# QR out of Control

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## 1. Introduction

Starting with Robert May's (1977) Ph.D. dissertation "The Grammar of Quantification", there has been a persistent strand of work attempting to explain certain systematic restrictions on quantifier scope in terms of restrictions on movement. The idea is that quantifiers reach their scope position via Quantifier Raising (QR), which differs from canonical instances of movement in that the moved expression is pronounced at its base-position, rather than at its final landing site. In syntactic theory, it has been known for some time that overt movement operations are heterogenous. As such, there has been significant debate concerning the status of the movement operation that quantifiers undergo, and which overt movement operation it corresponds to (if any).[1] Existing proposals that QR corresponds to some kind of overt movement or other have each been successful in deriving some of the restrictions on quantifier scope, but all face independent problems. In this paper, we consider the variable availability of QR out of infinitival clauses, which we take to motivate a new constraint on QR which we dub *the intervention constraint*. We show that this constraint can be applied to account for some otherwise puzzling restrictions on QR, such as the *reconstruction requirement* (Johnson & Tomioka 1997). Finally, we speculate on the implications of this constraint for the correct analysis of QR.

## 2. Restrictions on QR out of infinitives

### *2.1. Clause-boundedness*

It is well-established in the literature that finite clauses are opaque for QR (although for some systematic exceptions, which we control for throughout, see Farkas & Giannakidou 1996, Kennedy 1997, and Kayne 1998).[2]

(1) a. A different girl believes [$_{CP}$ that each boy is handsome]. *each > a different
b. Some audience member or other claimed [$_{CP}$ that the judge was biased against most contestants here]. *most > some

This fact alone would seem to militate against treating QR as a covert form of A-bar movement, given that canonical cases of A-bar movement, such as *wh*-movement, can proceed out of finite clauses. On the other hand, it seems that QR can proceed out of (at least some) infinitival clauses relatively easily.

Consider, for example, the transparency of control infinitives for QR, as illustrated by (2).[3]

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[1] Some representative examples include Kitahara (1994), Hornstein (1995) and Beghelli & Stowell (1997) for QR as A-movement, Johnson (2000) for QR as *mittelfeld* scrambling, and Drummond (2013) QR as object shift.

[2] In this paper, we are interested in the upper-limits of QR, and we largely abstract away from differences between quantifiers. When we are interested in the availability of inverse scope, we generally use examples where an indefinite of the form *a different NP* c-commands a DP with a (strongly-distributive) quantifier *each*. This is because, for many speakers, this particular configuration strongly biases an inverse scope reading. If, with this configuration, an inverse scope reading is nonetheless unavailable, we can be reasonably confident that this is due to a restriction on QR, rather than some extraneous factor.

[3] The clause-boundedness of QR follows from Hornstein's (1995) account, since inverse scope is thought to arise through a combination of (i) lowering of the subject into SpecVP, and (ii) raising of the object into SpecAgrOP. A subject cannot be lowered into a more deeply-embedded clause. Hornstein's account has several problems however; see Johnson (2000) and Kennedy (1997) for discussion.

 Proceedings of the 33rd West Coast Conference on Formal Linguistics, ed. Kyeong-min Kim et al., 119-127. Somerville, MA: Cascadilla Proceedings Project.

(2) a. A different person$_i$ wants [PRO$_i$ to borrow each book in the library]. ✓each $>$ a different
b. Some staff member or other$_i$ has been asked [PRO$_i$ to review for most journals].
✓most $>$ some

Furthermore, we can observe that QR is unbounded, i.e., it may proceed across an in principle arbitrary number of infinitival clause boundaries.

(3) a. A different girl$_i$ wanted [PRO$_i$ to try [PRO$_i$ to dance with each boy]]. ✓each $>$ a different
b. Some student or other$_i$ promised [PRO$_i$ to remember [PRO$_i$ to ask [PRO$_i$ to speak with each teacher]]. ✓each $>$ some

The over-arching question here is why some clausal complements are opaque for QR, whereas some are transparent. One conceivable scenario is that there is a straightforward dichotomy between finite and non-finite clauses, which are opaque and transparent respectively. A closer empirical examination of QR out of a variety of finite clauses will show that this straightforward dichotomy cannot be maintained.

### *2.2. Transparent Infinitives*

We will begin by identifying the variety of infinitive clauses from which QR *is* possible. As we have already seen illustrated in examples (2) and (3), QR from out of a control infinitive seems in general to be possible. We have only considered cases where the verb selects for a control infinitive as its sole argument, however. We can observe that control infinitives remain transparent in a *transitive object control* construction, where the embedding predicate takes another argument in addition to the control infinitive, which acts as the controller.

(4) a. Mary has persuaded at least one student$_i$ [PRO$_i$ to read each book on the reading list].
✓each $>$ at least one
b. At least one teacher persuaded Mary$_i$ [PRO$_i$ to read each book on the reading list].
✓each $>$ at least one

A quantifier embedded in a control infinitive may QR over a matrix object, as illustrated by (4-a), or a matrix subject, as illustrated by (4-b). Truswell (2013) also discusses scope possibilities in transitive control constructions, but his assessment of the data is different to ours. He claims the a quantifier embedded in a control infinitive may only take scope over the argument in the matrix clause identified as the controller. According to Truswell then, examples such as (4-b) should disallow inverse scope.[4] However we corroborated the availability of inverse scope in (4-b) and other structurally parallel examples with an informal questionnaire study of 10 native English speaker informants.

We will now move on to consider QR out of raising infinitives. A common claim in the literature is that raising infinitives are opaque for QR (see e.g., Fox 1999, Fox 2000, Lebeaux 2009, and Wurmbrand 2013). From a naïve perspective, this claim would seem to fly in the face of data such as (5).

(5) a. A different student$_i$ seems [$t_i$ to have solved each problem successfully].
✓each $>$ a different
b. Some student or other$_i$ is likely [$t_i$ to succeed in every field of study]. ✓every $>$ some

However, we can entertain (at least) two possible derivations for the inverse scope reading of examples such as those in (5): (i) the embedded quantifier QRs to a position in the matrix clause above the subject; the matrix subject is interpreted in its surface position) (as in (6)), (ii) the matrix subject is interpreted in its base-position, and the embedded quantifier QRs to a higher position (as in (7)). Note that in the second case, the embedded quantifier does not necessarily have to QR out of the infinitive to derive inverse scope, and so this derivation is compatible with the assumption that raising infinitives are opaque.

[4] Truswell test examples where the quantifier in the embedded clause is *every*, which seems not to take wide scope as readily as *each* for many speakers. It is possible that this putative difference between *each* and *every* has a structural explanation, such as the one in Beghelli & Stowell (1997), but assessing this would require a lot more empirical work.

(6) [ $\text{Qu}_2$ $\text{Qu}_1$ ... [ $t_1$ ... $t_2$ ... ]]

(7) [ $\text{Qu}_1$ ... [ $\text{Qu}_2$ $t_1$ ... $t_2$ ]]

To argue that raising infinitives are opaque for QR is to argue that (7) is the only way to derive inverse scope in these constructions. Putative evidence for this claim comes from the unavailability of inverse scope with an experiencer, as in (8) (from Wurmbrand 2013:278). This follows from the reconstruction account, since only the subject can reconstruct into the raising infinitive.

(8) a. This soldier$_i$ seems to someone [$t_1$ to be likely [$t_1$ to die in every battle]] *every $>$ someone

b. The ball$_i$ seems to a boy [$t_i$ to be under every shell.] *every $>$ a boy

We will come back to this datapoint soon, but we set it to one side for now. Straightforward evidence against the reconstruction account is provided by the possibility of an embedded quantifier taking scope over sentential negation.

(9) Bill$_i$ doesn't seem [$t_i$ to meet with more than two students on a regular basis].
✓more than two $>$ not

Since an embedded quantifier can take scope over matrix elements other than the subject, which presumably don't reconstruct, we can safely conclude that a raising infinitive is in principle transparent for QR, contra Wurmbrand (2013) and others. There is still a tension however with the data showing that an embedded quantifier can't take scope over a matrix experiencer. Tellingly, a quantifier can no longer take scope over negation or a Q-adverb when an experiencer is present.

(10) Bill$_i$ doesn't seem to the head of department [$t_i$ to meet with more than two students on a regular basis]. *more than two $>$ not

Nonetheless, inverse scope with the matrix subject is still possible in the presence of an experiencer, as shown by (11).

(11) A different student$_i$ seems to the head of department [$t_i$ to be excelling in each subject area].
✓each $>$ a different

On the assumption that inverse scope with the subject can be derived via reconstruction (we have no reason to rule this out), we can conclude that the presence of an experiencer renders a raising infinitive opaque for QR. In the absence of an experiencer, it is transparent.[5]

To sum up this section, we have seen that control infinitives and raising infinitives are all in general transparent. Raising infinitives are rendered opaque by the presence of an overt experiencer. In the next section we turn to opaque infinitives more generally.

### *2.3. Opaque Infinitives*

In the previous section we observed that the infinitive in a transitive object control construction is transparent. It is also possible for the subject to be identified as the controller in a transitive control construction with verbs like *promise*, although for many speakers this is a marked option.

(12) a. Mary$_i$ promised a different teacher [PRO$_i$ to read each book on the reading list].
b. %A different student$_i$ promised John [PRO$_i$ to read each book on the reading list].

For all of our informants who found baseline transitive subject control cases to be relatively acceptable, inverse scope between an embedded quantifier and the indirect object was a possibility, as in (12-a).

[5] We can show that the presence of an experiencer doesn't interfere with reconstruction by considering idiomatic subjects, which are typically taken to require reconstruction:

(i) [A great deal of headway]$_i$ seems to the dean [to have been made $t_i$ on this problem].

On the other hand, some but not all of our informants found inverse scope to be degraded between an embedded quantifier and the matrix subject, as in (12-b). Importantly, no informants found inverse scope acceptable in (12-b) but degraded in (12-a). It seems that QR over the subject is degraded (for some speakers), but not QR over the indirect object. We come back to this datapoint in §4.2.

Recall from the previous section that although raising infinitives are in principle transparent, a raising infinitive with an experiencer is opaque. This is reminiscent of Hartman's (2009; 2012) observation that no PP experiencer may intervene between a *tough*-predicate and an embedded infinitive.

(13) a. It is important (to Irene) [to avoid gluten].
b. Gluten is important (*to Irene) [to avoid ___].

(14) a. It was hard (on John) [to give up carbs].
b. Carbs were hard (*on John) [to give up ___].

Bruening (2014:710) observes that not just experiencers, but adjuncts in general, count as interveners in *tough*-constructions.

(15) a. It will be tough (tomorrow) to get an audience with the pope.
b. The pope will be tough (*tomorrow) [to get an audience with ___].

(16) a. It is always annoying (at meetings) to talk about the budget.
b. The budget is always annoying (*at meetings) [to talk about ___].

If the intervention effects in *tough*-constructions are related to the phenomenon whereby an experiencer render a raising infinitive opaque for QR, then we might expect that adjuncts more generally render raising infinitives opaque. The judgements are delicate, but we believe that once matters of information structure are controlled for, this is exactly what we find. Here we test raising infinitives ((9) is repeated as (17-a) here, as a control).

(17) a. Bill$_i$ doesn't seem [$t_i$ to meet with more than two students on a regular basis].
✓more than two $>$ not
b. Bill$_i$ doesn't seem to the secretary [$t_i$ to meet with more than two students on a regular basis]. *more than two $>$ not
c. Bill$_i$ doesn't seem in the Spring semester [$t_i$ to meet with more than two students on a regular basis]. *more than two $>$ not

We even find similar (and more easily detectable) intervention effects with control infinitives. Here we test scope inversion between matrix subject and embedded objects.

(18) a. A different professor wanted to supervise each student. a $>$ each, each $>$ a
b. A different professor wanted at the beginning of term to supervise each student.
a $>$ each, *each $>$ a
c. At the beginning of term, a different professor wanted to supervise each student.
a $>$ each, each $>$ a

The unavailability of inverse scope in (18-b) (cf. (18-a) and (18-c)) shows that the presence of an adjunct between the embedding predicate and the control infinitive renders the infinitive opaque for QR.

In the following section, we argue that the parallel with intervention effects in *tough*-constructions is crucial for understanding the variable availability of QR out of control infinitives. Specifically, we argue that almost all of the cases of opacity we have observed can be re-analyzed as *intervention* effects.

## 3. The Intervention Constraint

To begin with, it will be useful to recap the results of the previous section.

(19) **Transparent infinitives**
Control infinitives; raising infinitives;

(20) **Opaque infinitives** raising infinitives with an intervening experiencer/adjunct, control infinitives with an intervening adjunct

To try to make sense of this variability, we will take the intervention facts, as noted at the end of the previous section, to be the key fact that needs to be accounted for. In (21) we state a constraint which is designed to capture this.[6]

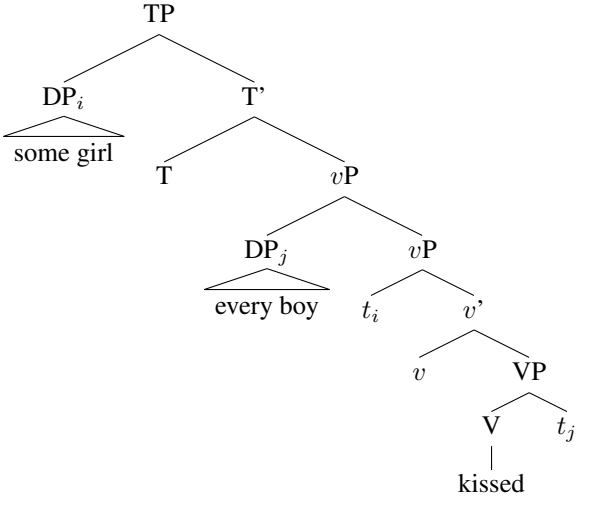
(21) **The Intervention Constraint (first attempt)**
[ $\text{Qu}_1$ ...$\alpha$... [ ...$t_1$... ]]
Where $\alpha$ is an intervening overt DP or adjunct ($\alpha$ c-commands $t_1$).

As we shall discuss in greater detail below, the constraint in (21) straightforwardly accounts for the following facts discussed in the previous section: (i) a matrix experiencer/adjunct renders an embedded raising infinitive opaque for QR, and (ii) a matrix adjunct renders a control infinitive opaque for QR. There is one major issue with (21) however that we must address before moving forward, namely, how is it ever possible to achieve inverse scope between subject and object in a simple, mono-clausal sentence? Under the standard account (May 1977) a sentence such as (22-a) has the LF in (22-b) under the inverse scope reading.

(22) a. Some boy likes every girl.
b. [ [Every girl]$_i$ [ [some boy]$_j$ [ $t_j$ likes $t_i$ ]]]

Note that the representation in (22-b) involves QRing over the overt DP *some boy*, which is disallowed according to the constraint in (21). It turns out, however, that there is independent evidence for an alternative route to the inverse scope reading, illustrated in (23). Johnson & Tomioka 1997 (see also Hornstein 1995 and Nevins & Anand 2003) argue that the inverse scope reading is parasitic on EPP-driven movement of the subject quantifier from a predicate-internal position to the matrix subject position (we identify the predicate-internal position with the specifier of $v$P for concreteness). The idea is that to derive the inverse scope reading, the object quantifier QRs to a position above the predicate-internal trace of the subject quantifier. The subject quantifier then reconstructs for scope (to $t_i$) to derive the object>subject reading.

(23)




[6] For the purposes of this paper, we concentrate on showing how the constraint in (21) can be put to work in accounting for variability in the availability of QR from certain domains. There is still the question of why this particular constraint should exist, and whether or not it can be derived from something more primitive. We leave this important question to future work.

Johnson & Tomioka (1997) argue that the derivation illustrated in (23) is the *only* route to the inverse scope reading. We refer to this as the *Reconstruction Requirement* (RR) on inverse scope. The RR is in fact a natural consequence of the intervention constraint in (21), which independently rules out a derivation where the object quantifier QRs to a position higher than the surface position of the subject quantifier. Since this is clearly a crucial prediction of the constraint we propose, we'll spend a little time laying out an independent argument for the RR.

Johnson & Tomioka (1997) point out that *some* in English is a Positive Polarity Item (PPI); it can't be interpreted in the scope of negation.

(24) I don't like some quantifiers *not > some, some > not

When *some* is in subject position, it may ordinarily take narrow scope with respect to an object quantifier, as in (25-a). If we add sentential negation however, as in (25-b), the inverse scope reading disappears.

(25) a. Some student or other has answered two thirds of the questions on the exam.
some > 2/3, 2/3 > some

b. Some student or other **hasn't** answered two thirds of the questions on the exam.
some > 2/3, *2/3 > some

Nevins & Anand (2003) contrast the behaviour of *some* with the behaviour of a non-PPI, such as *two*. Like *some*, when *two* is in subject position it may take narrow scope with respect to an object quantifier, as in (26-a). Crucially, if we add sentential negation, the inverse scope reading remains (contrast with (25-b)).

(26) a. Two students have answered many questions on the exam. two > many, many > two

b. Two students **haven't** answered many questions on the exam. two > many, many > two

If the RR is correct, it provides an explanation for why the presence of sentential negation blocks narrow scope of a PPI subject quantifier, but not a non-PPI subject quantifier. Namely, if subjects must reconstruct to a position below negation in order for inverse scope to be derived, then the PPI status of *some* precludes reconstruction in sentences like (25-b), and therefore the inverse scope reading is correctly predicted to be unavailable. An important consequence of the intervention constraint, therefore, is that the otherwise mysterious RR falls out as a natural consequence.

Note that we formulated the intervention constraint in (21) in terms of *overt* DPs, meaning that empty categories, such as PRO, and traces/copies don't give rise to intervention effects. As we have seen, this is necessary in order for inverse scope between a subject and object quantifier to ever be possible. Ultimately we would want it to the case that the distinction between *overt* and *covert* elements with respect to intervention follows from something more general, but for the purposes of this paper, we focus on the empirical question of what counts as an intervener for QR.[7]

Having reassured ourselves that the intervention constraint, although rather restrictive, is compatible with *object>subject* scope in simple transitive sentences, we are now in a position to explain in more detail how the intervention constraint accounts for some of the variability in QR out of infinitives which

[7] A natural question to consider at this point is whether or not the trace/copy left behind by overt A-bar movement counts as an intervener. This is difficult to test. Movement of an experiencer in the *tough* construction seems to obviate the intervention effect, as in (i).

(i) a. *Carbs are important to Irene to avoid.
b. ?To whom are carbs important to avoid?

On the other hand, movement of an experiencer does not seem to render the raising infinitive in (ii) transparent for QR.

(ii) To whom does Bill not seem to meet with more than two students on a regular basis? *more than two > not

One problem with the example sentences in (i) and (ii) is that we cannot be sure that the putative intervener has been base-generated in an intervening position. In any case, it is not clear what to conclude from these results; we leave this interesting issue to future work.

we observed in §2. Starting with the simple cases, the intervention constraint is compatible with in principle *unbounded* QR out of control infinitives (modulo interveners).[8] This is because if PRO is indeed present, it is a covert element and therefore does not count as an intervener.

The intervention constraint also predicts that raising infinitives should be transparent for QR (modulo interveners). We motivated this claim in §2 by showing that a quantifier embedded in a raising infinitive can take scope over sentential negation in the matrix clause.

Furthermore, the intervention constraint accounts for our conclusion in §2 that an intervening experiencer renders the raising infinitive opaque. This is because the experiencer counts as an intervener, and therefore QR cannot proceed to a position c-commanding it. This was in fact one of the very datapoints which we took to motivate the intervention constraint in the first place. Along similar lines, it accounts for the intervention effects we observed with adjuncts, in both control and raising infinitives.

All that remains to be addressed from the above is transitive control. We will return to this shortly, but first we need to make a digression to consider simpler cases of ditransitive complementation.

## 4. Scope Freezing and VP Structure

### *4.1. Double objects and prepositional dative constructions*

As has been widely discussed in the literature, the Double Object Construction (DOC) in English exhibits a scope freezing effect, whereas the Prepositional Dative Construction (PDC) does not (see e.g., Larson 1988). Consider first the DOC, as in (27-a). The Indirect Object (IO) may take scope over the Direct Object (DO), but the DO may not take scope over the IO. The PDC allows for both scopal orderings, as shown in (27-b).

(27) a. John gave a different student each book. ✓a diff. > each, *each > a diff.
b. John gave a different book to each student. ✓a diff. > each, ✓each > a diff.

Note that the unavailability of DO>IO scope in (27-a) falls out as a consequence of the intervention constraint, on the assumption that the the VP is uniformly right-branching in the DOC. This is because the IO is an overt DP, and therefore counts as an intervener. The representation in (28) is ruled out by the intervention constraint (following the discussion in §3 we assume that quantifiers uniformly take scope below the surface subject).

(28) John [each book]$_i$ [[a different student]$_j$ gave $t_j$ $t_i$].

If the intervention constraint blocks DO>IO scope in (27-a), why is IO>DO scope available in (27-b)? If the VP were uniformly right-branching in (27-b) as well, we would expect IO>DO scope to be blocked for the same reason that DO>IO scope is blocked in (27-a). We illustrate this in (29).

(29) John [each student]$_i$ [[a different book]$_j$ gave $t_j$ to $t_i$].

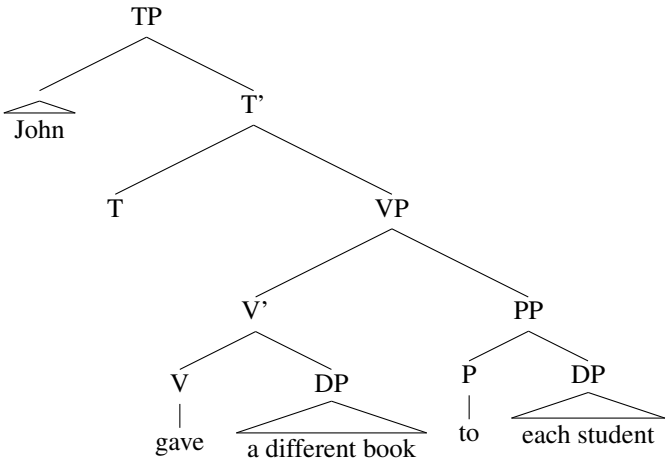
If it were possible to have a left-branching structure for the VP in (27-b) however, then we would correctly predict the availability of IO>DO scope. To see why, consider the simplified tree in (30).

[8] Admittedly, we have little to say regarding the fact that QR cannot proceed out of finite clauses. Despite the restrictiveness of the intervention constraint, it does nothing to block the possibility of an embedded subject taking scope over a matrix subject in cases like (i-a). Furthermore, it seems unlikely that the opacity of finite clauses should be explicable in terms of the locality of QR, since subjunctive clauses are transparent for QR, as shown by (i-b).

(i) a. Some teacher or other knows [that each boy is absent]. *each > some
b. Some teacher or other asked [that each boy leave]. ✓each > some

We speculate that the opacity of finite-clauses should receive an independent explanation; one possibility is Fox's (2000) *Scope Economy* constraint.

(30)




In (30), the DO *a different book* does not c-command the IO *each student*. Crucially, we stated the intervention constraint in terms of c-command rather than linear order, and therefore despite the fact that the DO linearly precedes the IO in (30), it does not count as an intervener. The IO is therefore free to QR over the DO, giving rise to IO>DO scope. Recall that only overt DPs (and adjuncts) count as interveners: this means that it is only the base position that counts for the purposes of intervention, and so it does not matter whether or not the DO must QR to a position that c-commands the base-position of the IO.

In sum, to derive the scope freezing paradigm using the intervention constraint, we must assume: (i) that the VP in the DOC is uniformly right-branching, and (ii) that the VP in the PDC may be left-branching. This is precisely the conclusion reached based on independent evidence by Janke & Neeleman (2012).

### *4.2. Back to transitive control*

The account just sketched for DOCs and PDCs transfers over nicely to give us an account of the difference between transitive subject and object control. Larson (1991) shows that there are numerous parallels between transitive subject control and DOCs on the one hand and transitive object control and PDCs on the other. For instance, transitive subject control verbs have a DOC frame, and in this and the control use only the argument closest to the verb is obligatory; compare transitive object control, which does not have a DOC frame in which it is the second argument that cannot be dropped.

(31) a. John promised/gave (Mary) *(a donation)
b. John promised (Mary) *(to leave)

(32) a. John persuaded (Mary (*a conclusion)
b. John persuaded *(Mary) (to leave)

We follow Larson in assuming that transitive subject control should be analysed as having a DOC frame and that transitive object control is to be analysed as having a PDC-like structure, and we implement this in the same way as above: transitive subject control, like the DOC, involves a uniform right-branching structure, whereas transitive object control is in principle ambiguous between a right-branching structure and a left-branching one. If this is correct, the difference between transitive subject control and transitive object control with respect to scope freezing follows straightforwardly from our constraint: with transitive subject control, the matrix object intervenes for QR out of the infinitive, since it c-commands the infinitive (just like the indirect object c-commands the direct object in DOCs), whereas with transitive object control the infinitive may occupy a left-branching position where it is not c-commanded by the direct object and so there is no intervener which would preclude QR from the IP.

## 5. Summary and conclusion

We have argued that various restrictions on QR may be explained as reflexes of an intervention constraint which restricts QR from moving DPs over any other overt c-commanding DPs. We have shown that this accounts for restrictions on QR out of many different kinds of infinitives, as well as the hitherto mysterious Reconstruction Requirement and the scope rigidity of some but not all ditransitives (cf. Bruening 2001).

The constraint proposed here renders QR much more constrained in English than is generally assumed. One appealing upshot of this line of research is that it can help us to bridge the gap between scope flexible languages such as English, and scope rigid languages such as German, without assuming parametric variation in the availability of QR. On the basis of independent evidence from coordination and variable binding, Sauerland (2001) concludes that QR *is* in fact available in German, despite the fact that *object>subject* scope is generally unavailable. Following Sauerland, we speculate that the pertinent difference here is the absence of EPP-driven movement to SpecTP in German (see e.g., Wurmbrand 2006). If inverse scope in simple transitive sentences is necessarily parasitic on reconstruction of the subject, then we expect it to be available in English but not in German, which is exactly what we find.

We believe that the constraint also allows us to account for a number of other properties of QR, such as restrictions on inverse linking, although a number of issues remain to be addressed. It is unfortunately beyond the scope of this short paper to develop a full explanation of why such a constraint should hold of QR, so we must leave this for future work.

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