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Exploring Geographical Variability in Sugarcane Yields: A Geographically Weighted Panel Regression Approach with MM Estimation

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Abstract

Purpose: This study aims to apply Geographically Weighted Panel Regression (GWPR) to panel data analysis, specifically to examine the influence of geographical variables and local variability on sugarcane yields in East Java. GWPR integrates the principles of panel regression with geographically weighted regression (GWR) analysis to capture varying relationships across different locations, considering panel fixed effects in its model**.** In the context of Decision Sciences, this research develops an innovative method for more accurate decision-making in the agricultural sector, taking into account geographical variability often overlooked in traditional decision models.

Design/Methodology/Approach: The study adopts a weighted least squares approach, sensitive to outliers, for parameter estimation within the GWPR model. The motivation of this paper is to address the limitations of conventional analysis models that often neglect the importance of location variability in data-driven decision-making. This approach is then applied to a dataset of sugarcane yields from East Java, to assess how it can manage variability and outliers in the data.

Findings: The analysis reveals that the size of plantation areas plays a crucial role in determining sugarcane yields, with significant variability detected across locations in East Java. The study identifies other factors such as soil conditions, climate, and farming practices contributing to sugarcane yield variations. The contributions of this paper include the application of GWPR methodology in agriculture, providing new insights and enriching the literature on the impact of geographical and local factors on agricultural yields.

Practical Implications: These findings have significant implications for agricultural strategy development in East Java, particularly in the context of land management and resource allocation.

Originality/Value: This study is original because it integrates GWR methods into panel data analysis, providing a new analytical framework to accommodate geographical variability in panel data.

Keywords : GWPR, fixed effects, outliers, M estimation, sugarcane yields, geographical variability.

JEL classification : C21, C23, C36, C52

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