

Overall environmental impacts of industrial agglomeration: An energy consumption-based agglomeration accounting for Chinese cities

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This study addresses the limitation of conventional monetary-based approaches in assessing industrial agglomeration (IA). From a perspective of how energy consumption, agglomeration can be quantified to better demonstrates the relationship between IA and environmental impacts. Drawing on China Emission Accounts and Datasets (CEADs) and the China Statistical Yearbook, we employs the multi-regional input-output (MRIO) method to calculate both local and non-local (embodied) energy consumption across 313 Chinese cities and 42 sectors, and measures agglomeration patterns using the Gini coefficient and location quotient index. This study innovatively utilizes the thermodynamic concept of energy as a metric, thereby distinguishing between output-based and energy-based agglomeration patterns. Our findings reveal that embodied energy consumption is highly concentrated in East China (approximately 4 times that of Northeast China), with Extraction of petroleum and natural gas (I3) exhibiting the highest agglomeration (Gini coefficient: 0.92) and Agriculture, forestry, animal husbandry and fisher (I1) the lowest. Importantly, significant sectoral variations exist between output-based and energy-based agglomeration: increased agglomeration alleviates overall environmental impacts in Manufacturing of communication equipment, computers and other electronic equipment (I20) but exacerbates them in Scientific research and polytechnic services (I36). The findings can serve as a supplement to conventional approaches for assessing IA and offer additional implications for industrial structure adjustments in China.