Causal Treatment Effect Aggregation in Boundary Discontinuity Designs*

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July 3, 2025

Abstract

This paper analyzes two distinct approaches for estimating aggregated average treatment effects in boundary discontinuity designs: the widely-used *pre-aggregation* method, and a novel *post-aggregation* method. The pre-aggregation approach bundles all units near a treatment assignment boundary first, and then estimates a single, aggregated local average treatment effect. While commonly used in empirical work, its formal statistical properties remain underexplored. In contrast, the post-aggregation approach first estimates heterogeneous treatment effects along the assignment boundary, and then aggregates them, offering flexibility in weighting and robustness to boundary irregularities. We provide a precise definition of the aggregated causal parameters identified by each approach, and establish valid estimation and inference methods based on them. The theoretical results elucidate the relative merits of each aggregation approach, providing practical guidance for past and future applications of boundary discontinuity designs. General-purpose companion software is provided, and illustrated using an empirical application.

Keywords: regression discontinuity, treatment effects estimation, causal inference.

*We thank Alberto Abadie, Boris Hanin, Kosuke Imai, Xinwei Ma, and Jeff Wooldridge for comments and discussions. In particular, we thank Alberto Abadie for suggesting the terminology "pre-aggregation" and "post-aggregation" used in this paper, and Kosuke Imai for suggesting that the pre-aggregation approach may circumvent the large uniform smoothing bias issues for non-smooth the assignment boundary documented in Cattaneo et al. [2025] as discussed in Remark 1 below. Cattaneo and Titiunik gratefully acknowledge financial support from the National Science Foundation (SES-2019432, DMS-2210561, and SES-2241575). Cattaneo gratefully acknowledge financial support from the Data-Driven Social Science initiative at Princeton University.

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