

*Full Length Research Paper*

## Accumulation of human capital and foreign direct investment (FDI) inflows in ASEAN-3 countries (Malaysia, Thailand, Indonesia)

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The event of globalization and the increasing inflows of foreign direct investment (FDI) to developing countries create a potential for technology transfers and spillovers which suggest a potential for future growth of human capital, and output. There is a noticeable lack of empirical findings in the literature on the impact of FDI on the accumulation of human capital in developing countries. In this paper, we investigate the relationship between accumulation of human capital and FDI inflows for three ASEAN countries (Malaysia, Thailand and Indonesia) during period 1985 to 2005. We use a new human capital indicator and an econometric method which is based on a panel dynamic method [System generalized method of moments (GMM)], the empirical finding shows FDI inflows has a positive and statistically significant impact on accumulation of human capital in Malaysia, Thailand and Indonesia.

**Key words:** Foreign direct investment (FDI), Human Capital, dynamic panel data.

### INTRODUCTION

This research attempts to contribute to literature on growth and development by investigating the effects of foreign direct investment (FDI), on the accumulation of human capital, in developing countries. Our interest in this topic is based on the following events: First, the literature tells us that there has been a surge in FDI inflows to developing countries in recent decades, this phenomenon began in the early 1980's due to the impact of debt crisis of the 1970's, and the subsequent reduction in official and other private capital inflows into developing countries. These events were followed by the easing of restrictions on the operations of transnational corporation, and the increase in the free market operations of the global economies (Globalization). Thus for developing countries, FDI became an important source of funding. Second, empirical evidence suggests that FDI may be the leading conduit by which technological advancements are made in developing countries. A threshold level of human capital is required for technological transfers and

spillovers from FDI activities to take place. However, there is evidence in the literature which suggests that most developing countries have reached or are close to the threshold level, but evidence on spillovers is inconclusive (Aitken et al., 1997; Blomstrom et al., 1999; Slaughter, 2002).

Third, there is evidence in the literature which suggest that human capital plays an important part in the growth and development of lesser developed countries. Even though there is disagreement in the empirical findings as to the exact relationship between human capital, and economic growth, there is still an abundance of evidence which suggest some positive impact between these variables. Finally, it has been suggested that FDI and human capital levels may have a dynamic non-linear connection whereby the type and level of human capital dictates the type of FDI inflows. Subsequently, FDI inflows will lead to technological advancements and growth which in turn spurs human capital accumulation.

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There is a noticeable lack of empirical findings in the literature on the impact of FDI on the accumulation of human capital in developing countries. The event of globalization and the increasing inflows of FDI to developing countries create a potential for technology transfers and spillovers which suggest a potential for future growth of human capital and output. In fact, Monge-Naranjo (2002) suggest that we should look for the effects of FDI on the host economy in their implications for human capital of future workers, and not the productivity of contemporaneous local firms. This paper contributes to literature on human capital, FDI and economic growth by examining the impact of FDI on the accumulation of human capital in developing countries

### FDI inflows to developing countries

Global FDI inflows soared in 2006 to reach \$1,306 billion – a growth of 38%. This marked the third consecutive year of growth, and approached the record level of \$1,411 billion reached in 2000 (WIR, 2007). It reflected strong economic performance in many parts of the world. Inflows increased in all three groups of economies: developed countries, developing countries and the transition economies of South-East Europe and the Commonwealth of Independent States (CIS). FDI inflows to South, East and South-East Asia maintained their upward trend in 2006, rising with about 19% to reach a new high of \$200 billion. At the sub-regional level, South and South-East Asia saw a sustained increase in flows, while their growth in East Asia was slower. However, FDI in the latter sub-region is shifting towards more knowledge intensive and high value-added activities.

China and Hong Kong (China) retained their positions as the largest FDI recipients in the region, followed by Singapore and India. Inflows to China fell in 2006 for the first time in seven years. The modest decline (by 4% to \$69 billion) was due mainly to reduced investments in financial services. Hong Kong (China) attracted \$43 billion in FDI, Singapore \$24 billion (a new high), and India \$17 billion (an amount equivalent to the combined inflows to that country of the preceding three years), (WIR, 2007).

### REVIEW OF LITERATURE

The possibility that FDI may have an impact on the accumulation of human capital has been suggested by some authors. However in analyzing the various avenues given in the literature by which FDI may have a positive effect on the accumulation of human capital in developing countries, we used a demand and supply framework (Slaughter, 2002; Te Velde 2003). On the demand side, the literature suggests three channels by which FDI may positively affect the accumulation of human capital. They

are technology transfer, spillovers and physical capital investment (Slaughter, 2002). On the supply side, the process is less well known and documented but FDI can affect human capital development via its effect on general education, and official and informal on-the-job training, (Slaughter, 2002).

Slaughter (2002) argues that the transfer of technology from MNEs to host country affiliates both the demand for more skilled within the host firms. He argues that the evidence of technology transfer leading to skill upgrading can be deduced from examining three indicators. The first is wage increases in host affiliates. The implication is that technology transfers will lead to the increase in the demand for skilled labor which in turn will increase the wage rate for skilled labor. Slaughter (2002) estimated the effect of MNEs on skill upgrading by regressing the wage-bill shares on MNEs' presence in various host affiliate firms. He used a country-industry-year panel data set consisting of 951 observations and found a positive relation between the wage-bill shares and the presence of MNEs in host firms in developing countries. Te Velde (2003) studied individual wages in the manufacturing industry in five African countries in the early 1990's. He found that on average foreign ownership is associated with a 20 to 40% increase in individual wages conditioned on age, tenure and education. However, this is halved to 8 to 23%, if taken into account the fact that foreign owned firms are larger and locate in high wage sectors. Aitken et al. 1997; Aitken and Harrison 1999) also finds that establishments owned by MNE's in Mexico and Venezuela pay higher wages than do domestically owned firms.

The second indicator which shows that technology is transferred to host affiliates, (which ultimately leads to an increase in the demand for skilled labor) is the increase in research and development (R&D). Slaughter (2002) contends that in 1982, host affiliates of US owned companies performed 6.4% of worldwide R&D; by 1994 that share rose to 11.5%. If one role of R&D is to facilitate technology transfer, then this rising share suggests rising technology transfer (Slaughter, 2002). The third indicator which shows that technology is transferred to host affiliates (which ultimately leads to an increase in the demand for skilled labor) is labor-demand mix of host affiliates. Slaughter (2002) contends that US owned host affiliates in developing countries have seen an increase in the employment of skilled labor while at the same time the share of less skilled labor has fallen. Slaughter (2002) report that there is a rising within-affiliate relative employment of more skilled workers in both developed and developing countries. Slaughter (2002) agrees that taken together this evidence on affiliate wage, R&D and skill-mix, is all consistent with the idea that affiliates stimulate demand for more skilled workers thanks to technology transfer.

Galor and Tsiddon (1997) also conclude that technological progress (which we can assume results

from technology transfer) raises the returns to skills, both ability and education. Consequently, this increase in the returns to skills induces an increase in the supply of educated workers. Bartel and Sicherman (1999) find that there is an education premium associated with technological change and that this is as a result of an increase in the demand for the innate ability or other unobservable characteristics of more educated workers. Furthermore, Bartel and Lichtenberg (1987) show that individuals respond positively to changes in the incentives to invest in human capital.

Borensztein et al. (1998) conclude that FDI is a vehicle for the adoption of new technology, and therefore, the training required to prepare the labor force to work with new technologies suggest that, there may also be an effect of FDI on human capital accumulation. Monge-Naranjo (2002) hypothesized that FDI speeds up the accumulation of general human capital. He used an overlapping generation model (OLG) to show that FDI alters the incentives for the accumulation of general human capital by changing the dynamical structure of the economy. Galor and Tsiddon (1997), who also used OLG models, states that the amount of real resources invested in human capital are positively related to the level of technology. Since FDI brings with it technological improvements, we may expect to witness increase investments in human capital as a result of FDI activities. Bils and Klenow (1998) contend that anticipated growth and technology driven growth can induce more schooling by raising the effective rate of return on investments in schooling. It has been suggested in the literature that technology driven growth in developing countries is an expected outcome of FDI activities. Thus we can expect to see an increase in schooling due to the activities of FDI in developing countries. Note too that the assumption is that foreign direct investment activities are a byproduct MNEs activities.

Investment in physical capital which is related to new technology is another link that connects FDI with human capital development (Slaughter 2002). The implication is that new technology will be embodied in new capital goods (Blomstrom, et al., 1999); thus, the demand for skilled labor will increase with the acquisition of new capital goods. Slaughter (2002) gives evidence which suggest that the coincidence of host affiliates capital deepening and the shifting of relative employment towards more skilled workers is consistent with capital skill complementing technology transfer. Borensztein, et al. (1998) point out that the training required to prepare the host affiliates labor force to work with new technology suggest that there may be an effect of FDI on the accumulation of human capital. Borensztein et al. (1998) used panel data in a test of 69 developing countries and found that FDI has a "crowding-in" effect on domestic investment thus facilitating the expansion of domestic firms. FDI actually leads to more domestic investment.

Slaughter (2002) suggest that MNEs lend support to local educational institutions in developing countries and in so doing affect the accumulation of human capital. Willem Te Velde (2002) gives evidence that MNEs offer worker training in developing countries but that this is more likely to occur where the work force is large, and highly educated, and where the MNEs invest in R&D and are export oriented. Slaughter (2002) contends that, in the long run, MNEs can improve the national supply of skilled labor in developing countries indirectly via its effect on the macro economy. He contends that MNEs can supply a steady stream of income which can boost fiscal policy thus providing a way for governments to increase their spending on education. Furthermore, FDI provides capital investment stability which can inhibit brain drain (no evidence has been found on this) and contribute to the general equilibrium incentive of individuals in host countries to acquire skills through education and/or training (Slaughter, 2002).

In conclusion, studies have looked at the effects of FDI and human capital on economic growth and total-factor productivity (TFP). Though the results are mixed, the general consensus is that both FDI and human capital positively affect economic growth and TFP. Some avenues through which FDI affects economic growth are via technology upgrading, and technology spillover. However, authors such as Xu (2000) and Borensztein et al. (1998) argue that even though FDI promotes technology transfer, the higher productivity in the host country only holds when a minimal level of educational attainment is achieved. They refer to this as the threshold level. The reasoning being that some level technical ability is needed in order to promote the new technology. Can FDI itself contribute to increasing this threshold level?

The impact of FDI on the accumulation of human capital in developing countries is scarcely covered the literature. However, the possibility that FDI increases the level of human capital in the recipient country can be deduced from selected works on FDI, human capital and their effects on productivity and economic growth. Much of the literature assumes that FDI is the major avenue for the transfer of technology from the developed to the developing world (Miyamoto, 2003). It is argued in the literature that human capital determines the level, type and efficiency of FDI, while FDI is believed to in turn affect the level of technology and human capital in developing nations. This research attempts to address the empirical deficiency in the empirical literature on FDI and human capital accumulation.

## METHODOLOGY AND EMPIRICAL MODEL

From the analysis of FDI on human capital, we define demand side and supply side effect: on the demand side, the academic literature on multinationals suggests several channels by which inward FDI

stimulates demand for more-skilled workers in host countries. These include technology transfer to host-country affiliates; technology flows—both market-mediated and via spillovers—to host-country firms; and investments in physical capital related to new technologies. On the supply side, the question of how inward FDI influences the development of human capital is much less clear. We distinguish two different modes by which MNEs can facilitate investments in human capital. One is the short-term: firm-level activities by which individual firms interact with host-country labor markets through on-the-job training, support for local educational institutions and the like. The other is long-term: country-level activities by which MNEs collectively contribute to the overall macro environment in which fiscal policy drives education policy. MNEs might directly affect labor supplies, as their transferred knowledge might boost the skills of their employees (and, with spillovers, the skills of domestic employees as well). They might also indirectly affect labor supplies, for example, by influencing the educational infrastructure of host countries in terms of curriculum choices and vocational training.

In this study, we focus on supply side affect for analysis FDI on human capital as a follow: first, MNEs contribute to rising demand and wages for skilled workers, and then in the long-run, they contribute to the general-equilibrium incentive of individuals in host countries to acquire skills through education and/or training. Second, the rise in economic activity from MNE affiliates means a rise in host-country tax revenue (whether taxes are levied on labor, capital, or both). This broadening of host-country tax bases can allow greater government investment in education and training. FDI output and taxes therefore do not automatically imply greater investment in human capital. But FDI output and taxes do free up budget constraints and thereby make possible these greater investments.

The regression equation in this research is motivated by the work done previously on growth. Theory dictates that we incorporate a time dimension in our analysis because FDI is expected to have an effect on the level of human capital of future generations. Hence, our analysis will employ panel estimation in order to take advantage of both the time series and cross-sectional nature of our research. There is not a consensus theoretical framework to guide empirical work on human capital accumulation in developing countries. This empirical investigation is based on the following regression equation:

$$HC_{it} = \alpha FDI_{it-1} + \beta CV_{it} + \lambda_{it} + V_{it} \quad (1)$$

$HC$  represents the human capital variable,  $FDI$  is a measure of the FDI inflows by MNEs into developing countries,  $CV$  is a vector containing other variables that we theorize to have an effect on the accumulation of human capital and  $\eta$  is a common fixed effect term and  $v$  is a white-noise error term.

Several econometric problems may arise from estimating Equation 1:

1) The  $FDI_{it-1}$  is assumed to be endogenous, because causality may run in both directions

– From FDI inflows to human capital and vice versa – these regressors may be correlated with the error term.

2) Time-invariant country characteristics (fixed effects), such as geography and demographics, may be correlated with the explanatory variables. The fixed effects are contained in the error term in Equation 1, which consists of the unobserved country-specific effects  $\eta_{it}$ , and the observation-specific errors,  $v_{it}$ :

$$u_{it} = \eta_{it} + v_{it} \quad (2)$$

To solve problem 1 (and problem 2) one would usually use fixed-effects instrumental variables estimation (two-stage least squares or 2SLS), but the fixed-effects IV estimators are likely to be biased in the way of the OLS estimators. Therefore, we have decided to use the Arellano – Bond (1991) difference system GMM. This makes the endogenous variables pre-determined, and therefore, not correlated with the error term in Equation 1. To cope with problem 2 (fixed effects) the difference system GMM uses first-differences to transform Equation 1. By transforming the regressors by first differencing the fixed country-specific effect is removed, because it does not vary with time.

The system GMM estimator uses the levels equation to obtain a system of two equations: one differenced and one in levels. By adding the second equation additional instruments can be obtained. Thus the variables in levels in the second equation are instrumented with their own first differences. This usually increases efficiency.

## Data

Levine and Renelt (1992) contend that most cross-country growth regressions include fiscal policy indicators in the conditioning set as a way to measure the effects of policy on the variable of interest; so for measuring effect of income on human capital, we use two main variables: 1- GDP, 2- GDP per capita. To measure the government's effect on the variable of interest in this research, we use the education expenditure (% of GNI). Other variables identified by other studies as providing conditions for improvements in human capital development include, fertility rates and the general health system of the country. To capture some of these effects, we use a life expectancy variable. Becker (1962) identifies a number of ways to invest in human capital besides schooling and they include medical care, vitamin consumption. It is hoped that the life expectancy variable will capture some of these effects. Becker (1962) further argued that the information about the economic system has impacts on the development of human capital. While FDI itself may proxy the variable about information on the economic system; a pertinent variable for economic system information may be the degree of openness of the economy. This variable can be found in many studies relating to economic growth, international trade and FDI. Levine and Renelt (1992) conclude that most studies include variables that measure the overall. Our human capital variables are extracted by data on educational enrolment base on what was collected by WDI (2001, 2007); data set on human capital include the following:

- 1) Gross enrollment rate (%), Primary<sup>1</sup>
- 2) Gross enrollment rate (%), Secondary
- 3) Gross enrollment rate (%), Tertiary

<sup>1</sup> The gross enrolment ratio is the number of persons enrolled at a certain education level, divided by the relevant age group. In other words, if 10 children are enrolled in primary education, which lasts from age 6 to age 12, and the total number of persons in the population between age 6 and age 12 is 20, then the gross enrolment ratio is 50%, as the enrolment has ‘% of the relevant age group’. It is important to note that the gross enrolment ratio calculates all persons enrolled in a certain level of education, not only the children which belong to that age class. As a consequence, the gross enrolment ratio may exceed 100%. If we would only include all children enrolled in a certain education level who belong to the relevant age class, we would get the net enrolment ratio.

**Table 1.** Sources and descriptive statistics of data.

Variable	Source	Unit of measurement	Standard deviation	Minimum	Maximum	Obs.
Net FDI inflow	WDI	US\$, Million	2216.062	-	7314.759	63
School enrollment, primary (% gross)	WDI	% Gross	8.968599	86.49443	117.8765	63
School enrollment, secondary (% gross)	WDI	% Gross	14.46675	30.09889	82.76057	63
School enrollment, tertiary	WDI	% Gross	10.36873	5.33569	43.00563	63
Education expenditure	WDI	% of GNI	1.792445	.4851828	6.549918	60
Life expectancy at birth, total	WDI	Years	9.292009	.4970791	73.70195	63
GDP per capita, PPP	WDI	US \$	2271.685	1722.233	9681.23	63
GDP (current US\$)	WDI	US \$	58491.79	28243.1	287216.8	63
Weighted of School enrollment	Calculated*	% Gross	8.586751	34.87428	63.94807	63

\*Weighted school enrollment rate =  $(1 \times \text{primary} + 2 \times \text{secondary} + 3 \times \text{tertiary}) / 6$ .

We use new index that were assigned different weights to capture the greater importance of high level skills for innovation. For this new index (different measures of education enrolment), a simple weighting scheme of 1 for primary, 2 for secondary enrolment and 3 for tertiary enrolment is used as follow:

$$\text{Weighted school enrollment rate} = (1 \times \text{primary} + 2 \times \text{secondary} + 3 \times \text{tertiary}) / 6$$

The new human capital index uses primary school enrolment as the broadest indicator of skills, secondary enrolments as an indicator of workforce skills and tertiary enrolments as an indicator of high level skills (UNCTAD, 2005). The data set cover from 1985 to 2005 for Malaysia, Indonesia and Thailand (Table 1).

## EMPIRICAL RESULTS

The estimates are presented in Table 2 which its columns present different specifications of the Human capital equation. Two types of diagnostic test are used for the empirical models. Arellano and Bond suggest two specification tests to address consistency issue of the GMM estimator. First, the Sargan/Hansen test of over-identifying tests for joint validity of the instruments. The null hypothesis is that the instruments are not correlated with the residuals.

Secondly, the Arellano-Bond tests for autocorrelation: the null hypothesis is that the errors in the first difference regression exhibit no second order correlation. The Arellano-Bond test statistics for autocorrelation do not reject the specification of the error term in all models except for model (1). Secondly, the sargan test statistics indicate that the human capital equation for all specifications is well specified and that the instrument vector is appropriate.

The results suggest that there is significant relationship between human capital and the FDI in all specifications. The education expenditure in specifications 2-3 has a statistically significant positive effect on human capital. In

specifications 2-3 GDP has a statistically significant positive effect on human capital.

The dummy variable for year 1998 (Asian crisis) in all specifications has a statistically significant negative effect on human capital. On the other hand, population and life expectancy are not statistically significant on human capital (specifications 3-4, but specification 4 GDP per capita has statistically significant positive effect on human capital.

## DISCUSSION

HC and FDI are among the key drivers of growth in developed and developing countries. While HC and FDI individually affect growth, they also reinforce each other through complementary effects. In general, enhanced HC increases incoming FDI by making the investment climate attractive for foreign investors. This is achieved through a direct effect of upgraded skill level of the workforce as well as via indirect effects such as improved socio-political stability and health. FDI contributes to HC since MNEs themselves can be active providers of education and training, bringing new skills, information and technology to host developing countries. Ultimately, this complementary effect leads to a virtuous circle of HC and FDI where host countries experience continuous inflow of FDI over time by increasingly attracting higher value-added MNEs while at the same time upgrading the skill contents of preexisting MNEs and domestic enterprises.

Meanwhile, the level of income has a positive and significant effect on the process of human capital development (Freire-Seren, 1999). Many studies agree that economic growth leads to higher rates of human capital accumulation. Bils and Klenow (1998) give strong evidence that technology driven growth leads to higher rates of human capital accumulation. Also, government spending on education has positive impact on human

**Table 2.** The relationship between FDI inflows and accumulation of human capital, system GMM equation.

Dependent variable: log (HC) <sup>†</sup>	(1)	(2)	(3)	(4)
Log( <i>FDI</i> ) <sub><i>t</i></sub>	0.0137962 (0.000)*	0.0096529 (0.012)**	0.0095358 (0.014)**	.0104052 (0.004)*
Log( <i>GDP</i> ) <sub><i>t</i></sub>		0.0190483 (0.010)**	0.0298216 (0.001)*	
Log ( <i>GDP per capita</i> ) <sub><i>t</i></sub>				.0418735 (0.003)*
Log(Life expectancy) <sub><i>t</i></sub>			.0015418 (0.737)	
Log(education expenditure) <sub><i>t</i></sub>		.0301953 (0.000)*	0.0187288 (0.013)**	
Log(Population) <sub><i>t</i></sub>				.0103867 (0.305)
DUM(1998) <sub><i>t</i></sub>	-0.0363747 (0.000)*	-0.0423744 (0.000)*	-0.0423183 (0.000)*	-0.036125 (0.000)*
_Cons	-0.125318 (0.016)**	-0.2533503 (0.000)*	-0.2549324 (0.000)*	-0.3251716 (0.000)*
Number of observation	58	58	58	60
Arellano-Bond test for AR(1), (p value)	0.5897	0.0003	0.018	0.0233
Arellano-Bond test for AR(2), (p value)	0.3704	0.8238	0.609	0.4756
Sargan test of over-identification. (p value)	0.0806	0.238	0.218	0.0927

Notes: All models are estimated using the Arellano and Bond dynamic panel system GMM estimations. Figures in the parentheses are p-value. \* Significant at the 1 percent level, \*\* Significant at the 5 percent level and\*\*\* Significant at the 10 percent level.

capital accumulation such that it shows the role of government in improving the level of human capital.

## Conclusions

The contribution of this paper however has highlighting the important role of FDI on human capital. FDI inflows create a potential for spillovers of knowledge to the local labor force and highlight the role of externalities (for example, technology spillovers and human capital generation) from foreign-induced investment to domestic economic performance. The presence of MNEs may however provide a useful demonstration effect, as the demand for skilled labour by these enterprises provides host-country authorities with an early indication of what skills are in demand.

A preliminary conclusion of this research is that FDI

improves the development of human capital, and in this way, it acts as a catalyst for future growth in these selected countries. The policy implications form this analysis is that FDI should be regarded as an important factor in the development programs of developing countries because of its dynamic effect on human capital which in turn promotes social and political development.

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