Power_Panel

Overview and Directions for Running the Shiny R Dashboard Program

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Power_Panel is a Shiny R dashboard that performs power analyses for three commonly used panel data designs: (1) difference-in-differences (DID), (2) comparative interrupted time series (CITS), and (3) interrupted time series (ITS). The calculations apply the methods developed in Schochet (Journal of Educational and Behavioral Statistics, 2022) that allow for a host of real-world issues that arise in practice for causal inference analyses using panel designs. These include variation in treatment timing, autocorrelated errors, unequal measurement intervals, clustering due to the unit of treatment assignment, and the inclusion of model covariates to improve precision and adjust for confounding bias.

The dashboard pertains to binary treatments—where individuals or groups who become treated remain so during the following periods—and allows for both continuous outcomes (such as student test scores or hospital costs) as well as binary outcomes aggregated to the cluster level (such as employment rates). The calculations allow for panel designs with separate cross-sections of individuals as well as longitudinal designs where the same individuals are followed over time.

Power_Panel is a Shiny R program named Power_Panel.R that can be run in R (Version 4.0 or later) using standard methods for running R programs (such as using R Studio). Before running the program, you will need to download the following six commonly used R packages from the official R repository (CRAN): shiny, shinydashboard, ggplot2, kableExtra, ggtext, and scales. These packages can be installed, for example, using the install.packages("ggplot2") command, and similarly for the other five packages. If not installed, you may be asked if you want them installed the first time you run the program.

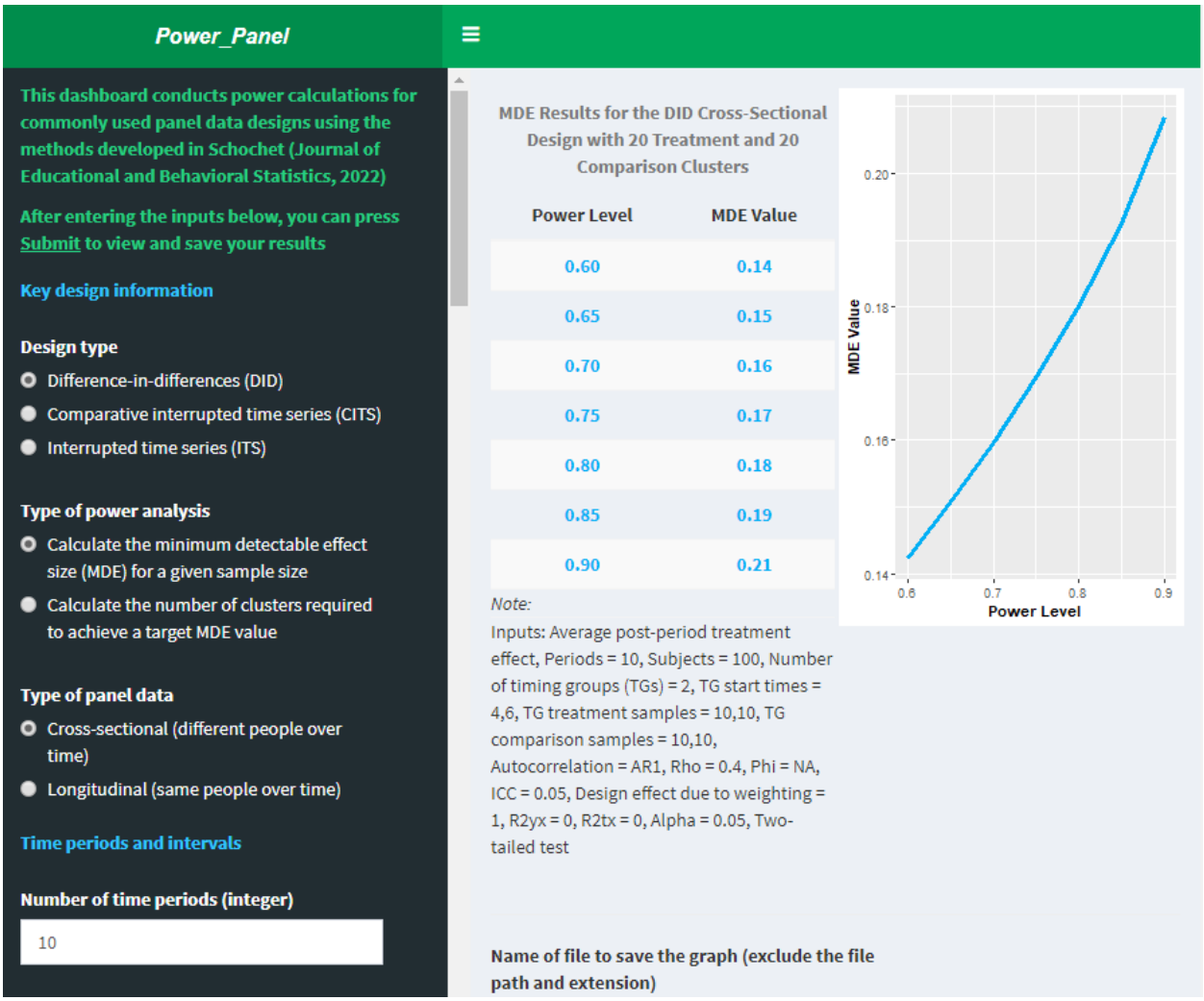
When the Power_Panel.R program is run, the *Power_Panel* dashboard will open and you can then enter inputs for your design in the sidebar panel. The dashboard displays default inputs that you should tailor to your design. After pressing the Submit button at the bottom of the sidebar, the program will then produce a table and graph showing the power analysis results (see two output examples on the following pages). The graph can then be saved to a .pdf or .png file. The program will check for errors and describe them. You can produce new results in the same session by updating your inputs.

When entering the inputs on study sample sizes, "clusters" should be considered the unit of treatment assignment for your design (for example, states, hospitals, or school districts). There are two special cases pertaining to clustering:

1. Non-clustered designs. For some longitudinal designs, the individual might be the unit of treatment assignment. In this case, clusters should be treated as individuals when entering the inputs, the "Clustering effect" input should be set to 0, and the "Number of individuals" input should be set to 1.
2. Designs relying on data aggregated to the cluster level. In these cases, the "Clustering effect" input could be set to 1. However, if possible, more accurate power results can be obtained if the inputs are entered "assuming" individual-level data are available for the analysis.

Two output examples from *Power_Panel*

1. Calculating minimum detectable impacts in effect size units (MDEs) for a given sample size



2. Calculating required sample sizes to attain a given MDE value