Analyzing the impacts of final demand changes on total output using input-output approach: The case of Japanese ICT sectors

Ubaidillah Zuhdi

Department of Industrial Administration, Tokyo University of Science, Noda 278-8510, Japan
School of Business and Management, Institut Teknologi Bandung, Bandung 40132, Indonesia

ubaidillah.zuhdi@gmail.com

Abstract. The purpose of this study is to analyze the impacts of final demand changes on total output of Japanese Information and Communication Technologies (ICT) sectors in future time. This study employs one of analysis tool in Input-Output (IO) analysis, demand-pull IO quantity model, in achieving the purpose. There are three final demand changes used in this study, namely (1) export, (2) import, and (3) outside households consumption changes. This study focuses on "pure change" condition, the condition that final demand changes only appear in analyzed sectors. The results show that export and outside households consumption modifications give positive impact while opposite impact could be seen in import change.

1. Introduction

The utilization of Information and Communication Technologies (ICT) can be easily seen in recent times. For example, people use mobile phone when doing communication with others. Another example is the usage of computer and internet by people in their daily activities. This phenomenon, actually, can be observed almost everywhere and every day. In other words, now ICT have been important aspect in human life.

There are many previous studies discussed about ICT. [1] investigated the impact of Foreign Direct Investment (FDI) and ICT on productivity growth. Their analysis was based on panel data of 42 developed and developing countries on the period between 1993 and 2001. [2] analyzed the role of ICT sectors in national economic structural changes of Indonesia during 1990-2005. They employed structural decomposition analysis as a tool of analysis. [3] conducted the international comparison in order to know the role of ICT in structural changes of national economy of analyzed countries, Indonesia and Japan. Similar with previous study, they also used structural decomposition analysis in doing analysis. The study focuses on impacts of changes of exogenous element on total output of ICT sectors in one country, however, is still lack. The kind of study, actually, can open the opportunity to increase total output of these sectors in future time. This study is conducted in order to fulfill the gap.

The purpose of this study is to analyze the impacts of changes of exogenous element, final demand, on total output of ICT sectors in future time. This study focuses on Japan, one of developed country in the world. The Input-Output (IO) analysis is employed as a tool of analysis in this study.

2. Methodology

As described in introduction, the purpose of this study is to analyze the impacts of final demand changes on total output of Japanese ICT sectors in future time. IO analysis is employed as an analysis tool. More specifically, this study uses demand-pull IO quantity model in order to achieve the purpose. Following explanation describes about methodology of this study.

The first step is to describe Japanese ICT sectors used in this study. Table 1 shows these sectors. The second step is to conduct the calculation in order to know the impacts of modifications of final demand to total output of the sectors. Demand-pull IO quantity model is used in this calculation. According to [4], following equation describes this model:

$$\mathbf{x}^1 = \mathbf{L}^0\mathbf{f}^1 \tag{1}$$

where x, L, and f are matrices of total output of industrial sectors, Leontief inverse, and final demand of industrial sectors, respectively. 0 and 1 indicate present and future times, respectively. Table 2 describes the scenarios of final demand modification used in this study. Modified 2005 IO table of Japan is used as a base of calculation. This study focuses on "pure change" condition, the condition that final demand changes only appear in analyzed sectors. The recommendations are then suggested based on calculation results.

Table 1. Japanese ICT sectors used in this study.

No.	Sector number	Sector name
1	72	Communication
2	73	Broadcasting and information services
3	80	Advertising, survey, and information services

(Source: [3])

Table 2. The scenarios of final demand modification used in this study.

Component of final demand	Scenario		
	1	2	3
	Export modification	Import modification	Outside households consumption modification
Export	Rises 30%	Constant	Constant
Import	Constant	Rises 30%	Constant
Outside households consumption	Constant	Constant	Rises 30%

(Source: [5] with slight modifications)

3. Results and discussion

Figures 1, 2, and 3 describe total output of Japanese ICT sectors for each scenario. All analyzed sectors, based on information in these figures, have similar patterns, namely scenario 1 and 3 gives positive impact while opposite impact observed in the calculation using scenario 2. A subtle difference, however, appears on former one. In communication sector, scenario 3 gives higher positive impact than scenario 1 while opposite situation happened in broadcasting and information services and advertising, survey, and information services sectors.

Above phenomenon indicates that import activities related to ICT products would decrease total output of Japanese ICT sectors in future time. In other words, these activities should be done carefully and mitigated. Japanese government should active in endorsing this restriction. Making regulation supports the mitigation is a good example.

Besides mitigating the import activities related to ICT products, to consider the ICT export and domestic markets are also important things. In other words, the actions to excite these markets should also be done in order to increase total output of Japanese ICT sectors. The examples of these actions are making new types and improving the quality of ICT products. Making the prices of these products competitive is also another example. Certainly, these actions can be combined in order to get optimal results.

4. Conclusions and further researches

The aim of this study is to analyze the impacts of final demand changes on total output of Japanese ICT sectors in future time. This study employs demand-pull IO quantity model in achieving the purpose. There are three final demand changes used in this study, namely (1) export, (2) import, and (3) outside households consumption changes. The "pure change" condition, condition that final demand changes only appear in analyzed sectors, is a main circumstance in this study.
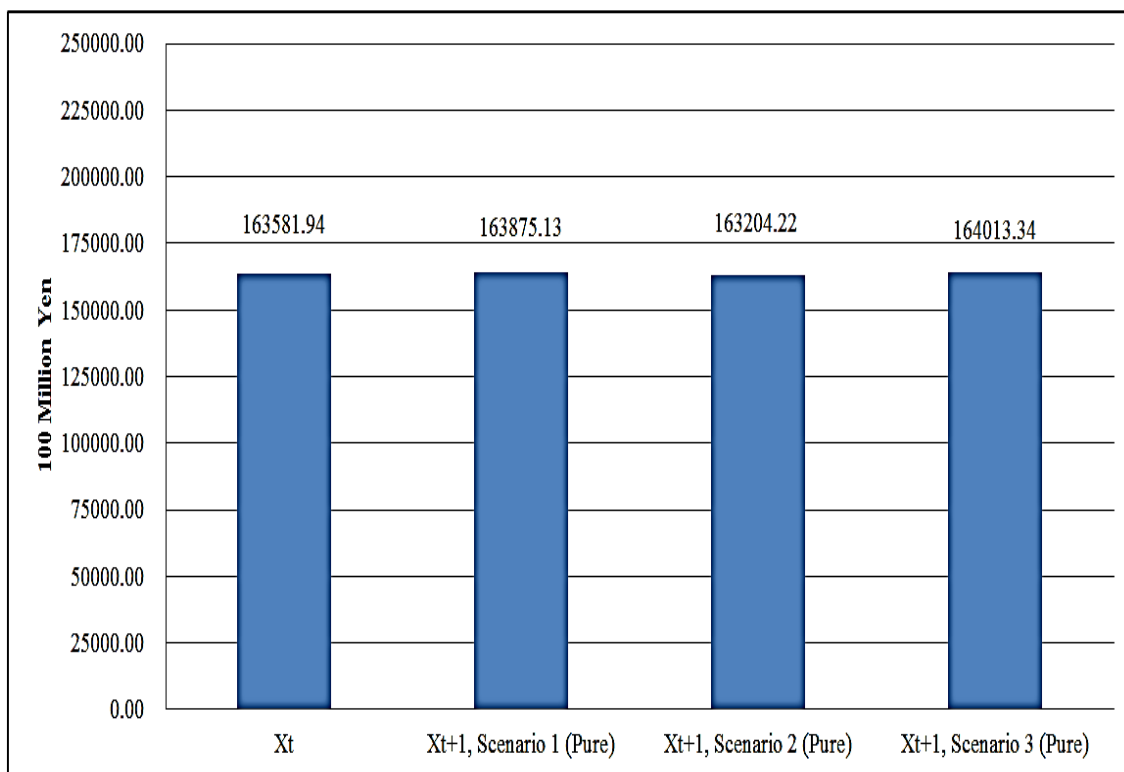
Figure 1. Total output of communication sector for each scenario.
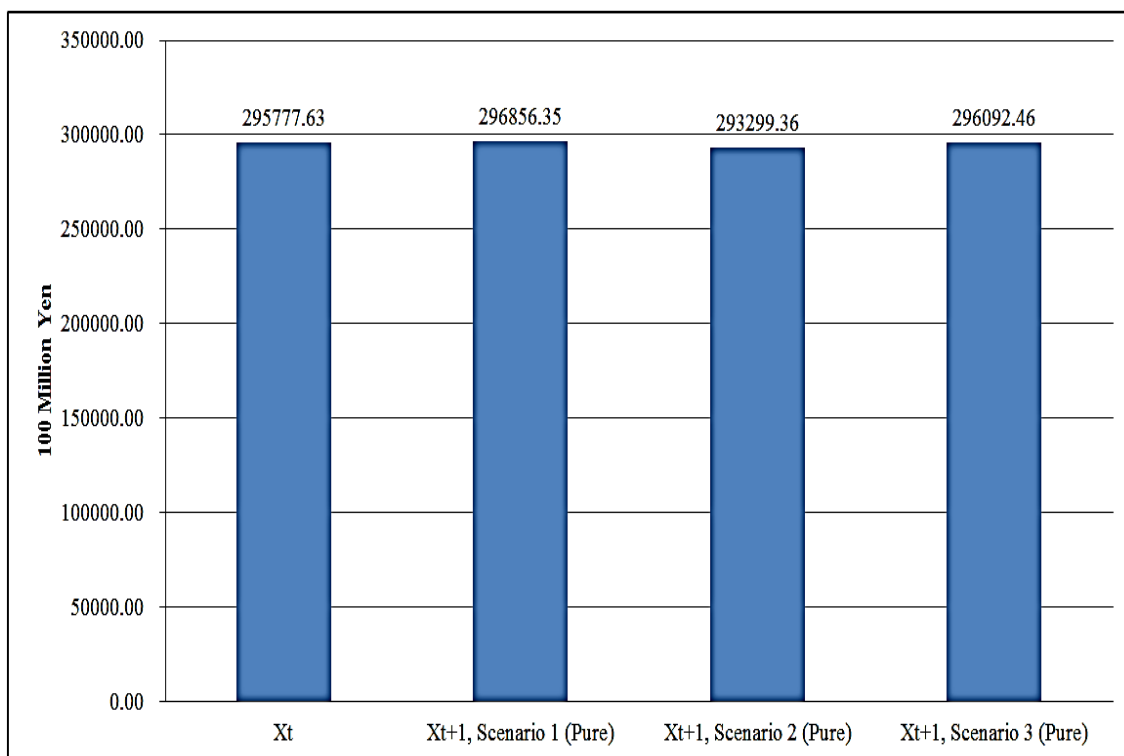
Figure 2. Total output of broadcasting and information services sector for each scenario.
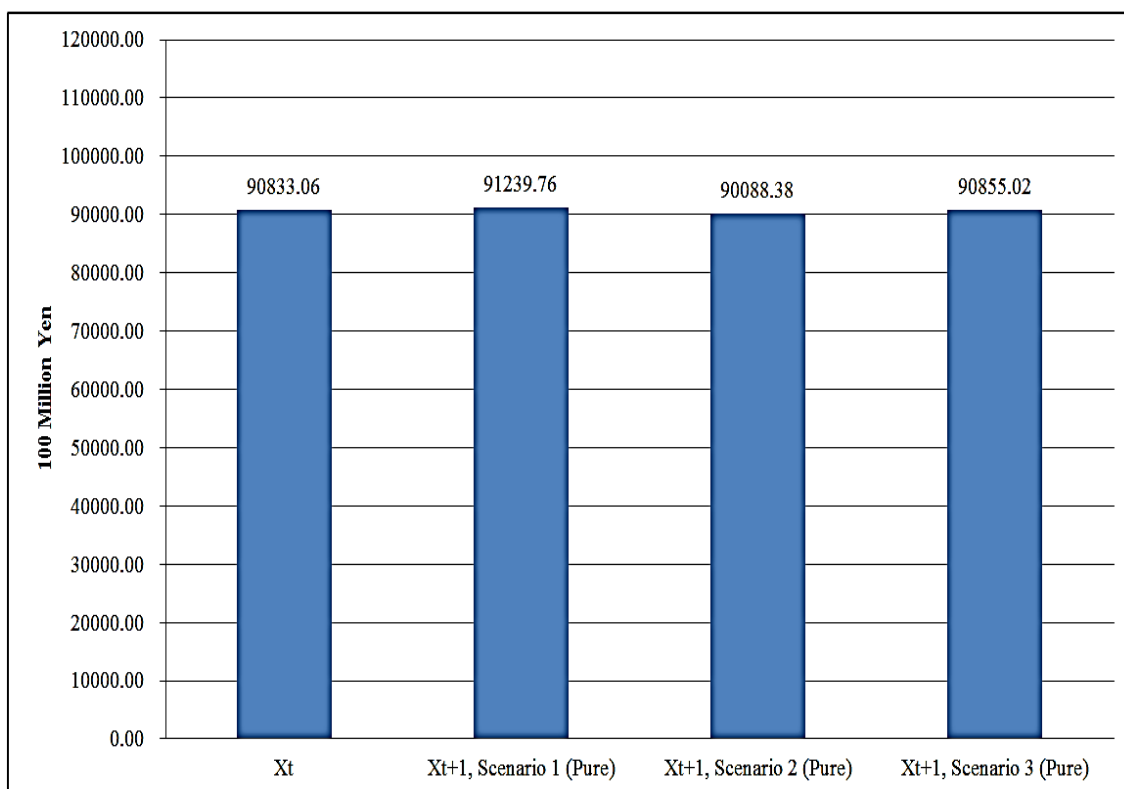
Figure 3. Total output of advertising, survey, and information services sector for each scenario.

The results show that export and outside households consumption modifications give positive impact while opposite impact could be seen in import change. This phenomenon indicates that import activities related to ICT products should be done carefully and mitigated. Japanese government should active in endorsing this restriction. Making regulation supports this mitigation is a good example. Besides, the actions to excite ICT export and domestic markets should also be done in order to increase total output of Japanese ICT sectors. For example, making new types and improving the quality of ICT products. Making the prices of these products competitive is also another example. The combination of these actions can be done in order to achieve optimal results.

This study, however, only analyzes the impact of final demand changes on total output of Japanese ICT sectors. In other words, deeper analysis on other points, such as analysis of current condition of ICT of Japan and their ICT policies, is not discussed in this study. This analysis, actually, is also important and should be considered in achieving the enhancement of total output of Japanese ICT sectors. Therefore, this kind of analysis is a suggested further research from this study.

Conducting IO multipliers analysis in this topic is also suggested further research from this study. This analysis, actually, will clearly describe the role of industrial sectors in national economy of one country. This study especially recommends to conducting income/employment multipliers analysis in further research because it can show the impact of final demand changes on additional earnings received by employees of specific sector. In other words, this study will show the sectors generate high additional earnings for their employees. Obviously, this analysis can be focused on specific sector, says ICT sector, so historical changes of additional earnings of this sector can be studied. Another suggested further research from this study is an international comparison, especially the comparison between developed and developing countries, related to this topic. This kind of study will show the characteristics of ICT sectors of analyzed countries, especially when final demand changes happened.

References

[1]   Dimelis S P and Papaioannou S K 2009 FDI and ICT effects on productivity growth: A comparative analysis of developing and developed countries *European Journal of Development Research* **22** 7996
[2]   Zuhdi U, Utomo D S and Alamanda D T 2011 Analyzing the role of ICT sector to the national economic structural change: The case of Indonesia *Jurnal Manajemen Teknologi* **10** 299307
[3]   Zuhdi U, Mori S and Kamegai K 2012 Analyzing the role of ICT sector to the national economic structural changes by decomposition analysis: The case of Indonesia and Japan *Procedia-Social and Behavioral Sciences* **65** 749754
[4]   Miller R E and Blair P D 2009 *Input-Output Analysis: Foundations and Extensions* (Cambridge: University Press)
[5]   Zuhdi U, Prasetyo A D and Sianipar C P M 2013 Analyzing the dynamics of total output of Japanese creative industry sectors: An input – output approach *Procedia Economics and Finance* **5** 827835