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Methodological Evaluation of Manufacturing Risk Reduction Systems in South Africa Using a Difference-in-Differences Approach

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Abstract

Manufacturing plants in South Africa face significant operational risks that can disrupt productivity and profitability. These risks are multifaceted, encompassing quality control issues, equipment failures, and supply chain disruptions. A DiD approach was employed to assess changes in operational risks pre- and post-intervention. The study utilised data from 20 manufacturing plants across various sectors, with differences-in-differences regression analysis applied to control for potential confounding variables. The DiD model indicated a statistically significant reduction of 15% in operational risk scores among the intervention group compared to the non-intervention group ($p < 0.05$). The findings support the efficacy of the implemented risk reduction systems, suggesting that these measures are effective in mitigating risks within South African manufacturing settings. Further implementation and continuous monitoring of these risk reduction systems should be encouraged to sustain their benefits and adapt them to emerging challenges. Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Methodological Evaluation, Manufacturing Risk Reduction, Difference-in-Differences, Quality Control, South Africa, Econometrics, Geographic Information Systems*

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