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A Difference-in-Differences Modelling Framework for Evaluating Power-Distribution Equipment Adoption in Kenya, 2000–2026

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ABSTRACT

Background: Evaluating the impact of infrastructure programmes on the adoption of new engineering technologies, such as advanced power-distribution equipment, requires robust quasi-experimental designs. Many existing methods struggle to isolate causal effects from concurrent policy changes and regional development variations.

Purpose and objectives: This article presents a methodological framework for quantifying the causal effect of a national electrification programme on the adoption rates of modern distribution transformers and switchgear. The objective is to provide a replicable model for engineers and planners to assess technology uptake.

Keywords: *difference-in-differences, quasi-experimental design, power-distribution systems, Sub-Saharan Africa, technology adoption, infrastructure evaluation, Kenya*

Article Highlights

- Presents a DiD model to quantify causal effects of electrification programmes on equipment adoption.
- Specifies core statistical model with cluster-robust standard errors for county-level inference.
- Framework detects significant treatment effects when key identifying assumptions are met.
- Provides replicable methodology for evaluating engineering and policy interventions in power grids.

Core Statistical Model

$Y_{it} = \beta_0 + \beta_1 \text{Treat}_i + \beta_2 \text{Post}_t + \delta (\text{Treat}_i \times \text{Post}_t) + \epsilon_{it}$, where Y_{it} is adoption rate in county i at time t.

This methodological article presents a framework for application, not empirical results.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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