NPIs, inferences, and double licensing: experimental evidence

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Introduction

Relevance of NPIs

- The most prominent theory of NPIs (Ladusaw, 1979 and subsequent work) explains their licensing as inference markers
  - Downward entailment (DE) environments
  - Downward inferences (DI)
- Our experimental research supports the hypothesis of Szabolcsi et al. (2008) and Barker (2018):
  - Double licensing (DL) of NPIs in Czech
  - Inferences triggered in DL environments
  - **NPIs are unreliable indicators of downward inferences**

Research Question

(1) RQ: Do NPIs in double licensing environments correlate with facilitating downward inferences?

Methodology

Double Licensing Environments

- **Double licensing environments**: NPI licensing varies in such contexts
  - Despite being intuitively upward entailing
  - Schmerling (1971); Barker (2018); Homer (2021)
- DL often fails when licensors are syntactically close
  - Homer (2021); Mayer et al. (2019)

Experimental Design

2 experiments (both acceptability judgment tasks):

- 7-point Likert scale
- Online on *L-Rex* platform
- 57 (out of 70) native Czech speakers
- Two versions with reversed order to control for order effects

Experiment 1: NPI Licensing in DL Environments

1×3 design:

- BASELINE,
- DOUBT-NEG,
- NEG-DOUBT

Experiment 2: Inference Reasoning

2×2 design:

- DE-DOWN,
- DE-UP,
- UE-DOWN,
- UE-UP

Experimental Items

Experiment 1 Examples

BASELINE:

(2) Policie **ne**-má *sebemenší důvod* tu stopu
Police neg-have.3sg slightest reason that.acc trail.acc
zahladit.
cover.
'The police have no reason to cover the trail.'

DOUBT-NEG:

(3) Petr **pochybuje**, [že policie **ne**-má *sebemenší*
Petr doubt.3sg that police neg-have.3sg slightest
důvod tu stopu zahladit].
reason that.acc trail.acc cover.
'Petr doubts that the Police have no reason to cover the trail.'

Experiment 1 Examples (cont.)

NEG-DOUBT:

(4) Petr **ne-pochybuje**, [že policie má *sebemenší*
Petr neg-doubt.3sg that police have.3sg slightest
důvod tu stopu zahladit].
reason that.acc trail.acc cover.
'Petr does not doubt that the Police have the slightest reason to cover the trail.'

Experiment 2 Examples

DE conditions:

(5) Petr **pochybuje**, [že si Marie **ne**-pořídila kočku].
'Peter doubts that Marie didn't get a cat.'
Petr doubt.3sg that refl Marie neg-got.3sg cat.acc.

a. → siamese cat [DE-DOWN]
b. → animal [DE-UP]

UE conditions:

(6) Petr **ne-pochybuje**, [že si Marie pořídila kočku].
Petr neg-doubt.3sg that refl Marie got.3sg cat.acc.
'Petr does not doubt that Marie has got a cat.'

a. → siamese cat [UE-DOWN]

b. → animal [UE-UP]

Results

Descriptive Statistics

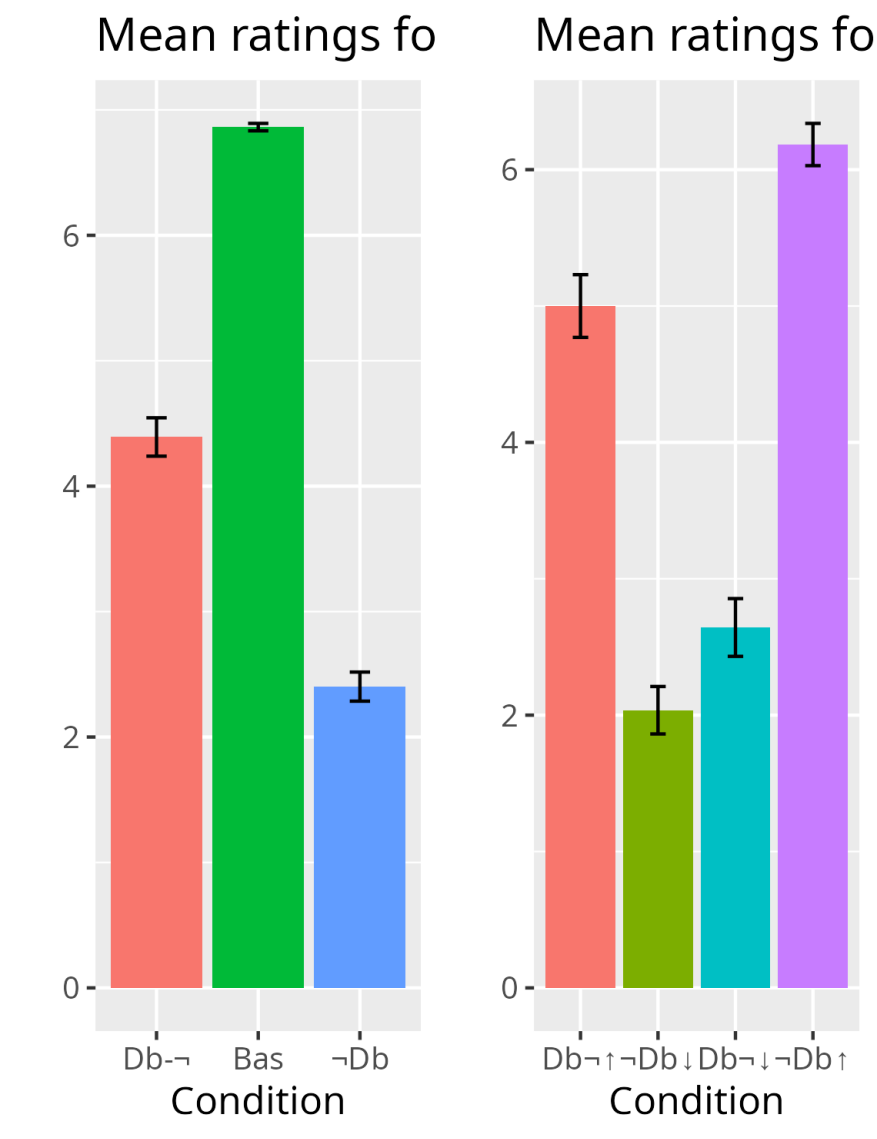

Figure 1: Acceptability and Inferences in DL environments

Statistical Models

Bayesian linear regression models in *rstanarm*:

Model 1 (NPI Licensing):

- BASELINE more natural than DOUBT-NEG $\widehat{\beta} = 2.46$, BF 1.01e+18)
- NEG-DOUBT less natural ($\widehat{\beta} = -1.98$, BF 2.25e+15)

Model 2 (Inferences):

- Upward inferences strongly preferred (INF: $\widehat{\beta} = 1.63$, BF 1.38e+16)
- No effect of negation position (ENV: $\widehat{\beta} = 0.14$, BF 0.044)
- **Intriguing interaction INF × ENV!**

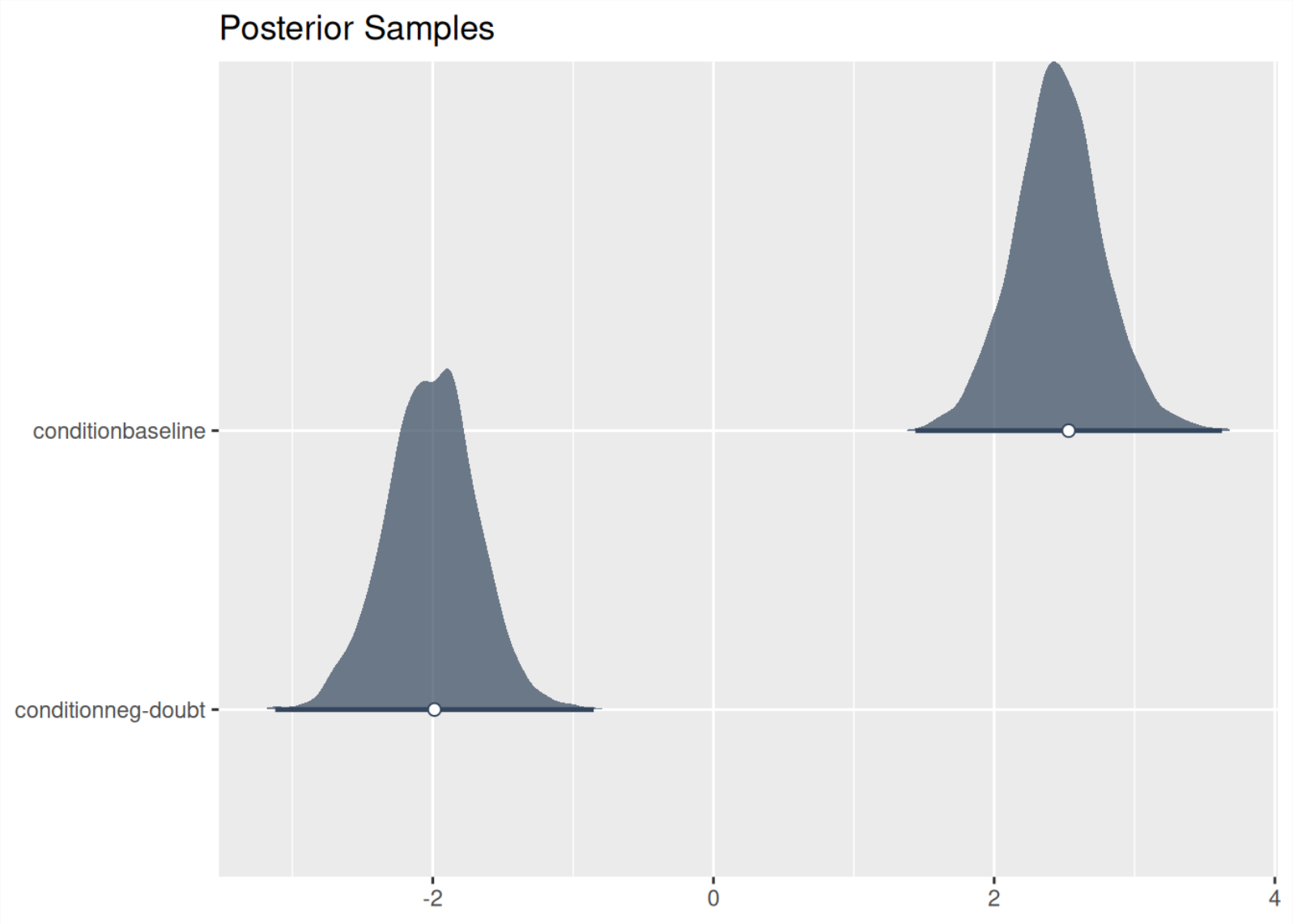

Figure 2: Exp1

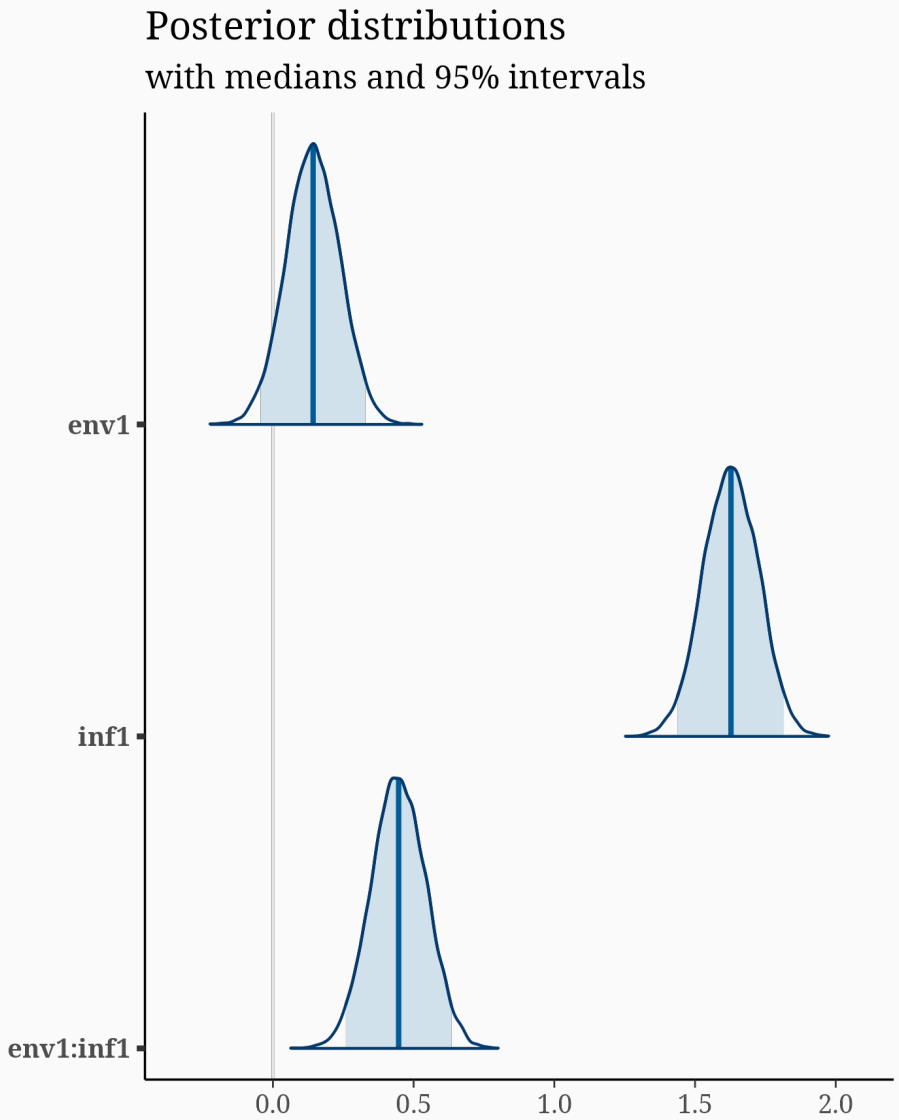

Figure 3: Exp2

Discussion

Key Findings

- **Support for Homer's (2021) environment-based approach:**
  - DL is acceptable when NPIs occur with their licensor (DOUBT-NEG)
- **Upward inferences always preferred**
  - Regardless of negation position across domains
- **Answer to research question:**
  - NPIs licensing in DL environments doesn't correlate with downward inference facilitation

Correlation Analysis

- Normalized correlations between Exp1 and Exp2 conditions:
  - **No credible link** between NPI licensing and inferences
  - Unlike Denić et al. (2021)
  - Only hint: interaction INF $\times$ ENV ($\widehat{\beta} = 0.45$, BF 171)
    - weaker UP inference in (5-a): 'doubt that Marie didn't get a cat', also the more acceptable (from the two non-baseline conditions) condition in Exp1

Theoretical Implications

Experimental support of Szabolcsi et al. (2008):

- NPIs signal narrow scope w.r.t. their licensor (Barker, 2018)
- In DL environments: NPIs remain indicators of narrow scope within their local polarity domain

Barker's (2018) NPI scope licensing:

- In DL cases: NPI licensed in embedded clause
- Wide scope does not entail narrow scope:

(7) $\exists[\textsc{Reason}(x) \wedge \neg\textsc{PoliceCovers}(x)] \not\models \neg\exists[\textsc{Reason}(x) \wedge \textsc{PoliceCovers}(x)]$

Theoretical Implications (cont.)

NPIs mark narrow scope but are not necessarily good signals of inferences

Overall alignment:

- More with Szabolcsi et al. (2008) and Barker (2018)
- Than with claims of DI-NPI link (Chemla et al., 2011; Denić et al., 2021; Ladusaw, 1979)

Bayesian analysis shows:

- Strong main effects but weaker interaction effect
- Supports view that NPIs are grammaticalized in DI environments
- But DI is not synchronically necessary for them (Herburger, 2023)

Conclusion

Summary

- **Double licensing environments** reveal complex NPI behavior
- **NPIs are unreliable indicators** of downward inferences
- **Scope-based theories** better explain the data than inference-based theories
- **Czech experimental evidence** supports cross-linguistic theoretical claims about NPIs being multi-faceted but at the core markers of scope (DE marking was maybe a historical fact but not a synchronic necessity)

References

Selected References

Barker, C. (2018). Negative polarity as scope marking. *L&P* 41(5), 483–510.

Denić, M., V. Homer, D. Rothschild, and E. Chemla (2021). The influence of polarity items on inferential judgments. *Cognition* 215, 104791.

Ladusaw, W. A. (1979). *Polarity Sensitivity as Inherent Scope Relations.* Ph.D. thesis.

Szabolcsi, A., L. Bott, and B. McElree (2008). The effect of negative polarity items on inference verification. *JoS* 25(4), 411–450.

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