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A Difference-in-Differences Modelling Framework for Evaluating Industrial Machinery Fleet Adoption in Kenya, 2000–2026

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ABSTRACT

Background: The evaluation of industrial machinery fleet adoption in developing economies is critical for infrastructure development and economic growth. Existing assessment methods often lack rigorous counterfactual analysis, leading to unreliable estimates of causal impact and adoption rates.

Purpose and objectives: This article presents a robust methodological framework for quantifying the causal effect of policy interventions and market factors on the adoption rates of industrial machinery fleets. The objective is to provide engineers and planners with a formal, quasi-experimental tool for programme evaluation.

Keywords: *Difference-in-differences, Industrial machinery fleets, Sub-Saharan Africa, Adoption modelling, Infrastructure evaluation, Kenya, Econometric analysis*

Article Highlights

- Formal difference-in-differences econometric framework tailored to industrial machinery adoption.
- Addresses confounding variables that bias simpler before-after comparisons.
- Provides engineers and planners with a quasi-experimental tool for programme evaluation.
- Methodology illustrated with a hypothetical policy scenario estimating a 15-point adoption increase.

Core Econometric Specification

Two-way fixed effects regression: $Y_{it} = \alpha + \beta(Treat_i \times Post_t) + \gamma_i + \delta_t + \varepsilon_{it}$, where β is identified under the parallel trends assumption.

This is a methodology article presenting a formal evaluation framework, not empirical results.