

A Multilevel Regression Analysis of Process-Control Systems for Cost-Effectiveness in Ghanaian Industrial Policy

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ABSTRACT

Background: Industrial policy in Ghana has increasingly emphasised the adoption of advanced process-control systems to enhance productivity. However, a rigorous, quantitative evidence base for evaluating the cost-effectiveness of these systems, particularly across different industrial sectors and scales of operation, is notably absent.

Purpose and objectives: This policy analysis aims to methodologically evaluate the cost-effectiveness of implemented process-control systems across Ghana's industrial landscape. The objective is to identify which system characteristics and contextual factors most significantly drive cost-performance outcomes, providing an evidence-based framework for future policy and investment.

Keywords: *Multilevel regression, Process-control systems, Cost-effectiveness analysis, Industrial policy, Sub-Saharan Africa*

Article Highlights

- Modular, scalable systems yielded significantly higher cost-effectiveness than monolithic installations.
- Sector-level infrastructure, like energy reliability, explained substantial variance in outcomes.
- Policy focusing solely on technology promotion without contextual enablers is suboptimal.

Core Statistical Model

A multilevel regression model nesting firms within sectors:
$$y_{ij} = \beta_0 + \beta_1 X_{1ij} + \dots + \epsilon_{ij}$$
, where $\beta_0 = \gamma_{00} + \gamma_{01} Z_j + u_{0j}$.

This analysis provides an evidence-based framework for industrial policy and investment.

ABSTRACT-ONLY PUBLICATION

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