Inverse scope in Czech: A sentence–picture matching study

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Background The (un)availability of inverse scope interpretations in doubly quantified sentences in free word order languages has been subject to continuous debate. The theoretical literature has produced plausible analyses for all kinds of scenarios: (i) inverse scope is always available, (ii) inverse scope is never available, (iii) inverse scope is only available for the canonical constituent order, and (iv) inverse scope is only available for non-canonical (scrambled) constituent orders. Position (i) is the null hypothesis; (ii) is the hypothesis that free word order mirrors scope relations (scope transparency); (iii) follows if covert quantifier raising is available, but overt movement necessarily changes scope relations (scope freezing); (iv) follows if covert QR is not available, but scrambling can be followed by reconstruction. Other factors such as A/A′ scrambling or information structure have been argued to play a role; for recent discussion see Bobaljik & Wurmbrand (2012), Ionin & Luchkina (2018), Antonyuk (2019), Łęska (2020), or Grabska (2020).

Contribution Judgments about quantifier scope are notoriously difficult and subject to variation (both cross- and intralinguistically), making it difficult to competently decide between the hypotheses under consideration. Our study contributes new results (first ever for Czech; adding to the growing body of empirical work; Scontras et al. 2017, Grabska 2020, Łęska 2020, a.o.), supporting position (iv) for the case of Czech sentences with quantifiers in the subject and in an object/adverbial. At the same time, it does so for bare nominals as existential quantifiers, thus contributing to another issue, namely that of bare nominal semantics in articleless languages, which have sometimes been denied quantificational status (Dayal 2004, 2011). Our study supports the position that bare nominals can have a narrow-scoping existential interpretation.

**Design, materials, procedure, participants** We set up a sentence–picture matching experiment, manipulating three variables in a $2 \times 2 \times 2$ design: scenario ($\pm$distr(ibutive); manipulated by pictures; taken from Bruening 2008), const(ituent) order ($\pm$can(onical)), and scope (surface vs. inverse; derivative of scenario and quantifier order $\forall > \exists$ vs. $\exists > \forall$). The linguistic stimuli corresponding to the pirate/bottle (A) pictures are in (1) and to the boy/ball pictures in (2). There were 16 items (complemented by 32 fillers), 8 of the A kind (false or failed in the presupposition in c/d and thus excluded from the analysis), 8 of

+distrA   −distrA

+distrB   −distrB

the B kind (false or presup. failed in a/b and thus excluded). The linguistic stimulus was presented alongside with the picture stimulus (relying on Latin Square design) and the task was to rate to what extent the sentence is a matching description of the picture on a 1 (bad match) to 7 (good match) scale. Data from 100 participants were used, yielding 1600 datapoints, of which 1200 entered the analysis (800 in +distr and 400 in −distr due to falsity/presupposition failures). The experiment was coded, pseudo-randomized, and administered by L-Rex (Starschenko & Wierzba 2021).
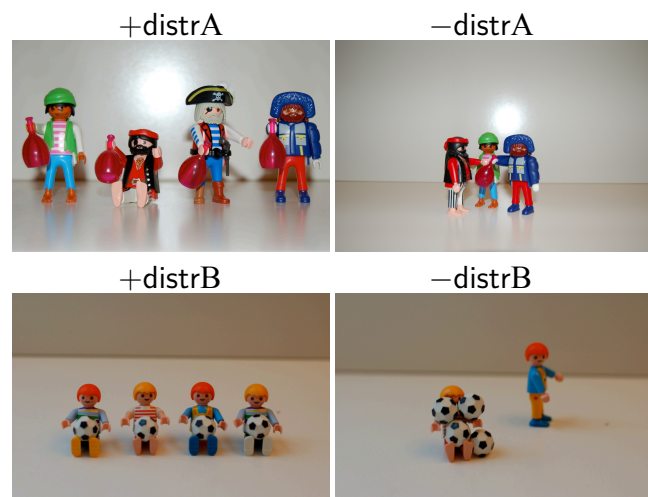
(1) a. Každý pirát drží láhev. [+can; surface in +distr & inverse in −distr]
      every pirate holds bottle
   b. Láhev drží každý pirát. [−can; inverse in +distr & surface in −distr]
   c. Pirát drží každou láhev. [+can; inverse in +distr & **excluded in −distr**]
   d. Každou láhev drží pirát. [−can; surface in +distr & **excluded in −distr**]

(2) a. Každý chlapec má míč. [+can; surface in +distr & **excluded in −distr**]
      every boy has ball
   b. Míč má každý chlapec. [−can; inverse in +distr & **excluded in −distr**]
   c. Chlapec má každý míč. [+can; inverse in +distr & surface in −distr]
   d. Každý míč má chlapec. [−can; surface in +distr & inverse in −distr]

Results and discussion The result plot shows the proportion of ratings per condition (the darker, the better the match; the 50% line cuts through the median/MD). The effect of the manipulated variables and their interactions was estimated using a cumulative link mixed model (clmm function of the R package ordinal; the full model including random slopes for items and participants was used; to be reported). There is a noticeable main effect of scenario (+distr better match than −distr; $z = 3.265, p = .001$), unrelated to the hypotheses, but suggesting that sentences with *každý* 'every/each' favor distributive scenarios. The +distr scenario reveals that inverse scope is available (MD 6) in the −can order ≈ (1b), but much less so (MD 3) in the +can order ≈ (2c). This is reflected in our model by the interaction between scenario and scope ($z = -3.474, p < .001$) and it is in line with the assumption that
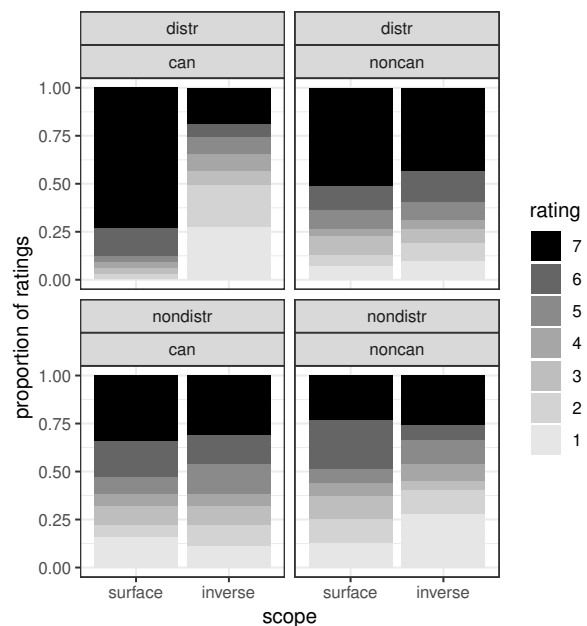
fronted bare/existential objects can be reconstructed under universal subjects, but universal objects cannot covertly QR across a bare/existential subject (position (iv); in line with Łęska's 2020 results for Polish double objects and in partial conflict with Grabska 2020, who, however, also manipulated information structure). In −distr inverse scope is apparently available in +can (MD 5), but this is not telling, as inverse scope with overt $\forall > \exists$ orders is entailed by surface scope (e.g. in −distrA it is true that for every pirate there is a bottle he is holding; it just happens to be the same one for all pirates). A by-item analysis (to be reported) revealed that the bimodal distribution in +distr&+can&inverse (prima facie suggesting that some participants accepted inverse scope in +can) is arguably due to the non-canonicity of subject > adverbial orders in some of the items and their (ostensibly incorrect) coding as +can. This post-hoc analysis harbors valuable insights for the analysis of basic word order. Our experiment also clearly demonstrates that bare nominals are compatible with existential semantics (contra Dayal 2011 and in line with Šimík & Demian 2020).

References: Antonyuk 2019 Quantifier scope in Russian. *Glossa* 4(54), 1-27. ● **Bobaljik & Wurmbrand 2012** Word order and scope: Transparent interfaces and the 3/4 signature. *Linguistic Inquiry* 43(3), 371-421. ● **Bruening 2008** The scope fieldwork project [online materials]. ● **Dayal 2011** Bare noun phrases. In *Semantics: An international handbook of natural language meaning,* vol. 2, 1088-1109. de Gruyter ● **Grabska 2020** Inverse scope in doubly-quantified sentences in Polish. *FASL 26,* 131-149. ● **Ionin & Luchkina 2018** Focus on Russian scope. *Linguistic Inquiry* 49(4), 741-779. ● **Łęska 2020** *Quantifier scope as a diagnostic for the position of arguments of ditransitive verbs.* Peter Lang. ● **Scontras, Polinsky, Tsai & Mai 2017** Cross-linguistic scope ambiguity. *Glossa*

2(36), 1-28. ● **Šimík & Demian 2020** Definiteness, uniqueness, and maximality in languages with and without articles. *Journal of Semantics* 37(3), 311-366.