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EXPERIMENTAL SUPPORT FOR  
INVERSE SCOPE READINGS OF  
FINITE-CLAUSE-EMBEDDED  
ANTECEDENT-CONTAINED-  
DELETION SENTENCES

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Unlike its overt counterpart, *wh*-movement, Quantifier Raising (QR) is typically assumed not to be able to cross a finite clause boundary. Two effects of this clause-boundedness constraint are that (a) a universal quantifier that is embedded in a finite clause is judged to be unable to take scope over an indefinite in subject position, and (b) in sentences in which antecedent-contained deletion (ACD) is embedded in a finite clause, a matrix reading is questionable—and extrawide scope over the indefinite subject even more so. However, counterexamples to this generalization about the QR locality constraint have surfaced over the years, and recent evidence demonstrates that the matrix reading is available, given certain linguistic and contextual manipulations. Cecchetto (2004) argues that if the quantificational phrase in an ACD sentence raises high enough by QR to take scope over the matrix VP, it should be able to take scope over an indefinite subject. Here, I provide experimental evidence that participants can indeed access the supposedly barred inverse scope reading of such ACD sentences and provide justifications that unambiguously signal this reading. These results, paired with those previously reported for the matrix reading, suggest that—at least in the case of ACD—there may be nothing in the grammar that a priori prevents QR out of a finite clause, and that interpretations arising from extrawide scope of a quantifier may be difficult to access for independent reasons.

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## 1 Introduction and Background

In a typical case of verb phrase ellipsis (VPE), as shown in (1), ellipsis is resolved by looking to a salient antecedent for interpretation (Hankamer and Sag 1976, Sag 1976).

- (1) Anna toured the Met, and Mary **did** *<tour the Met>*, too.

Antecedent-contained deletion (ACD), as shown in (2), is a special case of VPE in which the site of ellipsis is contained within its antecedent.

- (2) Anna [toured every museum that Mary **did**].

As a result, ACD encounters certain well-known problems, highlighted in discussions by Bouton (1970), May (1985), Kennedy (1997), and Fox (2000), among others.

Ordinarily, the VP antecedent and the VPE must share identity at some level (Sag 1976; see Van Craenenbroeck and Merchant 2013 for a review) and meet certain conditions on focus (Heim 1997, Jacobson 2004). However, when the VPE is contained in its antecedent, the two VPs cannot be parallel in form to each other (see Merchant 2000b, Fox 2002). Moreover, any attempt to copy in the antecedent VP results in an infinite regress, because the ellipsis site is copied in as well, as shown in (3).

- (3) Anna [toured [every museum that Mary **did** *<tour every museum that Mary did ... >>]]*

One notable solution to this problem is to have the object quantificational phrase (QNP)<sup>1</sup> covertly raise out of the VP in which it is contained through Quantifier Raising (QR), so that the VP can then serve as an antecedent for the VPE (May 1985, Larson and May 1990, Kennedy 1997; see also Fox 2002).<sup>2</sup> This process is captured in (4).

- (4) a. Anna [<sub>QNP</sub> every museum that Mary **did**] [<sub>VP</sub> toured *t*]  
 b. Anna [<sub>QNP</sub> every museum that Mary **did** *<tour t>*] [<sub>VP</sub> toured *t*]

There is evidence from binding and negative-polarity-item licensing that supports VP as the adjunction site for the QNP, allowing it to remain below the subject position (Fox 1995, Merchant 2000a), although vP (Bruening 2001) and IP (Sag 1976, Williams 1977, May

<sup>1</sup> The object DP need not be quantificational and could, for example, be headed by a definite determiner (see experimental stimuli in Hackl, Koster-Hale, and Varvoutis 2012 and Syrett 2015).

<sup>2</sup> This is certainly not the only solution that has been proposed to resolve ACD. See, in particular, Jacobson 1998 and earlier references therein.

1985, Fiengo and May 1994) are still viable options. What is clear is that targeting CP is not possible.

There is a direct correlation between the antecedent targeted (and the scope of the QNP) and the interpretations generated, as discussed by Larson and May (1990) and Kennedy (1997). Consider a linguistic context in which ACD is contained within multiple VPs, as in (5). If the QNP is able to raise out of the first VP by QR, one reading can be generated (the *embedded* reading), and if it can raise higher to adjoin to the matrix VP (in so-called *long QR*), yet another reading is available (the *matrix* reading).

- (5) a. Anna [<sub>VP</sub> wanted to [<sub>VP</sub> tour [<sub>QNP</sub> every museum that Mary **did**]]].  
 b. Embedded reading: *Anna wanted to tour every museum that Mary toured.*  
 c. Matrix reading: *Anna wanted to tour every museum that Mary wanted to tour.*

When ACD is embedded in a nonfinite clause, as above, both the embedded and matrix readings are uncontroversially available. However, when ACD is embedded in a finite clause, as in (6), the presence of a matrix reading is highly debatable.

- (6) Sophie reported that Anna toured every museum that Mary did.

Kennedy (1997) takes this as further evidence for a QR account,<sup>3</sup> given the independent observation that a QNP cannot raise by QR out of a finite clause (Farkas 1981, May 1985, Larson and May 1990). However, there are reasons to reevaluate the nature of the clause-boundedness constraint and consider the possibility that—at least in the case of ACD, and perhaps for a wider range of quantificational sentences—there is actually no clause-boundedness constraint on QR, and that the difficulty in accessing these interpretations may instead be attributed to processing complexity and/or lack of contextual support. The experiment reported here provides empirical evidence in support of this position.

The first reason to reevaluate clause-boundedness comes from experimental evidence reported by Syrett and Lidz (2011), and bolstered by results of another study (Syrett 2015), in which participants were presented with sentences such as (7).

- (7) Woody<sub>i</sub> said (that) he<sub>i</sub> jumped over every frog that Jessie did.

In a context that made the matrix reading false and favored the embedded reading (Woody said he jumped over the small frogs that Jessie

<sup>3</sup> See his discussion on page 669, and concerning his (19) in particular.

*jumped over*, not the big ones she *said* that she jumped over), many participants *rejected* the sentence, saying that Woody and Jessie did not *say* that they jumped over the same frogs.<sup>4</sup> By contrast, in contexts that made the embedded reading false and favored the matrix reading (Woody and Jessie both *said* independently that they jumped over the big frogs, while Jessie had actually *jumped over* the small ones), participants judged the sentence to be true, citing the fact that Woody and Jessie reported the same thing.<sup>5</sup>

Second, there are two often-cited counterexamples from Wilder (1997) demonstrating that the matrix reading is indisputable in situations in which the embedded reading is either not sensible or ungrammatical. For example, in (8) (Wilder's (31)), the DegP must raise out of the finite clause to generate the intended, sensible *de re* reading of the comparative, which is that *the degree to which John thinks Mary is tall exceeds the degree to which Bill thinks she is tall*. The nonsensible *de dicto* reading is that *John thinks that the degree to which Mary is tall exceeds the degree to which Bill thinks she is tall*. The sentence appears to have only the *de re* reading.

- (8) a. John thinks that Mary is taller than Bill **does**.  
 b. John [<sub>DegP</sub>-er [than Bill does *(think that Mary is d-tall)*]] thinks that Mary is d-tall

Wilder also observes that in sentences such as (9) (his (34a)), the verb choice forces the matrix reading over the embedded one.

- (9) a. John **said** that you **were** on every committee that Bill **did**.  
 b. John said that you were on every committee that Bill did *(say you were on)*.

While the ability of QNPs to raise out of finite clauses is made clear with these examples involving ACD, for which QR is required for interpretation, there are non-ACD sentences indicating that the phenomenon may apply beyond ACD. In particular, for sentences in which a universal quantifier is embedded in a finite clause and an indefinite is in subject position, an inverse scope reading ordinarily seems to be unavailable. But one does encounter exceptions to this generalization.

Reinhart (1997) and Fox and Sauerland (1996) observe that the inverse scope reading is made possible in generic contexts.<sup>6</sup> Consider examples (10)–(11) (Reinhart's (25b) and (25c)). Reinhart notes that it is very difficult to get the wide scope reading of the QNP for (10), but it is easier for the generic in (11).

<sup>4</sup> Jessie never made claims about what Woody jumped over, so the strict reading was never under consideration, and participants' responses did not indicate that they considered it.

<sup>5</sup> See Hardt and Romero's (2004:sec. 5.3) discussion regarding the role of context in making available otherwise dispreferred readings of ACD sentences.

<sup>6</sup> Lohndal's (2010) account of "illusive" wide scope also appeals to generic quantification over situations.

- (10) Someone believes that every politician is corrupt.  
 (11) Someone is always willing to believe that every politician is corrupt.

The contrast between a nongeneric and a generic context is also made clear by the minimal pair in (12) from Fox and Sauerland (1996) (their (1a) and (2a)), for which they argue that *every* can only take scope over the indefinite in (12b).<sup>7</sup>

- (12) a. Yesterday, a guide ensured that every tour to the Louvre was fun.  
 b. In general, a guide ensures that every tour to the Louvre is fun.

While Fox and Sauerland argue that this is a “scope illusion” particular to the generic tense and that the inverse scope reading does not actually arise because of wide scope of the universal, Farkas and Gianakidou (1996) demonstrate that inverse scope is also available in an episodic context, as in the Greek example (13) (their (9)).

- (13) Kapjos fititis frondise kathe proskeklimenos  
 some student took.care.PERF every invited  
 omilitis na exi metafora.  
 speaker SUBJ has transportation  
 ‘Some student made sure that every invited speaker got a ride.’

Let us then entertain the possibility—at the very least for ACD, and perhaps more generally—that QR out of a finite clause may be possible. Cecchetto (2004) proposes a way to account for such cases, claiming that finiteness itself plays no role in deriving locality constraints on QR. According to his account, the QNP in an ACD sentence undergoes QR from the verb’s complement position to a position outside of the VP (adjunction to VP, vP, IP, etc.). This movement, he argues, is constrained by a strong version of economy that is consistent with Fox’s (2000) Scope Economy, and by a version of the Phase Impenetrability Condition (Chomsky 2001) for strong phases (see also Wurmbrand 2013, 2014). Crucially, long QR is *only* licensed as long as it takes place in successive-cyclic fashion, where each sublink is semantically motivated and crosses just one instance of v or C (each a phase). Thus, the matrix reading for finite-clause-embedded ACD sentences is made available.

Cecchetto further argues, on the basis of both Italian and English ACD examples, that “ACD-triggered QR can be part of a successive cyclic QR which establishes the inverse scope reading” (2004: 386n37). That is, if the QNP raises high enough to take scope over the matrix VP, then nothing should prevent the QNP from taking scope over a matrix indefinite subject, as long as the movement is semantically motivated. Cecchetto points out that the inability to detect

<sup>7</sup> See also the contrast between their (1b) and (2b).

the matrix and inverse scope readings should not be taken as conclusive evidence that the structural configuration in question does not permit these readings at all.

Relevant to this point, Cecchetto (2004) and Wilder (1995)—who both argue that the matrix reading is available—hold different views on whether the inverse scope reading is available. Cecchetto argues that it *is* available and is predicted by his theoretical account. Wilder concedes that there is nothing about the QR landing site that should prevent such scopal interaction between the raised QNP and the subject indefinite. However, he claims that the inverse scope reading is simply not available.<sup>8</sup> Wilder says that once the quantifier has raised to a position outside of the matrix VP, syntactic theory (e.g., May 1985) *would* allow for it to scopally interact with the subject indefinite. However, since he does not admit the interpretation derived from the universal quantifier taking extrawide scope over the indefinite, he argues that “the facts about scopal interactions may be in need of revision” (1995:151) and thus posits a stipulation barring the movement that would derive it.

Since previous research has not systematically tested the availability of this inverse scope reading derived from extrawide scope of the universal quantifier, I do so here, capitalizing on the accessibility of the matrix reading to make it available. The experimental evidence strongly suggests that the universal quantifier not only raises out of a finite clause, but also can take further scope over an indefinite subject. Thus, under certain discourse conditions, an inverse scope reading of sentences in which ACD is embedded in a finite clause is accessible to participants. This finding is reflected not only in the striking well-above-zero percentages of acceptances of these target sentences, but also in the unambiguous justifications offered by participants, which reflect canonical inverse scope readings. Given this pattern of results, I argue that there is no reason to stipulate any additional constraints on quantifier movement.

## 2 Experiment

### 2.1 Participants

Forty undergraduate students (all native speakers of English) participated.

### 2.2 Methodology

The paradigm used for investigation was the truth-value judgment task (Crain and Thornton 1998). An experimenter narrated a series of sto-

<sup>8</sup> See Wilder 1995:150–151, and discussion of (79) and (80) in particular, as well as Wilder 1997:435.

Koster-Moeller and Hackl (2008) also assume that an object headed by a universal quantifier in the object position of ACD embedded in a finite clause cannot take wide scope over a subject indefinite. See in particular discussion of their (7a).

ries while simultaneously displaying the animated slides corresponding to each story using Powerpoint. At the end of each story, the participant saw a brief series of slides with images of Kermit the Frog on them, as the experimenter delivered Kermit's statements, the penultimate of which was the target sentence. The participant's task was to evaluate whether the sentence was true or false given the preceding context. All participants completed a paper-based response sheet, circling either "yes" or "no" for each item and providing a written justification for every answer that they circled. There were four test items (story and corresponding sentence) and four control items.

All test sentences had ACD embedded in a finite clause headed by the verb *say*, and an indefinite in the matrix subject position, as shown in (14).<sup>9</sup>

- (14) Someone<sub>i</sub> said he<sub>i</sub> could jump over every frog that Jessie did.

I attempted to facilitate the processing of these sentences by weakening the clause boundary, while maintaining the presence of a finite clause, by omitting the optional complementizer *that* and using a pronoun as the subject of the embedded clause. (See relevant discussion in Klender 2004 and stimuli in Syrett 2015.) The four test sentences were pseudorandomized with four control sentences (which were similar to or the same as those in Syrett and Lidz 2011 and Syrett 2015), all of which contained VPE and the matrix verb *say*. The experimental session took approximately 20–25 minutes. The full set of experimental sentences appears in online appendix A ([http://mitpressjournals.org/doi/suppl/10.1162/ling\\_a\\_00194](http://mitpressjournals.org/doi/suppl/10.1162/ling_a_00194)).

Each story had a similar structure, as illustrated here for (14). In this story, the scene opens with Woody and Jessie at the county fair. Woody notices a frog-jumping contest. He comments to Jessie that he knows she loves to jump over frogs and that he thinks she could win a prize for jumping over each of the three big frogs they see in front of them. Jessie replies that she is a very good frog-jumper, and she bets she'll win a prize. For each frog, she claims that she can jump over it. She says she'll be surprised if anyone else can jump over even one of these frogs. Woody suggests that she go eat something so she'll have enough energy for later. She agrees and leaves. In her absence, three boys who have overheard her bragging come over and say they'd like to give frog-jumping a try. Each one goes over to a frog, and one by one, each boy says he can jump over the frog in front of him. Jessie soon returns, and Woody tells her she's going to be disappointed, because the boys each said they could jump over one of the big frogs. Jessie is upset, because she thought she was the best jumper, and storms off. At the end of the story, Kermit appears on screen and says,

<sup>9</sup> A reviewer notes that *say* is a bridge verb, which may have consequences for movement out of the complement clause. This is an interesting observation, but I leave investigation of factors such as matrix verb type and frequency for future research. A finite clause boundary is still present regardless.



**Figure 1**

Inverse scope reading of (14) supported by the test item context

“That was a great story. And I know why Jessie was so mad! *Someone said he could jump over every frog that Jessie did.* Am I right?” The intended inverse scope reading supported by the story is shown in figure 1.

Here, the matrix reading is favored, because neither Jessie nor the boys jump over any of the frogs; they only say that they can do it.<sup>10</sup> That is, what matters in the story is not so much the jumping itself, but the characters’ claims about their jumping, and how those claims align with each other, as captured in (15) (without committing to whether or not the “someone” was one specific person or not).

(15) “For every frog  $x$  such that Jessie said she could jump over  $x$ , there was someone who said he could jump over that frog.”

It has been observed that a matrix reading forces a *de re* reading (Kennedy 1997). That requirement was satisfied. In the above scenario, Jessie said that she could jump over certain frogs, and it is these very frogs that each of the boys said that he could jump over. Note that if the Principle of Charity (Quine 1960) should lead participants to agree with Kermit and respond “yes,” it should not lead them to accept an

<sup>10</sup> The way in which the characters (the boys, the frogs, and Jessie) are involved as participants in the jumping event may also be related to a proposal made by Farkas and Giannakidou (1996) regarding the prerequisites for the availability of extrawide scope.



**Table 1**Possible interpretations of one target sentence (*Someone said he could jump over every frog that Jessie did*)

Scopal relation	VPE	Interpretation
$\forall > \exists$ (intended)	Matrix	For every frog $x$ such that Jessie said she could jump over $x$ , there was someone who said he could jump over that frog
$\exists > \forall$	Matrix	There is someone such that for every frog $x$ such that Jessie said she could jump over $x$ , that person also said he could jump over those frogs
$\forall > \exists$	Embedded	For every frog $x$ such that Jessie jumped over $x$ , there was someone who said he could jump over that frog
$\exists > \forall$	Embedded	There is someone such that for every frog $x$ such that Jessie jumped over $x$ , that person said he could jump over those frogs

ungrammatical reading; it is only predicted to override *preference* for one *grammatical* reading over another. (See discussion in Syrett and Lidz 2011:318–319.) The full range of interpretations, including the one intended in this scenario (leaving aside the *de re/de dicto* distinction), is presented in table 1.

### 2.3 Coding

Participants' ‘yes’/‘no’ responses and the corresponding justifications were transcribed and reviewed independently by four coders who were familiar with the range of possible interpretations for ambiguous ACD sentences and the experimental paradigm. This background was important, so that they could be confident about their decisions. Coders provided two judgments for each response: whether or not the QNP took wide or narrow scope with respect to the indefinite subject, and whether or not the matrix or embedded VP was the antecedent. Note that the QNP raising high enough to outscope the matrix VP (and certainly outscope the indefinite) permits either VP as an antecedent, since the QNP is contained in neither at that point.<sup>11</sup> A conservative method of coding was used, so that in case of any uncertainty, the

<sup>11</sup> A reviewer asks about the availability of a reading derived from extrawide scope paired with an embedded VP reading, given that the motivation for raising out of the matrix VP (which allows the QNP to raise even higher) would be to derive the matrix reading. If participants access the embedded reading, then the movement out of the matrix VP would not be semantically motivated. I agree with the reviewer's observation, but know of no claim about such cases, other than the fact that resolving ACD via movement out of a VP makes any VP that was contained therein a potential antecedent.

justification was coded as “n/a” (not applicable). In case of a tie or any confusion among the coders, a fifth coder was brought in to attempt to resolve the discrepancy by revisiting the responses. This happened in 16 instances (scope classification: 5 wide, 8 narrow, 3 n/a).

#### 2.4 Results

Participants performed near ceiling with the control sentences (92.5%). The raw percentage of “yes” responses was 42.5%.<sup>12</sup> This percentage alone is quite striking, considering the claims about this reading summarized above. Let us now look more closely at the classification of these responses derived from the coding. The complete set of coded participant responses is provided in online appendix B ([http://mitpressjournals.org/doi/suppl/10.1162/ling\\_a\\_00194](http://mitpressjournals.org/doi/suppl/10.1162/ling_a_00194)).

We begin with the coding for (extra)wide/narrow scope of the QNP. Of the 160 responses offered, 27 (or 16.3%) were categorized as “n/a.” Of the 133 remaining responses that could be unambiguously classified, 71 were classified as narrow scope, and 62 as wide scope. Percentages were fairly evenly distributed among the four stories (42% to 56%). Of the 40 participants, 16 (40%) appeared to never access the wide scope. However, 24 (60%) did so at least once, and 15 (37.5%) did so for three or four of the test items.

Of the 160 justifications, only 54 (33.8%) could unambiguously be classified as “embedded” or “matrix.” This percentage may seem surprising. However, note that since the main point of the story was associated with the matrix proposition (*Someone said that x*) and how the events of “saying” lined up with each other across event participants in the story, experimental participants’ responses about the truth value of the sentence usually only appealed to whether or not there was one “someone” or multiple “someones” who made the claim in question. Of these 54 responses, 38 (70.4%) were associated with the matrix reading, and among these, there were wide ( $n = 15$ ) and narrow ( $n = 23$ ) scope responses. Thus, while a matrix reading may facilitate an inverse scope reading, it by no means forces it. The responses classified as “embedded” ( $n = 16$ ) typically could not be classified by scope, since participants simply tended to acknowledge the fact that the main character did not perform the action in question. The distribution of coded responses is presented in table 2.

### 3 Conclusions

The experimental evidence presented here suggests that QR may not be clause-bounded after all: the object QNP can take scope not only over the matrix VP, but also over an indefinite in subject position. The results seem to reveal, as predicted by Cecchetto (2004), that it

<sup>12</sup> These percentages were fairly evenly distributed across items and are not correlated with the type of modal.

**Table 2**

Distribution of participant responses coded by scope and verb phrase ellipsis (VPE)

Raw response	Total	Scope			VPE		
		Wide	Narrow	n/a	Embedded	Matrix	n/a
Yes	68	61	1	6	1	15	52
No	92	1	70	21	15	23	54
Total	160	62	71	27	16	38	106

is possible for the object QNP to undergo QR out of the embedded finite clause through successive-cyclic movement and take both wide and extrawide scope. Discourse contexts that favor the matrix and inverse scope readings allow participants to access these elusive readings, suggesting that the grammar does not, in fact, bar them. The results thus motivate a reevaluation of the source of the apparent locality constraint on QR and the reason why interpretations arising from extrawide scope of a quantifier are so strongly dispreferred.

A promising step toward accounting for this pattern involves more systematically examining *why* accessing such interpretations incurs a processing cost. For example, it may be the more complex configuration or the increased number of derivational steps that places a burden on the sentence-processing mechanism (Anderson 2004), or it could be that the greater number of copies between a moved QNP and its base copy, which has undergone trace conversion (Fox 1999), plays a role (Wurmbrand 2014). The extent to which the locality constraint can be dissolved outside of ACD contexts (where QR is forced) is an open question for future research, as is whether an alternative framework that does not appeal to QR fares just as well (or perhaps even better) at capturing the pattern of judgments across these ACD sentences.

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