Reproducible Research

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What is reproducible research?

What is research?

Is this research?

It's (Change in) the (Future) Economy, Stupid: Economic Indicators, the Media, and Public Opinion

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Economic perceptions affect policy preferences and government support. It thus matters that these perceptions are driven by factors other than the economy, including media coverage. We nevertheless know little about how media reflect economic trends, and whether they influence (or are influenced by) public economic perceptions. This article explores the economy, media, and public opinion, focusing in particular on whether media coverage and the public react to changes in or levels of economic activity, and the past, present, or future economy. Analyses rely on content-analytic data drawn from 30,000 news stories over 30 years in the United States. Results indicate that coverage reflects change in the future economy, and that this both influences and is influenced by public evaluations. These patterns make more understandable the somewhat surprising finding of positive coverage and public assessments in the midst of the Great Recession. They also may help explain previous findings in political behavior.

A growing body of work demonstrates a link between economic conditions and both attitudes about government policy and preferences for spending (e.g., Durr 1993; Erikson, MacKuen, and Stimson 2002; Soroka and Wlezien 2010; Stevenson 2001; Wlezien 1995). There also are vast literatures exploring the degree to which support for governments and leaders follows economic trends. Some work focuses on economic conditions and assessments of presidential/government performance and voting (e.g., Bartels and Zaller 2001; Campbell 1996; Clarke and Stewart 1995; Erikson 1989; Happy 1986; Hibbs 1987; MacKuen, Erikson, and Stimson 1992; Nadeau, Niemi, and Amato 1994, 1996; Nadeau et al. 1999; Price and Sanders 1993; Sanders 1996, 1999; Sanders, Marsh, and Ward 1993; for reviews, see Lewis-Beck and Stegmaier 2000, 2007); a related body of research uses key economic variables to predict—with a good degree of success—the outcome of elections, both in the United States and elsewhere (e.g., Abramowitz 1988; Erikson and Wlezien 2012; Lewis-Beck 1988b; Wlezien and Erikson 1996; for recent reviews, see Kayser and Wlezien 2011; Linn, Nagler, and Morales 2010). There is, in sum, a considerable body of evidence highlighting the political importance of economic conditions.

Public *perceptions* of the economy matter as well. In fact, past work suggests that economic perceptions influence vote intentions and government evaluations above and beyond the impact of the actual economy (e.g., Nadeau, Niemi, and Amato 1994). The sources of

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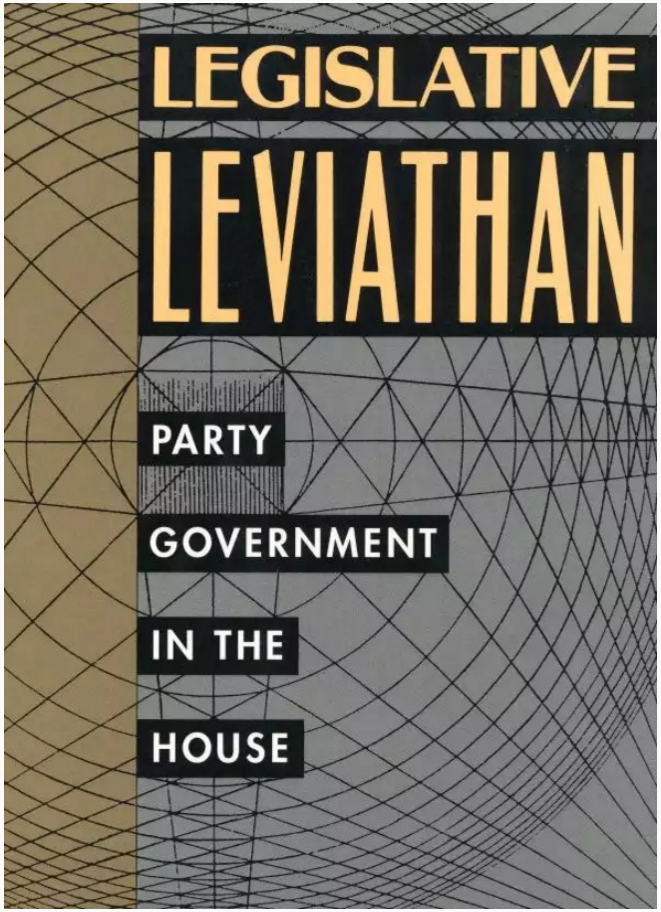
What is research?

Is this research?



Are they research?

No

Papers, articles, slideshows, talks, books are the **advertising, not the research**.

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What are they?

Presentation documents *announce* select findings and *tries to convince* us that they are correct (Mesirov 2010).

What is research?

Quantitative social science research involves the **procedures** and **choices** researchers make to gather data, process it, and analysis it in order to address their research questions.

For computational research, this includes "the full software environment, code, and data that produced the results" (Donoho 2010, 3015).

We need to make available our research, not just the advertising!

What is reproducible research?

Replicability

If we make the research available, not just the advertising, then it will be more likely that other researchers can replicate our work.

Replicable Research

When there is *sufficient information* available for *independent researchers* to make the *same findings*, using the *same procedures* with *new data*.

But...

Sometimes full replications **are not feasible** because:

- *limited resources* for gathering new data (e.g. very expensive to build another Large Hadron Collider),

- the original research already *sampled the universe* of cases.

So...

Reproducibility

Reproducible Research

When there is sufficient information available for independent researchers to make the same findings, using the same procedures with the *same data*.

Reproducibility

Really Reproducible Computational Research

"... the **data and code** used to make a finding are available and they are sufficient for an independent researcher to recreate the finding" (Peng 2011, 1226)

Reproducible and Replicable

Reproducible research **enhances** replicability.

- Reproducible research is a precondition for replicable research.
- Reproducibility is a 'second best' if attempting a replication is not possible.
- If it is **easy** to reproduce your work, more likely that someone else will be able to **replicate** it.

Reproducible and Replicable

Important!

"**A study can be reproducible and still be wrong**" (Peng 2014)

E.g. a finding that is statistically significant in one study may remain statistically significant when reproduced using the original data/code, but replication studies are unable to find a similar result.

The original finding could just have been **noise**.

Why reproducible research?

For science

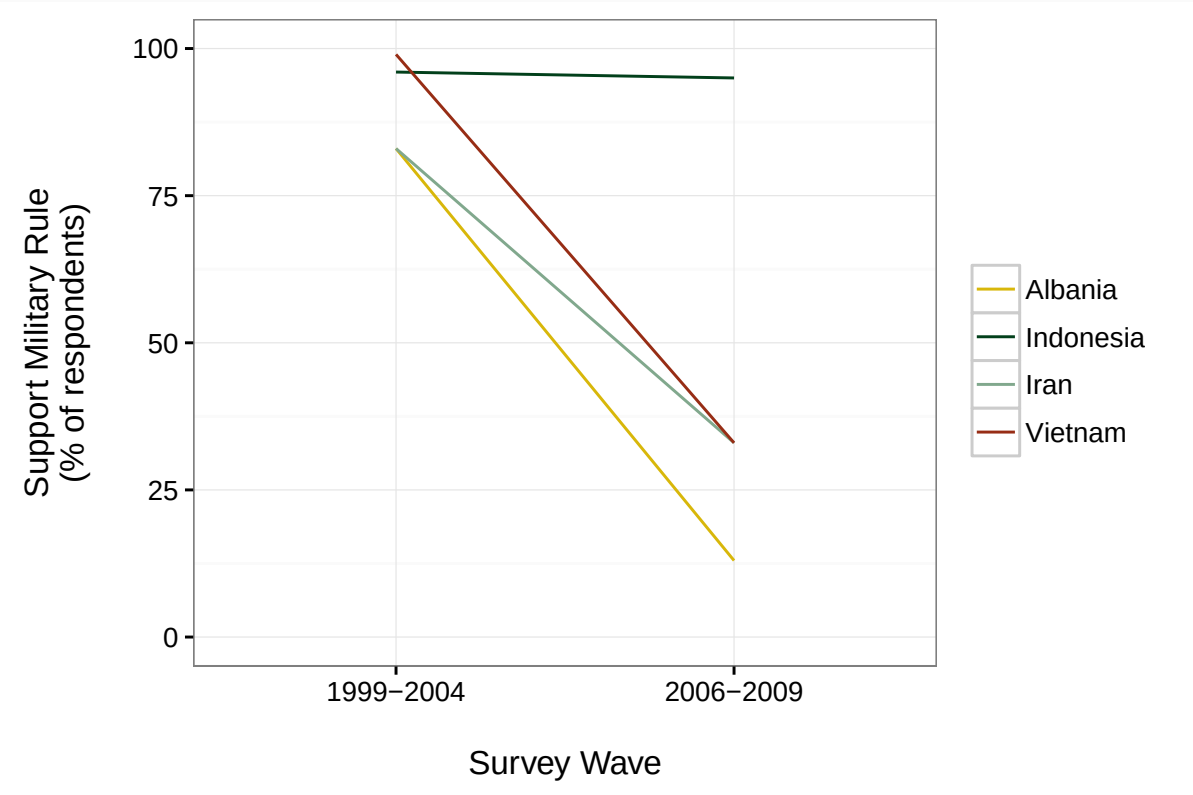
A core tenant of science: Scientific conclusions that are **not replicable** should be **abandoned or modified** "when confronted with more complete or reliable . . . evidence"

APS `http://www.aps.org/policy/statements/99_6.cfm`

Examples: World Values Survey

Background: the World Values Survey is a large, repeated cross-national survey of political and social values.

Original research finding:



Why did support for military rule decline so much in Albania, Iran and Vietnam in only a few years?

How to do really reproducible research

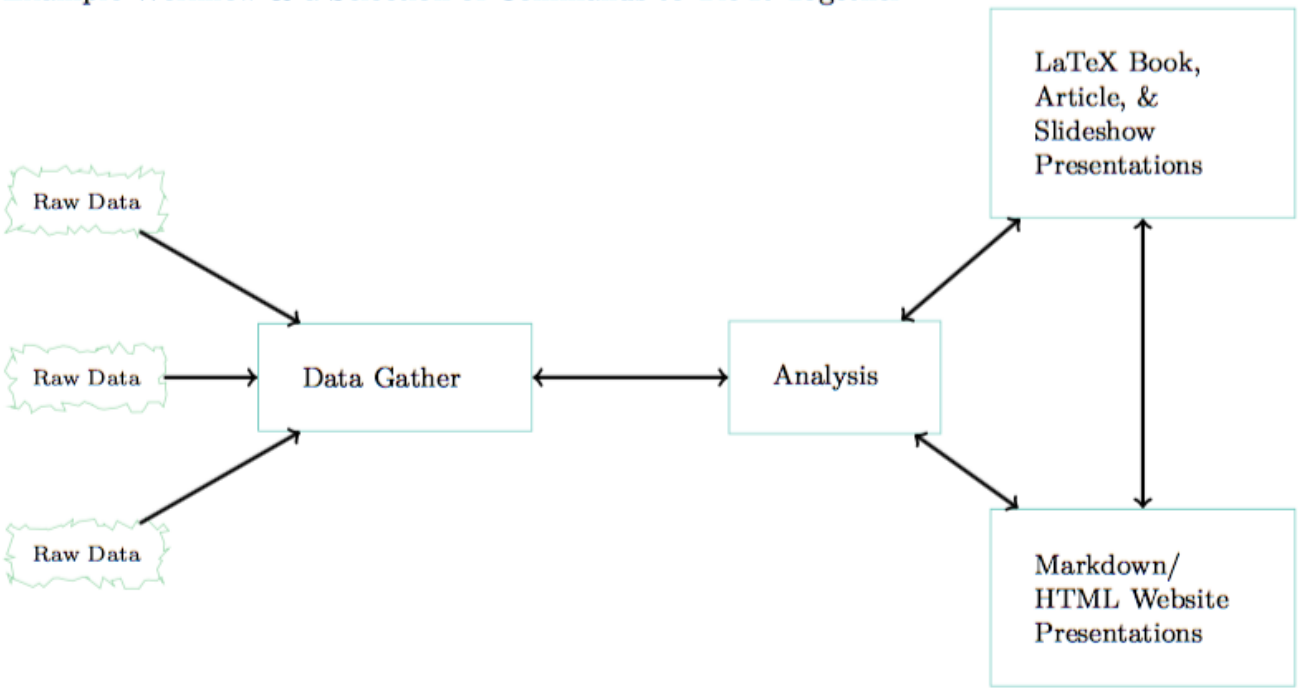
Linking Presentation to Research

To be able to **evaluate findings** in a presentation document, it needs to be **closely linked** to the research.

Need to fully document the steps we took and the rationale for these steps.

- Documentation *both* in the presentation document (usually discussion of general steps) and "appendix" files (e.g. source code, survey questionnaires, raw data).

FIGURE 2.1
Example Workflow & a Selection of Commands to Tie It Together



Gandrud (2015, 21)

Metropolis

```
1     # A comment
2     library(dplyr)
3     test <- mean(x, na.rm = T)
4
```