Title: An Analysis of the Relationships between IT Investments and the Industrial Structure Change in Japan using Input-Output Tables – Historical Analysis and Future Projection

Authors: Makoto Saito, Shunsuke MORI, Noriko Yoda and Kiyoshi Dowaki

Affiliation: Department of Industrial Administration, Faculty of Science and Technology, Tokyo University of Science

Address: Yamasaki 2641, Noda-shi, Chiba 278-8510, Japan
tel +81-471-24-1501 ext. 3800,3812
fax. +81-471-22-4566
e-mail: mori@ia.noda.sut.ac.jp

submitted for normal presentation

keywords: IT investment, industry structure change, Input-Output table, extended Principal Component for Regression, projection

Abstract

It is often pointed out that the penetration of Information Technologies (IT) has contributed to the productivity improvement and affected on the existing industry structure. However, since both statistics and methods are not well developed, a question the empirical analysis on the interactions between IT and whole economy has not been achieved so much. Thus, a big question whether IT contributes to the improvements of energy consumption and environmental issues is still controversial.

The purpose of this paper is to analyze the relationship between historical IT investment and the industrial structural change in Japan using input-output tables and generate its future projection. The historical software investment by industry sector is also incorporated.

The basic method is given by the authors (*15th International Symposium Environmental Informatics 2001*) where extended Principal Component Analysis for Regression is employed to analyze the relationships between historical input coefficient vector of industry sector and IT investments. In this paper, this study is expanded in the following manner: firstly, to take into account the importance of software, its historical investment is estimated and involved in the model. Second, the investment coefficient vector including seven IT equipments and software is formulated explicitly and then compared with the case without software. Third, the future projection of industry structure in Japan is generated.

The outline of our study is as follows: we extracted the seven IT investment categories, (1)copy machines, (2)word processors, (3)other office equipments, (4)computers, (5) computer peripherals, (6)wired communication appliances, and (7)wireless communication appliances, from the basic IO tables for 1980, 1985, 1990 and

1995. Since the fraction of software among sectors is available only in 1995, we distributed the historical whole sales of software industries among sectors based on it. Next, we estimated the relationship between macro economic variables and the IT investment coefficient vector by sector using extended PCR which generates estimated vector under the constraints among parameters. The relationships between IT investment vector and input coefficient vector are also modeled using extended PCR. Macro economic variable is also incorporated as explanatory variable. Future input coefficient vector is projected based on the above relationships by sector. Using the estimated IO coefficient matrix, we can estimate the future impacts of IT investments on the industry structure. The change of induced impact value of energy industry, we can evaluate their impacts on global warming under IT progress.

Our research results demonstrate that, the fitness of PCR is fairly good for both the investment coefficient and the input coefficient vectors. Second, the contribution of IT was statistically significant for all industries. Third, the projected input coefficient vectors suggest that the IT hardware investment coefficient will slightly decrease in some industries when software investments are taken into account. The total induced impacts of fossil fuel energy industry will be decreasing while those of IT equipments will increase.