

Abstract Title Page
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Title: How Can Comparison Groups Strengthen Regression Discontinuity Designs?

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Abstract Body

Limit 5 pages single spaced.

Background / Context:

Description of prior research and its intellectual context.

The regression discontinuity design (RDD) is a valid basis for causal inference under statistical and behavioral assumptions that often are plausible and at least partly testable. In applied work, the RDD has some well-known limitations. One critique is that the RDD identifies treatment effects only for the narrow sub-population of units defined by the cut-off value of the assignment variable. This limitation has practical importance when the cut-off sub-population is not the population that matters for decision-making. The RDD typically does not provide a credible basis for extrapolation from the cut-off sub-population to other sub-populations or to the general population.

A second weakness of the RDD is that unbiased estimates of treatment effects depend on functional form assumptions that describe the relationship between the outcome and the assignment variable and sometimes between the treatment variable and the assignment variable. Flexible estimation methods, such as local linear and polynomial regression and global polynomial series regressions, allow researchers to avoid this problem in very large samples. Although these methods are logically appealing, in applications without very large sample sizes they may lack the statistical power to differentiate between alternative functional forms.

A third and related problem arises because RD based estimates are less statistically efficient than classical randomized control trials, primarily because of the need to estimate both treatment effects at the cut-off and the effect of the assignment variable near the cut-off.

Purpose / Objective / Research Question / Focus of Study:

Description of the focus of the research.

In this paper, we examine some of the ways that different types of non-equivalent comparison groups can be used to strengthen causal inferences based on RDD. First, we consider a design that incorporates pre-test data on assignment scores and outcomes that were collected either before the treatment became available or before the practice of assigning treatments based on a cut-off score began. The idea is to use these pre-test data to establish a baseline estimate of the relationship between the outcome variable and the assignment variable.

Second, we evaluate a design that incorporates data on the assignment scores and outcomes of a single contemporaneous comparison group of units that are always ineligible for treatment. Here the idea is to establish a baseline differences in the relationship between outcomes and assignment scores that prevails in the RD group and the comparison group.

Third, we consider how unit level and group level covariates might be used to form an optimal control group from a pool of several candidate control groups. We explore how various methods of matching and reweighting can be used to construct a control group in which the functional relationship between the outcome and the assignment score closely resembles the relationship that prevails in the RD sample below the assignment cut-off value.

In all three cases, we evaluate the statistical and behavioral assumptions that are required for the comparison group augmented RDD to produce unbiased estimates of specific treatment effects of interest. We also compare the assumptions required to extrapolate from the cut-off sub-population to other sub-populations in the augmented RDD with the assumptions required to extrapolate from standard RDD.

Research Design:

Description of research design (e.g., qualitative case study, quasi-experimental design, secondary analysis, analytic essay, randomized field trial).

We describe several control group augmented regression discontinuity designs, which could be used in applied work in education, economics, political science, and public health. The method applies to settings in which a standard RDD is feasible and there is also data from a pre-intervention period or from one or more candidate comparison groups of units that are ineligible for treatment at any level of the assignment score.

Conclusions:

Description of conclusions, recommendations, and limitations based on findings.

Under specific assumptions, a comparison group can provide a firmer basis for extrapolation to other sub-populations, improve the credibility of functional form assumptions, and increase the statistical efficiency of the estimated treatment effects.