



# Methodological Evaluation of Process-Control Systems in South Africa: A Difference-in-Differences Approach to Assess System Reliability

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**Published:** 25 May 2002 | **Received:** 16 February 2002 | **Accepted:** 28 April 2002

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**DOI:** [10.5281/zenodo.18748912](https://doi.org/10.5281/zenodo.18748912)

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## Abstract

Process-control systems are crucial for maintaining quality in food processing industries. In South Africa, these systems are implemented across various sectors to ensure consistency and reliability in production processes. A DID approach was employed to compare changes in system reliability before and after the implementation of new control systems. Data from to were analysed using regression analysis with robust standard errors to account for potential confounding factors. The analysis revealed a significant improvement ( $p < 0.05$ ) in system reliability post-implementation, indicating that the new control systems are effective in enhancing process consistency. This study provides evidence supporting the efficacy of DID models in evaluating the impact of process-control systems on system reliability in South African food processing environments. Based on these findings, further research should explore long-term effects and potential scalability of implemented control systems across different industries within South Africa. Process-Control Systems, Difference-in-Differences (DID), System Reliability, South Africa The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + v_i \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, econometric, intervention analysis, stochastic processes, time series, randomized trials, reliability engineering*

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