



# Methodological Evaluation of Manufacturing Plants Systems in Tanzania Using Panel Data for Cost-Effectiveness Analysis

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## Abstract

This study evaluates manufacturing plants systems in Tanzania by employing panel data for a cost-effectiveness analysis. A mixed methods approach involving both quantitative (panel-data estimation) and qualitative methods was employed. The study utilised econometric techniques for cost-effectiveness analysis. Panel data revealed a significant reduction in operational costs by up to 20% when using efficient manufacturing systems, with variance explained by energy efficiency parameters at the 95% confidence level. The findings suggest that implementing more energy-efficient manufacturing practices is cost-effective and can lead to substantial economic benefits for Tanzanian businesses. Businesses are encouraged to invest in upgrading their manufacturing systems, particularly focusing on enhancing energy efficiency. Government support should also be provided to facilitate such transitions. The empirical specification follows  $Y = \beta_{0+\beta} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *Tanzania, Mixed Methods, Panel Data, Cost-Effectiveness, Econometrics, Sustainability, Qualitative Inquiry*

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