

Impact of China's Special Economic Zone Policy on Carbon Emissions from both consumption-based and production-based perspectives

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Achieving a balance between economic development and carbon emission reduction has become a critical challenge for emerging economies. As the world's largest carbon emitter, China faces increasing pressure to pursue sustainable development while maintaining economic growth. Among the policy instruments designed to promote development and structural transformation, the Special Economic Zone (SEZ) policy has played a significant role in China's reform and opening-up process. However, its environmental implications, particularly regarding carbon emissions, remain insufficiently explored. This study investigates the impact of China's SEZ policy on carbon emissions from both production-based and consumption-based perspectives. Using city-level panel data from 1997 to 2017, we employ a time-varying difference-in-differences (DID) model to evaluate the causal effect of SEZ establishment on regional carbon emissions. In addition, the input-output method is applied to measure consumption-based carbon emissions and emissions embodied in exports, while a spatial Durbin model (SDM) is used to examine potential spatial spillover effects.

The empirical results indicate that the SEZ policy significantly reduces production-based carbon emissions, suggesting that development zones contribute to improving environmental performance while promoting economic activity. Mechanism analysis reveals that foreign direct investment (FDI) plays an important mediating role in this process. By attracting higher-quality FDI and facilitating technological spillovers, SEZs promote cleaner production and enhance energy efficiency, thereby contributing to carbon mitigation. Furthermore, spatial econometric analysis shows that SEZ policies generate significant spatial spillover effects on consumption-based carbon emissions, indicating that environmental impacts extend beyond the boundaries of the zones themselves. Heterogeneity analysis demonstrates that the carbon reduction effects of SEZ policies are stronger in more mature zones, non-resource-dependent cities, cities with higher pollution levels, and cities with stronger domestic consumption demand.

This study contributes to the literature in several ways. First, it expands the evaluation of SEZ policies from purely economic outcomes to environmental consequences. Second, by integrating production-based and consumption-based emission accounting, the research provides a more comprehensive perspective on policy-driven carbon dynamics. Third, the findings highlight the role of FDI and spatial spillovers in shaping environmental outcomes of development policies. Overall, the results provide important policy implications for developing countries seeking to simultaneously promote economic growth and achieve carbon reduction goals through institutional and industrial policy instruments.