EPISTEMIC CONTAINMENT AND THE DISTRIBUTION OF QUANTIFIERS

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Taking scope

Since May (1977,1985) it is often assumed that all quantificational noun phrases behave alike; undergoing the Quantifier Rule (QR), and being scopally rather free in their clause. More recent work offers a different perspective (**Beghelli & Stowell [B&S] 1997**; Szabolcsi 1997).

We examine recent evidence of (non)-interaction between quantificational NPs (QPs) and epistemic modals (EMs). Sentences with quantifiers and deontic modal auxiliaries routinely show scope ambiguities.

(1) **Most of our students must get outside funding** (the others already have fellowships)
→ *must*>*most*: It is necessarily so (since were not paying them) that, for most students x, x is being independently funded

(2) **Most of our students must get outside funding** (for the dept. budget to work out)
→ *most*>*must*: For most students x, it is required (given the budget) that x find outside funding

The Epistemic Containment Principle (ECP)

von Fintel & Iatridou ([F&I] 2003) argue that QPs and EMs do not scopally interact.

(3) **Every student in this room might be the smartest student.**
every > **might** - *sensible, but not available(?), reading:*
for each student in this room x, it is possible that x is the smartest student.
might > **every** - *not sensible, but available, reading:*
it is possible that, for each student in this room x, x is the smartest student.

(4) F&I's **Epistemic Containment Principle** (ECP):
A QP cannot bind its trace across an epistemic modal (condition on QR).

Assuming a free QR, and if the only available reading in clauses with *every* and *might* is inverse scope, then what would force reconstruction? Thus, we ask: does such a condition on QR exist? Can we account for the data in another way?

Every vs. *each*

B&S propose that QPs do not all raise to the same position, instead, they posit a hierarchy of functional projections with particular landing sites for different quantificational expressions. They follow Szabolcsi (1997) in assuming that the (generally) distributive quantifiers *each*/*every* are not *generalized quantifiers*, but rather introduce a set variable which can be bound by other operators. They offer the following properties:

(5) **Licensing of** *every N*

a. *every*-QPs are specified [+singular agr.], and underspecified for [distributive]. They can, but need not, move to [Spec, DistP].
b. *every*-QPs move to [Spec, DistP] only when the set variable it introduces is bound by an existential operator in [Spec, RefP]. When there, *every*-QPs support Strong Distributivity.
c. When the closer binder is a negative or question operator, *every*-QPs do not move to [Spec, DistP].

(6) **Licensing of** *each N*

a. *each*-QPs are specified [+singular agr., +distributive] and must move to [Spec, DistP] at LF.
b. *each*-QPs always support Strong Distributivity.
c. Semantically, the set variable introduced by *each*-QPs must be bound by an existential or question operator.

Epistemic containment without the ECP

We develop a topological approach which captures the differential behavior of *each*/*every* with EMs. Unlike *every*-QPs, *each*-QPs do not respect F&I's representational constraint.

(7) *each* **but not** *every* **scopes over** *might*

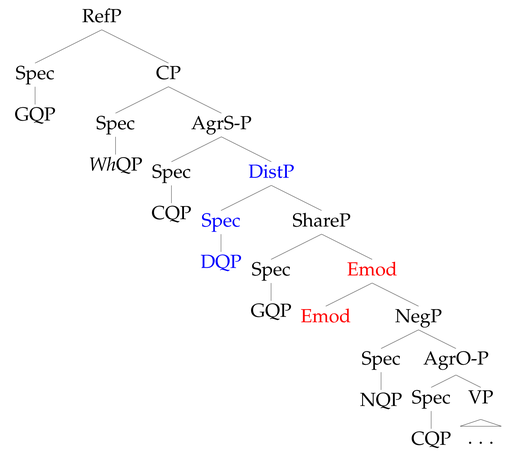
a. **#Every boy might love Mary, but some of them don't**
b. **Each boy might love Mary, but some of them don't**

Neither are they homogenous relative to other operators (e.g. negation, *wh*-operators):

(8) *each*/*every* **interact differently with negation and** *wh*-

a.	John didn't read every book	a.	Who read every book? [*pair-list]
b.	??John didn't read each book	b.	Who read each book? [*ok* pair-list]

We attribute the behavior of these quantifiers wrt EMs as a result of their particular syntax/semantics. We identify a projection site for EMs below DistP and ShareP in B&S' articulated clausal topology:



We propose that the set variable introduced by *every*-QPs is bound by the EM, blocking movement to [Spec, DistP], parallel to cases with *wh* (Beghelli 1997). Independent evidence for the binding of *every*-QPs is that, unlike *each*-QPs, they can be interpreted generically (B&S), and modals can unselectively bind (Heim 1982; Kratzer 1988).

(9) a. $\left\{\begin{matrix}Every\\Each\end{matrix}\right\}$ dog has a tail. b. Texans $\left\{\begin{matrix}can\\must\end{matrix}\right\}$ be tall.

each-QPs must raise to [Spec, DistP] as B&S suggest, and thus may scope above EMs.

(10) **LFs for the first conjuncts in (7)**

a. $[_{RefP}\ [_{CP}\ [_{Emod}$ might$_i$ $[_{AgrSP}$ every boy$_i$ $[_{AgrOP}$ Mary$_j$ $[_{VP}\ t_i$ love $t_j\ ]\ ]\ ]\ ]\ ]\ ]$

b. $[_{RefP}$ each boy$_i$ $[_{CP}\ [_{Emod}$ might $[_{AgrSP}\ t_i\ [_{DistP}\ t_i\ [_{ShareP}\ \exists e\ [_{AgrOP}$ Mary$_j$ $[_{VP}\ t_i$ love $t_j\ ]\ ]\ ]\ ]\ ]\ ]\ ]\ ]$

When an *every*-QP appears to distribute over other quantificational expressions in the environment of an EM, it is a case of *pseudo-distributivity* (e.g. B&S; Beghelli 1997), just as when an *every*-QP appears in the environment of negation and *wh*-operators.

Derivational *vs.* Representational Constraints

The approach we offer differs from F&I's: it involves derivational rather than representational constraints. The facts that the ECP purports to track is derived by the syntactic and semantic behavior of particular QPs.

The numerous arguments collected in Szabolcsi (1997) for treating QPs in a non-uniform manner are rather convincing, and this non-uniformity allows for an account of the ECP facts without additional stipulations.

If QPs are non-uniform, and if the topological approach of B&S is on the right track, then representational constraints which apply (arbitrarily) to a subset of QPs is extraneous.

Further, we add to B&S' discussion of the differential properties of *each* and *every*-QPs w.r.t. the latter's occasional loss of ability to strongly distribute: EMs, like negation and *wh*-question operators, bind the set variable introduced by *every*-QPs.

Excursus: Objective obviation?

Tancredi (2007; also Huitink 2009) argues that F&I's ECP applies only to subjective epistemics, and may be obviated in objective contexts. Anand & Hacquard (2007) divided attitude verbs into subjective/objective categories.

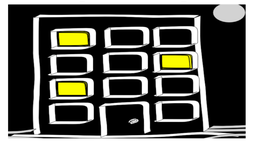
A woman tells a story and a man makes a comment about it, participants judge whether he is 'correct' or 'incorrect' (press F or J; Expts 1&3), or whether his comment is appropriate (1- 'appropriate', 3-'not sure', 5-'inappropriate'). Pictures as visual aids (Expt.1).

Expt. 1, *embedding* x *evidence* (subjective, objective) x *quantifier* (*every*, control: *any/no*)

Expt. 2: *evidence* x *quantifier*

Expt. 3: *evidence* x *quantifier* Predicates requiring unique satisifers (e.g. *be the winner*).

Sample item, Expt.1



"It's the end of the school year and you're wondering whether all or none of the honors students have left already. Standing in front of their dorm, you see that the lights are on in some rooms and off in others. You know that the building has an automatic system that switches lights off when no one is around, so it's safe to assume that if the light is off in one room, its occupant is gone. You can conclude that some students have left already, but since you dont know which student lives in which room, you can't tell who has left and who is still around. So..."

matrix - subjective - every:
Every student might have left

matrix - objective - every
Objectively speaking, every student might have left

embedded - subjective - every
Martin believes that every student might have left

embedded - subjective - every
Martin claimed that every student might have left

Results:

Expt.1 - no difference between *every* in subjective/ objective or matrix/ embedded contexts (avg 'true' 24.8%)

Expt.2 - no difference with *every* across conditions (average rating of 'appropriateness', 1.60 subjective, 1.67 objective)

Expt.3 - no difference in proportion of 'true' responses with *every* (avg 'true' 45% subjective, 48% objective)

Acknowledgments & references

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