

From Open Access to Open Science: Enhancing Transparency in Social Science Research

Richard Ball

Professor of Economics

Norm Medeiros

Associate Librarian

Directors, Project TIER

Open Access Week

Magill Library

26 October 2017

Project TIER is supported by the Alfred P. Sloan Foundation



10th Annual International Open Access Week,
sponsored by SPARC (Scholarly Publishing
and Academic Resource Coalition)

Goal: raise awareness of the importance of free, immediate access to published research

Open Access implies access to some finished product, frequently a publication such as a journal article

Project TIER is concerned with the processes that create that finished product—i.e, workflows that are *transparent* and lead to *reproducible* results. Well organized *replication documentation* (data, code, and documentation) promote transparency and reproducibility, and lead to improved student learning.

Project TIER promotes transparency and reproducibility in social science research by

- Developing curriculum and tools for teaching students to conduct empirical research transparently and reproducibly
 - TIER Protocol
 - syllabi and documents from TIER-influenced courses
 - OSF (Open Science Framework) template and demo project
 - exercises (Stata, R Markdown)
- Disseminating these curricula and tools to faculty interested in adopting them—in all the social sciences, at the undergraduate and graduate levels via workshops, conference talks, and our web site

Project TIER grew organically out of our experience teaching an introductory statistics course for students majoring in economics and other social sciences.

2003-2008: The primordial soup

- Observed need for greater clarity in research papers written by students
- Developed guidelines for documenting research intended to ensure this clarity

Over many semesters, we gradually extended and refined these documentation guidelines. In the end, we broke them up into two pieces:

- ***Specifications*** that describe the content and organization of the final documentation that should be prepared to accompany a completed research paper
- Recommendations on steps to take throughout the ***process*** of conducting a research paper to integrate the construction of the required final documentation into the entire life-cycle of a research project

All this can be seen at our website...

Example of a real student project:

Masella, John. *Racial Salary Discrimination in Major League Baseball: A Closer Look*. Senior Thesis, Haverford College Department of Economics. May 2017.

This thesis is stored on [OSF \(the Open Science Framework\)](#), and is available publicly in [Haverford's Institutional Research repository](#).

Following these guidelines transformed the way students conducted their entire research projects

- The final replication documentation results from processes that occur throughout the research lifecycle. Reproducibility is not tacked on at the end.
- These methods distinguish Open Science (a process) from Open Access (a product).

What's more, these processes that lead to comprehensive and valid replication documentation also (1) increase the efficiency with which students work, (2) help avoid disasters, and (3) really help students understand what they are doing.

It also means that communication with instructors while working on a project is more effective—we can see what students are doing and provide better guidance.

2009-2012: Start of outreach activities

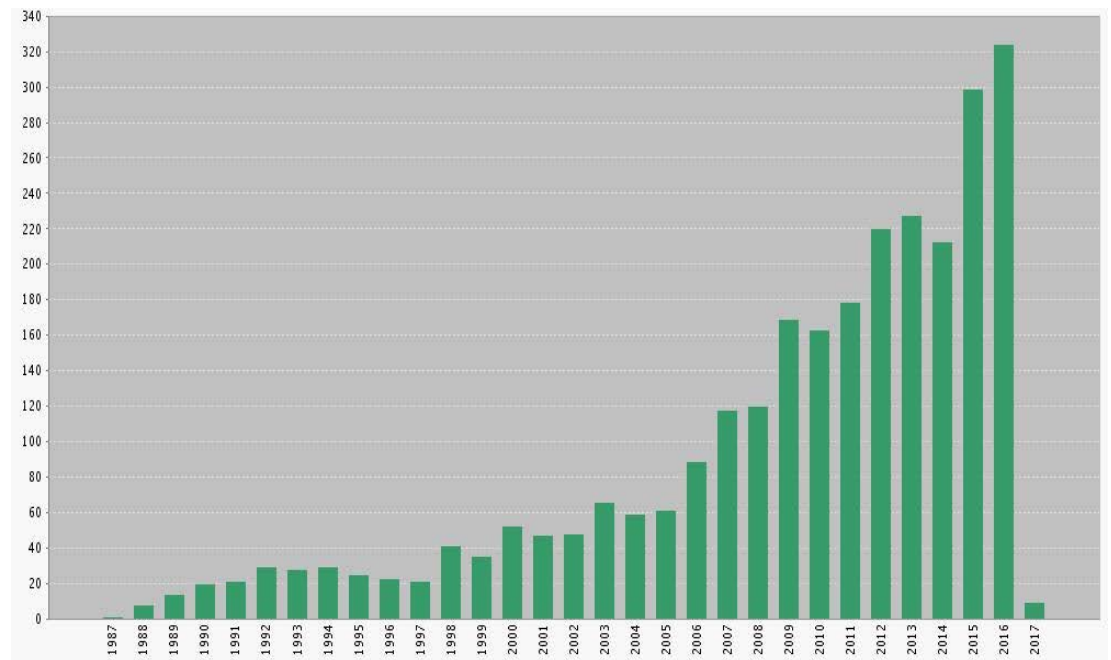
- Presentations at conferences related to teaching, including the first American Economic Association CTREE (Conference on Teaching and Research in Economic Education) in 2011
- Published a paper on this work

Ball, R. and Medeiros, N. (2012). Teaching Integrity in Empirical Research. *Journal of Economic Education*, 43(2), 182-189.

Landmark Studies

Dewald, W.G., Thursby, J.G., & Anderson, R.G. (1986). Replication in Empirical Economics: The Journal of Money, Credit and Banking project. *The American Economic Review*, 76(4), 587-603.

- 154 requests for data and code
- Received 90 responses with some information
- Reviewed the first 54 cases
- Only 8 replicated (15%)



Landmark Studies (cont'd)

Open Science Collaboration. (2015). Estimating the Reproducibility of Psychological Science. *Science* 349(6251), aac4716.

- 100 articles published in Psychological Science, Journal of Personality and Social Psychology, Journal of Experimental Psychology: Learning, Memory, and Cognition in 2008
- 39% found to replicate
- Prompted subsequent studies in Cancer Biology and the Social Sciences

Landmark Studies (cont'd)

Chang, A.C. & Li, P. (2015). Is Economics Research Replicable? Sixty Published Papers from Thirteen Journals Say “Usually Not.” *Finance and Economics Discussion Series 2015-083*. Washington: Board of Governors of the Federal Reserve System. Available:

<https://www.federalreserve.gov/econresdata/feds/2015/files/2015083pap.pdf>

- Reviewed 59 articles from 13 leading journals
- Used author-deposited data and code
- Initially only able to reproduce 33% of the papers
- After contacting authors, rate of reproducibility went to 49%

Cancer Research Is Broken

There's a replication crisis in biomedicine—and no one even knows how deep it runs.

How the Reproducibility Crisis in Academia is Affecting Scientific Research

Tackling the 'credibility crisis' in science

January 4, 2018

Psychology's Ongoing Credibility Crisis

New studies have intensified the debate over psychology's "reproducibility" problems.

About 40% of economics experiments fail replication survey

By John Bohannon | Mar. 3, 2016, 2:00 PM

The Credibility Crisis in Computational Science: An Information Issue

Science, Now Under Scrutiny Itself

By BENEDICT CAREY | JUNE 15, 2011

How do we solve science's 'credibility problem'?

April 7, 2015 9:42am EDT

High profile cases

Carmen Reinhart & Kenneth Rogoff (2010). Growth in a Time of Debt. *NBER Working Paper*, No. 15639. Available: <http://www.nber.org/papers/w15639>

- Analyzed data from 44 countries over 200 years to demonstrate a sharp decrease in economic growth once a country's debt reaches 90% of its GDP. Led to austerity policies in parts of the world.

Replicated by: Thomas Herndon, Michael Ash, & Robert Pollin (2013). *Does High Public Debt Consistently Stifle Economic Growth? A Critique of Reinhart and Rogoff*. Political Economy Research Institute Working Paper. Available: <https://www.peri.umass.edu/images/WP322.pdf>

- Found coding errors, exclusion of data, and unconventional weighting led to Reinhart and Rogoff's findings.

High profile cases (cont'd)

John J. Donahue III and Steven D. Levitt (2001). The Impact of Legalized Abortion on Crime. *The Quarterly Journal of Economics*, 116(2), 379-420.

- Claimed a relationship between the establishment of legalized abortion and a subsequent decrease in crime 18 years following.

Replicated by: Christopher Foote and Christopher Goetz (2005). The Impact of Legalized Abortion on Crime: Comment. *Research Department Working Papers (Federal Reserve Bank of Boston)*. Available:

<https://www.bostonfed.org/-/media/Documents/Workingpapers/PDF/wp0515.pdf>

- Found computer programming errors that failed to control for influencers of crime.

High profile cases (cont'd)

B. D. McCullough and Ross McKittrick (2009). *Check the Numbers: The Case for Due Diligence in Policy Formation*. Studies in Risk & Regulation (Fraser Institute). Available:

<http://www.pages.drexel.edu/~bdm25/DueDiligence.pdf>

- Demonstrate poor compliance with journal archive policies
- Describe failed replications for several high profile studies

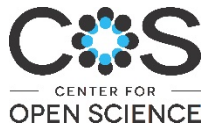
***[I]f the sums do not add up, the science is wrong.
If there are no sums to be added up, no one can tell
whether the science is right or wrong.***

– Donald Laming

Organizations



BITSS (Berkeley Institute for Transparency in the Social Sciences)



Center for Open Science



Replication Wiki



AIRLEAP (Association for Integrity and Responsible Leadership in Economics and Associated Professions)

....and many others

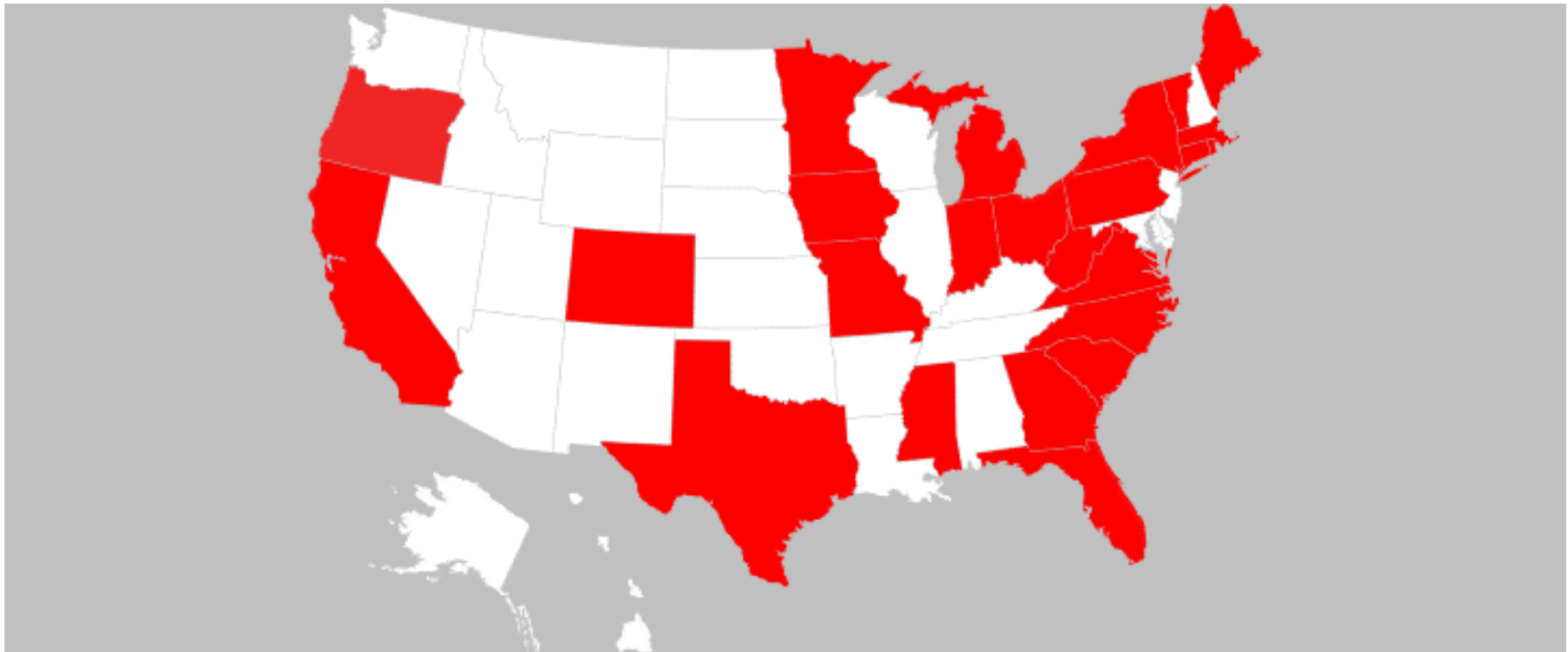
The nudge that got us to jump into the fray and launch Project TIER:

- ICPSR/Sloan Challenge grant (2013); the official start of Project TIER

Main activities

- Faculty development workshops twice per year at HC, 8-10 participants on average (upcoming Nov 17-18, 2017)
- Purpose: to help interested instructors teach transparent, reproducible methods in their own classes
- Have found these two-day workshops help faculty adopt the practices
- Held first workshop on the road at Occidental College in January 2017. Looking to hold a similar workshop in Spring 2018 at UCLA.

Workshop attendees



as well as from Brazil, Ecuador, Egypt, and the Netherlands

Other activities

- Grad student workshops—on site at particular grad programs—
(Duke, Clark, Penn, Cornell, University of Colorado)
- Faculty Fellowships
 - 5-6 individuals per year
 - 3 cohorts so far (2015/16, 2016/17, 2017/18)
 - service project and outreach

TIER in the classroom



University of Colorado
Boulder



Williams



Middlebury



One local example

- Bryn Mawr, [Sociology 265](#), Prof. Nate Wright
 - Individual students with multiple projects
 - Could easily support collaborative projects with differential access, such as ECON203

What is the real purpose of all this? Why teach students to conduct research transparently?

- Transparency and reproducibility are necessary for research to be scientifically valid and credible.
- Students who have these skills when they graduate from college are well prepared for jobs as research assistants, consultants, financial analysts, etc.
- Documenting their work throughout the research process helps students keep track of what they are doing, and consequently they have a much better understanding of what they are doing.
- The instructor's ability to provide guidance while students are working on a project is radically enhanced—it is a whole new world.

Most fundamentally, we are teaching students that when they say they have found evidence that supports some kind of claim, they need to be able to show the evidence to others, and reconstruct the argument that leads from the “raw” evidence to the claim.¹

In our view, helping students understand and internalize this principle is one of the principal goals of education.

¹ Frequent and emphatic tweets do not do the trick.