FDI SPILLOVER EFFECT ON ASIA PACIFIC CAPITAL PRODUCTIVITY DETERMINANTS

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Abstract - This paper presents a modified design of Extensive Growth Method in the area of calculating capital productivity in some selected Asia Pacific countries such as (Malaysia, Indonesia, Philippines, Singapore, Thailand, Japan, Korea, China, India, Australia and New Zealand) over the period of 1970 to 2012. This paper showed that human capital intensity provides the potential effects of FDI inflows to enhance the capital productivity as an input driven economy. In addition, the contribution of human capital intensity offers the strongest evidence in influencing capital productivity. Furthermore, based on TFP per unit of capital, the selected Asian Pacific economic growth (excepted Japan and South Korea) considered being input driven and highly dependent on FDI inflow per unit of capital, labour force per capital, and human capital intensity.

Keywords - FDI spillover effects, Asian Pacific countries, capital productivity growth, investment-driven.

I. INTRODUCTION

Capital productivity shows how efficiently capital is used to generate output growth. Investment in Foreign Direct Investment Inflows (FDI) enables new technologies to enter the production process and is seen as an important driver of productivity growth. Investment in human capital, not only contribute to expand the technological change but also enhances the ability of firms to adopt existing technologies, playing an important role in productivity growth. Fundamentalists view mainly focused on the way growth by allowing the mobilization of resources that capital accumulation drives economic growth. As investment levels have actually increased in most developing countries, the scope for further increases turned to productivity improvements as it offers getting more out of limited resources.

In keeping with this trend, FDI-driven growth strategy has recognized the role of productivity in economic growth. According Aitken and Harrison (1999), there exist a threshold effect in FDI productivity spillover. It is also generally acknowledged that spillover effect depends on the technology intensity of FDI Inflow, Ziliang Deng (2013). By measuring the effect of productivity change from the production environment, one can possibly explore hypothesis concerning the source of productivity growth. One of the most frequently referred to positive effect of multinational corporation (MNCs) in competition with local firms is the presence of productivity advantage which can lead to productivity increase in the host countries, allowing to become more efficient, Gorg and Strobl (2001).

II. FDI INFLOWS AND ECONOMIC GROWTH: AN OVERVIEW OF THE LITERATURE

Developing countries, emerging economies, and countries in transition have come increasingly to see FDI inflows as a source of economic development and modernisation, income growth and employment. Countries have liberalised their FDI inflow regimes and pursued other policies to attract investment. They have addressed the issue of how best to pursue domestic policies to maximise the benefits of foreign presence in the domestic economy, OECD (2002). The overall effect of FDI inflows on macroeconomic growth for developing economies arise from technology transfer, human capital enhancement, trade and investment, competition, and enterprise development. Ouyang (2009) stated that the benefits of FDI for country- and firm -level studies are well documented. In view of that, FDI inflows enhance economic growth by bring physical capital, advance technology, management experience into the host countries. All of these contribute to higher economic growth, which is alleviating poverty tool in those economies.

Across the world and in several Asia Pacific countries, East Asia stands out as the only region where living standards are catching up to those in industrial countries, while other parts of the developing world seem to be struggling to either tread water or fall further and further behind, Collins and Bosworth (1999). In this respect, FDI plays a strong catalyst role for domestic investment in developing countries, McMillan (1999). According to Agosin and Mayer (2000), such “crowding in” effect of FDI can be found in the case of Asia's countries success but not necessarily for other developing regions.

III. SPILLOVER EFFECT AND PRODUCTIVITY GROWTH

According to Markusen (2002), the concept of knowledge capital is a very critical factor in determining the dunning’s paradigm, which is driven by human and technology knowledge, requiring a high skilled and creative human capital to facilitate

the K-economy activities. Furthermore, effort to build human capital by improving education and training as a potential of improving productivity are through augmented knowledge and skills for economic growth and social progress, Schultz (1963). In this respect, new issues are being raised regarding the implications of the knowledge-based economy, and the role of human capital in development of the productivity driven economy. The importance of knowledge and new technology requires better understanding of "Absorptive Capacity".

The role of "Absorptive Capacity" as a dynamic capability is attributed to its productivity creation function, which is required to develop new organizational capabilities. These capabilities result in human capital development, which allows domestic firms to adapt productivity spillovers from FDI that is called as productivity driven economy. Moreover, an input driven economy corresponds to the initial stage of economic development.

The term of absorptive capacity is defined by Cohen & Levinthal (1990) as "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends". So, the concept of absorptive capacity is important for understanding knowledge transference between multinational companies (MNCs) and local people, which support the firm's capability of launching innovative products. Furthermore, the absorptive capacity in this study addresses how domestic firms are benefiting to develop their skills through the FDI inflows in their countries.

IV. FDI SPILLOVER EFFECTS ON LONG RUN PRODUCTIVITY GROWTH

FDI spillover effect can exert as the driver of long-run economic growth. According to Kinoshita (1999) spillover effect can take place on the local firms mainly through four channels: the imitation effect, the linkages effect, the training effect and the competition effect. Economic literatures on the FDI spillover effect gives explanation for support an exogenous positive effect of FDI on economic growth.

Human capital is primary factor in explanation of technology transfer brought by FDI which represents differences in productivity levels of economies. Nelson et al. (1966) on their studies claimed that human capital can be yields externalities. Arrow (1969) point out that difference in absorptive ability affects to benefit from the technology transfer. Levine et al. (1992) showed a robust relationship between economic growth, FDI and human capital. Benhabib et al. (1994) showed that the TFP growth depends on a nation's human capital stock level. Borensztein et al. (1998) considered FDI as a source of transfer of technology, contributing higher productivity when domestic economy has a minimum threshold stock of human capital. Xu (2000) counts a minimum threshold level of human capital need to gains spillover effects. Kneller and Stevens (2002), Klenow and Rodríguez-Clare (2005) also emphasize on the role knowledge externalities in productivity growth. Rajneesh (2004) paid attention on understanding concept absorptive capacity at the macro level and productivity growth. His finding shows the importance of the different aspects of absorptive capability at different stages.

The results of empirical studies on the effects of FDI inflow on productivity growth are not clear. For example, Felipe (1997) stated that the empirical work with fundamentalists view as Young (1992), (1995); Kim and Lau (1994); Krugman (1994); Bosworth and Collins (1999), who have argued that growth was mainly input-driven growth. Examples include studies by Mankiw, Romer, and Weil (1992) all find that the accumulation of physical capital has a large impact on economic success in absence of externalities. Easterly and Levine (1999) , Bandiera et al (2000), Todaro (2000), and Gaofeng Han et al. (2002) argued that capital accumulation plays a pivotal role in underlying economic growth. According to earlier studies, the long run growth has no correlation with capital productivity growth.

V. METHODOLOGY AND ESTIMATION PROCIDURE

The starting point for the capital productivity analysis follows the model developed by Elsadig (2009). The general idea behind this approach is to combine the estimation of production function to obtain the parameters of the explanatory variables in the first step and bagging these parameters in the model of growth accounting to calculate the productivity indictors in a second step. In this regard, an attempt is made to introduce FDI inflows per unit of capital, labour force per unit of capital, human capital deepening, absorptive capacity per unit of capital, telecommunications investment per unit of capital, and TFP per unit of capital of being able to achieve capital productivity contribution in selected Asia-Pacific countries. The regression function that used up by the production process within the economies represented as follows:-

$$GDP = AK^{\alpha} L^{\beta} FDI^{\lambda} HC^{\theta} AC^{\delta} TELINT^{\gamma}$$

Where, GDP is annual real gross domestic product, K is real fixed capital formation, L is number of employment, FDI is Foreign Direct Investment inflows, HC is human capital, AC is absorptive capacity, TELINT is telecommunications investment, and A is proxies for spillover effects (TFP). The index i represents for Country i = 1, 2…11 in Year t =1970-2012. In order to estimate the statistical

analysis of the series, this model have been developed into the parametric model and 1st difference for Country i = 1, 2…11 in Year t =1970-2012 as:-

$$\Delta \ln GDP_{i,t} = \ln A + \alpha \Delta Ln K_{i,t} + \beta \Delta Ln L_{i,t} + \lambda \Delta Ln FDI_{i,t} + \theta \Delta Ln HC_{i,t} + \delta \Delta Ln AC_{i,t} + \gamma \Delta Ln TELINT_{i,t} + u_{i,t}$$

$$i = 1, 2 \ldots 11$$
$$t = 1, 2 \ldots 43$$

Where, the parameters of the data as α, β, λ, θ, δ, and γ stands for the output elasticity with respect to physical capital, total labour forces, foreign direct investment (FDI) inflows, human capital, absorptive capacity, and telecommunications investment respectively. The Δ stands for differences in the model; the ln represents the log transformation of the variables, and A is the proxies for the TFP as a technological progress of these economies. Following Elsadig (2009), this model divided each term of equation by capital input to investigate capital productivity contribution as follows:

$$\Delta \ln (GDP/c)_{i,t} = \ln A + \alpha \Delta Ln (L/c)_{i,t} + \beta \Delta Ln (FDI/c)_{i,t} + \lambda \Delta Ln (HC/c)_{i,t} + \theta \Delta Ln (AC/c)_{i,t} + \delta \Delta Ln (TELINT/c)_{i,t} + \gamma \Delta Ln(TFP/c)_{i,t} + u_{i,t}$$

$$i = 1, 2 \ldots 11$$
$$t = 1, 2 \ldots 43$$

According to Dollar and Sokoloff, (1990) and Elsadig (2006), the output elasticity considered with respect to labour force per unit of capital, FDI inflows per unit of capital, human capital deepening, absorptive capacity per unit of capital, and telecommunications investment per unit of capital. The second step also follows the Elsadig (2009) which calculates the TFP intensity and the contribution indicators of the Equation.

$$\Delta \ln (TFP/c)_{i,t} = \Delta \ln (GDP/c)_{i,t} - [\alpha \Delta \ln (L/c)_{it} + \beta \Delta \ln (FDI/c)_{i,t} + \lambda \Delta \ln (HC/c)_{i,t} + \theta \Delta \ln (AC/c)_{i,t} + \delta \Delta \ln (Telint/c)_{i,t}]$$

$$i = 1, 2 \ldots 11$$
$$t = 1, 2 \ldots 43$$

The analysis has been made based on the divisia index approach that is desirable for both traditional economic indices and TFP growth indices. In other words, it is defined as a weighted average of relative growth rate of the production function. Hence the TFP growth of the selected economy is computed as the difference between the growth rate of aggregate output per unit of capital and weighted average of the growth in the labour force per unit of capital, FDI per unit of capital, human capital deepening, absorptive capacity per unit of capital, and telecommunication investment per unit of capital where the weights are the respective shares of each input in the economy's output per unit of capital.

VI. DATA SOURCES

Annual time series data over the period 1970-2012 for Gross Domestic Product (GDP), number of labour force, gross fixed capital formation, FDI inflows, human capital (the expenditure education), absorptive capacity (FDI*HC) and telecommunications investment are obtained from the World Development indicators (WDI), international financial statistics of International Monetary Fund yearbook, the International Labour Organization, the International Telecommunications Union (ITU) database, the UNCTAD (United Nations Conference on Trade and Development) database were employed in this study.

RESULT AND DISCUSSION

The Least Squares (NLS and ARMA) method has been applied to measure the shift in the production functions of the selected countries economic growth. With the Augmented Dickey-Fuller unit root test, it can be inference that the results not verify the validity of the null hypothesis that data series has a unit root in the level. By looking at the Johansen cointegration relation, it indicates the existence of at least three cointegrating vectors trace test for India, at least two cointegrating vectors for New Zealand, Japan, China, Indonesia, and Malaysia. Moreover, findings from hypothesis tests on the Cointegrating Vector indicate at least one cointegrating vectors for Philippines, Thailand, Korea, and Australia. The results on the Max-Eigen tests indicate at least three cointegrating equations for Japan, at least two cointegrating vectors for China, and at least one cointegrating vectors for India, Philippines, and New Zealand. The findings of this model support the long-run relationship within the variables.

According to the results obtained from the estimated coefficients effects at 1 percent, 5 percent, and 10 percent significant levels, the foreign direct investment inflows per unit of capital (FDI/c), which turn out to be negative effect on capital productivity in the regressions of China and Australian economy. Moreover, the coefficient effect of the FDI inflows per unit of capital provides positive relationships with capital productivity of the Malaysia, Indonesia, Singapore, Thailand, Philippines, India, Japan, South Korea, and New Zealand. The coefficient effect of labour force per unit of capital (l/c) describes statistically significant associations to capital productivity of the Philippines, South Korea, Japan, and Australia. In this point, it is found to be statistically insignificant relationships with capital productivity of the Malaysia, Thailand, Indonesia, Singapore, China, India, and New Zealand.

Further, the coefficient effect of human capital deepening (HC/c) implies positive relationships with capital productivity of the Malaysia, Indonesia, Thailand, Philippines, Japan, South Korea, and New Zealand. In the case of absorptive capacity per unit of capital (AC/c), its coefficient effect confirms negatively related to capital productivity of the china and Indian production function. In this regard, it confirmed positive relationships with capital productivity of the rest countries among the group economies. Finally, data analysis on the estimated coefficient effect of the telecommunications investment per unit of capital (Telint/c) on capital productivity proves the positive relationships with the Japan's and South Korean's production function. By considering this coefficient effect, it can be found that it has negative relationships with Malaysia,

GDP/C	FDI/C	LAB/C	HC/C	AC/C	Telint/C	TFP/C
-0.04	0.01	-0.05	-0.04	0.01	0.07	-0.02
-0. 094	-0.15	-0.01	0.03	-0.09	0.006	0.11
0.001	0.053	-0.001	0.018	0.004	-0.005	-0.067
-0.055	-0.003	-0.005	0.003	0.005	-0.006	-0.049
0.046	0.016	-0.003	0.011	-0.002	-0.002	0.023
0.164	0.058	-0.001	0.009	-0.002	0.109	-0.009
-0.016	-0.062	0.005	0.016	0.001	-0.011	0.035
0.033	0.016	0.004	0.013	-0.005	-0.038	0.043
0.033	0.0175	-0.025	0.024	-0.007	0.057	-0.033
-0.064	0.009	-0.035	-0.001	-0.005	0.003	-0.038
-0.087	-0.043	-0.014	0.024	-0.001	0.012	-0.065

Figures Showing in Percentage Variables.
Country's Name: Malaysia, Indonesia, Singapore, Philippines, Thailand, China, Japan, Korea, India, Australia, and New Zealand respectively.

Table 1: Productivity Indicators of Selected Asia Pacific Countries; 1970- 2012

Indonesia, Philippines, Thailand, Singapore, China, India, Australia, and New Zealand economies. According to summary statistics, the output has shown that the coefficient value of adjusted (R2) of the Malaysia, Indonesia, Australia, and New Zealand are 0.828, 0.976, 0.901, and 0.860 respectively. In this regard, the analysis demonstrates 83 percentage point of the Malaysian capital productivity change can be explained by shift in explanatory variables of the model including FDI inflows per unit of capital, total labour inputs per unit of capital, human capital deepening, absorptive capacity per unit of capital, telecommunications investment per unit of capital jointly. Moreover, 97 percentage point of the change in Indonesian capital productivity can be attributed by simultaneous shift in used independent variables. Further, 90 and 86 percentage point of the variance of the GDP per unit of capital Australia, and New Zealand ascribed to explanatory variables that have been applied in the model. According to Durbin-Watson values of the selected group of countries, it can be found that the model excepted for China, and Philippines have no problem of serial correlation in the residuals.

TFP PER CAPITAL CONTRIBUTION ANALYSIS

The highest contribution of capital productivity (GDP/c) to the average annual productivity growth between selected countries (excepted Japan and Korea) has recorded for the Indonesian economy. It reflected that the period of 1970-2012 was found to be investment-driven policies with particular attention on the human capital deepening and telecommunications investment per unit of capital variables. In addition, the highest contribution of the FDI inflows per unit of capital (FDI/c) to the average annual productivity growth through TFP intensity was found to be in China. This implies that the increase in the quantity of FDI inflows per unit of capital can be attributed by input driven policies. Moreover, the highest contribution of the labour intensity (l/c) in this model was the contribution of the Japan and Korea economies. The highest contribution capital productivity to the average annual productivity growth by including human capital deepening (excluding Japan and Korea) was the contribution of the Indian's and New Zealand's economies together. As a result, it has increasingly quantity of this factor to TFP by input driven productivity growth and has no improvement in the quality new skills human capital used for technological driven economies. Furthermore, the highest contribution of absorptive capacity per unit of capital to capital productivity in terms of average annual growth was found to be in Malaysia. By looking at the result, it is clear that how the quantity of this input term contributed the TFP intensity by input driven productivity channel.

Finally, the highest contribution of telecommunications investment per unit of capital to capital productivity in terms of average annual productivity growth of these eleven selected economies was seen in China among others. It also indicates the increase in quantity of the telecommunications investment variable to achieving sustainable economic growth in a knowledge-based economy. As a result, the low and negative

contribution of TFP per capital growth can be explained in the models by economic recession of 1973 and1985; the financial crisis of 1997; the quality of human capital applied, and the technology used in their production function (Elsadig 2012).

CONCLUSION

Foreign direct investment (FDI) plays as the most important channel for technology transfer in the host countries. The empirical work in this paper analyses the real GDP per unit of capital in the intensive growth model to realize the contribution of TFP per unit of capital (TFP intensity) to the economic growth of the selected Asian-Pacific countries over the entire period of 1970-2012. In this regard, capital productivity determined by FDI inflows per capital, Labour force per unit of capital, human capital intensity, absorptive capacity per of capital, and telecommunications investment per capital. In the first step, a positive relationship between FDI inflows per unit of capital and human capital intensity (absorptive capacity) was seen, those tested to know the level of the spillover effects on capital productivity. Whereas, the influence of the labour force per unit of capital and telecommunications investment per unit of capital on the group Asia Pacific's economic growth in terms of capital productivity was found to be positive.

Moreover, this paper showed that human capital intensity provides the potential effects of FDI inflows to enhance the capital productivity as an input driven economy. Meanwhile, the contribution of human capital intensity offers the strongest evidence in influencing capital productivity. In addition the MNEs have played a major role in bringing economic development to selected countries.

However, this paper contributes to available literature by applying the modified intensive growth model which is providing statistical measures to show its reliability by calculating the capital productivity indicators. Meanwhile, based on TFP per unit of capital, the selected Asian Pacific economic growth (excepted Japan and South Korea) considered being input driven and highly dependent on FDI inflow per capital, labour force per capital, and human capital intensity.

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