



Project TIER:
Teaching **I**ntegrity in **E**mpirical **R**esearch

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Presented at the 14th Annual St. Louis Fed Professors Conference
November 4, 2016



@Project_TIER

www.projecttier.org

Project TIER is supported by the Alfred P. Sloan Foundation.

One of the goals of education is to teach students to construct analytically sound, evidence-based arguments to support any findings or conclusions they claim to have reached on the basis of research or any other process or inquiry and discovery they have conducted.

Project TIER is an initiative whose purpose is to incorporate this principle into curriculum for teaching statistical methods, in economics and across the social sciences.

Concretely, the focus is on teaching students to

document all the work they do with statistical data

to ensure that

*all the steps of data processing and analysis they
conducted can be replicated*

and

all their results and findings can be reproduced.

This focus on replicability parallels concerns about professional economic research that date back at least to the landmark *Journal of Money, Credit and Banking* study:

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

The current “research transparency” movement has generated renewed attention to the problem of replicability in empirical research across the social sciences.

For example, read about the Berkeley Initiative for Transparency in the Social Sciences (BITSS) at www.bitss.org.

Project TIER's contributions:

developing curriculum for teaching replicable methods of data management and statistical analysis

disseminating this curriculum to instructors and students so they can incorporate it in their classes or independent projects

Curriculum

- The TIER Protocol for documenting statistical research
- The Open Science Framework (OSF) platform for managing research files
- “Soup-to-nuts” reproducibility exercises
- Reproducibility via markdown documents with embedded code

The TIER Protocol for documenting statistical research

Primarily for students writing complete research papers based on statistical research—typically senior theses, or research papers for classes on quantitative methods (e.g., econometrics) or empirical fields (e.g., labor)

The TIER Protocol (continued)

Consists of:

- ***Specifications*** of a set of electronic files that students submit with their final papers to serve as replication documentation.
- Guidance on how to organize the entire research ***process*** so that constructing this replication documentation is an integral part of every phase of work.

The Specifications of the TIER Protocol in a nutshell

The replication documentation a student turns in with a paper includes:

- The “*original*” *data file(s)* that the student obtained at the very beginning to use in the project.
- *Command files* written by the student, in the syntax of the statistical software used for the project.
- Some additional documents with *supplementary/explanatory information*.

Original data files

Exact copies of the files that the student initially obtained to use for the project, ***with no changes made to their format or content.***

Command files

Processing: One or more command files that open the original data files, combine/clean/process them as necessary to create one or more “final” data files that will be used in the analysis.

Analysis: One or more command files that open the “final” data file(s), and then perform the analyses or conduct the procedures that generate the results (e.g., figures, tables, and numerical results reported in the text).

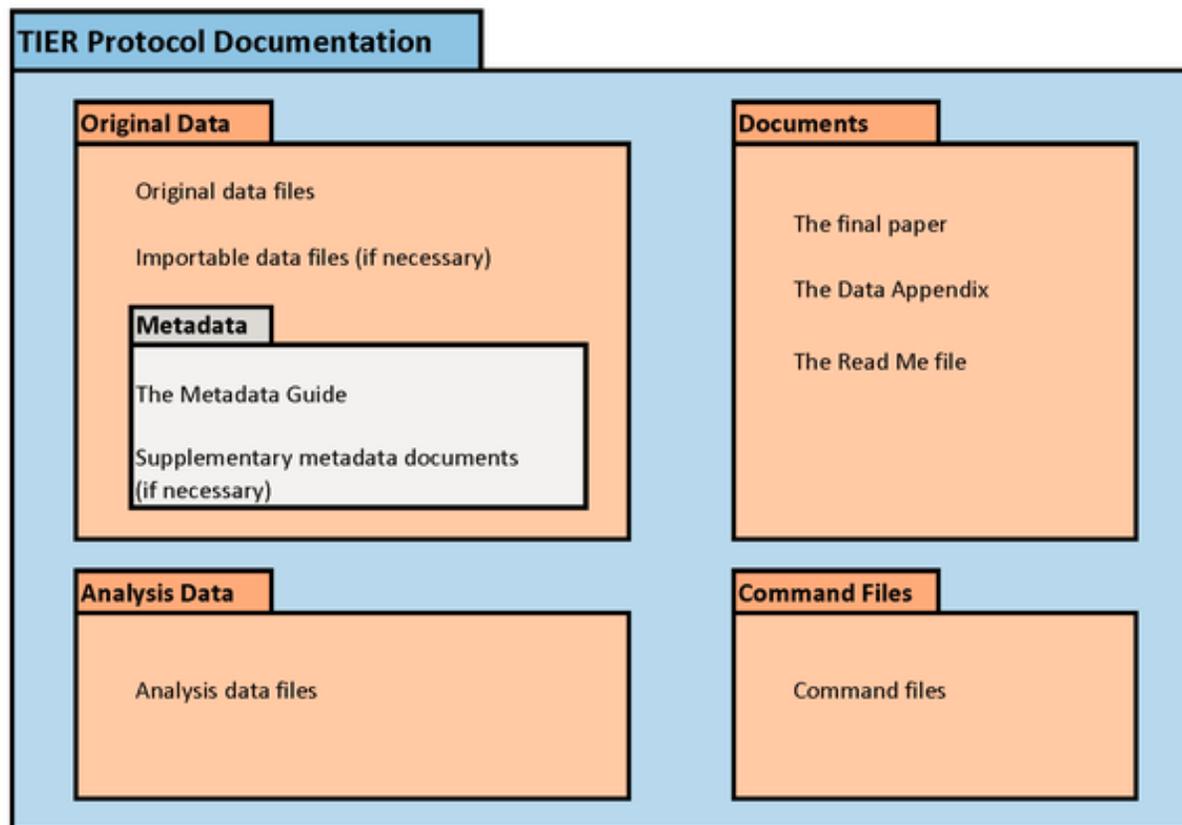
Explanatory/supplementary information:

A *read me file* with explicit step-by-step instructions on how to use the replication documentation to replicate the data processing and analysis that generated the results reported in the paper.

Metadata describing the *original data files* (the kind of information you would find in a codebook or user's guide).

A *data appendix* that serves as a codebook or user's guide for the *final data sets*.

How to organize the documentation for a paper



Benefits of teaching students to follow the TIER Protocol and turn in replication documentation with their papers

- Students learn a valuable professional skill.
- It helps them keep track of and understand what they are doing with their data.
- It vastly increases the instructor's ability to provide constructive guidance while students are working on projects and feedback when the projects are completed.
- ***It reinforces the principle we started out with:*** you should be prepared to substantiate claims you make about what you discovered in your research.

The Catch

Students must do all their work with data by writing command files that execute all the data processing and analysis.

This means that students cannot run their software interactively (type and execute one command at a time) or using drop-down menus.

It probably also means that Excel can't be the software students use for their projects—they must use a programmable package like Stata, R, SPSS, SAS, Matlab, etc.

The complete TIER Protocol, along with much more information and resources, are available on the Project TIER website. Some highlights:

The TIER Protocol

- Specifications
- Process
- Demo Project

TIER in the Classroom

- Examples of real student work
- Course descriptions, syllabi and other documents from courses that teach the TIER Protocol

The DRESS Protocol: standards for documenting professional research

Outreach—live events

Faculty Development Workshops on the Haverford College campus. Coming up Nov. 18-19 and again March 31-April 1.

Graduate Student Workshops on the campuses of host programs and departments, offered on demand.

TIER Faculty Fellowships, now in their second year. Faculty with expertise in transparent and reproducible research methods collaborate with us to develop and disseminate new curriculum.

Outreach—electronic and social media

The Project TIER website: we want it to become a portal for resources on teaching transparent and reproducible research methods.

Twitter: [@Project_TIER](https://twitter.com/Project_TIER)

E-mail updates: Sign up at the bottom of any page on the Project TIER website.