1 The standard route towards inverse scope

In modern generative approaches to the syntax-semantics interface, the following two assumptions are commonly made: (1) When an element moves to a different position, it leaves behind a full copy of itself rather than a trace — the Copy Theory of Movement (Chomsky, 1993); (2) When a quantifier occurs in object position, the type clash between it and the lexical item it combines with is resolved by using quantifier raising (QR) (Heim & Kratzer, 1998). We will argue that these two assumptions cannot be made simultaneously.

The reason is that a run-of-the-mill doubly quantified sentence like (1) has the same syntactic structure in the inverse scope configuration as in the surface scope configuration. To see this, let us go through the derivation.

(1) Some cat ruined every piece of furniture.

First, the object quantifier *every piece of furniture* is merged in its theta-position as a sister of the verb *ruined*. Then the subject quantifier *some cat* is merged in the vP (the vP-Internal Subject Hypothesis, e.g. Koopman & Sportiche, 1991). *Every piece of furniture* is not interpretable *in situ* and needs to attach to a node of type $t$ to be interpreted. The closest node of type $t$ is the vP-node in (2-b), so given Shortest Move, we can assume that this is what it attaches to, as in (2-c). Finally, *some cat* overtly moves to its final landing site in TP.
a. \([\text{VP ruined every piece of furniture}]\)

b. \([\text{vP some cat [VP ruined every piece of furniture]}]\)

c. \([\text{TP every piece of furniture [vP some cat [VP ruined every piece of furniture]}]}\)

d. \([\text{TP some cat [TP every piece of furniture [vP some cat [VP ruined every piece of furniture]]]}]\)

The sentence in (1) is scopally ambiguous. The surface scope interpretation can now come about by interpreting the higher copy of both quantifiers and deleting the lower copies, as in (3).

(3) \([\text{TP some cat [TP every piece of furniture [vP some cat [VP ruined every piece of furniture]]]}]\)

To get the inverse scope interpretation, the higher copy of the object quantifier and the lower copy of the subject quantifier can be interpreted, as in (4).

(4) \([\text{TP some cat [TP every piece of furniture [vP some cat [VP ruined every piece of furniture]]]}]\)

Thus, the inverse scope interpretation is obtained by reconstructing the subject to its vP-internal position, which in the Copy Theory of Movement is done by simply interpreting the lower copy and deleting the higher one (Chomsky, 1993, 1995). This makes it end up under the higher copy of the object, which results in the desired reading.

Hornstein (1995) and Johnson and Tomioka (1997) have argued for a configuration like the one in (4), where QR involves both movement of the object and Reconstruction of the subject. However, given the two assumptions above, (4) is an inevitable consequence; there is no need to do any special work to obtain this
configuration. If the object quantifier moves for type reasons, by assumption 2, it will end up above the lower copy of the subject. If movement leaves a full copy rather than a trace, by assumption 1, it will be possible to interpret the lower copy of the subject rather than the higher one. Therefore, (4) must be a possible structure that leads to an inverse scope reading. As a consequence, the only difference between surface scope and inverse scope in this system is the deletion and interpretation of a different copy of the subject. Crucially, no additional movement operation is needed to get an inverse scope reading. The surface scope structure in (3) is the same as the inverse scope structure in (4) but for the location of the interpretation of the subject.

In this squib, we argue that this is an undesirable aspect of our system. The reason is that there exist phenomena that are standardly explained by maintaining that the derivation of the inverse scope configuration is more complex than the derivation of the surface scope reading. Given that the assumptions above make it that both readings result from the same configuration (4), the assumptions make incorrect empirical predictions. The upshot is that we need to assume some additional step to obtain an inverse scope configuration. Below, we will provide one particular example of an assumption that implements this idea, namely to assume that object quantifiers can be interpreted in situ, essentially dropping assumption 2: object QR is optional, not mandatory. First, however, we will explain in more detail why the present system is problematic, starting with an argument related to Scope Economy.

---

1Our argument is independent of two further assumptions made above, namely the vP-Internal Subject Hypothesis and Shortest Move. Regarding the former, if we drop this assumption, the subject will be directly merged in TP. The only node of type t then where the object can attach is this TP. Given that the VP copy of the object is not interpretable, we need to interpret the higher copy of the object. As a consequence, we automatically obtain the inverse scope reading. For the surface scope reading, the subject would need to undergo movement to take scope over the highest copy of the object. In other words, dropping the vP-Internal Subject Hypothesis only makes things worse, since now the derivation of surface scope involves more steps. We leave it to the reader to verify that a similar negative result is obtained by dropping Shortest Move.
2 Constraints on inverse scope

Fox (2000) proposes the Scope Economy Condition, a constraint on covert movement that can be defined as in (5).

(5) Scope Economy

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

A Scope Shifting Operation is a movement operation that changes the scope relations between operators in a sentence. Although Fox does not explicitly state this, his choice of examples indicates that he considers Scope Shifting Operations to be the covert movement operations of QR and Reconstruction, and not overt movement operations like \textit{wh}-movement, topicalisation, or movement for EPP reasons. These types of movement can also affect scope relations but even when they do not, they affect the phonology interface. It seems that the intuition behind Fox’s proposal is that if you move, this should affect one of the interfaces. If it has no impact on the phonology, it should affect interpretation.

We will assume familiarity with the empirical arguments for (5) (Fox, 2000), and just provide the example in (6). On the assumption that an ellipsis of some phrase is only licensed if a parallel phrase can be found in the antecedent sentence, it is expected that an elliptical sentence has the same scope configuration as its antecedent sentence whenever the ellipsis involves a scope bearing element. The observation is that the antecedent sentence in (6) only has its surface scope reading, which Fox explains using (5). Since relative scope to a proper name is semantically vacuous, the elliptical sentence can only have the surface scope configuration. We can observe this by looking at the parallel antecedent sentence.

(6) A cat ruined every piece of furniture. Walter did, too.
Fox (2000) does not assume the Copy Theory of Movement. Instead, he assumes that movement leaves behind a trace that is co-indexed with the moved element. The derivation of the ellipsis sentence of (6) then proceeds as follows. The object is first merged in the VP and then covertly moves up to TP for type reasons. The subject starts off in vP and overtly moves to TP. This is shown in (7). Both movement operations leave behind traces rather than full copies.

\[
(7) \quad [_{TP} \text{Walter}_2 \  [_{TP} \text{ever piece of furniture}_1 \ [_{vP} t_2 \ [_{VP} \text{ruined } t_1 ] ] ]]
\]

The structure given in (7) is the surface scope structure of (6). To get an inverse scope reading, \textit{every piece of furniture} has to QR over Walter to take scope over it, as it has done in (8).

\[
(8) \quad [_{TP} \text{every piece of furniture}_1 \ [_{TP} \text{Walter}_2 \ [_{TP} t_1 \ [_{vP} t_2 \ [_{VP} \text{ruined } t_1 ] ] ] ]]
\]

This last movement step is the one that is blocked by Scope Economy. As \textit{Walter} and \textit{every piece of furniture} are scopally commutative, moving one over the other has no semantic effect and is therefore prohibited.

Now let us consider how the derivation would proceed if you assume the Copy Theory of Movement. The steps displayed in (7) would be exactly the same, except that the movement now leaves full copies instead of traces. The resulting structure is the one in (9).

\[
(9) \quad [_{TP} \text{Walter} \ [_{TP} \text{every piece of furniture}_1 \ [_{vP} \text{Walter}_2 \ [_{VP} \text{ruined every piece of furniture}] ] ] ]
\]

As we have seen, the movement operation illustrated in (8) is no longer necessary to get inverse scope now. Instead, the semantic component can simply interpret the higher copy of the object and the lower copy of the subject and delete the other two copies, as in (10).
How can Scope Economy block semantically vacuous QR in this system? Let us consider each movement step involved in the derivation and see if Scope Economy can block them.

**Option 1: the first movement step of the object** Can Scope Economy block the movement of the object out of the VP? The way Fox stated Scope Economy, the answer to that question is no. Recall from (5) that Scope Economy restricts movement that is not forced by type reasons. The first movement step of the object is forced by type reasons and is therefore not semantically vacuous; without it, the structure would be uninterpretable. Because the movement is semantically motivated, Scope Economy allows it. Therefore, this movement is not blocked.

**Option 2: overt movement of the subject** Now let us consider the movement step of the subject from vP to TP. Could Scope Economy block this movement step? The answer is no: Scope Economy restricts covert movement, not overt movement. And even if Scope Economy could somehow prevent the subject from moving to TP, this would not help. In fact, it would only make matters worse: the object would still end up above the subject (above the vP copy, which is now the only copy), resulting in an inverse scope reading. The surface scope reading would then be predicted to be unavailable instead of the inverse scope reading.

We have tried to put Scope Economy to work at both steps of the derivation, but neither option is possible. In other words, Scope Economy has no way to prevent (10) from coming into existence. Inverse scope is therefore predicted to

---

2If Scope Economy also restricted overt movement, this would have dramatic consequences: every single movement operation in the grammar would have to result in some semantic change.

3This problem also arises if we assume the PF movement theory of Reconstruction.
be available for the ellipsis sentence in (6). Consequently, Parallelism has no choice but to allow inverse scope in the antecedent sentence of (6). Therefore, we now predict that both surface scope and inverse scope should be available for the antecedent sentence in (6). This is an incorrect prediction.

We have already shown that this problem does not arise if we do not assume the Copy Theory of Movement. Fox did not assume it, and everything went quite well for him. (11) demonstrates that the problem also does not arise if we do not assume that objects move for type reasons. If *every piece of furniture* were interpretable *in situ*, the surface scope structure would be the one in (11-a) (which copy of the subject is deleted here is irrelevant). Inverse scope would look as in (11-b), which is the same structure we saw earlier, in (10). The difference, however, is that the movement of the object is now not forced for type reasons. Instead, it happens purely so that the object can take scope over the subject. Therefore, it is not exempt from Scope Economy as it was before, and so it can be blocked by it. We correctly predict that inverse scope is impossible.

(11) a. Surface scope: $[TP \text{ Walter } [vP \text{ Walter } [VP \text{ ruined every piece of furniture } ] ] ]$

   b. Inverse scope: $[TP \text{ Walter } [TP \text{ every piece of furniture } [vP \text{ Walter } [VP \text{ ruined every piece of furniture } ] ] ] ]$

In sum, if we make the two assumptions that movement leaves behind full copies and that objects must move for type reasons, Scope Economy no longer blocks semantically vacuous movement. As soon as we give up one of these assumptions, Scope Economy works again. Put differently, assuming both movement for type reasons and the Copy Theory of Movement breaks Scope Economy.

There is a second, more broader problem. Scope Economy is but one example of a constraint on quantifier raising. More generally, QR is a severely restricted
form of covert movement. For instance, none of the sentences in (12) have inverse scope readings.

(12) a. Some students read exactly two books.
    b. No music critic listened to exactly two albums.
    c. Every child visited exactly two amusement parks.
    d. Every student attended no parties.
    e. No child found an Easter egg.
    f. No boy read every book.
    g. Two people carried three pianos.

Many authors have proposed restrictions on QR that aim to explain observations like these (e.g. Beghelli & Stowell, 1997; Mayr & Spector, 2012). The details of these proposals are not relevant here. What is important is that the proposed restrictions are intended to prevent QR from deriving the inverse scope reading. In the current system – the Copy Theory of Movement combined with employing object QR to prevent type clashes – such constraints are unstatable. For instance, (12-a) would get the derivation in (13), where the semantics is free to interpret the lower copy of some students and the higher copy of exactly two books and delete the other two copies.

(13) $[\text{TP Some students [TP exactly two books [VP some students [VP read exactly two books ] ] ] }]$

As was the case for Scope Economy, any restriction on movement will be unable to prohibit inverse scope for (13).

The third and final problem we discuss here concerns language processing. Many authors have shown that inverse scope configurations require more processing resources than surface scope configuration (Catlin & Micham, 1975; Micham,
Catlin, VanDerveer, & Loveland, 1980; Gillen, 1991; Kurtzman & MacDonald, 1993; Tunstall, 1998; Anderson, 2004). Anderson, for instance, shows in a series of offline and online experiments, that participants have more trouble processing inverse scope configurations than surface scope ones.

This indicates that something about inverse scope configurations makes them harder to process than surface scope configurations. The most obvious reason for this, and indeed the reason Anderson gives for her findings, is that inverse scope configurations have a higher degree of complexity than surface scope configurations. Once more, this cannot follow from the current system, since the derivation of the surface and inverse scope configurations contain the same movement steps.

Dropping one of the assumptions central to our argument would remedy this situation. Without the Copy Theory of Movement, an extra movement step would be required to get inverse scope, and this would lead to a more complex structure, as illustrated in (14).

(14) a. Surface scope:
   \[ TP \text{ some cat } 2 [ TP \text{ every piece of furniture} 1 [ VP \text{ ruined } t1 ] ] ] ]

   b. Inverse scope:
   \[ TP \text{ every piece of furniture} 1 [ TP \text{ some cat } 2 [ TP \text{ t1 [ VP \text{ ruined } t1 ] ] ] ] ] ]

Similarly, if we did not assume that object quantifiers need to move for type reasons, we would correctly predict that surface scope is less complex and therefore easier to process than inverse scope, as shown in (15).

(15) a. Surface scope:
   \[ TP \text{ some cat } [ VP \text{ some cat } [ VP \text{ ruined every piece of furniture } ] ] ] ]

   b. Inverse scope:
   \[ TP \text{ some cat } [ TP \text{ every piece of furniture } [ VP \text{ some cat } [ VP \text{ ruined every }
3 Optional object QR

We have seen that it is the combination of the two assumptions listed at the start of this squib that is problematic. Neither assumption is problematic on its own, and if we were to give up one of these assumptions, the system would regain the desired ability to constrain occurrences of inverse scope readings.

Both the Copy Theory of Movement and QR itself are well-motivated operations. However, as far as we know, there are no strong arguments that support QR for type reasons. This means that there are no reasons (known to us) why the operation that gives us inverse scope readings should be the same as the mechanism that resolves the type clash object quantifiers give rise to. In principle, object QR is optional.

In the semantic literature, there are plenty of mechanisms that allow quantifiers to be interpreted *in situ* (Montague, 1973; Partee & Rooth, 1983; Hendriks, 1993). If we adopt such a mechanism, the two possible structures of our running doubly quantified example are as in (16):

(16) a. Surface scope:

\[ \text{TP some cat [VP some cat [VP ruined every piece of furniture ] ] ]} \]

b. Inverse scope:

\[ \text{TP some cat [TP every piece of furniture [VP some cat [VP ruined every piece of furniture ] ] ]]} \]

With optional object QR in place, (16-b) is now more complex than (16-a) in the sense that there are two movement operations in (16-b) and only one in (16-a). This allows the system constrain inverse scope. For instance, Scope Economy is now operational again, since the inverse scope reading will involve an operation
that is not required for type reasons. Thus, one way to fix the problem is to assume that type shifting allows object quantifiers to be interpreted \textit{in situ}, whilst QR only happens for scope reasons.\footnote{Or for ACD reasons, see e.g. Fox (2002).}

4 Discussion

In the discussion above we have consistently assumed that constraints on scope have to involve constraints on movement. What if instead we assume that scope constraints can involve the choice what of what to interpret and delete?

Let us see how this could work. In general, the system derives the following configuration.

\begin{equation}
\begin{aligned}
\text{TP} & \left[ \text{TP} \text{ Subject } [ \text{TP Object } [\text{vP Subject } [\text{VP Verb Object } ] ] ] ] \right]
\end{aligned}
\end{equation}

The only difference between surface scope and inverse scope is that in the former the higher and in the latter the lower copy of the subject is interpreted. We see no independent reasons for why one of these options should be more complex than the other, except that in the inverse scope configuration the subject would be deleted high at LF and low at PF, as in (19), while LF and PF are (more) aligned for the surface scope readings, as in (18):

\begin{enumerate}
\item \textbf{Surface Scope}
\begin{enumerate}
\item LF: [TP Subject [TP Object [vP Subject [VP Verb Object ] ] ] ] ]
\item PF: [TP Subject [TP Object [vP Subject [VP Verb Object ] ] ] ] ]
\end{enumerate}
\item \textbf{Inverse Scope}
\begin{enumerate}
\item LF: [TP Subject [TP Object [vP Subject [VP Verb Object ] ] ] ] ]
\item PF: [TP Subject [TP Object [vP Subject [VP Verb Object ] ] ] ] ]
\end{enumerate}
\end{enumerate}
Given this, we could propose a preferential ordering grammar is subject to:

(20) **PF/LF alignment**: grammar favours deletion and interpretation choices at LF that align with pronunciation choices made at PF.

We see at least two immediate problems with such an approach. The first is that it is unclear what the status of (20) is. Where in our model of language do we find (20)? This question becomes all the more urgent, since, standardly, LF and PF are entirely separated levels of grammar. The second problem is that it stipulates an ordering of choices. There is no inherent notion of economy that makes (20) plausible. This is most visible if we try and restate Scope Economy in terms of PF/LF alignment. The principle in (21) is such an attempt:

(21) **Scope Economy**: when two copies of the same element are generated, LF and PF can each delete a different copy if and only if this procedure leads to different truth conditions than when LF and PF delete the same copy.

As we think is evident, the intuitions of ‘economy’ behind the original statement of Scope Economy are absent from (21). Of course, we could try and resolve both problems with (20), by proposing that LF and PF are much closer connection, for instance by claiming that LF precedes PF, as do Bobaljik and Wurmbrand (2012). Indeed, given such a dramatically different take on the relation between LF and PF, a principle as (21) could well become less ad hoc. (See Blok, 2019 for discussion.) However, this would entail a drastic departure from our current generative model, where PF and LF are only connected through syntax. Adopting optional QR, on the other hand, is a simple solution that allows our model of the grammar to remain as it is.
References


Hendriks, H. (1993). *Studied flexibility: categories and types in syntax and se-


