Do money rewards motivate people?

A Meta-Analysis

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Explanation of the Thesis

Target

- Do monetary incentives motivate people?
- A quantitative literature survey of over 40 studies

Findings

- Little to no effect of rewards on motivation
- Presence of publication bias in the literature
- 9 main driving factors behind the effect
- Robustness checks are in line with the results

Effect of Rewards on Motivation

- Undermining intrinsic motivation theory (Deci, 1971)
- 11 meta-analyses on the topic of rewards-motivation
- Looking at the problem from a strictly economic point of view using an updated set of literature
- Quantification of the driving factors behind the effect using the newest meta-analytical methodology
- Extensive search for publication bias

Data Collection

- Google Scholar search
- 30 top economic journals according to IDEAS/RePEc
- 202 potential studies
- Exclude papers that don't report quantitative effect and standard error
- Identified 44 suitable studies, out of which we collected 1568 estimates (more than 95% of all meta-analyses)

Partial Correlation Coefficient

We unified the effect using the partial correlation coefficient:

$$PCC = \frac{t}{\sqrt{t^2 + df}},$$

along with its respective standard error:

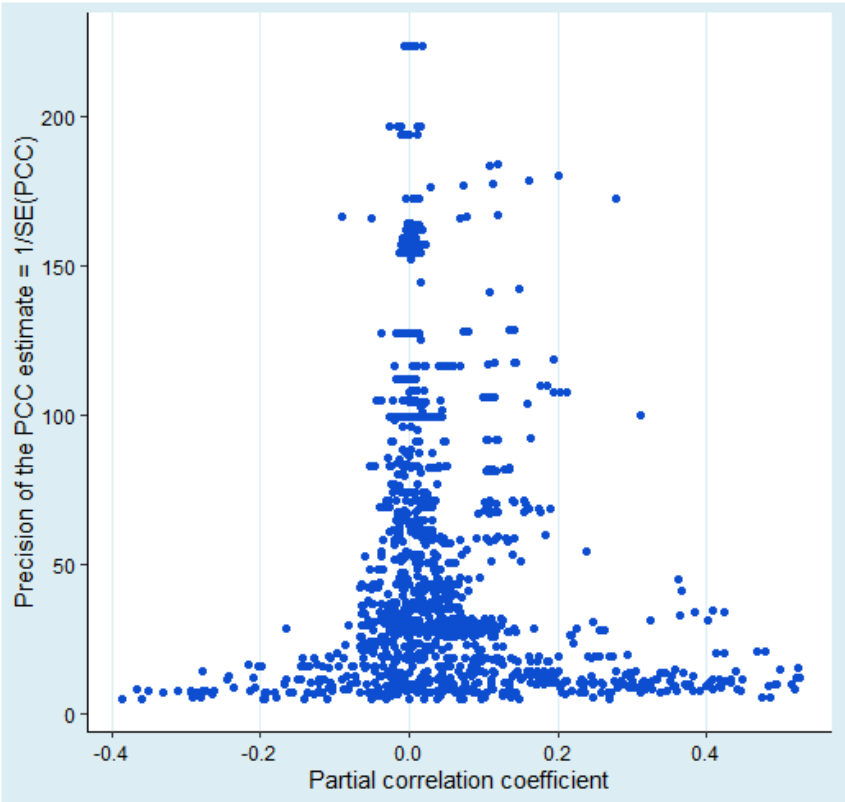
$$SE_{PCC} = \sqrt{\frac{(1 - PCC^2)}{df}}.$$

This allows us to test for publication bias:

$$PCC_{ij} = \underbrace{\beta_0}_{true\ effect} + \underbrace{\beta_1 * (SE_{PCC})_{ij}}_{publication\ bias} + u_{ij}.$$

Graphical Test Using a Funnel Plot

The funnel plot should be symmetrical distributed around the true mean if there is no publication bias. (Egger et al., 1997)



Statistical Tests Suggest Minimal Overall Effect

Linear tests	OLS	FE	BE	Study	Precision
SE	0.319**	0.879***	0.627***	0.203	0.879***
Publication bias	(0.131)	(0.037)	(0.125)	(0.134)	(0.172)
Constant	0.032***	0.014***	0.020***	0.035***	0.014***
Effect beyond bias	(0.004)	(0.001)	(0.003)	(0.004)	(0.003)
Observations	1568	1568	1568	1568	1568

Non-linear tests	WAAP	Top10	Stem-based	Selection	Hierarchical	Endo. kink
Publication bias	-	-	-	-	0.684	0.887***
	-	-	-	-	(0.677)	(0.152)
Effect beyond bias	0.024***	0.019***	0.021***	0.000	0.049	0.012***
	(0.003)	(0.004)	(0.007)	(0.003)	(0.068)	(0.002)
Observations	1568	1568	1568	1568	1568	1568

What Drives the Effect of Money on Motivation? (1)

Variable	Mean	SD
Effect characteristics		
Effect GPA	0.348	0.476
Effect Charity	0.276	0.447
Effect Game	0.272	0.445
Effect Work	0.104	0.305
Positive effect	0.866	0.341
Negative effect	0.134	0.341
Methodology		
OLS	0.558	0.497
Logit	0.063	0.243
Probit	0.085	0.279
Tobit	0.034	0.181
Fixed-effects	0.037	0.188
Random-effects	0.027	0.161
Diff-in-diff	0.030	0.171
Other method	0.036	0.187

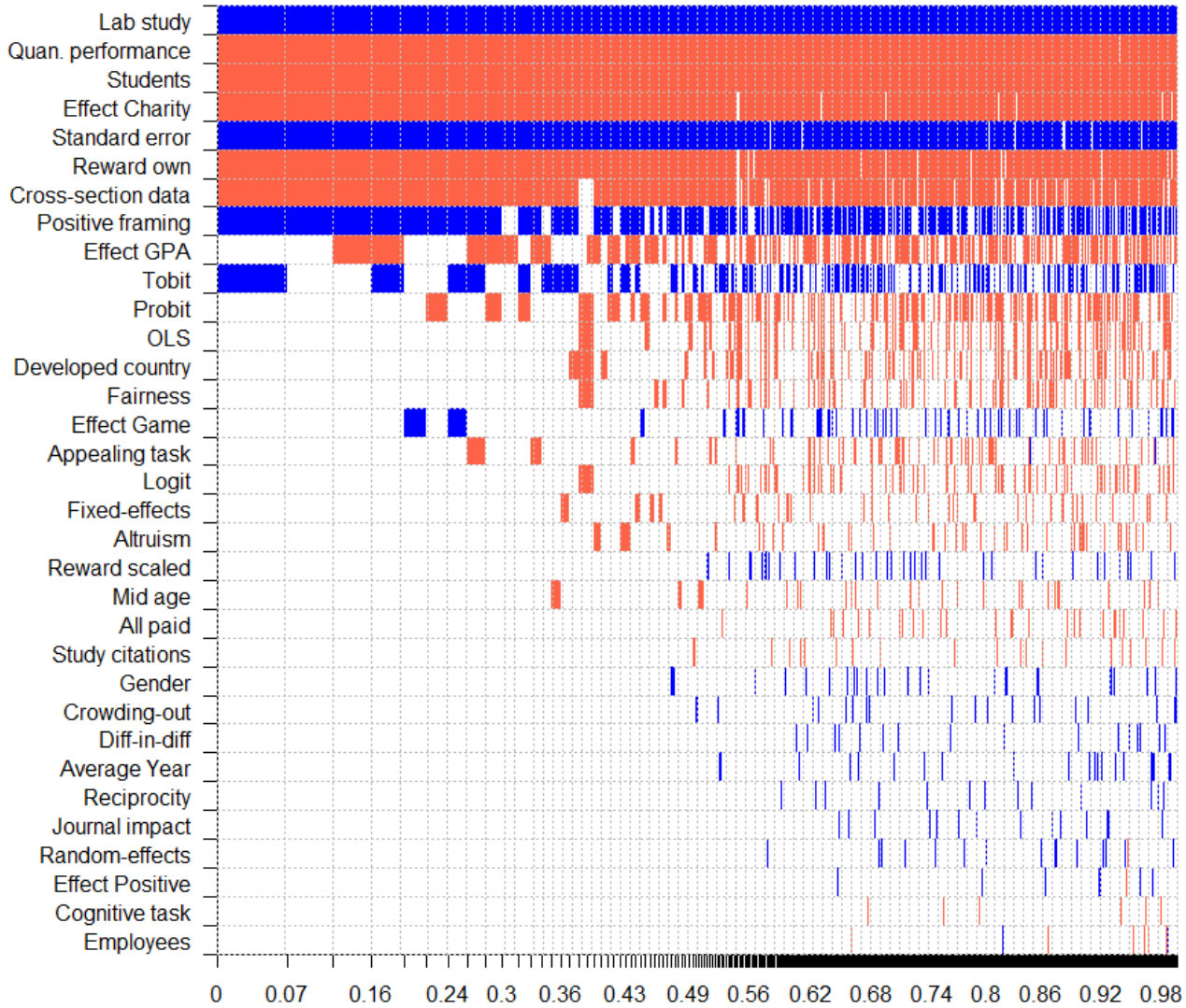
Variable	Mean	SD
Study specifications		
Cross-sectional data	0.454	0.498
Panel data	0.546	0.498
Time horizon	4.096	2.667
Average Year	7.605	0.002
N. of obs.	7.084	1.960
Lab study	0.224	0.417
Field study	0.776	0.417
Journal impact	5.491	3.201
Study citations	4.876	1.773
Crowding-out	0.476	0.500

What Drives the Effect of Money on Motivation? (2)

Variable	Mean	SD
Reward scheme		
Positive framing	0.827	0.379
Negative framing	0.173	0.379
Reward scaled	0.610	0.299
All paid	0.735	0.441
Reward own	0.811	0.391
Reward else	0.189	0.391
Task nature		
Quan. performance	0.694	0.461
Qual. performance	0.306	0.461
Cognitive task	0.701	0.458
Manual task	0.299	0.458
Appealing task	0.479	0.500
Non-appealing task	0.521	0.500

Variable	Mean	SD
Motivation		
Altruism	0.279	0.449
Trust	0.020	0.140
Reciprocity	0.098	0.298
Fairness	0.156	0.363
Monetary	0.447	0.497
Subject and country characteristics		
Students	0.607	0.489
Employees	0.079	0.269
Mix	0.314	0.464
Gender	0.528	0.228
Mid age	2.932	0.317
Developed country	0.833	0.369
Developing country	0.167	0.369

Model Inclusion in Bayesian Model Averaging



Best-Practice Estimate Tells a Similar Story

We compute estimates of the effect mean conditional on subjective best-practice and compare these results to estimated means from other works.

	Best-practice estimate		
Subjective best pratice	0.079 (0.018, 0.140)	0.060 (-0.003, 0.123)	**Lazear (2000a)**
Takahashi et al. (2016)	0.071 (-0.029, 0.171)	0.019 (-0.013, 0.051)	**Angrist et al. (2009)**

Economic Significance of Key Variables

	One SD change		Maximum change	
	Effect on PCC	% of BP	Effect on PCC	% of BP
Standard error	0.0202	25.52%	0.2469	312.05%
Effect GPA	-0.0081	-10.24%	-0.0170	-21.48%
Effect Charity	-0.0233	-29.39%	-0.0520	-65.72%
Cross-sectional data	-0.0294	-37.13%	-0.0590	-74.56%
Lab study	0.0338	42.70%	0.0810	102.37%
Positive framing	0.0144	18.19%	0.0380	48.02%
Reward own	-0.0188	-23.73%	-0.0480	-60.66%
Quan. performance	-0.0272	-34.36%	-0.0590	-74.56%
Students	-0.0318	-40.13%	-0.0650	-82.15%

Results

Main Findings

1. We observed a close to zero overall effect of rewards on performance (0.012-0.035).
2. A presence of publication bias in the literature was detected by a number of statistical tests.
3. Positive influence on the effect: publication bias, laboratory setting and positive framing.
4. Negative influence on the effect: school setting, charitable giving, cross-sectional data, self-reward, quantitative performance, and students subgroup.

References

Deci (1971): Effects of externally mediated rewards on intrinsic motivation.
Journal of pers0onality and Social Psychology 18, no. 1 (1971): 105

Egger, M., Smith, G.D., Schneider, M. & Minder, C. (1997): Bias in meta-analysis detected by a simple, graphical test.
Bmj 315, no. 7109 (1997): 629-634.

Relaxing the Exogeneity Assumption

	IV	**p-uniform***
Publication bias	0.512	YES
	(1.121)	(2.017)
Effect beyond bias	0.023	0.021**
	(0.050)	(0.012)
Studies	44	44
Observations	1568	1568