Measuring Regional Specialization in China's Counties: An Upstreamness Perspective

Topic: Trade and Global Value Chains Policies (2)
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Production fragmentation has geographically segmented manufacturing processes across regions, anchoring local economies in specialized stages of value creation. While this spatial reorganization improves resource allocation efficiency, it simultaneously generates regional disparities through uneven value distribution. Crucially, such production networksâ€”emerging from variations in factor endowments, industrial bases, and policy frameworksâ€”operate not only within global value chains (GVCs) but fundamentally reshape domestic division-of-labor patterns. Subnational regions increasingly specialize in differentiated functions like R&D, manufacturing, and services. This regional specialization mirrors the structure of global value chains, potentially generating similar economic effects, including efficiency gaps, agglomeration dynamics, and persistent regional imbalances. However, the lack of systematic metrics for measuring subnational fragmentation limits empirical insights into these spatial-economic dynamics.

Within national production systems, regions position themselves along value chains according to comparative advantages, shaping both local development trajectories and broader national competitiveness. Despite its significance, precise quantification of regional specialization remains underdeveloped. Existing research predominantly focuses on international production fragmentation, leaving systematic analysis of intra-national spatial heterogeneityâ€”particularly at the county levelâ€”largely unexplored. This gap is particularly consequential for China, where vast territorial disparities necessitate a granular understanding of regional specialization to inform development strategies. Addressing this limitation requires a robust framework for identifying and measuring subnational production positioning.

To fill this gap, we introduce the concept of county-level upstreamness as a novel metric for evaluating subnational positions within domestic production networks. Ideally, county-level input-output tables would provide direct insights into regional specialization, yet data constraints necessitate an alternative estimation strategy. We propose a weighted-average approach that integrates national industrial upstreamness indices with county-level sectoral output shares, offering a systematic methodology to infer countiesâ€™ relative positions in value chains.

Empirically, we leverage Chinaâ€™s benchmark input-output tables, multi-regional input-output data, and two micro-level enterprise databases to conduct a comprehensive analysis of county-level upstreamness. First, we compute upstreamness scores for all counties based on national industrial linkages and county-sector output structures. Second, we examine the spatial and temporal evolution of upstreamness across China. Our findings reveal two key trends: (1) since 2000, county-level upstreamness has exhibited an upward trajectory, with significant shifts in positioning and increased dispersion in value chain integration; (2) spatial patterns reveal strong asymmetriesâ€”southern counties exhibit relatively even distributions, while northern regions display more pronounced industrial clustering, forming distinct production belts. Finally, we investigate the determinants of county positioning in production networks, constructing an analytical framework incorporating economic development levels, factor endowments, administrative hierarchy, and geographic attributes.

This study makes three key contributions. First, methodologically, we develop a new metric for measuring subnational specialization, addressing gaps in spatial-economic analysis at the county

level. Second, theoretically, we extend production network research by integrating intra-national fragmentation into value chain discussions, revealing how domestic specialization structures mirror and diverge from global production systems. Third, from a policy perspective, our findings provide actionable insights for optimizing industrial policies, mitigating regional inequalities, and enhancing the overall resilience of Chinaâ€™s production network. By offering a systematic approach to evaluating county-level integration into national value chains, this study provides a foundation for future research on subnational economic development and spatial reconfiguration in emerging economies.