Multilevel Regression Analysis for Evaluating Cost-Effectiveness in Tanzanian Manufacturing Plants Systems,

Kamunye Kibogo[1,2]**, Magamba Maganga**[3]**, Musiele Mabika**[4]**, Mwihaki Mawanda**[5,6]

[1] Department of Interdisciplinary Studies, State University of Zanzibar (SUZA)

[2] Department of Advanced Studies, Ardhi University, Dar es Salaam

[3] Department of Advanced Studies, State University of Zanzibar (SUZA)

[4] Department of Interdisciplinary Studies, Catholic University of Health and Allied Sciences (CUHAS)

[5] Department of Research, National Institute for Medical Research (NIMR)

[6] Catholic University of Health and Allied Sciences (CUHAS)

Author notes

Kamunye Kibogo is affiliated with Department of Interdisciplinary Studies, State University of Zanzibar (SUZA) and focuses on Environmental Science research in Africa.

Magamba Maganga is affiliated with Department of Advanced Studies, State University of Zanzibar (SUZA) and focuses on Environmental Science research in Africa.

Musiele Mabika is affiliated with Department of Interdisciplinary Studies, Catholic University of Health and Allied Sciences (CUHAS) and focuses on Environmental Science research in Africa.

Mwihaki Mawanda is affiliated with Department of Research, National Institute for Medical Research (NIMR) and focuses on Environmental Science research in Africa.

Abstract

This study focuses on evaluating cost-effectiveness in manufacturing systems within Tanzanian industries, a critical area for sustainable economic growth and environmental stewardship. Multilevel regression analysis was employed, incorporating data from a representative sample of Tanzanian manufacturing plants over two years. The model accounts for hierarchical structure within the data (e.g., individual plants nested within sectors). The multilevel regression revealed significant differences in cost-effectiveness across different sectors, with some showing substantial variance explained by factors such as energy consumption and labour productivity. Multilevel regression analysis provided nuanced insights into the complex interplay of variables affecting manufacturing costs, offering a robust framework for future research and policy development. Further studies should explore additional contextual factors not captured in this model to enhance its predictive accuracy. Policymakers could leverage these findings to design more targeted interventions aimed at improving cost-effectiveness and sustainability. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Tanzania, Multilevel Regression, Hierarchical Analysis, Econometrics, Cost-Benefit Analysis, Stochastic Frontier Analysis, Panel Data Analysis*

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