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DIW Berlin
German Institute for Economic Research
Mohrenstr. 58
10117 Berlin

Tel. +49 (30) 897 89-0
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The Economics of Replication

Frank Mueller-Langer[1,2], Benedikt Fecher[3,4], Dietmar Harhoff[1,5] and Gert G. Wagner[3,6,7*]

[1]Max Planck Institute for Innovation and Competition, Department of Innovation and Entrepreneurship Research
[2] European Commission, Joint Research Center
[3]German Institute for Economic Research (DIW Berlin)
[4]Alexander von Humboldt Institute for Internet and Society, Internet-enabled Innovation
[5]LMU, Munich School of Management
[6]Max Planck Institute for Human Development, Fellow
[7]Berlin University of Technology (TUB), Faculty of Economics and Management

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Abstract
Replication studies are considered a hallmark of good scientific practice. Yet they are treated among researchers as an ideal to be professed but not practiced. To provide incentives and favorable boundary conditions for replication practice, the main stakeholders need to be aware of what drives replication. Here we investigate how often replication studies are published in empirical economics and what types of journal articles are replicated. We find that from 1974 to 2014 less than 0.1% of publications in the top-50 economics journals were replications. We do not find empirical support that mandatory data disclosure policies or the availability of data or code have a significant effect on the incidence of replication. The mere provision of data repositories may be ineffective, unless accompanied by appropriate incentives. However, we find that higher-impact articles and articles by authors from leading institutions are more likely to be subject of published replication studies whereas the replication probability is lower for articles published in higher-ranked journals.

Keywords: Replication, economics of science, science policy, economic methodology
JEL codes: A1, B4, C12, C13

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1 Introduction

The scientific community has repeatedly experienced instances of misconduct and erroneous analyses (Lacetera and Zirulia, 2011). The data fraud scandal concerning social psychologist Diedrik Stapel (Levelt et al., 2012), Hwang's fraudulently reported breakthroughs in stem-cell research (Cyranoski, 2006), or Schoen's entirely fabricated results on organic transistors in over 40 publications (Grant, 2002) are only the most prominent examples. In times of increasing publication rates and data-intense research, the traditional peer review alone is unlikely to guarantee the correctness of published findings. Given the increasing demand for science to be open and transparent (e.g., regarding access to scientific outputs), expectations regarding the replication of published results are growing. However, despite its importance, replication is an ideal professed but not practiced among researchers (Duvendack et al., 2015; Hamermesh, 2007).

Here we investigate how often replication studies are published in empirical economics and which types of journal articles are replicated. We find that high-impact articles and articles by authors from leading institutions are more likely to be replicated, but the overall incidence of less than 0.1% of articles being replications is surprisingly low. We do not find empirical support for the hypothesis that the lower cost of replication that is associated with the availability of data or code has a significant effect on the incidence of replication. Our results suggest that the mere provision of data repositories may be ineffective, unless accompanied by appropriate incentives.

The remainder of the paper is organized as follows. Section 2 provides on overview of the data, sample creation and variables under study. In Section 3, we outline the methodological approach. Section 4 discusses our results and provides robustness checks. Section 5 concludes.

2 Data and variables

The period under study is 1974 to 2014. We consider all replicated and nonreplicated articles published in issues of the top 50 economics journals that contain at least one replicated article. Our sample consists of 1,243 articles, 10.5% of which are subject to replication studies. Our definition of replication studies includes (a) narrow replications using the same data and methods as the replicated article, (b) wide replications using the same methods but different data, (c) replications using the same data but different methods, and (d) replications that use new data and new methods (Duvendack et al., 2015).

2.1. Data and sample creation

We followed two distinct strategies to identify replication studies. First we considered Web of Science (WoS) metadata for all articles published in the top 50 economics journals (in total, 126,505 articles) and counted how often indicative terms such as "replication," "reassessment," "reexamination," "revisit," "retesting," or "reappraisal" among others appeared in the titles and abstracts of these articles. All articles were ranked in terms of the likelihood of being a replication study.

For the 100 highest-ranked articles of each journal, we studied the articles in detail in order to identify replication studies. In addition, we included all eligible replication studies published on the website of *ReplicationWiki*[2] in our data set. We then identified the respective journal article (henceforth, replicated article) that was the subject of any replication study. For the analysis, we only considered empirical research articles and removed purely theoretical articles. We defined a purely theoretical article as an article that does not use any data. We searched for summary statistics and statistical tables in the PDFs in order to distinguish between empirical and purely theoretical articles. Lastly, we considered

[2] http://replication.uni-goettingen.de/wiki/index.php/Main_Page (last accessed 30 January 2017)

all replicated and nonreplicated articles published in issues with at least one replicated article. From the 1,243 published journal articles in our sample 130 are replicated articles (1,113 nonreplicated articles).

Among the top 50 economics journals (according to the WoS impact factor), 23 had published at least one replicated article in the past. Table 1 provides on overview of the journals under study.

[Table 1 HERE]

We retrieved article metadata from WoS, i.e., publication date, number of references, pages and authors, and journal information. We gathered information on the rank position of the institutions that the authors are affiliated with from the Ranking Web of Universities 2014 and obtained author citation metrics from Scopus.

Following Andreoli-Versbach and Mueller-Langer (2014) we identified journals that have data disclosure policies in place and the first volume in which the policy was adopted in order to identify articles that are subject to a data disclosure policy. In our sample, nine of the 23 journals under study have a mandatory data disclosure policy (see Table 1). Notably, *Experimental Economics* is the only top-50 economics journal with an explicit replication policy. Its website indicates: *"Lastly, the journal publishes articles with a primary focus on methodology or replication of controversial findings."* Two other replication policies (JPE and Labour Economics) were suspended, according to the editors, due to a lack of interest in replication (Hamermesh, 2007). Moreover, 292 of the empirical articles under study are subject to a mandatory data disclosure policy. Notably, the data sets used or program codes are available on the respective journal website for 183 of these articles (62.7%). We identified one article out of 292 that was subject to a mandatory data disclosure policy, but for which the data or program code was not available because it was proprietary (which leads to an exemption from disclosure). This suggests that for 37% (108) of the 292 empirical

articles subject to mandatory data disclosure policies, the data or program code was not available although the data was not proprietary. This result raises concerns regarding the enforcement of mandatory data disclosure policies. Figure 1 illustrates the total number of articles published under a mandatory data disclosure policy and the total number of articles published under a mandatory data disclosure policy where the policy is not strictly enforced. It suggests that both numbers increase over time and that for a large share of journals mandatory data disclosure policies are announced but not always enforced or monitored.

[Figure 1 HERE]

We also analyzed the funding guidelines of 36 research funding bodies worldwide regarding their data management policies. To this end, we randomly selected 27 public funding bodies from the 15 countries with the highest public expenditure for research according to the OECD (2016). We added 9 funding bodies that are not necessarily public, but that support noncommercial research (e.g., Bill and Melinda Gates Foundation), that are international (e.g., the European Commission's Horizon 2020), or that are from countries that are too small to appear in the list of the top funding countries (e.g., the Swiss National Science Foundation). In addition to screening the websites manually for the guidelines, we contacted every funding body in our sample via email in two waves and asked for relevant documents. 20 funding bodies replied to our information request. We were able to gather the guidelines from all 36 funding bodies. We regard the guidelines as textual data and code if they mention data management, if they specify where and how data should be stored, its terms of access (e.g., on request or public), documentation standards, and if they mention replication studies. From the 36 guidelines under study, 22 (61%) mention data sharing; 19 (53%) specify how or where to publish data;[3] 20 (56%) mention data documentation; 16 (44%) require data management plans; and 20 (56%) mention an embargo period for data in which the principal

[3] For instance, 12 guidelines (33%) indicate that data from funded projects should be stored in a public repository while 2 (6%) mention that data needs to be made available upon request.

investigator has exclusive rights to access and publish with the data. Notably, none of the funding bodies under study has an explicit replication policy.

2.2. Variables

Table 2 provides an overview of the dependent and independent variables used in our study.[4] The dependent variable, *ReplicatedArticle,* is a binary variable indicating whether the article under study was subject of a successfully published replication study. This variable measures the joint likelihood of a replication being undertaken and then being published. Merely analyzing the incidence of replication studies being undertaken (measurable by replications described in discussion papers or other pre-publication media) would not capture the most important filter mechanism in academic communication: review and ultimate publication. We obtained this variable by identifying replication studies published in the top-50 economics journals and the respective replicated articles published in these journals.

[Table 2 HERE]

Figure 2 shows that the total number of journal articles has increased at a higher rate than the total number of published replication studies. It is also noteworthy that the share of published replication studies on the total number of journal articles per year never exceeds 0.26% in the period from 1974 to 2014. From our sample we also estimate that the share of empirical articles rose from about 73% in 1975 to about 80% in 2010 (Figure 3).

[Figures 2 and 3 HERE]

Regarding our independent variables, we distinguish between the main variables of interest and control variables indicating article, author, journal, and institutional characteristics (see Table 2).

[4] Appendix 1 provides a correlation matrix for the dependent variable and main variables of interest.

As for the main variables of interest, *CitesPreReplication* indicates the total number of citations of replicated articles and nonreplicated articles in the same issue one year prior to the publication of a replication study. Arguably, replicated articles may attract more cites prior to the publication of a replication study if there is a longer lag between the publication of the article and the publication of the respective replication study. *LagReplication* measures this lag in years. Table 3 provides extended descriptive statistics on *CitesPreReplication* and *LagReplication* by subgroups while distinguishing between replicated and nonreplicated articles. The descriptive statistics indicate that, prior to replication, replicated articles have attracted more cites than nonreplicated articles for virtually all subgroups.

[Table 3 HERE]

The quality of a journal is given by WoS impact factor 2014, *ImpactFactor*. We include a dummy variable, *Top5Journal*, which indicates whether an article was published in one of the top five economics journals according to Card and DellaVigna (2013), i.e., American Economic Review, Econometrica, Journal of Political Economy, Quarterly Journal of Economics, and Review of Economic Studies. *Top-50* University indicates that an author is affiliated with a top-50 university according to the Ranking Web of Universities 2014. *MandatoryDisclosure* is a binary variable indicating whether an article is subject to a mandatory data disclosure policy. *DataOrCode* is a dummy variable indicating whether the data or program code used in an article are available on the journal website.

As for the control variables, *SelfCreatedData* is a dummy variable indicating whether the data used in an article are self-created (in contrast to archived data which is re-analyzed), e.g., via laboratory or field experiments, surveys, or interviews. We read all explanatory notes in order to determine whether the data used in an article was confidential or proprietary to generate the dummy variable *ConfidentialData*. *ProceedingsArticle* is a binary variable indicating whether articles were published in conference proceedings. *References* and *Pages*

are defined as the total number of references and pages. *Authors* indicates the number of authors. To control for author quality, we created the variable *BestH*, which indicates the h-index of authors of single-authored articles or the highest h-index of all co-authors in the case of multi-authored articles, respectively. *Funded* is a dummy variable indicating whether an article received third-party funding (18.5% of the articles under study). *FunderDataSupport* reflects the number of data policies and data management tools that external research funders provide to the authors they support. This variable can be thought of as the extent to which external funders have policies that facilitate data availability. Table 4 provides on overview of the data guidelines of the funding agencies under study.

[Table 4 HERE]

FunderDataSupport takes on one of five values, from 0 (no policy facilitating data availability) to 5 (full set of policies). It is computed as the sum of five binary variables that take on the value of 0 or 1.

3 Methodology

To examine the determinants of the likelihood of a journal article being the subject of a published replication study we run probit (and OLS) regressions as given by:

$$prob(ReplicatedArticle) = \beta_1 \cdot ProceedingsArticle + \beta_2 \cdot LogReferences + \beta_3 \cdot LogPages + \beta_4 \cdot Authors + \beta_5 \cdot LogBestH + \beta_6 \cdot SelfCreatedData + \beta_7 \cdot ConfidentialData + \beta_8 \cdot Funded + \beta_9 \cdot FunderDataSupport + \beta_{10} \cdot LogCitesPreReplication + \beta_{11} \cdot LogLagReplication + \beta_{12} \cdot Top5Journal + \beta_{13} \cdot LogImpactFactor + \beta_{14} \cdot Top50University + \beta_{15} \cdot MandatoryDisclosure + \beta_{16} \cdot DataOrCodeAvailability.$$

We also include dummy variables for 23 journals and for nine 5-year intervals. Note that author citation metrics are not available for 18 out of 1,243 observations. In the regressions we use log transformations. As some researchers have an h-index of zero, we define *LogBestH* = log(*LogBestH* + 1). We follow the same procedure for *LogReferences*. We compute robust standard errors clustered at the journal level. All specifications reported in this paper are straightforward modifications of this baseline specification.

4 Results

We run our regressions with five different specifications as reported in Table 5. In specification [1], we consider control variables (article, author and institutional characteristics), journal and year fixed effects. Table 5 does not report marginal effects of the control variables (Appendix 2 provides the full version of Table 5). For all specifications, we provide the Wald test statistics for these variables. We include the log of total cites before publication of a replication study and the log lag between the publication of replicated articles and of the respective replication studies in specification [2] to examine the effect of article impact on the replication probability. In specification [3], we include the Top-5 economics journal dummy variable and the log of the journal impact factor to account for the effect of journal quality on the probability of replication. In specification [4], we add the affiliation with a top-50 university. We include binary variables for data policies and data or code

availability in specification [5] to examine the impact of mandatory data disclosure policies on the probability of replication.

[Table 5 HERE]

The results reported in Table 5 provide empirical evidence that the impact of journal articles—measured in citations—positively affects the probability of them being the subject of published replication studies. The marginal effects at the mean of *LogCitesReplication* range from 0.053 to 0.057 and are statistically significant at the 0.1% level across specifications. In addition, the log lag between the publication of the replicated articles and of the respective replication studies negatively affects the probability of replication. This effect is statistically significant at the 0.1% level across specifications. Interestingly, the effect of *LogLagReplication* is larger in magnitude than that of *LogCitesPreReplication*. This indicates that articles initially published further in the past are less likely to be the subject of a published replication study, irrespective of their citation performance. Our analysis further suggests that articles published in better journals are less likely to be the subject of published replication studies. The marginal effects of both *Top5Journal* and *LogImpactFactor* are negative and statistically significant at the 0.1% level across specifications. We find empirical evidence that journal articles by authors from better institutions have a higher incidence of being replicated. The marginal effects of *Top50University* are positive and statistically significant at the 5% level in specification [4] and [5]. In contrast, we find no significant effect of *MandatoryDisclosure* and *DataOrCode* on replication. For robustness, we also perform linear probability regressions. Table 6 reports OLS regression coefficients. We essentially yield the same results.

[Table 6 HERE]

5 Conclusion

We argue that researchers behave highly rationally, as they tend to replicate high-impact research from renowned researchers and institutions, presumably because in this case replications are more likely to be publishable. Our results are in line with previous assumptions that relate replication to impact. Hamermesh (2007, 2017) proposes that the probability that an individual will attempt a replication increases with the visibility of the published results. Furman et al. (2012) suggest that results from frequently cited articles generate more interest and scrutiny and—possibly, due to a higher probability of replication—have a higher probability of observed retraction. Dewald et al. (1986) suggest that replication studies in empirical economics are more likely to be published when they detect error or fraud. Sukhtankar (2017) finds that the strongest predictor of whether or not a paper is replicated is the paper's Google Scholar citation count. In this regard, private incentives are well aligned with societal interests, since high-impact publications are also the studies that are most likely to influence decision-makers in private and public organizations. Moreover, replicators focus on publications that have been published in less demanding journals because the chances of detecting an error might be higher, possibly due to less strict peer review.

However, the question remains whether sufficient replications are conducted to guarantee the correctness of published findings. The overall incidence of less than 0.1% of articles being replications is surprisingly low. In our view, replications—and further meta-analyses (Anderson and Kichkha, 2017)—are necessary extensions to the peer review and should be promoted via journal policies (Hoeffler, 2017), integration in teaching (Fecher et al., 2016) and a higher likelihood of publication. Our results suggest that the decision to conduct a replication study is—at least partly—driven by the replicator's reputation considerations. Thus the low number of replication studies being conducted would potentially

increase if replication studies received more formal recognition, e.g. through publication in (high-impact) journals.

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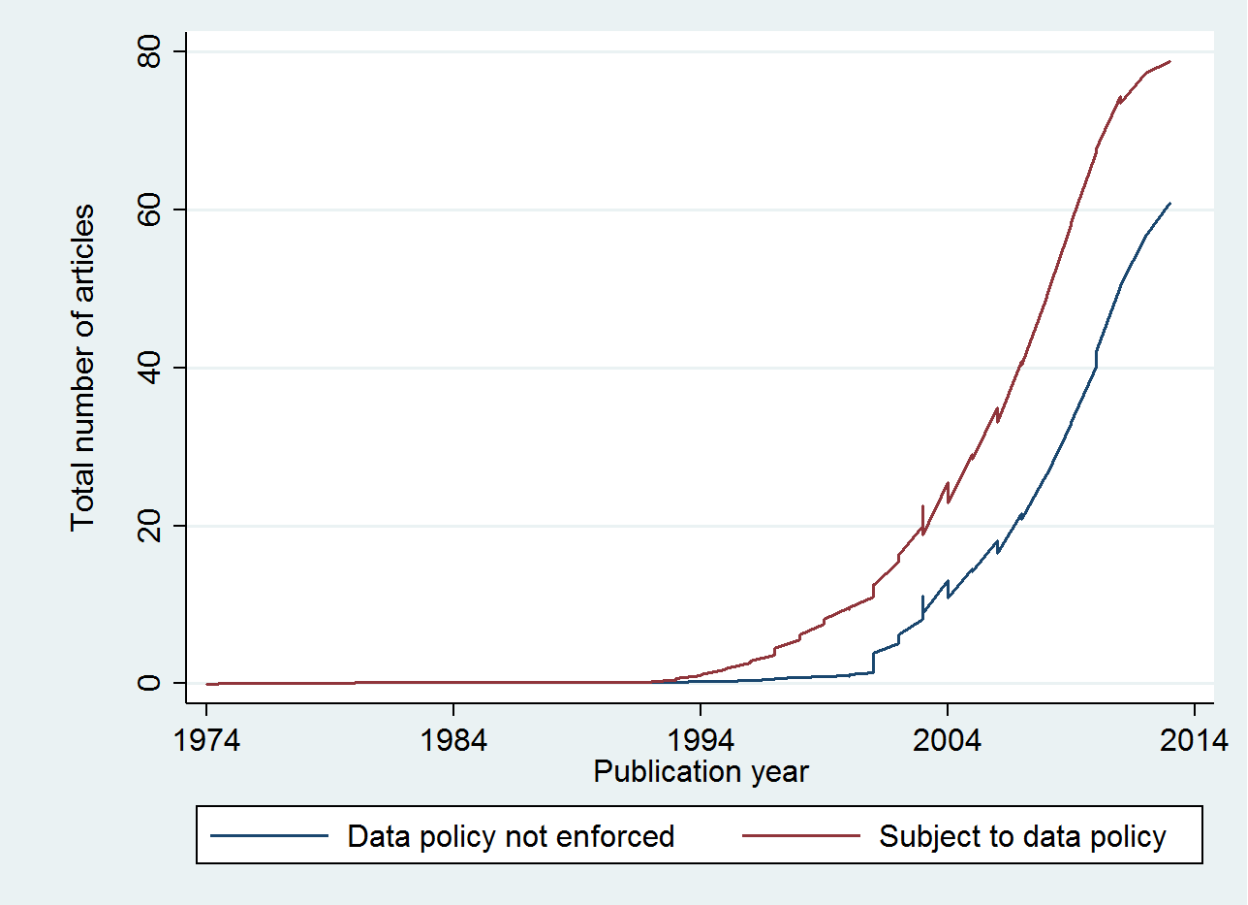

Figure 1 | Prevalence and enforcement of mandatory data disclosure over time (Lowess line)

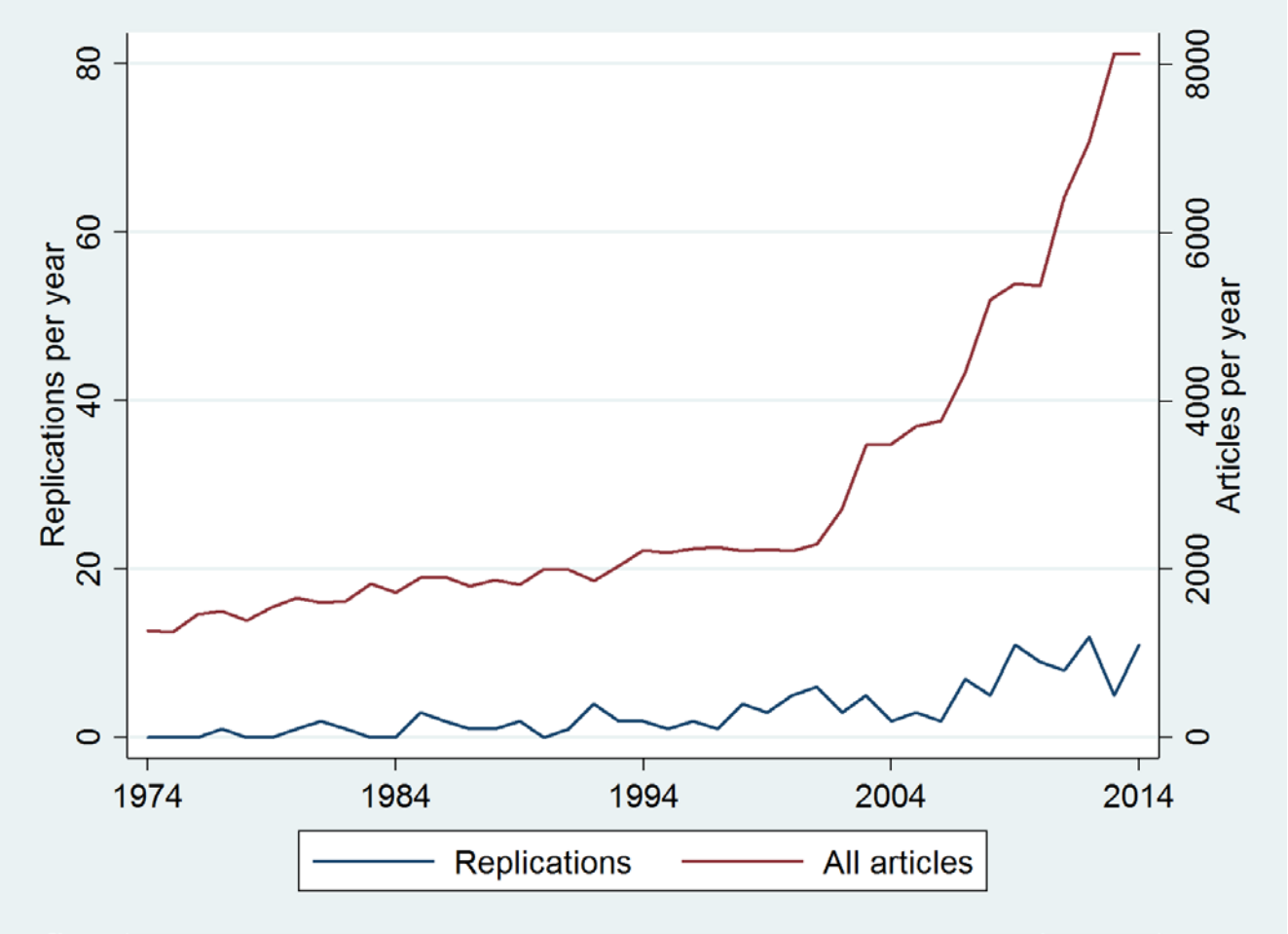

Figure 2 | Total number of published replication studies and of all journal articles by publication year

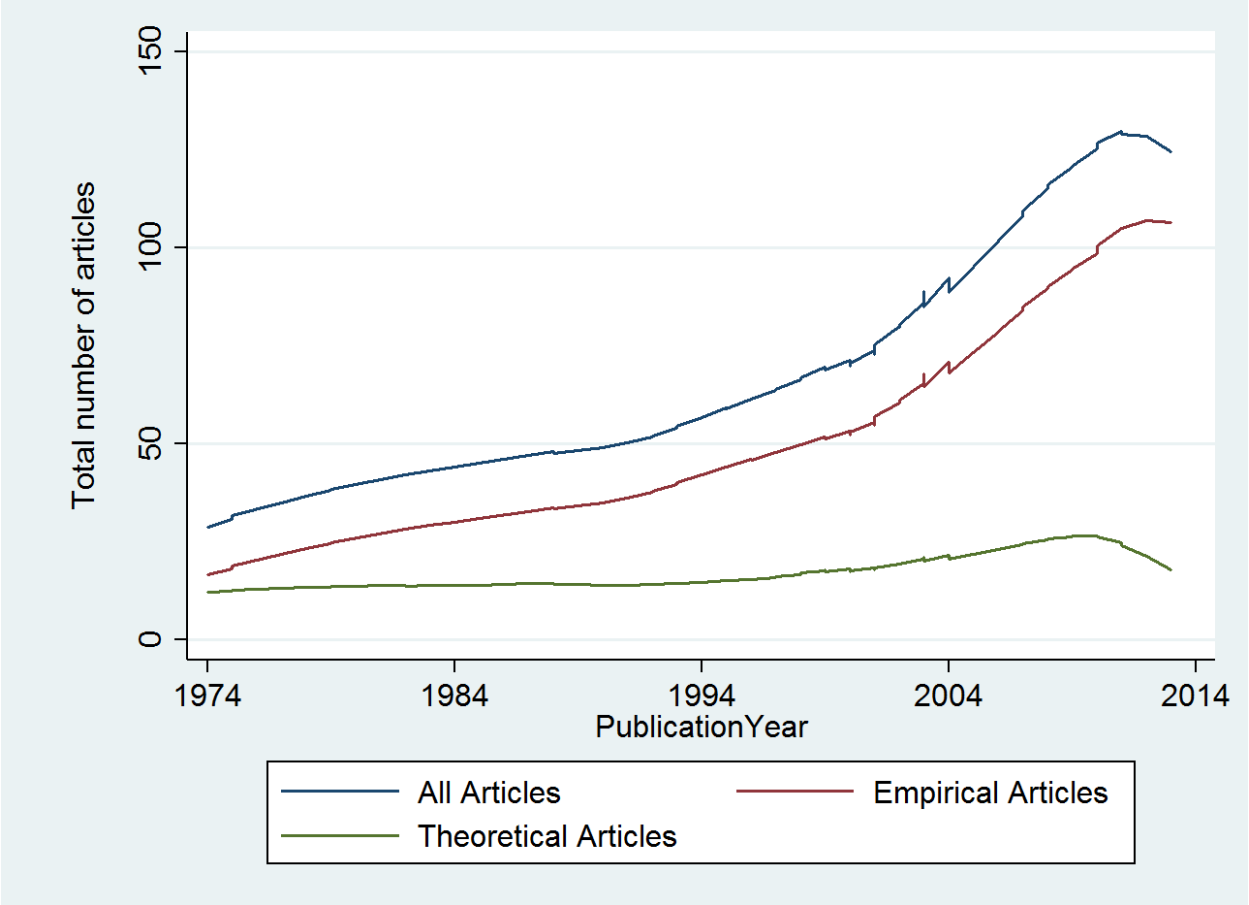

Figure 3 | Total number of empirical articles in our sample by year (Lowess line)

Table 1 | Overview of the journals and data policies under study

Journal	Impact Factor Rank	Mandatory Data Disclosure Policy	# Replicated Articles
JOURNAL OF ECONOMIC LITERATURE	1		
JOURNAL OF FINANCE	2		10
QUARTERLY JOURNAL OF ECONOMICS	3		10
JOURNAL OF ECONOMIC PERSPECTIVES	4		
TRANSPORTATION RESEARCH PART B-METHODOLOGICAL	5		
JOURNAL OF FINANCIAL ECONOMICS	6		9
JOURNAL OF POLITICAL ECONOMY	7	YES	13
REVIEW OF FINANCIAL STUDIES	8		1
ECONOMETRICA	9	YES	3
JOURNAL OF THE EUROPEAN ECONOMIC ASSOCIATION	10	YES	1
REVIEW OF ENVIRONMENTAL ECONOMICS AND POLICY	11		
PHARMACOECONOMICS	12		
AMERICAN ECONOMIC REVIEW	13	YES	35
ECONOMIC GEOGRAPHY	14		
REVIEW OF ECONOMIC STUDIES	15	YES	
JOURNAL OF ECONOMIC GROWTH	16		
BROOKINGS PAPERS ON ECONOMIC ACTIVITY	17	YES	1
AMERICAN ECONOMIC JOURNAL-APPLIED ECONOMICS	18	YES	
JOURNAL OF FINANCIAL STABILITY	19		
VALUE IN HEALTH	20		
AMERICAN ECONOMIC JOURNAL-MACROECONOMICS	21	YES	
ECONOMIC POLICY	22		1
JOURNAL OF ACCOUNTING & ECONOMICS	23		9
JOURNAL OF ECONOMIC GEOGRAPHY	24		
TECHNOLOGICAL AND ECONOMIC DEVELOPMENT OF ECONOMY	25		
REVIEW OF ECONOMICS AND STATISTICS	26	YES	4
ECONOMIC JOURNAL	27	YES	1
ENERGY ECONOMICS	28		
AMERICAN ECONOMIC JOURNAL-ECONOMIC POLICY	29	YES	
EXPERIMENTAL ECONOMICS	30		1
TRANSPORTATION RESEARCH PART A-POLICY AND PRACTICE	31		1
JOURNAL OF ENVIRONMENTAL ECONOMICS AND MANAGEMENT	32		2
ECOLOGICAL ECONOMICS	33		4
ANNUAL REVIEW OF ECONOMICS	34		
ECONOMICS & HUMAN BIOLOGY	35		
JOURNAL OF INTERNATIONAL ECONOMICS	36		1
JOURNAL OF DEVELOPMENT ECONOMICS	37	YES	1
ECONOMIC SYSTEMS RESEARCH	38		
FOOD POLICY	39		
JOURNAL OF BUSINESS & ECONOMIC STATISTICS	40	YES	3
JOURNAL OF AGRARIAN CHANGE	41		
JOURNAL OF POLICY ANALYSIS AND MANAGEMENT	42		
JOURNAL OF HEALTH ECONOMICS	43		12
JOURNAL OF TRANSPORT GEOGRAPHY	44		
TRANSPORTATION RESEARCH PART E-LOGISTICS AND TRANSPORTATION REVIEW	45		1
HEALTH ECONOMICS	46		6
WORLD BANK RESEARCH OBSERVER	47		
JOURNAL OF MONETARY ECONOMICS	48		
JOURNAL OF REGIONAL SCIENCE	49		
JOURNAL OF LABOR ECONOMICS	50	YES	
			TOTAL: 130

Notes: 23 journals under study that published at least one replicated article in bold.

Table 2 | Descriptive statistics

	mean	sd	min	max	N
Dependent variable					
Replicated article	0.105		0	1	1,243
Main variables of interest					
Total cites before publication of replication study	20.89	64.18	0	1,508	1,243
Lag between publication of replicated article and of respective replication	4.851	3.601	0	23	1,243
Journal impact factor	3.516	1.153	2.137	6.033	1,243
Top-5 economics journal	0.512		0	1	1,243
Top-50 university	0.606		0	1	1,243
Mandatory data disclosure policy	0.235		0	1	1,243
Data or program code available	0.169		0	1	1,243
Control variables					
Self-created data	0.124		0	1	1,243
Confidential or proprietary data	0.012		0	1	1,243
Article published in conference proceedings	0.118		0	1	1,243
Number of references	29.28	17.83	0	130	1,243
Number of pages	19.51	10.94	1	65	1,243
Number of authors	2.057	1.097	1	16	1,243
h-index of best author	17.42	12.90	0	106	1,225
Third party funding	0.185		0	1	1,243
Funder's support for data availability	0.598	1.366	0	5	1,243
Year variables					
Publication year 1970-1974	0.006		0	1	1,243
1975-1979	0.039		0	1	1,243
1980-1984	0.043		0	1	1,243
1985-1989	0.106		0	1	1,243
1990-1994	0.091		0	1	1,243
1995-1999	0.109		0	1	1,243
2000-2004	0.207		0	1	1,243
2005-2009	0.223		0	1	1,243
2010-2014	0.175		0	1	1,243

Table 3 | Extended descriptive statistics

	Replicated articles		**Nonreplicated articles**	
	CitesPreReplication mean	*LagReplication* mean	*CitesPreReplication* Mean	*LagReplication* mean
Main variables of interest				
Top5Journal=1	100.57	6.71	24.51	6.10
Top5Journal=0	25.23	3.64	7.40	3.45
Top50University=1	73.07	5.04	19.67	5.07
Top50University=0	26.69	5.17	11.32	4.47
MandatoryDisclosure=1	34.84	4.16	11.94	4.14
MandatoryDisclosure=0	64.99	5.23	17.66	5.05
DataOrCode=1	29.00	4.26	20.15	3.87
DataOrCode=0	65.99	5.22	15.45	5.02
Control variables				
SelfCreatedData=1	13.00	3.93	13.65	4.42
SelfCreatedData=0	66.79	5.23	16.63	4.88
ProceedingsArticle=1	27.40	2.60	6.92	4.33
ProceedingsArticle=0	61.91	5.18	17.62	4.90
Funded=1	118.23	5.67	23.66	5.06
Funded=0	43.29	4.90	14.63	4.77
Year variables				
Pyear1970=1	78.00	8.00	12.43	8.00
Pyear1975=1	3.25	3.50	3.02	3.98
Pyear1980=1	10.29	6.57	11.25	5.04
Pyear1985=1	71.62	5.85	10.73	4.48
Pyear1990=1	49.40	7.13	22.25	8.32
Pyear1995=1	106.57	5.71	21.11	5.75
Pyear2000=1	99.48	5.28	30.04	5.57
Pyear2005=1	24.54	3.96	14.39	3.90
Pyear2010=1	19.25	2.08	5.08	3.17

Table 4 | Overview of data guidelines of funding agencies

Funding Agency	**[1] Policy/ guideline mentions data sharing**	**[2] Policy/ guideline specifies how or where to publish data**	**[3] Policy/ guideline mentions data documen-tation/ metadata**	**[4] Policy/ guideline requires data manage-ment plan**	**[5] Policy/ guideline mentions embargo period**
National Science Foundation (NSF)	1	0	0	1	1
US National Institutes of Health (NIH)	1	1	1	1	1
National Natural Science Foundation of China (NSFC)	0	0	0	0	0
Deutsche Forschungsgemeinschaft (DFG)	1	1	1	0	0
Bundesministerium für Bildung und Forschung (BMBF)	0	0	0	0	0
Japanese society for the promotion of science (JSPS)	0	0	0	0	0
Japan Science and Technology Agency (JST)	0	0	0	0	0
Russian Foundation for Basic Research (RFBR)	0	0	0	0	0
French National Research Agency (ANR)	1	0	0	0	0
National Research Foundation of Korea (NRF)	0	0	0	0	0
Ministry of Knowledge Economy (MKE)	0	0	0	0	0
Science & Technology Facilities Council (STFC)	1	1	1	1	1
Medical Research Council (MRC)	1	1	1	1	1
Engineering and Physical Science Research Council (EPSRC)	1	1	1	0	1
Biotechnology and Biological Science Research Council	1	1	1	1	1
Natural Environment Research Council (NERC)	1	1	1	1	1
Economic and Social Research Council (ESRC)	1	1	1	1	1
Arts and Humanities Research Council (AHRC)	1	1	1	0	1
National Research Council (CNR)	0	0	0	0	0
Ministry of Education, Universities and Research (MIUR)	0	0	0	0	0
Spanish Ministry of Economy and Competitiveness	0	0	0	0	0
Social Sciences and Humanities Research Council of Canada	1	1	1	1	1
Natural Science and Engineering Research Council of Canada	1	1	1	1	1
Netherlands Organisation for Scientific Research (NWO)	1	1	1	1	1
Swedish Research Council (VR)	1	1	1	0	1
Swedish Foundation for Strategic Research (SSF)	0	0	0	0	0
Swedish Agency for Innovation Systems (VINNOVA)	0	0	0	0	0
Australian Research Council (ARC)	1	1	1	0	1
Norwegian Research Council	1	1	1	1	1
Portuguese Found. Sci. & Techn. (FCT)	1	1	1	1	1
Bill and Melinda Gates Foundation	1	1	1	1	1
Wellcome Trust	1	1	1	1	1
NASA	1	0	1	1	1
Leverhulme Trust	0	0	0	0	0
European Commission (Horizon 2020)	1	1	1	1	1
Swiss National Science Foundation	0	0	0	0	0

Notes: Columns [1] to [5] report the five dummy variables that are used to create *FunderDataSupport* which can be thought of as the extent to which external funders have policies that facilitate data availability. It takes on one of five values, from 0 (no policy facilitating data availability) to 5 (full set of policies). To obtain this variable, we analyzed the funding guidelines of 36 research funding bodies worldwide regarding their data management policies. We regard the guidelines as textual data and code if they mention data management, if they specify where and how data should be stored, its terms of access (e.g., on request or public), documentation standards, and if they mention replication studies.

Table 5 | Marginal effects at the mean after probit regression

	[1]	[2]	[3]	[4]	[5]
VARIABLES					
Log total cites before publication of replication study		0.057***	0.057***	0.054***	0.053***
		(0.007)	(0.007)	(0.007)	(0.008)
Log lag between publication of replicated article and of respective replication		-0.110***	-0.110***	-0.104***	-0.102***
		(0.016)	(0.016)	(0.017)	(0.017)
Top-5 economics journal			-0.040***	-0.052***	-0.056***
			(0.008)	(0.010)	(0.010)
Log impact factor			-0.079***	-0.097***	-0.096***
			(0.016)	(0.017)	(0.018)
Top-50 university				0.042*	0.042*
				(0.021)	(0.021)
Mandatory data disclosure policy					-0.012
					(0.023)
Data or program code available					0.020
					(0.025)
Observations	1,225	1,225	1,225	1,225	1,225
Pseudo R-squared	0.0763	0.118	0.118	0.125	0.125
Log Pseudo Likelihood	-382.8	-365.7	-365.7	-362.8	-362.7
Journal FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Wald Test Statistics, Control variables (*)					
Chi-squared	133.6	23.68	23.68	23.31	16.95
Degrees of freedom	9	9	9	9	9
p-value	0.000	0.005	0.005	0.005	0.049
Wald Test Statistics, Journal FE					
Chi-squared	506,595	4.521e+06	6.570e+06	1.760e+07	4.442e+06
Degrees of freedom	16	18	18	19	20
p-value	0.000	0.000	0.000	0.000	0.000
Wald Test Statistics, Year FE					
Chi-squared	202.2	724.7	724.7	998.1	648.9
Degrees of freedom	8	8	8	8	8
p-value	0.000	0.000	0.000	0.000	0.000

Note: *ReplicatedArticle* is the dependent variable. Robust standard errors clustered at the journal level in parentheses. Control variables, not reported (*): *ProceedingsArticle, LogReferences, LogPages, Authors, LogBestH, SelfCreatedData, ConfidentialData, Funded, FunderDataSupport*. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

Table 6 | Ordinary least squares (OLS) regression coefficients

VARIABLES	[1]	[2]	[3]	[4]	[5]
Article published in conference proceedings	-0.006	0.012	0.012	0.007	-0.002
	(0.026)	(0.029)	(0.029)	(0.029)	(0.032)
Log number of references	-0.002	-0.017	-0.017	-0.014	-0.013
	(0.027)	(0.026)	(0.026)	(0.027)	(0.027)
Log number of pages	0.057	0.031	0.031	0.025	0.025
	(0.031)	(0.029)	(0.029)	(0.030)	(0.031)
Number of authors	0.018	0.015	0.015	0.015	0.015
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Log h-index of best author	0.028	0.008	0.008	0.002	0.002
	(0.016)	(0.017)	(0.017)	(0.015)	(0.016)
Self-created data	-0.012	0.003	0.003	0.007	0.008
	(0.014)	(0.015)	(0.015)	(0.016)	(0.017)
Data proprietary	-0.012	-0.016	-0.016	-0.014	-0.016
	(0.091)	(0.076)	(0.076)	(0.080)	(0.082)
Third party funding	-0.012	-0.018	-0.018	-0.015	-0.016
	(0.062)	(0.055)	(0.055)	(0.052)	(0.053)
Funder's support for data availability	0.009	0.008	0.008	0.007	0.008
	(0.016)	(0.015)	(0.015)	(0.014)	(0.014)
Log total cites before publication of replication study		0.063***	0.063***	0.061***	0.061***
		(0.007)	(0.007)	(0.006)	(0.006)
Log lag between publication of replicated article and of respective replication		-0.109***	-0.109***	-0.106***	-0.106***
		(0.017)	(0.017)	(0.016)	(0.017)
Top-5 economics journal			-0.040***	-0.056***	-0.061***
			(0.010)	(0.012)	(0.014)
Log impact factor			-0.081***	-0.103***	-0.105***
			(0.017)	(0.020)	(0.020)
Top-50 university				0.051	0.050
				(0.026)	(0.026)
Mandatory data disclosure policy					0.023
					(0.024)
Data or program code available					-0.012
					(0.022)
Constant	-0.218**	-0.011	0.134	0.162*	0.157*
	(0.060)	(0.066)	(0.076)	(0.070)	(0.071)
Observations	1,225	1,225	1,225	1,225	1,225
R-squared	0.049	0.074	0.074	0.079	0.080
Journal FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Wald Test Statistics, Control variables (*)					
F statistic	7.913	1.765	1.765	1.279	1.152
Degrees of freedom	9	9	9	9	9
p-value	0.000	0.133	0.133	0.302	0.371
Wald Test Statistics, Journal FE					
F statistic	1,143	22,636	12,730	26,923	5,988
Degrees of freedom	16	18	18	19	19
p-value	0.000	0.000	0.000	0.000	0.000
Wald Test Statistics, Year FE					
F statistic	17.31	22.06	22.06	30.46	13.03
Degrees of freedom	8	8	8	8	8
p-value	0.000	0.000	0.000	0.000	0.000

Note: *ReplicatedArticle* is the dependent variable. Robust standard errors clustered at the journal level in parentheses. Control variables (*): *ProceedingsArticle, LogReferences, LogPages, Authors, LogBestH, SelfCreatedData, ConfidentialData, Funded, FunderDataSupport.* *** $p<0.001$, ** $p<0.01$, * $p<0.05$.

Appendix 1 | Correlation matrix for the dependent variable and main variables of interest

	Replicated Article	*CitesPre Replication*	*Lag Replication*	*Top5 Journal*	*Impact Factor*	*Top50 University*	*Mandatory Disclosure*	*DataOr Code*
ReplicatedArticle	1.00							
CitesPreReplication	0.21	1.00						
LagReplication	0.02	0.36	1.00					
Top5Journal	-0.03	0.17	0.37	1.00				
ImpactFactor	-0.01	0.11	0.08	0.11	1.00			
Top50University	0.09	0.11	0.08	0.20	0.15	1.00		
MandatoryDisclosure	-0.07	-0.06	-0.11	0.43	-0.12	0.14	1.00	
DataOrCode	-0.02	0.00	-0.12	0.35	-0.10	0.10	0.68	1.00

Appendix 2 | Full version of Table 5 (Marginal effects at the mean after probit)

VARIABLES	[1]	[2]	[3]	[4]	[5]
Proceedings article	-0.054	-0.043	-0.043	-0.045	-0.038
	(0.028)	(0.032)	(0.032)	(0.033)	(0.036)
Log number of references	-0.005	-0.015	-0.015	-0.012	-0.011
	(0.029)	(0.025)	(0.025)	(0.026)	(0.026)
Log number of pages	0.067*	0.038	0.038	0.032	0.030
	(0.034)	(0.028)	(0.028)	(0.029)	(0.030)
Number of authors	0.012	0.009	0.009	0.009	0.008
	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)
Log h-index of best author	0.029*	0.007	0.007	0.004	0.003
	(0.014)	(0.015)	(0.015)	(0.014)	(0.014)
Self-created data	-0.016	0.003	0.003	0.006	0.005
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
Data proprietary	-0.003	-0.010	-0.010	-0.011	-0.013
	(0.106)	(0.088)	(0.088)	(0.091)	(0.091)
Third party funding	-0.012	-0.024	-0.024	-0.023	-0.023
	(0.050)	(0.043)	(0.043)	(0.041)	(0.041)
Funder's support for data availability	0.009	0.010	0.010	0.009	0.009
	(0.013)	(0.012)	(0.012)	(0.011)	(0.011)
Log total cites before publication of replication study		0.057***	0.057***	0.054***	0.053***
		(0.007)	(0.007)	(0.007)	(0.008)
Log lag between publication of replicated article and of respective replication		-0.110***	-0.110***	-0.104***	-0.102***
		(0.016)	(0.016)	(0.017)	(0.017)
Top-5 economics journal			-0.040***	-0.052***	-0.056***
			(0.008)	(0.010)	(0.010)
Log impact factor			-0.079***	-0.097***	-0.096***
			(0.016)	(0.017)	(0.018)
Top-50 university				0.042*	0.042*
				(0.021)	(0.021)
Mandatory data disclosure policy					-0.012
					(0.023)
Data or program code available					0.020
					(0.025)
Observations	1,225	1,225	1,225	1,225	1,225
Pseudo R-squared	0.0763	0.118	0.118	0.125	0.125
Log Pseudo Likelihood	-382.8	-365.7	-365.7	-362.8	-362.7
Journal FE	YES	YES	YES	YES	YES
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Chi-squared	133.6	23.68	23.68	23.31	16.95
Degrees of freedom	9	9	9	9	9
p-value	0.000	0.005	0.005	0.005	0.049
Wald Test Statistics, Journal FE					
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Degrees of freedom	16	18	18	19	20
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Degrees of freedom	8	8	8	8	8
p-value	0.000	0.000	0.000	0.000	0.000

Note: *ReplicatedArticle* is the dependent variable. Robust standard errors clustered at the journal level in parentheses. Control variables (*): *ProceedingsArticle, LogReferences, LogPages, Authors, LogBestH, SelfCreatedData, ConfidentialData, Funded, FunderDataSupport*. *** $p<0.001$, ** $p<0.01$, * $p<0.05$.