How Enterprises are Multi-connected? An Empirical Case Study of Chinese Real Estate Enterprises Using A â€œInput-Output and Investmentâ€• Multi-layer Network

Topic:
Author: Anran Mi
Co-Authors: Xiaoyue Xu, Xiuting Li

How Enterprises are Multi-connected? An Empirical Case Study of Chinese Real Estate Enterprises Using A â€œInput-Output and Investmentâ€• Multi-layer Network

Author Information:
Anran Mi, Xiaoyue Xu, Xiuting Li

Abstract:
This paper delves into the intricate multiplex network of relationships among enterprises. With the backdrop of the information technology revolution and economic globalization, enterprise has become more connected through multiple interactions encompassing transactions, guarantees, shareholding, and upstream-downstream connections. Enterprises thereby are more likely to influence each other. For instance, once the enterprise in these relationships has a crisis, then other enterprises with which it has various related relationships will also be affected. Therefore, it is urgent to study the multiple relationships among enterprises. Despite existing studies recognizing various types of single links among enterprises, such as transactional, shareholding, and interpersonal ties of manages, etc., there's a dearth of research into multiple links simultaneously in one framework that includes the interactions between these different types of connections.

Employing a multilayer network analysis approach, this paper cites some new multiple topological indicators that can be applied to multilayer networks and constructs multiplex networks to explore the structural evolution of relationships among real estate enterprises and their counterparts in other sectors, drawing on data from input-output tables, shareholding, and outward investment records from 2005 to 2020. In addition, this study also conducted a robust analysis, indicating that when a risk event occurs in a certain real estate enterprise, the enterprise with multiple links to the enterprise will receive a greater negative impact than the enterprise with a single link to the enterprise. Findings indicate a higher complexity in the input-output layer compared with the investment-related layer within the multiplex networks of real estate enterprises. Additionally, analysis of edge overlapping probability suggests a propensity among Chinese real estate enterprises for diversified operations, with most real estate enterprises are willing to invest in industries in their own input-output chain and most shareholding companies associated with real estate enterprises belonging to closely related industries in the input-output chain. Notably, post-2015, thereâ€™s a significantly positive correlation between the importance of nodes in the input-output layer and the investment-related layer, indicating a growing awareness among enterprises of the importance of input-output connections for mitigating risks and enhancing business resilience.

The marginal contribution of this paper is as follows. A new methodology measuring the multiple links of enterprises is prosed based on multilayer network analysis, which has promising applications in economic and finance fields, including behavioral finance, asset pricing, risk management, etc. It constructs the "input-output and investment" multi-layer network among enterprises innovatively, and explores the overall topology of the multi-layer network. The correlation between input-output correlation and capital link is explored. This paper underscores the significance of input-output interconnections in mitigating credit risk contagion among real estate

enterprises, offering valuable insights into risk transmission pathways and exposure levels to aid both enterprises and regulatory authorities in safeguarding financial system stability.

Keywords: Multiple links; Input-output correlation; Capital link; Multilayer network; Network structure; Real estate enterprise