Title: Examining the synergy of green supply chain practices, circular economy, and economic growth in mitigating carbon emissions: Evidence from EU countries

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Abstract: Integrating green supply chain strategies and circular economy (CE) practices holds substantial potential for promoting environmental sustainability and reducing CO2 emissions. This study investigates the synergy between green supply chain practices, circular economy, and economic growth (RGDP) impacts on carbon emissions in 13 selected European Union (EU) countries, using a comprehensive panel dataset from 2000 to 2022. We employ both linear and nonlinear panel ARDL models, along with causality tests, to examine how CO2 emissions respond to changes in green supply chain management (GSCM), real GDP (RGDP), and various recycling practices, including bio-waste, municipal waste, and packaging waste. Our findings reveal that GSCM practices significantly reduce carbon emissions in the long run, while economic growth (RGDP) and municipal waste generation correlate positively with increased CO2 emissions. Interestingly, the nonlinear ARDL model highlights that only recycling packaging waste (RWP) exhibits a positive long-run effect on reducing emissions. Additionally, the method of moments quantile regression (MMQR) analysis indicates that the impact of GSCM is more pronounced at higher quantiles of CO2 emissions, whereas the effect of RGDP on emissions remains inconsistent. These results underscore the crucial need to adopt and enhance green supply chain practices within a circular economy framework to achieve substantial carbon emission reductions, holding significant implications for carbon emissions policies in the selected EU countries.

Keywords: Green Supply Chain Management (GSCM), Circular Economy (CE), Carbon Emissions (CO_2), Economic Growth (RGDP), European Union (EU), Panel ARDL.

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