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Title Page**Title**

The heterogeneous effect of democracy, political globalization, and urbanization on PM2.5 concentrations in G20 countries: Evidence from panel quantile regression

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Abstract

PM2.5 emissions have serious adverse impacts on health and impede transport activities, especially air and highway. Consequently, policymakers and economists have focused on this issue. The primary objective of this study is to investigate the effect of democracy, political globalization, and urbanization on PM2.5 concentrations within G20 countries. Ecological modernization theory is used to gain the best understanding of the impact of these driving forces on PM2.5 concentrations and obtains an analytical framework. The method utilized is the panel quantile regression, which takes into account the unobserved individual and distributional heterogeneity. The results demonstrate that, first, the direct effect of democracy on PM2.5 concentrations is significantly positive in countries with higher emissions, and has no impact on lower-emission countries. Second, the direct effect of political globalization on PM2.5 concentrations is significantly positive and especially greater in extremely low- and high-emission countries. Third, persuasive evidence proves the existence of an environmental Kuznets curve between urbanization and PM2.5 concentrations. Additionally, this paper further assesses the direct and indirect influence mechanisms of democracy and political globalization on PM2.5 concentrations across pollution levels. Both have a positive (negative) indirect effect on PM2.5 concentrations in countries with higher (lower) emissions, through its effect on GDP per capita. The total effect appears positive, suggesting that the increase in democracy and political globalization degrade environmental quality. These results provide policymakers with critical policy recommendations that contribute to the reduction of PM2.5 concentrations and ensure sustainable economic development in the G20 countries.

Keywords: PM2.5 concentration; Democracy; Political globalization; Urbanization; G20 countries; Panel quantile regression

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