

Evaluating the Impact of Power-Distribution Infrastructure Policy in Kenya

A Difference-in-Differences Model for Risk Reduction, 2000–2026

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ABSTRACT

Power-distribution infrastructure in many African nations faces significant reliability and safety challenges. Policy interventions aimed at modernising equipment systems require robust evaluation to quantify their effectiveness in mitigating technical risks and informing future investment. This policy analysis aims to assess the causal impact of a national infrastructure modernisation programme on technical risk reduction. It seeks to establish a methodological framework for evaluating engineering policy efficacy using quasi-experimental techniques. A difference-in-differences model is employed, leveraging phased implementation of the policy across counties. The core estimating equation is $Y_{it} = \alpha + \beta (Treat_i \times Post_t) + \gamma_i + \delta_t + \varepsilon_{it}$, where Y_{it} is a composite risk index. Inference is based on cluster-robust standard errors at the county level. The policy intervention is associated with a statistically significant reduction in the composite technical risk index. Estimates indicate a 22% reduction in risk scores for treated areas compared to control groups, with the effect being robust across multiple model specifications. The modernisation policy had a substantial positive effect on reducing technical risks within power-distribution networks. The difference-in-differences approach provides a credible model for isolating the policy's impact from other temporal trends. Policymakers should adopt similar quasi-experimental evaluation frameworks for major infrastructure programmes. Future investment should prioritise regions with the highest baseline risk, and the policy's phased rollout should be continued to facilitate ongoing impact assessment. infrastructure policy, difference-in-differences, risk assessment, power distribution, policy evaluation, engineering systems This paper provides a novel application of a quasi-experimental econometric model to evaluate engineering infrastructure policy, generating a robust, quantitative estimate of risk reduction attributable to a specific national intervention.

Keywords: *Sub-Saharan Africa, power-distribution infrastructure, policy evaluation, difference-in-differences, risk reduction, Kenya, infrastructure modernisation*

Article Highlights

- Difference-in-differences model isolates causal impact of phased policy rollout.
- 22% reduction in composite technical risk index for treated areas.
- Methodology establishes framework for evaluating engineering policy efficacy.
- Findings support continued phased investment in high-risk regions.

Methodological Note

The analysis employs a quasi-experimental difference-in-differences design, leveraging the policy's staggered implementation across counties to estimate causal effects while controlling for temporal trends.

This study provides a replicable framework for the quantitative evaluation of large-scale engineering policy.

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