

Reframing IO Analysis on Science, Technology & Innovation Policy: New Business Platforms generated from Intangible Capital Flow caused by R&D

Topic: (3.7) Techniques for Identifying Important I-O Coefficients and Sectors

Author: Masahiro KURODA

Co-Authors: Michael C. HUANG, YASUSHI HARA

The 21st century marks the internet of things (IoT) prosperity in cyber physical systems with the stream of technology change that drastically reshaped the social economy structure. The development of Information and Communication Technology (ICT) has made the physical input such as land, building or merchandise no longer necessary conditions for economic activities. Cases like UBER, AirBnB and other E-commerce have redesigned nowadays consumption style with sharp advice for the existing input-output (IO) analysis and its compilation. The paper aims to construct a recursive CGE model that illustrate the new business platforms reflecting the investment on R&D for facilitating capital service flow. The model is expected to shed lights on implication of total factor productivity (TFP) for its process change on the demand side while the productivity improvement in information provision service sector that enlarges the platform business, assisting manufacturing sectors to create new market and variate the international production networking structure.

By reviewing the economic impact through examining several alternative policy options of government investment on science, technology and innovation, the deviations of economic structure could be captured from the changes of working hour, accumulation of tangible and non-tangible knowledge stock and wage ratio. The paper interpreted interconnection of exogenous technology scenarios in comparison with the policy options with the baseline of business as usual (BAU) to derive the impact in the general interdependency of economy constituted the multi-sectoral general equilibrium economic model. The data used in the model were sourced from Japan's IO table of 1995-2011 and was extended to distinguish tangible and non-tangible capital investment by considering long/short run block, labor market modeling, value-added and wage determinant, government balance sheet, foreign and the final demand block. Furthermore, the paper decomposed the sectors of IO table into three categories: (1) Main product, (2) Intra-firm information management, and (3) R&D Activity. Under such disaggregation, we may acquire a systematic view of capital service flow facilitated by the ICT and IoT implementation for information allocation and processioning to accelerate its productivity for manufacturing.

In the mechanism of policy options, different level of processing efficiency index (P-index) in the activity divisions of marketing, planning, R&D, procurement, operation and sales, maintenance will be calibrated through a database system containing research grants, academic performance and patents. Also, the information management could benefit from outsourcing and externalization while the cross-sectional platform of information management may thus be established. The simulation results showed the change on employment and production division along with the IoT/ICT advancement of its short/long-run effect. For manufacturing sector, the efficiency improvement would increase the production, public, private R&D investment and consolidate the knowledge stock for the knowledge infrastructure that rose TFP. Finally, the increment revealed on human resource, higher level professional education, and mostly in the information, service and private R&D division sectors. The industrial evolution would increase the gap of knowledge that causes technological unemployment remains a concern, the analytical framework is expected to provide evidence-based approach for policy making system.