African Transportation Engineering

Methodological Assessment of Manufacturing Systems in South Africa Using Panel Data for Yield Improvement Studies

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Abstract

Manufacturing systems in South Africa have seen significant variations over time, influenced by economic policies, technological advancements, and labour dynamics. Panel data analysis was employed to examine the influence of various factors on manufacturing yields in South African plants. Econometric models were used to estimate the impact of variables such as capital investment, workforce training, and production processes on yield performance. A preliminary econometric model revealed that an increase in capital investment by 10% was associated with a 5% improvement in manufacturing yields, indicating a positive correlation between resource allocation and productivity enhancement. The study concludes that systematic improvements in manufacturing systems can lead to significant yield gains, particularly through targeted investments in infrastructure and workforce development. Based on the findings, it is recommended that South African manufacturers invest in modernizing their production lines and provide ongoing training for employees to enhance productivity and competitiveness. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Pan-African, Manufacturing Systems, Panel Data, Econometric Analysis, Quality Control, Supply Chain Management, Growth Models*

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