

Research on the Nested Network Alliance Chain of Synergistic Carbon Emission Reduction in China's Manufacturing Industry

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Abstract:

China plays a pivotal role in climate change mitigation and has enacted comprehensive climate change strategies in order to transcend geographical and industrial constraints, facilitate the optimal allocation of resources, and leverage complementary strengths in achieving carbon emission reduction goals more efficiently and at a reduced cost. Utilizing complex network-based machine learning techniques, this study examines 48 industries across 30 Chinese provinces. Initially, we construct a network depicting the interregional and inter-industry linkages of carbon emission intensity, as well as a regional network that integrates key determinants of carbon emission intensity, including economic development levels, energy profiles, green innovation capacities, digital transformation extents, and the volatility of climate policies. Through Deep Clustering methodologies, we identify Province Clusters with similarity and establish Provincial Alliances. Our analysis of the nested network's inter-layer connections between the regional-industrial carbon emission intensity network and the Provincial Alliance network innovatively constructs a nested structure, precisely revealing the synergistic mechanisms of carbon emission reduction cooperation across Chinese regions and industries. This study's characterization of the nested network alliance chain of synergistic carbon emission reduction in China's manufacturing sector aims to offer targeted policy insights and strategic directives for reducing carbon emission intensity, thereby contributing to the global pursuit of a sustainable and inclusive future with Chinese perspectives and solutions.