Chinese provincial CO2 emission flows in global production

Topic:
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As the key implementer in achieving Chinaâ€™s climate target, Chinese provinces, with their diverse resource endowments, locational conditions, and development foundations, have aroused wide attention. Being fragmented by the increasingly complex global production, the CO2 emissions embedded in trade led to concerns about potential carbon leakage and the reallocation of responsibility. To provide an accounting base for further analytical studies, this paper decomposes the CO2 emissions of Chinese provinces by flowing route based on the most up-to-date Inter-Country Input-Output model of the year 2017 with Chinese provinces embedded, following the accounting framework for global value chains.

The CO2 emissions of a province are decomposed into five terms of three categories: (1) the non-traded CO2 emissions, referring to the CO2 emissions embedded in the products produced and consumed locally; (2) the CO2 emissions via traditional trade, referring to the CO2 emissions embedded in products produced locally but consumed in other regions; (3) the CO2 emissions via cross-border production trade, referring to the CO2 emissions embedded in products produced by multiple regions, i.e., the cross-border production network. The cross-border production trade includes simple cross-border production trade that only crosses the border once, and the complex cross-border production trade that crosses the border multiple times. The latter can be further decomposed into two terms by whether the products finally flow back to the original region or not.

Results show that CO2 emissions embedded in cross-border production, especially those crossing borders more than once, dominated Chinese provincial CO2 emissions in 2017. At the sector level, high CO2-intensive sectors originally emitted the CO2, while some less CO2-intensive manufacturing and service sectors play a major role in the mid- and down-stream of the cross-border production, and differences exist between the production processes crossing borders once and multiple times. At the regional level, compared to the destinations when CO2 first crosses borders, more international regions are involved in leading the multi-time cross-border production network. Besides, the United States is a crucial final destination for Chinese provincial CO2 emissions via multi-time cross-border production and traditional trade. Based on these findings, the potential pathways for CO2 reduction in Chinese provinces are discussed.