



Methodological Evaluation of Power-Distribution Equipment Systems in Ghana Using Difference-in-Differences for Reliability Assessment

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Abstract

Power distribution equipment systems (PDEs) play a critical role in ensuring reliable electricity supply to communities in Ghana. However, their performance and reliability vary significantly across different regions. A DiD model was employed to analyse data from PDE installations across various regions. The model accounts for pre-existing differences and time-varying unobserved effects, providing robust estimates of the impact of PDEs on electricity supply reliability. The analysis revealed that PDEs in rural areas showed a statistically significant improvement in power distribution efficiency compared to urban settings ($p < 0.05$). This study demonstrates the efficacy of using DiD for evaluating PDE systems and highlights regional disparities in reliability. Further research should be conducted to explore potential improvements in PDEs, particularly in underserved rural areas. 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: *Geographic, Difference-in-Differences, Reliability, Power Distribution, Equipment, Infrastructure, Metrics*

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