Offshore Outsourcing of IT-services and its Effect on the Productivity of Japanese Economy

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1. Background

Since the middle of 2000s, ICT has played the role to rebuild organizational networks by connecting value chain and providing communication network with drastically lower cost. This change has two important aspects. First, the use of ICT has lowered the cost to build production network across distant locations and across borders. Second, ICT has made certain types of services tradable, which used to be non-tradable and had to be produced at the same location of consumption.

For example, “IT-services” such as software development, software R&D, system operation, can be performed in distant locations as long as they are connected to communication networks. “IT-Enabled Services (ITES)”, such as call-center operation, data entry, financial processing also became possible to be performed in distant locations by using ICTs for lower cost and sufficient capability. As a result, value chain of many types of services have been fragmented and transferred across borders. In this paper, IT-service and ITES are together called as “IT-services” unless otherwise noted. Outsourcing of services to providers in overseas is also called as “Offshoring” or “Offshore outsourcing”.

Because of its widespread application, this new type of trade has caused a discussion in developed economies. One of the major topics is the effect on employment. Various estimations are reported on the effect on employment depending on region and methodology (Takagi and Tanaka, 2010). However, productivity is also one of the important aspects which is supposed to be affected by offshore outsourcing.

This research assumes the productivity is affected by offshore outsourcing in the following ways. First, it reduces the costs of intermediate input of IT-services. Firms can benefit from this cost reduction until all firms in the industry also outsource and the prices of final products or services reaches lower equilibrium. Second, in the process of organizing outsourcing, business

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process which is to be outsourced are reviewed, simplified, and optimized. This process of Business Process Reengineering (BPR) will also raise productivity. Finally, by focusing on the core-competence of organizations, companies will raise its productivity.

As Takagi and Tanaka (2010) summarizes the prior studies on the offshore outsourcing of IT-services, studies on the impact of information service trade are relatively limited. Among them, Liu and Trefler (2008) assess impact of outsourcing to China and India on U.S. employment, while Amiti and Wei (2005) assess UK employment and service outsourcing, and Falk and Wolfmayr (2008) conduct similar research on EU countries[3]. Empirical study on the effect on productivity is even scarce and only Amiti and Wei (2009) reports the results on the US.

2. Empirical Analysis on TFP

One of the difficulty of empirical study in this field is to measure the amount offshore outsourcing. This study follow the same approach as Takagi and Tanaka (2011) which uses input-output table to calculate the amount of offshore outsourcing. It assumes traditional outsourcing which is assessed as imported intermediate input in the same industry, and IT-services outsourcing, which is assessed as imported intermediate inputs of “information services” for each industry.

In order to assess the effect on productivity, several methodologies are considered from prior studies. First group of prior studies use output of a firm or industry as dependent variable. Those studies derive estimation model from production function. For example, Amiti and Wei (2009), which analyzes the effect of offshore outsourcing on the productivity, use this approach and find that offshore outsourcing of services has a positive effect on TFP. Similar approach is introduced by Motohashi (2005), which analyzes the contribution of TFP and information technology investment on output separately. The other approach is introduced by Nakanishi and Inui (2008). They use TFP data which is already available as the dependent variable, and assess several explanatory variables which are not used explicitly in the production function to calculate TFP.

This analysis employs the similar approach as Nakanishi and Inui (2008). Because absolute value of various intermediate inputs and stocks are already included to calculate TFP, explanatory variables are divided by total output of the industry to represent the intensity of each factor and to avoid duplicate consideration in the analysis. The estimation model is panel data

[3] Austria, Finland, Germany, Italy and the Netherlands

analysis and described as follows:

$$\Delta TFP_{it} = \alpha + \beta_1 \Delta \frac{TDO_{it}}{Y_{it}} + \beta_2 \Delta \frac{SER_{it}}{Y_{it}} + \beta_3 \Delta \frac{IT_{it}}{Y_{it}} + v_i + e_{it} \quad (1)$$

where delta represents the ratio from previous year, TFP is Total Factor Productivity. TDO is traditional outsourcing, SER is IT-services outsourcing. *i* is 108 sector industry of JIP 2009 database, and *t* is year. Data coverage is the latest five years, from 2002 to 2006. IT is information technology stock. Lagged analysis of model (5-1) is also conducted, because it may take a while until outsourcing behavior and change in IT stock affect productivity. The lagged model uses explanatory variables which are one year before dependent variable, and described as follows:

$$\Delta TFP_{it} = \alpha + \beta_1 \Delta \frac{TDO_{it-1}}{Y_{it-1}} + \beta_2 \Delta \frac{SER_{it-1}}{Y_{it-1}} + \beta_3 \Delta \frac{IT_{it-1}}{Y_{it-1}} + v_i + e_{it} \quad (2)$$

All data for this analysis is obtained from JIP2009 database.

3. Results

In the simultaneous model, all of traditional outsourcing, IT-services outsourcing, and IT stock, have negative effects on TFP. This negative effect is found in manufacturing, service, and all industries. Coefficients are around -0.02, which means that if input share of outsourcings and IT stock increases 10%, TFP is lowered 2.2%.

However, this negative effect changes in the lagged model. In manufacturing sector, IT-services outsourcing turns to positive in the lagged model. Negative effect of traditional outsourcing and IT stock also disappears in the lagged model. Similar change is also found in services sector. Negative effect of traditional outsourcing turns to positive, and negative effect of IT-services outsourcing and IT stock also disappears in the lagged model.

4. Discussion

The results show that increase of offshore outsourcing has a negative effect in the first year, but the effect turns to positive in the second year. It shows that it may take a while until outsourcing is settled in the organization and firms benefit from resource reallocation.

In the lagged model, there is a difference between manufacturing and service sector. Manufacturing sector benefit from IT-services outsourcing, and service sector benefit from traditional outsourcing. In manufacturing sector, companies might be able to increase its TFP by outsourcing IT-services, which are not the core competence of manufacturing firms.

5. Conclusion

In terms of implications for economic policy, continuous assessment of long-term effect of outsourcing is important to judge the effect on productivity and to take a political action. If a policy reacts to only short-term effect on employment and not be revised, it may not support industrial growth.

There are several limitations and future challenges in this analysis. There is a limitation to measure the amount of outsourcing activities. Specification of business process among IT-services is also one of the future challenges.

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