

Impact of Renewable Energies as a Moderator between Carbon Emission and Economic Growth

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Abstract: This paper examines the moderating role of renewable energy in the relationship between CO₂ emissions, greenhouse gases, and economic growth. The relevance of this study lies in the need to understand how the energy transition can mitigate the negative effects of pollution on economic performance, particularly in the context of G20 countries, which play a central role in the global economy and global environmental issues. To this end, the study uses panel data and the generalized method of moments (GMM) econometric approach, recognized for its robustness to endogeneity and dynamic dependence issues in panel data. The sample includes G20 countries over the period 2010–2024, allowing for the analysis of growth and emissions dynamics over an extended time horizon. The results show that CO₂ and greenhouse gas emissions significantly hinder economic growth, while the development of renewable energy stimulates growth and mitigates the negative impact of polluting emissions. The moderating effect of renewable energy confirms its strategic role in the energy transition and the promotion of sustainable economic growth.

Keywords: Economic Growth, CO₂ Emissions, Greenhouse Gases, Renewable Energy, Moderating Effect

JEL Classification Number: O44, Q42, Q43, Q54, C33

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