Crossing clauses covertly—difficult but not impossible

Synopsis This paper proposes that clause-boundedness effects observed for *quantifier raising* (QR) are only apparent, and that QR obeys the same syntactic restrictions as other A'-movement operations. Instead the difficulty associated with constructing non-clause-bound inverse scope interpretations is attributed to increased processing costs arising for covert (but not overt) movement, which is calculated based on the complexity of the structure, specifically the number of syntactic domains crossed.

The issue A standard claim about the locality of QR is that it is clause-bounded since examples like (1) are often considered to be unambiguous. Such judgments, however, are not absolute but gradient, and some speakers do allow inverse scope across finite clauses (e.g., Syrett and Lidz 2011). As shown in Tanaka (2015), extensive experimental evidence leads to the scale in (2a): QR out of finite clauses is significantly more difficult than local QR, but also significantly easier/better than QR out of strong islands. Furthermore, QR tracks the *wh*-extraction potential in weak adjunct islands, as in (2b,c).

(1) a. *#Someone said that every man is married to Sue.* *∀»∃ [Fox 2000: 62]
b. *#Someone said that Sue is married to every man.* *∀»∃ [Fox 2000: 62]
c. *I told someone you would visit everyone.* *∀»∃ [Johnson 2000: 188]

(2) a. QR: *⇠ strong island »$_{\text{sig}}$ finite indicative >$_{\text{not-sig}}$ finite subjuctive »$_{\text{sig}}$ no locality violation ⇢✓
b. *wh*: strong island »$_{\text{sig}}$ after gerund >$_{\text{not-sig}}$ during PP »$_{\text{sig}}$ no locality violation
c. QR: strong island »$_{\text{sig}}$ *after* gerund »$_{\text{sig}}$ *during* PP »$_{\text{sig}}$ no locality violation

Since there is a clear difference between QR from finite clauses and overt A'-movement—only the latter appears to be able to escape from a finite clause, see (3a,b)—a common approach is to prohibit successive cyclic QR by a syntactic locality or economy constraint, e.g., *Scope Economy* (Fox 2000, Cecchetto 2004). However, in a such a view it is difficult to implement the gradient nature of QR in (2). Furthermore, considering *antecedent contained deletion* (ACD), in cases like (3c), wide ellipsis is possible as indicated. Assuming QR is required to resolve ACD, such examples then must involve QR of *every committee* + the relative clause to a position above the matrix verb, thus across a finite clause boundary.

(3) a. *What did a technician say __ that John inspected __?* [Cecchetto 2004: 350]
b. *A technician said that John inspected every plane.* */%∀»∃ [Cecchetto 2004: 350]
c. *John said that you were on every committee that Bill did ~~say that you were on~~.* [Wilder 1997]

QR from infinitives poses similar issues. While Hornstein 1994, 1995) and Cecchetto 2004) state that QR is only possible out of (mono-clausal) restructuring infinitives [RI] like (4a), and impossible out of non-restructuring infinitives [NRI] as in (4b), this claim is contested in Kennedy 1997), as well as experimental evidence provided in Moulton 2007). Moulton shows that QR within a simple predicate is significantly easier than QR from both NRIs and RIs, thus leading to the scale in (4c). Finally, ACD with wide ellipsis resolution, (4d,e) is again possible for most speakers, from any type of infinitive.

(4) a. *Someone wants/tried/managed to dance with every woman.* RI: ∀»∃
b. *A different student decided/planned/expected to report on every article.* NRI: %∀»∃
c. non-restructuring complement » restructuring complement » simple predicate
d. *Tim believes the students to know everything Joe does* [~~*believe the students to know*~~]. %
e. *A middle school teacher claimed to be about to catch each problem student John did* [~~*claim to be about to catch*~~]. ?∀»∃; [Cecchetto 2004: 388, (93)]

This talk proposes a non-syntactic processing constraint on QR which covers the above distribution and difficulty scales noted for QR.

Syntax of infinitives Following Wurmbrand (2014), size restructuring is an option available cross-linguistically for (certain) infinitives. Assuming (based on Grohmann 2003) that clauses are built in three cycles—a Θ domain (~*v*P), a Φ domain (~TP), and an Ω domain (~CP)—restructuring involves the omission of the Ω domain or the omission of the Ω and Φ domains. The latter is only possible in tenseless infinitives, since future is encoded in the Φ domain and thus must be present in future infinitives (cf. (5)).

(5) a. *John tried/began/managed* [$_{\Theta}$ *to win* (**tomorrow*)] Tenseless: minimum Θ domain
b. *John decided/planned/promised* [$_{\Phi}$ FUT [$_{\Theta}$ *to win*] (*tomorrow*)] Future: minimum Φ domain

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Table 1		Difficulty	Domains crossed
(6) a.	*A technician inspected every plane.*	✓	∅
b.	*A technician tried to inspect every plane.*	[?]	Θ
c.	*A technician decided to inspect every plane.*	[??/*]	Θ, Φ
d.	*A technician decided that he would inspect every plane.*	[??/*]	Θ, Φ, Ω

The cost of QR As shown in Table 1, under a 3-domain clause structure approach the complexity of the different structures maps exactly to the difficulty scale in (4c)—the more domains are crossed, the more difficult QR becomes. Following (among others) Anderson (2004), multi-step QR incurs additional processing costs. To calculate such costs, I propose that the three clausal domains are cyclic domains, and that the syntactic computation of long-distance dependencies requires a stop-over (e.g., edge movement) in each cyclic domain. I adopt a copy approach to movement (both overt and covert), and a process of *trace conversion* (Fox 2003) to resolve copy choice at LF and to create the necessary Q-variable configuration. QR in a simple predicate like (6a) has the derivation in (7), where both QR copies are relevant for the interpretation—the highest copy is interpreted for scope, the lowest (roughly) as a variable.

(7) a. [$_\Theta$ {*every plane*} *a technician v* [$_{VP}$ *inspected* {*every plane*}]] QR: simple predicate
b. [$_\Theta$ {~~*every plane*~~} *a technician v* [$_{VP}$ *inspected* {*every plane*}]] PF copy choice
c. [$_\Theta$ {*every plane*} λx [*a technician v* [$_{VP}$ *inspected* {*the plane x*}]]] LF copy choice

The derivation for (6b) differs in one crucial respect: to escape the infinitival Θ domain, an intermediate step is necessary, creating an additional QP copy. This copy is only needed to satisfy syntactic locality but semantically, it is entirely vacuous. It is the presence of such linker copies which I suggest creates the additional processing costs. In (6), QR is within a single domain, thus no linker copy is required. In (8a,b), QR exits a domain, which leads to the presence of a linker copy in a RI, making QR more difficult. Finally, in NRIs (8c) both Θ and Φ domains are present (due to the future interpretation), which, in the course of QR, requires two stop-overs and hence two vacuous linker copies as indicated in (8d).

(8) a. [$_\Theta$ {*every plane*} *a technician tried* [$_\Theta$ {*every plane*} *to inspect* {*every plane*}]] QR: RI
b. [$_\Theta$ {*every plane*} λx *a techn. tried* [$_\Theta$ {~~*every plane*~~} *to inspect* {*the plane x*}]] LF copy choice
c. [$_\Theta$ {*every plane*} ∃ *decided* [$_\Phi$ {*every plane*} [$_\Theta$ {*every plane*} [$_{VP}$ {*every plane* }]]]] QR: NRI
d. [$_\Theta$ {*every plane*} λx ∃ *decided* [$_\Phi$ {~~*every plane*~~} [$_\Theta$ {~~*every plane*~~} {*the plane x*}]]] LF copy choice

Why is covert movement more costly? Although filler-gap dependencies also involve an increased processing burden (Wanner and Maratsos 1978), sentences such as (3a) are perfectly grammatical, whereas inverse scope in the parallel (3b) is much more difficult, and often rejected by speakers, unless an additional cue such as ACD is present. I propose that the difference lies in the way parsing has to proceed in overt vs. covert movement. Assuming that in QP»QP QR configurations, QR is movement to the left, the filler-gap dependency is essentially reversed, and there is no cue for a long-distance dependency until the second QP is reached. Thus, in contrast to overt *wh*-movement, QR involves a retrospective search in parsing, which incurs the higher processing cost for QR than for overt successive-cyclic movement.

ACD In Italian, high (matrix) ACD resolution is possible in RIs, but in NRIs only when the embedded VP is excluded as an antecedent due to a tense mismatch (Cecchetto 2004). Similarly, the experimental results in Syrett and Lidz (2011) indicate that non-local ACD resolution in English is significantly more difficult compared to wide VPE resolution without QR. Finally, Sugawara et al. (2013) show that non-local ACD is facilitated when more local options are excluded via a mismatching auxiliary. ACD thus also incurs QR-related processing costs, however, the need to resolve ACD lowers the processing costs otherwise arising for multi-step QR. If, following Fox (2003), Fox and Nissenbaum (1999), QR is rightward movement in ACD contexts (since the QP must properly merge with the right adjoined late-inserted relative clause containing the ACD site), but the usual leftward movement in QP»QP contexts, parsing is affected in interesting ways. In ‘regular’ QR, the gap precedes the filler, and this is what makes processing more costly. However, if ACD-related QR is rightward movement, then, for the purpose of processing, this form of QR is a filler-gap dependency, thus it would not trigger the additional cost associated with covert movement but is predicted to be more comparable to overt movement.