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# Foreign Direct Investments - A shortcut to Development and Economic Growth?

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Abstract

Foreign direct investment has grown substantially since the energy crisis during the 1970s, meanwhile countries in the East Asia & Pacific area has experienced growth rates pursuant to established convergence theories. This study examines the effect made by foreign direct investment on economic growth and development through technological spillovers. Data from eight different countries from Asia are investigated in a panel data analysis, four developed and four less developed in order to conclude any significant effect of FDI but also to compare if there is a difference in the effect between developed and transitional countries. The result of this study suggests that there is a positive significant effect on growth in transitioning countries. Therefore, this paper shows that there is a difference between developed and transitional economies regarding the effect of FDIs.

**Keywords: Foreign Direct Investments, Panel data, Economic growth, convergence theory & technological spillovers**

# List of abbreviations

| | |
|---|---|
| FDI | Foreign Direct investment |
| MNE | Multi-National Enterprise |
| HDI | Human Development Index |
| AREAER | Annual Report on Exchange |
| OECD | Organization for Economic Co-operation and Development |
| IMF | International Monetary Fund |
| GDP | Gross Domestic Product |
| OPEC | Organization of the Petroleum Exporting Countries |
| R&D | Research and Development |
| OLS | Ordinary Least Squares |
| MLR | Multiple Linear Regression |

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# 1 Introduction

After the energy crisis 1979, the world economy saw a stagflation. Commercial bank lending became more restricted under the Reagan administration and global capital flows was in a decreasing trend. To compensate for the loss in capital inflows, many developing countries chose the path to liberalize the restrictions regarding investments and capital inflows (Carkovic & Levine 2002). Since the restrictions were lowered, the globalization increased and investment climate became better resulting in an increase in global capital flows. Following the liberalization of restrictions there was a persistent increase in foreign direct investments since early 1980s.

The motive behind foreign direct investments is to achieve lower costs of production of goods or to capture market shares in a foreign market. Furthermore, FDIs are often seen as a channel for technology to spread from developed countries to less developed countries with a significantly lower labor cost (Delmar et al 2011). With a transfer of technology between countries, FDIs have shown to be an important driver in the transitioning process from a less developed country to an industrialized country. There are four channels through which technology can transfer: vertical linkages with suppliers or purchasers in the host country, horizontal linkages with competing or complementary companies, internationalisation of R&D, and migration of skilled labor, where the vertical linkage is the strongest evidence for a positive spill-over effect (OECD 2002).

In order to generate externalities, the technologies imported in a less developed country must be relevant for both the company and also other sectors in the host-country. Furthermore, the technological gap between the companies cannot be too big since the host-country will not be able to utilize the new technology effectively (OECD 2002). In conclusion of the technological impact on a developing economy, a country's economic development is under strong influence of the technological transfer and the challenges of utilizing potential technological transfers lies within the host-country (Alquist 2014).

In addition to the aforementioned possible technological spillovers, human capital levels and spillovers are interrelated with technology transfers (OECD 2002). As previously mentioned, the knowledge gap between the host-country and the MNE cannot be too significant, otherwise the spillovers will be limited as the host country is having difficulties utilizing potential

transfers. An entry of an MNE can never substitute the education level in a country but rather provide training and limited upgrading of the human capital in the host-country. Therefore, FDIs in general can only be seen as a supplement to a general increase of human capital in the host-country. For this to be effective, there has to be two satisfied assumptions. Firstly, the knowledge gap cannot be too significant. Secondly, the labor market must offer access to a satisfying degree of security and social acceptance to employees in order to increase the incentives of the participants in the labor market to achieve a higher level of human capital. The evidence often implies that even if multinational enterprises offer more training than domestic, the spillovers to other sectors of the economy will be comparatively weak. Since technological and educational achievements are complementary, policy makers can buttress these spillovers by implementing policies that simultaneously enhance the labor market flexibility and spur entrepreneurship (OECD 2002). When these assumptions are satisfied and policy makers buttress spillovers, a host-country will attract more FDIs and be able to experience an increase in human capital and development.

In the end, there are clear signs stating that if a country can attract a significant amount of FDIs and are effective in reaping the benefits of spillovers in the aspect of either technological transfers or knowledge transfers, there will most likely be an upsurge in development. After having discussed the possible benefits of attracting significant amounts of FDIs briefly, it is natural to examine the capital flows of FDIs in the Asian area in the next section.

As stated before, globalization together with closed economies implementing policies that are enabling and enhancing international capital flows has been of great importance for the observed increase in FDI-flows in recent years. In 1970, the net inflow of foreign direct investments was worth $10 billion (World Bank 2018a). By 2000, this has turned into $1 461 billion, growing by 145 times in the 30-year range and by 2015 the net inflow of foreign direct investments was $2 398 billion. A graphical overview where the global inflows has been divided into significant regions can be found in appendix A, graph 1. With this significant increase, the trends of where this capital is flowing into and the source of these inflows has changed. There has been clear evidence that leading in FDIs are Hong Kong and mainland China representing 20% of the inflow in Asian FDIs on an average between 2001-2005 (Hattari & Rajan 2008).

Furthermore, (Hattari & Rajan 2008) found that the triad, which consist of Japan, European Union, and United Sates of America, accounted for 40% of the FDI inflows in Asia. Intraregional flows accounted for 35% of the inflows and a vast majority of the remaining 25% was from offshore financial centers. In 1995, the inflows in East Asia and Pacific was $81 billion and has increased to $610 billion by 2015, resulting in an increase of 650%. In addition, the characteristics of the FDI inflows are that the inflows has been upward trending since the early 1970's (World Bank 2018b). There can be observed small deviances due to financial crises that has occurred during the last 45 years, implying that the inflows are very dependent on how the global economy in general is performing. Pertinent to this discussion is that the majority of the recipients have changed from developed countries to transitioning economies or developing economies given the fact that they were recipients of 54% of global FDI inflows (Alquist 2014).

Under those circumstances, it is obvious that FDI, if they can be utilized and generate spillovers in the host economy, is a significant driver of development and economic growth. Therefore, the authors of this paper will study the effects of FDI on the domestic economy of the host-country. Since transitioning economies and developing economies account for the majority of the global FDI inflows, as mentioned in the previous section, it is of interest to study countries that has experienced a rapid growth since the 1980's shows that East Asia and Pacific and South Asia has had a higher gross domestic product (GDP) growth rate than the world and the OECD members (World Bank 2018b). For this reason, this paper focus on the abovementioned regions and determine if inflows of FDIs has had an effect in amplifying the growth rate of GDP. The countries of interest will therefore be divided into two groups where one group consists of countries which has experienced a persistent and high growth since the late 1980s and has a Human Development Index (HDI) of at least 0.9 as of 2015. There are four countries that satisfy these criterions and these are Republic of Korea, Hong Kong Special Administrative Region of the People's Republic of China (for the sake of simplicity, Hong Kong will be referred to as a country in this study), Singapore, and Japan. In opposite to these countries there will be four countries that have not had a growth rate as significant as those mentioned above in the early period leading up to the OPEC crises but have had a high growth rate since the 2000s. These countries were chosen based on the fact that they have a GDP/c less than $10 000 in 2016 and have a Human Development Index of less than 0.8 (Jahan 2016). Those countries were Malaysia, Philippines, Sri Lanka, and Thailand. For future references the richer countries will be referred to as developed countries while the latter group will be referred

to as less developed countries or transitioning economies when discussed jointly. When choosing countries to study, the authors of this paper has widened the span of variables to observe with population and GDP/c, which can be seen in appendix A, table 1. The argument for studying these countries were that they should, if not be similar, at least resemble each other in terms of economic development and geographical attributes as access to water and possibility to build ports, with the prospect to limit the effect of omitted variables of non-economic property that might have had an impact on economic development.

In the discussion of development, trade and FDI are often seen as drivers of economic growth. In the process of determining whether countries are developed or not, it is equally important to analyze variables such as GDP/c, HDI, and also a country's openness in regard to international trade flows and capital flows. In graph 2, appendix A, a graphical representation of each country's trade and capital flows implies there is a positive trend for both groups. However, the trend line for the group of developed countries are steeper, implying that with higher GDP and HDI, a country is increasing both inflows and outflows of FDIs. It is of importance to remember that this conclusion is only in regard to our observations and not a general estimation for all developed countries and similarly there does not exist a perfect ratio of capital and trade flows. With this discussed, the assumption for our observations is that with a higher development, an observation on our graph should be positioned further away from the origin of the graph. A clear sign however shows that the ratio of capital flows should increase in relation to trade flows with a higher GDP and HDI (IMF 2016). A deeper analysis of the tables showing an overview on current and capital restrictions show that the less developed countries have stricter regulation on current and capital restrictions than the developed countries. Therefore, it is intuitive to think of graph 2 as such that the trend line will be steeper with less regulations on current and capital transactions and thus increasing the openness of the country in question.

Further delimitation in this paper considers the time aspect. The authors of the book argues that financial crises, especially OPEC II in 1979, lead to policy changes and liberalization of capital restrictions. The 1970s are characterized of several major changes or shocks in the global economic system. Some examples of major global economic shocks or changes that occurred during the 1971s were the fall of the Bretton Woods System, the oil crisis in 1973 (OPEC I), and the energy crisis in 1979 (OPEC II). Therefore, the data collected and treated will include these events. Despite the fact that years prior to the fall of the Bretton Woods System is of high

importance when analyzing the long-term impact of FDIs, the first significant increase in FDIs can be observed during the end of the 1970s, which can be observed in appendix A, graph 1. This paper will not discuss the impacts of financial crises on FDIs and development but cannot exclude financial crises altogether neither due to the major policy changes and new legislation affecting capital transfers following the previously mentioned financial crises and their effects on economic flows, especially FDIs inflows, which this paper aims to study and the effect of FDI inflows. In conclusion, the data analyzed will at earliest include the fall of the Bretton Woods System and include 2016.

## 1.1 Purpose

Asia and the pacific area is developing fast and catching up with the western countries, the economic growth and development occurs in many of the countries but far from all. Some of the Asian countries are more developed and shows great economic growth. The four countries in *the four Asian Tigers* and Japan are examples of nations/states where development and growth exceed the general in Asia (Winkler 2017). Meanwhile countries such as Thailand, Malaysia, Sri Lanka and Philippines with similar conditions have failed to show the same success. Through the theory based on the *Solow's model* the authors of this paper imply that the difference in access to capital is a big factor to why. This study aims to determine the effect caused by FDI's in the host country. By analyzing foreign direct investment inflow in eight different Asian countries and conclude if FDIs and the increasing capital contribute to an effect on economic growth. With these results the authors of this paper intend to conclude if foreign direct investment is crucial to development and economic growth.

With the aforementioned purpose, this paper aims to answer the following questions:

- Do foreign direct investments have any significant effect on economic development and economic growth?
- Does the effect of foreign direct investments differ depending on the wealth of the host country?

# 2 Theoretical background

Neo-classical growth models and endogenous growth models constitute the foundation for empirical studies on FDI and growth. The Solow model is a growth model superseded by the neo-classical framework. The central aspect of neo-classical growth models is the fact that accumulation of total factor productivity (TFP) is the key source to economic growth in the long term (Lui et al 2009)

## 2.1 Solow model

In the Solow model, which is a model derived from the initial Harrod-Domar model, there are four variables present: output ($Y$), capital ($K$), labor ($L$), and technology ($A$), whereas technology can be interpreted as either knowledge or basically the effectiveness of either labor or capital (Romer 2012, pp 10). The initial production function for the Solow model consists of these variables where $A$ and $L$ is augmented due to the fact that these are multiplied with each other in the discussion of inputs (Romer 2012). Therefore, the Hicks-neutral production function is as following:

$$Y = AF(K, L) \tag{2.1}$$

However, as knowledge can enter through labor the function is labor-augmenting. This can be seen in the following equation where A multiplies L:

$$Y = F(K, AL) \tag{2.2}$$

The labor-augmenting production function is convenient in this paper since this implies that the capital-ratio to output is constant and this characteristic has the result of making the analysis simpler (Romer 2012). Albeit it is a convenient production function that explains long-term growth, there are a few assumptions regarding this equation.

### 2.1.1 Assumptions and the technical background of the production function

As stated before, there are certain critical assumptions. These are of importance since the production function is very simplified as it does not consider exogenous factors such as that there is a single good and the model is ignoring legislation and regulations. In addition, rates of saving and depreciation are constant (Romer 2012, pp. 14). One of the more widely used production functions is the Cobb-Douglas production function which is a good approximation to actual production functions and an equally important property is that Cobb-Douglas is easy to analyze and can effectively illustrate the assumptions. The Cobb-Douglas production function is as following:

$$F(K, AL) = K^{\alpha}(AL)^{1-\alpha}; \quad 0 < \alpha < 1 \tag{2.3}$$

There are three general assumptions in the technical properties of the production function. Those are constant returns to scale, marginal product of a factor is positive, and lastly, the law of diminishing marginal productivity (Gottfries 2013, pp. 46) (these assumptions are presented in appendix A under 8.4, mathematical derivations).

Ultimately, the remaining assumptions concern how various stocks of the aforementioned input factors develop over time. Labor and knowledge each grow exponentially and the initial levels are taken as given. Due to the simplicity of the model it can be viewed as $L$'s and $A$'s respective rates of change of the logs are constant and that they equal population growth ($n$) and technological progress ($g$) (Romer 2012, pp. 14). Furthermore, growth output is either consumed or invested and the fraction of output devoted to investment, $s$, is exogenous and constant. Also, the common denominator is that there are no restrictions on $n$, $g$, and depreciation rate ($\delta$).

### 2.1.2 The dynamics

Prior to examining the dynamics of the model, it is important to notice that further derivation of previous equations would finally lead to the fact that $k = K/AL$ where $k$ is described as capital stock per unit of effective labor. The key equation of the Solow model is as following:

$$\dot{k}(t) = \frac{dk(t)}{dt} = sf\big(k(t)\big) - (n + g + \delta)k(t) \tag{2.4}$$

As stated in the section above, $f(k)$ can simply be interpreted as the output per unit of effective labor. If equation (2.4) is assiduously examined, the first term, $sf\big(k(t)\big)$, is a further development which is basically the fraction of that output which is reinvested as this equals investment (Romer 2012, pp.16). Moreover, as depreciation rate has been included in the Solow model, the latter term of equation (2.4) is showing the break-even level of investment where $k$ can be held at a constant level. As the latter term consist of $n + g$, it will not be sufficient to only replace the depreciation of the existing capital stock. As the growth rate of effective labor is equal to the rate of $n + g$, to achieve a steady $k$ capital stock must grow at the same rate.

Another important dynamic of the Solow model is that $k$ converges to the steady state level of capital ($k^*$). Steady state is achieved when the input in $k$ is equal to population growth,

technology progress, and the depreciation rate of capital stock. For this purpose, the model is implying that the economy will converge to a balanced growth path and this conclusion can be translated into the growth rate of output per worker will therefore be solely determined by the rate of technological progress (Romer 2012 pp.18).

### 2.1.3 Central aspects of growth theory and criticism

The Solow model have established that there are two sources of variation in output per worker over time which is either differences in capital ($K/L$) or differences in the effectiveness of labor ($A$) (Romer 2012). The central conclusion is that, due to the convergence property of the model, it is solely possible to achieve a persistent and significant growth in output through technological progress.

The growth rates of all the variables except for $A$ is straightforward to measure. However, the contribution of technological progress to output is often characterized as the Solow residual. The Solow residual will also include all sources of growth other than capital accumulation or increased labor input and can therefore be referred to as TFP in Solow's theory (Romer 2012).

Furthermore, the model does not take into account the limitation of natural resources and land. The weakness of having these limitations absent from the model are that output and a rising output will eventually deplete a fixed amount of resources. The consequence must therefore be that a perpetually rising output must eventually fail (Romer 2012, pp.42). The Cobb-Douglas as shown in equation (2.3) does not take into consideration this limitation and a percentage change in $A$ will always equal to the same percentage change in $Y$, which is a subject to criticism of the model. In order to limit the effect of this limitation on this study, all of the observations in the data set have similar land properties and similar access to natural resources.

Thus, the Solow model is able to explain growth. As technology can be obtained through spillovers of FDIs, the model is suggesting that a country should be able to attain persistent growth through significant inflows of FDIs. However, the model does not explain in depth what the effectiveness of labor is. Furthermore, the growth of the effectiveness of labor is seen as exogenous and the model is taking the variable that is the driving force of growth as given. Basically, it can be summarized as that the model is explaining growth by assuming growth (Romer 2012, pp.29).

Subsequently with this explained, the model does have considerable weaknesses which cannot be neglected. The model is, despite the weaknesses, adequate for the purpose of this paper as it explains persistent growth through technological progress, which is a product of technological spillovers due to FDIs. Therefore, this model constitute a solid foundation for the theoretical explanation of why FDIs is supposed to increase growth persistently in developing- or transitioning economies.

One of the main weaknesses of the Solow model for the purpose of this paper is that it holds technological progress as exogenous. In order to further evaluate the impact of FDIs on growth it is of significance to determine in depth why FDIs boost growth within the framework stated by Solow and further evaluate how $A$ affects growth. $A$ as technological progress is included in the Solow but in order to examine how technological progress behaves, Solow need to be complemented with another model.

## 2.2 The effects of an increase in technological progress

FDIs can further be divided into sub-categories, Green-Field investments and cross-border mergers and acquisitions. Depending on which kind of FDIs the transmission channels for capital and technological spillovers are different. Founding an enterprise and setting-up a production plant is defined as Green-Field investment while purchasing an existing production plant is called a cross-border mergers and acquisition and the sum of these types of investments is known as FDIs (Neuhaus 2006). This distinction is important for the upcoming section.

When a MNE engage in Green-Field investments, they directly employ new technology in the host country. Furthermore, if these production technologies were used in the production of capital goods, they will add substantially to the aggregate physical capital stock. Especially when Green-Field investments aim for increasing the quality and variety of capital goods, these can promote per capita economic growth in the long run (Neuhaus 2006). This channel will be considered as “direct transmission”. On the contrary hand, production plants changing ownership and the shift of management expertise and production know-how can also increase production of new types of capital goods and generate technological development and economic growth. This channel will be referred to as “indirect transmission”. Moreover, since a presence of foreign firms simplifies the process of adopting new technologies for domestic

firms, this will result in a raise of production for domestic firms in the developing country. This channel will be called "second-round transmission" because of the technology diffusion and knowledge spillover effects to domestic firms (Neuhaus 2006).

The argument for not analyzing neoclassical models thoroughly is that they neglect technology-enhancing aspects of FDI by only considering pure capital accumulation which can be summarized as FDI has no long-term effect on economic growth. On the contrary, recent FDI models that include technology spillovers and can describe the long-run effects of FDI on economic growth do so by only considering the second-round transmission channel (Neuhaus 2006). By neglecting first round effects, these models are showing a great weakness in explaining whole effects of FDIs. However, in order to understand where Neuhaus model is derived from, there are some background aspects of each model that has to be analyzed.

### 2.2.1 Background and features of the FDI model

In simple neoclassical models, growth emerges from exogenous technological progress. However, when determining the source of technological progress there are two different factors. First, $A$ is determined by the quality of the factor inputs, capital and labor. Second, $A$ depend on the knowledge of combining both factors in order to maximize efficiency. The endogenous growth model of (Lucas, cited in Neuhaus 2006) is focusing on quality of labor while (Romer, cited in Neuhaus 2006) developed an endogenous growth model of technological change on capital deepening and therefore focuses on the quality of capital. Lastly, the endogenous growth models of (Romer, cited in Neuhaus 2006) and (Lucas, cited in Neuhaus 2006) focused on the overall efficiency of technology and were based on knowledge spillovers (second round). In conclusion, as Solow's growth model showed previously, pure capital accumulation occurs by increasing the quantity of capital goods produce, which is called capital widening. The technological change is drawn from either improvement in quality of capital goods or from the invention of completely new types of capital goods. The last two sources of technological change are called capital deepening (Neuhaus 2006, pp. 48).

The basic idea of capital widening is that physical amount of capital goods employed by production will be increasing. The depreciation of existing capital goods will be replaced by new capital goods of the same quality. Capital widening can therefore be achieved only if the total amount of capital goods (capital stock) has increased despite the depreciation of existing

capital goods (Neuhaus, 2006, pp. 49). Capital deepening however can occur through two methods. Capital deepening due to quality improvements is experienced when technological progress has made it possible to produce an existing capital good with higher quality. In addition, if an existing capital good has depreciated, it will be replaced with a capital good of the same quality unless there is not a capital good of higher quality that has been invented, otherwise it will be replaced by a capital good of higher quality (Neuhaus 2006). When capital deepening occurs through an increase in the variety of capital goods, the basic principle is that completely new capital goods is invented through R&D activities. This is implying that there is not an existing capital good that can perform the same function as the newly invented capital good. As with capital deepening through quality improvements, if an existing capital good would depreciate, it would be replaced by a new capital good of the same type (Neuhaus 2006). As $A$ no longer includes the quality level of the factor inputs, it is renamed to $A^*$ and a rewritten neoclassical production function based on Cobb-Douglas production function can illustrate in equation (2.5) the abovementioned changes where $qK$ and $qL$ are qualities of the input factors:

$$Y = A^*(qK * K)^{\alpha}(qL * L)^{1-\alpha} \tag{2.5}$$

Prior to introducing the FDI model there are a couple of mechanical aspects that have to be clarified. For the model to be able to explain FDI effects in an open economy, it is important to determine where R&D occurs. Foreign firms invest in R&D only in their home country and they do not engage in R&D activities in the host country (Neuhaus, 2006, pp. 53). This argument can be simplified to that the global technological progress originates in industrialized countries. It is therefore plausible to believe that foreign firms in industrialized countries lead the global frontier of technological progress, both in invention of new capital goods and increasing quality of existing capital goods and that there is a full economy-wide employment of the capital product in the foreign countries. The newly invented capital goods disseminate to developing countries when foreign firms transfer know-how (blueprints) to host countries where the foreign firms have a technological advantage over local firms (Neuhaus 2006). For foreign firms to have a technological advantage over local firms, they have to be able to produce capital goods of either better quality or capital goods that has not been used in the host country or to such a small extent that they have not had a significant impact on aggregate production. Accordingly, FDI will therefore lead to a market penetration of either completely new (for the host country) capital goods or improved capital goods. Therefore, the FDI model accounts for both types of capital deepening. For this reason, a developing country with a small

and qualitatively low capital stock is to predominantly see production of completely new for the host country capital goods through FDIs (Neuhaus 2006). This is further illustrated in appendix A, figure 1.

Characteristics of a developing country is that transitioning economies have small capital stocks, both in terms of variety of capital goods and the quality of existing capital goods. Initially, inflows from FDIs is to significantly increase variety of capital goods which is equal to FDIs induce capital accumulation (Neuhaus 2006). On the contrary, FDIs in developed or industrialized countries will lead to quality improvements of existing capital goods which can be translated to capital improvements. This transitioning process can be described by two assumptions regarding the global technological frontier. First, the technological progress at the technological frontier originates from quality improvements. This assumption can be rephrased to that there are no inventions and that the number of different types of capital goods are held constant. Second, technological progress at the world level is marginal. There are only small improvements of the capital goods (Neuhaus, 2006). Both assumptions imply that the technological progress of the world is significantly smaller than the technological progress of a transitioning country. Even quality improvements of the existing capital goods can increase significantly through FDIs if there is a big difference between the domestic level of technological progress and the technological progress of the world (Neuhaus 2006). This will be described in detail by the model.

### 2.2.2 The FDI model

Hitherto, the discussion regarding the final FDI model has considered only how capital stock differs on the production of capital goods since firms of the intermediate sector produce capital goods which result in a capital deepening process. Final goods producers have been kept absent in the previous sections. However, final goods producers are the purchasers of the capital goods from the intermediate sector. For the simplicity of the model, the model assumes that there are a finite number of final goods producers and that the producers can be represented by a single firm (Neuhaus 2006). This firm will then produce according to the production function in equation (2.6):

$$Y(t) = AL^{1-\alpha}K(t)^{\alpha} \tag{2.6}$$

The mechanical features of this function states that the output at time $t$ will be produced by constant levels of $A$ and $L$ in addition to the capital stock at time $t$. $A$ in this model denotes economic efficiency and L represents employment. For the simplicity of the model, labor force, quality of labor force and causes of economic efficiency is not modelled endogenously (Neuhaus 2006). Therefore, the development of the capital stock is explained by $K(t)$. In equation (2.7) is a detailed composition of $K(t)$:

$$K(t) = \left\{ \sum_{j=1}^{N(t)} \left[ q^{\kappa_j(t)} * X_j(t) \right]^{\alpha} \right\}^{1/\alpha} \tag{2.7}$$

Equation (2.7) shows that at time $t$ the capital stock consists of $j = 1, \dots, N(t)$ types of capital goods. The amount of each type of capital product $j$ employed in production is denoted by the term $X_j(t)$. The discussion about quality of input factors is included by the term $q^{\kappa_j(t)}$, which is simply the productivity of each unit of capital good employed in production. Each capital good is located on a rung on a quality ladder where the rungs are spaced proportionally at $q > 1$. $\kappa$ represents the highest possible quality of the capital variety. In equation (2.7), the quality of the capital variety $j$ is assumed to be smaller than the quality of the same capital variety at a world level, to illustrate this assumption it can be seen such as $\kappa_j < \kappa_j^*$. Embodying technological diffusion in the discussion of the quality ladder, if a foreign firm improves the capital variety in a developing country, the jump in quality of capital variety can increase with more than one rung, depending on $\kappa_j^* - \kappa_j$.

Having clarified how equation (2.7) is composed and by plugging in equation (2.7) in equation (2.6), the central equation of the model is equation (2.8) and:

$$Y(t) = AL^{1-\alpha} \left\{ \sum_{j=1}^{N(t)} \left[ q^{\kappa_j(t)} * X_j(t) \right]^{\alpha} \right\}^{1/\alpha} \tag{2.8}$$

The model, albeit providing useful insights in long-run effects of FDIs, is a subject to limitations. First, all improvements in the capital stock occurs due to the FDIs of foreign firms and therefore does not include capital production carried out by the domestic sector. Second, by excluding domestic sector, the model does not consider any interaction between domestic and foreign investment activities. As it excludes domestic sector completely, the model does not account for the possibility of a crowding-out effect or if domestic firms benefit from a presence of foreign firms. Third, in addition to not including the domestic sector, the model does neither include any effects on the labor force or other sources of economic growth. In the

discussion of transitioning from a developing to an industrialized country, both labor force and factors for economic growth such as quality of institutions can benefit from FDIs. Ultimately, as there can be both horizontal and vertical FDIs, both should be included by the model. However, the model only accounts for FDIs where local production is to serve the foreign market in the aspect of foreign firms. A complete analysis of effects of FDIs is to include vertical FDIs where only a part of the supply chain is moved to a foreign location in order to exploit efficiency gains in lower labor costs (Neuhaus 2006). On the whole, the model is technological progress in depth, which is of the essence for this paper.

In conclusion, (Neuhaus 2006) assume that as a developing country open for FDIs, FDIs will primarily increase the capital goods variety. The increase in capital goods variety is a process of capital accumulation which significantly increases the capital stock and raises aggregate production. As the developing country becomes more industrialized, the capital stock of the country will predominantly increase through quality improvements if FDIs continue to enter the host country. For this reason, the quality improving FDI-led technology diffusion will shrink as the technological level approaches the technological level of the world. Furthermore, the growth rate will also decrease as a country during the transition to a industrialized country. This is supported by the two assumptions regarding technological progress on the global technological frontier. With this stated, the model is a tool for explaining the transition to an industrialized country given a permanent inflow of FDIs.

# 3 Literature review

This section contains some earlier empirical research on the effects of FDI regarding economic growth and development. Table (3.1) shows a compilation of studies made earlier regarding FDIs effect on economic growth.

Table (3.1)

| **Study** | **Author** | **Dependent variable** | **Independent variables of interest** | **Method** | **Result** |
|---|---|---|---|---|---|
| *The effects of FDI inflows on a Host Country Economic Growth* | Johnson (2006) | GROWTH | FDI inflow | Cross-section, panel data and time series. | Positive effect on economic growth in developing counties but not developed countries |
| *Foreign direct investment, economic freedom and growth: new evidence from Latin America* | Bengoa & Sanchez-Roblez (2003) | GROWTH | FDI, index of economic growth, | Panel data analysis OLS | Positive effect on economic growth, different effect depending on host countries state |
| *Causality Tests for Cross-Country Panels: New Look at FDI and Economic Growth in Developing Countries* | Usha Neir-Reichert & Diana Weinhold | GDP growth | FDI | MFR panel data analysis | Positive long-term effect on growth, openness to trade enhance this effect |
| *Does Foreign Direct Investment Accelerate Economic Growth?* | Carkovic & Levine (2002) | GROWTH | FDI inflow | GMM dynamic panel data analysis, OLS regression | No independent effect from FDI on economic growth |

## 3.1 Positive effects from FDI

In the article *The effects of FDI inflows on a Host Country Economic Growth (2006)* Andreas Johnson study the development and economic effects FDI has in host countries. He argues that FDI through their technological spillovers will enhance the economic growth in the host economy. Johnson uses data from 90 different economies between the years 1980 and 2002, including both developed and developing countries which he divided in to two separate sample groups. To conclude any effects Johnson uses panel data analysis, cross-section and time series, with the dependent variable *GROWTH* which represent the annual growth rate of GDP per capita over the period 1980 to 2002. The main variable of interest Johnson uses is *FDI inflow* and aims for providing a proxy for the contribution inward foreign direct investment has on the host country. Furthermore Johnson uses a group of different control variables to control which could be determinants for economic growth, these variables are *domestic investment*, *average years of schooling*, *initial GDP* and a *dummy variable for war*, which takes value 1 if they host country have been suffering from war during the period of the study (Johnson 2006).

Johnson's conclusion was that FDI inflow has positive effect on economic growth in developing countries, but was unable to find any causality and evidence for more developed countries. He argues that in more developed countries the more mature market probably will neglect if the capital investments are domestic or foreign (Johnson 2006).

Bengoa and Sanchez-Robles (2003) article *Foreign direct investment, economic freedom and growth: new evidence from Latin America* displays the interplay between FDI, economic freedom and economic growth. This study investigate a data sample of 18 Latin American countries between the period of 1970-1999 in order to conclude any evidence as to what effect FDI has on economic growth, but also to conclude if openness and economic freedom is positive for foreign direct investment. Bengoa and Sanchez-Robles uses panel data analysis to find the linking effects between FDI, economic freedom and growth, by inserting control variables such as school enrollment in secondary school, inflation and government debt they isolate the independent effect from FDI on growth and the effect economic freedom have on FDI inflow (Bengoa & Sanchez-Robles 2003).

Bengoa and Sanchez-Robles concludes that there is a significant positive effect on growth by foreign direct investment but regarding the state of the country the effect differs. Therefor also

concluding that economic freedom enhance FDI inflow and suggesting that government should implement different policies to increase economic freedom and thereby increase FDI and growth (Bengoa & Sanchez-Robles 2003).

In the study *Causality Tests for Cross-Country Panels: New Look at FDI and Economic Growth in Developing Countries (1999)* Usha Nair-Reichert and Diana Weinhold examine the causality effect from FDI on economic growth in developing countries. In the study they use a mixed fixed and random effect (MFR) panel data estimation method. Using this method cover the heterogeneous relationship between investment and economic growth the authors argues exist, while other more traditional methods such as fixed effect estimator panel data (FEE) assume homogeneity and therefor does not take this in consideration (Nair-Reichert & Weinhold 1999).

Usha Nair-Reichert and Diana Weinhold uses a data set containing 24 developing countries over the period from 1971 to 1995 to examine the effect from FDI on economic growth. Dependent variable is growth rate of GDP, variable of interest is FDI whereas they consider gross domestic investment, trade openness in the host country and inflation as control variables which is seen as determinants for economic growth (Nair-Reichert & Weinhold 1999).

The authors concludes that FDI has a positive long-term effect on economic growth overall but the effect enhances if the host country has high value of openness to trade. This study also contributes to further research regarding method usage and assumption making when determine foreign direct investment effects (Nair-Reichert & Weinhold 1999).

## 3.2 No significant effect

Not all earlier studies show that FDI has a significant positive effect on economic growth. Maria Carkovic and Ross Levine's article *Does Foreign Direct Investment Accelerate Economic Growth? (2002)* Contributes to further research on the effect FDI has on economic growth. By analyzing data from 72 countries over the period 1960 to 1995 using generalized-method-of-moments (GMM) panel data analysis they search to find any evidence for FDIs positive effect on economic growth. The dependent variable in these regressions and analysis is *the rate of real per capita GDP growth*, with the variable of interest being foreign direct investment inflow. To control for other determinants on economic growth they include the

control variables *initial income per capita, average years of schooling, inflation, openness to trade, black market premium* and *private credit* (Carkovic & Levine 2002).

The results and findings in this study suggest that there is no significant evidence that FDI independent have any positive effect on economic growth. Still they could conclude some positive effects but these effects was closely connected with other determinants for economic growth and not solely on FDI (Carkovic & Levine 2002).

# 4 Empirical strategy and analysis

The purpose of this paper is to examine whether FDI inflows affect economic growth. The theoretical framework has showed that FDI inflows is to increase the capital stock through various channels, depending on the state of technological progress in the host country and the difference between the quality of capital goods in the host country and the quality of capital goods at a world level. The empirical evidence is confirming the theoretical framework that under certain conditions, FDIs have a positive effect on economic growth. Therefore, the empirical model is to incorporate the effects of FDIs on economic growth and further control for other factors that might affect economic growth in the long run. As the theoretical framework examines only the long-term effects, the following empirical models is to remain within this time frame and therefore will only continue to examine the effects of an increase of the capital stock in the long run.

The data assembled in order to examine the effects of FDIs on economic growth is consisting of two dependent variables, GDP per capita (GDP/c) and GDP-growth (GDP-g). These two variables are to give a good indication of the economic development of a country. As observed in appendix A, table 1, there are visual differences in GDP/c between our industrialized countries (group 1) and transitioning countries (group 2). Therefore, both dependent variables jointly are to explain economic growth pursuant to the purpose of this paper and within the framework presented previously.

The data consists of eight countries which are: Hong Kong, Japan, Singapore, South Korea, Malaysia, Philippines, Sri Lanka, and Thailand. The first four is relatively developed and industrialized and the latter four are the transitioning economies. World Bank Open Data has been used to gather the data and the data used in the forthcoming regressions are from 1960 as earliest.

According to both the theoretical and the empirical framework that are suggesting that FDI increases economic growth, the empirical method will estimate the effect of FDI on economic growth according to the production function presented in equation (3.13). Furthermore, the basis of the theoretical framework is that there is a presence of permanent FDI inflows. Therefore, the primary model is as following for each dependent variable of interest, where $t = 1, \dots, T$:

$$Log(GDPC_t) = \beta_0 + \beta_1 * Log\left(\frac{FDI_{t-1}}{population_{t-1}}\right) + \beta_2 * D_i + u_t \quad (4.1)$$

$$GDP\ growth = \beta_0 + \beta_1 * Log\left(\frac{FDI_{t-1}}{population_{t-1}}\right) + \beta_2 * Log(GDPC_{initial}) + u_t \quad (4.2)$$

The empirical strategy is to first evaluate the impact of $Log(FDI/c)$ on each dependent variable and second to examine if any of the control variables are also affecting economic growth.

## 4.1 Data, definitions and descriptive statistics

The data in this study is gathered from the World Bank data bank (World Bank 2018c) and from worldwide governance indicators (WGI 2017), for a trustworthy and accurate dataset. The dataset contains variables from eight different countries located in the Asia & Pacific area in the period from 1970 to 2016, four developed and four less developed countries are examined in order to conclude any causal effect and to conclude if there is a difference between developed and developing countries regarding foreign direct investments effect on economic growth and development. Below is an explanation on how we gathered and created our dataset variable by variable.

GDP per capita are gathered from the World Bank and are the value of GDP divided by population in the country, the variable is measured in current US$ using single year official exchange rates. Although we are well aware that the usage of current US$ would allow inflation to have an effect and also allow currency changes, this data was the most observed and frequent in each variable, therefor the choice. We choose to logarithm this dependent variable in order to reduce skewness in the distribution and to show percent changes.

Economic growth is also collected from the World Bank database and contains the annual growth in GDP for each country. The data for this variable is measured in constant local currency with an aggregate on constant US$ 2010, there was no access to this data in current US$. This is the second dependent variable that is tested.

We gathered the data for the main variable of interest *FDI* from World Bank database, this data contains the annual amount of FDI net inflow in current US$. We constructed a new variable

$FDI\ per\ capita = \frac{Foreign\ direct\ investment\ inflow}{Population}$ in each country to consider population. We conducted a logarithmic variable of FDI inflow and FDI per capita inflow to reduce skewness.

The data for the variable *Natural resources* was collected from the World Bank database and contains total natural resource rents in percentage of GDP, which states what percentage of GDP is made out of natural resources.

Government consumption contains data from the World Bank database regarding general government final consumption in percentage of GDP because government consumption is a part of GDP.

We collected data for institutional quality from Worldwide Governance Indicators, this variable was created by the data from government effectiveness that measure the quality of public service, quality of civil service and degree of freedom from political pressures, quality of policy formulation and implementation and the credibility of the government's commitment to such policies.

The data for the last variable openness to trade was collected from The World Bank database, the pure data is sum of export and import in percentage of GDP and the authors of this paper proxy percentage of trade of GDP for openness to trade.

Further description and reasoning behind selected dependent variable, variable of interest and control variables will be described in the following paragraph.

### 4.1.1 Dependent variables, FDI, and control variables

The authors of this study decided to use two dependent variables in order to conclude any effect on economic growth and development. The dependent variables are being examined in different regressions. Selected dependent variables are GDP annual growth and logarithmic GDP per capita. The reason behind the selection of these two variables is that logarithmic GDP per capita explains the effect in percent of GDP per capita and includes population which can affect the measurement of economic growth. GDP annual growth represent the real growth rate of each country and does not take population in consideration and will state the effect FDI has on real growth rate of the country's economy. The variable of interest is the logarithmic value

conducted from foreign direct investment inflow in current US$. Notably, the authors of this study choose not to use FDI inflow in a percentage of GDP because of the misleading values it may present, higher GDP would show lower percent values. This is important since the countries used in the regressions differ significantly in GDP in absolute values. Latter we constructed the variable FDI inflow per capita to take population in consideration. The reason to use the logarithmic variable is to reduce skewness and to eliminate the significance of outliers. It is plausible that FDI inflow in time $t$ will cause problem since the authors of this study believe that FDIs affect GDP and in addition a higher GDP attracts more FDI inflows and therefore suspect an estimator bias. By lagging the explanatory variable, the prospect is to limit this two-way effect on each other.

Control variables in the model were selected by determinates for economic growth and which has been used in the empirical evidence of the theory and in previous studies. However, the authors of this paper have made some changes to control variables used in earlier studies. As stated above, the inflows of FDIs has been calculated population instead of being calculated as a capital stock of GDP. The selected control variables in this study are government consumption as a share of GDP, amount of natural resources which is proxied by rents as a percentage of GDP, openness to trade which is defined as the sum of exports and imports divided by GDP, and institutional quality which is represented by government efficiency. Government efficiency is estimated on a scale, ranging from -2.5 to 2.5. Government consumption was selected due to arguments that higher consumption equals lower savings, therefore an important factor in a country's economic growth. Furthermore, government consumption can itself be a driver of economic growth if the government is engaging in expansionary fiscal policies. Including natural resources was determined due to beliefs that higher value of natural resources would guarantee a higher GDP per capita through an additional channel of income. Openness to trade has been included with the argument that previous studies have included openness to trade. The reason for researchers in the field to include openness to trade is buttressed in the belief that openness to trade can also be a significant driver of economic growth despite none to low inflows of FDIs. Institutional quality was selected to control the attraction of FDI and technological conditions and development condition, as well as it is a determinant for economic growth. Following is an in-depth presentation of each variable, the source of the data and whether any data conversion has been performed on the variables.

Table 4.1: Source, conversion and observations of each variable

| Variables gathered from databases | Data source | Data conversion | Logarithmic form of level values | Observations |
|---|---|---|---|---|
| GDP per capita in current US$ | The World Bank | No | $Log(GDPc)$ | 456 |
| Growth rate of GDP in local constant currency | The World Bank | No | None | 446 |
| Foreign direct investment inflow in current US$ per capita | The World Bank | Levels are calculated from total FDI inflow and population | $Log\left(\frac{FDI}{Population}\right)$ | 321 |
| Natural resource rents in percentage to GDP | The World Bank | No | None | 376 |
| Government consumption in percentage of GDP | The World Bank | Levels are calculated from total Government consumption and GDP | None | 456 |
| Institutional quality as a proxy from government effectiveness | Worldwide Governance Indicators | No | None | 144 |
| Openness to trade | The World Bank | No | None | 456 |

### 4.1.2 Definitions

As the purpose of the paper is to determine whether the effect of FDIs differ depending on the wealth of the host country, the data gathered has been divided into two groups. First group consist of the industrialized and developed countries and the second group consist of transitioning economies. This variable is included in the regression as a dummy variable where the variables takes value 0 if the country is a developed country and value 1 if the country is a developing country. The variable is named ($group$) in the regressions presented in the following sections. Furthermore, in order to determine the effect of FDIs for developing economies an interaction has been used. The reason for including an interaction is that the intercept is not of significance for the purpose of the paper. The coefficient for the interaction

is of higher significance when determining whether there is a difference between the wealth of the host country. Following is a table where the countries included in each group is presented:

Table 4.2: Sample groups

| Group 1: Developed countries | Group 2: Developing countries |
|---|---|
| 1. Hong Kong | 5. Malaysia |
| 2. Japan | 6. Philippines |
| 3. Singapore | 7. Sri Lanka |
| 4. South Korea | 8. Thailand |

### 4.1.3 Methods

Observations in the data consist of both cross-sectional dimension, indicated by $i$, and a time series dimension, denoted by $t$. Since the data consist of a time variable, ($year$), the best estimation of the effect of FDI on economic growth will be provided through a panel data analysis. The addition of time series data to the ordinary static cross-sectional improves significantly the accuracy of the estimation. On the contrary, it is implausible that observations for the same variable measured at different times are independent. This violates the MLR assumption 3 regarding random sampling in cross-sectional data as presented in (Wooldridge 2012). However, this violation is compensated by making the assumption regarding exogeneity stricter. Furthermore, panel data has several advantages over cross-sectional data or time series data. First, panel data relates to individuals such as firms or countries over time, therefore it is plausible that there will be heterogeneity in these observations as they develop over time in the dataset used for this study. The appropriate estimations used for panel data can take such heterogeneity into account since subject-specific variables are allowed (Gujarati & Porter 2009). Second, as described before, by combining time series data and cross-section observations, panel data is bound to give less collinearity, more informative data, and more variability. Third, due to the increased complexity of panel data analysis and by combining cross-section observations and time series data, it can better detect and measure effects which are not observed when analyzing each data separately (Gujarati & Porter 2009). There are further advantages of using panel data, however, these three advantages are of higher significance for the purpose of this paper.

Since the purpose of the paper is to determine whether economic growth is affected by inflows of FDIs and if there are a difference of the effects of FDI inflows in each country, the

appropriate test for this purpose is to use a random effects analysis on gathered panel data. When determining whether to use fixed effects or random effects on panel data, there is an appropriate test to perform that can confirm that the data is to be analyzed using either random or fixed effects. Performing a Hausman test for the final models have shown that fixed effects is to be used in model 3. However, the P-value for model 6 was not available and no conclusion can be done on the basis of the Hausman test. Contradicting the Hausman test, the authors of this paper will use random effects as the arguments for using a random effects analysis are pursuant to what this paper is studying. However, the majority of the models reviewed in the literature review has used fixed effects but fixed effects is not pursuant to the purpose of this paper and is therefore not appropriate. Random effects was used since $log(gdpci)$ is time-invariant and this variable would have been omitted if fixed effects was used and likewise for the dummy variable used in each model. In addition, (Bell & Jones 2014) is arguing that random effects is offering higher flexibility and is able to model context with variables that are only measured at higher levels. Therefore, random effects is preferred fixed effects as the latter can produce overly simplistic model and result in a misinterpretation of the result.

### 4.1.4 Stepwise regression

When performing the stepwise regression, the process of including control variables in the regression will depend on number of observations in each particular control variable and on whether the control variable contains information about a capital flow. The number of observations range between 144 (government efficiency) and 456 (government spending as a share of GDP). Therefore, the order for including control variables will be identical irrespective of the dependent variable. In addition, $\boldsymbol{\alpha}_t$ represents a vector of year dummies and is included in each model except for model 1 and 4. The first regression will contain $Log(FDIC)$ pursuant to the purpose of the paper and a dummy where less developed economies $= 1$. The equation is as following:

**Model 1**

$$Log(GDPC)_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * D_i + u_t \tag{4.3}$$

The next model will contain government consumption ($govgdp$) with 456 observations, natural resources ($nr$) consisting of 376 observations, and openness of trade ($open$) with 456 observations. Furthermore, an interaction will be included here in order to obtain estimates on the second question of this paper, whether effects of FDIs differ between the groups of countries. The argument for including these variables simultaneously is that previous research

presented in the literature review have controlled for natural resources and that (Neuhaus 2006) has included both openness of trade and government consumption when performing empirical analysis of the FDI model. Equationally, model 2 can be structured as following:

$$Log(GDPC)_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * D_i + \beta_3 * Log(FDIC_{t-1}) * D_i + \beta_3 * govgdp_t + \beta_4 * nr_t + \beta_5 * open_t + \boldsymbol{\alpha}_t + u_t \quad \textbf{Model 2} \quad (4.4)$$

The next model is to include a non-economic control variable which is expected to have an impact on the dependent variable. The last control variable to get included is government efficiency ($inst$) since (Bengoa and Sanchez-Robles, 2003) controlled for economic freedom. The authors of this paper have decided to include government efficiency ($inst$) instead of economic freedom as government efficiency is representing the quality of government in each host country. The argument for include government efficiency this late in the stepwise regression is because the number of observations is low. The final regression is illustrated by the following equation:

$$Log(GDPC)_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * D_i + \beta_3 * Log(FDIC_{t-1}) * D_i + \beta_3 * govgdp_t + \beta_4 * nr_t + \beta_5 * open_t + \beta_6 * inst_t + \boldsymbol{\alpha}_t + u_t \quad \textbf{Model 3} \quad (4.5)$$

For the second dependent variable, the stepwise regression will be identical with the same arguments for why including the control variables in a particular order. However, the main difference between the models is that the logarithmic form of initial GDP/c ($gdpci$) is included in each model. Equation (4.6) through equation (4.8) represents respectively model 5-8 with GDP growth as the dependent variable.

$$GDP\ growth_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * Log(gdpci) + u_t \quad \textbf{Model 4} \quad (4.6)$$

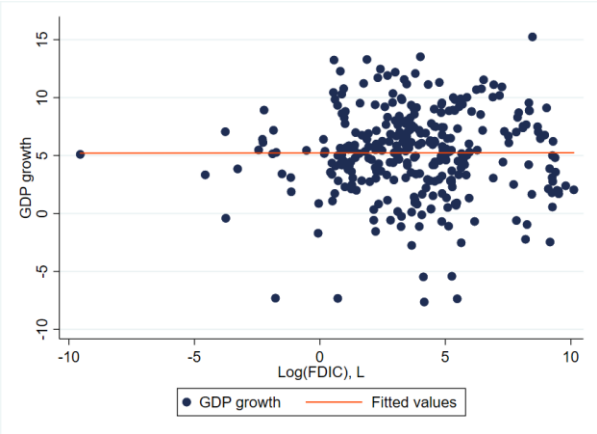
$$GDPgrowth_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * Log(gdpci) + \beta_3 * D_i + \beta_4 * Log(FDIC_{t-1}) * D_i + \beta_4 * govgdp_t + \beta_5 * nr_t + \beta_6 * open_t + \boldsymbol{\alpha}_t + u_t \quad \textbf{Model 5} \quad (4.7)$$

$$GDPgrowth_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * Log(gdpci) + \beta_3 * D_i + \beta_4 * Log(FDIC_{t-1}) * D_i + \beta_4 * govgdp_t + \beta_5 * nr_t + \beta_6 * open_t + \beta_7 * inst + \boldsymbol{\alpha}_t + u_t \quad \textbf{Model 6} \quad (4.8)$$

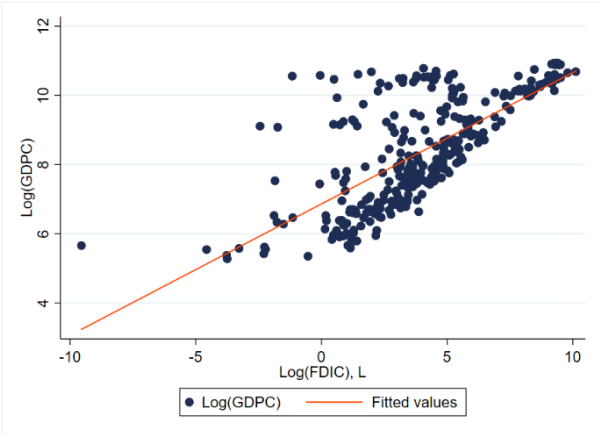
As denoted previously, random effects will be used for every regression. Furthermore, as the authors of this study suspect a high level of heteroscedasticity among the residuals, robust standard errors will be used. Lastly, model 2, model 3, model 5, and model 6 will include fixed time effects with the expectation to absorb the variability between different years.

Descriptive statistics are an important procedure prior to running any regression. The ambition with descriptive statistics is to determine if the data have any particular pattern and check for any factors that might complicate the analysis such as outliers. Following is a visual presentation of the relationship between each dependent variable and lagged $lfdic$. In appendix B, graph (B.1) and (B.2) is a line graph for each country individually with each dependent variable and $log(FDIC)$.

Graph (4.1)




Graph (4.2)




In graph (4.2), there is a clear visual relationship between $log(GDPC)$ and $lagged\ log(FDIC)$. Therefore, it is clear that as FDIC increase in value, $log(GDPC)$ is expected to increase also. The cloud of observations in graph (4.1) is not showing any pattern and a very small but positive trend. The graph contradicts established theories on the subject of effects of FDI. There is a positive correlation in figure 4.2 between lagged $log(FDIC)$ and GDP growth rate.

Since the data consists of several continuous variables the authors of this paper suspects there might be a high degree of skewness due to the nature of the data. Three histograms will present visual presentations of GDP/c, FDI/c, and initial GDP/c and can be found in appendix B, graph (B.3) through (B.5). By using the logarithmic form of observations, skewness is reduced and the variables is to become more normally distributed. However, as data sets increase in observations, even unimportant deviations from normality might become significant which is resulting in that the P-value of Shapiro-Wilk test is low enough to reject the null hypothesis of normality. In addition, a strong argument for using logarithmic form is to create a log-log model where the output can be interpreted more easily as the output can be interpreted as elasticity rather than original scale. One last argument to use logarithmic form is to transform nonlinear relationships into linear relationships (Pedace 2018). With these arguments presented for why to use a logarithmic form, the authors of this paper is studying the output of Shapiro-Wilk test to certify that the variables achieve a higher degree of normality. If a higher W-value is achieved through the logarithmic form, it will be used in future regressions. Shapiro-Wilk tests are presented in appendix B, table (B.2). In conclusion, GDP/c, FDI/c and initial GDP/c achieved higher W-value in logarithmic form and therefore will be included in the regression in their logarithmic form.

Having established which variables are being used in their logarithmic form. Following is a table overview over each variable used in the regressions. Notably in the table is that $lfdic$ have a relatively high standard deviation in regard to the mean and the fact that the number of observations in each variable can differ substantially. Therefore, the number of observations will be of importance when determining in what order to control for which variables. Stepwise regression was discussed in depth in section (4.1.4).

Table 4.4: Summary statistics

| Variable | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| lgdpc | 456 | 7.765 | 1.766 | 4.541 | 10.939 |
| gdpg | 446 | 5.794 | 3.909 | -7.634 | 16.164 |
| lfdic | 313 | 3.768 | 2.870 | -9.548 | 10.120 |
| govgdp | 456 | 0.115 | 0.031 | 0.052 | 0.203 |
| open | 456 | 123.124 | 109.470 | 0.000 | 442.620 |
| nr | 376 | 2.782 | 6.574 | 0.000 | 37.599 |
| inst | 144 | 0.914 | 0.801 | -0.424 | 2.437 |
| lgdpci | 456 | 5.491 | 0.543 | 4.613 | 6.172 |

Prior to performing a table of expected signs of each coefficient, the table is showing the output from pairwise correlation matrix, implicating the relationship between the collected data. The pairwise correlation test will be used together with the findings in the theoretical background and literature review to determine the expected signs of coefficients. The pairwise correlation matrix can be found in appendix B, table (B.3).

Following is a table of expected sign for each independent variable in each model. The intuitive argument for expecting a positive sign in the interaction is because of the convergence aspect of theories in the theory review. A less developed economy with a significant inflow of FDIs is expected to have a higher growth rate than an industrialized economy with similar inflows of FDI.

Table 4.5: Expected signs of the coefficients of independent variables

| Model No | Dependent variable | Independent variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Log (FDIC) | Group | Inter-action | Gov-gdp | Nr | Open | Inst | Log (gdpci) |
| Model 1 | Log (GDPC) | + | - | | | | | | |
| Model 2 | Log (GDPC) | + | - | + | + | - | + | | |
| Model 3 | Log (GDPC) | + | - | + | + | - | + | + | |
| Model 4 | GDPg | + | - | | | | | | - |
| Model 5 | GDPg | + | - | + | - | + | + | | - |
| Model 6 | GDPg | + | - | + | - | + | + | + | - |

## 4.2 Empirical models and estimation results

In the previous sections, the models are presented in equational form. Depending on the dependent variable, the authors of this paper has regressed each dependent variable three times on explanatory variables. This has been done in a stepwise order in order to determine how the effect of FDIs affect each dependent variable, depending on which variables are included to control for. Table 4.6 is showing how each explanatory variable affects $Log(GDPC)$. Table 4.7 is displaying how each explanatory variable affects $GDP - growth$. The main difference between these tables are that $Log(initial\ GDP/c)$ is included when the dependent variable was $GDP - growth$ with the argument to determine whether initial wealth had a significant effect on economic growth.

### 4.2.1 Empirical models: The impact of FDI on GDP/c

Following is a table of model 1 to 3 where each model is commented in the sections below the table.

Table 4.6: Estimation results of Models 1 to 3

| Dependent variable: Log(GDPc) | (1) | (2) | (3) |
|---|---|---|---|
| Log(FDIC) | 0.360** | 0.025 | -0.028 |
| | (0.065) | (0.095) | (0.029) |
| Group | -1.515* | -2.232** | -2.550** |
| | (0.638) | (0.644) | (0.505) |
| Log(FDIC) x Group | | 0.021 | 0.266** |
| | | (0.098) | (0.095) |
| Government consumption | | 8.269* | 1.014 |
| | | (3.797) | (2.641) |
| Natural Resources | | 0.030* | 0.003 |
| | | (0.014) | (0.022) |
| Openness to trade | | 0.001 | -0.000 |
| | | (0.001) | (0.000) |
| Institutions | | | 0.723** |
| | | | (0.160) |
| Fixed time effects | No | Yes | Yes |
| Observations | 313 | 313 | 140 |
| R-squared | 0.737 | 0.930 | 0.973 |

Note: Values without parenthesis are estimated coefficients. Values in parenthesis are robust standard errors.
* p<0.05, ** p<0.01

Model 1 is the benchmark model used in order to determine whether $Log(FDIC)$ alone have an impact on $Log(GDPC)$. The coefficient is positive and significant as expected. The coefficient for $Log(FDIC)$ is 0.36 which can be interpreted such as 1 percent increase in FDI inflows per capita is going to increase GDP/c with 0.36 percent. The variable $group$ has been included in order to absorb any variations between the groups and the coefficient is both significant and the sign was expected. In model 1, the number of observations is 313 as the variable has been lagged. The coefficient is pursuant to the theory that FDIs is to have an impact on economic growth. Furthermore, the base model has a Goodness-of-fit of 0.737 which is showing that 73.7% of the variation in $Log(GDPC)$ can be explained by $Log(FDIC)$ and $group$.

In model 2, all control variables of economic character have been included. $Log(FDIC)$ has lost significance, both as a sole variable and when used in the interaction which was not expected. The sign of both estimates remains positive which is as expected. As the variable is not significant, the findings can be interpreted such as that there is no effect of FDIs on economic growth when controlling for government consumption, rents of natural resource as a percentage of GDP and openness to trade. $Group$ remains significant and have a negative

coefficient which is as expected. However, this is of smaller importance as this variable only affects the intercept. Government consumption as a share of GDP has obtained a positive value and a significant which is as expected. $Govgdp$ is interpreted such as if government consumption as a share of GDP increases by 1 percentage point, GDP/c is increasing with 8.3%. This is plausible due to the fact that investments in developing countries affects economic growth more significantly than in developed countries. Natural resources is also significant with a relative small coefficient of 0.03 where a 1 percentage point increase in the income from rents from natural resources increase GDP/c by 0.03%. The coefficient is smaller than expected. Lastly, openness to trade is not significant which was not expected. However, the sign of the coefficient is positive which was expected. The model has a Goodness-of-fit of 0.93 which is a high value. The regression overall is slightly disappointing as FDIc is not a significant driver of economic growth when controlling for the aforementioned variables. The model has not lost any observations in comparison with the previous model.

Lastly, model 3 is basically the same as model 2 with an adjustment of including government efficiency. $Log(FDIC)$ remains not significant and a change of sign to negative which was not expected. Group remained significant, although as stated before this variable only affects the intercept. The interaction term has become significant with a positive coefficient of 0.266. This is interpreted such as a 1 percent increase in FDI inflows is increasing GDP/c with 0.266%. This was expected and the finding is satisfying for the purpose of the paper. Furthermore, this is pursuant to the theory about the convergence between developing and developed economies. A developing economy is to have a higher economic growth from FDI inflows than a developed economy. Government consumption and natural resources have lost significance which was not expected. However, the sign of the coefficients is positive which was expected. Openness to trade remained not significant with a change of sign. Government efficiency is significant with a positive coefficient of 0.723. This is interpreted as a one-unit increase in the estimate of governance performance increases economic growth with 0.723%. This is plausible since a higher level of governance performance is to increase growth. The major difference between model 2 and model 3 is that number of observations has been reduced by more than 55% which is a weakness of model 3 due to the fact that the last control variable regarding government efficiency is just containing 140 observations. However, in panel data analysis, it is intuitively a satisfying amount of observations. In addition, the goodness-of-fit has increased further to 0.973 and therefore the model is considered reliable. The findings from model 3 is satisfying

as it confirms what the authors of this paper have expected based on findings from theoretical background and literature review.

### 4.2.2 Empirical models: The impact of FDI on GDP-growth

The table beneath is a presentation of models 4 to 6 where the dependent variable is the growth rate of GDP. As stated before and also shown by the table is that the logarithmic form of initial GDP/c is introduced in each model.

Table 4.7: Estimations results of Models 4 to 6

| Dependent variable: GDP-g | (4) | (5) | (6) |
|---|---|---|---|
| Log(FDIC) | -0.324<br>(0.213) | -0.169<br>(0.176) | -0.141<br>(0.278) |
| Group | -1.324<br>(1.146) | -4.334**<br>(0.817) | 0.753<br>(1.040) |
| Log(FDIC) x Group | | 0.767**<br>(0.228) | 0.174<br>(0.397) |
| Government consumption | | -36.305**<br>(9.689) | -33.926**<br>(13.197) |
| Natural Resources | | 0.086**<br>(0.020) | -0.071<br>(0.175) |
| Openness to trade | | 0.006<br>(0.004) | 0.000<br>(0.005) |
| Institutions | | | 0.729<br>(1.318) |
| Log(Initial GDP/c) | -1.186<br>(1.283) | -2.271**<br>(0.261) | -0.620<br>(0.669) |
| Fixed time effects | No | Yes | Yes |
| Observations | 313 | 313 | 140 |
| R-squared | 0.005 | 0.595 | 0.669 |

Note: Values without parenthesis are estimated coefficients. Values in parenthesis are robust standard errors.
* p<0.05, ** p<0.01

Model 4 is the base model where the effect of FDIs is measured with only $log(gdpci)$ and $group$ as control variables. Model 4 is showing that neither $Log(FDIC)$ or $\log(gdpci)$ is significant and where both explanatory variables have a negative coefficient. Furthermore, $group$ is insignificant with a negative sign. The negative sign was expected, however, as $group$ only affects the intercept, this variable will not be discussed further. Model 4 is contradictive to what was expected based on previous studies and the theory review. However,

as the goodness-of-fit is only 0.005, the model is interpreted such as there is a strong belief of omitted variable bias.

Model 5 is a more sophisticated model which is taking into consideration more factors than only FDIs. $Group$ has gained significance, showing that there is a difference in the growth rate between industrialized and developing economies. The coefficient is stating that a developing economy is to have a lower growth rate which is plausible. However, the interaction term is positive and significant with a coefficient of 0.767. This is interpreted such as a 1 percent increase in FDI inflows is to increase GDP-growth by 0.767 percentage points. As the interaction term is for less developed countries, this finding is pursuant to the theory about convergence. Government consumption have a negative coefficient of -36.305 and is significant. Therefore, a 1 percentage point increase in government consumption is expected to decrease GDP-growth by 36%. In comparison with other coefficients, this coefficient is extremely high to such extent that the authors of this paper suspect the model is overstating the effect of government consumption on GDP-growth. Theoretically, an increase in government consumption is supposed to increase GDP-growth in the long run, however, this expectation is not buttressed by the findings in model 5. Furthermore, natural resources have a significant positive coefficient of 0.086. This is interpreted such as when rents from natural resources increase by one percentage point, GDP-growth is to increase by 0.086. This finding was expected as countries rich on natural resources have experienced high economic growth. An intuitive example of this is Norway with high oil reserves. Initial GDP/c is significant with a negative coefficient, interpreted such as for each percentage point higher initial GDP/c, the growth rate is expected to be 2.271 percentage lower which is pursuant to the theory of convergence. Lastly, $open$ is not significant in model 5 which was not expected, however, the sign of the coefficient was expected. As goodness-of-fit is 0.595, the model has become significantly better in explaining the variation in GDP-growth, confirming the suspicion of omitted variable bias stated in model 4.

Lastly, in model 6 $inst$ is included. Both $log(FDIC)$ and the interaction term has lost significance. On the contrary to model 5, $group$ has lost significance. Government consumption remained significant with a negative coefficient of -33.926 which is as argued previously, suspected to have been overstated by the model. This is interpreted as previously, a one percentage point increase in government consumption is reducing the GDP growth rate

by 33.926%. Natural resources have lost significance and change sign which was not expected. Initial GDP/c has lost significance, showing that the initial wealth of the country does not have an effect on economic growth when controlling for government efficiency also. Both $open$ and $inst$ are not significant. The model was not expected to estimate the effect of both FDIs and openness to trade insignificantly. Lastly, as $inst$ is not significant, the model cannot support the belief that a higher government efficiency is to have a positive impact on GDP growth rate. The goodness-of-fit for model 6 is 0.669, an increase in comparison to model 6. A major difference between model 5 and 6 is that likewise in the comparison between model 2 and 3, nearly 55% of the observations has been dropped. Furthermore, model 5 contains more significant variables and is therefore identifying several of the expected economical drivers. However, as the empirical framework has been set to control for institutions, model 6 is to be used as it controls for government efficiency which is a key part in the discussion of what drives economic growth in transitioning economies, which is further pursuant to the literature review. In conclusion, findings in model 4-6 was not expected and the high coefficient of government consumption is expected to have been overstated. Therefore, the findings from model 4-6 and in particularly model 6 is to be taken into consideration warily.

In conclusion, the models 1-3 was generally expected with minor contradictions to what was expected based on the theoretical background and the literature review. The authors of this paper estimate model 1-3 to be accurate in estimating the effect of FDIs on GDP/c growth. On the contrary, model 4 and 6 have shown great weakness of various types. Weaknesses of model 4 is that none of the explanatory variables can explain the growth rate of GDP with statistical certainty and model 6 is estimated to have overstated the effect of government consumption significantly. Model 5 have estimated the effects pursuant to what was expected based on the evidence found in the literature review and the theoretical background, however, model 5 is not to be used as it does not control for government efficiency as stated before.

### 4.2.3 Differences between the wealth of the host country

In previous sections, there has been clear evidence that inflows of FDIs affect economic growth. Model 3 and 5 shows that the interaction term is statistically significant, each with the expected sign. In order to further evaluate whether there is a difference between the wealth of the host country, four additional regressions with a small adjustment will be performed. Model 3 and 6 is the final model where all control variables are included for each dependent variable.

These models will be run on each group individually and the coefficients will then be compared. Following is each model in equation form and a table of estimation results where each regression is run on each group individually.

$$Log(GDPC)_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * govgdp_t + \beta_3 * nr_t + \beta_4 * open_t + \beta_5 * inst_t + \boldsymbol{\alpha}_t + u_t; \quad for\ group\ 1$$

**Model 7** (4.7)

$$Log(GDPC)_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * govgdp_t + \beta_3 * nr_t + \beta_4 * open_t + \beta_5 * inst_t + \boldsymbol{\alpha}_t + u_t; \quad for\ group\ 2$$

**Model 8** (4.8)

$$GDPgrowth_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * govgdp_t + \beta_3 * nr_t + \beta_4 * open_t + \beta_5 * inst + \beta_6 * Log(GDPCI) + \boldsymbol{\alpha}_t + u_t; \quad for\ group\ 1$$

**Model 9** (4.9)

$$GDPgrowth_t = \beta_0 + \beta_1 * Log(FDIC_{t-1}) + \beta_2 * govgdp_t + \beta_3 * nr_t + \beta_4 * open_t + \beta_5 * inst + \beta_6 * Log(GDPCI) + \boldsymbol{\alpha}_t + u_t; \quad for\ group\ 2$$

**Model 10** (4.10)

Table 4.8: Estimations results of Models 7 to 10

| | (7) | (8) | (9) | (10) |
|---|---|---|---|---|
| Dependent variable: | Log(GDP/c) | Log(GDP/c) | GDP growth | GDP growth |
| Group | 1 | 2 | 1 | 2 |
| Log(FDIC) | -0.000 | 0.152** | -0.492 | 0.111 |
| | -0.042 | (0.059) | (0.265) | (0.273) |
| Government consumption | 5.527 | -0.502 | -35.195** | 8.443 |
| | (3.509) | (1.456) | (10.734) | (5.901) |
| Natural Resources | -29.939* | -0.046 | 16.851 | 0.522** |
| | (-13.000) | (0.032) | (33.684) | (0.103) |
| Openness to trade | -0.001 | 0.004** | 0.004 | -0.048** |
| | (0.001) | (0.001) | (0.004) | (0.012) |
| Institutions | 0.262 | 0.875** | 3.460** | -0.075 |
| | (0.195) | (0.245) | (0.881) | (0.940) |
| Initial GDP/c | | | -2.747** | -0.009 |
| | | | (0.507) | (0.373) |
| Fixed time effects | Yes | Yes | Yes | Yes |
| Observations | 68 | 72 | 68 | 72 |
| R-squared | 0.058 | 0.962 | 0.841 | 0.683 |

Note: Values without parenthesis are estimated coefficients. Values in parenthesis are robust standard errors. * p<0.05, ** p<0.01

Notably, there is a difference in the number of observations between group 1 and group 2. Since Japan has had years with negative inflows of FDIs, the logarithmic form of the inflows cannot be calculated and these observations are therefore dropped from the regression.

Focusing on $log(GDPC)$, $log(fdic)$ is significant for group 2 but not for group 1. The coefficient is positive with 0.152 which is interpreted such that a 1 percent increase in FDI inflows in a less developed country is to increase GDP/c by 0.152%. Furthermore, openness to trade and institutions are both significant. This is intuitive as in previous discussion it has become clear that both significant trade flows and FDI inflows will affect the growth of GDP/c. Furthermore, variable $nr$ is significant in model 7 but no in model 8, with a very high coefficient. This variable is suspected to have been overstated by the model since natural resources have never been estimated with a coefficient above 1 in any previous model. The goodness-of-fit for model 7 is only 0.058 which is showing that there is a weakness in the model. Combining a low goodness-of-fit and an unexpectedly high coefficient, the authors of this paper is suspecting there is omitted variable bias. Model 8 has a goodness-of-fit of 0.962 where $lfdic$, $open$, and $inst$ is statistically significant with the expected sign and therefore the authors of this paper are concluding that this model estimates the growth of GDP/c accurately.

Models 9 and 10 are regressing GDP growth on FDIs and control variables. In neither one of the models has FDIs become significant which was not expected. Government consumption is statistically significant with an extremely high coefficient of -35.195. As previously, this is interpreted such as a 1 percentage point increase in government consumption is to reduce GDP growth rate by more than 35 percentage points. The authors of this paper are suspecting that this variable has been overstated in the model, which has been the case previously in model 5 and 6. Institutions in model 9 are statistically significant with a positive sign of 3.46 showing that as the estimate of the government efficiency increases by one number, growth rate is increased by 3.46 percentage points. This is a significant increase in growth rate of GDP, however, as the estimates of government efficiency ranges from [-2.5, 2.5], this estimate is plausible. Lastly in the discussion regarding the coefficients of model 9, initial GDP/c is statistically significant with a negative coefficient of 2.747 showing that a 1% lower initial GDP/c is estimated to lower the growth rate of GDP by 2.747 percent. Furthermore, in model 10, $nr$ is significant with a positive sign of 0.522, showing that as rents from natural resources increase by 1 percentage point, GDP growth is estimated to increase by 0.522 percentage points. Openness to trade is also significant with negative coefficient of 0.048 indicating that a 1 percentage point increase in trade flows is to lower the growth rate of GDP by 0.048 percentage points. The sign of openness to trade is not expected and is contradicting the both the theoretical background and what has been discussed in the literature review. A goodness-of-fit for both models has been estimated with 0.841 respectively 0.683. Both values are satisfying, however, as previously stated that as the authors of this paper are suspecting that at least one variable has been overstated in model 9, the accuracy of model 9 is to be considered warily.

In conclusion, the estimates of FDIs in model 7 and 8 has confirmed the theory about convergence discussed in Solow's growth model regarding a less developed host country is expected to have a higher growth rate than a developed country as it is situated further away from the steady state levels of the capital stock. Furthermore, an increase in openness to trade and government efficiency is increasing GDP/c which is expected. The findings regarding how natural resources affect GDP/c is to be taken into consideration with deliberation as a low R-squared has been obtained. The comparisons between model 7 and 8 show that there is a difference in how FDIs affect economic development depending on the wealth of the host country.

Model 9 is further to be considered with deliberation as one variable has obtained an extremely high coefficient, showing that for the industrialized country, at least on country has experienced unusual government spending. However, the model cannot show that FDI affects GDP growth rate in the time range studied when controlling for previously mentioned factors despite the high goodness-of-fit. In addition to his, model 10 has also obtained a high goodness-of-fit and FDIs is not statistically significant. In comparison to model 9, the coefficients of natural resources and openness to trade are significant in model 10 but not in model 9 and government consumption, government efficiency, and initial GDP/c is significant in model 9 but not in model 10. The conclusion is that as a transitioning country is experiencing high economic growth, the economical drivers are different than in the case of a developed country experiencing further economic growth.

# 5 Discussion

Capital flows and investments experienced significant deregulation among less developed countries after the energy crises during the 1970s. Capital flows in 1970 have increased by 145 times in the 30-years following up to 2000, resulting in it becoming a well-researched field within developing economics. In the report released from OECD, there are clear evidence that FDIs can boost development in a transitioning economy through various channels. The host-country can experience an increase in both human capital and capital stock under previously discussed conditions. Combining the mere size of capital inflows with the assumption that host-countries are benefitting from capital flows through spillovers, it is plausible to state that FDIs contribute to development of economies and is a key driver in the development process of an economy.

Recall that the purpose of this paper was to determine if FDIs have any significant effect on economic development in Asian transitioning and developed economies and to further evaluate if the effect differs depending on the wealth of the host-country.

As discussed in the theoretical background, a country that is experiencing significant inflows in the capital stock can either develop the capital stock through capital widening or deepening. Recall that capital widening was discussed in Solow's growth theory where the capital stock was increased through an increase in the physical amount of capital goods. On the contrary, capital deepening is to increase the capital stock through either *i*) quality improvements of existing capital goods or *ii*) invention of new capital goods. Depending on the level of the host-country's technology, the capital stock will develop through capital but differ on how capital goods influence the economic growth. These assertions are further supported by the literature review.

Based on the introduction, the authors of this paper believed that there is enough evidence to confirm that FDI is to enhance growth. The theoretical background presents a model that has been derived from the Solow's growth model. The Solow model showed that persistent long run growth can be achieved through increases in capital stock, primarily through the advancement in the technological progress. However, a weakness of the Solow model was that technological progress was kept exogenous and was limited in the discussion of the properties of technological progress. The Solow model has been the base for several growth theories that

was developed with the ambition to explain growth more accurately. Neuhaus model is explaining technological progress by extracting factors that affect the capital stock and manipulated the function in order to show how technological progress is augmenting the capital stock. One key feature of Neuhaus's FDI model is the process of capital deepening. This paper does not distinguish between how FDI inflows affect the capital stock but focuses mainly on the presence of FDI. With the final FDI model presented in the theoretical background, the authors of this paper is interpreting the theoretical background such as it is confirming the assumption that FDI is to increase development and economic growth. The FDI model is showing that a developed country will experience growth through primarily invention of new capital goods or improving the quality of existing capital goods due to the fact that a developed country is assumed to be at the technological frontier (Neuhaus 2006). The improvements are considered marginal. On the contrary, as a transitioning economy is far from a steady state level and have a limited variety of capital goods in comparison to the world level of capital goods. If a foreign country is to introduce for the host-country new technology, the effect will be significant. These assumptions are supported by the theory of convergence. The model itself is explaining growth relatively accurate and pursuant to the key findings in the literature review. However, as the model does not account for domestic production or excludes other sources of economic growth, the model can only be interpreted such as it gives a good indication of possible effects rather than true estimation of how FDI inflows will affect a host-country's development. Considering the findings in the theoretical background, the authors of this paper is to expect a significant effect of FDI in the regression.

Furthermore there are many earlier studies regarding this subject, collectively most on them concludes the same thing, FDI has a positive effect on economic growth in developing countries. Johnson (2006) likewise this study argues that through spill-over of technological development due to foreign direct investment, will lead to an increasing in economic growth and a general development in the host country. Johnsons (2006) concludes that there is a significant effect from FDI on economic growth in developing countries, assumable from technological improvements. This further strengthens the authors of this paper's beliefs that the result in this paper would imply the same. As written in paragraph 3.2 there is studies that did not find any significant effect made by FDI on economic growth, even though they all use a relatively similar method the result in the different studies differ. The thoughts of the authors of this study is that the usage of different control variables, small changes in method, and number of observations will determine a substantial part of the outcome. An expectation for

the effect is therefore difficult to conduct. In addition to this it will be said that the countries this study investigate is not solely examined earlier. Expectations for the result was therefore made by a combination of theory knowledge and result in earlier studies regarding similar thesis.

With regard to the difference in earlier studies results and the limitation in this paper's examined countries and variable the authors of this paper is not concluding any exact effects on economic growth attributed to FDI, but rather if there is a significant effect, and determine the sign of this effect.

## 5.1 The estimation of effects

In evaluating the output from model 3 and 6, all significant variables have the expected sign according to table 4.6. In model 3, the output is showing that there is a significant effect of FDI on $log(GDPC)$. The variable $group$ is significant, however, as it only affects the intercept, it is not of interest for the purpose of this paper. In model 3, the interaction term is positive, showing that if a country belongs to group 2, the inflows of FDI is to have a positive effect on the GDP/c growth. This is confirming that FDI is important for the growth of transitioning economies. Further, government efficiency is also statistically significant, showing that as an economy is having a higher degree of government efficiency, it is to increase the GDP/c growth. This output from the regression is confirming the conclusion made on the basis of the theoretical background. A transitioning economy is to experience higher growth if FDI inflows are present. In addition to this finding, since $log(FDIC)$ is not significant but the interaction term is significant, the conclusion is that a transitioning economy is to be able to attribute a higher degree of the growth to FDI inflows. This is pursuant to what was discussed in both the introduction, theoretical background, and the literature review. Equally important is that this finding is pursuant to the convergence theory discussed in the theoretical background. If a country is further away from the steady state level, an inflow of FDI is to have a higher positive impact on growth in comparison to a developed country. This finding confirms the expected result of the FDI model.

However, the FDI model have weaknesses as discussed before. The model trying to estimate the effect of FDI inflows on GDP/c is lacking the feature of reflecting the weaknesses of the FDI model. Domestic production has been excluded and the model does not account for if the

production in the host-country is to serve the domestic market. Conversely, as the purpose of this paper is not to determine how FDI affect economic growth but just to determine that there is an effect, this model has satisfied the ambition of the purpose of the paper. Model 3 is answering the first question in the question formulation accurately.

In model 6, the same conclusion cannot be done. As there is no evidence in the regression that FDI inflows is to affect GDP growth rate, FDI is not believed to accelerate the growth rate of GDP. The reason for including GDP growth rate and estimate the effect of FDI on this dependent variable is to determine if it can further boost high growth rates. All countries observed have had a significant growth rate for a long period of time and the lack of effect from FDI is arguably because as growth rates become higher, it can be expected to establish several drivers rather than just one significant. The findings in model 6 was unexpected as FDI was suggested to increase growth, however, as GDP-growth is measured in local current currency, this opens up for currency volatility and can therefore affect the output. The output has to be taken into consideration warily as it contradicts evidence from the literature review. Furthermore, the pairwise correlation matrix, appendix B, table (B.3), showed that there would be a weak correlation between $lfdic$ and $gdpg$ which can be attributed to currency denomination.

Model 3 and 6 showed the estimate on each dependent variable. Recall that one part of the purpose of this paper is to determine if there is a difference of effect depending on the wealth of the recipient country. Model 7 and 8 is showing the difference between groups on $lgdpc$ and model 9 and 10 is presenting the effects on GDP growth rate. Therefore, these models will be interpreted jointly.

As seen in table 4 for model 7 and 8 in the section 4.2.3., $lfdic$ is significant only for the group consisting of transitioning countries. Furthermore, rents of natural resources are significant for group 1 with a negative sign while for group 2, openness to trade and government efficiency is significant. Besides $lfdic$, openness to trade is seen as a driver of economic growth for transitioning economies according to the findings in literature review. Establishing that both $lfdic$ and openness to trade is significant in model 8 with positive signs, it is expected that pursuant to the theory of convergence discussed in theoretical background, a transitioning country is expected to have higher impact on growth. Model 8 confirms the theory about

convergence and the discussion of several drivers of economic development in transitioning economies.

In the discussion regarding GDP growth rates, the findings from the model was not expected intuitively as $lfdic$ is not significant in neither one of the models. There is evidence in literature review and theoretical background showing that there will be different determinants of economic growth, depending on the current wealth of the transitioning country. Model 9 and 10 confirms this argument as not one variable is significant for both groups. There is a difference of determinants of growth for each group. However, $lfdic$ is not affecting GDP growth rate. In addition, previous pairwise correlation matrix, appendix B, table (B.3), showed that there is a weak relationship between $lfdic$ and $gdpg$, therefore this finding is not all unexpected. One weakness of model 9 and 10 however is the difference between how the dependent variable was measured and the explanatory variables. Therefore, the model is to be taken into consideration warily as the findings both confirm and contradict various aspects of previous literature review.

## 5.2 General discussion

The models have found a positive effect of FDI on GDP/c growth. However, as model 3 focuses on capital inflows and GDP/c, it is plausible that FDI affects growth by increasing capital stock. For this reason, it is conceivable that there is a degree of technological spillovers pursuant to the theoretical background regarding persistent long term growth through technological progress. Therefore, as this paper has found evidence on economic growth over 46 years for some of the observed countries, the effect of FDI is persistent.

There are several general weaknesses of the empirical models. First, the models assume that the host-country is an open economy and accessible for foreign firms to invest in. This estimate can therefore not be used for any country that is pursuing low capital mobility and high capital restrictions. Second, all the control variables are of internal properties in such a way that the local policy making can influence values observed in control variables, resulting in a possibility that the models hold key factors exogenous and therefore either overstates or understates the effect of each variable. Third, since the discussion regarding growth is complex and can be achieved through several determinants, the models cannot answer on whether there is a clear causality between growth and inflows of FDI. The models can only answer on when controlling

for variables of economic character that are under direct influence of local policy makers, there is a correlation between FDI and GDP/c growth. Fourth, the empirical evidence does not consider current state of the host-country. If a host-country is extremely poor, it can experience challenges in reaping the benefits of FDI. Lastly, as it excludes domestic sector, growth can be a result of a strong domestic sector before being an effect of inflows of FDI. In conclusion, as there are several factors that has to be excluded in order to produce a model that is manageable, models presented in this paper are not to be used as a general true estimate but rather give an indication that FDI can have an effect on GDP/c under certain conditions.

# 6 Conclusion

This study has argued that there is a persistent economic development attributed to inflows of FDI. The empirical evidence has shown that inflows of FDI is affecting GDP/c positively in transitioning economies under certain conditions such as, the country has to be open and offer foreign firms the access to the domestic market. For developed countries, this study has not found that FDI affects economic growth. The empirical models have further shown that there are different drivers of economic growth depending on the wealth of the host-country, pursuant to the theoretical background and findings in the literature review. In addition, FDI is not to have an effect on GDP growth rate for neither developed or developing countries when controlling for government consumption, openness to trade, rents from natural resources, and government efficiency.

However, as the subject of FDI is complex, determining true effects of FDI on economic growth is challenging since a country is subject to exogenous factors. Therefore, the evidence presented can only explain growth in the countries used in the study and not be considered a general rule for all transitioning economies. One major strength of this study is that the time range has been extended to account for significant historical economic events in comparison with previous studies.

In conclusion, this study has found evidence that FDI is contributing to development in Asian transitioning economies through an increase and/or improvement in the capital stock and therefore increasing growth.

## 6.1 Further research

To further evaluate the effect of inflows of FDI in transitioning economies, the number of observations has to be increased in such a manner that it accounts for multiple countries in different regions. This study has been region-specific and this weakness can be solved by increasing the number of countries.

Lastly, future studies should include control variables that accounts for factors outside of reach for local policy makers.

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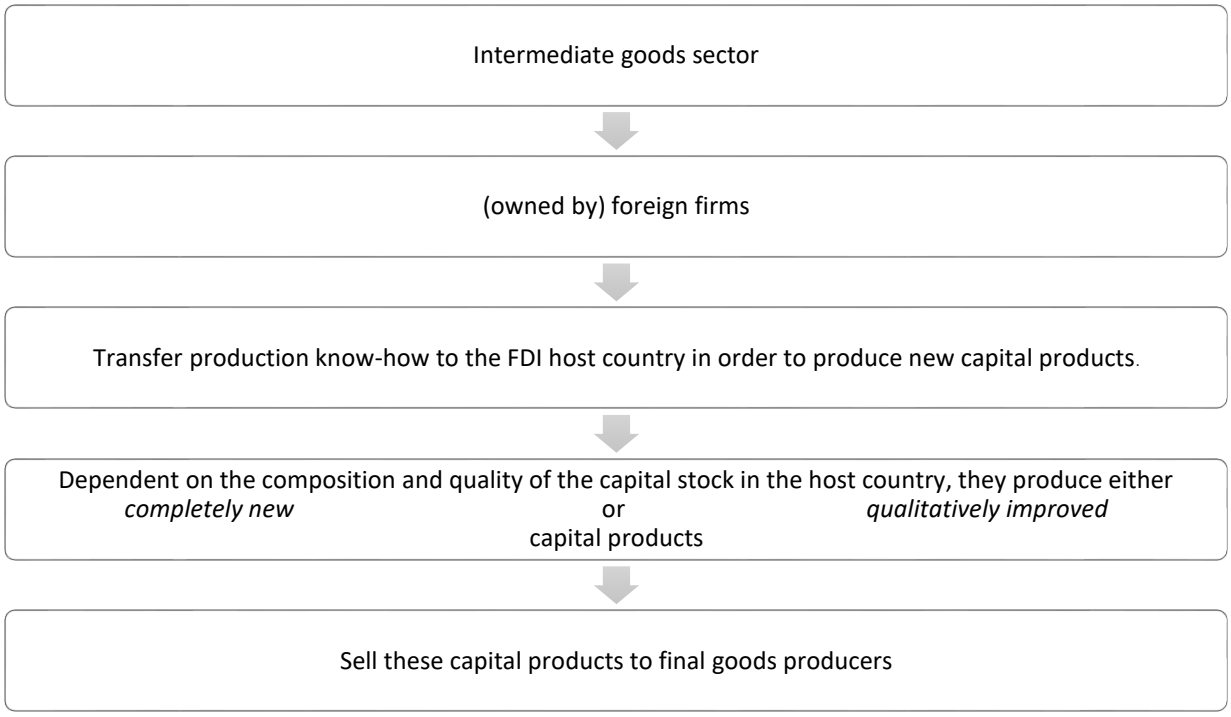
# 8 Appendix A

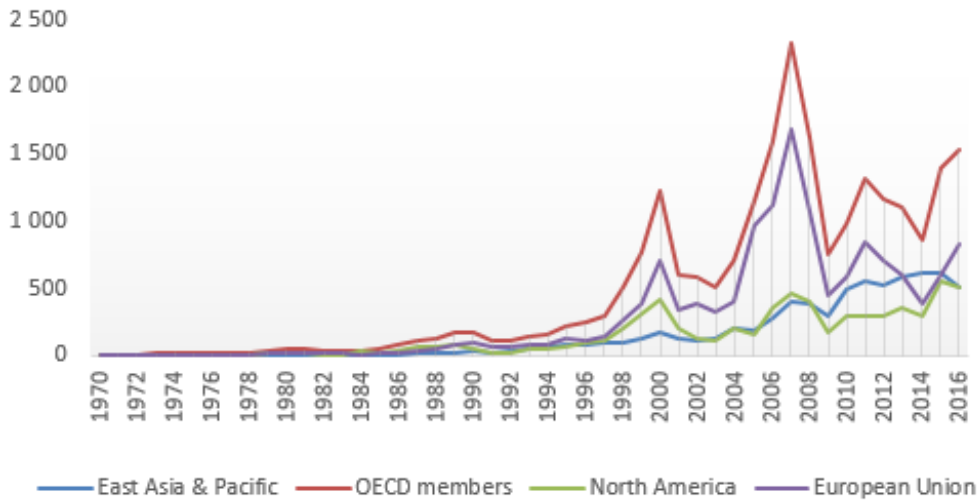
## 8.1 Figures

### 8.1.1 Figure 1: Capital production in Open-Economy FDI Model



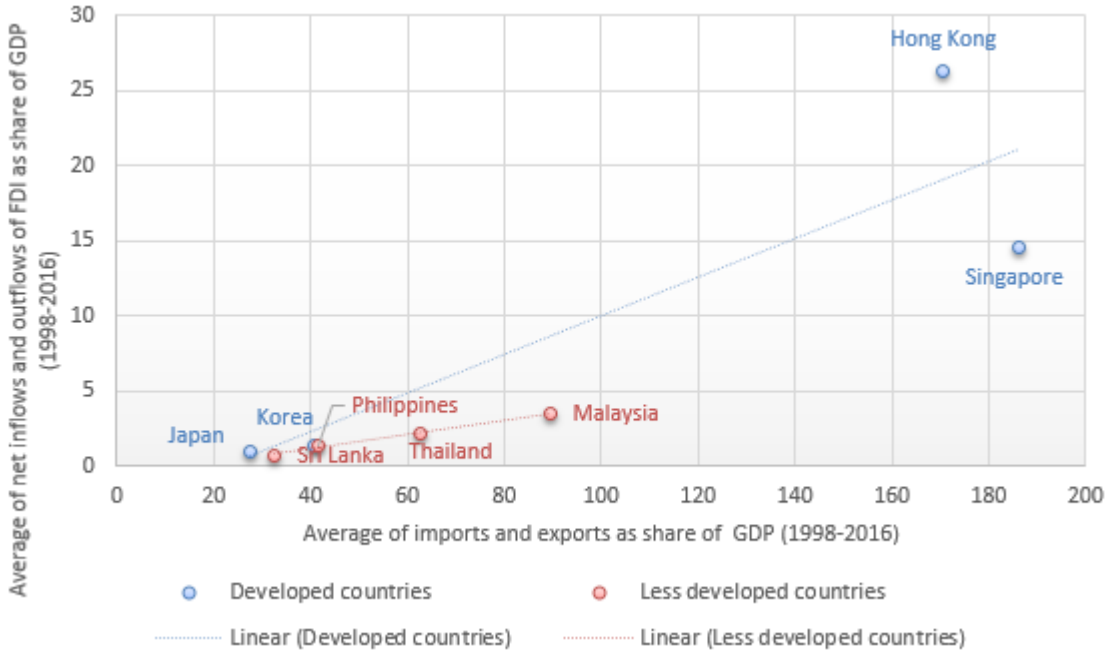
## 8.2 Graphs

### 8.2.1 Graph 1: Net inflows of Foreign Direct Investment for major regions ($ bn)




Source: World Bank (2016).

### 8.2.2 Graph 2: Openness to trade and FDI




Source: World Bank (2016).

## 8.3 Tables

### 8.3.1 Table 1: Overview and comparisons between countries chosen to study

| Developed | GDP | Population | GDP/c | GDP growth | HDI |
|---|---|---|---|---|---|
| Hong Kong | 320 910 000 000 | 7 346 700 | 43 741 | 2.0456% | 0.917 |
| Japan | 4 949 273 000 000 | 126 994 511 | 38 972 | 0.9382% | 0.903 |
| Singapore | 296 976 000 000 | 5 607 283 | 52 962 | 1.9963% | 0.925 |
| South Korea | 1 411 246 000 000 | 51 245 707 | 27 539 | 2.8277% | 0.901 |
| *Average* | *1 744 601 250 000* | *47 798 550* | *40 804* | *1.9520%* | *0.912* |

| Less developed | GDP | Population | GDP/c | GDP growth | HDI |
|---|---|---|---|---|---|
| Malaysia | 296 536 000 000 | 31 187 265 | 9 508 | 4.2199% | 0.789 |
| Phillipines | 304 905 000 000 | 103 320 222 | 2 951 | 6.9239% | 0.682 |
| Sri Lanka | 81 322 000 000 | 21 203 000 | 3 910 | 4.3797% | 0.766 |
| Thailand | 407 026 000 000 | 68 863 514 | 5 911 | 3.2380% | 0.740 |
| *Average* | *272 447 250 000* | *56 143 500* | *5 570* | *4.6904%* | *0.744* |

Source: World Bank (2016) and United Nations Development Programme (2015).

## 8.4 Mathematical derivations

The first assumption of constant returns to scale is interpreted such as if the inputs are multiplied by a constant $c$, the output will also increase equally, which is illustrated by equation (A.1) and (A.2) (Romer).

$$F(cK, cAL) = (cK)^{\alpha}(cAL)^{1-\alpha}; \quad c \geq 0 \tag{A.1}$$

$$= cF(K, AL) \tag{A.2}$$

Moreover, it is assumed that the marginal product of an input factor is positive which is shown in equation (A.4) and that the marginal product of input is diminishing as the level of input increases, illustrated by equation (A.5). As $k = K/AL$, $y = Y/AL$, and $f(k) = F(k, 1)$, an intense and simpler function can be used to show the marginal product of input factors:

$$y = f(k) \tag{A.3}$$

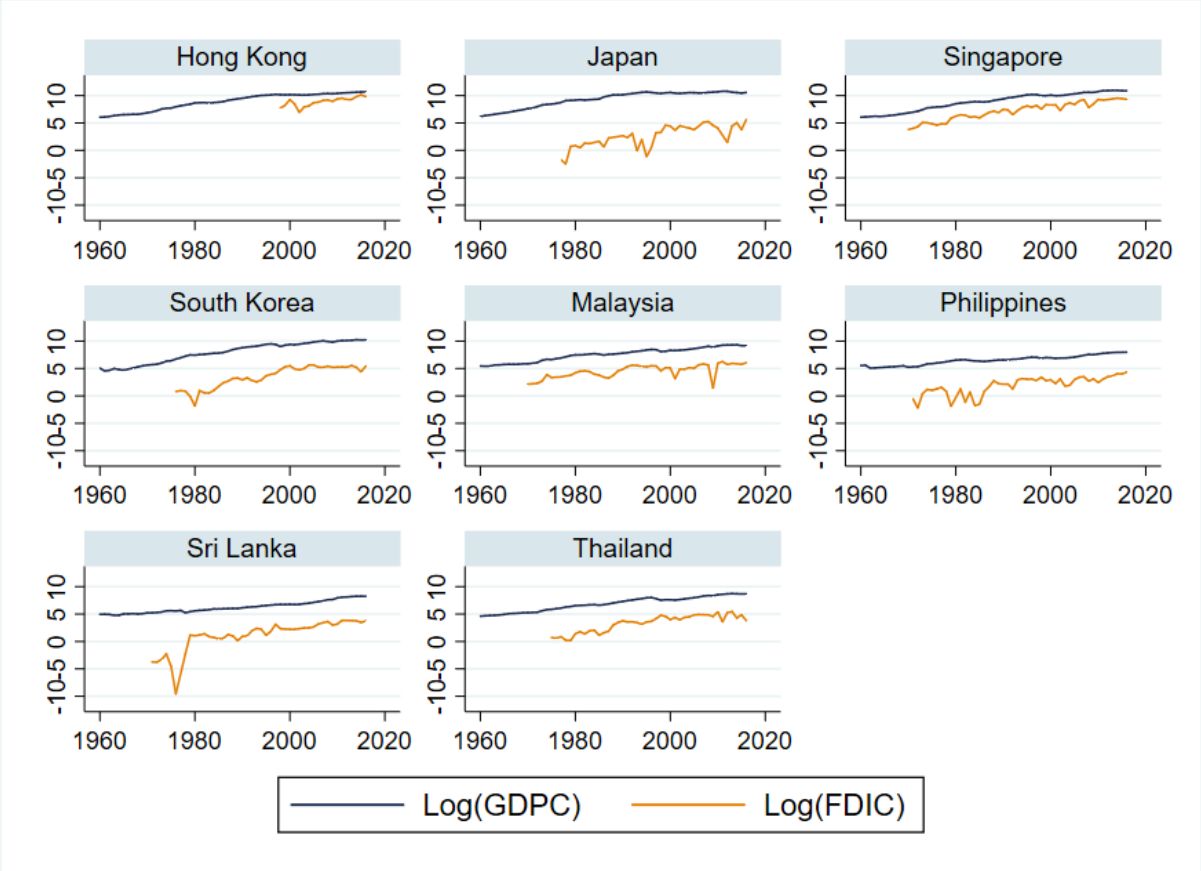
$$f'(k) > 0 \tag{A.4}$$

$$f''(k) < 0 \tag{A.5}$$

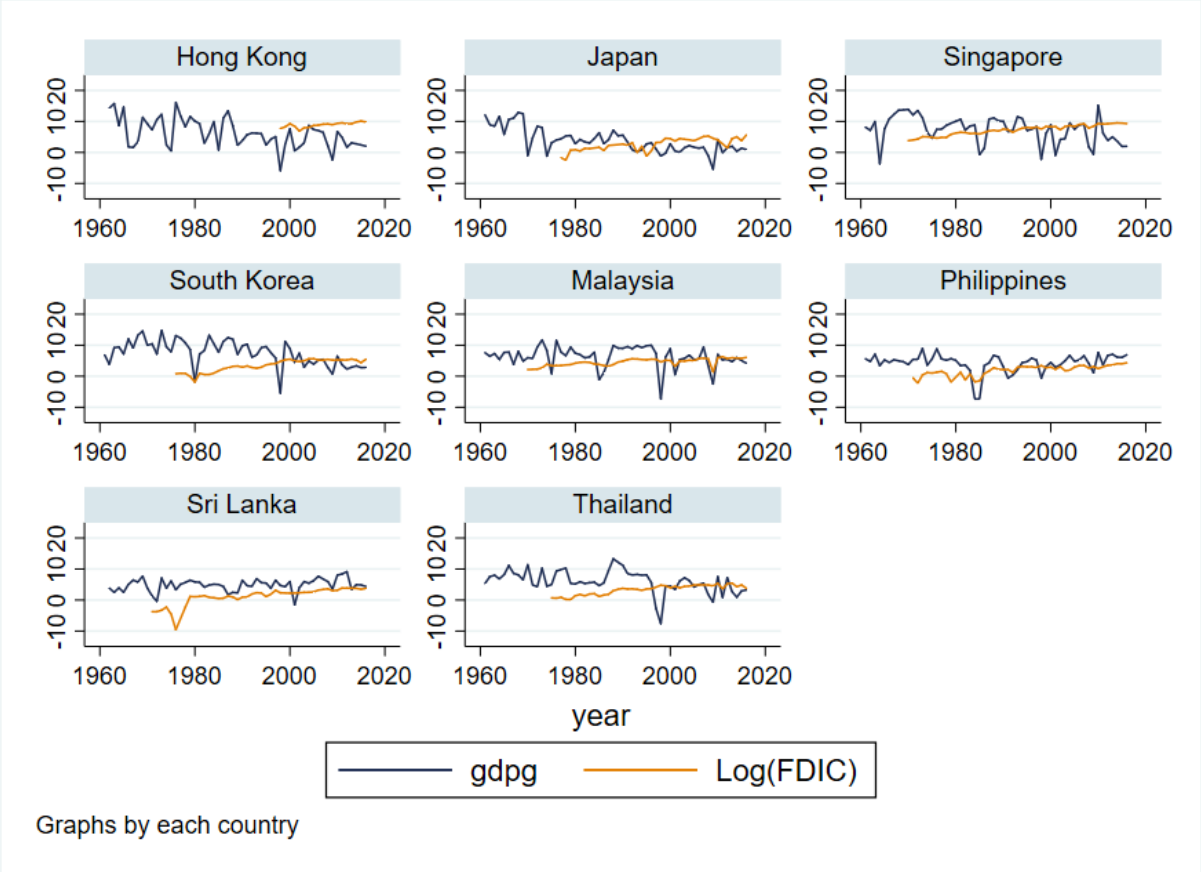
# 9 Appendix B

## 9.1 Graphs

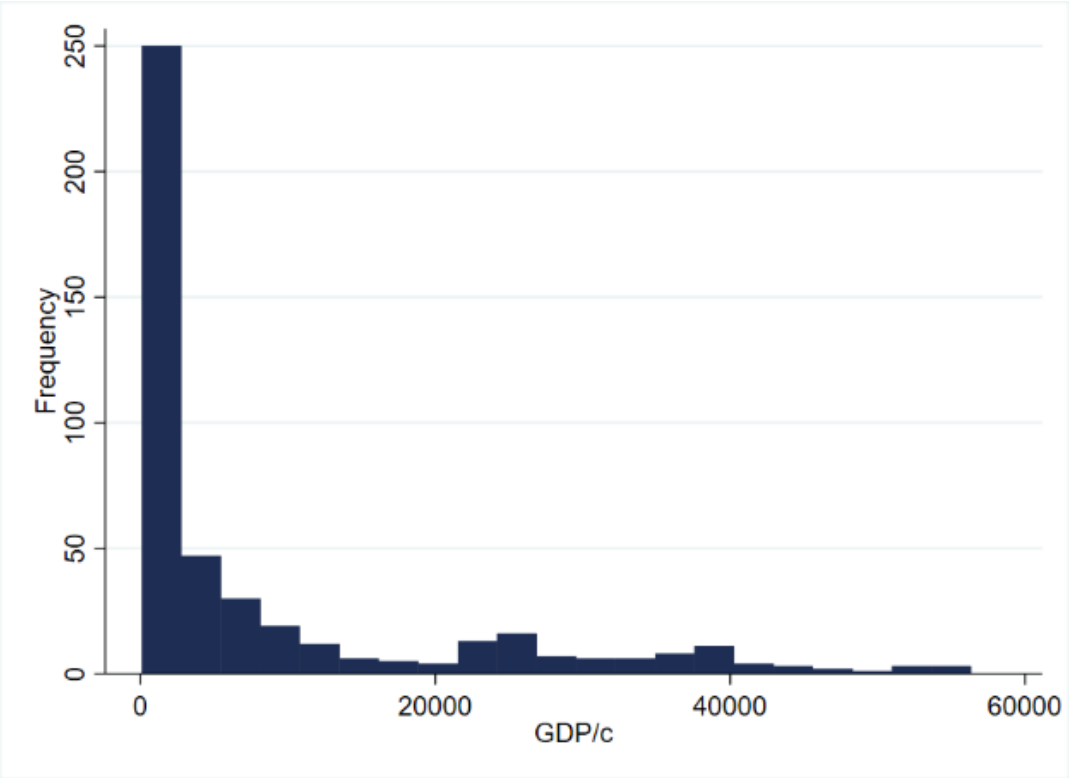
### 9.1.1 Graph 1: Graph of log(GDPC) and log(FDIC) for each country



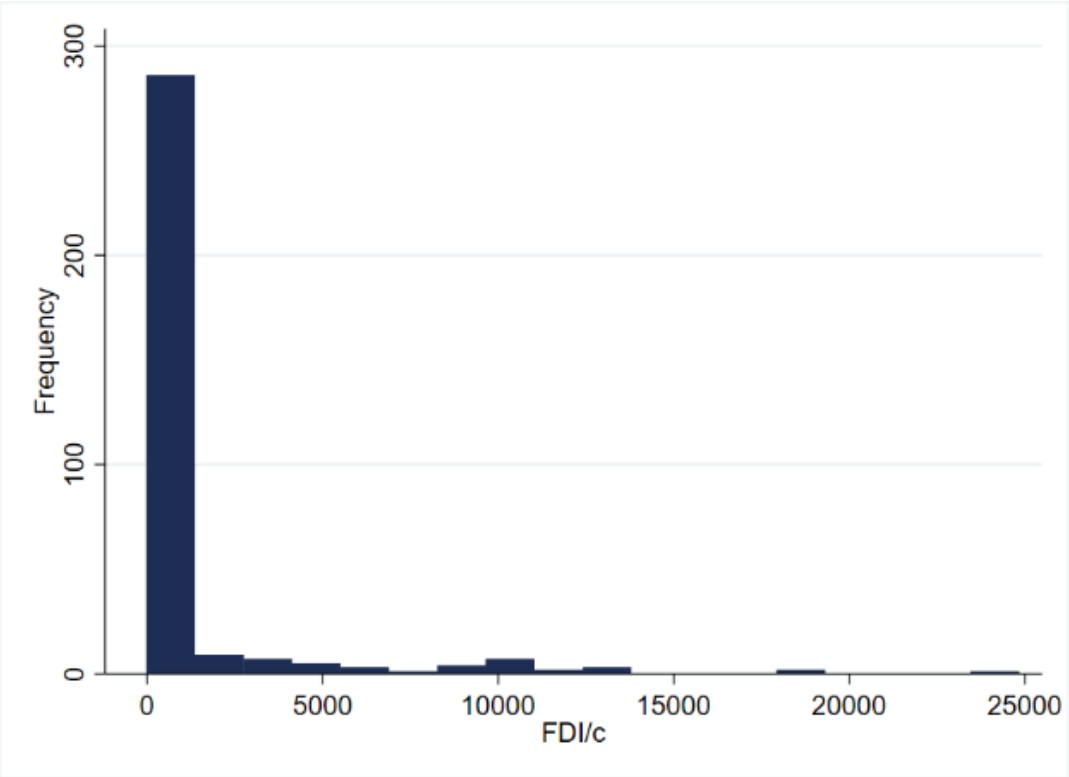
### 9.1.2 Graph 2: GDPG and log(FDIC) for each country



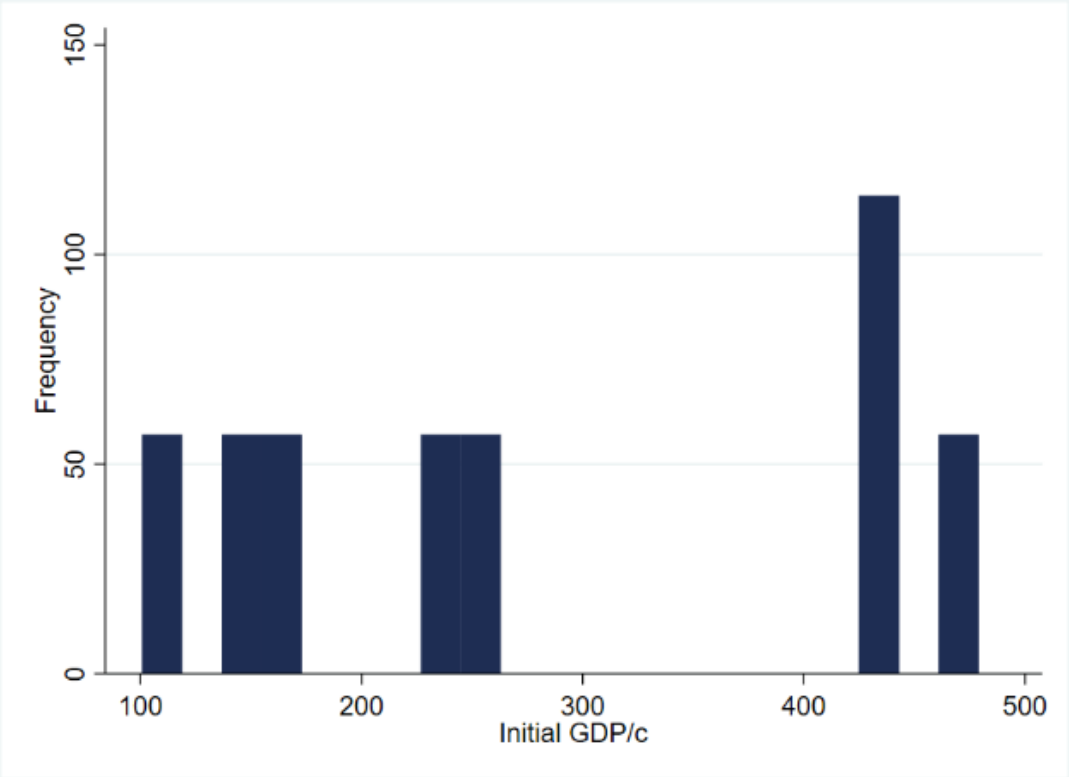

### 9.1.3 Graph 3: Histogram of GDP/c



### 9.1.4 Graph 4: Histogram of FDI/c




### 9.1.5 Graph 5: Histogram of initial GDP/c



## 9.2 Tables

### 9.2.1 Table 1: Hausman test

Following table show the output from Hausman test of both model 3 and model 6.

| | Coefficients | | | |
|---|---|---|---|---|
| | (b) | (B) | (b-B) | sqrt(diag(V_b-V_B)) |
| | fe | re | Difference | S.E. |
| Model 3 | | | | |
| lfdic | -0.010 | -0.028 | 0.017 | |
| Interaction | 0.780 | 0.266 | -0.188 | |
| govgdp | -2.735 | 1.014 | -3.750 | |
| open | -0.002 | -0.001 | -0.002 | |
| nr | 0.014 | 0.003 | 0.013 | 0.006 |
| inst | -0.235 | 0.723 | -0.957 | 0.039 |
| Chi2 = | (b-B)'(V_b-V_B)^(-1)(b-B) | | | |
| = | 428.78 | | | |
| P-value = | 0.000 | | | |

| | Coefficients | | | |
|---|---|---|---|---|
| | (b) | (B) | (b-B) | sqrt(diag(V_b-V_B)) |
| | fe | re | Difference | S.E. |
| Model 6 | | | | |
| lfdic | 0.026 | -0.127 | 0.153 | 0.102 |
| govgdp | -2.817 | -30.150 | 27.332 | 7.551 |
| open | -0.007 | 0.003 | -0.010 | 0.006 |
| nr | 0.102 | 0.060 | 0.042 | 0.198 |
| inst | 0.722 | -0.158 | 0.880 | 1.290 |
| Chi2 = | (b-B)'[(V_b-V_B)^(-1)](b-B) | | | |
| = | -5.78 | | | |
| P-value = | N/A | | | |

### 9.2.2 Table 2: Shapiro-Wilk tests for variables

| Variable | Obs | W | V | Z | Prob>z |
|---|---|---|---|---|---|
| gdpc | 456 | 0.692 | 95.264 | 10.908 | 0.000 |
| lgdpc | 456 | 0.957 | 13.351 | 6.204 | 0.000 |
| fdic | 330 | 0.387 | 142.110 | 11.688 | 0.000 |
| lfdic | 321 | 0.975 | 5.620 | 4.066 | 0.000 |
| gdpci | 456 | 0.906 | 29.066 | 8.066 | 0.000 |
| lgdpci | 456 | 0.934 | 20.324 | 7.210 | 0.000 |

### 9.2.3 Table 3: Pairwise correlation matrix

| | lgdpc | gdpg | lfdic | govgdp | open | nr | inst | lgdpci |
|---|---|---|---|---|---|---|---|---|
| lgdpc | 1.000 | | | | | | | |
| gdpg | -0.231 | 1.000 | | | | | | |
| lfdic | 0.707 | 0.056 | 1.000 | | | | | |
| govgdp | 0.212 | -0.291 | -0.040 | 1.000 | | | | |
| open | 0.454 | 0.084 | 0.768 | -0.310 | 1.000 | | | |
| nr | -0.208 | 0.122 | -0.009 | 0.333 | -0.059 | 1.000 | | |
| inst | 0.906 | 0.097 | 0.814 | 0.022 | 0.679 | -0.103 | 1.000 | |
| lgdpci | 0.495 | -0.049 | 0.407 | -0.083 | 0.447 | -0.071 | 0.729 | 1.000 |