an earlier draft of Safir 1999 for these):<sup>1</sup>

- (9) (Sauerland 1998, 65, (56))
- a. There's a singer whose picture in John<sub>1</sub>'s office he<sub>1</sub>'s very proud of.
  - b. \* There's a singer whose picture of John<sub>1</sub>'s office he<sub>1</sub>'s very proud of.
- (10) (Sauerland 2003, (10a–b))
- a. Max is a prince John<sub>1</sub>'s description of whom he<sub>1</sub> varies when spies are around.
  - b. \* Max is a prince whose description of John<sub>1</sub> he<sub>1</sub> varies when spies are around.

In contrast to the above, other authors have presented examples of R-expressions contained within arguments to a fronted head that they judge to be grammatical with coindexing. The following are some examples:

- (11) a. Which biography of Picasso<sub>1</sub> do you think he<sub>1</sub> wants to read? (Higginbotham 1983, 411)
- b. That Ed<sub>1</sub> was under surveillance he<sub>1</sub> never realized. (Ross 1973b, 198)
  - c. That John<sub>1</sub> had seen the movie he<sub>1</sub> never admitted. (Culicover 1997, 333)
  - d. Which picture of John<sub>1</sub> does he<sub>1</sub> like best? (Heycock 1995, 557, note 13)

The most extensive set of examples is provided by Kuno (2004). He presents numerous examples. We organize them by CP complements to nouns in (12) and PP complements to nouns in (13):<sup>2</sup>

- (12) (Kuno 2004, 335, (72))
- a. Whose allegation that John<sub>1</sub> was less than truthful did he<sub>1</sub> refute vehemently?
  - b. Whose opinion that Weld<sub>1</sub> was unfit for the ambassadorial appointment did he<sub>1</sub> try to refute vehemently?
  - c. Whose claim that the Senator<sub>1</sub> had violated the campaign finance regulation did he<sub>1</sub> dismiss as politically motivated?
  - d. Which psychiatrist's view that John<sub>1</sub> was schizophrenic did he<sub>1</sub> try to get expunged from the trial records?
- (13) (Kuno 2004, 335, (73–74))
- a. Which witness's attack on John<sub>1</sub> did he<sub>1</sub> try to get expunged from the trial records?
  - b. Which artist's portrait of Nixon<sub>1</sub> do you think he<sub>1</sub> liked best?
  - c. Whose criticism of John<sub>1</sub> did he<sub>1</sub> choose to ignore?
  - d. Which doctor's evaluation of John<sub>1</sub>'s physical fitness did he<sub>1</sub> use when he<sub>1</sub> applied to NASA for space training?
  - e. Which psychiatrist's evaluation of John<sub>1</sub>'s mental state did he<sub>1</sub> try to get expunged from the trial records?

Additionally, Leddon and Lidz (2006) report on an experiment testing reconstruction for Binding Condition C in both adults and children. They find that adults always reconstruct with predicates (more on this in section 4), but not with fronted arguments. Adults permit coreference in examples like the following 23% of the time:

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<sup>1</sup>Note that example (10b) on the indicated indexing would require that John somehow vary the prince's description of him. That is an unlikely scenario.

<sup>2</sup>In Henderson (2007, note 12), a reviewer suggests that pied-piping a possessor may affect reconstruction for Condition C. Most of Kuno's examples include a possessor to the fronted N. None of our experimental items include a pied-piped possessor.

(14) Which painting of Miss Cruella<sub>1</sub> did she<sub>1</sub> put up? (Leddon and Lidz 2006, (7b))

Leddon and Lidz (2006) note that the subjects' coreferential responses were evenly distributed across both subjects and items, meaning that there are not two distinct populations of speakers with respect to reconstruction (i.e., two dialects). Leddon and Lidz (2006) moreover report that children overwhelmingly prefer the coreferential interpretation in questions like (14), answering with that one 67% of the time (in contrast with fronted predicates, where they overwhelmingly prefer the disjoint interpretation; more on predicates in section 4).

Given these contradictory judgments, we attempt to clarify the empirical picture by conducting a series of surveys on coreference in A-bar movement contexts.

### 3 Studies Using Amazon Mechanical Turk

We report here on three experiments run using Amazon Mechanical Turk (see Gibson *et al.* 2011, Sprouse 2011). Experiment 1 looks at CP within fronted NPs. Experiment 2 looks at PPs within fronted NPs. Experiment 3 then tests fronted PPs.

#### 3.1 Experiment 1: CPs within NPs

Experiment 1 examined *wh*-movement of NPs that include CPs within them. We designed experimental items in a 2x2 design with factors *argument vs. adjunct* (whether the CP was an argument of the N, or a relative clause) and *wh-movement vs. no wh-movement*. The following is a sample set from the paradigm:

- (15) a. A female staffer told everyone which of the announcements that Hillary Clinton was running for president she had actually authorized. (Wh Arg)  
b. A female staffer told everyone which of the announcements that Hillary Clinton had tried to take back she had actually authorized. (Wh Adj)  
c. A female staffer told everyone that she had actually authorized one of the announcements that Hillary Clinton was running for president. (NoWh Arg)  
d. A female staffer told everyone that she had actually authorized one of the announcements that Hillary Clinton had tried to take back. (NoWh Adj)

We used embedded *wh*-questions for two reasons: First, to provide another possible referent for the pronoun, in the form of the matrix subject; and second, so that subjects would not be confused about what question they should be answering. Rather than trying to ask them directly about coreference possibilities, we gave them a forced choice question about who the referent of the pronoun was. For instance, for the set of four sentences above, the question was *Who authorized the announcement? A: the staffer B: Hillary Clinton*. In half of the experimental items, the relevant R-expression was the second choice of the two, and in half it was the first choice, to guard against any bias for picking the first or second of two choices.

This method has the disadvantage that we cannot know for sure from any results whether subjects truly disallow a given referent. However, it has the advantage that it is a very natural task and does not require that the subjects try to engage in any metalinguistic analysis, which could be faulty or trigger reasoning outside the grammar. In practical terms, we believe this method can provide a reasonable amount of evidence for or against a grammatical constraint on coreference. If a referent truly is ruled out by the grammar, then we should see choices of that referent at a rate close to zero. If there is no grammatical constraint, then we should see subjects behaving at around chance, which in a two-choice task is 50%.<sup>3</sup> Since the experimental

<sup>3</sup>This is assuming that all else is equal, and it may well not be; word order in particular could play a role, such that subjects prefer anaphoric to cataphoric reference, for instance. So rates may differ from chance, but if they are significantly different from zero, we could still conclude that coreference is permitted. In all of our experiments, we find rates well above zero.

items are set up to directly compare argument and adjunct CPs, we will also be able to see if naive subjects treat them differently, as some of the theoretical literature would lead us to expect.

We distributed the experimental items into four lists so that each subject saw only one of the four sentences in the set in (15). We created eight such sets, so that each subject judged two of each type. The complete set of items appears in the appendix. We also included sixteen filler items with comprehension questions, to check that subjects were engaged in the task. Subjects therefore read 24 sentences and answered one question about each. Within each list, the order of sentences was randomized.

Using Amazon Mechanical Turk, we recruited 20 subjects for each list, for a total of 80 subjects. Subjects were paid 60 cents for participating. We limited recruitment to subjects with IP addresses in the United States, and also asked them to say what their native language was and what country they were from. Subjects who reported a language other than English as their native language were excluded from the analysis. Subjects were also excluded if they got more than two questions wrong on the filler items. Five subjects were excluded for one of these reasons, leaving a total of 75 subjects in the analysis.

Results are shown in Table 1, in the form of percentage of “B” responses. This is the response that violates Binding Condition C in the NoWh conditions, and would violate it if there were complete reconstruction in the Wh conditions. As can be seen, where there is no wh-movement, subjects choose the Condition C violating answer at a rate close to zero. In contrast, in the two wh-movement conditions, the Condition C violating answer is chosen at a rate close to chance, which is 50%. There is a difference between arguments and adjuncts, such that we see a higher percentage with adjuncts, but this difference is fairly small.

Table 1: Results of Experiment 1, CPs

NoWh Arg	NoWh Adj	Wh Arg	Wh Adj
4.7%	2.7%	42.7%	56%
percent “B” response			

Statistical analysis was run using R (R Core Team 2012). Responses were analyzed by means of linear mixed-effect modeling using the R-package lme4 (using glmer with family binomial). The two fixed effects in the analysis were wh-movement and the argument/adjunct distinction. Following the recommendations in Barr *et al.* (2013), we first included by-subject random intercepts and slopes and by-item random intercepts. However, the maximal model failed to converge, so we ended up simplifying to a model using only random intercepts for both subjects and items. Table 2 shows the results.

Table 2: Summary of fixed effects in the mixed-effects model for Experiment 1

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-4.4366	0.7029	-6.311	2.76e-10
Wh-movement	4.7674	0.8004	5.956	2.58e-09
Argument vs. Adjunct	0.6562	0.8413	0.780	0.435
Wh-movement*Argument/Adjunct	-1.3902	1.0065	-1.381	0.167

The last column lists the p-values. As can be seen, only a main effect of wh-movement is significant. There is no main effect of the argument/adjunct distinction, and no interaction. This means that, in these types of examples, wh-movement simply bleeds Binding Condition C. R-expressions contained within adjuncts and R-expressions contained within arguments are both free to corefer with a lower pronoun.

We conclude from this that there is no reconstruction for Condition C at all with CPs that front as part of wh-NPs. While the literature has claimed that argument CPs do reconstruct for Binding Condition C, we find no evidence for such reconstruction in the broader population. Our subjects chose the Condition

C violating antecedent for the pronoun at a rate close to chance, indicating that there is no grammatical constraint against that coreference.

### 3.2 Experiment 2: PPs within NPs

Experiment 2 examined *wh*-movement of NPs that include PPs within them. As noted above, Safir (1999) claimed that the argument-adjunct distinction is most robust with PP dependents of fronted NPs. We followed the same experimental design, and constructed experimental items in a 2x2 design with factors *argument vs. adjunct* (whether the PP was an argument of the N, or an adjunct) and *wh-movement vs. no wh-movement*. The following is a sample set from the paradigm:<sup>4</sup>

- (16) a. The chambermaid told me which portrait of the countess she considered to be the most valuable. (Wh Arg)  
b. The chambermaid told me which portrait in the countess's collection she considered to be the most valuable. (Wh Adj)  
c. The chambermaid told me that she considered one particular portrait of the countess to be the most valuable. (NoWh Arg)  
d. The chambermaid told me that she considered one particular portrait in the countess's collection to be the most valuable. (NoWh Adj)

As before, subjects were given a forced-choice question regarding the referent of the pronoun. For the set of four sentences above, the question was *Who considers the portrait valuable? A: the chambermaid B: the countess*. Once again, in half of the experimental items, the relevant R-expression was the second choice of the two, and in half it was the first choice, to guard against any bias for picking the first or second of two choices.

As before, we distributed the experimental items into four lists so that each subject saw only one of the four sentences in the set in (16). We created eight such sets, so that each subject judged two of each type. The complete set of items appears in the appendix. We also included sixteen filler items with comprehension questions, to check that subjects were engaged in the task. Subjects therefore read 24 sentences and answered one question about each. Within each list, the order of sentences was randomized.

Using Amazon Mechanical Turk, we recruited 20 subjects for each list, for a total of 80 subjects. Subjects were paid 60 cents for participating. We limited recruitment to subjects with IP addresses in the United States, and also asked them to say what their native language was and what country they were from. Subjects who reported a language other than English as their native language were excluded from the analysis. Subjects were also excluded if they got more than two questions wrong on the filler items. Five subjects were excluded for one of these reasons, leaving a total of 75 subjects in the analysis.

Results are shown in Table 3, in the form of percentage of “B” responses. This is the response that violates Binding Condition C in the NoWh conditions, and would violate it if there were complete reconstruction in the Wh conditions. As can be seen in Table 3, where there is no *wh*-movement, subjects choose the Condition C violating answer at a rate close to zero. In contrast, in the two *wh*-movement conditions, the Condition C violating answer is chosen at higher rate, though now at a lower rate than in Experiment 1 (lower than chance, but still much higher than zero). Note that the rates here roughly match what Leddon and Lidz (2006) found for adults on similar items.

Statistical analysis was run using R (R Core Team 2012). Responses were analyzed by means of linear mixed-effect modeling using the R-package lme4 (using glmer with family binomial). The two fixed effects

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<sup>4</sup>Because it was difficult to come up with matching adjunct PPs, half of the sets used a relative clause for the adjunct conditions rather than a PP. We do not believe this affects the results, and it is also in keeping with the literature, which frequently contrasts an argument PP with an adjunct CP (e.g., example (6) above, from van Riemsdijk and Williams 1981).

Table 3: Results of Experiment 2, PPs

NoWh Arg	NoWh Adj	Wh Arg	Wh Adj
2.7%	1.3%	22.0%	30.7%

percent “B” response

in the analysis were wh-movement and the argument/adjunct distinction. Following the recommendations in Barr *et al.* (2013), we included by-subject random intercepts and slopes and by-item random intercepts. In this case, the maximal model failed to converge, so we simplified it down to include only random intercepts for subjects and items. Table 4 shows the results.

Table 4: Summary of fixed effects in the mixed-effects model for Experiment 2

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	-5.0157	0.8698	-5.766	8.1e-09
Wh-movement versus no wh-movement	3.9473	0.9323	4.234	2.3e-05
Argument vs adjunct	0.7204	1.0351	0.696	0.486
Wh-movement*Argument/Adjunct	-1.3622	1.1898	-1.145	0.252

As can be seen from the last column in Table 4, there is a main effect of wh-movement, but no main effect of the argument-adjunct contrast. Contrary to the expectations of the standard view in the literature, there is also no interaction between the argument-adjunct contrast and wh-movement. As with CPs, we find no statistically significant difference between argument and adjunct PPs regarding reconstruction for Condition C. We see only a main effect of wh-movement (wh-movement bleeds Condition C).

We conclude that the literature that has claimed there is a difference between argument and adjunct PPs is incorrect. We find no effect of the argument-adjunct distinction. Instead, we see only a main effect of wh-movement, such that fronting an NP that contains a PP bleeds Condition C for any R-expressions contained within the PP.<sup>5</sup>

<sup>5</sup>David Pesetsky (email correspondence) suggests that not all apparent PP arguments of Ns are actually arguments. He suggests, following Grimshaw (1990), that if an *N PP* sequence can be restated as *N is PP*, with the copula between them, then that PP is not an argument but is instead an adjunct. This test treats *portrait of the countess* in (16) as having an adjunct PP: *the portrait was of the countess*. However, at least two of the experimental items we used cannot be rephrased this way, *corner of* (*\*the corner was of the room*) and *container of* (*\*the container was of fish*), and these items were among those that received the most coreferent responses in the Wh Arg condition. Moreover, it is not clear why we should view this as a valid test for arguments versus adjuncts. As far as we can see, Grimshaw (1990) gave no basis for taking it to be a valid test, she simply asserted that it is. We believe it not to be a valid test. First, there is no other test it correlates with. All other tests treat the *of* PP with Ns like *portrait* as an argument (it cannot iterate, it can only appear with certain Ns, etc.). Conversely, some PPs that are clearly adjuncts cannot appear in the *N is PP* frame: *\*the girl is with blue eyes*, *\*the portrait is with a gold frame*; *a run for freedom* vs. *\*the run was for freedom*; *the hole in your reasoning* vs. *\*the hole is in your reasoning*. Second, there are semantic differences that indicate that the PP after the copula is not the same as the postnominal PP. For instance, *water under the bridge* has either a locational or a directional meaning, but *water is under the bridge* has only a locational (stative) meaning. In *a giant leap for mankind*, mankind is the leaper, but in *the leap was for mankind*, mankind is only a benefactive. Fourth, and most tellingly, it is possible to have both a postnominal PP and a PP after the copula at the same time: *the portrait of the count behind his desk was of a young man with dark hair*. It is not possible to have two such PPs after an N: *\*the portrait of the count of a young man with dark hair*. This indicates that the PP after the copula is not fulfilling the same semantic function as the postnominal PP. We are not entirely sure what the post-copular PP is semantically, but we see no basis for concluding from the ability of a PP to appear after the copula that the same PP is an adjunct when it appears postnominally.

### 3.3 Interim Summary

Experiments 1 and 2 have found no support for the argument-adjunct asymmetry in reconstruction for Binding Condition C that previous literature has reported. Rather, speakers freely permit coreference between an embedded pronoun and an R-expression contained within a fronted wh-phrase.

We might conclude at this point that A-bar movement simply bleeds Condition C. Given this possibility, we decided to check a data point from Reinhart (1976) that was very important to the development of syntactic theory. It will turn out that not all A-bar movement bleeds Condition C.

### 3.4 Experiment 3: Fronted PPs

The important data point involves fronted PPs. Reinhart (1976, 1983) used these to argue for the importance of c-command in Binding Condition C. These present a contrast like the following:

- (17) (Reinhart 1976, 23, exx.18, 20)
- a. Near him<sub>1</sub>, Dan<sub>1</sub> saw a snake.
  - b. \*Near Dan<sub>1</sub>, he<sub>1</sub> saw a snake.

According to Reinhart (1976, 1983), (17b) is a Condition C violation, with the pronoun subject c-commanding the R-expression to its left. Bruening (2014) showed that this explanation is untenable, and instead analyzed (17b) as involving reconstruction of the fronted PP. Since the PP semantically modifies the VP, it reconstructs to the edge of the vP phase (in the phase theory of Chomsky 2000; see Bruening 2014, 361–363 for details). In this reconstructed position, the pronoun subject binds the R-expression. One of the arguments for this analysis is the fact that further embedding the R-expression obviates Condition C:

- (18) (Bruening 2014, 360, (70))
- a. \*Near Dan<sub>1</sub>, he<sub>1</sub> saw a snake.
  - b. Near the man that Dan<sub>1</sub> was approaching, he<sub>1</sub> saw a snake.

Further embedding the R-expression would not change backward c-command, so Reinhart's analysis would still expect a Condition C violation. In contrast, if a relative clause inside a fronted constituent does not need to reconstruct (as we saw above), then the reconstruction analysis predicts this contrast.

Given our findings that most subjects do not show reconstruction for Condition C at all, we began to wonder whether Reinhart's original contrast is actually real. We decided to test both it and Bruening's embedding effect using the paradigm and method from Experiments 1 and 2. The two factors were now *R-expression vs. pronoun* and *embedded vs. non-embedded*. All sentences in the paradigm had a fronted PP. As before, the clause with fronting was embedded, to provide another possible antecedent for the pronoun. In this case, the forced-choice question had to vary depending on the item. We show a sample set of items, with the question corresponding to each item, below:

- (19)
- a. The policeman said that near him, Dan saw a snake. (Pro NoEmb)  
Who was the snake near to? A: the policeman B: Dan
  - b. The policeman said that near Dan, he saw a snake. (Rexpr NoEmb)  
Who saw the snake? A: the policeman B: Dan
  - c. The policeman said that near the woman he was approaching, Dan saw a snake. (Pro Emb)  
Who was approaching the woman? A: the policeman B: Dan
  - d. The policeman said that near the woman Dan was approaching, he saw a snake. (Rexpr Emb)  
Who saw the snake? A: the policeman B: Dan



Given the literature, we now expect the following pattern of responses. First, in the Pro NoEmb and the Pro Emb conditions, there should be no grammatical condition ruling out either R-expression as a referent for the pronoun, so we expect around chance performance, or 50% “B” responses (but note that in the Pro Emb condition, it is most natural to take the pronoun to refer to the higher NP, and this is what we find in the results). Second, if the Rexpr NoEmb condition really is a Condition C violation, we should expect close to zero “B” responses. In contrast, in the Rexpr Emb condition, if the relative clause does not need to reconstruct, we expect around 50% “B” responses again. If the contrast is not real and there is no reconstruction for Condition C at all, we expect roughly 50% “B” responses in all four conditions.

As before, we distributed the experimental items into four lists so that each subject saw only one of the four sentences in the set in (19). We created eight such sets, so that each subject judged two of each type. The complete set of items appears in the appendix. We also included filler items with comprehension questions, to check that subjects were engaged in the task. In this case, we used the experimental items from Experiment 3 as half of the fillers for Experiment 2, so the items for Experiment 2 served as half of the fillers for Experiment 3. Subjects saw eight sentences from Experiment 2, eight sentences from Experiment 3, and eight filler sentences, for a total of 24 sentences (each with one question). Within each list, the order of sentences was randomized.

The subjects were the same 80 subjects from Experiment 2, recruited via Amazon Mechanical Turk. As stated in the description of Experiment 2, five subjects were excluded, leaving 75 subjects whose data entered the analysis.

Results are shown in Table 5, in the form of percentage of “B” responses. This is the response that would violate Binding Condition C if there were complete reconstruction of the fronted PP in the Rexpr conditions. Responses in Experiment 3 were messier than in the other two experiments. We see a high percentage of “B” responses in the Pro NoEmb condition, and a lower but still high percentage of “B” responses in the two Emb conditions. An embedded R-expression does not seem to differ from an embedded pronoun, as Bruening (2014) claimed. In the original Reinhart sentence, the Rexpr NoEmb condition, the rate of “B” responses was much lower, but still higher than zero (see below).

Table 5: Results of Experiment 3, fronted PPs

Pro NoEmb	Rexpr NoEmb	Pro Emb	Rexpr Emb
61.3%	12.7%	31.3%	38.7%
percent “B” response			

We take these results to support the reconstruction account. We find a high percentage of “B” responses in all conditions except the Rexpr NoEmb condition, exactly the one that Reinhart (1976) claimed was a Condition C violation and Bruening (2014) analyzed as Condition C under reconstruction. We will come back to why the percentage in that condition, though low, is still higher than we saw above in other Condition C environments.

Statistical analysis was run using R (R Core Team 2012). Responses were analyzed by means of linear mixed-effect modeling using the R-package lme4 (using glmer with family binomial). The two fixed effects in the analysis were R-expression vs. pronoun and embedding vs. no embedding. Following the recommendations in Barr *et al.* (2013), we included by-subject random intercepts and slopes and by-item random intercepts. Once again the maximal model failed to converge, so we simplified to a model with only random intercepts for both subjects and items. Table 6 shows the results.

We see significant main effects of both factors and a significant interaction in the last column of table 6. The effects go in the opposite direction. For pronouns, embedding reduces the number of “B” responses because, as noted above, it is most natural in the Pro Emb condition to take the pronoun to refer to the higher NP. In contrast, embedding increases the number of “B” responses with R-expressions. We interpret this to

Table 6: Summary of fixed effects in the mixed-effects model for Experiment 3

	Estimate	Std. Error	z value	Pr(> z )
(Intercept)	0.5452	0.4910	1.110	0.266918
R-expression vs. pronoun	-3.2313	0.7765	-4.161	3.17e-05
Embedding vs. no embedding	-1.4945	0.6989	-2.138	0.032497
Rexpr/Pron*Embedding	3.4905	1.0492	3.327	0.000878

mean that reconstruction takes place in the NoEmb condition, but embedding the R-expression results in it no longer being reconstructed in the Emb condition.

We conclude that Reinhart (1976, 1983) was correct to analyze *Near Dan, he saw a snake* as a Condition C violation on the coreferential reading, and Bruening (2014) was correct to analyze this as Condition C under reconstruction. The fronted PP reconstructs to a position lower in the sentence, where it is in the command domain of the pronoun subject. A relative clause within the PP does not need to reconstruct, so if the R-expression is contained within such a relative clause, there is no Condition C violation.

Complicating this picture, though, is the relatively high percentage of “B” responses to the original Reinhart sentence, the Rexpr NoEmb condition (12.7%). It turns out that two particular items were responsible for almost all of these “B” responses. These two items are shown below:

- (20) a. The magician said that in front of Dave, he might be able to see a floating symbol. (26.3% choose “Dave”)  
 b. The flight attendant joked that above the passenger, she would find the controls for the sun roof. (57.9% choose “the passenger”)

For comparison, the other six items are given below:

- (21) a. The policeman said that near Dan, he saw a snake. (0% choose “Dan”)  
 b. The witness reported that beside the homeless man, he discovered a body. (0% choose “the homeless man”)  
 c. Jane said that behind another woman, she heard an owl. (0% choose “the other woman”)  
 d. The trick rider said that under the contortionist, she was expecting some padding. (5.6% choose “the contortionist”)  
 e. The waitress said that around the hostess, she heard a strange whispering. (5.3% choose “the hostess”)  
 f. The mason reported that beneath the jackhammer operator, he discovered a skeleton. (5.3% choose “the jackhammer operator”)

What is different about the two items with a high rate of “B” responses is that the lower clause includes a modal. The sentence in (21d) includes an auxiliary but not a modal, while the others are all simple past tense. Further investigation does seem to indicate that it is the modal that is crucial. Consider the following contrast:

- (22) a. The policeman said that near Dan, he saw a snake. (0% choose “Dan”)  
 b. The zookeeper said that near Dan, he might be able to see a snake.

Native speakers we have consulted find coreference greatly improved in (22b).

We propose that in sentences without modals, the PP semantically modifies the VP, as stated above. This results in the PP having to reconstruct to the edge of the vP phase, giving rise to a Condition C violation

if an R-expression contained within it is coindexed with the subject. However, if there is a modal, the PP can instead semantically modify the modal. In this case the PP now acts like the high adjuncts discussed in Reinhart (1976) and Bruening (2014), which do not show any Condition C effect:

- (23) a. In Ford<sub>1</sub>'s home town, he<sub>1</sub> is considered a genius. (Reinhart 1976, 70, (31a))  
b. In Ben<sub>1</sub>'s family, he<sub>1</sub> is the genius. (Reinhart 1976, 70, (32a))

As discussed in Bruening (2014), these adjuncts do not reconstruct at all when fronted, because in the fronted position they are already in a position where they can be interpreted. That is, their surface position is the edge of the CP phase, and the position where they are interpreted semantically, IP, is part of this phase. No reconstruction is necessary in order to interpret them. The same will be true with modals: the surface position of the PP is the edge of the CP phase, and the modal is part of this phase. There is no need to reconstruct in order to combine the PP semantically.

Importantly, with the items that lacked modals, subjects in the survey almost never chose the “B” answer. This means that with these items, there is reconstruction to a lower position, giving rise to a Condition C violation. It is then not true that A-bar movement simply bleeds Condition C. We do see reconstruction for Condition C with fronted PPs, if they semantically modify the VP and therefore have to reconstruct in order to be interpreted. Condition C is only bled completely with dependents of fronted NPs.

## 4 When Reconstruction Happens

We hypothesize that fronted PPs are patterning with fronted predicates. The literature has universally concluded that reconstruction is necessary with fronted predicates (e.g., Huang 1993, Heycock 1995, Leddon and Lidz 2006). In contrast with the claimed argument-adjunct asymmetry debunked above, we have found no one who disagrees with the following judgment:

- (24) ?\* How afraid of Margaret<sub>1</sub> do you think she<sub>1</sub> expects John to be? (Heycock 1995, 554, (19))

Leddon and Lidz (2006) found in their experiment that neither adults nor children respond with the coreferential interpretation with fronted predicates, in contrast with fronted arguments. In another series of experiments (which we discovered after running the three experiments reported here), Adger *et al.* (2016) also find that speakers allow coreferential interpretations with fronted arguments but not with fronted predicates. Their evidence converges with ours on a lack of Condition C reconstruction with either arguments or adjuncts to fronted Ns. However, they, like Leddon and Lidz (2006), find that subjects never permit coreferential interpretations with fronted predicates. An R-expression that is an argument of a fronted predicate uniformly gives rise to a Condition C violation if it is covalued with a pronoun that commands its base position. If it is further embedded, Condition C once again disappears:

- (25) How pleased with the pictures Pollock<sub>1</sub> painted in his youth do you think he<sub>1</sub> really was? (Heycock 1995, 554, (21))

In this example, the R-expression is not an argument of the fronted predicate, but is instead embedded within a dependent of an argument.

We offer the following generalization about when reconstruction for Binding Condition C takes place:

- (26) *Reconstruction for Binding Condition C*

Where a phrase XP with head X occupies the head of an A-bar chain:

- a. If X is a predicate, only X and the head Y of its complement reconstruct;  
b. If X is an argument, only X reconstructs.

The head of a fronted argument has to reconstruct. That is what gives rise to strong crossover:

- (27) \* Which girl<sub>1</sub> does she<sub>1</sub> claim *t* has seen a unicorn?

We analyze strong crossover as a Condition C violation under reconstruction. The head *girl* reconstructs to the position of the trace, where it is bound by the higher pronoun. This violates Binding Condition C.<sup>6</sup>

In contrast, dependents of the head of an argument do not reconstruct:

- (28) Which portrait of the countess<sub>1</sub> does she<sub>1</sub> consider *t* to be the most valuable?

Only the head *portrait* reconstructs, so there is no Condition C violation with *the countess*.

With a fronted PP, the P and the head of its NP complement reconstruct:

- (29) (Bruening 2014, 360, (70))  
a. \* Near Dan<sub>1</sub>, he<sub>1</sub> saw a snake *t*.  
b. Near the man that Dan<sub>1</sub> was approaching, he<sub>1</sub> saw a snake *t*.

In (29a), this results in *near Dan* reconstructing, giving rise to a Condition C violation. In (29b), only *near (the) man* reconstructs, with no Condition C violation. The same holds for other types of predicates, like adjectives:

- (30) a. ?\* How afraid of Margaret<sub>1</sub> do you think she<sub>1</sub> expects John to be? (Heycock 1995, 554, (19))  
b. How pleased with the pictures Pollock<sub>1</sub> painted in his youth do you think he<sub>1</sub> really was? (Heycock 1995, 554, (21))

In (30a), the predicate *afraid* and the head of its complement *Margaret*<sup>7</sup> both reconstruct, giving rise to a Condition C violation. In (30b), only *pleased* and *pictures* reconstruct, so there is no Condition C violation.

The generalization then is that predicates and the heads of their arguments obligatorily reconstruct, but no dependents of arguments ever have to reconstruct. This is true whether those dependents are arguments or adjuncts.

## 5 Pragmatic Bias

Our experiments 1 and 2 have shown that there really is no argument-adjunct asymmetry, and CP and PP arguments and adjuncts do not reconstruct at all. But now the question arises of why so many publications reported that coreference was bad in examples like (31).

- (31) \* Which corner of John<sub>1</sub>'s room was he<sub>1</sub> sitting in? (Takahashi and Hulsey 2009, 391, (5b))

We suggest that speakers who rule out coreference in such examples are not doing so because of Condition C under reconstruction. Rather, they are following some sort of pragmatic restriction. As is well known, Condition C is not the only factor that can render coreference unacceptable. In sequences like the following, most English speakers will also reject coreference:

- (32) He came in. John sat down.

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<sup>6</sup>Possessors complicate this picture. We do not address them here, because it is not clear to us what the facts are. Postal (1993), among many others, shows that *wh*-possessors give rise to strong crossover (what Postal calls *secondary strong crossover*). Safir (1999) presents numerous examples where he claims a possessor reconstructs for Condition C. We are skeptical of some of these judgments, but leave investigation of them to another time.

<sup>7</sup>One can either view the P as a type of case marker, and so the head of the complement is *Margaret*, or the P is the head of complement of the adjective, but it itself is another predicate, and so both it and the head of its complement reconstruct.

Since coreference here crosses two sentences, the strong preference against coreference cannot be due to Condition C, which is a principle of sentence grammar. It must be due to some pragmatic constraint governing discourse (on there being two distinct constraints against coreference, one syntactic and one pragmatic, see Balaban *et al.* 2016).

If this is correct, then we expect that manipulations that improve coreference in examples like (32) will also improve coreference in *wh*-questions like (31). One such manipulation involves first setting up a discourse referent, then referring back to it with a pronoun, and then using the R-expression again, but this time embedded, for instance as part of a conjoined noun phrase. Doing this greatly improves coreference in examples like (32):

- (33) Mary had been waiting for John<sub>1</sub> at the back of the room. Finally, he<sub>1</sub> came in. Then John<sub>1</sub> and Mary sat down, but not together.

This confirms that the strong preference against coreference in (32) is not due to Condition C, because simply embedding an R-expression inside a coordinate NP does not improve Condition C violations:

- (34) a. \* Don't tell him<sub>1</sub> that the cows don't like John<sub>1</sub> milking them.  
b. \* Don't tell him<sub>1</sub> that the cows don't like John<sub>1</sub> and Mary milking them.

This is because the R-expression is still commanded by the pronoun. In contrast, in (32) and (33), syntactic command is not at issue, pragmatic principles are.

We then predict that speakers who find coreference bad in (31) will find it improved in contexts like the following:

- (35) a. Nixon<sub>1</sub> is notoriously hard to get a meeting with, but that reporter has been dying to interview him<sub>1</sub>. She can't wait to find out which investigation of Nixon<sub>1</sub> and his aides he<sub>1</sub> is most livid about.  
b. Jack<sub>1</sub>'s missing and we need to find him<sub>1</sub>. Does anyone know which corner of Jack<sub>1</sub> and Jill's room he<sub>1</sub> was sitting in when the candle went out?

We have had great difficulty locating any English speakers who find coreference bad in (31), and so have been unable to test this systematically. One speaker who rules out coreference in (31) found it much improved in (35a), at least. Since we cannot find anyone else who finds coreference bad in (31), we will have to leave further testing of the pragmatic hypothesis to future research.

## 6 Conclusion

Our surveys using Amazon Mechanical Turk found no support for the argument-adjunct distinction that has dominated discussion of reconstruction in the syntax literature. Neither arguments nor adjuncts to fronted nouns reconstruct for Binding Condition C. Those speakers who dislike coreference probably do so for pragmatic, not syntactic reasons. We did find reconstruction for Condition C with fronted PPs, in contrast to fronted NPs. We suggested that Ps are predicates, and fronted predicates require reconstruction of the head of their arguments.

## Appendix: Experimental Items

### Experiment 1: CPs within NPs

- (a) A female staffer told everyone which of the announcements that Hillary Clinton was running for president she had actually authorized.

- (b) A female staffer told everyone which of the announcements that Hillary Clinton had tried to take back she had actually authorized.
  - (c) A female staffer told everyone that she had actually authorized one of the announcements that Hillary Clinton was running for president.
  - (d) A female staffer told everyone that she had actually authorized one of the announcements that Hillary Clinton had tried to take back.
2.
    - (a) An advisor told me which of the claims that the president had misled the public he would never discuss again.
    - (b) An advisor told me which of the claims that the president had made he would never discuss again.
    - (c) An advisor told me that he would never again discuss one of the claims that the president had misled the public.
    - (d) An advisor told me that he would never again discuss one of the claims that the president had made.
  3.
    - (a) Lady Agatha announced which of the guesses that Miss Elizabeth was the masked performer she would reward with a kiss.
    - (b) Lady Agatha announced which of the guesses that Miss Elizabeth liked the best she would reward with a kiss.
    - (c) Lady Agatha announced that she would reward one of the guesses that Miss Elizabeth was the masked performer with a kiss.
    - (d) Lady Agatha announced that she would reward one of the guesses that Miss Elizabeth liked the best with a kiss.
  4.
    - (a) A statistician explained which of the predictions that that candidate would lose he would not pay any attention to.
    - (b) A statistician explained which of the predictions that that candidate had heard he would not pay any attention to.
    - (c) A statistician explained that he would not pay any attention to some of the predictions that that candidate would lose.
    - (d) A statistician explained that he would not pay any attention to some of the predictions that that candidate had heard.
  5.
    - (a) The editor told me which of the reports that that philanthropist had embezzled he would not comment on.
    - (b) The editor told me which of the reports that that philanthropist had submitted he would not comment on.
    - (c) The editor told me that he would not comment on one of the reports that that philanthropist had embezzled.
    - (d) The editor told me that he would not comment on one of the reports that that philanthropist had submitted.
  6.
    - (a) A Hollywood reporter told me which of the rumors that that male movie star was getting married he had confirmed in private.

- (b) A Hollywood reporter told me which of the rumors that that male movie star had publicly denied he had confirmed in private.
  - (c) A Hollywood reporter told me that he had privately confirmed one of the rumors that that male movie star was getting married.
  - (d) A Hollywood reporter told me that he had privately confirmed one of the rumors that that male movie star had publicly denied.
7. (a) A spokesman let slip which of the demands that the CEO admit to wrongdoing he was feeling really guilty about.
  - (b) A spokesman let slip which of the demands that the CEO had made he was feeling really guilty about.
  - (c) A spokesman let slip that he was feeling really guilty about one of the demands that the CEO admit to wrongdoing.
  - (d) A spokesman let slip that he was feeling really guilty about one of the demands that the CEO had made.
8. (a) A lady in waiting told us which of the threats that the Queen would be attacked she thought should be taken seriously.
  - (b) A lady in waiting told us which of the threats that the Queen had made she thought should be taken seriously.
  - (c) A lady in waiting told us that she thought one of the threats that the Queen would be attacked should be taken seriously.
  - (d) A lady in waiting told us that she thought one of the threats that the Queen had made should be taken seriously.

### **Experiment 2: PPs within NPs**

1. (a) A female reporter told me which investigation into Hillary Clinton's email server she never publicly discussed.
  - (b) A female reporter told me which investigation that Hillary Clinton initiated she never publicly discussed.
  - (c) A female reporter told me that she never publicly discussed one investigation into Hillary Clinton's email server.
  - (d) A female reporter told me that she never publicly discussed one investigation that Hillary Clinton initiated.
2. (a) The chambermaid told me which portrait of the countess she considered to be the most valuable.
  - (b) The chambermaid told me which portrait in the countess's collection she considered to be the most valuable.
  - (c) The chambermaid told me that she considered one particular portrait of the countess to be the most valuable.
  - (d) The chambermaid told me that she considered one particular portrait in the countess's collection to be the most valuable.
3. (a) A secret service agent let slip which attack on the president he was very unnerved by.

- (b) A secret service agent let slip which attack within the president's vacation compound he was very unnerved by.
  - (c) A secret service agent let slip that he was very unnerved by one particular attack on the president.
  - (d) A secret service agent let slip that he was very unnerved by one particular attack within the president's vacation compound.
4.
    - (a) A literature professor explained which unauthorized biography of Putin he was most angry about.
    - (b) A literature professor explained which unauthorized biography that mentioned Putin he was most angry about.
    - (c) A literature professor explained that he was very angry about one unauthorized biography of Putin.
    - (d) A literature professor explained that he was very angry about one unauthorized biography that mentioned Putin.
  5.
    - (a) A female aide told us which critique of the Queen's policies she was absolutely furious about.
    - (b) A female aide told us which critique from the Queen's critics she was absolutely furious about.
    - (c) A female aide told us that she was absolutely furious about one critique of the Queen's policies.
    - (d) A female aide told us that she was absolutely furious about one critique from the Queen's critics.
  6.
    - (a) The assistant didn't know which evaluation of the department head's performance he should submit as part of a periodic review.
    - (b) The assistant didn't know which evaluation from the department head's office he should submit as part of a periodic review.
    - (c) The assistant didn't know that he should submit one evaluation of the department head's performance as part of a periodic review.
    - (d) The assistant didn't know that he should submit one evaluation from the department head's office as part of a periodic review.
  7.
    - (a) The decorator was unsure which corner of the empress's bedroom she wanted to barricade off.
    - (b) The decorator was unsure which corner that the empress wasn't using she wanted to barricade off.
    - (c) The decorator was unsure whether she wanted to barricade off one corner of the empress's bedroom.
    - (d) The decorator was unsure whether she wanted to barricade off one corner that the empress wasn't using.
  8.
    - (a) The research assistant needs to figure out which container of the professor's secret formula he left out all night.
    - (b) The research assistant needs to figure out which container that the professor needs he left out all night.
    - (c) The research assistant needs to figure out whether he left one container of the professor's secret formula out all night.
    - (d) The research assistant needs to figure out whether he left one container that the professor needs out all night.



### Experiment 3

1. (a) The policeman said that near him, Dan saw a snake.  
(b) The policeman said that near Dan, he saw a snake.  
(c) The policeman said that near the woman he was approaching, Dan saw a snake.  
(d) The policeman said that near the woman Dan was approaching, he saw a snake.
2. (a) The witness reported that beside him, the homeless man discovered a body.  
(b) The witness reported that beside the homeless man, he discovered a body.  
(c) The witness reported that beside the car he was looking at, the homeless man discovered a body.  
(d) The witness reported that beside the car the homeless man was looking at, he discovered a body.
3. (a) Jane said that behind her, another woman heard an owl.  
(b) Jane said that behind another woman, she heard an owl.  
(c) Jane said that behind the tree she was trimming, another woman heard an owl.  
(d) Jane said that behind the tree another woman was trimming, she heard an owl.
4. (a) The magician said that in front of him, Dave might be able to see a floating symbol.  
(b) The magician said that in front of Dave, he might be able to see a floating symbol.  
(c) The magician said that in front of the table he was standing beside, Dave might be able to see a floating symbol.  
(d) The magician said that in front of the table Dave was standing beside, he might be able to see a floating symbol.
5. (a) The trick rider said that under her, the contortionist was expecting some padding.  
(b) The trick rider said that under the contortionist, she was expecting some padding.  
(c) The trick rider said that under the blanket she was on, the contortionist was expecting some padding.  
(d) The trick rider said that under the blanket the contortionist was on, she was expecting some padding.
6. (a) The waitress said that around her, the hostess heard a strange whispering.  
(b) The waitress said that around the hostess, she heard a strange whispering.  
(c) The waitress said that around the menu she was carrying, the hostess heard a strange whispering.  
(d) The waitress said that around the menu the hostess was carrying, she heard a strange whispering.
7. (a) The mason reported that beneath him, the jackhammer operator discovered a skeleton.  
(b) The mason reported that beneath the jackhammer operator, he discovered a skeleton.  
(c) The mason reported that beneath the concrete he was working on, the jackhammer operator discovered a skeleton.  
(d) The mason reported that beneath the concrete the jackhammer operator was working on, he discovered a skeleton.
8. (a) The flight attendant joked that above her, the passenger would find the controls for the sun roof.  
(b) The flight attendant joked that above the passenger, she would find the controls for the sun roof.

- (c) The flight attendant joked that above the seat she was adjusting, the passenger would find the controls for the sun roof.
- (d) The flight attendant joked that above the seat the passenger was adjusting, she would find the controls for the sun roof.

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