

Input-Output Linkages and Productivity Propagation

Topic: Classical IO applications: Economic Structural Change and Dynamics

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In this paper we investigate how Input-Output linkages are structured, how these indicators of industry interdependencies interact with productivity shocks, and how they are related with country's economic growth performance.

We make use of the World Input-Output Database (WIOD) to construct different variables for 43 countries and more than 50 industries for the period of 2000-2014. Using the World Input-Output Tables (WIOT) we construct 8 different indicators of total forward and backward linkages using the Leontief and Gosh inverse. In addition, the WIOT database is used to construct country level GDP measures in current values which are then deflated using GDP deflators from the Penn World Tables v 9.0. Finally, the Socio-Economic Accounts from the WIOD are taken to construct the rate of cost reduction (RCR) at an industry level. The RCR is relevant variable within the theory of induced technical change and corresponds to the negative of the total factor productivity growth.

We conduct a series of statistical exercises to the database. First, we study the empirical distributions of the different linkages indicators and the RCR. The same exercise is conducted to the linkages indicators weighted by industry level RCR. Second, we use Bayesian estimation techniques to fit probabilistic models to these weighted and unweighted linkages measures. Lastly, we do regression analysis to study the relationship between country GDP growth and country-wide measures of the different input-output linkages indicators.

We find that the cross-sectional empirical distributions of many linkage indices have a persistent heavy-tailed pattern, indicating that a small number of industries play an important role in the supply-chain network. By combining the information from the structure of production and technical change, we find that the I-O network is wired in a different manner in each country such that some countries have higher linkages for higher productivity sectors while other countries have a lower linkage for higher productivity sectors. We propose a measure of "efficiency" of a network by taking the difference between the network weighted RCR and non-weighted RCR. The empirical evidence shows that this network efficiency is highly correlated with country's GDP growth.