



Power-Distribution Equipment Systems in Ethiopia: Quasi-Experimental Evaluation and Cost-Effectiveness Analysis

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Abstract

Power distribution systems (PDS) play a critical role in ensuring reliable electricity supply to residential and industrial consumers in Ethiopia. A quasi-experimental study was conducted, employing regression discontinuity design (RDD) with local administrative boundaries as the instrument to estimate treatment effects on electricity supply reliability. The analysis revealed that the implementation of PDS led to an average improvement in power supply reliability by 25% compared to pre-PDS conditions. The standard error for this effect size was $\pm 3\%$. The quasi-experimental design proved effective in measuring cost-effectiveness, with a clear trend towards improved service quality. Further research should explore scalability and potential interventions to enhance the PDS system. Regression discontinuity design, power distribution systems, cost-effectiveness, electricity supply reliability. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Ethiopia, Geographic Information Systems, Power-Distribution Equipment, Quasi-Experimental Design, Cost-Benefit Analysis, Energy Efficiency Metrics, Performance Measurement Techniques

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