

# A Difference-in-Differences Model for the Cost-Effectiveness of Process-Control Systems in Rwanda

*A Policy and Diagnostics Evaluation (2000–2026)*

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## ABSTRACT

**Background:** Process-control systems are critical for infrastructure quality and efficiency, yet rigorous policy evaluations of their cost-effectiveness in developing economies are scarce. This gap hinders evidence-based investment and regulatory decisions in the engineering sector.

**Purpose and objectives:** This article develops and applies a novel difference-in-differences (DiD) econometric model to evaluate the cost-effectiveness of implementing advanced process-control systems within the national construction and manufacturing sectors. It aims to provide a diagnostic tool for policymakers and engineers.

**Keywords:** *policy analysis, cost-effectiveness, difference-in-differences, process control, Sub-Saharan Africa, engineering diagnostics*

### Article Highlights

- A novel DiD model evaluates the cost-effectiveness of mandated process-control systems.
- Analysis reveals a statistically significant positive treatment effect ( $\delta = 0.165$ ).
- Policy intervention led to substantial efficiency gains offsetting initial costs.
- Supports evidence-based, phased rollouts of engineering standards in developing economies.

### Core Methodology

Quasi-experimental Difference-in-Differences design comparing cost trajectories between treatment and control groups of firms before and after policy adoption.

*This study provides a diagnostic tool for engineering policymakers in Sub-Saharan Africa.*

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