Transparency, Reproducibility and the Credibility of Economics Research

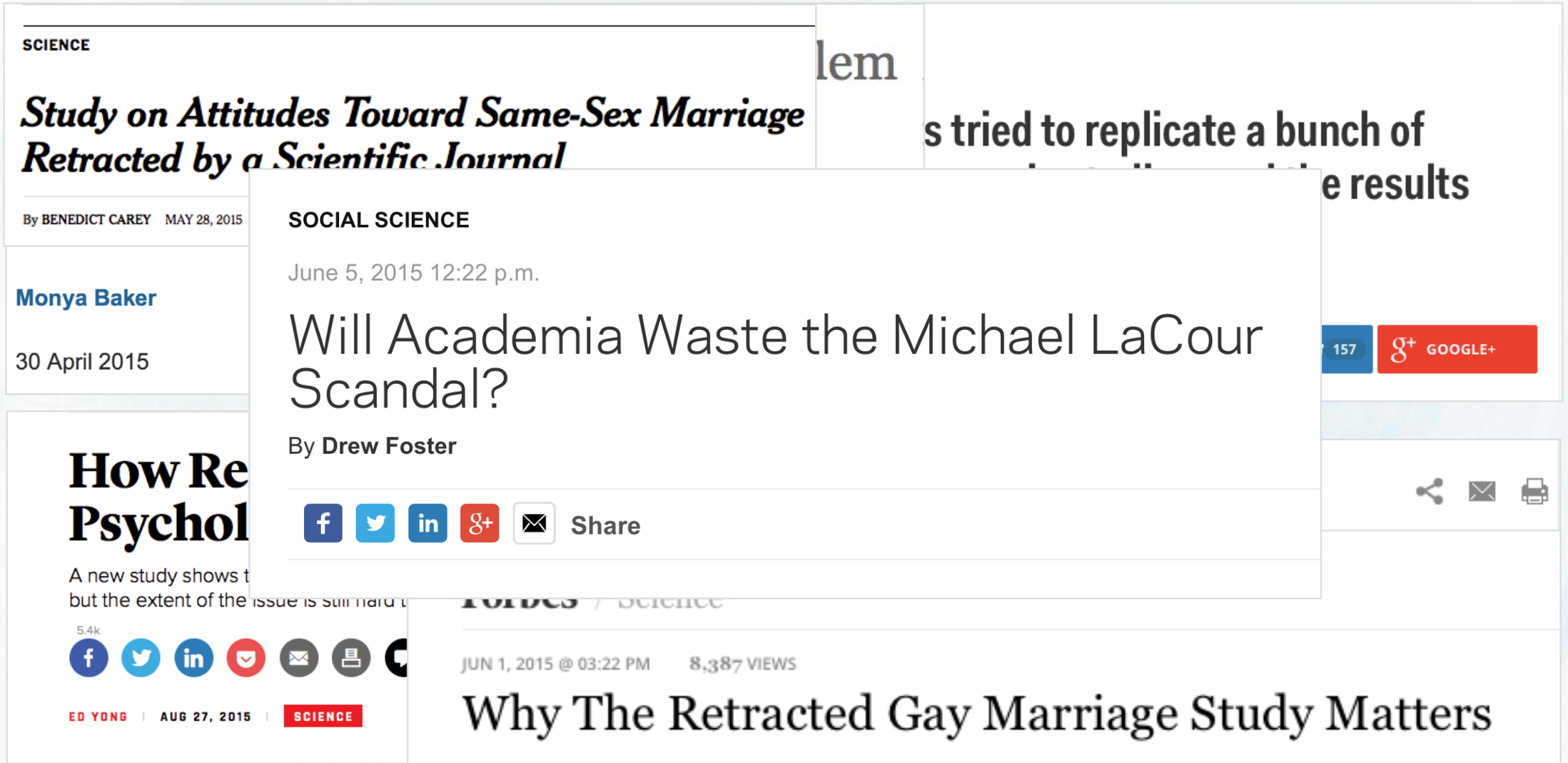
Edward Miguel
Department of Economics
University of California, Berkeley
Faculty Director, BITSS

@tedmiguel

[1] The credibility crisis in social science

- There are numerous **concerns** about the validity of empirical social science research

[1] The credibility crisis in social science



[1] The credibility crisis in social science

- There are numerous **concerns** about the validity of empirical social science research:
  - literatures distorted by false-positives (Ioannidis 2005)
  - data mining and selective reporting (Brodeur et al 2016)
  - null findings “invisible” to the research community (Rosenthal 1979, Franco et al 2014)

[1] The credibility crisis in social science

- There are numerous **concerns** about the validity of empirical social science research
  - literatures distorted by false-positives (Ioannidis 2005)
  - data mining and selective reporting (Brodeur et al 2016)
  - null findings “invisible” to the research community (Rosenthal 1979, Franco et al 2014)

- But how to **solve** them?

[1] What is BITSS?

- The Berkeley Initiative for Transparency in the Social Sciences, BITSS, aims to strengthen the quality of social science research – and the evidence used for policy-making – by enhancing the research practices of economists, political scientists, psychologists, and other social scientists.
  - Established 2012

[1] BITSS programs

Norms + Consensus	>Build **standards** of openness, integrity, and transparency across research ecosystem
Tools + Resources	>Identify, fund, and develop **tools** and resources for a network of researchers
Education	>Deliver **coursework** for students, faculty, and researchers through our network
Recognition	>**Awards** for exceptional achievements in the advancement of open social science
Research	>**Fund** research to understand the problem, explore solutions, and monitor progress

[2] Moving towards solutions

- Miguel et al (2014) on three inter-related approaches
  - “Promoting transparency in social science research”, *Science*, 2014, 10.1126/science.1245317.

[2] Moving towards solutions

- Miguel et al (2014) on three inter-related approaches:

1. Disclosure (>> conflicts of interest, treatment arms)

2. Open data and materials (>> replication)

3. **Pre-registration** of research hypotheses

› Sharing research design, hypotheses beforehand makes the other approaches more useful and has other benefits.

[2] Why pre-specify?

- First of all, what is pre-registration?

[2] Why pre-specify?

- First of all, what is pre-registration?
- A researcher posts her research hypotheses, the data she plans to use to test them, and the planned research design and methodology in a publicly available registry

- There is obviously a wide range of detail one could potentially include in a pre-analysis plan (PAP)

› How much is too little? Too much?

[2] Why pre-specify?

- The American Economics Association (AEA) registry, **socialscienceregistry.org**, was founded in May 2013 with a focus on randomized control trials (RCTs).

Google News | Google Calendar | Google News | Golden State | Files | clinicaltrials.gov | AEA RCT Registry | how do you print

https://www.socialscienceregistry.org/site/about

Apps | Google News | Google | Gmail: Email from G... | Google Calendar | Other bookmarks

Create Account Sign in

AEA RCT Registry

The American Economic Association's registry for randomized controlled trials

About RCTs Registration Guidelines FAQ

Advanced Search SEARCH

ABOUT THE REGISTRY

REGISTER A TRIAL ›

Welcome.

This is the American Economic Association's registry for randomized controlled trials.

Randomized Controlled Trials (RCTs) are widely used in various fields of economics and other social sciences. As they become more numerous, a central registry on which trials are on-going or complete (or abandoned) becomes important for various reasons: as a source of results for meta-analysis; as a one-stop resource to find out about available survey instruments and data.

Because existing registries are not well suited to the need for social sciences, in April 2012, the AEA executive committee decided to establish such a registry for economics and other social sciences.

If you are running or have run a trial: Registration is free and you do not need to be a member of the AEA to register. We encourage you to register any new study at its outset. However, given the backlog of existing trials, we invite you to also register past studies.

If you are searching for results: Please browse the data base. More results are forthcoming!

About FAQ Contact

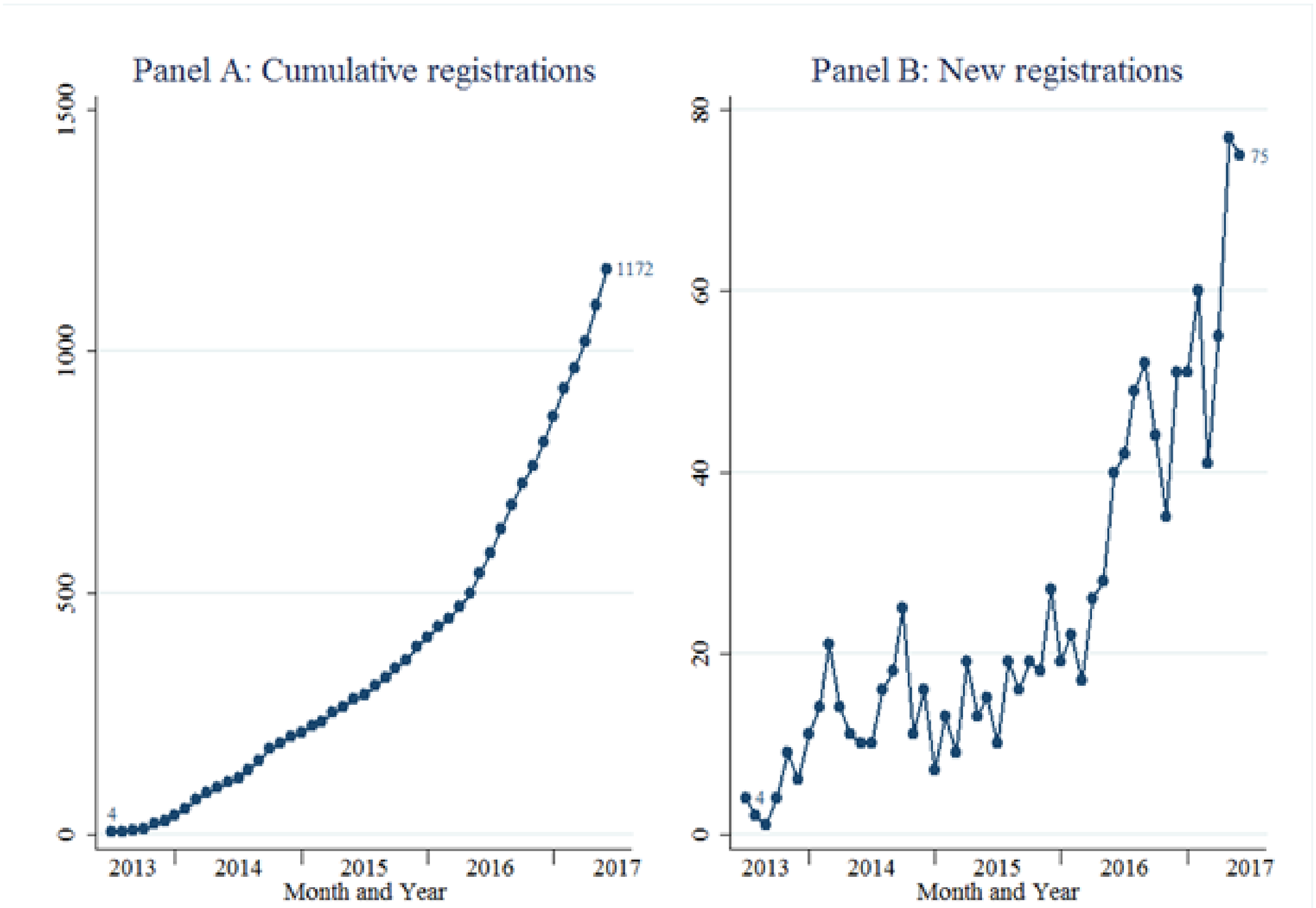
[2] Why pre-specify?

- The American Economics Association (AEA) registry, **socialscienceregistry.org**, was founded in May 2013 with a focus on randomized control trials (RCTs).

› Over 1400 studies in >100 countries already registered

Studies in the AEA trial registry, May 2013 to April 2017.

Figure shows the cumulative (Panel A) and new (Panel B) registrations in the AEA Trial Registry (http://socialscienceregistry.org)



> Figure available in public domain: http://dx.doi.org/10.7910/DVN/FUO7FC

[2] Why pre-specify?

- The American Economics Association (AEA) registry, **socialscienceregistry.org**, was founded in May 2013 with a focus on randomized control trials (RCTs).

› Over 1400 studies in >100 countries already registered

- Some are earlier studies that are being registered (for completeness >> meta-analysis) but most are new.

› G. Christensen and E. Miguel, 2017, “Transparency, Reproducibility, and the Credibility of Economics Research”, forthcoming *Journal of Economic Literature*.

[2] Why pre-specify?

- Why might pre-registration be useful?

1. **Rounds out the body of evidence** by creating a “paper trail” of unpublished studies in an area

› Potentially helps address publication bias (e.g., Franco et al. 2014, *Science*) and improve meta-analysis.

[2] Why pre-specify?

- Why might pre-registration be useful?

1. Rounds out the body of evidence by creating a “paper trail” of unpublished studies in an area
2. **Reduces the risk of data mining** and other tendentious presentation of results (“cherry-picking”)
   - Makes original research goals, hypotheses clear(er).

[2] Why pre-specify?

- Why might pre-registration be useful?

1. Rounds out the body of evidence by creating a “paper trail” of unpublished studies in an area
2. Reduces the risk of data mining and other tendentious presentation of results (“cherry-picking”)
3. **Generates correctly sized statistical tests**, bolstering the validity of reported p-values

› Clarifies which tests were originally planned, making multiple testing adjustment more credible

[2] Why pre-specify?

- Why might pre-registration be useful?

1. Rounds out the body of evidence by creating a “paper trail” of unpublished studies in an area
2. Reduces the risk of data mining and other tendentious presentation of results (“cherry-picking”)
3. Generates correctly sized statistical tests, bolstering the validity of statistical significance levels
4. **Makes open data and disclosure more effective**

› Allows other scholars to cross-check published information against original research plans.

[2] Why pre-specify?

- Why might pre-registration be useful?

1. Rounds out the body of evidence by creating a “paper trail” of unpublished studies in an area
2. Reduces the risk of data mining and other tendentious presentation of results (“cherry-picking”)
3. Generates correctly sized statistical tests, bolstering the validity of statistical significance levels
4. Makes open data and disclosure more effective
5. Leads researchers to **more carefully think about the analysis beforehand**, improving research quality

› Reduce “waste” of funding on poorly conceived projects

[2] Why pre-specify?

- A common concern: will pre-analysis plans **stifle creativity** and limit exploratory research?

› Many, if not most, important scientific findings undoubtedly originated as unexpected discoveries…

[2] Why pre-specify?

- A common concern: will pre-analysis plans **stifle creativity** and limit exploratory research?

› Many, if not most, important scientific findings undoubtedly originated as unexpected discoveries…

- But findings from such work are inherently more tentative because of the greater flexibility of tests, and the greater opportunity for the outcome to obtain by chance.

› Pre-specification is not intended to disparage exploratory analysis, but rather to free it from the tradition of being **portrayed as formal hypothesis testing**.

[3] How widely to apply pre-specification?

- A major open question, and my focus today

[3] How widely to apply pre-specification?

- A major open question, and my focus today

1. **Laboratory experiments:** pre-analysis plans could be particularly important given the relatively low cost to researchers of running multiple experiments and never publishing the results from those that “didn’t work”
   - Seems like low-hanging fruit
   - Flip-side: many lab experiments are relatively cheap to replicate (Coffman and Niederle 2015)

[3] How widely to apply pre-specification?

2. **Prospective observational (non-experimental) studies:** One promising area is the registration of studies of anticipated policy changes.

› First pre-analysis plan in Economics (to my knowledge) was Neumark's (1999, 2001) plan to study the effect of future minimum wage increases on unemployment.

[3] How widely to apply pre-specification?

- Pre-registration can also be used before new “rounds” of **data are released** (e.g., a new PSID wave, Census round), or where access to existing data is restricted and thus data mining is impossible ex ante.

› Promising approach in political economy: register PAP before election results are realized.

[3] How widely to apply pre-specification?

3. **Beyond applied empirical studies:** To reduce concerns about "specification searching", could also pre-register:

› parameters to be used in macroeconomic calibrations, "quantitative exercises"

› models used in structural estimation, i.e., in industrial organization (Bai et al. 2017)

› prior distributions used in Bayesian statistical analysis (perhaps gathered through eliciting expert opinion).

[3] How widely to apply pre-specification?

- The **Open Science Framework** (OSF) provides a flexible platform for time-stamping and archiving materials to be made publicly available.

[3] How widely to apply pre-specification?

- The **Open Science Framework** (OSF) provides a flexible platform for time-stamping and archiving materials to be made publicly available.

› Yet fields have mainly coordinated on their own registries, e.g., AEA in economics, AsPredicted in psychology, EGAP in political science, rather than OSF

› Why? Greater ability to search for studies is a big upside to a centralized registry.

[3] How widely to apply pre-specification?

- What about systematic reviews (SR) and meta-analyses (MA)?
- SR protocols and MA pre-analysis plans could be registered on OSF **OR** on a site tailored to this field (e.g., standardize information on study inclusion criteria, etc.)

› E.g., MAER-Net could create a specialized registry.

[4] Should meta-analyses be pre-registered?

- But first things first: is it even desirable for SR’s, MA’s and other non-prospective observational studies (OS) to be pre-registered?

› How to do it?

[4] Should meta-analyses be pre-registered?

- Relates to a big question: how can non-experimental empirical research be made more transparent?

› Dal-Re et al. (2014) “Making prospective registration of observational research a reality”, *Science Translational Medicine*, 6(224).

[4] Should meta-analyses be pre-registered?

- Dal-Re et al. (2014) first show that OS's constitute the vast majority (90%) of human subjects based medical studies published in 2011, while <6% were RCT's

› Same in economics: **>85% of empirical papers** in leading journals are non-experimental (Oster 2014)

- Bottom line: transparency practices will have limited impact if they are only applied to experimental research.

[4] Should meta-analyses be pre-registered?

- Currently, **no consensus** on the registration for OS's in medical research or epidemiology (dueling editorial statements in leading epidemiology journals in 2009-10)

› E.g., "The registration of observational studies—When metaphors go bad." *Epidemiology* 21 (2010).

[4] Should meta-analyses be pre-registered?

- Dal-Re et al (2014) make a strong call **in favor**. Why?
  - If already prepared research plans for grant proposals or IRB approval, minimal additional burden
  - Make the totality of the evidence “more visible” to other scholars, i.e., even unpublished studies
  - Speculatively, might increase publication of null findings
  - Other benefits?

[4] Should meta-analyses be pre-registered?

- Dal-Re et al (2014) also discuss some concerns.
  - A (the?) leading concern is that there is **no way to verify whether registration preceded analysis**, perhaps leading to a false sense of confidence in OS results – or even greater skepticism about their findings

[4] Should meta-analyses be pre-registered?

THE REGISTRATION CHALLENGE

In contrast to CTs, which require prospective data collection and follow-up of participants, analyses of some OSs can be performed readily in minimal time whenever required data have been collected, perhaps as part of a prior survey or a byproduct of health care activities (for example, administrative or billing databases, disease registries). In these cases, registering a protocol or a full analysis plan may not qualify as prospective. Theoretically, an investigator can mine the available data, notice some provocative results, and build a protocol and analysis plan around the selected results while spuriously claiming that the plan was prospectively conceived. Therefore, for ex-

(p. 2)

[4] Should meta-analyses be pre-registered?

- Dal-Re et al also discuss some concerns.

› A (the?) leading concern is that there is **no way to verify whether registration preceded analysis**, perhaps leading to a false sense of confidence in OS results – or even greater skepticism about their findings

› Practically, developing a single pre-registration standard may be more difficult for OS's, given the wide range of methods and data they employ

[4] Should meta-analyses be pre-registered?

- Issues specific to systematic reviews, meta-analysis:

› This type of research is time consuming, may take months or years to carry out. This makes pre-registration of SR/MA studies seem **more feasible** (to me).

[4] Should meta-analyses be pre-registered?

- Issues specific to systematic reviews, meta-analysis:

› This type of research is time consuming, may take months or years to carry out. This makes pre-registration of SR/MA studies seem **more feasible** (to me).

› Yet concerns may linger that the SR/MA strategy was deliberately designed to exclude certain results, “rigging” the study in favor of a particular conclusion.

[4] Should meta-analyses be pre-registered?

- Does pre-registration of meta-analyses, in cases where data is already publicly available, simply move us back to the researcher “honor system”?

› A registry of ongoing and completed SR/MA studies could be valuable even in the absence of pre-registration.

>>Research transparency

- Check out materials for researchers and instructors on: http://www.bitss.org/

- Enroll in the BITSS FutureLearn online course (MOOC), “Transparent and Open Social Science Research”: https://www.futurelearn.com/courses/open-social-science-research

- Follow us @ucbitss

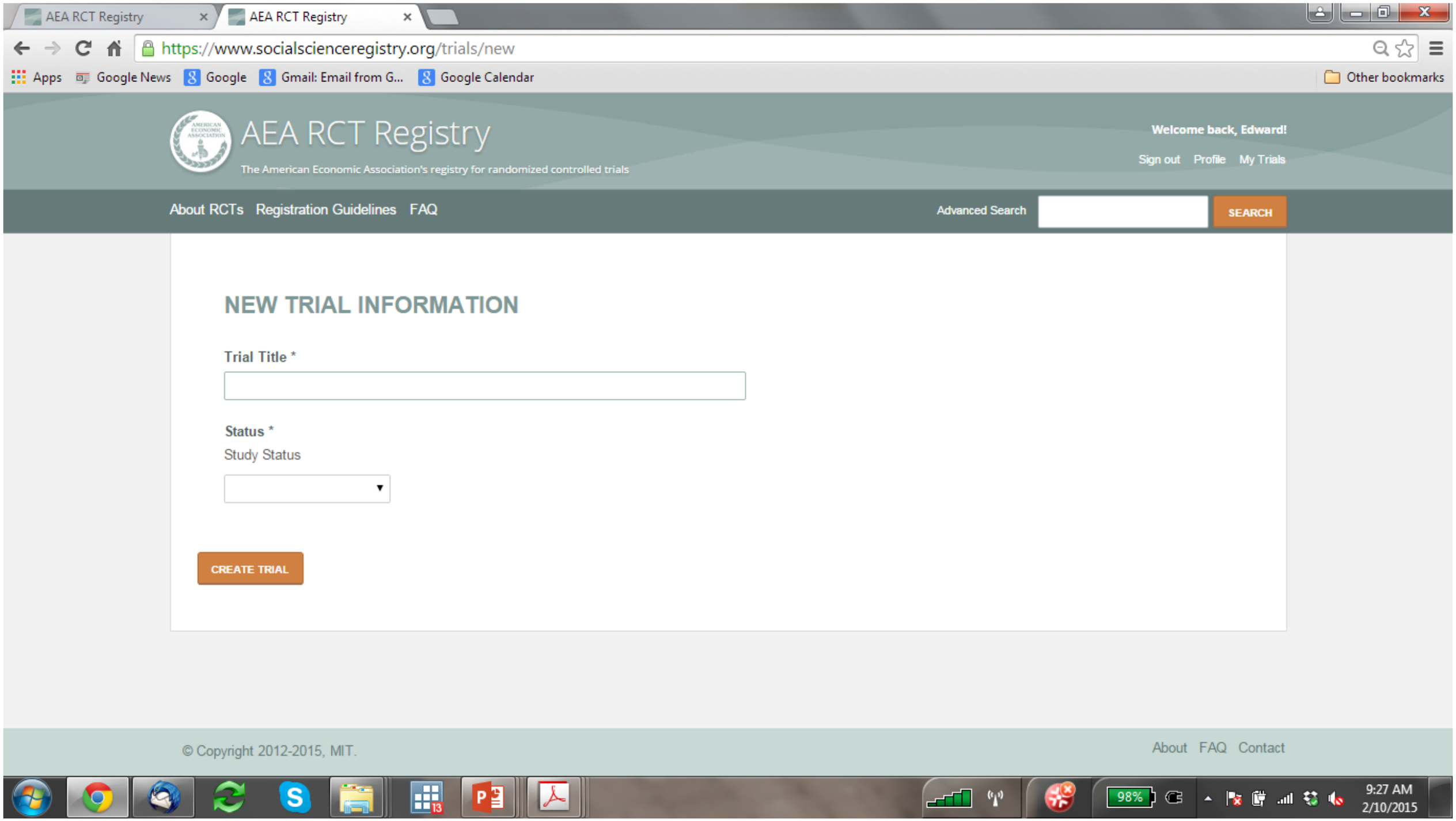
Extra slides

[2] Why pre-specify?

- The required information on the AEA site includes:

- Trial Title; Country; Status (i.e., ongoing, completed); Keywords; **Abstract**; Trial Start Date; Intervention Start Date; Intervention End Date; Trial End Date; **Outcomes (End Points); Experimental Design (Public)**; Was the treatment clustered?; Planned Number of Clusters; Planned Number of Observations; IRB approval info.

[2] Why pre-specify?



[2] Neumark (1999, 2001)

- To my knowledge, **first pre-analysis plan** in Economics
- This paper is a (largely forgotten) **milestone in social science** research methodology

- Study of the highly contentious (and politicized) issue of labor market impacts of minimum wage increases
  - Card and Krueger's (1995) point about publication bias in this area is a starting point