

Quantifier Scope Resolution in Doubly Quantified Ditransitive Sentences

Ava Creemers (University of Pennsylvania)
creemers@sas.upenn.edu

Background Quantifier scope ambiguity may arise when there are two DPs in a sentence that contain a quantifier. Such quantifier scope interactions have been explained by covert raising of quantifiers (QR; May 1977, 1985). This study is concerned with the resolution of ambiguous quantifier scope in ditransitive doubly quantified sentences with the universal quantifier *each* and the existential quantifier *a*, as illustrated in (1).

(1) Peter showed a house to each client.

- a. $\forall x[\text{client}(x) \rightarrow \exists y[\text{house}(y) \wedge \text{Peter showed } y \text{ to } x]]$ *each > a*
 b. $\exists y[\text{house}(y) \wedge \forall x[\text{client}(x) \rightarrow \text{Peter showed } y \text{ to } x]]$ *a > each*

The sentence in (1) is ambiguous between an inverse scope reading (a) in which the universal quantifier takes wide scope, and a surface scope reading (b) in which the existential quantifier takes wide scope. This is expected under a theory of QR, since quantifiers can be moved and adjoined in any order: for (1a), QR first applies *a house*, while for (1b), QR first applies to *each client*. The corresponding LF structures are given in (2a) and (2b), respectively (adapted from Bruening 2001).

- (2) a. $[_{IP} \text{ each client}_2 [_{IP} \text{ a house}_1 [_{IP} \text{ Peter showed } t_2 \text{ to } t_1]]]$ *each > a*
 b. $[_{IP} \text{ a house}_2 [_{IP} \text{ each client}_1 [_{IP} \text{ Peter showed } t_1 \text{ to } t_2]]]$ *a > each*

However, it seems to be the case that there are certain restrictions on available scope readings. For instance, it has been reported that double object constructions (DOCs) are “scope-frozen”, in that the second object cannot take wide scope, as illustrated in (3a) (taken from Bruening 2001). In contrast, the dative counterpart in (3b) is reported to be ambiguous.

- (3) a. I gave a child each doll. *a > each, *each > a*
 b. I gave a doll to each child. *a > each, each > a*

Moreover, from a processing perspective, several other factors have been proposed to influence the resolution of ambiguous quantifier scope (see also Filik et al. 2004, Paterson et al. 2008): (i) the surface linear order of the quantified DPs (e.g., Fodor 1982: the first quantifier prefers to take wide scope over the second quantifier); (ii) the intrinsic properties of the quantifiers (Ioup 1975: *each* prefers to take wide scope over *a*); (iii) the grammatical function of the quantified DPs (Ioup 1975: topic > deep (i.e., external) and surface subject > deep subject or surface subject > indirect object > direct object); and (iv) the thematic roles of the quantified DPs (Kurtzman and MacDonald 1993; Raffray and Pickering 2010: agents prefer to take wide scope over other thematic roles). Our study investigates the factors that play a role in ambiguous quantifier scope resolution, and the principles that impact it.

Methods A truth-value judgment task with a Covered Box (Huang et al. 2013) was used in an experiment that manipulates the linear order, the quantifiers used (*each/a*), the grammatical roles (IO/DO), the thematic roles, and the grammatical construction (DOC/dative)–

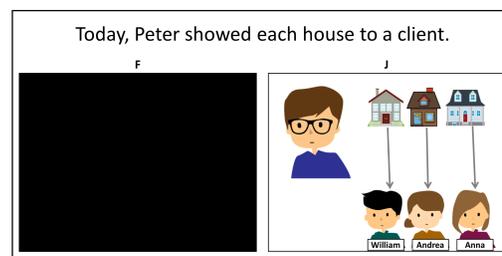


Figure 1: Example item in active voice.

with three different verbs. Subjects are asked to select a match for a given sentence amongst two pictures, one of which is “covered” with a black box (Figure 1). Critical items consist of 24 sentences (Exp 1: in active voice; Exp 2: passive voice) with the ditransitive verbs *assigned*, *showed*, and *sent*. The DO and IO are quantified DPs with *a* or *each*. Each critical sentence has a variant in 4 conditions, combined with \exists -wide and \forall -wide pictures (total of 8 lists). We furthermore included 24 unambiguous control items (e.g., *Peter showed each house to Mary*), in all 4 conditions, with false/true picture. We measured choice of picture (visible/covered) and RTs. Subjects were 48 participants, recruited through Prolific. Predictions for the different principles are given below.

Table 1: Conditions and predictions (Passive is formed by first DP + *was shown* + (to) second DP).

Condition	Linear Order	Gramm. roles	Quantifiers	Thematic roles
1. DO-first / <i>a</i> -each				
Peter showed [a house _{DO}] to [each client _{IO}]	$\exists > \forall$	$\forall > \exists^\dagger$	$\forall > \exists$	$\forall > \exists$
2. DO-first / <i>each</i> - <i>a</i>				
Peter showed [each house _{DO}] to [a client _{IO}]	$\forall > \exists$	$\exists > \forall^\dagger$	$\forall > \exists$	$\exists > \forall$
3. IO-first / <i>a</i> -each				
Peter showed [a client _{IO}] [each house _{DO}]*	$\exists > \forall$	$\exists > \forall$	$\forall > \exists$	$\exists > \forall$
4. IO-first / <i>each</i> - <i>a</i>				
Peter showed [each client _{IO}] [a house _{DO}]	$\forall > \exists$	$\forall > \exists$	$\forall > \exists$	$\forall > \exists$

*Following Larson (1988) and Bruening (2001), we expect that in a DOC construction, the second object cannot take wide scope. This means that we expect clear rejections for the $\forall > \exists$ picture in this condition.

†If the grammatical hierarchy plays a role we predict opposite patterns for grammatical roles and for thematic roles in Condition 1 and 2 with passive sentences. We also predict acceptance for the $\forall > \exists$ in Condition 3 with passives.

Results Preliminary analysis shows that readings that are said to be dispreferred are still available readings. This also holds for inverse-scope in DOC constructions. We further see that Condition 1 and 4, and Condition 2 and 3 pattern together in terms of acceptance of the overt picture, which suggests that the grammatical/thematic roles of the DPs play an important role. However, a more in depth analysis is needed, since scope resolution seems to differ per verb, as shown in Figure 3 for Exp1. While \forall -wide overt pictures with the verb *assign* are more often accepted than \exists -wide pictures, we see the opposite pattern for *show*. Looking at the DOC in Condition 3, this means that subjects preferred a \exists -wide reading for *Peter showed a client each house* (i.e., surface scope)– but a \forall -wide reading for *Nathan assigned a reviewer each article* (i.e., inverse scope). It seems that *give*, as used in the literature to illustrate that DOCs are scope-frozen, behaves more like *show*, rather than *assign*. Further analyses will and future research should focus on the (potential) influence of the type of verb on scope resolution.

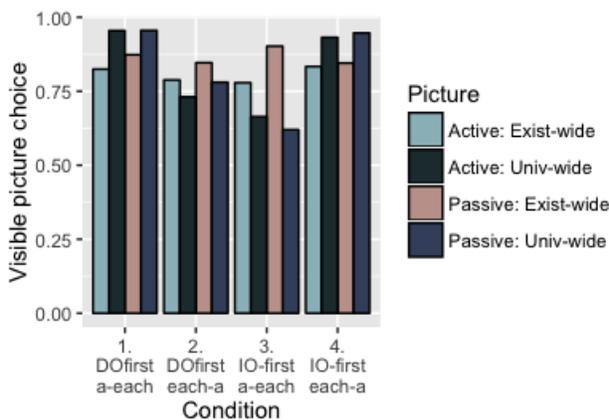


Figure 2: Visible picture choice active/passive data

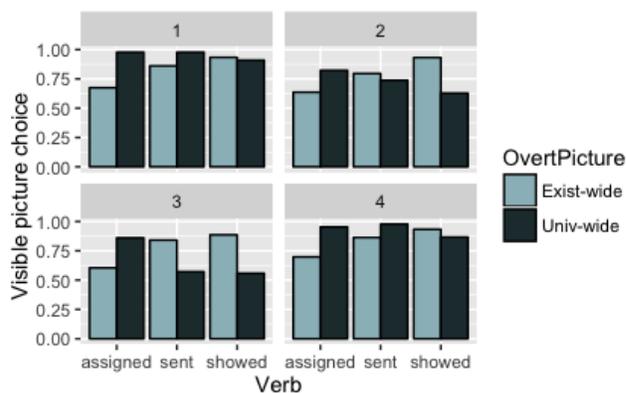


Figure 3: Exp 1, picture choice per verb/condition