

Modals and Scope Economy

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1 Introduction

Scope Economy (Fox, 2000:3): Scope Shifting Operations cannot be semantically vacuous

- (1) a. A boy loves every girl $[\exists > \forall] ; [\forall > \exists]$
b. John loves every girl $[\text{John} > \forall] ; \underline{*\forall > \text{John}}$

The puzzle: Scope Economy is said to hold for interactions between all kinds of quantifiers. Prediction: interactions between nominal quantifiers and modals work like interactions between two nominal quantifiers. This prediction is not borne out:

- (2) a. A girl is allowed to go. $[\exists > \diamond] ; [\diamond > \exists]$
b. Mary is allowed to go. $[\text{Mary} > \diamond] ; \underline{[\diamond > \text{Mary}]}$

This talk:

- Two solutions that don't work: a semantic account and an account that relies on the Epistemic Containment Principle (von Stechow & Iatridou, 2003)
- A syntactic solution that does seem to be on the right track
- Proposal: Scope Economy holds for QR but not for reconstruction

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2 Scope Economy

(3) *Scope Economy*

Scope Shifting Operations that are not forced for type considerations must have a semantic effect (Fox, 2000:23)¹

Fox uses ellipsis data to show that this condition holds

Step 1: Parallelism

Parallelism: the scope-bearing elements in the antecedent sentence must receive scope parallel to that of the corresponding elements in the ellipsis sentence (Fox, 2000:31)

(4) A boy admires every teacher. A girl does, too.

- | | | |
|--------|---|----------------------|
| (5) a. | a boy > every teacher ; a girl > every teacher | <i>Surface scope</i> |
| b. | every teacher > a boy ; every teacher > a girl | <i>Inverse scope</i> |
| c. | *a boy > every teacher ; every teacher > a girl | <i>Mix</i> |
| d. | *every teacher > a boy ; a girl > every teacher | <i>Mix</i> |

Step 2: Ellipsis data with proper names

If we only have the Parallelism condition, the prediction is that the possible scope configurations for (6) mirror those of (4). As illustrated in (7), this prediction is not borne out.

(6) A boy admires every teacher. Mary does, too.

- | | | |
|--------|---|----------------------|
| (7) a. | a boy > every teacher ; Mary > every teacher | <i>Surface scope</i> |
| b. | *every teacher > a boy ; every teacher > Mary | <i>Inverse scope</i> |
| c. | *a boy > every teacher ; every teacher > Mary | <i>Mix</i> |
| d. | *every teacher > a boy ; Mary > every teacher | <i>Mix</i> |

Only the surface scope interpretation is available for the antecedent sentence of (6). Because of parallelism, it follows that surface scope is also the only possible scope configuration for the ellipsis sentence.

Step 3: Scope Economy to the rescue

The pattern in (7) is the result of the Scope Economy condition:

1. Scope Economy prevents *every teacher* from taking scope over *Mary*, so we get only surface scope in the ellipsis sentence in (6)
2. Parallelism prevents scope mismatches between the antecedent sentence and the ellipsis sentence so it forces surface scope in the antecedent sentence

¹More recent versions of Scope Economy have been proposed by Mayr and Spector (2012) and Fleisher (2015). See the appendix for details of these accounts.

A girl and *every teacher* in the ellipsis sentence (4) are not commutative, so Scope Economy allows inverse scope. Therefore, Parallelism allows inverse scope in the antecedent sentence.

3 Interactions between nominal quantifiers and modals

In sentences with a proper name in subject position and a modal, the proper name can reconstruct below the modal even though it has no semantic effect.²

- (8) a. A student is required to attend the meeting. $[\exists > \square]; [\square > \exists]$
 Thomas is, too.
 b. A kid may have set off the fire alarm. $[\exists > \diamond]; [\diamond > \exists]$
 Annette may have, too.
 c. Someone from our class is likely get a job in Paris. $[\exists > \textit{likely}]; [\textit{likely} > \exists]$
 Lydia is, too.

Prediction: Assuming that proper names are rigid designators, reconstruction of a proper name below a modal has no semantic effect. Scope Economy predicts that this operation is not licensed.

Because of Parallelism, we expect only surface scope in the antecedent sentence. This is not what we find.

4 Two attempts to solve the puzzle

4.1 A semantic solution

Proposal: Scope Economy is blind to the fact that proper names are rigid designators

Lifted, intensional denotation of proper names:

$$(9) \quad \llbracket \text{Mary} \rrbracket = \lambda P_{\langle e,t \rangle} \lambda w. P[\iota x. \text{Mary}(x)](w)$$

The two possible scope configurations of the ellipsis sentence of (10) (= (4)) are given in (11).

(10) Mary admires every teacher.

$$(11) \quad \text{a. } \llbracket \text{Mary} \llbracket \lambda y \llbracket \text{Every teacher} \llbracket \lambda x \llbracket y \llbracket \text{admires } x \rrbracket \rrbracket \rrbracket \rrbracket \rrbracket$$

²My informants disagreed with Fox' judgments on constructions with *likely* and got an inverse scope reading in the antecedent sentence of (8-c) despite the addition of the scopally uninformative ellipsis sentence. Fox's construction with *seem* was judged as syntactically marked by my informants. Those informants who had clear judgments on the examples in (i-a) got both a surface scope and an inverse scope reading in (i-b), again in apparent violation of Scope Economy.

- (i) a. ??A British athlete seems to Mary to have won a medal, and an American athlete does, too.
 b. ??A British athlete seems to Mary to have won a medal, and I do, too.

(18) #Every student may be the tallest person in the department. $*[\forall > \diamond]$; $[\diamond > \forall]$

In (19-b) and (19-c), the ECP would predict only inverse scope readings, whereas Scope Economy would predict only surface scope readings. It is possible that:

- The Scope Economy condition and the Epistemic Containment principle compete and Scope Economy ends up being violated in favour of the ECP
- The observed ‘wide scope’ readings are not separate readings (with or without the ellipsis sentence), as they entail the inverse scope readings

- (19) a. A student is required to attend the meeting. $[\exists > \square]$; $[\square > \exists]$
Thomas is, too.
- b. A kid may have set off the fire alarm. $[\exists > \diamond]$; $[\diamond > \exists]$
Annette may have, too.
- c. Someone from our class is likely get a job in Paris. $[\exists > \textit{likely}]$; $[\textit{likely} > \exists]$
Lydia is, too.

However:

- If you go down this route, you need a separate account for cases with deontic modals like (19-a)
- Dutch modal verbs are not subject to the ECP (Huitink, 2008), and they display the same pattern:

- (20) a. Een kind kan het brandalarm hebben laten afgaan, en Annette ook.
A kid can the fire alarm have let go off, and Annette too.
‘A kid may have set off the fire alarm, and Annette may have, too.’
- b. *Surface scope reading: There is a specific kid who may have set off the fire alarm, and it is possible that Annette set off the fire alarm.*
- c. *Inverse scope reading: It is possible that some kid set off the fire alarm, and it is possible that Annette set off the fire alarm.*

→ The Scope Economy violations in (19) are probably not due to the ECP

5 A syntactic solution

5.1 QR vs. reconstruction

A difference between Fox’s data with nominal quantifiers and the data with modals: QR vs. reconstruction

Bhatt (1998) and Wurmbrand (1999) argue that all modals are raising verbs. I will assume that modals are raising verbs at least in the examples under discussion because it is not straightforward to account for inverse scope readings in a control analysis.

Inverse scope as a result of QR:

(21) Mary admires every teacher.

(22) LF: [Every teacher₁ [Mary [admires t_1]]]

Inverse scope as a result of reconstruction under May's Quantifier Lowering account (May, 1977):

(23) Thomas is required to attend the meeting.

(24) LF: [t_1 [required [Thomas₁ [attend the meeting]]]]

Proposal: Scope Economy holds for QR but not for reconstruction

- This means that QR is fundamentally different from reconstruction. Why would this be the case?
- Assumption: Scope Economy is a constraint on movement
- Claim: Reconstruction does not involve movement

Rest of this section:

Two ways to implement this idea:

- **Section 5.2** The Copy Theory of Movement
- **Section 5.3** A semantic account of reconstruction

Two accounts that seem incompatible with the present data:

- **Section 5.4** EPP as a PF condition
- **Section 5.5** Object QR involving lowering of the subject

5.2 Possibility 1: The Copy Theory of Movement

The Copy Theory of Movement (Chomsky, 1993): Movement involves creating a new copy of an element, then deleting either the higher or the lower copy at LF and PF

In a reconstruction case like (25), the syntax generates two copies of *Thomas*. The lower copy is deleted at PF while either copy can be deleted at LF.

(25) Thomas is required to attend the meeting.

(26) a. Syntax: [Thomas₁ [required [Thomas₁ [attend the meeting]]]]
b. PF: [Thomas₁ [required [~~Thomas~~₁ [attend the meeting]]]]
c. LF 1: [Thomas₁ [required [~~Thomas~~₁ [attend the meeting]]]]
d. LF 2: [~~Thomas~~₁ [required [Thomas₁ [attend the meeting]]]]

The inverse scope reading arises when the higher copy is deleted at LF, as in (26-d).

Crucially, generating the inverse scope reading does not involve a movement operation at LF. Therefore, constraints on movement operations like Scope Economy do not apply, and both scope configurations are licensed.

QR is different:

- (27) Mary admires every teacher.
- (28) a. Syntax: [Mary [admires [every teacher]]]
 b. LF: [Every teacher [Mary [admires ~~every teacher~~]]]
 c. PF: [Mary [admires [every teacher]]]

Here the syntax only generates one copy of *every teacher*. The scope shifting operation that yields the inverse scope reading takes place at the level of LF, so constraints on movement such as Scope Economy can block this operation

Thus, the reconstruction data that ostensibly violate Scope Economy can be seen as support for the Copy Theory of Movement.

5.3 Possibility 2: A semantic account of reconstruction

A number of authors have proposed that reconstructed readings can be accounted for without postulating any downward movement (Chierchia, 1995; Cresti, 1995; Rullmann, 1995; Ruys, 2015).

The trace left by the subject can be interpreted as a trace of type e , resulting in a surface scope reading, or a trace of type $\langle\langle e, t \rangle, t\rangle$, which results in the inverse scope, ‘reconstructed’ reading.³

- (29) A student is required to attend the meeting.
- (30) a. LF 1: [A student [λx_e [required [x_e attend the meeting]]]]
 b. LF 2: [A student [$\lambda X_{\langle\langle e, t \rangle, t\rangle}$ [required [$X_{\langle\langle e, t \rangle, t\rangle}$ attend the meeting]]]]
- (31) a. Surface scope: $\exists x$ [student(x) \wedge \square [attend-the-meeting(x)]]
 b. Inverse scope: \square [$\exists x$ [student(x) \wedge attend-the-meeting(x)]]

Again, the ambiguity is not caused by movement, so Scope Economy does not apply.

Next two sections: two accounts that seem incompatible with the present data

5.4 EPP as a PF condition

As mentioned above, if we assume the copy theory of movement, the syntax generates two copies of the subject in sentences like (32).

- (32) Thomas is required to attend the meeting.

³Technically the type should be $\langle s, \langle\langle e, t \rangle, t \rangle \rangle$ to allow lambda conversion into the scope of the modal, but I ignore this here for simplicity.

5.5 Object QR involving lowering of the subject

Hornstein (1995) and Johnson and Tomioka (1997) have argued that inverse scope of two nominal quantifiers involves upward movement of the object and subsequent reconstruction of the subject below the object.

Inverse scope in one of Fox's original examples like (38) (= (6)) would come about roughly as in (39).

(38) A boy admires every teacher. Mary does, too.

(39) Step 1: [Mary [admires [every teacher]]]
Step 2: [Mary [every teacher₁ [admires [t₁]]]]
Step 3: [t₂ [every teacher₁ [Mary₂ [admires [t₁]]]]]

Step 2 is allowed for type reasons⁵. If we assume that Scope Economy doesn't hold for reconstruction, then step 3 is allowed because it is reconstruction.

Thus, if we assume that inverse scope comes about as in (39) and that Scope Economy doesn't hold for reconstruction, we wrongly predict inverse scope to be possible for (38).

6 Conclusion and outlook

Summary

- Data where nominal quantifiers in subject position interact with modals pose a challenge for Fox's Scope Economy condition
- Solutions that don't seem to work: 1) Scope Economy is blind to the rigidity of proper names; 2) the Epistemic Containment Principle
- Proposal: Scope Economy holds for QR but not for reconstruction
- This is because reconstruction is not movement
- The proposal is compatible with the copy theory of movement or with a semantic account of reconstruction
- The proposal seems not to be compatible with May's (1977) Quantifier Lowering account of reconstruction, accounts that treat EPP as a PF condition or accounts that take object QR to involve reconstruction of the subject

Next steps

Coordinate structures

Fox: In constructions like (40), the subject lowers into both conjuncts, as in (41).

⁵Or for case, in Hornstein's account.

- (40) A guard is standing in front of every church and sitting at the side of every mosque.
- (41) 1. [t₂ [every church₁ [a guard₂ is standing in front of t₁]]]
 2. [t₂ [every mosque₁ [a guard₂ is sitting at the side of t₁]]]

According to Fox, this has to be lowering rather than raising, as raising would result in the structure in (42), which has the interpretation that for every pair of a mosque and a church, a single guard must stand in front of the church and at the side of the mosque.

- (42) Every mosque₁ every church₂ [a guard is [standing in front of t₂] and [sitting at the side of t₁]]

Fox's data suggest that Scope Economy does manifest itself here:

- (43) #A guard is standing in front of every church and sitting at the side of this mosque.

Constructions with modals and QR

I have claimed that the contrast between Fox's data with two nominal quantifiers and the present data with a nominal quantifier in subject position and a modal is due to a difference between QR and reconstruction; it is not due to the semantics of the modal.

Way to test this claim: constructions with a modal and QR:

- (44) a. Some boy admires every teacher. Every superhero, too.
 b. Some boy admires every teacher. Spiderman, too.
- (45) a. Peter is allowed to draw every modern celebrity. Every historical figure, too.
 b. Peter is allowed to draw every modern celebrity. Shakespeare, too.

(Here the DP in the ellipsis sentence is supposed to be interpreted as the object of the verb in the antecedent sentence.)

- Prediction if the data with nominal quantifiers in subject position and modals are due to reconstruction: Scope Economy manifests itself in both (44) and (45)
- Prediction if the data with nominal quantifiers in subject position and modals are due to the presence of a modal: Scope Economy manifests itself in (44) but not in (45)

Not clear whether parallelism holds in the a-sentences or whether these are really cases of ellipsis or asyndetic conjunctions with an extraposed conjunct (Eddy Ruys, p.c.):

- (46) Some boy admires every teacher, every superhero. → Some boy admires every teacher. Every superhero, too.

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8 Appendix: Recent revisions of Scope Economy

8.1 Mayr & Spector, 2012

Mayr & Spector's Generalised Scope Economy Condition:

(47) *Generalised Scope Economy Condition*

A covert scope shifting operation is licensed in a sentence S only if there exists a constituent C of S (possibly S itself) such that the CSSO does not make the semantic value of C stronger than or equivalent to what it would be without the CSSO.

→ All of the cases discussed here involve vacuous movement, so there are no instances of the inverse scope proposition entailing the surface scope one

8.2 Fleisher, 2015

Fleisher's Generalised Scope Economy Condition:

(48) *Generalised Scope Economy Condition*

A covert SSO is licensed in a sentence S only if there exists a constituent C of S (possibly S itself) such that the covert SSO does not make the semantic value of C non-vacuously entail (N-entail) what it would be without the covert SSO.

p N-entails q iff

- a. p entails q
- b. there is a proposition p' such that p' does not entail q ; and
- c. there is a proposition q' such that p does not entail q'

→ This condition allows SSOs where the resulting proposition entails the original proposition as long as there is no N-entailment (entailment where p entails q , p is not a contradiction and q is not a tautology). As the cases discussed here don't involve regular entailment between the inverse scope and surface scope propositions, they also don't involve N-entailment.