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Methodological Evaluation of Off-Grid Communities Systems in Senegal Using Difference-in-Differences for Adoption Rates Measurement

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Abstract

Off-grid energy systems are increasingly deployed in Senegal to meet rural electrification needs. A DiD regression was employed with panel data from 20 villages across Senegal to measure impact over two years post-installation of systems. Uncertainty in estimates is accounted for by robust standard errors. The DiD model revealed a significant adoption increase in off-grid communities, with an estimated effect size of +15% compared to control groups, though this varies geographically and among socio-economic factors. While the DiD approach effectively highlights differences in adoption rates over time between treated and untreated villages, it does not account for all confounding variables. Further research is recommended to refine understanding. Further studies should explore additional demographic and economic factors influencing off-grid system adoption in Senegal's diverse regions. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, off-grid, panel analysis, econometrics, renewable energy, DiD, rural electrification*

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