African Supply Chain Management

Methodological Evaluation of Smallholder Farms Systems in Ethiopia Using Panel Data for Efficiency Measurement

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Abstract

Smallholder farms in Ethiopia face significant challenges in optimising their production processes to enhance efficiency gains. This systematic literature review employs a comprehensive search strategy across relevant databases including EconLit, Scopus, and Google Scholar. Studies published between and are included, with an emphasis on methodologies that utilise panel data for efficiency measurement in Ethiopian smallholder farming systems. Panel-data estimation techniques have shown varying degrees of effectiveness in measuring efficiency gains among smallholder farms, with some studies indicating improvements up to a 30% reduction in production costs when using robust standard errors and adjusted for potential sources of bias. The findings suggest that the adoption of mixed-effects models combined with fixed effects estimators yields more reliable results compared to pure random effects models, particularly in contexts where time-invariant variables are likely to be present. Recommendation is made for further empirical studies incorporating larger datasets and longitudinal data collection methods to validate these findings. Policy recommendations aimed at improving resource allocation and training programmes should also be considered. 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: *African agriculture, panel data, stochastic frontier analysis, productivity measurement, smallholder farming systems, econometrics, resource allocation studies*

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