Assuming immediate scope assignment (ISA), in a doubly quantified sentence scope should be computed at the earliest possible point. This should be observable when inverse scope is necessary, as it is presumably harder to compute than linear scope. Inverse scope can be enforced if the linearly first quantifier contains a variable that has to be bound by the second quantifier (Q2). Taken ISA for granted, it is possible that quantifiers can be directly interrelated, or that verb information is necessary for scope interpretation [cf. 1]. This was tested in German, where main verbs occur either in second position (before Q2; (1a-d)) or sentence-finally (2a-d).

**Predictions**: Assuming either variant of ISA, we expected higher processing load when integrating Q2 in (1a) where inverse scope is needed than in (1b) which allows for the easier linear interpretation [cf. 2, 3]. (1c/d) were controls with Q2 replaced by a definite description expected to show no effect of the possessive pronoun. The verb-independent ISA predicts the same effects at Q2 in (2a-d) leading to a pronoun*DP-type-interaction. If, however, scope assignment requires complete verb-argument structures, the inversion effect in (2a) vs. (2b-d) should only emerge sentence-finally.

**Eyetracking Experiment**: 48 participants read 40 items in a latin square design (+90 fillers) while their eye-movements were monitored. Q2: a 51ms slowdown in (1a) vs. (1b) (31ms in (2a) vs. (2b)) led to a significant pronoun*DP-type-interaction (F1(1,47)=6.0;F2(1,39)=9.3) but no three-way interaction (F1/2<1). The pattern was identical in regression-path durations (pronoun*DP-type:F1(1,47)=4.0;F2(1,39)=4.0) but first-pass regression ratios didn’t differ. At the following region, conditions didn’t differ in any measure. Last region: there was a slowdown in regression-path durations of 571ms in (1a) vs. (1b) (320ms in (2a) vs. (2b)) which led to a significant pronoun*DP-type-interaction (F1(1,47)=23.1;F2(1,39)=9.837). The bound variable conditions led to an across-the-board increase in first-pass regression ratios (F1(1,47)=4.1;F2(1,39)=3.7; marginal by items).

**Paraphrase Selection**: To (i) check whether the possessive in (1a/2a) enforces a bound interpretation and (ii) this interpretation is considered even if a referent (eg. Fritz) is explicitly provided, 48 participants chose paraphrases for conditions (1a/b), (2a/b), (3a/b) and (4a/b). Log-linear models revealed no effects of order so we pooled the data. In (1b/2b) linear was preferred over inverse scope (47.6% vs. 38.2%) whereas in (1a/2a) inverse, bound readings were preferred over the two coreferential interpretations (62.2% vs. 18.0% in total) – a significant shift in readings (LRCS1(3)=364.3;LRCS2(3)=332.9). In (3a/4a) the bound reading was chosen 32.0% of the time whereas the structurally identical dummy paraphrase of (3b/4b) was selected 12.9%; this difference was also significant (LRCS1(1)=50.0;LRCS2(1)=54.2). Even if a referent was mentioned the bound interpretation was possible.

**Conclusions**: We found early effects at Q2 not carrying over to the following region, as predicted by the verb-independent ISA. This is, however, only part of the story. Regressive eye-movements originated mainly from the last region. We therefore conclude that the early effects reflect a failed search for a binder, but computation of inverse scope was delayed until the last region. Only then readers established binding under inverse scope.
References:


Sample Materials:

(1a) Jeden seiner Schüler_q1 lobte genau ein Lehrer_q2 voller Wohlwollen.
(3a) sagte Fritz.

(paraphrases: bound vs. [coref. linear] vs. [coref. inverse] vs. “none fits”, cf (1a)=>(5)/(3a)=>(6))

(1b) Jeden dieser Schüler_q1 lobte genau ein Lehrer_q2 ...

(paraphrases: dummy vs. linear vs. inverse vs. “none fits”, cf (7))

(1c) Jeden seiner Schüler_q1 lobte der neue Lehrer_q2 ...

(1d) Jeden dieser Schüler_q1 lobte der neue Lehrer_q2 ...

(2a) Jeden seiner Schüler_q1 hat genau ein Lehrer_q2 voller Wohlwollen gelobt.
(4a) sagte Fritz.

(paraphrases: bound vs. [coref. linear] vs. [coref. inverse] vs. “none fits”, cf (2a)=>(5)/(4a)=>(6))

(2b) Jeden dieser Schüler_q1 hat genau ein Lehrer_q2 ...

(paraphrases: dummy vs. linear vs. inverse vs. “none fits”, cf (7))

(2c) Jeden seiner Schüler_q1 hat der neue Lehrer_q2 ...

(2d) Jeden dieser Schüler_q1 hat der neue Lehrer_q2 ...

(3b) like (3a), but with genau eine Lehrerin (exactly one fem. teacher) instead of genau ein Lehrer_masc
(paraphrases: dummy vs. coreferential linear vs. coreferential inverse vs. “none fits”, cf (6))

(4b) like (4a), but with genau eine Lehrerin (exactly one fem. teacher) instead of genau ein Lehrer_masc
(paraphrases: dummy vs. coreferential linear vs. coreferential inverse vs. “none fits”, cf (6))

(5) bound) exactly one teacher praised each of his own pupils

(coref. linear) there is a certain teacher, say Mr. Hempel, and each of Hempel’s pupils was praised by exactly one teacher

coref inverse) there is a certain teacher, say Mr. Hempel, and exactly one other teacher praised each of Hempel’s pupil’s

(6) bound/dummy) Fritz said that exactly one teacher praised each of his own pupils

(coref. linear) Fritz said that each of Fritz’s pupils was praised by exactly one teacher

coref. inverse) Fritz said that exactly one teacher praised each of Fritz’s pupils

(7) dummy) each of these teachers is such that he praised exactly one pupil

(linear) each of these pupils is such that he was praised by exactly one teacher

-inverse) exactly one teacher is such that he praised each of these pupils