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An Empirical Investigation on Role of Human Capital on Foreign Direct investment: The Lucas Paradox Revisited

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ABSTRACT

This paper investigates the role of human capital for the difference of FDI inflows between rich and poor countries "Lucas Paradox." We conduct a GMM analysis of 50 developed and developing countries over1980-2005. We have utilized a newly developed index that is the focused on weighted HC stock to examine the effects of HC on FDI inflows. Our main finding is that the existence a higher level of HC in developed countries is one of the explanation for the gap of FDI inflows among developed and developing countries. This finding is in line with the Lucas Paradox.

Introduction

Over the last ten years, globalisation has become a contentious issue. Much of the debate has focused on the role of capital inflows and FDI as an engine for growth but trends of FDI in developed and developing countries are so different. FDI inflows in developed countries in the past two decades are more than developing countries and there is a huge gap between them (share of developed countries in FDI inflow in 2007 is around 70% of total FDI inflow). One of the characteristics of rich industrial economies is the availability of a workforce with a high level of HC. Whether HC has been the key driver of FDI or vice-versa is still a matter of debate. On the other hand, the composition of FDI has changed. The majority of FDI now goes into services rather than manufacturing and natural resource productions. Recently, this change of composition has been accompanied by a change in purpose. As a result, FDI is now more likely to finance a large initial surge in capital goods imports, bringing advanced technology, know-how and organisational techniques. HC is now one of the essential factors to attract FDI in this change from low-tech to high-tech sectors. As we know, the HC level in developed countries is more than developing countries. Therefore, perhaps one of the main problems for attracting FDI in developing countries is the low level in HC.

How do host developing countries attract FDI? Previous studies (Lall, 1997; Dunning, 2002; Donges, 2005; Dunning and Lundon, 2008) indicate the importance of an attractive investment climate and sound policy environment in order for host developing countries to successfully attract FDI. Investment climate includes availability/quality of factors of production, market size/access, logistic costs and numerous socio-political environments conducive for doing business with minimal risk. Past experiences of countries that have successfully attracted FDI indicate that many of these factors were indispensable. Among these, the level of HC has been a crucial factor that MNEs, especially the high value-added MNEs, were seeking when determining the new location of operation. This has recently become even more crucial as the mode of MNEs production is becoming relatively skill-based with an increasing number of high-technology manufacturing and services MNEs seeking labour force equipped with knowledge in engineering, technology, organisational skills and business administration.

Under standard neoclassical assumptions (where output is produced by capital and labour), capital is predicted to flow from wealthy to poor countries until capital–labour ratios equalise across countries. The observed pattern of FDI, with most capital flowing from one wealthy country to another country, is thus an apparent paradox. Lucas (1990) argues that differences in HC could explain this paradoxical pattern. Recently, there has been renewed interest in the idea that HC might play a role in encouraging foreign investment. To the extent that physical capital and skills are complementary inputs, the presence of a healthy and more highly educated workforce can increase the productivity of capital. This is driven in part by economic activity shifting first from the primary goods to manufacturing sectors and then toward services, which are successively more knowledge intensive. For example, in the early 1970s, the services sector accounted for only 25% of the world FDI stock. By 2002, the services sector had risen to about 60% of the total stock (UNCTAD, 2004).

According to the "Lucas-Paradox", it is therefore important to explore the relationship between FDI and HC due to the following reasons. Firstly, the literature (UNCTAD, 2006) tells us that there has been a surge in FDI inflows to developing countries in recent decades. These phenomena began in the early 1980s due in part to the 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

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global economies (globalisation). Thus, for developing countries, FDI became an important source of financing.

Secondly, empirical evidence suggests that FDI may be the leading conduit by which technological advancements are made in developing countries. A threshold level of HC is required for technological transfers and spillovers from FDI activities to take place (Tamura, 2002; Liu, 2008; Mastromarco and Ghosh, 2009). However, there is evidence in the literature (UNESCO, 2002) which suggests that most developing countries have reached or are close to the threshold level but evidence on spillovers is inconclusive.

Thirdly, there is evidence in the literature which suggests that HC plays an important part in the growth and development of lesser developed countries (Welch, 1975; Barro, 1991; Barro, 1998; Mastromarco and Ghosh, 2009). Even though there is disagreement in the empirical findings as to the exact relationship between HC and economic growth, there is still an abundance of evidence which suggests some positive impact between these variables.

Fourthly, 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 (World Bank, 1999; UNESCO, 2003; OECD, 2003). On the other hand, 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.

Finally, it has been suggested (Krueger & Lindahl, 2001; Tamura, 2002; Miyamoto, 2003; Sianesi and Van Reenen, 2003; Kugler, 2006; Branstetter, 2006; Todo, 2006; López-Bazo and Moreno, 2008; Mastromarco and Ghosh, 2009). That FDI and HC levels may have a dynamic connection where by the type and level of HC dictates the type of FDI inflow. Subsequently, FDI inflows will lead to technological advances and growth which in turn spurs HC accumulation.

This study will therefore, made an attempt to contribute to the literature on HC and FDI by examining the impact and relationship of HC on FDI and to explore whether HC has been one of the key drivers for FDI inflow to developed countries. Another issue which will be address in this study is whether one of the problems for developing countries to attract FDI is because of the lower level of HC and whether that can explain the difference between FDI inflows in developed and developing countries.

Sectoral trends of FDI inflows

Over the past 25 years, FDI has increased significantly in absolute terms in all three major sectors: primary, manufacturing and services. However, the shares of the primary and manufacturing sectors in the global inward FDI stock have declined. In 2005, FDI stock in the primary sector accounted for less than one tenth of total world inward FDI stock which was only slightly lower than its share in 1990. The manufacturing accounted for slightly less than a third of total FDI stock (30%), which noticeable is drop from its share of 41% in 1990). Services represented nearly two thirds of the global FDI stock (61%) in 2005; up from 49% in 1990. FDI flow data for recent years suggest that the share of the primary sector is partly recovering and could eventually reach its 1990 level; possibly even surpassing it if current trends continue. This sector accounted for 12% of world FDI inflows between 2003-2005, compared to 7% between 1989-1991. Data on cross-border M&As confirm the growing importance of the services sector. This sector's share in worldwide cross-border M&As rose from 37% between 1987-1990 to 58% between 2002-2006. The primary sector was halved, from 11% to 5% between 1987-1990 and 1996-2000, but it recovered to 11% in 2002-2006. The share of the manufacturing sector fell from 52% of global cross-border M&As between 1987-1990 to 31% between 2002- 2006 (UNCTAD, 2007). Regard to sectoral distribution in recent years, FDI rose in almost all sectors in all the groups of economies. While FDI in the services sector increased in all regions, the largest increase was occurred in manufacturing in developing and developed economies. On the other hand, the transition economies FDI in the manufacturing sector fell but increased significantly in the primary sector (Table 1).

Consequently the composition of FDI has changed. The majority of FDI now goes into services rather than manufacturing and natural resource productions. This change of composition has been accompanied by a change in purpose. As a result, FDI is now more likely to finance a large initial surge in capital goods imports; bringing advanced technology, know-how and organisational techniques. It is noted HC is one of that the essential factors of attracting FDI in this change from low-tech to high-tech sectors. Therefore, policy makers try to create an attractive environment for FDI inflows in high- tech.

Trends in human capital formation

The level of HC in developing countries has on average improved over the past three decades. However, HC index in these countries is lower than that of developed countries and the average world (Fig 1). Trends in HC are reflected in numerous educational indicators including adult literacy and educational attainment of the adult working age population. While the education level of the working age population provides a picture of the current state of HC, focusing on the present state of education among students and training activities among enterprise workers sheds light on the future prospects of human capital. To this end, the current state of education and training is also described.

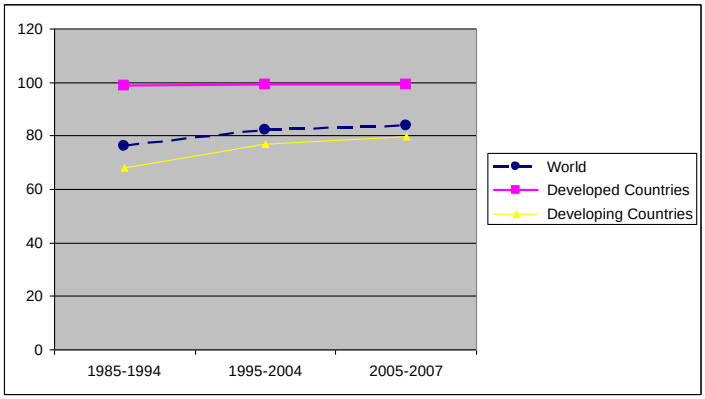

Fig.1. Percentage of adult literacy rate in developed, developing countries and the world

Literature Review

The hypothesis that HC in host countries is a determinant of foreign investment has been embodied in the theoretical literature. For example, Lucas (1990) conjectures that a lack of HC discourages foreign investment in less-developed countries. Zhang and Markusen (1999) present a model where the

availability of skilled labour in the host country is a direct requirement of MNEs and affects the volume of FDI inflows. Dunning (1988) maintains that the skill and education level of labour can influence both the volume of FDI inflows and the activities that MNEs undertake in a country.

There have been only few cross-country analyses conducted in order to identify the determinants of inward FDI in developing countries. Perhaps the reason for this lack of studies comes from the difficulty in constructing quality explanatory variables, especially for the indicator of HC. This becomes even harder when one tries to gather consistent cross-country variables. The literature on cross-country analyses can be divided into two groups. The first uses datasets that cover the period between the 1960s and 1980s while the second is based on datasets between the 1980s and mid-1990s. All studies adopt cross-section and time-series analysis covering different sets of developing countries.

The first group includes Root and Ahmed (1979), Schneider and Frey (1985), Hanson (1996) and Narula (1996). Root and Ahmed (1979) show that, among the 58 developing countries, none of their proxies for HC (literacy, school enrolment and the availability of technical and professional workers) are statistically significant determinants of inward FDI. Schneider and Frey(1985), in a cross-section of 54 developing countries for the years 1976, 1979 and 1980, discover the share of an age group with secondary education to be a less significant determinant as compared with other economic and political influences. Hanson, using a sample of 105 developing countries, shows that the adult literacy rate was not an important determinant of FDI as compared with other socio-political variables.

Narula (1996) investigates the determinants of the stock of inward investment in pooled regressions of 22 developing countries for four time periods, namely 1975, 1979, 1984 and 1988. He discovers that, while the coefficient of the proxy for technological capability is highly significant but has the wrong (negative) sign, the coefficient of the proxy for HC is positive but insignificant. Narula shows that country-level economic structure provides a better explanation for the extent of inward direct investment activity for developing countries. These results contrast with those obtained for 18 industrialised countries, where technological capability and human skills are highly significant and correctly signed. Narula argues that the inward investment into industrialized countries is increasingly aimed at seeking complementary created assets. The presence of HC plays an increasingly important role as countries move along their development path.

Blomström and Kokko (2003) present indirect evidence related to the issue, focussing on the interactions between FDI and HC. They demonstrate that technology-intensive FDI will flow essentially towards those economies with high educational levels, further contributing to the development of HC in these economies. On the other hand, economies with low levels of initial HC will attract less technology-intensive FDI, and this type of FDI will play a smaller role in the future development of these economies (also see Aitken and Harrison, 1999; and Monge-Naranjo, 2002).

Checchi, De Simone and Faini (2007) examine the role of HC of inward FDI, and use of gross enrolment rate of secondary and tertiary attainment for 67 developing countries and base of data for HC according to Barro and Lee (2000), they discover that, only the population share with secondary school attainment is statistically significant positively correlated with FDI inflow.

Kim and Park (2007) utilise bilateral panel data for 63 developed and developing countries over the period of 1963-1998 and discover that, the population share of foreign-educated students has a positive effect on FDI inflow from the foreign country where the students were educated. This effect is robustly present when we control factors, such as transportation cost, market sizes and growths in FDI-host and source countries, bilateral trades, and dyad-specific idiosyncratic effects.

Suter and Walter (2008) utilise extreme bounds analysis to study empirical regularities between political conditions and average inflows of FDI, portfolio equity and debt across 100 countries from 1984-2003, they use of the average secondary school enrolment rate and average years of schooling in the population over 25 years old as a HC indicators. The results show that human capital is significantly related FDI inflows and portfolio equity inflows across countries.

There are two main groups of cross-country studies related to relationship between HC and FDI inflows. The first group of cross-country studies shows that HC is not necessarily an important input for inward FDI. This view is consistent with the fact that between the period of the 1960s to 1970s when FDI in the developing countries was concentrated on market and resource seeking and/or lower-end manufacturing types and those cheap labour and/or abundant natural resources were more important (Deyo, 1989; Ritchie, 2002; Dunning, 2002). Thus, demand for higher-educated labour appears to be less crucial during this period. The second group of cross-country analyses include Noorbakhsh et al. (2001), UNCTAD (2002) and Nunnenkamp and Spatz (2002) Using a dataset that covers form the 1980s to mid-1990s, Noorbakhsh et al. (2001) find that levels of human capital, defined as accumulated years of secondary and tertiary education, are a significant determinant of FDI inflows, and that the effects became more significant over time.

The major difference in the results comparing the second with the first group of studies, apart from the econometric precision should come from the fact that they have used a more recent dataset that contains relatively more high value-added manufacturing firms. Indeed most MNEs operating in developing countries during the late 1980s and 1990s tend to be efficiency-seeking types and/or subcontracting (Dunning, 2002; Nunnenkamp and Spatz, 2002) and high skilled labour force is expected to be crucial. UNCTAD also discovers a high correlation between HC proxies, tertiary gross enrolment ratio and science and engineering student ratio, and FDI inflows among 140 developed and developing countries (UNCTAD, 2002).

Nunnenkamp and Spatz (2002) have used data from a study by Barro and Lee (2000) on the average years of education of total population aged 15 and above in 28 developing countries and discover that education had become an increasingly important determinant from the mid-1980s to the late 1990s. Thus, cross-country evidence indicates that HC is an important determinant for inward FDI, especially among efficiency-seeking MNEs, while not being an important determinant among market or resource-seeking MNEs. This is consistent with evidence that none of the Southeast Asian countries had institutions for industrial upgrading with skills development before the influx of FDI, at least in the low-end manufacturing sector (Deyo, 1989; Ritchie, 2002). This is also consistent with the experience in the African region, where much of the growth in FDI was in natural resources and market-seeking MNEs that were accompanied by stagnant growth in HC (UNCTAD, 2002).

Does this evidence indicate that countries seeking natural resources and/or market-seeking MNEs do not necessarily need to improve the level of HC, while countries that seek higher value-added MNEs need to have a solid HC base to the extent that increased HC contributes to civil liberties, political stability, health and reduced crime/corruption. All of which are considered to be key determinants of any type of FDI where HC can still be a determinant for any type of FDI. One possible reason why HC has not been a significant determinant among studies (Root and Ahmad, 1979; Schneider and Fery, 1985) using FDI data for the 1960s and 1970s is that other control variables may have captured the effect of improved socio-political stability due to improved HC. Another reason may be that it may take longer time for improved HC to have an impact on improved socio-political stability. Although supported by limited evidence (Noorbakhsh et al., 2001; Checchi, De Simone and Fiani, 2007) education at the secondary school level appears to be the minimal level of education that is necessary for attracting relatively high value-added, efficiency seeking FDI. The evidence, however, does not inform us which type of HC, be it level or types of education or firm-based training experience, is most effective in facilitating inward FDI. Some cross-section studies (Sauter and Walter, 2008) use secondary or tertiary level of schooling as a proxy of HC. None of the studies compare different levels or types of HC in order to identify the most effective level/type of HC.

While cross-country analyses provide a general idea of the importance of HC on inward FDI, inconsistencies in the definitions of each explanatory variable are likely to plague their results. In this sense, country-specific studies are likely to reduce this bias. Unfortunately, there are equally less country-specific studies that delve into the role of HC. Broadman and Sun (1997), and Coughlin and Segev (2000) provide evidence for China in the early 1990s, where they show that adult literacy is one of the key determinants for geographic determinants of FDI. Mody et al. (1998) identify the determinants of Japanese MNEs' expected investment in Asia. A variable representing labour quality shows strong impact on expected investment for China, India, Indonesia, Malaysia, Philippines, Thailand and Vietnam. While a limited amount of evidence exists for other Asian countries, to the best knowledge, none exists for the Latin American and African regions. Thus, the experience in limited country case studies is consistent with the importance of HC on inward FDI, while giving no clear picture of the minimal level of HC that is essential nor the level/type of HC that is most effective.

To sum up, the literature on HC and FDI indicates that HC is an important determinant of FDI, especially among efficiency-seeking FDI that requires a skilled workforce as one of its key inputs. Although higher HC does not appear to affect inflows of resource/market seeking FDI directly, it can indirectly affect FDI by improving civil liberties, health and crime rates. Basic schooling (until lower-secondary school level) appears to be the minimal level of schooling required for FDI after the mid- 1980s. Given that the tendency of FDI in recent years is towards relatively skill-intensive production and services, and less towards primary and resource-based manufacturing, basic schooling should be the absolute minimum level of education that the developing countries must provide. For countries seeking to attract higher value-added MNEs, it is necessary to upgrade HC way above the basic schooling level. On the other hand MNEs can improve HC in the host countries by providing training, supporting formal education and technology transfers through numerous channels of training spillovers including vertical/horizontal linkages.

Theoretical Framework

To analyses the effects of HC accumulation on growth of output per worker and physical capital, we have examined a model developed in 1992 by N. Gregory Mankiw, David Romer and David N. Weil. Their model is very similar to the Solow Model developed earlier they also postulate that HC is an additional accumulated production factor. According to them, accumulating years of schooling amounts to reinforcing labour, thereby increasing productive efficiency even when technology is constant. However, the returns to the two types of capital are not assumed as constant or increasing. The researchers include HC in the aggregate neo-classical Cobb-Douglas production function. Total output (Y) now depends on three input factors: physical capital (K), labour (L) and human capital (H) where the Harrod-neutral technical progress (A) remains exogenous. The aggregate production function is augmented with human capital (*H*):

$$Y_t = K_t^{\alpha} H_t^{b} (A_t L_t)^{1-\alpha-\beta} \qquad 0<\alpha<1; \qquad 0<\beta<1; \qquad \alpha+\beta<1 \tag{1}$$

This may be expressed in labour-intensive form: $q = \frac{Q}{L}$ so that:

$$\frac{Y_t}{A_t L_t} = \left[\frac{K_t}{A_t L_t}\right]^{\alpha}\left[\frac{H_t}{A_t L_t}\right]^{\beta} \Rightarrow Y_t = k_t^{\alpha} h_t^{\beta} \tag{2}$$

The goal here is to explain the variation in output per worker *q* across countries.

According to labour-intensive form of the production function, this depends on physical capital per worker $k=K/L$ and HC per worker $h=H/L$ both physical capital and HC are treated as growing in the same way that physical capital did in the model. Society devotes a proportion S_h to the provision of education and training. Both categories of capital deprecate over time, and so both grow when gross investment exceeds deprecation. Using the same reasoning as that used to derive the growth rate in ***k*** over time in the Solow-Swan model and again assuming that:

$\frac{\dot{L}t}{Lt} = n \;\&\; \frac{\dot{A}t}{At} = g$ $\dot{kt}$ and $\dot{h}$ can be written as:

$$\dot{kt} = s_K yt - (n+g+\delta_K)kt \tag{3}$$

So that:

Growth of the physical capital stock per unit of effective labour, ***k*****:**

- is an increasing function of physical capital investment, for example, $S_K Y_t$;
- a decreasing function of the depreciation rate;
- a decreasing function of the growth rate of technological progress;
- a decreasing function of the growth rate of the labour force;

$$\dot{h}_t = S_H y_t - (n+g+\delta_H)h_t \tag{4}$$

So that:

Growth of the HC stock per unit of effective labour, *h*:

- is an increasing function of HC investment, for example $S_H Y_t$;

- a decreasing function of the depreciation rate;
- a decreasing function of the growth rate of technological progress;
- a decreasing function of the growth rate of the labour force;

At equilibrium:

$$\dot{kt} = 0 \Rightarrow S_K yt = (n + g + \delta_K)ht \Rightarrow kt = \left[\frac{S_K}{n + g + \delta_K}\right]^{\frac{1}{1-\alpha}} h_t^{\frac{\beta}{1-\alpha}} \quad (5)$$

$$\dot{ht} = 0 \Rightarrow S_H yt = (n + g + \delta_H)kt \Rightarrow ht = \left[\frac{n + g + \delta_H}{S_H}\right]^{\frac{1}{\alpha}} kt^{\frac{1-\beta}{\alpha}} \quad (6)$$

This means that the equilibrium level of k ($\hat{k}$) and h ($\hat{h}$) can be succinctly written as:

$$\hat{k} = \left[\frac{s_K^{1-\beta} s_h^{\beta}}{n + g + \delta}\right]^{\frac{1}{1-\alpha-\beta}} \text{ and } \hat{h} = \left[\frac{s_K^{\alpha} s_H^{1-\alpha}}{n + g + \delta}\right]^{\frac{1}{1-\alpha-\beta}} \text{ if } \delta_K = \delta_H = \delta \quad (7)$$

From the equations that describe $\hat{k}$ and $\hat{h}$, it can be seen that both $\hat{k}$ and $\hat{h}$ increase as n declines, this in turn implies that the new steady state levels of y must also be larger than those at the previous steady state where the labour force increases at a faster rate.

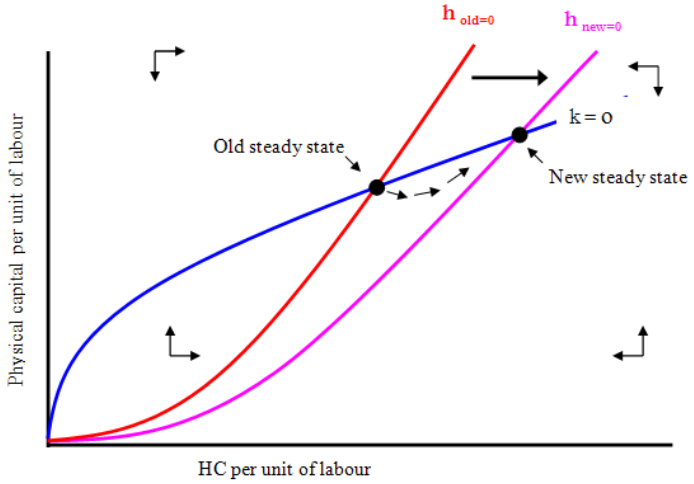

Fig. 2. Steady State Level with Increase in Human Capital

If the economy is endowed with a greater amount of HC, then the level of consumption is initially low and increases toward a given steady-state solution. Such a steady state exhibits a higher amount of physical capital (Fig 2). In our endogenous growth framework, an increase in physical capital may affect the time devoted to education and thus may induce changes in the amount of HC accumulated in the economy. Since the level of human capital affects the value of the marginal productivities, a change in physical capital may move the economy to a different steady state. Indeed, we have found that an increment in physical capital from a given steady-state solution can lead to the following three situations:

(a) The normal case: the level of HC goes up and the economy converges toward another steady state with a higher level of physical capital.

(b) The paradoxical case: the level of HC goes down and the economy converges toward another steady state with a lower level of physical capital.

(c) The exogenous growth case: the level of HC remains constant and the economy converges back toward the initial steady state.

Consequently, when the economy's HC saving rate increases, then the economy will converge to higher steady state levels of physical and HC per unit of effective labour this will then increase output per unit of effective labour.

Methodology And Data

The empirical investigation for this study is based on the following equation:

$$FDI_{it} = \alpha + \beta_1 HC_{it} + \beta_2 CV_{it} + \eta_{it} + \nu_{it} \quad (8)$$

Where the dependent variable *FDI* is a measure of the inflows of FDI by MNEs into developing and developed countries.

HC is a measure of Human Capital; ***CV*** is a vector of control variables, for example, a set of FDI determinants other than HC; η is a common fixed effect term and ν is a white-noise error term. The analysis employs The Generalized Method of Moments (GMM) estimation. Although it would be possible to use a cross-country regression, the chosen method saves a large number of degrees of freedom. This is all the more important when, as in this case, several explanatory variables must be used in order to characterize the multiple determinants of FDI inflows. The analysis in this study uses panels based on six averages in an attempt to reduce the problem of random fluctuations in the data while, at the same time, exploiting the time-series variation in the data. Thus, the equation (8), the subscript *i* refer to countries and the subscript *t* denotes a six-year period.

Several econometric problems may arise from estimating equation (8) as follows:

1) The HC variables in HC_{it} are assumed to be endogenous. Because causality may run in both directions – from HC to FDI inflows and vice versa – these repressors 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 (1.8), which consists of the unobserved country-specific effects η_{it}, and the observation-specific errors, ν_{it}:

$$u_{it} = \eta_{it} + \nu_{it}$$

3) The panel dataset has a short time dimension ($T = 6$) and a larger country dimension ($N = 50$).

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 GMM estimator first proposed by Holtz-Eakin et al. (1988). 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 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. Finally, the Arellano–Bond estimator was designed for small-T large-N panels (problem 3). In large-T panels, shock to the country's fixed effect, which is shown in the error term, will decline with

time. Similarly, the correlation of the lagged dependent variable with the error term will be insignificant (Roodman, 2006).

HC variable is extracted from data based on educational enrolment collected by world development indicators (WDI). The data set on HC include the following:

1) Primary Gross[1] Enrollment Rate (%).
2) Secondary Gross Enrollment Rate (%).
3) Tertiary Gross Enrollment Rate (%).

In order for countries to connect with global networks of FDI inflows and knowledge creation as well as to attract and benefit from high technology from MNEs, a certain basic level of innovative capabilities is needed. However, countries vary greatly in this respect, and in many cases, the gaps between countries have been growing over time. In order to illustrate the current situation, we propose a new index that assigns different weights to different schooling enrollment rate in order 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 follows:

*Weighted School Enrollment Rate = (1*primary +2*secondary+3*tertiary)/6* (9)

The new HC index (WSER)[2] uses primary school enrolment as the broadest indicator of skills, secondary enrolments as an indicator of workforce skills and tertiary enrolments as an indicator that captures high level technical and managerial skills (UNCTAD, 2005). In this new index, higher levels of education are assigned higher weights because they are considered more important for technical and managerial innovation. Index cover for six average years (1980, 1985, 1990, 1995, 2000 and 2005) for 50 developing and developed countries have been used in this study.

Control variables

A large number of variables have been considered in the literature as possible determinants of inward FDI. However, surprisingly few are consistently significant across the broad set of empirical studies that have been performed.

Market Size

The growth of the domestic markets in host countries is typically found to be a major determinant of FDI flows (Root and Ahmed, 1979; Schneider and Frey, 1985; Tsai, 1985; Gastanaga at al. 1998; Knickerbocker, 1973). While the size of local markets should reach a certain threshold in order for local production to be efficient and profitable, continued expansion of FDI requires that market growth prospects be favorable.

The theoretical linkage between real GDP and location advantage is straightforward. A larger market implies that distribution costs will be lower when production and distribution facilities are sited in that market where, presumably, the bulk of a seller customers will be located. As a related point, a clustering of other producers in the large market may create or accentuate agglomeration economies that, in turn, lower costs for all producers in that market. Contributing to the relevant agglomeration economies may be the availability of highly specialised inputs that cannot be found in smaller markets. Therefore, we have use the GDP, the growth rate of GDP and the GDP per capita as current market size and potential market size in order to capture the impact of these variables on FDI with expectation that they have positive impacts on FDI inflows.

Exchange rate

It has been recognised in the literature that exchange rates affect FDI, and that the impact is significant, especially in the short-run. All theoretical studies on the nexus of FDI and exchange rates propose that a devaluation of the FDI host country's currency against that of source country will enhance inflows of FDI, through both the production cost and relative wealth channels (Root and Ahmed, 1979; Dunning, 2002; Blonigen, 2005). However, the existing literature concentrates solely on how exchange rates affect direct investment flows between FDI source and host countries and ignore the impact of devaluation on FDI into other host countries which compete for FDI from the same source.

There is mixed evidence on the impact of depreciation of real exchange rate in the host country on FDI inflows. Foreign investors may gain or lose from a devalued exchange rate. They may gain due to larger buying power in host countries. Also, they can produce more cheaply and therefore export more easily. This may therefore attract resource seeking and efficiency seeking FDI. However, foreign firms may not enter host countries if they believe that depreciation may continue after they enter a country as this would imply costs to be too high in order to justify their investments. We expect devalued exchange rate to encourage inflow of FDI into host countries as this would reduce the Cost of investment to the foreign firms.

Overall Economic Stability

FDI faces variability of basic macroeconomic variables (for example, inflation, budget deficit, balance of payments and current account balance) across countries. Volatility of macroeconomic policy creates both problems and opportunities for international firms, requiring them to manage the risk inherent in volatile countries, how also it presents the opportunity of moving production to lower cost facilities. Theoretical studies on this subject concluded that a positive relationship exists between economic stability and FDI flows (Schneider and Frey, 1985; Zhang and Markusen, 1999). Overall economic stability is measured in this study through budget deficit and current account balance as a ratio of GDP.

The current account balance of the host country is an indicator of the strength of its currency. Where a deterioration current account balance leads to a depreciation of the host country's currency. It is possible that potential multinational investors view current account deficits negatively because such deficits may lead to inflation and exchange rate variations. If this is the case, then an increase in the current account deficit may lead to a reduction in FDI inflows. In contrast, if multinational companies take advantage of the current account

[1] The Gross Enrolment Rate 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 Rate is 50%.as the enrolment as '% 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 Rate may exceed 100%. If we only include all children enrolled in a certain education level who belong to the relevant age class, we would get the Net Enrolment Ratio.

[2] The index which is probably closest to the WSER is the Knowledge Index used by the World Bank. However, while the Knowledge Index encompasses 14 dimensions of knowledge capacities, the WSER focuses on innovation capacity, drawing on a smaller set of variables. The WSER weightings (especially with regard to HC) are also different.

deficits of the host country by negotiating more favorable operative terms, then the current account deficits may increase FDI inflows.

The financial health of the host economy is captured by the ratio of external debts to exports. It is expected that lowering this ratio makes higher is the probability of economic stability higher in the country. Studies have used country credit ratings given by various institutions as an indicator of overall economic stability that includes political and macroeconomic stability. However, there arises the question of subjectivity in these ratings since it is found that the ranking of countries based on these ratings differ across estimates provided by different agencies. To avoid the problem of subjectivity, we prefer to use budget deficit as a ratio of GDP in the host countries as an indicator of overall economic stability. A large and continuous deficit in budget in an economy may reflect higher chances of economic instability in the host country.

Openness of Economy

Developing countries have significantly liberalised their trade regimes. Open economies encourage more confidence and foreign investment since, even in countries characterised by the small size of their domestic markets, MNEs can reap economies of scale and scope. This is further boosted by the increasing participation of developing countries in regional integration schemes. As is common practice, openness is measure in this study by the ratio of total trade to GDP([import + export]/GDP) Haufbauer, et al., (1994), Rotjanapan (2005) have used this ratio as examples of this variable in empirical literature on FDI.

Infrastructure

Another factor that is often cited to explain location decisions by MNEs is the availability of physical infrastructure. Energy is a critical factor of production and a fundamental requirement for the implementation of effective industrial strategies. Dunning (1988), for example, argues that it might be in the foreign investors' interest as part of a global strategy to utilise their firm-specific advantages together with at least some factor inputs, such as cheaper energy sources, in order to minimize costs. Dependable energy availability is a major infrastructure concern for foreign investors (UNCTAD, 1998).

As possible proxy for this aspect, we have used telephone mainlines per 1,000 as a variable that shows infrastructure in host countries. Yet, more variables, such as democracy, risk, cultural variables, the characteristics of legal systems, the extent of urbanization and the degree of corruption can be suggested as possible explanatory variables of FDI. However, this study which does not aim to identify and contrast all possible determinants of FDI but only to assess the importance of HC as one of the determinants, as we believe that the chosen control variable represent the most relevant set of factors that have emerged from previous literature on FDI.

Sources of Data

The dataset includes FDI inflows,[3] HC index and control variables between 1975- 2005 for 50 developed and developing countries. Table 1 provides an overview of all variables used in the equations and data sources.

Table 2. Data description and sources

Variable	Description	Source
PRSCEN	Gross Enrollment Rate (%), (Primary)	WDI (2001,2007)
SECSCEN	Gross Enrollment Rate (%), (Secondary)	WDI (2001,2007)
TERSCEN	Gross Enrollment Rate (%), (Tertiary)	WDI (2001,2007)
WEIGSCEN	Weighted School Enrollment Rate (%),(Three levels)	WDI (2001,2007)
GDP	Gross Domestic Production (current US$)	WDI (2007)
GDPPC	Gross Domestic Production Per capita	WDI (2007)
GROWTH	Economic Growth (%)	WDI (2007)
EXCH	Official Exchange Rate(LCU per U.S.D, Period Average)	WDI (2007)
CURACC	Current Account Balance (% of GDP)	WDI (2007)
INFL	Inflation, Consumer Prices (annual %)	WDI (2007)
TRADE	Trade (% of GDP)	WDI (2007)
TEL	Telephone Mainlines (per 1,000 people)	WDI (2007)
FDI	Foreign Direct Investment, Inflows (Million U.S.D)	UNCTAD (2007)

Empirical Results

According to Lucas (1990) one of the explanations for the lack of capital flows from rich to poor countries is the existence of other factors such as human capital that positively affect the returns to capital but this generally ignored by the conventional neoclassical approach. For example, if human capital positively affects capital's return, less capital tends to flow to countries with lower endowments of human capital. Therefore, this section identifies the role of HC in contribution to Lucas Paradox.

Table 2 and 3 report the results of two step system GMM that investigated whether HC is a significant determinate of FDI inflows to developed and developing countries. The bottom of the tables shows the two specification test results for the GMM estimations. Firstly, the Sargan/Hansen test of over-identifying tests for joint validity of the instruments. Show through the null hypothesis that the instruments are not correlated with the residuals. Secondly, the Arellano-Bond tests for autocorrelation show through the null hypothesis that the errors in the first difference regression exhibit no second order correlation.

In table3 (developed countries) the coefficient of Weighted School Enrollment Rate (WEIGSCEN) is significant at 1% confidence level in models (1) and (4)-(6) and at 5% level in models (2) and (3) also the coefficient of this indicator is more than of 2.1 in all models. On the other hand according to results in table 4 (developing countries) this indicators for developing countries is significant at 5% confidence level in models (2), (3), (6) and at 10% level in models (1) , (4) and (5) also the coefficient of this indicators for developing countries is less than 1 in all models. The results reported in tables 3 and 4 are suggestive that importance of HC in FDI inflows in developed countries is more than of developing countries and in line with Lucas indicated that the existence a higher level of HC in developed countries is one of the explanation for the gap of FDI inflows among developed and developing countries.

On the other hand, Most of the variables reported tables 3 and 4 have the expected signs and are consistent with the literature. FDI is found to be attracted to large market size (GDP, GDP per capita and economic growth), higher

[3] We measure FDI in terms of flows. To the extent that inward and outward FDI have been going on for a long time, recent and relatively large changes in FDI behavior may not be apparent if FDI stock figures are used. That is, changes in stocks on a year-to-year basis will be quite small when they occur against an absolutely large accumulated base value. As a result, it may be difficult to identify the empirical factors affecting FDI stock values given relatively small variations in the FDI stock dependent variable. Moreover, inward and outward FDI behaviors are more comprehensively measured for flows than for stocks.

availability of infrastructure in the economy (telephone main line), openness of economy (trade).

Moreover the results show that macroeconomic stability captured by exchange rate and current account balance and The dummy variable for the year 2000 (as a boom of FDI inflows) are found to be significant on FDI inflows among developed and developing countries.

Conclusion

The results show that differences and a shortage of appropriate human capital is one of main reason to explain a large gap of FDI inflows between developed and developing countries, because the absorption of MNEs' technology may require a certain level of HC accumulation on the recipient side and that many developing countries cannot meet such a threshold and there is a huge HC gap between development and developing countries. Therefore, HC remains the main explanation for the "Lucas paradox" and answer to this question "why doesn't capital flow from rich to poor countries?" so that, there is an evidence for Lucas' explanation that HC is a significant predictor of future FDI inflows. FDI tends towards countries with sophisticated human capital.

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Table 3. Dynamic Panel Data Estimation, Two Step system GMM, Six Year- Average Observations and Weighted School enrollment rate (WEIGSCEN) as HC for Developed Countries

Dependent Variable log(FDI)2						
Model Specification	(1)	(2)	(3)	(4)	(5)	(6)
LWEIGSCEN	2.180297 (0.000)***	2.121348 (0.032)**	2.119086 (0.040)**	2.307583 (0.000)***	2.102867 (0.003)***	2.924173 (0.000)***
LFDI(-1)	0.033944 (0.030)**	0.031489 (0.050)*	0.1025868 (0.052)*	0.0283122 (0.056)*	0.1694255 0.050)*	0.0202954 (0.047)**
LGDP	0.9513397 (0.000)***			0.809667 (0.000)***		1.172057 (0.000)***
LGDPPC		0.1455303 (0.073)*	0.2500552 (0.021)**			
LGROWTH					0.0172072 (0.045)**	
LEXCH		-0.1682226 (0.000)***	-0.1762151 (0.000)***			-0.1210064 (0.000)***
LCURACC					0.2615535 (0.056)**	0.1014637 (0.472)
LINFL		-0.196086 (0.000)***	-0.997615 (0.000)***			-0.571388 (0.000)***
LTRADE	0.9224607 (0.000)***	0.467306 (0.207)			1.164144 (0.000)***	1.598822 (0.000)***
LTEL					0.1106568 (0.821)	0.3036654 (0.053)*
DUM(2000)	2.306705 (0.004)***	1.599748 0.000)***	3.030752 (0.016)**	1.583737 (0.000)***	1.741523 (0.003)***	3.013859 (0.000)***
Constant	-31.07066 (0.000)***	-7.009944 (0.060)*	-3.526859 (0.555)	-24.25354 (0.000)***	-8.084769 (0.048)**	-41.49971 (0.000)***
Observation	115	115	115	115	109	115
AR(1), (p value)	0.0023	0.0033	0.0021	0.0051	0.0093	0.0264
AR(2), (p value)	0.9027	0.9201	0.8018	0.7933	0.5712	0.6903
Sargan test ,(p value)	0.1490	0.0907	0.1403	0.1791	0.8511	0.2088
Number of instruments	15	17	16	14	16	19

Notes: Figures in the parentheses are p-value. * denotes Significant at the 10 percent level, ** denotes Significant at the 5 percent level and*** denotes Significant at the 1 percent level. In terms of Dummy variables, we arrived at the final specification by eliminating all Dummy variables those were not statistically significant in preliminary estimations.

Table 4. Dynamic Panel Data Estimation, Two Step system GMM, Six Year- Average Observations and Weighted School enrollment rate (WEIGSCEN) as HC for Developing Countries

Dependent Variable log(FDI) $_t$						
Model Specification	(1)	(2)	(3)	(4)	(5)	(6)
LWEIGSCEN	0.4355379 (0.060)*	1.017491 (0.031)**	1.016696 (0.034)**	0.359261 (0.083)*	0.7311423 (0.070)*	0.8891397 (0.021)**
LFDI(-1)	0.0361474 (0.082)*	0.0309612 (0.089)*	0.0007147 (0.071)*	0.0472 (0.087)*	0.04769 (0.068)*	0.0235706 (0.009)***
LGDP	1.084428 (0.000)***			0.9277089 (0.000)***		1.200698 (0.000)***
LGDPPC		0.4303394 (0.043)**	0.1905864 (0.305)			
LGROWTH					0.7515731 (0.000)***	
LEXCH		0.0027059 (0.929)	-0.014665 (0.021)**			-0.006757 (0.032)**
LCURACC					0.0325301 (0.801)	0.4288443 0.000)***
LINFL		-0.002114 (0.971)	-0.035259 (0.078)*			-0.0099936 (0.033)**
LTRADE	0.8762018 (0.000)***	0.6256629 (0.025)**			0.4186431 (0.011)**	1.263335 (0.000)***
LTEL					0.4064357 (0.008)***	0.0784508 (0.063)*
DUM(2000)	0.3256283 (0.071)*	1.474974 (0.457)	1.605323 (0.084)*	0.0127467 (0.083)*	1.303378 (0.059)*	2.531345 (0.072)*
Constant	-23.24965 (0.000)***	-0.917914 (0.554)	-0.562999 (0.018)**	-18.78668 (0.000)***	-2.798014 (0.042)**	-25.96309 (0.000)***
Observation	174	174	174	174	154	174
AR(1), (p value)	0.0094	0.0013	0.0041	0.0021	0.0093	0.0061
AR(2), (p value)	0.7419	0.8856	0.8096	0.6192	0.5463	0.4875
Sargan test ,(p value)	0.0953	0.1941	0.1655	0.0911	0.2602	0.1577
Number of instruments	13	15	14	12	16	17

Notes: Figures in the parentheses are p-value. * denotes Significant at the 10 percent level, ** denotes Significant at the 5 percent level and*** denotes Significant at the 1 percent level. In terms of Dummy variables, we arrived at the final specification by eliminating all Dummy variables those were not statistically significant in preliminary estimations.

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Appendix:

Table

List of Selected Countries

Developed countries		**Developing countries**	
Australia	Japan	Argentina	Kenya
Austria	New Zealand	Algeria	Korea
Canada	Norway	Brazil	Kuwait
Denmark	Portugal	Bulgaria	Malaysia
Finland	Spain	Chile	Mexico
France	Sweden	China	Pakistan
Germany	Switzerland	Costa Rica	Philippines
Iceland	The Netherlands	Czech Republic	Poland
Ireland	United Kingdom	Ecuador	Romania
Italy	United States	Egypt	Saudi Arabia
		Honduras	South Africa
		Hong Kong	Thailand
		Hungary	Turkey
		India	UAE
		Indonesia	Uganda

Note: In choosing the respective countries, The World Bank classification of developing and development countries has been used.