African Maintenance Engineering

Multilevel Regression Analysis for Evaluating Cost-Effectiveness of Industrial Machinery Fleets in Ethiopia: An Empirical Study

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Abstract

Industrial machinery fleets play a critical role in Ethiopia's industrial sector, yet their cost-effectiveness is not well understood. This study employs multilevel regression analysis to examine data from multiple levels (e.g., machinery, fleet management, operational units) related to machinery utilization and maintenance costs. The dataset includes historical records from various industries across the country. The multilevel regression analysis revealed significant variations in cost-effectiveness metrics depending on geographical location and industry type, with machinery usage efficiency being particularly high in urban centers compared to rural areas. Multilevel regression analysis provides a robust framework for assessing the cost-effectiveness of industrial machinery fleets in Ethiopia, offering insights into management strategies that can enhance overall system performance. Based on the findings, targeted interventions should focus on improving maintenance practices and increasing awareness about energy-efficient machinery usage in rural areas to maximise fleet efficiency and reduce costs. multilevel regression analysis, industrial machinery fleets, cost-effectiveness, Ethiopia

Keywords: *Ethiopia, multilevel regression, cost-effectiveness, industrial machinery, hierarchical analysis, econometrics, machine maintenance, stochastic frontier analysis*

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