A Comprehensive Analysis of the Hungarian Firm-Level Supplier Network

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In this research project we conducted descriptive, exploratory analysis of the Hungarian firm-level supplier network. We obtained access to transaction data (containing all trade links among firms where the tax content exceeds EUR 3000) coming from VAT reports collected by the National Tax and Customs Administration of Hungary. We could connect this data to the location, balance sheet and profit and loss statements of firms. Using this uniquely rich dataset we could carry out analysis not only based on topological information but we could include several relevant node and link attributes as well. We examined this system between 2014-2017, which made it possible to examine temporal stability and to distinguish between long-term supplier connections and incidental transactions. The resulting directed, weighted network consists of around 90 000 firms and 220 000 links per year.

The most important insights revealed by our analysis can be grouped into two categories: (i) the stability of the production network and (ii) the composition of the production chains. We could identify sharply separated (but occasionally overlapping) community structure which reflects closely the production chains of different segments in the Hungarian economy. This grouping allowed us to assess firms capacity to connect communities which measure can be used as a proxy for shock transmission ability between the otherwise separated chains of production. We also found strong homophily based on several firm attribute, most notably in the case of productivity, profitability and geographical location. Interestingly, firms belonging to the lowest productivity decile have almost no connections to the more productive segments of the Hungarian economy suggesting that there is very limited scope for knowledge spillovers. This finding supports the observed "low productivity trap" in some segments of the Hungarian economy. The results of this project inspired several further research directions in the Central Bank of Hungary, most importantly the estimation of credit supply shock propagation in the supplier network and the development of a micro-simulation stress test model in which we are able to connect contagion in the financial sector with supply chain shock propagation.