Examining the total output changes of ICT sectors of Japan: An approach of input – output

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Abstract

The purpose of this study is to analyze the dynamics of total output of Japanese Information and Communication Technology (ICT) sectors caused by final demand changes. This study employs input – output analysis, an approach in analyzing the interdependence of industries in an economy, as a tool of analysis. The results show that Japanese ICT sectors have similar pattern. The suggestions suggested from this study, based on the previous results, are (1) to enhance the export activity related to ICT sectors, (2) to restrict the import activity regarding ICT products, and (3) to capture more ICT domestic market.

Keywords: ICT sectors, final demand changes, input – output analysis, Japan;

1. Introduction

The role of technology in human life is important. There are many previous studies investigated that importance. Du and Wagner (2006) argued that the creation of distinct advantage in the highly competitive top-levels of the blogging world is probably influenced by the choice of technology. Hays and Farhar (2000) described that the experts agree that technology and science are important instruments in enhancing women’s live. Moreover, Kincaid (2004) explained that increasing of technology utilization has impacts on delivery of human services and the quality of life of clients who use technology.

The example of well-used technology in recent times is Information and Communication Technology (ICT). Many previous studies have examined the role of this technology in human life. For example, Zuhdi, Utomo, and Alamanda (2011) analyzed the role of ICT in economic aspect of Indonesia on the period between 1990 and 2005. Besides that, Zuhdi, Mori, and Kamegai (2012) conducted the international comparison analysis in order to know the contribution of ICT sectors to the structural changes of compared countries. In more specific, they selected Indonesia and Japan as objects of research. The emphasis of the ICT role in human life has described by Kramer, Jenkins, and Katz (2007) on the following statements:

Unbound from the structures of the PTT days, ICT has become the foundation of every sector of every economy, everywhere. The reason for this are, by now, fairly well-known, but demand brief

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repetition here. Information and communications technologies reduce transactions costs and thereby improve productivity; offer immediate connectivity – voice, data, visual – improving efficiency, transparency, and accuracy; substitute for other, more expensive means of communicating and transacting, such as physical travel; increase choice in the marketplace and provide access to otherwise unavailable goods and services; widen the geographic scope of potential markets; and channel knowledge and information of all kinds. (p. 7)

The study examines the impact of final demand changes to the total output of ICT sectors on future period, however, remains lack. That study, actually, is needed because better prediction related to ICT sectors will open the opportunity in enhancing the outcome of those sectors. The consequence of that enhancement is a rise of the prosperity of society. This study is done in order to fulfill the gap in that topic.

The purpose of this study is to analyze the dynamics of total output of ICT sectors caused by final demand changes. In this study, we focus on ICT sectors of Japan, one of developed country. This study employs an input–output analysis as a tool of analysis.

2. Methodology

The 2005 input–output table of Japan is employed as a reference data. Before starting the calculation, industry sectors in that table are aggregated. After conducting that processes, sectors of industry of Japan change from 108 to 89 sectors. The ICT sectors of Japan discussed in this study can be seen in Table 1. The scenarios of final demand modification used in this study can be seen in Table 2. In this study, \( t \) denotes initial period, 2005, while \( t+1 \) denotes future period.

We then calculate and analysis the impacts of final demand changes to the total output of ICT sectors of Japan on future period. The following equation is applied in that calculation.

\[
X_{t+1} = (I-A)^{-1}Y_{t+1}
\]

\( X_{t+1} \), \((I-A)^{-1}\), and \( Y_{t+1} \) explain about the matrix of total output of sectors on \( t+1 \) period, Leontief inverse matrix, and matrix of final demands on \( t+1 \) period, respectively (Nazara, 2005). Based on the results of calculations and analysis, we then arrange the suggestions for increasing the total output of Japanese ICT sectors on future period.

<table>
<thead>
<tr>
<th>Table 1. ICT sectors of Japan</th>
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<td>No.</td>
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<td>1</td>
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<td>2</td>
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<td>3</td>
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<th>Table 2. The scenarios of final demand change</th>
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<tr>
<td>Final Demand</td>
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<tr>
<td>------------</td>
</tr>
<tr>
<td>Export</td>
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<tr>
<td>Rises 30%</td>
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<tr>
<td>Import</td>
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<tr>
<td>Outside Households Consumption</td>
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</table>
3. Result and analysis

3.1. The impact of final demand changes

Figure 1 explains the comparison of total output of communication sector of Japan for each condition. Based on the information in that figure, scenario 1, the change of export, has the biggest positive impact to the total output of this sector on future period. Similarly, scenario 3, the change of outside households consumption, has also positive impact but less than scenario 1. On the other hand, the opposite impact appears on scenario 2, import change.

Figure 2 describes the comparison of total output of broadcasting and information services sector of Japan for each condition. Based on the information in that figure, scenario 1, export modification, has the biggest positive impact to the total output of this sector on future period. Similarly, scenario 3, outside households consumption change, has also positive impact but less than scenario 1. Contrarily, the negative impact to the total output of this sector on future period is given by scenario 2, the change of import.

Figure 3 shows the comparison of total output of advertising, survey and information services sector of Japan for each condition. Based on the information in that figure, scenario 1, export change, has the biggest positive impact to the total output of this sector on future period. Scenario 3, the modification of outside households consumption, has also positive impact but less than scenario 1. Similar with the information in previous figures, the negative impact is owned by scenario 2, import change.

The phenomenon appears in figure 1 through 3 indicates that ICT sectors of Japan have similar pattern. In more specific terms, scenario 1 and 3, export and outside households consumption changes, will positively impact their total output on future period while negative impact will be given by scenario 2, the modification of import. Therefore, the suggestions regarding steps in increasing Japanese ICT sector’s total output should be structured based on that pattern. Following sub-chapter will discuss those suggestions.

3.2. The suggestions in increasing the total output of ICT sectors of Japan

The first suggestion, from this study, in order to increase Japanese ICT sector’s total output on future period is to enhance the export activity related to those sectors. As we know, export activity has a linkage with the global competition. In other words, considering how to compete in that battle is needed when conducting the improvement of export activity. The components should be considered, in order to compete in global competition, are quality and price of products. Therefore, Japanese government needs to improve those components in enhancing export activity of ICT sectors.

Myoken (2008) argued that one of weakness in ICT of Japan is a lack of engineers with high skills of communication and foreign languages. That weakness, actually, will have a detrimental effect to the Japanese ICT sectors since they will difficult to satisfy the foreign demands. In other words, because of lack of foreign languages and communication skills, the sectors of ICT of Japan are difficult to fulfill the demands of foreign. Consequently, the foreign consumers will evaluate that the quality of products of Japanese ICT sectors is low. As an effort in increasing the quality of products of those sectors, Japanese government should improve the communication and foreign languages abilities of ICT engineers.

On the other hand, the improvement of price of ICT products can be achieved by doing efficiently the production process. Using this process, actually, the total cost of production can be decreased. The consequence of cost reduction is to get equal profit even though the price is decreased. The efficient production process in ICT sectors can be accomplished by, for example, selecting wisely the vendors of parts.

The second suggestion is an import activity restriction regarding ICT products. As shown in previous discussion, the increase of import activity related to ICT products will give a negative impact to the total output of Japanese ICT sectors on future period. Because of that the regulation for organizing this activity is important aspect for those sectors. Obviously, very tight restriction is not wise action since import activity could not be avoided in global era.
In other words, import activity remains important for the ICT components which Japan still difficult to produce those. Therefore, the restriction should be focused on the replaceable import components.

Figure 1. The comparison of total output of Japanese communication sector for each condition

Figure 2. The comparison of total output of Japanese broadcasting and information services sector for each condition
The third suggestion from this study is to capture more ICT domestic market. This suggestion is suggested since, from previous calculations, increasing of outside households consumption will give positive impact to the total output of ICT sectors of Japan on future period. Besides that, according to Ministry of Internal Affairs and Communications (2012), in ICT scope, Japan is ranked highest in consumer sophistication comparing with surrounding countries. In other words, domestic market of Japan related to ICT is very potential. Similar with first suggestion, Japanese government needs to improve quality and price of ICT products in order to seize ICT domestic market.

4. Conclusions and future research

This study analyzes the impact of final demand changes to the total output of ICT sectors of Japan on future period. The results show that Japanese ICT sectors have similar pattern. In more specific terms, scenario 1 and 3, export and outside households consumption modifications, will positively impact their total output on future period. Moreover, negative impact will be given by scenario 2, the change of import. The suggestions suggested from this study, based on the previous results, are (1) to enhance the export activity related to ICT sectors, (2) to restrict the import activity regarding ICT products, and (3) to capture more ICT domestic market.

This study, however, uses the condition which final demand changes appear in all of Japanese industrial sectors. In other words, the “pure” condition, the situation which final demand changes only appear in ICT sectors of Japan, is not captured in this study. The discussion of this condition, actually, will decisively show the genuine impact of final demand changes to the total output of Japanese ICT sectors on future period. Therefore, this topic is a suggested further research from this study. Besides that, the analysis of inputs related to ICT sectors which domestically produced will be an interesting further research. This analysis will purely describe the consequences of economic of final demand changes on the domestic level from ICT sector’s point of view. Moreover, the comparison of international level related to the ICT sector, especially among developing and developed countries, is also suggested further research from this study. This international comparison will explain the peculiar characteristics of that sector for each compared country.

References


