

A Panel-Data Estimation of Advanced Manufacturing Systems Adoption in South Africa

A Methodological Evaluation, 2000–2026

Thandiwe van der Merwe¹

¹ Department of Mechanical Engineering, SA Medical Research Council (SAMRC)

Correspondence: tmerwe@aol.com

Received: 21 June 2018 | Accepted: 18 October 2018 | Published: 02 December 2018 | DOI:

[10.5281/zenodo.18971214](https://doi.org/10.5281/zenodo.18971214)

ABSTRACT

Background: The adoption of advanced manufacturing systems (AMS) is a critical driver of industrial competitiveness, yet robust longitudinal measurement of adoption rates in developing economies remains methodologically underdeveloped. South Africa's manufacturing sector presents a salient case for such methodological evaluation.

Purpose and objectives: This study aims to methodologically evaluate panel-data estimation techniques for measuring AMS adoption trajectories. The objective is to identify the most robust econometric specification for capturing temporal adoption dynamics and controlling for plant-level heterogeneity.

Keywords: *Advanced manufacturing systems, Panel-data estimation, South Africa, Industrial competitiveness, Methodological evaluation, Adoption rates, Developing economies*

Article Highlights

- System GMM estimator proves superior for handling unobserved plant heterogeneity and dynamic adjustment.
- A one-unit increase in prior tech capability raises AMS adoption probability by ~0.15 (95% CI: 0.11–0.19).
- Static models significantly overstate the speed of advanced manufacturing systems adoption.
- Framework enables more reliable, nuanced measurement of adoption rates in developing economies.

Core Econometric Specification

Dynamic panel model: $y_{it} = \alpha y_{i,t-1} + \beta X_{it} + \eta_i + \varepsilon_{it}$, estimated via System GMM to address endogeneity, with robust standard errors clustered at plant level.

This study evaluates methodological approaches rather than reporting aggregate adoption figures.



ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.



REQUEST FULL PAPER

 **Email:** info@parj.africa

Request your copy of the full paper today!



SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We
welcome your submissions!**

Join our community of African scholars and share
your groundbreaking work.

 **Submit at:** app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global
Knowledge