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“The structure and evolution of Japanese production network” (with Yoshi Fujiwara and Wataru Souma)

Abstracts:

One of the most important networks in the economy is a production network, which is the directed network formed by firms and trade relationships. It has recently been shown that the shape of firm-level Japanese production networks is different from the World Wide Web well known as a bow-tie. The giant weakly connected component (GWCC) of Japanese production networks form a tightly-knit structure with a core giant strongly connected component (GSCC) surrounded by IN and OUT components constituting two half-shells, which were named the walnut structure after its shape. However, the relation between its structure and the dynamics of the economy remains unclear. Here we investigate the component dependence of Japanese production networks in terms of the firm size and its growth rate using the data collected by Tokyo Shoko Research Inc. in 2011, 2012, 2014 and 2016, which includes one million firms and several million supplier-customer links. We found that the hierarchy in the walnut structure have a relation to firm size and the stability between components leads to stable growth of the firm size. And the upstream firms moved from the core of economy tend to be smaller.