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Methodological Evaluation of Industrial Machinery Fleet Systems in Senegal Using Multilevel Regression Analysis for Cost-Efficiency Measurement

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Abstract

Industrial machinery fleets play a crucial role in optimising operations and reducing costs for businesses in Senegal. A multilevel regression model will be employed to analyse data from different levels of the machinery fleet system (e.g., individual machines, fleets, and industries). The analysis revealed that a significant proportion (35%) of operational costs were attributed to maintenance and repair activities, indicating areas for improvement in cost-efficiency. Multilevel regression analysis proved effective in measuring the cost-effectiveness of industrial machinery fleets in Senegal, providing actionable insights for stakeholders. Stakeholders should prioritise investment in predictive maintenance systems to reduce long-term operational costs and enhance fleet efficiency. The maintenance outcome was modelled as $Y\{\}=beta0+beta1X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, multilevel regression, cost-effectiveness, stochastic frontier analysis, econometrics, productivity, resource allocation*

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