

Essays on Knowledge Spillover and Firm Network

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Dissertation Abstract

The first chapter explains two data facts related to firm size distribution. First, it uses sector-specific inter-firm knowledge spillovers to explain cross-sector differences in firm size heterogeneity. I formalize an environment in which greater inter-firm knowledge spillovers in a sector induce firms in that sector to invest relatively more in imitation. This implies that imitation contributes a greater share to firm growth rates in these sectors. Greater imitation also implies faster catch-up by lagging firms. Hence, the sectoral firm size distribution becomes more homogeneous. Second, I use cross-sector knowledge spillovers in a multi-sector version of this environment to explain the observed universal Pareto size distribution in any subset of the economy. I test the model using patent citation data and find support for both its sectoral and aggregate predictions.

The second chapter rationalizes firms' motivations to build directed links with each other and formalizes the dynamic formation process that generates the observed network structure in the citation network. Random meetings of customers and firms in the differentiated goods market are unlikely to result in a perfect match between demand and supply, but if two firms are connected by social linkages, one firm can earn commission fees by redirecting customers to the other firm, which is able to meet the demand. Therefore, each firm wants links to more firms, in order to earn more commission fees. On the other hand, every firm also desires more links from other firms in order to gain more redirected customers. The model extends the dynamic formation of the non-directed network model in Jackson and Rogers (2007) into the directed network domain and results in various structural features exhibited in actual directed networks. I then estimate the model's parameters using firm citation panel data from the NBER Patent Citation Database. Using the estimated parameters, I simulate the model to generate artificial sectoral citation networks and show that the simulated network structure is similar to the network structures observed in the data.

The third chapter studies the macroeconomic consequences of changes in knowledge spillover patterns across firms. It attributes the moderation in macroeconomic volatility beginning in the late 1980s in industrialized countries to a slowdown in cross-firm knowledge diffusion. The root of this phenomenon is the Bayh-Dole Act (1980), which induced American universities – the hubs in knowledge networks – to become more commercially oriented and thereby reduce their creation of knowledge spillovers. This legislation allowed universities to patent their research, which restricted the flow of information across knowledge networks. As a consequence, information heterogeneity across firms increased. I use a simple heterogeneous firm model to show that firms' reactions to unanticipated technology shocks become less synchronized when their information sets are more heterogeneous. This makes macroeconomic variables less volatile, because the asynchronous movements at the firm level tend to wash out at the aggregate level.