Methodological Evaluation of Municipal Water Systems in Ethiopia Using Difference-in-Differences Modelling for Risk Reduction Analysis

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Abstract

The study examines municipal water systems in Ethiopia to assess their effectiveness in risk reduction. A Difference-in-Differences (DiD) econometric model was employed to analyse pre- and post-intervention data from selected municipalities in Ethiopia. The DiD approach allows for the isolation of treatment effects by comparing changes over time between treated and control groups. The DiD analysis revealed a significant reduction in waterborne disease incidence (42%) following the implementation of municipal water systems, with robust standard errors indicating the reliability of these findings. Municipal water system interventions have demonstrated substantial risk reduction in Ethiopia. The DiD model provided clear evidence on the effectiveness and areas needing further improvement. Further research should focus on expanding coverage to underserved regions and incorporating community participation for sustainable outcomes. Difference-in-Differences, municipal water systems, Ethiopia, risk reduction, DiD model Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Ethiopia, Water Systems, Methodology, Econometrics, Difference-in-Differences, Risk Analysis, Geographic Information Systems*

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