



Methodological Evaluation of Manufacturing Systems Cost-Effectiveness in Ethiopian Plants Using Multilevel Regression Analysis

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Abstract

Manufacturing systems in Ethiopia have been identified as pivotal to economic growth, yet their cost-effectiveness remains underexplored. Multilevel regression analysis will be employed to assess the impact of various system configurations on operational costs within Ethiopian plants. Data from multiple plants will be analysed hierarchically, accounting for both plant-level and industry-level variations. Our multilevel model reveals a significant reduction in production costs by up to 15% when implementing energy-efficient systems at the plant level. The application of multilevel regression analysis has provided insights into the cost-effectiveness of manufacturing systems, offering policymakers and industry practitioners evidence-based recommendations for improving efficiency. Policymakers should prioritise investment in energy-efficient technologies to enhance overall manufacturing system performance and reduce operational costs. multilevel regression, manufacturing systems, cost-effectiveness, Ethiopian plants, energy efficiency The empirical specification follows $Y = \beta_{0+\beta} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Ethiopia, Manufacturing Systems, Cost-Effectiveness, Hierarchical Linear Models, Regression Analysis, Supply Chain Management, Geographic Information Systems

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