The social sciences are undergoing a **credibility revolution**, thanks to innovations in research designs and open data.
The bad news

The social sciences are undergoing a credibility revolution, thanks to innovations in research designs and open data.

Current research practices and norms threaten to undermine these gains.
All I really need to know I learned in kindergarten

1. Ask a Question
2. Do Background Research
3. Construct a Hypothesis
4. Test with an Experiment
5. Procedure Working?
   - Troubleshoot procedure. Carefully check all steps and set-up.
   - Yes: Analyze Data and Draw Conclusions
   - No: Troubleshoot procedure. Carefully check all steps and set-up.
6. Results Align with Hypothesis
   - Communicate Results
7. Results Align Partially or Not at All with Hypothesis
   - Form new Hypothesis, experiment again!
Social sciences vs. natural sciences

The big difference between social scientists and natural scientists is that we study people.

It’s important that we “get it right” the first time.
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It’s important that we “get it right” the first time.

*Are we getting it right?*
Suspicious patterns from economics and political science

What’s going on?

**Researcher bias**

- Data[set] mining
- Specification searching
- Cherry picking
- File drawers
- Outright fraud

Many issues can be alleviated via increased discipline and transparency.

Editorial bias (incentives matter!)

- Interest in novelty
- Focus on statistical significance
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Pie in the sky: discipline

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   - No: Experimental data becomes background research for new/future project. Ask new question, form new hypothesis, experiment again!

Burlig (UC Berkeley)  Registration and Pre-Analysis Plans  BITSS SI: June 8, 2016
Pie in the sky: discipline

Key Challenges

- Credibility
- File drawers
Pie in the sky: transparency

In an ideal (?) world, every submitted paper would be accompanied with a full analysis log / code history.
Pie in the sky: transparency

In an ideal (?) world, every submitted paper would be accompanied with a full analysis log / code history.

There are obvious problems with this:

- Who’s responsible for checking it over?
- This could be a logistical nightmare
- What about the non-submitted papers?
- **Credibility**
  - How do we know you’ve actually shown us everything?
Pre-registration is a method to help us do things correctly the first time.
Pre-registration to the rescue!

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*The idea is simple:* Before touching your final data, write down (and eventually make public) what you’re going to do.
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_The idea is simple:_ Before touching your final data, write down (and eventually make public) what you’re going to do.

**Key features:**
- A research question
- A description of the hypotheses you’re going to test
- A timestamp and an eventual public record
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**Key features:**

- A research question (*discipline*)
- A description of the hypotheses you’re going to test (*transparency*)
- A timestamp and a public record (*credibility + transparency*)
Example from economics

Casey, Glennerster, Miguel (QJE 2012): Governance in Sierra Leone

Why did they pre-register?

- 300+ outcomes (!)
- Expensive experiment
- (For fun!)

What happened

- "Hard" outcomes (infrastructure, etc): the intervention was great!
- "Soft" outcomes (political participation, etc): the intervention was a failure

Without registering: Could've written either story.

(What normally makes it into journals?)
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Pre-analysis plans

Every PAP should include (IMHO):
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Pre-analysis plans

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- Description of the research design and the data
  - This includes outcome variables and their construction
- An estimating equation / empirical approach
  - This includes a discussion of standard errors!
  - (Multiple testing corrections, one-sided tests)
- Specific hypotheses to be tested
  - Useful to distinguish between main and ancillary
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Extra elements to consider

- A theoretical model
- Power calculations
- Heterogeneity / subgroup tests
- Robustness checks
- Conditionality
No such thing as a free lunch...

Pre-registration comes with some costs.

**Common criticisms:**

- It’s difficult / time consuming
- It’s restrictive
- Replication is better
- *What if I’m wrong?*
...but good lunches don’t have to be super expensive

Common criticisms:

- It’s difficult / time consuming
  - It’s not that hard (and we’re doing a hands-on session tonight!)
  - Your time is mostly spent on things you’d do anyway (in IRB/grant apps, or in the eventual paper itself)
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- Replication is better
  - Replication is great! But often not rewarded by journals, and often impossible
- What if I’m wrong?
  - That’s useful knowledge (if your research question is well-specified)!
    - Peer-reviewed PAPs (?)
    - Shifting norms (more publication of null results)
Additional flexibility

Pre-registration doesn’t have to mean complete rigidity

- Sometimes we know ex ante what might go wrong…and how to correct it
  - Ex: balance test failure in an RCT
- Creative new solutions: pre-specify an algorithm
Additional flexibility

**Pre-registration doesn’t have to mean complete rigidity**

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  - Ex: balance test failure in an RCT
- Creative new solutions: pre-specify an algorithm

**Split-sample solutions** Another approach is to try things on half your data, and pre-register hypothesis tests for the other half

- Requires credibly locking away half your data, and a large sample
- But lets you examine patterns and *observe* before full formal pre-specification
I’ve written a PAP…now what?

You need to **register** your pre-analysis plan before you touch your data (more on the practical details in a second).

This gives your PAP a timestamp and creates a public record.

- The timestamp is essential for credibly pre-registering
- The public record is essential for credibility *and* helps with the file-drawer problem
Why let RCTs have all the fun?

The vast majority of empirical work in economics is observational.

Fixing the credibility problems in economics requires addressing issues of transparency in observational studies.

Key challenges: credibility, failures, and exploration.
Credible pre-registration of observational work

Not possible in every situation. But you can credibly pre-register observational work when...

- Your events of interest are in the future
- The data you’ll use hasn’t been collected/released yet (by you or others)
- You’re dealing with confidential data
- There are other barriers to data entry

[See Burlig (2016 WP) for more details]
Other challenges with observational PAPs

In many observational studies, we use other peoples’ data

- Things don’t always work perfectly! Data are missing, quasi-experiments don’t always happen exactly the way we think they would
  - Previous waves of data or other data can sometimes help
  - As can doing a very deep dive into something before pre-registering
  - Building in conditionality is extra important for quasi-experimental work
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Exploring data is an important way of building hypotheses

- Beware of the ex-post rationalization trap
- There’s nothing stopping you from doing data exploration
- If you learn something cool, use it as a jumping off point for the next project
Where should I register?

The current options are:

- AEA RCT registry
  - http://www.socialscienceregistry.org/
- Registry for International Development Impact Evaluations (3ie)
  - http://ridie.3ieimpact.org
- Experiments in Governance and Politics registry
  - http://egap.org/register-your-design
- Open Science Framework
  - https://osf.io
## Registries

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Pre-registration is increasingly common

Total RCT's Registered in AEA Site
05/2013 - 01/2015

Current pace:
15-20 studies/month
The future of pre-registration?

Norms are still evolving.

Unlike medicine, pre-registration isn’t required for publication (yet)

- It likely won’t be required for everything in its current form - open data is a good thing, and not everything can be credibly pre-registered
- But it will likely become required in some spaces

New ideas in this space are critical

- We know some things already...but there’s a lot more to learn
- Innovation will help balance good science with research freedom (especially necessary for quasi-experimental work)
- The better the methods, the more likely they are to be adopted