Competition and moral behavior:
A meta-analysis of 45 crowd-sourced experimental designs

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Introduction

Morals and Markets

- **Does competition erode, promote, or not affect moral behavior?**
  - Smith (1776) argued that markets can have a civilizing effect on behavior.
  - Markets may attenuate conflict and violence (Hirschman 1977), stimulate morality, and induce trust (Henrich *et al.* 2001, 2006; Choi and Storr 2020).
  - Marx (1867) and Veblen (1899) expected markets to be innately alienating.
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- More recently, this debate has been taken to the laboratory...
  - Falk and Szech (2013) provide evidence that subjects are less likely to forego money to prevent the death of a mouse in competitive settings.
  - Follow-up experiments question the robustness of this finding based on rather inconclusive evidence (e.g., Bartling *et al.* 2015; Kirchler *et al.* 2016; Pigors and Rockenbach 2016; Ockenfels *et al.* 2020; Bartling *et al.* 2022).

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Design Heterogeneity

- **Why does empirical evidence lead to different conclusions?**
  - Sample heterogeneity: relatively small to moderate variability in effect sizes across samples (e.g., Klein *et al.* 2014, 2018; Ebersole *et al.* 2016).
  - Analytic heterogeneity: significant variance in estimates across analyses (Silberzahn *et al.* 2018; Botvinik-Nezer *et al.* 2018; Menkveld *et al.* 2021).
  - Design heterogeneity: systematic evidence is scarce (Landy *et al.* 2020).

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- **#ManyDesigns:**
  - As there are multiple valid approaches to operationalize competition and morality, we implemented a crowd-sourced project (Uhlmann *et al.* 2019).
- We eliminate sampling and analytic heterogeneity …
  - … by collecting data on various designs using a single sample
  - … by randomly assigning participants into one of the designs
  - … by standardizing the statistical analyses across designs

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Crowd-Sourcing Research Designs

Research Teams (RTs)

- We left it to the research teams to operationalize competition and morality.
- RTs were required to design (and later program) a between-subjects study.
- RTs filed a preregistration (incl. a proposed analysis) for their experiment.

- Sample of n = 200 per treatment, i.e., n = 400 for each design/experiment.
- Envisaged sample of 50 research teams, i.e., a total of ∼20,000 participants.
- Sample of n = 400 are sufficiently large to obtain adequate statistical power to detect small to medium effect sizes (t-test: $\pi = 0.9$ for $d = 0.32$ at $\alpha = 0.05$).

- After screening applications, 102 RTs were invited to submit a research design.
- 95 RTs submitted a design, and 50 RTs were randomly selected to participate.
- 45 RTs delivered the software and were thus included in the data collection.

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Design Requirements

- The design has to be eligible to obtain (fast track) IRB approval, i.e., …
  - no deception, preservation of participants' anonymity, explicit information (duration, repetitions, interactions, random processes), confidentiality, etc.
- The experiment must involve incentive compatible payments (avg. expected bonus payment of £1.70, on top of a flat participation fee of £1.30 per subject).
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Data Collection

- All data was collected in a single Prolific study, set up by the coordinators.
- Participants were directed to a common welcome screen, signed a captcha, provided informed consent, and completed a common attention check item.
- After that, participants were redirected to one of 45 × 2 = 90 treatments in batches of four (to mitigate attrition for designs using real-time interaction).

- We collected the data in ten time slots during the two weeks from January 17 to January 28, 2022, with one slot per day, from Monday to Friday in each week.
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- Participating RTs were asked to assess each others' designs anonymously.
- RTs involving two members were required to submit one rating per design.

- In particular, each RT was asked to assess ten other randomly selected designs (based on the pre-registration template submitted by each RT):

> *To what extent does this design [..] provide an informative test of the research question: "Does competition affect moral behavior?"*
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> *→ 0 (not informative at all) to 10 (extremely informative)*

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Two Analytic Approaches ...

A. For each research design, we estimate the effect size and standard error according to the analytic specification that has been proposed by the RT. *(Requirement: ordinary least squares regression on a treatment indicator.)*

B. To remove as much of the analytical variation across RTs as possible, we employ a standardized analytic specification for all 45 research designs. *(No controls, no exclusions, individual level, robust standard errors.)*

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Hypotheses

- **Primary hypotheses:**

  1A/1B Competition affects moral behavior.

  2A/2B Estimated effect size are heterogeneous.

- **Secondary hypotheses:**

  1A/1B Effect size estimates vary systematically with mean peer ratings.

  2A/2B Effect sizes are heterogeneous after controlling for mean ratings.

- *Pre-registered exploratory analyses and robustness tests:*
  - Analytic approach B with the exclusion criteria as used in approach A.
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Meta-Analytic Effect & Heterogeneity

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  - Random effects meta-analysis (DerSimonian and Laird 1986)
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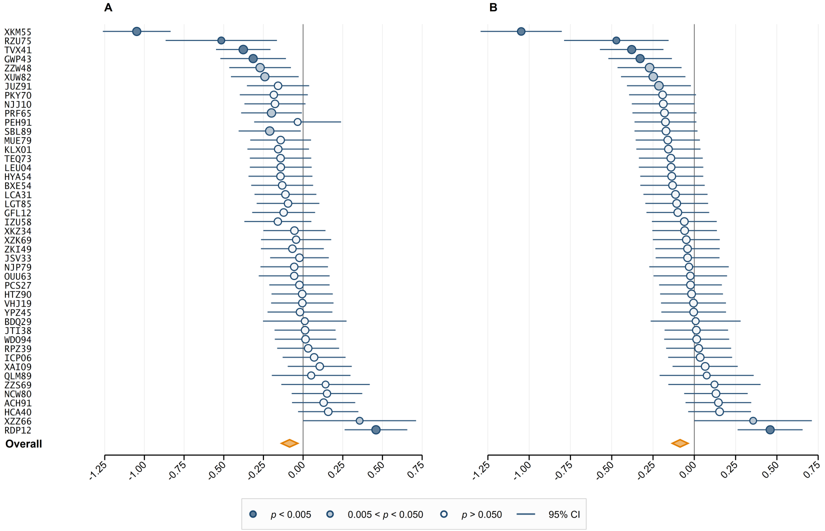

Meta-Analytic Effect & Heterogeneity

	Approach A	**Approach B**
Meta-analytic effect	$d = -0.085^{*}$ ($p = 0.008$)	$d = -0.086^{**}$ ($p = 0.004$)
# $d < 0$, $p < 0.05$	8 (17.8%)	7 (15.7%)
# $d > 0$, $p < 0.05$	2 (4.4%)	2 (4.4%)
Cochran's Q	$Q(44) = 181.1^{**}$ ($p < 0.001$)	$Q(44) = 161.5^{**}$ ($p < 0.001$)
I^2	72.8%	75.7%
τ	0.185	0.169
τ/σ	1.69	1.57

Moderating Effects of Design Quality?

- **Secondary hypotheses:**

  1A/1B Effect size estimates vary systematically with mean peer ratings.

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- **Secondary hypothesis tests:**
  - Meta-regression on the peers' average (demeaned) quality ratings (1A/1B).
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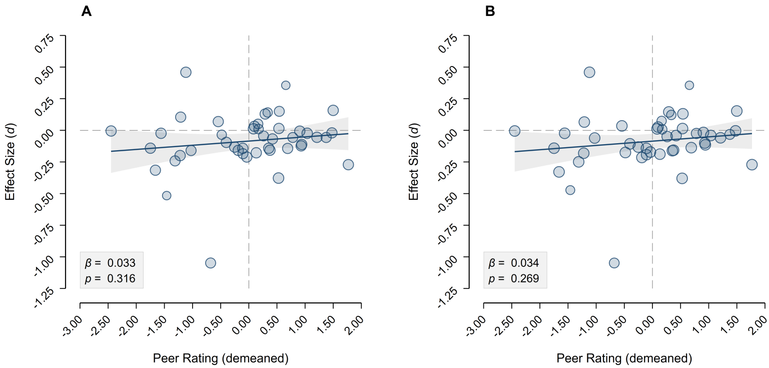

Residual heterogeneity remains significant (p < 0.001) for both analytic approaches; and the heterogeneity measures τ and I^2 are virtually unaffected by the moderator.

Summary and Conclusion

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- We find evidence of an **adverse effect of competition on moral behavior**, yet the estimated negative effect size is quite small with a Cohen's *d* of about 0.1.
- We find strong evidence of **substantial design heterogeneity**, i.e., systematic variation in effect sizes across designs, above and beyond sampling variance.

For Illustration Purposes...

- The substantial design heterogeneity identified in our study suggests that the informativeness and generalizability of a single study protocol can be limited.

- Consider randomly implementing one of the 45 designs ...
  - The average sample standard error for our 45 designs is $\sigma = 0.108$.
  - The estimated standard deviation of the true effect size is $\tau = 0.169$.

  - Considering the uncertainty due to design choice ...

    → the standard error doubles ($\sqrt{\sigma^2 + \tau^2} = 0.200$)

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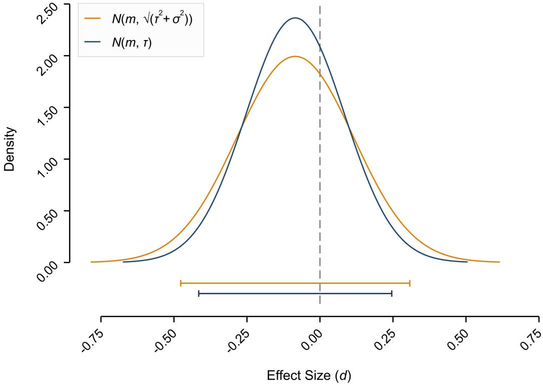

Summary and Conclusion

- To obtain more reliable scientific evidence, researchers should conduct studies based on multiple conceivable designs pooled in a meta-analysis.
- Moving towards much larger data collections and more team science could improve the informativeness and generalizability of experimental research.

Thank you!

Christoph Huber

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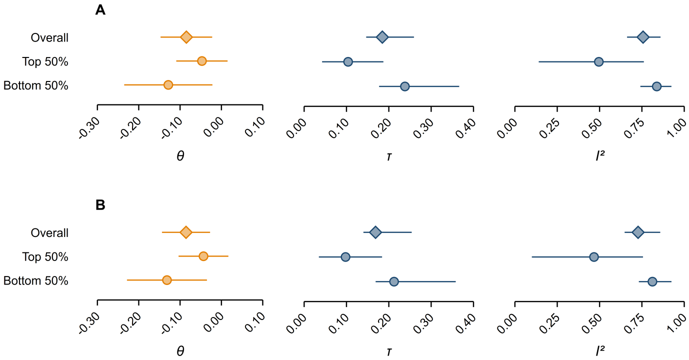
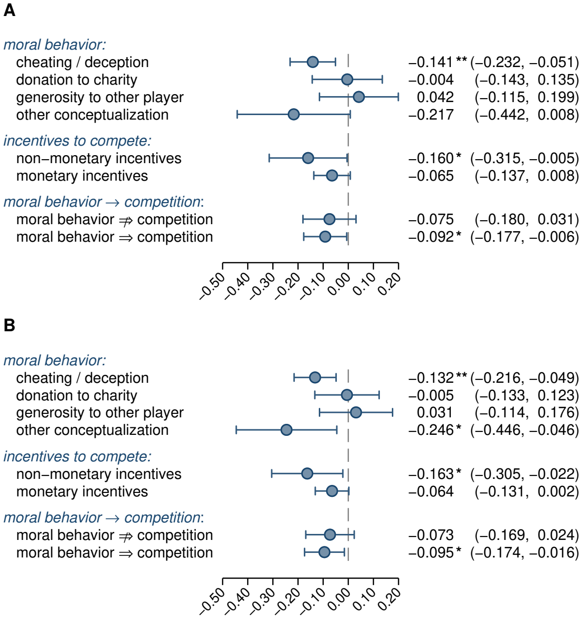
Appendix

Moderating Effects of Design Quality?



Moderating Effects of Design Quality?

Analytic Approach B	**Top 50%**	**Bottom 50%**
Meta-analytic effect	$d = -0.043$	$d = -0.132^{*}$
	($p = 0.159$)	($p = 0.008$)
# $d < 0$, $p < 0.05$	2 (9.1%)	5 (21.7%)
# $d > 0$, $p < 0.05$	1 (4.5%)	1 (4.5%)
Cochran's Q	$Q(44) = 39.4^{*}$	$Q(44) = 117.0^{**}$
	($p = 0.009$)	($p < 0.001$)
I^2	46.7%	81.2%
τ	0.098	0.212
τ/σ	0.89	2.01


A
moral behavior:
cheating / deception
−0.141 ** (−0.232, −0.051)
donation to charity
−0.004 (−0.143, 0.135)
generosity to other player
0.042 (−0.115, 0.199)
other conceptualization
−0.217 (−0.442, 0.008)
incentives to compete:
non−monetary incentives
−0.160 * (−0.315, −0.005)
monetary incentives
−0.065 (−0.137, 0.008)
moral behavior → competition:
moral behavior ⇏ competition
−0.075 (−0.180, 0.031)
moral behavior ⇒ competition
−0.092 * (−0.177, −0.006)
−0.50
−0.40
−0.30
−0.20
−0.10
0.00
0.10
0.20
B
moral behavior:
cheating / deception
−0.132 ** (−0.216, −0.049)
donation to charity
−0.005 (−0.133, 0.123)
generosity to other player
0.031 (−0.114, 0.176)
other conceptualization
−0.246 * (−0.446, −0.046)
incentives to compete:
non−monetary incentives
−0.163 * (−0.305, −0.022)
monetary incentives
−0.064 (−0.131, 0.002)
moral behavior → competition:
moral behavior ⇏ competition
−0.073 (−0.169, 0.024)
moral behavior ⇒ competition
−0.095 * (−0.174, −0.016)
−0.50
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−0.30
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