



Methodological Evaluation of Industrial Machinery Fleets Systems in Tanzania Using Multilevel Regression Analysis for Cost-Effectiveness Studies

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Abstract

Industrial machinery fleets in Tanzania are essential for various sectors including agriculture, manufacturing, and construction. However, there is a lack of systematic cost-effectiveness studies to optimise fleet management. Multilevel regression analysis was employed to assess the impact of various factors on fleet costs and operational efficiency. Data from 50 randomly selected industrial enterprises were analysed, accounting for both firm-level (e.g., size, sector) and machine-level (e.g., model, usage frequency). The multilevel regression analysis revealed a significant interaction effect between enterprise size and machinery type on total fleet costs, with medium-sized enterprises experiencing higher costs when using more expensive machinery. This study provides insights into the cost-effectiveness of industrial machinery fleets in Tanzania, highlighting the importance of considering both firm and machine characteristics for effective management. Policymakers should encourage the adoption of energy-efficient machinery to reduce overall fleet costs. Enterprises are advised to conduct regular maintenance to minimise operational inefficiencies. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Tanzania, multilevel regression, cost-effectiveness, econometrics, maintenance, productivity, stochastic models

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