Rethinking scope islands

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Near-final version of January 5, 2021

Abstract: Relative clauses and tensed clauses are standardly assumed to be scope islands. However, naturally-occurring counterexamples are abundant and easy to find. Therefore we should revisit analyses that rejected Quantifier Raising on the assumption that QR is clause bounded. The data show that scope islands are sensitive to the identity of both the scope-taker and the predicate embedding the island. I propose the *Scope Island Subset Constraint*: given two scope islands, the scope-takers trapped by one will be a subset of the scope-takers trapped by the other. A simple refinement of semantic types allows encoding and enforcing scope islands.

Keywords: scope, scope islands, quantifier raising, clause bounded, exceptional scope

1 Introduction

A **SCOPE ISLAND** is a syntactic context that traps a scope-taker inside of it.

(1) Someone asked everyone to leave. $\forall > \exists$

(2) Someone thought everyone left. $*\forall > \exists$

Thanks to Sam Alxatib, Dylan Bumford, Simon Charlow, Patrick Elliott, Wen Kokke, Jeremy Kuhn, Cara Leong, Louise McNally, Anna Szabolcsi, and audiences in Dubrovnik, Stanford, Osnabrück, and NYU, and two referees. I gratefully acknowledge that the idea presented in section 6 is due to a referee.

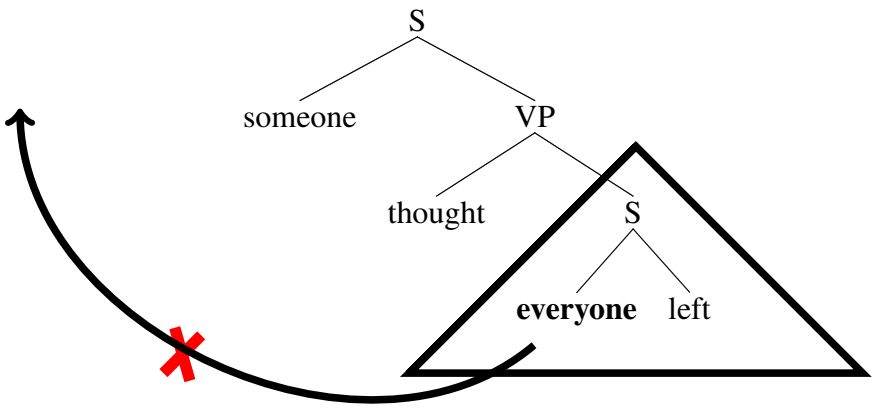


Figure 1: A scope island. The scope-taker *everyone* is unable to take scope outside of the clausal complement of *think*.

The consensus in the literature is that inverse scope for (1) is possible, in which case there can be a different asker for each person who was asked to leave, but not for (2), which only entails the existence of one thinker and one thought. The difference is supposed to be that the embedded clause in (2) is tensed. Tensed clauses are supposed to be scope islands that trap scope-takers such as *everyone*, as illustrated in Figure 1.

Although I don't dispute the standard scopability judgments as just described, I will argue that clauses are not in general scope islands for Quantifier Raising, regardless of whether they are tensed clauses or relative clauses. I will argue that a more accurate picture requires a more fine-grained approach that is sensitive both the identity of the embedding predicate, as well as to the identity of the scope-taker in question. Thus the data in (1) and (2) show only that the complement of *think* traps *everyone*, not that clauses in general are scope islands for all scope-takers.

Islands of any sort, whether syntactic islands or scope islands, have considerable

intrinsic theoretical interest. But in addition, a number of consequential decisions about how to analyze major semantic phenomena have been based at least in part on the assumption that QR is clause bounded. Notable examples include the computation of focus, the semantics of indefinites, functional relative clauses, and more. The supposed clause-bounded nature of QR motivated some non-QR scoping mechanisms, including pointwise composition, choice functions, etc. When these alternative scoping methods are placed side by side, a pattern emerges that I call the *exceptional scope conspiracy*: in each case, the net result for truth conditions is exactly what they would have been if QR had delivered the scoping directly.

At the very least, we should rethink in each case whether QR might be the right scoping mechanism after all. But even if some of the alternative approaches remain well-motivated after discounting the belief that clauses are scope islands, the conspiracy suggests that QR nevertheless provides an accurate model for all sorts of scope taking.

Of course, we must first find a way to modulate the behavior of QR in order to account for contrasts such as that illustrated in (1) and (2). I propose below a refinement of standard semantic types that can encode and enforce scope islands. When the needs and limitations of a variety of scope takers are considered within a single comprehensive system, a second pattern emerges, which I call the *Scope Island Subset Constraint*: for any two scope islands, the set of scope takers trapped by one will be a subset of the scope takers trapped by the other.

2 Clauses are not scope islands

I take it that it is currently widely assumed that QR is subject to some kind of clause boundedness. Therefore it is worthwhile to build a careful case that neither relative clauses nor tensed clauses are scope islands.

In this section I will present data—some old, some new—showing that neither relative clauses nor tensed clauses are scope islands. The presence of a scope island depends instead on the identity of the clause-embedding predicate: some predicates create scope islands, and some do not.

2.1 *The beautiful idea: that QR obeys constraints on overt movement*

Rodman 1976 discusses the following two examples:

(3) John has dated a woman who loves every man. $*\forall > \exists$

(4) Guinevere has a bone that is in every corner of the house. $*\forall > \exists$

On the basis of (only) these two sentences, he declares that "In a relative clause the element that is relativized always has wider scope than any other element in that relative clause"—in other words, that relative clauses are scope islands. He then shows how a modification of Montague's 1973 PTQ fragment could enforce relative clauses as a scope island. He points out that the modification also makes relative clauses syntactic islands, which he considers a good result.

Chomsky 1975 challenges the accuracy of Rodman's empirical generalization.

(5) John said that everyone had left. *$\forall >$ said

Based on the observation that (5) resists inverse scope, Chomsky suggests that clauses, plain and simple, are scope islands, not relative clauses in particular. Given that relativization ignores clause boundaries (e.g., in *the man that [Ann said [Bill liked _]]*, the relativization crosses two clause boundaries), Chomsky concludes, contrary to Rodman, that with regards to scope islands and relativization, "very different principles are at work."

In his 1977 dissertation, May explores Chomsky's suggestion that clauses in general, and not just relative clauses, are scope islands. However, May endorses Rodman's idea that syntactic and semantic constraints could turn out to be a single set of constraints (May 1977, p. 2):

> [I] propose a rule, QR, which generates representations at Logical Form for sentences containing quantifiers. Well-formedness of representations at this level is determined by universal principles on the output of the rules of core grammars... [I]t follows from the Subjacency Condition that quantification is clause bounded, in the unmarked case.

Subjacency says that overt syntactic movement cannot cross more than one bounding node, where at least S counts as a bounding node. On May's 1977:172 analysis:

(6) $[_{S_2}$ John hissed $[_{\bar{S}}$ that $[_{S_1}$ Smith liked $[_{NP}$ $[_{Q}$ every painting]]]]]

In order for the universal to take scope over the matrix clause via QR, it must cross two S nodes, which would violate Subjacency. It follows that if we assume that QR obeys constraints on syntactic movement, we predict that clauses are always scope islands.

This beautiful idea—that constraints on semantic scope and syntactic movement could flow from a single source—took a powerful hold on the imaginations of a generation of semanticists. The idea is clearly articulated in recent handbook articles. Ruys and Winter 2011 write that "evidence for QR exists to the extent that generalizations on quantifier scope can be stated in terms of syntactic properties of the relevant constructions, and to the extent that these generalizations apply to other purported movement operations as well. Ultimately, on the QR approach, a unified theory explaining properties of both overt and covert movement should be possible." Likewise, Dayal 2013 writes that "Conceiving of Quantifier Raising as a syntactic rule provides a general explanation for some of the restrictions on quantifier scope... [W]hatever principles of syntax rule out the formation of overt dependencies in these constructions can be tapped to rule out the creation of problematic covert dependencies at LF."

Variations on the basic idea have been proposed. To mention just two notable examples, Huang 1982 argues that Subjacency does not apply to QR, but the ECP does, a position later taken up by May 1985:29. Cecchetto 2004 proposes that it is syntactic phases that create scope islands (see sections 6 and 7 below for further discussion).

Of course, given the assumption that clauses are scope islands, one inconvenient fact for the beautiful idea is that clauses are typically not syntactic islands; they certainly are not in English. So any correspondence between syntactic islands and scope islands would have to be imperfect at best.

Since relative clauses are among the strongest syntactic islands cross linguistically, the belief that relative clauses are scope islands was consistent with the idea that syntactic islands and scope islands arise through general constraints on movement. But unfortunately for the beautiful idea, as we will see immediately below, relative clauses are not scope islands.

Despite the immediate and sustained popularity of the hypothesis, there were dissenting views. Farkas 1981 argues that QR ignores syntactic islands, and Huang's 1982 dissertation showed that in-situ wh in Mandarin scopes out of syntactic islands. In both of these cases, covert scope-taking clearly does not behave like overt syntactic movement.

2.2 *Relative Clauses are not scope islands*

The literature contains a number of counterexamples to the claim that relative clauses are scope islands.

May 1977:223 himself offers a sentence that he considers to be an exception to the claim:

(7) A book [which every prisoner left] surprised the warden.

Here and in the next few examples, I've surrounded the relative clause in question in square brackets. According to May, the universal can scope over the indefinite.

Sharvit 1999 observes that (8) has an interpretation on which the universal appears to take wide scope and bind the pronoun.

(8) The woman [that every man hugged] pinched him.

I'll return to Sharvit's analysis below in section 3.4.

Based on examples like the following, Hulsey and Sauerland 2006 declare that "relative clauses are not scope islands."

(9) The picture of himself [that everyone sent in] annoyed the teacher.

Finally, Szabolcsi 2010:107 offers the following counterexample:

(10) $^{\gamma}$A timeline poster should list the different ages/periods (Triassic, Jurassic, etc.) and some of the dinosaurs or other animals/bacteria [that lived in each].

Here and throughout I'll use $^{\gamma}$ to indicate a naturally-occurring example. The context clearly expects that there will be a different list of dinosaurs for each period covered by the timeline, i.e., in which case *each* takes scope over *some*.

In addition to these examples from the literature, it is easy to find as many naturally-occurring counterexamples as desired. Here are some:

(11) $^{\gamma}$The data set represents the number of snails [that each person counted on a walk after a rainstorm]. 12, 13, 22, 16, 6, 10, 13, 14, 12

(12) $^{\gamma}$The papers are all laid out by alphabetical order, so you can see the grade [that every person got].

(13) $^{\gamma}$What is the absolute earliest [that each character can die]?

(14) $^{\gamma}$Classroom time and content vary based on the job [that each person does].

(15) $^{\gamma}$For the experiment, measure the time [that each person took to travel 20 meters].

(16) $^{\gamma}$There is a role [that each person is uniquely designed by God to fulfill].

(17) $^{\gamma}$Include the name of the person [that each volunteer must report to].

(18) $^{\gamma}$Ask for the complete name of the insurance company [that will issue each policy].

(19) $^{\gamma}$Give the name [that corresponds to each abbreviation]: (a) GTP; (b) dCDP; (c) dTTP; (d) UDP.

(20) $^{\gamma}$Yet at the time [that we devised each plan], we were confident it would succeed.

(21) $^{\gamma}$Reflecting and thinking about all of this, we separate the word [that most represents each sign of the zodiac].

(22) $^{\gamma}$The following diagram sets out the stages, and the main events [that occur in each stage].

(23) $^{\gamma}$Note that the superscripts displayed are the changes [that occur to each bit when borrowing].

All of these example allow interpretations on which the universal can take scope outside of the relative clause. In several of these examples, it is clear that the intended interpretation requires the universal to take wide scope. Note that in the last six examples, the quantifier is not in subject position.

These examples show that relative clauses are not in general scope islands. What, then, accounts for Rodman's examples, repeated here?

(24) John has dated **a woman** who loves every man.

(25) Guinevere has **a bone** that is in every corner of the house.

These examples contrast with the data in (11) through (23), which (except for the existential construction in (16)) all contain definite relational head nouns and relative clauses in the past tense.

Perhaps more tellingly, Rodman's examples involve *every*. It is well known that *each* is a stronger island escaper, so if we want to test whether relative clauses are islands, we should test with *each*.

Putting these considerations together, we can attempt to construct an example that favors the wide scope reading by adjusting the determiner, putting the relative clause into the past tense, and replacing *every* with *each*:

(26) As part of their usual painstaking security clearance background investigation, the FBI agents tracked down and interviewed at least one woman [who had dated each man].

The context favors a scenario in which there are multiple women. To the extent that this example makes an inverse scope easier to access, it supports the hypothesis that an explanation for Rodman's examples does not require that relative clauses are scope islands.

More research is needed to understand the factors that are at play in Rodman's examples. But in any case, what matters here is whether there are *any* quantifiers that systematically scope out of relative clauses—and, as we have seen, there clearly are.

2.3 *Tensed clauses are not scope islands*

Just as for relative clauses, the literature reports a number of counterexamples to the claim that tensed clauses are scope islands.

Von Stechow 1984 and Larson 1988 each notice that universals embedded in tensed clauses in comparative clauses can take scope over the clause in which they are embedded, as indicated by the logical paraphrase of (27).

(27) Ann is taller than every professor is. $\forall x.\mathbf{taller}(\mathbf{ann})(x)$

Moltmann and Szabolcsi 1994 observe that the truth conditions of sentences like (28) are equivalent to the universal taking wide scope over the embedded interrogative, though they provide an analysis that does not involve the universal undergoing QR.

(28) Ann knows who made each dish. $\forall x.\mathbf{dish}(x) \rightarrow \mathbf{knows}(\lambda y.\mathbf{made}(y)(x))(\mathbf{ann})$

Their analysis is discussed below in section 3.5.

Fox and Sauerland 1996 observe cases in which the universal appears to scope out of the embedded clause.

(29) In general, a guide ensures that [every tour to the Louvre is fun].

They suggest that this is an "illusion", and that the quantification comes from the generic operator.

Farkas and Giannakidou 1996 offer (30) as a counterexample to Fox and Sauerland's

claim in which the universal scopes over the matrix indefinite despite no hint of genericity.

(30) A student made sure that [every invited speaker had a ride].

See also Dayal 2013 for relevant discussion.

Szabolcsi 2010:107 offers (31):

(31) Determine whether [each number in the list is even or odd].

Based on a number of similar examples, her assessment is that the scope of universal quantifiers "is not always clause-bounded: *each NP* supplies solid counterexamples."

Finally, Wurmbrand 2018 develops a processing theory on which scoping out of tensed clauses is (normally) expected to be degraded, but not impossible. That theory is discussed below in section 7.

And of course, in all of the relative clause examples above, the relevant scope taker is within a tensed clause.

In addition to the constructed examples from the literature just discussed, naturally-occurring examples of universals scoping out of tensed clauses are easy to find.

***Before* and *after*:**

(32) Someone needs to clean the room after each guest has left.

(33) $^{\gamma}$After [each person had been taken], we heard a shot—one for each.

(34) $^{\gamma}$After [each person had eaten], they had a spot of kunkumam (colored powder) placed on their foreheads.

(35) $^{\gamma}$Henceforth you will see a draw method call after [each object is created]

(36) $^{\gamma}$Before [each person had a turn doing the DB thrusters], that person had to do a farmer's carry of 40 meters

(37) $^{\gamma}$After [each person had a turn of leading the horse, they were given a debrief on their communication style which ranged from bored, quiet, ...

(38) $^{\gamma}$after [each person had written down his opinion on an issue] he was handed back a slip of paper presumably containing a tabulation of the opinions in the group

***When*:**

(39) $^{\gamma}$When [each person had finished his turn at shoveling], he placed the spade back into what remained of the mound.

(40) $^{\gamma}$When [each person finishes], thank them for sharing. Take a few seconds to pause in silence before the next person shares.

(41) $^{\gamma}$When [each person finishes filling out the form], they should place it back on a table and remain or leave the space.

(42) $^{\gamma}$When [each person finishes speaking], they pass the football to someone else.

***Unless*:**

(43) $^{\gamma}$Unless [each person thinks that the others will cooperate], he himself will not.

(44) $^{\gamma}$Unless [each person communicates their needs], the other family members aren't likely to help them satisfy ...

***Make sure/ensure*:**

(45) A student made sure that [every invited speaker had a ride]
== Farkas and Giannakidou's (30) above

(46) $^{\gamma}$But someone has to make sure that [each actor has what is needed at the time it is needed].

(47) $^{\gamma}$On a global scale, someone has to make sure that [each application, when introduced, doesn't send ... shock waves through the economy].

(48) $^{\gamma}$Someone needs to make sure that [each incoming report or complaint of abuse is actually being investigated].

(49) $^{\gamma}$Someone should ensure that [each tool has been returned to its proper storage location]...

(50) $^{\gamma}$Once the responsibilities are clarified, someone should make sure that [each group is doing what it is supposed to do].

The last set of counterexample is particularly revealing, since they involve verbs that take a tensed clause complement.

Given the number and the variety of counterexamples, I conclude that tensed clauses are not in general scope islands.

So what explains the examples motivating the belief that Quantifier Raising is clause bounded? Here is May's 1977:171 entire data set motivating the claim that QR is clause bounded:

(51) Jones hissed that Smith liked every painting in the Metropolitan.

(52) John quoted Bill as saying that someone had left.

(53) His mother said loudly that everyone had to go.

(54) Susan didn't forget that many people had refused to contribute.

(55) Helen grieved that each of the monkeys had been experimented upon.

(56) It is instructive for someone to play the piece first.

(57) It's impossible for The Kid to fight a contender.

(58) It's false that all the men left the party.

(59) John asked whether he had bought some shuttlecocks at Abercrombie's.

(60) Carol wondered why everyone was reading *Gravity's Rainbow*.

(61) Mark regretted Sam's having invited so few people.

It has been well-known since the early 1980's that the scope of indefinites is not clause bounded, so we can disregard (52), (54), (56), (57), and (59). (Wide-scope indefinites are discussed below in section 3.2.) The literature on pair-list readings argues that universals can in effect scope over wh-questions, which allows us to also set aside (60).

The remaining predicates are all attitude verbs or verbs of communication: *hiss*, *say*, *grieve that*, *regret*, and (arguably) *be false*. This suggests an alternative hypothesis: the complement of attitude verbs is a scope island for *every* and *each*. The prediction is that if we can find a clause-embedding verb that is not an attitude verb, it might potentially allow universals inside of its complement to scope out. And this is exactly what we found above for *ensure* and *make sure*. (It is interesting to realize how few verbs that embed tensed clauses are not attitude verbs or verbs of communication.)

Again, what matters here is whether there are *any* situations in which universals scope out of a tensed clause—and we have seen abundant evidence that there are.

So here's what the evidence so far shows: universal quantifiers can systematically scope out of clauses, including relative clauses and tensed causes. It follows that clauses as a class are not scope islands. Furthermore, it is clear that whether a universal can scope out of a clause depends on the embedding predicate: if the embedding predicate is *think*, it cannot, but if the embedding predicate is *make sure*, it can. Therefore any adequate theory of scope islands must allow scope islands to be created on a per-predicate basis.

3 The exceptional scope conspiracy

The supposed islandhood of clauses guided important decisions about the right way to analyze semantic phenomena. So if clauses are not in fact scope islands, we need to rethink those decisions.

On the assumption that QR is clause bounded, when a scope-taker takes scope outside of its local clause, it is often said to take "exceptional" scope, presumably via some mechanism other than QR. In this section, I'll show that after examining a number of cases, a suspicious pattern emerges:

(62) **The exceptional scope conspiracy**: Non-QR scoping mechanisms deliver the same truth conditions that QR would have if we ignored islands.

The conspiracy does not require QR to deliver the exact same set of interpretations as an alternative technique. In particular, plain QR without additional constraints may

overgenerate. (We'll turn to restricting QR in section 5.) All that is required in order to count as a situation in accord with the conspiracy is for each interpretation that is provided by the alternative scoping method to be among the interpretations that an unconstrained QR analysis would have provided.

The following subsections will present brief cases for indicting five theories as co-conspirators.

3.1 *Focus*

Rooth's 1985 dissertation composes focus meanings via pointwise combination of sets of alternatives. Rooth considers using QR as a scoping mechanism for computing focus, but rejects QR for two main reasons. The first reason is that association with focus is not clause bounded, and so presumably can't be handled by QR; and the second reason is that alternative sets provide an elegant account of multiple foci.

But, as we've seen, QR is not clause-bounded. This motivates rethinking the composition of focus. Multiple foci are no impediment; see Krifka 1992 for an approach to multiple foci that does not rely on alternative sets. Rooth himself in his 1996 handbook article discusses the tradeoffs between QR and alternative sets for handling multiple foci, nested foci, and variables bound by focused antecedents. He concludes that "we might as well adopt scoping [i.e., QR] or some other compositional mechanism with a semantics of lambda binding as our compositional semantics for focus."

3.2 *Indefinites*

It is well known that the scope of indefinites is definitely not clause bounded. Fodor and Sag 1982 argued that the scope of indefinites is either clause bounded or maximal (root level). Farkas 1981 discovered that (63) has an additional interpretation on which the indefinite takes scope at a strictly intermediate level, in this case, outside of its local clause but inside the scope of *each*.

(63) Each student read every paper that discussed a particular problem. $\forall > \exists > \forall$

Faced either with abandoning clauses as a scope island, or seeking a principled explanation for the behavior of indefinites, the field began the search for a non-QR account of indefinite scope.

Abusch 1994 explained how to understand indefinite scope as a consequence of Heim's 1982 proposal that indefinites contributed properties rather than quantifiers.

Reinhart 1997, Kratzer 1998, and Winter 1997 each argued that indefinites could contribute a variable with the type of a choice function ($(\mathtt{e} \to \mathtt{t}) \to \mathtt{e}$). That variable was either bound by a spontaneously generated existential quantifier ("existential closure"), or provided by context.

For all of these theories, the reason that indefinites were not clause-bounded was simple: they contributed a variable, not a quantifier; and since they weren't quantificational, they didn't need to take scope. This strategy enabled QR to catch all the universally-quantified tuna in its clause-bounded net, at the same time the indefinite dolphins swam free.

Schwarzschild 2002 discussed singleton indefinites: indefinites whose restrictions were pragmatically limited to an extension of cardinality 1, in which case the indefinite could have its scope limited by scope islands, yet the truth conditions would be equivalent to wide scope interpretations.

A separate strand of the literature (Kratzer and Shimoyama 2002, Alonzo-Ovalle 2006, Charlow 2019) proposes that indefinites contribute sets of alternatives, in much the same way that focused phrases do in Rooth's alternative semantics for focus. And just as for focus composition, the sets of alternatives are composed via pointwise function composition.

What is most relevant here is that in each of these proposals, the reason indefinites are not clause bounded is supposed to be because they take scope via some mechanism other than QR; and in each of these proposals, the net effect of the alternative scoping mechanism is equivalent to what we could have derived by using a non-clause-bounded version of QR. That is, alternative semantics is perfectly in accord with the expectations of the exceptional scope conspiracy.

Schwarz 2001 detected signs of the conspiracy, observing that "indefinites can often be interpreted as if they had scoped from a syntactic island."

An important refinement: Reinhart 1997 shows that standard generalized quantifier theory gives the wrong result for cardinal quantifiers.

(64) If three of my relatives die, I'll inherit a fortune.

We can't simply use QR to scope the quantifier standardly denoted by *three of my relatives* out of the conditional, since that would predict a reading that entails that the

speaker could inherit as many as three fortunes, one for each relative, an interpretation that is not available for (64).

The diagnosis in Szabolcsi 2010 chapter 7 is that cardinal indefinites (along with other types of scope-takers) systematically give rise to two layers of quantification: an existential quantification over plural (sum) individuals (in (64), over sums of three relatives), and a distributive quantification over the elements of the sum. These two quantificational elements have different scoping potentials. In particular, the existential component can take arbitrarily wide scope, just like an ordinary singular indefinite can, but the distributive component will be trapped by more local scope islands, just as if it were an ordinary universal quantifier. Charlow's 2019 detailed account of this kind of 'split scope' using higher-order traces is fully compatible with the fragment below. Once we have this more fine-grained analysis in place, QR of the existential quantifier part gives the same truth conditions as the choice function analysis, in accord with the expectations of the conspiracy.

A related note about intensions: for the sake of readability, the denotations in this paper are all extensional. However, intensionality is potentially relevant for evaluating the claim that QR delivers the same interpretations as other scoping mechanisms. The reason is that using QR to give indefinites wide scope forces a de re interpretation of the descriptive content contained by the indefinite. Keshet and Schwarz 2019 point out that both of the leading theories of de dicto/de re (world variable binding and split intensionality) also guarantee that wide scope forces de re, and most scholars accept this as an accurate empirical prediction. More work would be required to fully litigate this issue, but it appears that the distribution of de re readings conforms to the conspiracy.

3.3 *Functional indefinites*

Building on Reinhart 1997, Winter 1997, and others, Schwarz 2001 argues that there are two kinds of indefinites: the kind that can be accurately represented by an existential quantifier with the appropriate scope, and functional indefinites.

(65) If every student improves in a (certain) area, no one will fail.

$\exists f.\textbf{if}(\forall x.\textbf{improves}(x)(f(x)(\textbf{area})))(\textbf{no-fail})$

Schlenker 2006 shows that the truth conditions for (65) are not equivalent to any configuration of *if*, $\forall$, and $\exists$. He shows that allowing the indefinite to denote a Skolemized choice function will work, i.e., allowing the variable f in the truth conditions above to have the type $\mathtt{e} \to (\mathtt{e} \to \mathtt{t}) \to \mathtt{e}$. Note that the existence of functional indefinites does not refute the conspiracy hypothesis; even taking the data at face value, all it shows is that there are semantically two kinds of indefinites, differing only in whether they quantify over ordinary choice functions or Skolemized choice functions. Both kinds rely on the introduction of an existential quantifier, and QR remains eminently well-suited to delivering that existential to its scope position.

Bumford 2015, building on insights of Solomon 2011, points out that functional indefinites, like pair-list readings and certain other phenomena, only arise in the presence of a small number of distributive quantifiers, essentially *every* and *each*. For instance, the example above in (65) crucially contains an occurrence of *every*. Bumford suggests that it is the semantics of the distributive quantifiers that is special, and he provides a semantics on which the independently-motivated semantics of the distributive quantifiers, along with an appropriately dynamic theory of indefinites, delivers the functional reading even

though the indefinites contribute a completely ordinary simple existential meaning.

In any case, the conspiracy theory remains viable throughout this discussion of indefinites: no matter what scoping mechanism is proposed, the truth conditions end up being exactly what they would be if the indefinite introduced an existential quantifier that took scope via QR.

3.4 *Functional Relative Clauses*

Sharvit 1999 discusses a class of examples in which a universal appears to take scope outside of a relative clause:

(66) ha-iSa Se kol gever xibek cavta oto [Hebrew]
the-woman that every man hugged pinched him
For every man *x*, the woman that *x* hugged pinched *x*.

Sharvit reports that functional relative clauses are only available in Hebrew when the universal in question is in subject position in the relative clause. Farkas and Giannakidou 1996 make a similar observation about when universals can scope out of relative clauses in Greek. However, as we have already seen in (10) and in (18) through (23), there is no corresponding subject requirement in English.

Sharvit remarks that "if Scoping (Quantifier Raising or 'quantifying in') is clause-bounded, as is often argued, it cannot be the mechanism responsible for these readings." This consideration is a significant factor motivating an analysis based on a special-purpose silent relativization type-shifting operator. This operator takes as arguments an adjacent quantifier (*every man*) the rest of the relative clause (*hugged*), the content of the head noun that the relative clause modifies (*woman*), the determiner (*the*),

and a relation formed by abstracting a pronoun position contained within the continuation of the determiner phrase (*pinched him*). The operator collects these pieces and reassembles them in such a way that the net effect is exactly as if the universal had undergone QR to a position taking scope over the matrix sentence. In other words, the operator is engineered in a way that fulfills the expectations of the conspiracy hypothesis.

3.5 *"Scope island? Scope the island!"*

There is a well-known technique for obeying the letter of the standard wisdom on scope islands while flouting the spirit. Even if scope takers remain unable to scope out of their minimal clauses, those clause themselves can be raised, and, under various assumptions, scope takers trapped inside the raised clause can in effect take exceptional scope. Charlow 2019 calls this "scoping the island," and views it as a similar to Nishigauchi's 1990:42 covert pied piping of wh expressions embedded in islands. (The title of this subsection is advice that Nick Fleisher (personal communication) gives graduate students who need to cope with the incorrect predictions of making QR clause-bounded.)

Scoping the island is conspiratorial behavior: the net result is exactly as if the original scope-taker had scoped out of what was incorrectly assumed to be an island.

Moltmann and Szabolcsi 1994 and Szabolcsi 1997 offer empirical evidence in favor of island-scoping.

(67) a. Some librarian or other found out which book every student needed.

b. 'for every student, there is some librarian who found out which book he needed'

They note that it is "standardly assumed" (Szabolcsi 1997: "generally agreed") that QR is

clause bounded. Moltmann and Szabolcsi propose an analysis that respects this assumption. On their analysis, the universal takes scope (only) over the complement of *found out*. Rather than returning a quantified proposition as usual, it returns a function from clause continuations to propositions. For instance, in (67a), the relevant continuation is λq.*some librarian or other found out* q. The net result is "exactly the same as what we would get if *every student* scoped out on its own". In other words, this is a clear example of the exceptional scope conspiracy.

Moltmann and Szabolcsi 1994 and Szabolcsi 1997 argue in support of their analysis.

(68) More than one$_i$ librarian found out which book every boy stole from her$_i$.

If *every boy* QRs to matrix position, nothing prevents *one librarian* from binding *her*, as in *More than one$_i$ librarian gave every boy her$_i$ email address*. But if the entire embedded clause takes scope, the pronoun is lifted along with the embedded clause to a position where it can't be bound by *one librarian*. Moltmann and Szabolcsi report that native speaker intuitions favor the island-scoping analysis and not the direct QR analysis.

However, binding is notoriously sensitive to pragmatic factors. If we adjust the pragmatics, the bound reading becomes noticeably easier:

(69) In fancy restaurants around here, more than one$_i$ waiter always asks which type of water (still or sparkling) every customer wants him$_i$ to bring to the table.

At least some native speakers get a reading on which sets of waiters covary with customers, at the same time that the pronoun is bound by the quantifier.

Charlow 2019 advocates scoping the island as a general technique for handling

wide-scope indefinites. In Charlow's formal system, indefinites introduce alternatives, which combine via pointwise composition to in effect take scope over their minimal clause, respecting the assumption that clauses are scope islands. The same mechanism then allows the clause, which now denotes a set of alternative propositions, to take scope over *its* embedding clause, and so on. The truth conditions work out exactly as predicted by the scope conspiracy hypothesis: as Charlow put it, it's as if "the indefinite had directly undergone one vast island-disrespecting scoping." Clearly conspiratorial.

3.6 *Is QR the one true scoping mechanism?*

If this conspiracy is real, what could lie behind it? One obvious possible explanation is that all scope taking is accomplished by Quantifier Raising after all. Of course, QR would have to be supplemented with some general way of imposing scope constraints. In section 5 I propose just such a system, and show how it can account for a wide variety of scope island effects.

Another possibility is that QR accurately approximates multiple scoping strategies because scope taking is scope taking: there is really only one way for an expression to take a portion of its surrounding context as its semantic argument. Then the reason that QR serves as such a good general scoping mechanism is because it is 'pure' scope taking, that is, scope taking without any additional requirements.

In any case, it remains quite possible that natural languages make use of more than one scope-taking mechanism. There may be good reasons—that is, reasons other than a mistaken belief that clauses are scope islands—for appealing to non-QR scoping mechanisms for certain phenomena, even if they deliver truth conditions equivalent to

those QR would give.

But even if so, we can still use QR as a uniform mechanism to describe a wide range of scope-taking phenomena. As we'll see in the next section, placing a number of different scope taking elements side by side within a single grammatical framework can reveal systematic patterns that might not have been obvious otherwise.

4 The subset constraint

The data in the previous sections support the following claims:

- Relative clauses are not scope islands
- Clauses are not scope islands
- Scope islands are created on a per-predicate basis (e.g., the complement of *think* is a scope island for universals, but *make sure* is not)
- Scope islands trap some scope-takers but not others (e.g., indefinites can escape from some islands that universals cannot)

This section poses the following research question: how many different kinds of scope islands are there? The methodological goal here is to imagine a worst-case scenario in which we need several distinct flavors of scope island. It's not as bad as it might have been, however: I'll argue that the various flavors obey a systematic pattern that I will call the Scope Island Subset Constraint.

The traditional answer to the question of how many types of islands we need is "one". On this view, a scope island traps all and only elements that take scope via QR, including

universals, leaving all other scope takers free to scope as widely as their non-QR scoping methods allow.

However, since we are exploring the possibility that all scope-taking can be implemented via QR, we'll need to find a way to allow various scope takers to escape from some islands but not others. This should not be too traumatic, given that syntacticians have long recognized that some syntactic islands are sensitive to the identity of the extracted expression, the so-called 'weak islands' (see Szabolcsi and Lohndal 2017 for an overview).

For instance, we've seen that universals can take scope outside of the complement of *make sure*. It seems unlikely, however, that downward-monotone quantifiers like *no one* can ever scope out of an embedded clause.

(70) a. Someone claimed that no one left. $*\neg\exists > \exists$

b. Someone claimed that everyone left. $*\forall > \exists$

(71) a. Someone made sure that no one left. $*\neg\exists > \exists$

b. Someone made sure that everyone left. $\forall > \exists$

The predicate *claimed* traps both the downward monotone quantifier and the universal, but the predicate *made sure* traps only the downward monotone one. That means we'll need at least two types of islands, since we need to make a three-way distinction between downward monotone quantifiers, universals, and indefinites.

Weak negative polarity items (NPIs) like *anyone* motivate adding a third type of island. The contribution to truth conditions of an NPI is equivalent to that of a narrow-scope indefinite (setting aside contrastive widening effects, which are independent of

quantificational force and scope of quantification):

(72) a. I will never vote for a republican.
b. I will never vote for any republican.

Chierchia 2013:28 comments that in non-contrastive environments, these sentences are "perfectly interchangeable" (cue the conspiracy theme music...).

It follows from any viable theory of negative polarity that the scope of an NPI must be narrower than some licensing operator. But merely guaranteeing that an NPI must take scope within its licensing context is not enough to get the scope facts right. The reason is that when an NPI has two potential licensors, it must be licensed by the *closest* potential licensor.

(73) Ann doubts Bill didn't see anyone. *doubt $>$ $\exists$ $>$ not

Even though *doubt* is a potential licensor (*Ann doubts Bill saw anyone*), the scope of the NPI in (73) is trapped inside the embedded negation. This is precisely what we should expect if all licensing operators, including sentence negation, are scope islands for weak NPIs.

What this means for the question at hand is that although NPIs can escape from the complement of *claimed*, the complement of *doubt* traps NPIs, but not ordinary indefinites:

(74) a. Ann doubts Bill claimed anyone left. doubts $>$ $\exists$ $>$ claimed
b. Ann doubts anyone left. *$\exists$ $>$ doubts
c. Ann doubts someone left. $\exists$ $>$ doubts

Thus the kind of island that traps the scope of NPIs must differ both from those that trap universals and those that trap indefinites.

In fact, it turns out that there may be contexts that trap the scope even of ordinary indefinites. I'm not aware of any place in the literature where this has been noted:

(75) Ann only showed a book to BILL. *$\exists >$ only

When an indefinite occurs in the focus domain of VP-modifier *only*, it must take scope inside the focus domain. That is, (75) does not have an interpretation on which it entails the existence of a specific book x such that the only person Ann showed x to was Bill (which would be compatible with there being a different book y that Ann showed to several people).

For theorists who favor treating indefinites as introducing alternatives, this new observation may be welcome. Since *only* manifestly collapses the alternatives introduced by the presence of a focus operator, we might expect that it will capture the scope of any other alternative-introducing operators, including indefinites.

Unfortunately, it's not quite that simple. As Charlow 2019 observes, different indefinites can take scope over different regions.

(76) If [a persuasive lawyer visits a rich relative of mine], I'll inherit a house.

He observes that either or both of the indefinites can take scope inside or outside of the antecedent of the *if* clause. Charlow accomplishes this by allowing (actually, by failing to prohibit) higher-order scope-taking, which produces layers of scope-taking. Glossing over

the technical details, lower layers of alternative sets can be collapsed without preventing higher layers from taking wider scope. And in general, the various semantic operators that have been supposed to introduce alternatives (indefinites, disjunction, weak NPIs, etc.) all have scope domains that are independent of each other when focus is not present.

Given indefinite layering, the natural expectation is that *only* could associate with one or more of the lowest layers of alternatives, in which case an indefinite could potentially escape. Forcing *only* to always capture all layers would require special stipulation. On the formal account developed below, the desired result falls out from making focus domains a kind of island that traps indefinites.

Is the focus domain of *only* such a strong island that nothing escapes? No: expressives can escape from any island.

(77) Ann said she only showed the damn book to BILL.

It is the speaker, not Ann, who is committed to the expressive contribution of *damn*.

We can now take stock. In the chart below, a '*' indicates that there is empirical data suggesting that the scope-taker at the top of the column cannot escape from the scope island created by the predicate on the left.

						Island strength:
	damn	someone	anyone	everyone	no one	
only		*	*	*	*	4
doubt			*	*	*	3
claimed				*	*	2
make sure					*	1
	4	3	2	1	0	←**Escaper strength**

Table 1: Island strength versus escaper strength

There is an obvious pattern: all of the stars are bunched up in the top right corner. This motivates the following generalization:

(78) **The Scope Island Subset Constraint** (island version): given any two scope islands, the scope-takers trapped by one is a subset of the scope-takers trapped by the other.

If the subset constraint holds in general, we can always associate each scope island with an element in a strict ordering, and we can think of that element as the strength of the island in question. For instance, in the chart above, the complement of *claimed* is assigned an island strength of 2, since it traps universal and downward monotone quantifiers. (There is nothing special about using integers to index island strength, any well-ordered set will do.)

Likewise, we can characterize the island-escaping capacity of each scope-taker by associating it with the strength of the strongest island it is able to escape. Thus indefinites like *someone* are assigned an island-escaping strength of 3, since they can escape from all

three types of verb complement.

There is a second, completely equivalent way to state the constraint:

(79) **The Scope Island Subset Constraint** (scope-taker version): given any two scope takers, the set of scope islands that trap one is a subset of the set of scope islands that trap the other.

The two formulations are equivalent in the sense that a counterexample to one is also a counterexample to the other. They both predict that there will never be a case like the following:

(80)

	scope taker X	scope taker Y
island A		*
island B	*	

This is a situation in which the scope takers trapped by one island are in complementary distribution with the scope takers trapped by the other.

To illustrate the predictions of the subset constraint, consider the predicate *think*, which traps universals like *everyone* but not indefinites like *someone*. The subset constraint predicts that there can never be a predicate of English that traps indefinites but not universals. As far as I know, this prediction is correct.

However, there are situations in which a universal can appear to take wider scope than

an indefinite.

(81) What did everyone buy?

(82) What did someone buy?

The question in (81) has a pair list interpretation, on which a suitable answer could be 'Ann bought a book, Bill bought a record...'. In contrast, there is general agreement (e.g., Krifka 2001) that (82) does not have a corresponding wide-scope reading, which would convey roughly 'For some person *x*, tell me what *x* bought'.

The reason this is not a counterexample to the subset constraint is that the unavailability of the indefinite scoping over the interrogative in (82) is not due to the interrogative begin a scope island, since indefinites can easily scope out of interrogatives in other contexts:

(83) Ann knows what someone bought. $\exists >$ know

This example allows scoping the indefinite out of the interrogative, in which case there is a particular person such that Ann knows what that person bought. If so, then interrogatives as a class are not scope islands for indefinites. And indeed, Krifka 2001 proposes that the unavailability of the indefinite wide scope reading for (82) is due to the incompatibility of the so-called choice reading with the pragmatics of the speech act of asking a question, not on the interrogative clause constituting a scope island for indefinites.

5 Encoding and enforcing islands

Now that we have an empirical target to aim for, I will propose a formal model of scope islands, one that enforces the Subset Constraint.

It is important not to set expectations too high. Even assuming that further investigation bears out the predictions of the Subset Constraint, it is at best a descriptive generalization, and not an explanation. The same is true of the formal implementation offered in this section: although having a precise characterization of the predictions of the constraint is an essential next step, it does not in itself explain *why* the Subset Constraint exists. This formal proposal should be thought of merely as a clarification of the question—as a referee puts it, as an *invitation* to figure out what is really going on.

As usual with phenomena at the syntax/semantics interface, formal accounts can emphasize the syntactic side or the semantic side. I will propose here a simple solution that uses semantic types to encode scope islands, but I will also sketch below in section 6 how a syntactic approach might go.

I assume familiarity with the semantic framework developed in Heim and Kratzer 1998. As there, the set of types includes the two familiar base types $\mathtt{e}$, individuals, and $\mathtt{t}$, truth values. In addition, let $A \xrightarrow{m} B$ be the type of a function from objects of type A to objects of type B. The only novel part is the integer m, which encodes the *mode of syntactic combination* required by the type. These modes of combination are analogous to Montague's 1973 double and triple categorial slashes, and are also related the modes of multimodal Type Logical Grammar. Types with unlabeled arrows (e.g., '$\mathtt{e} \to \mathtt{t}$') have the default mode 0. I'll adapt the standard type abbreviations for default mode types: $\mathtt{et} = \mathtt{e} \to \mathtt{t}$ is the type of a default mode intransitive verb phrase, $\mathtt{et,t} = (\mathtt{e} \to \mathtt{t}) \to \mathtt{t}$

is the type of a default-mode (extensional) generalized quantifier, and so on.

These types allow us to construct a fragment that encodes the island constraints displayed above in table 1:

(84)

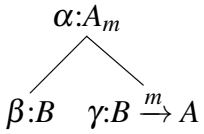
Scope takers		Embedding predicates	
no one	$(\mathtt{e} \xrightarrow{0} \mathtt{t}) \to \mathtt{t}$	ensure	$\mathtt{t} \xrightarrow{1} \mathtt{et}$
everyone	$(\mathtt{e} \xrightarrow{1} \mathtt{t}) \to \mathtt{t}$	claimed	$\mathtt{t} \xrightarrow{2} \mathtt{et}$
anyone	$(\mathtt{e} \xrightarrow{2} \mathtt{t}) \to \mathtt{t}$	doubt	$\mathtt{t} \xrightarrow{3} \mathtt{et}$
someone	$(\mathtt{e} \xrightarrow{3} \mathtt{t}) \to \mathtt{t}$	only	$\mathtt{e} \to \mathtt{eet} \to \mathtt{et}$
FOCUS	$\mathtt{e} \to (\mathtt{e} \xrightarrow{4} \mathtt{et}) \xrightarrow{4} \mathtt{only} \to \mathtt{et}$		
damn	$((\mathtt{et},\mathtt{et}) \xrightarrow{4} \mathtt{t}) \to \mathtt{t}$		

The types of the quantifiers and the clause-embedding verbs are completely standard except for their mode annotations. I'll explain the types for *only*, focus, and *damn* below. The remaining lexical items in the fragment have their usual (default-mode) types: *Ann, Bill* : e, *dog, left* : et, *saw* : eet, *the* : et,e.

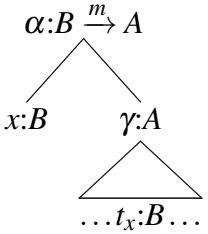
In order for these lexical entries to identify otherwise legitimate Quantifier Raising derivations as scope island violations, we must adjust the typing rules for logical forms.

(85) Island-sensitive typing rules for logical form:

Function application. Given a logical form α with two daughters β and γ (ignoring order), neither of which is an index, α will be composed via mode m and will have type A whenever β has type B and γ has type $B \xrightarrow{m} A$.



Predicate Abstraction. Given a logical form α with two daughters x and γ, where x is an index, α will have type $B \xrightarrow{m} A$ just in case γ contains exactly one trace with index x, and γ has type A whenever the coindexed trace has type B. **Island enforcement**: no node on the path between t_x and the root of γ can be composed via mode n if $n \geq m$.



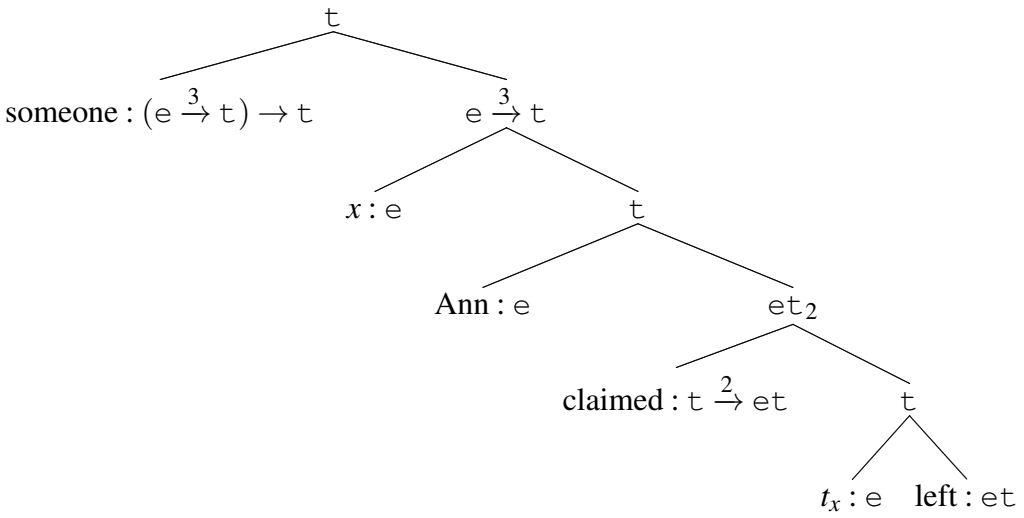
A QR derivation will be semantically coherent and island-compliant just in case every branching node in the final logical form (i.e., after all applications of QR) satisfies one of these two composition rules. (A rule for Predicate Modification can easily be added if desired.)

A technical point: the typing rule for Predicate Abstraction is non-deterministic, since there will always be an unbounded number of integers m that are large enough to satisfy the island enforcement clause. Which value for m should we choose? In practice, as we

will see in a moment, the choice of m is typically forced by the type of the raised element that creates the abstraction. In general, this potential source of non-determinism could be eliminated, if desired, by replacing individual modes with the set of all compatible modes (e.g., $\{m|m \geq 2\}$).

To illustrate, we have the following logical form for the sentence *Ann claimed someone left*:

(86)

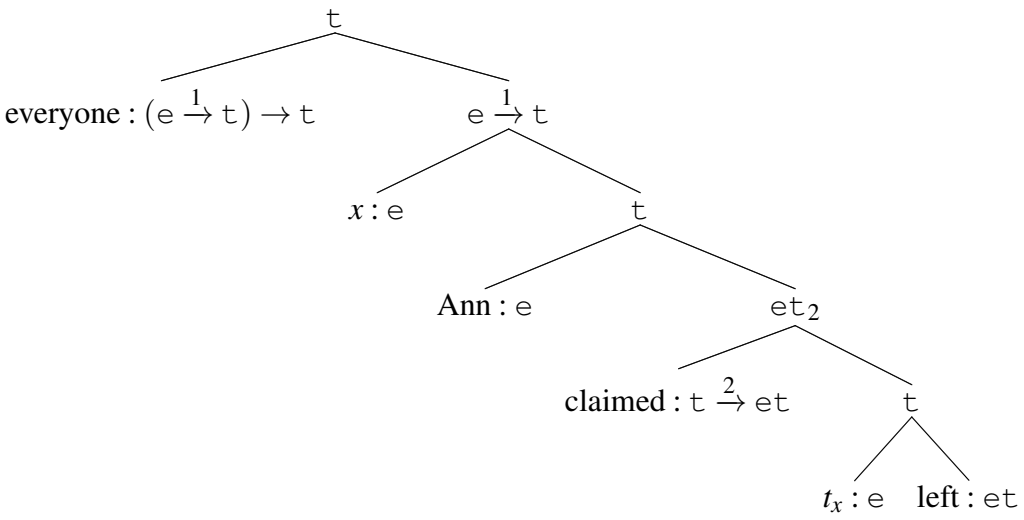


This logical form was created by Quantifier Raising *someone* out of the embedded clause. A subscript on a node label indicates the mode via which it was composed (e.g., '$\texttt{et}_2$'); unsubscripted nodes have default mode 0. It is easy to check that each node in this logical form satisfies one of the two composition rules just given. Note in particular that the lexical type of *claimed* requires that it compose with its clausal complement via mode 2, as indicated by the subscript on the VP node. The island enforcement clause of the Predicate Abstraction composition rule says that none of the nodes on the path between

the trace and the root of the nuclear scope of *someone* can have a mode greater than or equal to 3, but since that requirement is satisfied here, the derivation is sanctioned by the composition rules.

To illustrate an island violation, consider this logical form corresponding to the sentence *Ann claimed everyone left*:

(87)



In this derivation, the island enforcement clause is not satisfied, since there is a node on the path to the trace (namely, the embedded VP node) with mode 2, and $1 \not\geq 2$. Thus the lexical types, along with the composition rules, guarantee that the complement of *claimed* is a scope island for *everyone* but not for *someone*.

I have left unspecified the mechanism by which the grammar checks the scope island enforcement clause. There must be some way for passport control agents to scrutinize the visa of each long-distance traveler at every local trainstop along the movement path. One fully compositional way to do this is sketched in Barker and Shan 2014:201. The system

there is limited to two modes, but can easily scale up to any number of modes. However, explaining that system here would vastly complicate the exposition, so I will leave those details for a different occasion.

The following derivations will illustrate some of the predictions of this tiny lexicon.

(88) a. Someone ensured no one left.

b. someone (ensured (no one left))

(89) a. Someone ensured everyone left.

b. someone (ensured (everyone left))

c. everyone (λx (someone (ensured (left x))))

In each case, the complete set of interpretations is given. So the fact that (88) displays just one interpretation while (89) displays two shows that *everyone* is a stronger island-escaper than *no one*.

(90) a. Ann claimed everyone left.

b. (claimed (everyone left)) ann

(91) a. Ann claimed someone left.

b. (claimed (someone left)) ann

c. someone (λx ((claimed (left x)) ann))

Likewise, *someone* is a stronger island-escaper than *everyone*.

The complement of *doubt* traps weak NPIs, but not ordinary indefinites:

(92) a. Ann doubts anyone left.

b. (doubts (anyone left)) ann

(93) a. Ann doubts someone left.

b. (doubts (someone left)) ann

c. someone (λx ((doubts (left x)) ann))

Although ordinary indefinites can take scope out of many islands that trap other types of scope-takers, it is not true that they can always take wide scope.

(94) a. Ann only claimed someone saw BILL.

b. only BILL ($\lambda x(\lambda y((\text{claimed}(\text{someone}(\lambda z((\text{saw}x)z))))\text{y})))$ ann

c. only BILL ($\lambda x(\lambda y(\text{someone}(\lambda z((\text{claimed}((\text{saw}x)z))y)))))$ ann

For the sake of concreteness, I've adopted a structured meaning approach to focus as in, e.g., Krifka 1992, in which the focus particle *only* takes an ordered pair consisting of the focused phrase and a continuation created by abstracting the focused phrase; nothing hangs on this choice. In order to keep the type system simple, I've used the Church encoding of ordered pairs: the FOCUS operator takes for its arguments a focus value (the denotation of the DP in focus), its nuclear scope after raising to VP level (type `eet`), and the denotation of *only*, to which it feeds the focus value and the nuclear scope, returning a (quantified) verb phrase meaning (type `et`).

When *someone* takes scope under *claimed*, as in (94b), the property that Bill alone possesses is having Ann claim that someone saw him. When *someone* takes scope over

claimed, as in (94c), the property that Bill alone possesses is there being someone that Ann claims saw him. The difference is subtle, and has to do with whether Ann's claim was about a specific person.

The main point of interest here is that there is no reading on which *someone* takes scope over the entire focus domain, which would entail the existence of some person x such that it was only Bill that Ann claimed x saw. As discussed above, this reading does not appear to be an available reading for (94a), as predicted by making focus domains a scope island too strong for even indefinites to climb out of.

Finally, no scope island is strong enough to trap an expressive like *damn*:

(95) a. Ann only claimed the damn dog saw BILL.

b. $\text{damn}(\lambda f((\text{only}\ \text{BILL}\ (\lambda y(\text{claimed}((\text{saw}\ y)(\text{the}(f\ \text{dog})))))\ \text{ann}))$

Unlike indefinites, *damn* can escape even from a focus domain. In the terminology of Potts 2005, expressives are *speaker-oriented*: they always commit the speaker to certain attitudes, no matter how deeply the expressive is embedded.

Because of their speaker orientation, it is not self-evident that expressives should be analyzed in the same way as other scope-takers. Although the fragment allows *damn* to take widest scope, it does not guarantee that it will, so the fragment as it stands overgenerates. However, the logic of the scope conspiracy does not require that QR give a complete analysis of a phenomenon, only that QR provides appropriate truth conditions for the reading that are available. There are various ways compatible with QR to force expressives to take widest scope. For a particularly flat-footed example, adding a projection for expressives at the root level would suffice. Since a QR scoping analysis

provides appropriate truth conditions, the methodological principle suggested by the scope controversy says that we should continue to use QR to model scope until forced to use some other mechanism.

This simple fragment enforces scope islands depending both on the lexical type of the embedding predicate and that of the scope-taker in a way that respects the Subset Constraint.

5.1 *Previous formal accounts of scope islands*

Rodman 1976 adapts Montague's 1973 fragment in a way that enforces relative clauses as a scope island. His strategy is to adjust the relative clause formation rule, as well as the Quantifying In rule, so that a quantifier cannot bind into a relative clause. However, it is not clear how to scale Rodman's approach into a more general theory of scope islands that accounts for the full range of data surveyed above.

There are a number of accounts that make fine-grained distinctions among scope-takers, and then constrain where those scope-takers are allowed to take scope. Beghelli and Stowell 1997 is an especially prominent instance of this strategy. They articulate the left periphery of the clause into a sequence of nested functional categories, and then mark which classes of scope-takers are allowed to move into each of the functional projections. Their analysis makes a large number of welcome empirical predictions. However, nothing in their system limits scope-taking to a minimal clause, or to any other island context. We may ultimately need some analysis like Beghelli and Stowell's to have a complete account of scope constraints, but we must look beyond their analysis for a general mechanism for enforcing scope islands. (See section 6 below for

one idea about how to do this.)

Bernardi and Szabolcsi 2008 pursue a Beghelli and Stowell style approach within a formal system that provides a derivability relation among the syntactic categories of the scope-takers. This establishes a partial order among scope-takers that enables Bernardi and Szabolcsi to state useful generalizations over classes of scope-takers. However, like Beghelli and Stowell, they also assume some unspecified mechanism that enforces scope islands.

Bernardi and Szabolcsi pursue their investigation in the setting of a type logical grammar, taking advantage of the unary modalities, Galois connectives, and logical derivability afforded by the type-logical approach. The type logical tradition has long provided explicit mechanisms for constraining a variety of grammatical phenomena, from scrambling to associativity to scope taking. The first decades of this work is concisely summarized in Moortgat 1997. He explains how unary modalities can be deployed in a "lock and key" strategy: one modality (the lock) creates an island, and only elements marked with the dual modality (the key) can remove the lock to enable the completion of the derivation. In the usual deployment (e.g., Moortgat 1997, Bernardi 2002), scope takers are able to take scope freely within a region, but their scope-taking must be extinguished before the context that contains them (say, an embedded clause) can be placed under the key modality. Although this strategy can guarantee that scope-takers are restricted to their smallest containing clause (or other island), and although it is admirably flexible about creating islands on a per-predicate basis, it is not flexible about distinguishing among different scope-takers: in the usual configuration, either all scope-takers are trapped, or none.

Kokke 2016 supplements the lock and key strategy with special-purpose structural inference rules that allow specific scope-takers to escape from selected islands. For instance, he shows how to allow indefinites to scope out of embedded clauses at the same time that universals are trapped. In general, this allows for a system that creates islands that are both per-predicate and per-scope taker.

Kiselyov and Shan 2014 develop a continuation hierarchy along the lines of Danvy and Filinsky's 1990 general strategy for building hierarchical layers of continuations. The idea is that a scope-taker is an expression that takes a portion of its context as its argument. A scope island, then, is a context that bounds the scope-takers it contains. But if a scope-taker has a high enough type (higher in the continuation hierarchy) to take the context of its context as an argument, it can escape from the scope island. Kiselyov and Shan construct a hierarchy of levels of scope island and island escaping scope takers.

The system of Kiselyov and Shan has excellent theoretical and computational properties. In addition, it has plenty of fine-grained control: it establishes islands on a per-predicate, per-scope taker basis. On this approach, quantifier scope ambiguity is due to (systematic, rule-governed) polysemy in the scope takers. In contrast, on the system here, each scope-taker has a single type and a single denotation. In addition, the Kiselyov and Shan grammar has some expressive limitations in the form in which they present it: only clauses can be islands, scope takers can take scope only over clauses, the result type must be a clause. In practical terms, this means that their system cannot address focus, expressives, or in-situ wh, all of which are compatible with the LF-based approach developed above.

6 Sketch of a syntactic approach

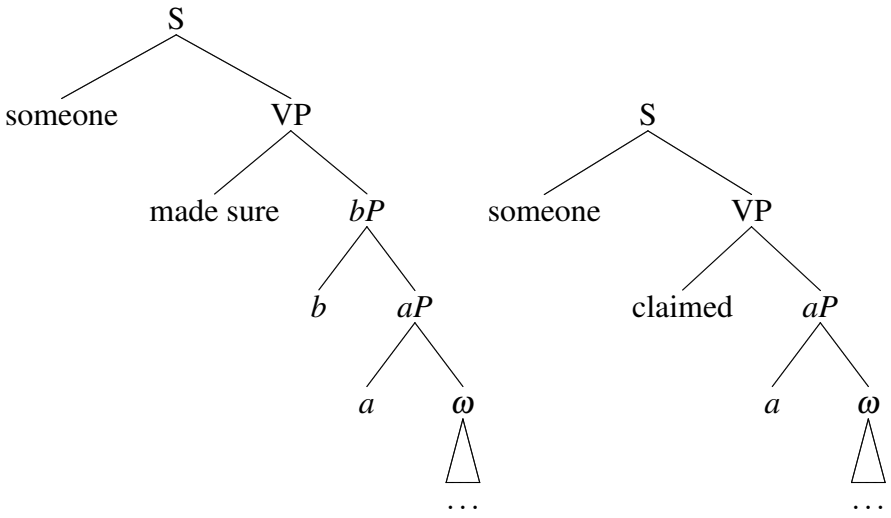
The idea discussed in this section is thanks to a generous referee.

First, assume that Quantifier Raising is successive cyclic. Nothing we've seen so far requires this, but nothing rules it out, either. There is good reason to believe that wh-movement can be successive cyclic (e.g., Chung 1982), and if overt movement is cyclic, why not covert movement (the beautiful idea again...)? This means that since the clause is generally taken to be a movement domain (that is, a phase), the only way a scope-taker could scope out of a clause would be to first move to some projection immediately above the domain boundary (call it ω), then move on further from there.

Second, in a spirit highly similar to Beghelli and Stowell 1997, imagine a set of functional elements *d*, *c*, *b*, and *a*, that must occur in a fixed order without gaps. That is, we can have structures such as [*c*[*b*[*a*[ω...]]]], but not [*c*[*a*[ω...]]], since it is not ok to skip the *b* projection in between *c* and *a*. Then the strength of a scope island depends on which

element in the order the embedding predicates selects for its complement.

(96)



If we assume that QR of *everyone* is triggered by the *b* feature, then it could escape from the complement of *made sure*, since *made sure* selects for a clause periphery that includes a *b* projection. But *everyone* could not escape from the complement of *claimed*, since *claimed* selects for a more restrictive periphery that does not allow for a *b* projection. Predicates that select for smaller peripheries create stronger islands, since there are fewer opportunities for scope-taking elements to escape. This strategy clearly respects the subset constraint, since selecting for a complement of a certain periphery size guarantees the presence of projections corresponding to all smaller sizes.

The cartographic approach brings the subset principle in line with the many other implicational hierarchies in the literature. To mention just one especially compelling semantic example, Deal 2019 chapters 3 and 4 derives implicational asymmetries in the context-shifting potential of indexicals by supposing there are four nested varieties of

clausal complements. Verbs can select which flavor of clause they take, and indexicals choose how much of the clausal spine they shift.

There are many details that would need to be worked out for this to be a full-fledged proposal, of course. One potential issue is that the cartographic approach gives a special role to phases as the boundaries at which scope islands are drawn. In contrast, the semantic type approach described above allows any argument expression to serve as a scope island, including the nuclear scope of downward monotone quantifiers, focus domains, coordinate structures, oblique arguments in scope-freezing constructions, and so on.

7 Processing cost

Wurmbrand 2018 proposes a theory on which there are no hard and fast scope islands. Instead, suppose that every instance of Quantifier Raising requires processing effort. Assuming cyclicity, then since scoping out of an embedded clause requires two successive instances of Quantifier Raising, such a construal will be more costly than one on which the universal takes scope within the embedded clause. The processing cost approach predicts that acceptability is gradient, in proportional to the number of domain boundaries crossed. On this view, clauses are relevant only because they are generally taken to be movement domains (phases), so scoping out of a clause is explicitly allowed.

Wurmbrand cites experimental evidence from Tanaka 2015 showing that scoping universals out of clauses, as well as scoping out of non-finite adjunct clauses (e.g., *after seeing each film*), is degraded compared to scope taking within the scope-taker's minimal

clause. Using subject-reported "naturalness" ratings, Tanaka concludes that the acceptability of scoping out of clauses and adjuncts is "marginal at best". However, her materials are dominated by attitude verbs (e.g., *thinks*) and verbs of communication (*claimed*); furthermore, the adjuncts were tested exclusively with DP and gerund arguments, rather than the tensed clauses that appear in the data in section 2. It remains possible that examples modeled on the data in section 2 would be rated as more natural. Along these lines, it is suggestive that Tanaka's materials containing the predicate *make sure* have the highest mean acceptability ratings (Tanaka 2015:348) of any of the embedding predicates in her study.

Because the cost model predicts construal availability based entirely on structural complexity, there is no sensitivity to the identity of the lexical items involved (holding structure constant), whether for the embedding predicate or the scope taker. To the extent that the data above show that the lexical identity of the embedding predicate and of the scope taker are relevant to scope construal, the cost approach is incomplete. Since the hierarchical functional projections approach sketched in section 6 also depends on a cyclic view of covert movement, that would be a natural way to build a system that combined predicate and scope-taker sensitivity with processing cost.

8 Conclusions

Despite decades of careful observation—epitomized and collected in Szabolcsi 2010—we still have only a hazy idea what the full picture of scope islands looks like. In order to make progress we will need to find a way to collect large data sets of scope judgments.

Although it is useful to use QR as a general-purpose scoping mechanism to combine various different scope takers into a single comprehensive grammar, it is important to not lose track of the explanations for the individual scope restrictions, where explanations are available. For instance, on some theories of negative polarity, the reason that weak NPIs are trapped inside of their licensing domain is because that aligns in most situations with making a stronger, more informative, assertion.

In other cases, convincing explanations are harder to find. Why is *think* but not *make sure* an island for *everyone*? Why do downward-monotonic operators resist undergoing inverse scope?

We can hope that once we get the explanations for each of the various semantic phenomena right (indefinites, negative polarity, focus, expressives, etc.), the patterns of the comprehensive grammar will fall out as a consequence of the component explanations. It is not obvious, however, on this federalist approach what will guarantee the Subset Constraint.

The data show that the standard wisdom about scope islands is not correct. That means we need to rethink decisions that were based on the standard wisdom, at the same time that we rebuild our theory of scope islands with a wider range of empirical facts in view.

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