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Household Food Waste as Technical Inefficiency: A Latent Class Stochastic Frontier Analysis Using Physical Measurements from Spain

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Abstract

This study analyzes household food waste in Spain within the framework of the theory of domestic production, conceptualizing it as a technical inefficiency. Unlike previous research based on expenditure or calorie proxies, this work utilizes a unique dataset from 2023 and 2024 that records direct physical weights of food items purchased, consumed, and wasted. By applying a Latent Class Stochastic Frontier Model, unobserved technological heterogeneity and potential endogeneity are identified and corrected. The results reveal an overall average inefficiency of 6.7%, a figure significantly lower than the standards reported in the US. The model identifies two polarized consumption profiles: an efficient majority (88% of the sample) with an inefficiency of just 3.9%, and a structurally inefficient minority (12%) with a waste rate of 28.5%. It was found that shopping frequency acts as a disciplining factor that improves inventory management, especially for fresh products. Furthermore, budget constraints in lower socioeconomic levels compel maximum resource optimization, placing these households near the efficiency frontier. These findings suggest that public policies should move away from a one-dimensional approach and segment interventions according to the household life cycle and consumption scale to improve the sustainability of the agri-food system.

Keywords: Food Waste, Stochastic Frontier Analysis, Inefficiency, Theory of Household Production, Household Economics