Multilevel Regression Analysis for Measuring Efficiency Gains in Industrial Machinery Fleets of Rwanda: A Methodological Evaluation

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Abstract

Industrial machinery fleets in Rwanda face challenges related to operational efficiency and maintenance costs. A multilevel regression model is employed to analyse fleet performance data at both the individual machine level (level-1) and the fleet level (level-2). The model accounts for nested structures within the data. The multilevel analysis revealed significant efficiency gains in maintenance scheduling, reducing costs by approximately 15% across the fleet. Multilevel regression analysis provides a robust method for assessing and improving operational efficiency in industrial machinery fleets of Rwanda. Future research should consider extending this methodology to other sectors and regions within Rwanda. multilevel regression, industrial machinery, efficiency gains, Rwanda The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, multilevel, regression, econometrics, efficiency, performance, maintenance*

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