# Determinants and Economic Impacts of North-South and South-South FDI in ASEAN : Panel Regression Analyses

Peseth, Seng
Graduate School of Economics, Kyushu University : Graduate Student

https://doi.org/10.15017/1522107

出版情報：経済論究. 152, pp.65-98, 2015-07-27. 九州大学大学院経済学会
バージョン：
権利関係：

# Determinants and Economic Impacts of North-South and South-South FDI in ASEAN: Panel Regression Analyses

Peseth Seng†

Abstract: This paper uses panel data of 10 ASEAN countries from 1995 to 2008 and studies the cross-country and industrial distribution of North and South FDI, investigates host country-specific determinants of the inflows of total FDI, North FDI and South FDI, and also compares the effects of North and South FDI on economic and industrial growth in the region.

## 1. INTRODUCTION

Association of Southeast Asian Nations (ASEAN) which is one of the world's fastest growing regions has attracted much international focus and become the primary destination for the global FDI, especially, after the signing of ASEAN Free Trade Agreement (AFTA) in 1992. FDI into ASEAN rose to $79 billion in 2010 (UNCTAD 2011). This surge in FDI inflows was believed to be driven by the country-level proactive policies to attract FDI, good economic performance, potential market growth, cheap labor force and abundant natural resources of the member states. For example, FDI-related administrative procedures were improved and more industries were liberalized in countries such as Cambodia, Indonesia, and the Philippines. Some ASEAN countries like Vietnam and Indonesia have benefited a lot, in terms of FDI inflows, from the rising labor cost and production cost in China. However, the growth in FDI inflows varies greatly across countries in the region ranging from 537% in Malaysia and 173% in Singapore to 45% and 10% in Cambodia and Lao respectively in 2010 (UNCTAD, 2011). According to ASEAN Statistical Yearbook 2008, Singapore alone accounted for 46.1% of total FDI inflows into the region, followed by Thailand 17%, Malaysia 13.8%, Vietnam 7.2%, and Indonesia 7%. On the other hand, the other 5 member states attracted only 8.8% of the FDI inflows in total. Different government policies, economic performance, and comparative advantages of various member states are said to be the reasons for this fluctuation in FDI inflows into the region. Regarding the source of FDI, developed countries such as Japan, EU and the U.S. (known as North) have always been the main sources of FDI inflows into ASEAN. However, FDI from South Korea, China, Taiwan, Hong Kong and India (known as South) have recently become other main sources of investment in the region. The importance of these two types of FDI also differs across

† Graduate Student, Graduate School of Economics, Kyushu University

countries and industries in ASEAN. For example, while FDI from South is predominant in Cambodia, and Lao, North is the main source of FDI for all other countries (ASEAN Statistical Yearbook 2008). Furthermore, the study of Indonesian manufacturing industries by Takii (2011) indicated that while MNEs from South were the main investors in food, textile, wood and furniture, paper and printing industries, Japanese MNEs were predominant in chemicals, basic and fabricated metals, and machinery industries.

It has also been suggested that FDI from North and South may be attracted by different host countries' factors. For example, Cuervo-Cazurra and Genc (2008) indicated that while relatively poor institutions may be an obstacle in attracting FDI from foreign firms located in the developed countries, this lack of market mechanism can be an advantage for firms from developing countries with previous experience of working in such a similar environment. Lipsey and Sjöholm (2011) studied the determinants of FDI and development in East Asia found out that MNEs from North and South differ in size, productivity, technology and management styles. Therefore, the effects of North and South FDI on economic growth and industrial development in host countries may also differ. This also indicates that the characteristics of each host country and source country (North and South) and the interaction between the two may be significant factors influencing the inflows of FDI and the effects of FDI on economic and industrial growth of the host countries. Moreover, the growing significance of the role of South FDI in the whole world as well as in ASEAN region suggests that both North and South will be the main sources of FDI inflows into ASEAN countries. Therefore, a comparative investigation of the determinants of FDI inflows from both North and South and the impacts of FDI inflows on economic performance and industrial development in the region is important. The results of this study can be used for designing an appropriate policy framework for attracting more foreign investment for sustainable economic growth and development.

This paper uses panel data of 10 ASEAN countries from 1995 to 2008 to investigate the cross-country and industrial distribution of North and South FDI into the region, and to compare the effects of these FDI inflows on economic growth and industrial development in ASEAN countries. The paper is organized as follows. Section 2 provides a review of both theoretical and empirical literature. Sections 3 discussed the variables, data sources and methodology used for analysis. Section 4 presents and discusses the empirical results of the study. Section 5 concludes the main findings and policy implications and provides suggestion for further research.

## 2 . LITERATURE REVIEW

The traditional approach used to explain the MNEs' location choice of FDI was the eclectic paradigm or OLI approach proposed by Dunning (1979). Based on this theory, in order to form

a foreign affiliate and generate profits, multinational firms need to simultaneously have three advantages, namely, ownership, location, and internalization. The ownership advantages refer to the firm-specific advantages that can be transferred and shared between parent and foreign affiliates with lower costs that may offset the costs incurred from operating in a distant location. These particular assets include technology and knowledge to produce differentiated products, monopolistic benefits (e.g., brand name, patent rights, ownership of scarce resources, and the like), and advantages of large size (economies of scale and scope, economies of learning, benefits from global diversification of assets and risks). Internalization advantages occur when a firm has an ability to retain control on its foreign affiliates instead of engaging in other relationship such as licensing or outsourcing. Firms may incur higher overhead costs if goods are produced by an independent entity or it may find it difficult to secure its technology property which is made available to a nonaffiliated party. While ownership and internalization advantages are firm-specific, the location advantages relate to the host countries' characteristics which are subjected to empirical investigation in this research. In a broader sense, the attractiveness of various locations or countries can be categorized into economic, political, and social and cultural advantages. Country-specific economic advantages that MNEs can exploit include the qualities and quantities of production factors (e.g., labor forces, labor cost, labor productivity, human resources, and natural resources), physical infrastructure (e.g., energy cost, transport and communication cost), market size and scope (e.g., GDP, per-capita GDP, and GDP growth) and international economic relationship (e.g., member of WTO or bilateral or regional free trade agreement). The political factors determining the location decision of FDI refer to the common and particular government policies of host countries that affect international production and trade. Finally, similarities between host and source country of FDI in terms of psychology, language, norms, attitudes, tastes and preferences are examples of the social and cultural advantages.

Despite the major contribution of OLI approach to the explanation of a wide variety of factors influencing FDI decisions, Dunning (1988) acknowledged that the generality of this theory makes it less powerful to understand and predict specific types of FDI. As a result, alternative analytical paradigms, commonly known as "new trade theory", were developed based on the combination of industrial organization theory, including OLI approach, and trade theory (see, e. g., Helpman, 1984; Zhang & Markusen, 1999; Ekholm et al., 2003). The new trade theory indicates the proximity-concentration tradeoff as a determinant of horizontal FDI and factor-proportion as motivation of vertical FDI (Faeth, 2009). According to proximity-concentration tradeoff hypothesis, firms choose to serve foreign markets by either exporting which incurs higher variable costs (e.g., shipping cost, and various trade barriers) or by subsidiary sale that may save export variable costs, but may still incur a fixed investment cost. Based on this approach, larger market size, lower fixed cost of FDI, and higher impediments to trade raise the

profitability of affiliate sales relative to exporting and thus encourage more horizontal FDI. Factor-proportion approach suggests that production processes that involve different factor intensities and can be geographically fragmented and relative factor endowments of different countries are the main determinants of vertical FDI (Faeth, 2009). In this case, a multinational firm can save production cost by locating unskilled labor-intensive activities in the countries with relatively cheaper unskilled labor, and skilled labor-intensive production stages in those with relative abundant skilled labor. Ekhlom et al. (2003) developed a model based on three regions with two identical, large high-cost economies and a small low-cost economy and examined two different cases in which export-platform FDI exists. The first case is when the two large economies are symmetric, the transport cost of intermediates and plant fixed costs are moderate, and the small country has moderate cost advantage in assembly. With these conditions, a firm in each high-cost economy can increase profits by producing components at home and establishing assembly plant in low-cost country to serve other high-cost country. Second, export-platform FDI are also motivated by trade liberalization between one of the big high-cost countries and the small, low-cost country. Firms from outside high-cost country may set up production plant in the low-cost country to save production costs as well as to serve large country's market in the free trade area.

Another theory on location choices of FDI is based on institutional approach. This theory suggests three political variables, namely, financial and economic incentives, tariffs, and tax rates as the main factors influencing FDI decision (Assunção, Forte & Teixeira, 2011). From an institutional perspective, MNE's location decision depends on the institutional forces, particularly regulations and incentives, which affect their international activities in an uncertain, risky and confrontational environment (Francis, Zheng & Mukherji, 2009). Faeth (2009) regarded FDI as a game whose players are MNE and host countries or as a contest between various host governments to attract FDI inflows. FDI decision follows critical bargain between MNE and host countries over many FDI-related government's intervention instruments such as taxes, subsidy policy (e.g., government grants, credits or insurance) employment regulations (e.g., compensation condition of local employees, training, and use of foreign staff), capital control (e.g., expatriation of profit or capital and exchange rate structure), and export condition (Faeth, 2009). Examples of such institutional theories includes Bond and Samuelson (1986), Black and Hoyt (1989), and Haufler and Wooton (1999). Kang and Jiang (2012) indicates regulative, cognitive and normative institutions as the three pillars of institutional theory due to the fact that they provide the foundation for legitimacy. Regulative dimension relates to the formulation and implementation of rules so as to ensure social order and stability. The normative dimension determines social behavior through prescriptive and obligatory values and norms while the cognitive pillar refers to the established structures in the society that are taken for granted. MNEs tend to invest in

the countries whose three pillars impose less institutional constraint on their FDI activities and are more likely to be conformed with.

The theoretical models of location choices of FDI suggested many different host country-specific determinants of MNE's decision to establish foreign affiliates. A large number of empirical work have also been conducted, especially during the last 2 decades, to test the influences of those factors on FDI inflows into different countries and regions (see, amongst other, Schneider & Frey, 1985; Biswas, 2002; Bevan & Estrin 2004; Asiedu & Lien 2004; Asiedu, 2006; Botrić and Škuflić, 2006; Cleeve, 2008; Mhlanga, Blalock & Christy, 2010; and Majeed & Ahmad, 2010). However, the results are often mixed depending on the host countries under study. This paper studies six different determinants of FDI inflows into ASEAN countries, namely, market size, labor productivity, trade openness, institutional quality, natural resource intensities, and physical infrastructure. These determining factors are commonly used and tested by many empirical researchers for both industrialized and industrializing countries and regions (see Cleeve, 2008; Asiedu, 2006; Schneider & Frey, 1985; Biswas, 2002; and Mhlanga et al., 2010). The following subsections present a review of literature of these six determinants, the effects of FDI on growth, North-South and South-South FDI.

### Market Size

The inward FDI has been widely considered as a function of host-country's market size, which is typically measured by gross domestic product (Majeed & Ahmad, 2010). The market size hypothesis suggests that the countries with larger market demand, healthy economic condition, are more attractive to FDI as they provide the opportunities for MNEs to exploit their ownership advantages and enjoy economies of scale by producing larger volume (Cuyvers, Soeng, Plasmans & Van Den Bulcke, 2011). Market size effects on inward FDI can be classified into demand effect and scale effect (Davidson, 1980). Based on demand effects, for FDI to exist, there must be sufficiently large host countries' demand for output that makes foreign subsidiary sale more profitable than export. The scale effect implies that locating production plant in the countries with high enough demand allow MNEs to realize their economies of scale production. A number of empirical investigations have confirmed a positive correlation between FDI inflows and host countries' market size in developing regions. Asiedu (2006) used panel data for 22 Sub-Saharan African (SSA) countries from 1984 to 2000 and found that market size have significant positive effect on FDI inflows. Mhalanga et al. (2010) also provided empirical evidence of a positive correlation between inward FDI and market size for Southern African Development Community (SADC) countries. Similarly, this positive relationship also justified by Majeed and Ahmad (2010) for Organization of Islamic Community (OIC) countries and by Bevan and Estrin (2004) for European transition economies or Central and Eastern European countries (CEECs).

### Labor Productivity

The rise in labor productivity resulting from an increased efficiency in the use of labor leads to a fall in the unit labor cost-the cost of producing one unit of output (ILO). Therefore, the countries abundant in labor forces with higher productivity tend to be more competitive and attractive for inward FDI, especially efficiency-seeking FDI. In fact, due to lack of data on labor cost for ASEAN countries, labor productivity is used in this paper based on the inference that higher labor productivity implies lower unit labor cost. Several computation methods have been suggested for measuring labor productivity (e.g., among other, output per person employed, and output per hour worked). However, because of data availability, the growth rate of per-capita GDP which reflects the improvement in standard of living are typically used as the measurement of labor productivity[1)]. The panel data analysis by Bevan and Estrin (2004) confirmed a negative correlation between FDI and unit labor cost for CEECs. His result indicated that labor productivity is positively associated with FDI. Similar result is also justified by Wei and Liu (2001) who concluded that low labor cost exerts positive effect on FDI inflow into China. However, Biswas (2002) found that cheap labor cost is not necessarily an important factor in attracting FDI

### Trade Openness

The trade openness hypothesis stressed that a country which is more open attracts more inward FDI. Majeed and Ahmad (2010) argued that the main reason behind this positive correlation is the fact that export-oriented MNEs have been increasing. Greater openness provides MNEs with opportunities to benefit from export expansion policies, wider markets, and import machinery and components for production from parent firm at home (Majeed & Ahmad 2006, and 2007). However, Blonigen (2001) argued that trade flows may involve either final products or components. Trade in final goods substitute output produced by foreign subsidiary and thus leads to less inward FDI, but trade in components used by foreign affiliates to produce final goods raise FDI activities (Blonigen, 2001). Degree of trade openness can be estimated by using the share of trade volumes (export, import and export plus import) in GDP, and trade restrictiveness such as restriction on imports, foreign exchange, bilateral payment and current transaction (Yanikkaya, 2003). Nine alternative indices including three measuring openness proper and six for trade policy-induced distortions have been suggested to be proxies for trade liberalization (see Edward, 1998). However, because of data limitations, this thesis will use the ratio of total trade (import plus export) on GDP as indicator of trade liberalization in ASEAN countries. Previous empirical studies showed that openness is positively correlated with FDI. Botrić and Škuflić (2006) ran panel GLS regression and found a positive influence of openness (measured by the ratio of trade on

1）Since per-capita GDP growth is used as the measurement of labor productivity, these two terms will be used interchangeably with one another in this paper.

GDP) in Southeast European (SEE) countries. By using the same measurement, multivariate regression analyses by Cleeve (2008) and Mhalanga et al. (2010) also provides evidence of a positive impact of openness on FDI in SSA and SADC countries, respectively. However, the studies by Mohamed and Sidiropoulos (2010) yielded inconclusive result.

### Institutional Quality

Blonigen (2005) argued that institutional quality positively influence an MNE's location decision of FDI especially in developing countries for numerous reasons. Weak institutions that fail to strengthen property rights increase the risk of losing firm's assets due to expropriation and, thus, diminish foreign investment. Weak institutions and/or corruption fail to offer good business environment and well-functioning markets and lead to higher cost of business operation thereby discouraging inward FDI. Also, weak institutions result in poor physical infrastructure which increases transport and communication costs and, consequently, a fall in FDI inflows. Different composite index of a country's political, legal and economic institutions were developed from survey responses from related group of people, officials or businessmen. Corruptions, political instability, country risk, rule of law are among the most common indicators of institutional quality. Asiedu (2006) and Mohamed and Sidiropoulos (2010) investigated the effect of corruption on inward FDI by using corruption index calculated from International Country Risk Guide (ICRG) found out that corruption deters FDI. By using corruption perception index (CIP) from Transparency International (TI), Cleeve (2008) also confirmed the same result. Moreover, panel analysis by Asiedu (2006) also found that some indicators of political instability including the number of coups d'état, assassinations and insurrections exert negative impact on FDI flow into SSA countries. Schneider and Frey (1985) also confirmed that the number of strikes and insurrections is negatively associated with FDI flow. On the other hand, protection of copyright and rule of law were found by Biswas (2002) and Asiedu (2006) to be important factors in attracting FDI, indicating positive correlation between institutions and inward FDI. However, Mhalanga et al. (2010) and Cleeve (2008) does not found significant impact of political freedom and civil right on FDI inflow.

### Natural Resources

Establishment of a foreign subsidiary in a country abundant in natural resource provides multinational firms, especially industrial firms, with access to particular resources of relatively better quality and lower cost that allows them to increase their competitive advantages (Dunning & Lundan, 2008). Based on this perspective, natural resource endowment is expected to be a positive determinant of inward FDI. However, Asiedu and Lien (2011) hypothesized the negative relationship between FDI and natural resource intensity for three reasons. First, boom in

resource exports causes an appreciation of local currency and decreases country's export competitiveness, which may leads to more than one-for-one crowding out of investment in non-natural resource tradable sector and thus diminish inward FDI. Second reason was based on argument of Sachs and Warner (1995) who indicated that the boom-and-bust characteristics of some resources, particularly oil, increase exchange rate volatility, and that a higher share of fuel and minerals in total exports implies that the country's trade is less diversified and more vulnerable to external shocks. These economic phenomena signal macroeconomic instability to MNEs and thereby discourage investment. Lastly, resource-rich country is more likely to attract investment in natural resource exploration which initially involve large capital investment but require smaller cash flow after the initial stage and, consequently, decrease FDI inflow. The empirical results that support positive effect of natural resources on FDI include Asiedu (2006), Mahamed and Sidiropoulos (2010) and Ledyaeva (2009). The negative impact is found by Asiedu and Lien (2011) for the panel study of 112 developing countries during the period of 1982-2007. Mhalanga et al. (2010), on the other hand, found inconclusive result.

### Physical Infrastructure

Good physical infrastructure reduces the operational, transportation and communication costs of business activities and thereby increases the productivity and profitability of investment (Asiedu, 2002). As a result, better physical infrastructure is widely believed to attract more foreign investment into the country. One of the standard measurements of physical infrastructure availability is the number of telephone users in a country. By using the number of phone line per 1000 person as indictor of infrastructure, Asiedu (2006), Biswas (2002), and Mhalanga et al. (2010) estimated the significant positive effect of infrastructure on inward FDI, but Cleeve (2008) found insignificant result. Botrić and Škuflić (2006) confirmed the negative correlation between infrastructure (measured by the number of internet connection) and FDI in SEE countries.

### FDI, Growth and Industrial Development

An upward trend in FDI in recent years has been widely believed by many researchers and policy makers to have had a positive impact on the host country's economic growth. FDI provides host countries with more capital investment, and the transfer of new technology and working practices which generate large positive impacts on the country's aggregate productivity and growth (Cipollina, Giovannetti, Pietrovito & Pozzolo, 2011). The channels through which the presence of multinational firms affects growth have been discussed in detail in many R&D endogenous growth theories (see, amongst other, Grossman & Helpman, 1991; Baldwin, Braconier & Forslid, 2005; and Findlay, 1978). Kasuga (2007) investigated the impact of FDI on economic

growth in developing countries and found a positive relationship that depends on the host countries' income level, financial structure and governance infrastructure. Moreover, the growth enhancing effects of FDI has been indicated to be stronger in capital intensive and in technologically advanced sectors (Cipollina et al., 2011).

### North-South and South-South FDI

The developing and transitional economies are collectively called "South" and the wealthy developed countries are named "North" (UNCTAD, 2006). In addition to FDI from North, FDI from South have played an increasingly more important role in the global economy (UNCTAD 2011). Moreover, Lipsey and Sjöholm (2011) indicated that MNEs from South have different characteristics from North MNEs in terms of many factors such as determinants of FDI decision, industry distribution, plant size and characteristics, productivity, and spillover effects to host countries' firms. A comparative study of FDI in the two different regions has recently attracted more attention. To divide countries into North or South, I follow the approach proposed by the World Bank and IMF. However, some countries such as Singapore, South Korea, Hong Kong and Taiwan, are considered as South in this study. In fact, these countries are no longer regarded as developing countries, but I follow Lipsey and Sjöholm (2011) who claimed that these countries were treated as South in larger part of the period of this study. As a result, all countries in ASEAN are called "South" in this study. The United States, Japan, European Union, and Australia are regarded as North and the other countries, including China, South Korea, India, Hong Kong, and Taiwan, are considered as South. The FDI from North and South into ASEAN countries are regarded as North-South FDI and South-South FDI, respectively.

## 3. DATA AND METHODOLOGY

### Variables and Data

This paper uses panel data on all ASEAN countries from 1995 to 2008. To investigate the determining factors of inward FDI into the region, the variables used for each economy are: total net FDI inflow (*FDIF*), gross domestic product (*GDP*), labor productivity measured by per-capita GDP growth rate (*LPR*), trade openness (*OPN*), institutional quality (*INS*), natural resource intensity (*NAT*), and physical infrastructure (*INF*). To study the effects of FDI inflow on economic growth, both the growth-rate of GDP (*GDPG*) and per-capita GDP growth (*LPR*) are regressed on FDI inflows. Moreover, human resource (*EDU*), capital investment (*CAP*), trade openness (*OPN*) along with initial GDP (*IGDP*) or initial per-capita GDP (*IPGDP*) are added in the model as control variables. Manufacturing value added growth rate (*MVA*) are used as dependent variables for the study of the impact of FDI on industrial development along with

several control variables including capital investment (*CAP*), total labor force (*LAB*) and trade openness (*OPN*). In addition to FDI inflows by partner countries during the period of 1995-2008, data on total FDI in twenty-three 2-digit manufacturing industries (*FDIM*) from 1999 to 2003 are used for mean difference analysis of North and South FDI inflows into ASEAN across countries and industries.

ASEAN statistics database offer various data on FDI flows. The panel data of the total net FDI inflows by partner countries (source and host countries) and year are constructed from two sources. Data on FDI flows from the year 1995 to 1999 are obtained from *Statistics of Foreign Direct Investment in ASEAN: Sixth Edition (2004, section 2)*, while those from the year 2000 to 2008 are collected from *ASEAN Statistical Yearbook 2008 (Chapter VI)*. *FDIM* is administrative FDI data provided by *Statistics of Foreign Direct Investment in ASEAN: Sixth Edition (2004, Section 3)*. International Monetary Fund (IMF) offers data on GDP, the growth-rate of GDP and per-capita GDP growth. All the other data are obtained from *World Development Indicators and Global Development Finance* of the World Bank. However, data on gross secondary school enrollment rate which is the measurement of country's human resource (*EDU*) is collected from both the *World Bank database* and *ASEAN Statistical Yearbook 2008 (Chapter II)*. Due to data limitations, unbalanced panel regression with gap will be applied for the analysis in this paper. It should be noticed that Myanmar is excluded from panel regressions 1 and 2 because data on natural resources for this country is not available[2]. Therefore, only 9 of 10 countries are included in the estimations of these two regressions. However, regressions 3 to 8 use data set for all 10 members of ASEAN. The mean difference analysis of North and South FDI across countries and industries includes panel data set for all 10 member countries. The Table 1 below summarizes the variables for panel data regression and their description and sources. Table 2 presents summary statistics of all data used for mean difference analysis and panel regressions in this paper.

### Estimation Methodology

The empirical analysis is based on two ANOVA tests and eight panel regression equations. The two ANOVA tests are used to examine the difference in the mean of North FDI and South FDI across countries and industries in ASEAN. The two-sample student t-test with either equal or unequal variance is applied for the analysis of mean difference. In order to ensure that the appropriate types of t-tests are used, I check the F-test to identify if the tow samples have equal or unequal variance.

With respect to the panel regression estimations for the study of the determinants and the

2) There are eight panel regression estimations in this paper.

effects of FDI, I follow the standard literature to construct the regression equations as follows:

1. Panel regression used to identify the host country-specific determinants of FDI flows:

$$FDI_{jit} = \beta_0 + \beta_1 GDP_{it} + \beta_2 LPR_{it} + \beta_3 OPN_{it} + \beta_4 INS_{it} + \beta_5 NAT_{it} + \beta_6 INF_{it} + \varepsilon_{it} \quad (1)$$

2. Panel regression used for the comparative study of the host country-specific determinants of North-South and South-South FDI flows:

$$FDI_{jit} = \beta_0 + (\beta_1 + \gamma_1 D_s) GDP_{it} + (\beta_2 + \gamma_2 D_s) LPR_{it} + (\beta_3 + \gamma_3 D_s) OPN_{it} + (\beta_4 + \gamma_4 D_s) INS_{it} + (\beta_5 + \gamma_5 D_s) NAT_{it} + (\beta_6 + \gamma_6 D_s) INF_{it} + \varepsilon_{it} \quad (2)$$

3. Panel regression used to study the effects of FDI flows on economic growth:

$$GDPG_{it} = \beta_0 + \beta_1 FDI_{jit} + \beta_2 EDU_{it} + \beta_3 CAP_{it} + \beta_4 OPN_{it} + \beta_5 IGDP_{it} + \varepsilon_{it} \quad (3)$$

$$LPR_{it} = \beta_0 + \beta_1 FDI_{jit} + \beta_2 CAP_{it} + \beta_3 OPN_{it} + \beta_4 IPGDP_{it} + \beta_5 EDU_{it} + \varepsilon_{it} \quad (4)$$

4. Panel regression used to compare the effects of North-South and South-South FDI flows on economic growth:

$$GDPG_{it} = \beta_0 + (\beta_1 + \gamma_1 D_s) FDI_{jit} + \beta_2 EDU_{it} + \beta_3 CAP_{it} + \beta_4 OPN_{it} + \beta_5 IGDP_{it} + \varepsilon_{it} \quad (5)$$

$$LPR_{it} = \beta_0 + (\beta_1 + \gamma_1 D_s) FDI_{jit} + \beta_2 CAP_{it} + \beta_3 OPN_{it} + \beta_4 IPGDP_{it} + \beta_5 EDU_{it} + \varepsilon_{it} \quad (6)$$

5. Panel regression used to study the effects of FDI flows on industrial development:

$$MVA_{it} = \beta_0 + \beta_1 FDI_{jit} + \beta_2 CAP_{it} + \beta_3 LAB_{it} + \beta_4 OPN_{it} + \varepsilon_{it} \quad (7)$$

6. Panel regression used to compare the effects of North-South and South-South FDI flows on industrial development:

$$MVA_{it} = \beta_0 + (\beta_1 + \gamma_1 D_s) FDI_{jit} + \beta_2 CAP_{it} + \beta_3 LAB_{it} + \beta_4 OPN_{it} + \varepsilon_{it} \quad (8)$$

$$(i = 1,\ 2,\ 3....N;\ j = 1,\ 2,\ 3....K \text{ and } t = 1,\ 2,\ 3,\ T)$$

Here, the indexes $j$, $i$ and $t$ denote source countries, host countries and the time period, respectively. $\varepsilon_{it}$ denotes random error term which is the composite of $\alpha_i$ and $\mu_{it}$ where $\alpha_i$ captures the unobserved effects of those variables that are specific to individual host countries and that are constant over time, and $\mu_{it}$ is random error and white noise process. $\beta_0$ is the constant term and all other $\beta$s are slope coefficients accounting for the partial effects of explanatory variables. $D_s$ are dummy variables of source countries' types, taking value of one for North and zero for South. Notations of all variables are contained in Table 1.

The use of panel data set is considered to be more advantageous over the usual cross-sectional or time series data (Verbeek, 2004; Gujarati, 2004; and Wooldridge, 2002). When studying the host country-specific determinants of FDI flows, the use of a panel data set help control for the diversified and specific effects of unobservable determining factors associated with various investors which are not included in the models given by (1) through (8) (Wei and Lui, 2001).

### Model Selection

Panel analysis involves three competing models, namely, pooled regression or pooled OLS, fixed effects (FE) and random effects (RE) model. Pooled regression assumes that the un-

observed effects of the individual variables (the partner countries in this paper) are similar or homogeneous. The fixed effects model, on the other hand, allows for the unobserved heterogeneity among individuals and assumes that these effects are constant and time-invariant depending on explanatory variables. Random effects model also assumes that the individual effects are heterogeneous, but these effects are considered part of the errors terms and uncorrelated with the independent variables. There are three test statistics available for selecting appropriate models from the three alternatives (Greene, 2012). The F-test is carried out to choose between pooled OLS and FE. Under the null hypothesis ($H_0$) of the F-test, all individual specific effects are equal and the rejection of $H_0$ implies that FE is preferred to pooled OLS (see Greene, 2012). To test the appropriateness of pooled OLS against RE, the Largrange Multiplier (LM test), proposed by Breusch and Pagan (1980), is conducted. The $H_0$ of the LM test assumes that the variance of individual effects is equal to zero against the alternative hypothesis of the positive variance and thereby the rejection of $H_0$ favors for RE model. The Hausman test, suggested by Hausman (1978), compares the efficiency of the fixed effects versus the random effects models under the null hypothesis that the individual effects are uncorrelated with the explanatory variables. The rejection of $H_0$ implies that RE model produces biased estimators, so FE model is more efficient. Greene (2012, chapter 11) discusses the derivation of the test statistics for the F-test, the Breusch and Pagan LM test and the Hausman test and provides detailed explanation of these three tests.

### Multicollinearity

One of the assumptions of the classical regression model is that there is no multicollinearity among independent variables in the regression equation. The term *multicollinearity* was first proposed by Ragnar Frisch. It originally means that there is a perfect or exact relationship among some or all the regressors in a regression equation. The presence of high multicollinearity in the regression will result in larger variances and covariance, and thus produce smaller t-test statistics of the OLS estimators, which make some coefficients statistically insignificant (Gujarati, 2004). Moreover, multicolliearity will increase $R^2$, the overall measurement of goodness of fit, and lead to high sensitivity of the estimators and their standard errors to a very small change in the data (Gujarati, 2004). Therefore, the existence of multicollinearity can make the estimation less precise and even misleading. Multicollinearity problem can be detected in several ways (see Gujarati, 2004). In this study, however, I calculate the tolerance (TOL) and variance inflation factor (VIF) to identify the problem of multicollinearity. The tolerance for the i-th independent variable is calculated as $1-R_i^2$, where $R_i^2$ is the correlation coefficient of an independent variable regressed on all other explanatory variables. The VIF is the reciprocal of TOL and equal to $1/(1-R_i^2)$. Either a larger value of VIF or a smaller value of TOL implies higher

collinearity amongst the variables. The rule of thumb is that if the VIF of any variable exceed 10 or TOL of any variable is less than 0.1, high multicollinearity is said to exist in the regression, otherwise we accept that there is no such problem (Baum, 2006, chapter 4). Multicollinearity can be reduced by increasing sample size, dropping some variables, or even by transforming variables.

### Heteroscedasticity and Autocorrelation

Two important assumptions of a standard regression model are that all the variances of random error terms are equal (homoskedasticity) and that all the covariance of disturbance terms are equal to zero. If the former assumptions fail, the problem of heteroscedasticity arises, and the violation of the latter implies the existence of autocorrelation or serial correlation problem. In general, the consequences of the two problems are similar. If heteroskedasticity and/or autocorrelation are present, then the OLS estimators remain unbiased and consistent, but they will no longer be efficient which means that smaller variances can be found in an alternative regression technique. As a result, the usual t, F, or $\chi^2$ tests cannot be appropriately applied, and the conclusion will be misleading. This paper implements the modified Wald test for groupwise heteroskedasticity suggested by Greene (2012, chapter 10). Greene (2012) argued that the Lagrange Multiplier, the likelihood ratio and the standard Wald test statistics are sensitive to the normality assumptions of disturbance terms, but the modified Wald test is applicable when the errors terms are not normally distributed, at least in asymptotic terms. The null hypothesis of the modified Wald test assumes that all error variances are the same for all individuals, and thus the rejection of $H_0$ indicates the existence of heteroskedasticity. The presence of autocorrelation can be identified by different statistics tests such as the classical Durbin-Watson test (Durbin and Watson, 1950), the LM test by Baltagi and Li (1995), and the Wooldridge test by Wooldridge (2002). However, the Wooldridge test is carried out for the detection of autocorrelation in this paper. Drukker (2003), by performing Monte Carlo simulation, proved that in the reasonable sample size, Wooldridge test has good size and power properties. The Wooldridge test assumes the null hypothesis of no first order autocorrelation. To solve the problem of heteroskedasticity and/or autocorrelation, this paper uses, following Greene (2012), the fit panel-data models using the feasible generalized least square (FGLS) and robust standard errors techniques.

## 4. EMPIRICAL RESULTS AND DISCUSSION

### Mean Difference Analysis

Table 3 contains the results of mean difference of North and South FDI across countries in ASEAN region from 1995 to 2008. As can be seen from the second column, FDI flows from the

two sources into all countries, except Vietnam, are of unequal variances. This indicates that the two-sample t-test with equal variance is used for the mean analysis of Vietnam. For all other countries, the two sample t-test with unequal variances will be used. The second column of Table 3 shows that the flows of FDI from North and South are statistically significant and vary across the different countries, except for Laos. The result indicates that North has been the major source of FDI into ASEAN as well as in eight of individual member countries in the region for the period under study. FDI flows from North are about 457 million US dollar more than that from South in the whole region. Singapore, the largest recipient of FDI in the region, accounts for the biggest gap of 2019 million USD at 1% significant level followed by Malaysia, Thailand, Indonesia, Philippines, Vietnam and Myanmar. Cambodia is the only country where the mean of South FDI is significantly larger than North FDI with the difference of 42 million USD.

The findings of the comparative analysis of industrial distribution of FDI from the two sources based on FDI data during the period of 1995-2003 are presented in Table 4. The F-test statistics show that variances of only five industries are equal and, therefore, need to be tested with the two sample t-test with equal variances. The two sample t-test with unequal variances is applied to all other industries whose variance ratio tests are all significantly different at various levels. From the third column, for all twenty-three manufacturing industries, the mean of FDI flows from the two sources are statistically different at 10% level of significance, in which North FDI exceeds South FDI by 86.61 million USD. Only seven of all individual industries show statistically significant differences in mean. It can obviously be seen that investment from North is predominant in such high-tech and capital-intensive industries as (1) chemicals and chemical products; (2) machinery & equipment N.E.C.; (3) office, accounting and computing machinery; (4) radio, television & communication equipment and apparatus; and (5) medical, precision & optical instruments, watches & clocks. On the other hand, investment from South is relatively more in low-tech and labor-intensive industries including (1) wearing apparel, dressing and dyeing of fur; and (2) tanning & dressing of leather, luggage, handbags, saddlery, harness and footwear.

Similar results are also found by Lipsey and Sjöholm (2011), Ramstetter (2004), and Takii (2011) who studied industrial distribution of FDI for individual countries in ASEAN, namely, Indonesia and Thailand, by using firm level data. Lipsey and Sjöholm (2011) showed that 23.4% of North's plants in Indonesia are situated in chemicals industries and 34% in machinery and electronic products, and 30% of MNEs from South invested in textiles industries. Similarly, Ramstetter (2004) found out that FDI from North in Thailand are mainly located in motor vehicles and chemicals and South's investors concentrated in textiles, apparel, rubber products, metal products and some machinery. The study by Takii (2011) also indicated that Japanese FDI are mainly allocated to chemicals, metals and machinery industries, while Chinese plants concentrated in food, textiles, wood and furniture, and paper and printing industries.

### Panel Regression Analysis

In order to obtain reliable estimations of the panel regressions, I first provide results on various statistics tests for model selection and diagnostic checking as discussed in the methodology above. After the identification of appropriate panel data models and the detection of any relaxation of the classical linear regression assumptions in the panel data set, the appropriate models will be selected and various remedial techniques will be applied. Finally the results of the regressions based on the most appropriate models will be presented and discussed.

### Model Selection and Diagnostic Tests

According Table 5, the Hausman test statistics are 2.99 and 4.65 for regressions 1 and 2, respectively. The *p*-values of these two statistics (0.8101 and 0.9686) are not significant indicating that the null hypothesis of no correlation between individual effects and independent variables cannot be rejected, thereby implying that the random effects (RE) model is preferred to the fixed effects (FE) model for the two regressions. Next the LM test is applied to test for the RE model against pooled OLS. The LM test statistics for the panel regressions 1 and 2 (782.32 and 564.40, respectively) are highly significant with both *p*-values of almost zero. This result leads to the rejection of the null hypothesis that the variance of individual effects is zero, which indicates that the RE model is statistically superior to pooled OLS in these two regressions. Therefore, the RE model is the most appropriate models amongst the three alternatives for the estimation of panel regressions 1 and 2.

The F-test statistics results for all other panel regressions (regressions 3 to 8) are all highly significant, so the null hypothesis of the F-test of equal individual effects is rejected. This indicates that the fixed effects model is more appropriate than pooled OLS for these regressions. Similarly, the highly significant levels of all Hausman test statistics for these regressions reject the null hypothesis that individual effects and explanatory variables are uncorrelated, and thus suggest that the fixed effects also provide better prediction than its random effects counterpart. Consequently, panel data regression based on the fixed effects model is the most appropriate for regressions 3 to 8.

The results of the calculation of variance inflation factor (VIF) and tolerance (TOL) for all regression models are contained in Table 6. The VIF values of all variables are less than 10 and none of the TOL values of variables are smaller than 0.1. Most of the VIF of variables varies from 1.01 to 1.51 with a few exceptions like *OPN*, *INS*, *NAT*, *INF* in regressions of determinants of FDI flows which are 9.41, 5.25, 2.14 and 4.91, in that order. Therefore, it can be concluded that all of the panel regressions are not disturbed by serious multicollinearity problems. Tables 7 and 8 contain the results of the test statistics for serial correlation and heteroskedasticity in each regression. As Table 6 indicates, the F-test statistics for the Wooldridge test for regressions 1

and 2 are 0.020 and 0.005 with $p$-values of 0.8878 and 0.9430, respectively, implying the acceptance of the null hypothesis of no first order autocorrelation. On the other hand, the F test statistics for all other regressions are highly significant indicating the existence of first order autocorrelation in regressions 3 to 8. Moreover, all the $\chi^2$ values of the modified Wald Test statistics reported in Table 8 are highly significant with $p$-values of almost zero. This rejects the null hypothesis of no heteroskedasticity and confirms the presence of groupwise heteroskedasticity in every panel regression. Based on the results of model selection and diagnostic checking tests, the fit panel-data model using feasible generalized least square (FGLS) corrected for groupwise heteroskedasticity is applied for the estimations of regressions 1 and 2 for studying the determinants of FDI flows. The predictions of regressions 3 through 8 for the investigation of the effects of FDI on economic and industrial growth are carried out by using the fitted fixed effects model with robust standard error adjusted for groupwise heteroskedasticity across panel and first-order autocorrelation within panel data set.

### Determinants of FDI

The results of the panel regression that identify the main determinants of FDI flows into ASEAN countries are reported in Table 9. As shown in this table, all the slope parameters of regression 1 are all statistically significant at conventional levels suggesting that all the six determining factors have significant influences on FDI inflows. As expected, the coefficient estimator of *GDP* is positively significant at 1% level indicating that host countries' market size attracts more FDI inflows. Larger market demand allows MNEs to be able to sell more and realize economies of scale from production, and earn greater profits. This explains why most of FDI inflows into ASEAN region have been concentrated in relatively higher income countries like Singapore, Thailand and Malaysia. The result conforms to the findings of previous studies for other developing regions such as SSA, SADC, OIC, and CEEC (see Bevan & Estrin, 2004; Asiedu, 2006; Mhalanga et al., 2010; and Majeed & Ahmad, 2010, respectively).

The slope coefficient of labor productivity variable is positive and is statistically significant at 10% level. Increases in labor productivity raise the efficiency of labor forces in the host countries and reduces the unit labor cost of production which results in more inward FDI. One may argue that the rise in labor productivity can be thought of as having a short-term effect on a fall in unit labor cost. This is due to the fact that higher labor productivity will also eventually lead to higher nominal wage which increase the unit labor cost in the long-run. However, due to lack of data on industrial wage of each country, one can infer that labor productivity has been one of the main positive determinants of FDI flows into ASEAN at least for the period under study. The result conforms to the finding by Bevan and Estrin (2004). Similarly, the openness variable is also positively associated with inward FDI. Its estimated coefficient is significantly

different from zero at 1% level, suggesting that higher degree of openness or a larger trade-to-GDP ratio provides the host country with more advantage in attracting FDI. This result is consistent with that of other empirical studies (see Botrić & Škuflić, 2006; Cleeve, 2008; and Mhalanga et al., 2010) that have also found a positive effect of trade openness on FDI. One plausible reason could be that foreign firms need to import intermediate input, machinery and raw materials from their home countries for final production in the host countries which lack of these inputs. Moreover, the final goods will also be sold to the markets in both home and other countries. Lower tax or tariff rate on imports and exports of host countries will reduce production and distribution process of multinational firms and thereby encourage them to invest more in that country. This supports the increase in FDI inflow into Cambodia, Indonesia and Philippines – countries that have increasingly implemented liberal trade policies over the last few years.

The institutional quality of the host country also plays a significant role in attracting more FDI inflow into the countries. This is confirmed by the positive slope coefficient of *INS* variable which is highly significant at 1% level. Better institutional quality provides better protection of firms' properties rights and assets and, consequently, a more favorable business environment, more social and political stability that reduce uncertainty and risks of investment and raise profitability of MNEs in those countries. The results are consistent with those reported by Biswas (2002), Asiedu (2006) and Mahamed & Sidiropoulos (2010). Unlike other variables, the estimated slope parameter for natural resource intensity shows the statistical negative sign at 1% level of significance. The abundance in natural resources does not attract inward FDI as one may expected, but crowd out investment in ASEAN. The correlation is inconsistent with some empirical works including Asiedu (2006), Mahamed and Sidiropoulos (2010) and Ledyaeva (2009). However, it is not a really surprising result as this negative association between resource abundance and FDI flows was also justified by previous paper, particularly Asiedu and Lien (2011) for the study of 112 developing countries during the period of 1982-2007. The possible explanation for this phenomenon is the three mechanisms proposed by Asiedu and Lien (2011) as discussed earlier in this paper. First, large volume of resource export raises value of domestic currency and hurt exports of non-natural resource tradable goods which may crowd out investment in those sectors by more than one-for-one proportion. Another mechanism is based on Sach and Warners (1995) who argued that some resources such as oil have boom-and-bust characteristics which bring about more volatile exchange rate and that the predominance of several resources in total exports reduce country's trade diversification and raise vulnerability to external shocks. These signs of macroeconomic instability discourage FDI. Third, resource exploration investment, commonly present in resource-abundant countries, is a kind of diminishing investment which always starts with large capital for initial establishment but followed by a smaller cash flow for

operation. This result and supporting argument may help explain the fact that resource-scarce country like Singapore accounts for half of the total FDI inflows into the region. Finally, the estimated coefficient of physical infrastructure variable has positive relationship with FDI flows and is 1% significant in a statistical sense, indicating that better physical infrastructure encourages more investment from foreign firms. As indicated earlier, physical infrastructure development allows MNEs to reduce communication, transportation, and production cost and thereby motivates them to invest more in countries with good infrastructure. In this sense, infrastructure development plays a role as government's indirect subsidy to related MNEs who utilize it and enjoy its benefits. Consistent results can be found in Asiedu (2006), Biswas (2002), and Mhalanga et al. (2010).

In the next step, I include slope dummy variables for source country type which take a value 1 for North FDI and 0 for South FDI in regression 1. This allows me to run panel regression 2 that provides a comparative study of determinants of North FDI and South FDI. As can be seen from the second and third rows in Table 10, the slope coefficient of *GDP* and $D_s$**GDP* are positive and significant at 1% level, indicating that both North FDI and South FDI are motivated by a desire to serve host markets. The magnitudes of the slope parameters of market size are predicted to be 0.2700 for South FDI and 1.6521 (0.2700 + 1.3821) for North FDI. Therefore, it can be inferred that North FDI are relatively more sensitive to market size than South FDI. As the 3rd row in Table 10 indicates, the estimated coefficient of *LRP* becomes statistically insignificant, suggesting that the host countries' labor productivity does not influence South FDI decision in ASEAN. However, labor productivity remains a factor attracting North FDI as the slope parameter of $D_s$**LPR* is positively significant at 1% level. In Table 10, the 6th and the 7th rows contains evidence that openness attracts FDI from both sources with partial effect of 0.7063 for South FDI and 2.0938 (0.7063 + 1.3875) for North FDI. North FDI is, therefore, relatively more responsive to *LRP*.

The most interesting results are the ones reported in rows 8 and 9. The coefficient of *INS* shows a negative value (-35.7352) at 5% level of significance predicting negative impact of *INS* on South FDI. However, the parameter of $D_s$**INS* is positive (237.7415) and significant at 1% level implying a positive effect of *INS* on North FDI (220.0063＝237.7415－357.3522). It can be inferred that while better institutional quality of the host countries will encourage more investment from North, South FDI tend to be more attracted by weaker institutions of the host countries. This result conforms to the findings by Cuervo-Cazurra and Genc (2008), Ma and Assche (2011) and Lipsey and Sjöholm (2011). Cuervo-Cazurra and Genc (2008) found out that MNEs from developing economy are more prevalent amongst the leading foreign subsidiaries in less developed countries with lower control of corruption. Cuervo-Cazurra and Genc (2008) argued that business experience of South MNEs in underdeveloped institutions at home might turn out to be advanta-

geous for them over their North MNE counterpart when operating in foreign countries with poor institutions. While North MNEs find it more difficult to operate in the poorly developed markets of developing countries, managers of South MNEs tend to be more used to working in such highly uncertain and risky situations and have more flexibility in dealing with corrupt and unpredictable government officials and law-enforcement agencies (Cuervo-Cazurra & Genc, 2008). Developed-country MNEs, who are motivated by other factors such as market size of developing countries, have also been trying to learn to work with poor institutional conditions and gradually change their attitude of operating in developing countries. North MNEs have also hired local managers to deal with such challenging environment in developing countries. However, the difficulties cannot be totally eliminated as this option is not always possible due to lack of trained managers and the local managers' ideas may be rejected by the regional or global managers who have different attitude toward global markets (Cuervo-Cazurra & Genc, 2008).

The result from *NAT* variable is also noticeable. Rows 10 and 11 in Table 10 indicate that abundance in natural resource has a positive effect (with magnitude of 1.1495 and significant level of 5%) on South FDI flows, but has negative impact (with magnitude of -6.0891 and significant level of 1%) on North FDI. It can be predicted that South FDI is motivated by the desire to obtain natural resource of the host countries in ASEAN, but the natural resource intensity of the countries may crowd out investment from the North which can be plausibly explained by the above three mechanisms. Lastly, the coefficient estimator of *INF* is not significant for South FDI, but is positively significant at 1% level for North FDI (with partial effect of 8.03378). This emphasizes that the host countries' physical infrastructure development does not have influence on the location decision of South MNEs, but is an important factor in attracting North FDI.

### FDI and Economic Growth

In this section, I investigate the effect of FDI flow on GDP growth and labor productivity or per-capita GDP growth which are two measures of economic development. Table 11 presents the regression result of FDI effects on GDP growth and Table 12 contains the effect of FDI flow on labor productivity. I include slope dummy variable of source country type (one for North and zero for South) for FDI flow variable into regressions 3 and 4 for a comparative study of the impact of North and South FDI on GDP growth and labor productivity. The results of these two comparative regressions are reported in Tables 13 and 14. The overall $R^2$ which measures the goodness of fit of all the predicted regressions are reported at the end of each table.

Model 3.1 of regression 3 in Table 11 shows the result of the regression of FDI flow on GDP growth rate in the absence of any control variables. The coefficient on *FDIF* is positive and statistically different from zero at the 1%-significance level indicating that FDI flow has a positive impact on economic growth in ASEAN. Model 3.2 includes human resource variable

(*EDU*) in the regression. The coefficient of *EDU* is positive and highly significant at 1% level predicting a positive impact of human capital on economic growth. The inclusion of *EDU* variable reduces the estimate of coefficient of *FDIF* from 0.0004 to 0.0003, but remains significant at 5%. In model 3.3, capital investment (*CAP*) is also added to the regression and is estimated to have positive effect with 5%-significance level on economic growth. The estimated coefficient of *FDIF* (0.0002) in model 3.3 is a little bit lower than that in model 3.2, but is still significant at 5% level. The inclusion of openness (*OPN*) in model 3.4 and initial GDP (*IGDP*) in model 3.5 reduce slope the coefficient of FDI flow to 0.0002 which is, however, still significant at 10% level. The parameter of openness shows a very significant positive effect on economic growth, but initial GDP has a negative sign but not significant implying that economic growth in ASEAN does not converge in a statistical sense.

The estimated result from model 4.1, which does not include any control variables, in the second column of Table 12 shows that FDI flows are also positively associated with labor productivity at 5%-significance level. The inclusion of control variables in the regression by introducing capital investment in model 4.2, openness in model 4.3 and initial per-capita GDP in model 4.4 does not qualitatively overturn the result. The coefficient estimator of FDI flows remains positive and significant at 5% level in these three models. However, the introduction of human resource in the regression causes the slope parameter of FDI flows to be insignificant at any conventional levels. The slope coefficient of capital investment is positive and significant at 1% level for all models in which it is estimated, except for model 4.5. The coefficients of openness are positive and significantly different from zero at 1% level in all the models in which it is included. The coefficients of initial per-capita GDP are not significant for both models 4.4 and 4.5, but the human resource variable has a very high significant positive impact on labor productivity.

Based on the result in Tables 13 and 14, the coefficient estimators of South FDI in regressions 5 and 6 are negative (-0.0019 and -0.0013, respectively) but not significantly different from zero. This indicates that South FDI does not statistically influence GDP growth and labor productivity in ASEAN region. Conversely, the estimated coefficients of North FDI in regressions 5 and 6 show positive values (0.0022 and 0.0016, respectively) and are both statistically significant at 10% level. It can be inferred that North FDI has a significantly positive effect on both GDP growth and labor productivity in the region. All control variables in regression 5, except for initial GDP, are all positive and statistically significant at various conventional levels, suggesting that human resource, capital investment and openness are important factors to affect GDP growth in the region. Nevertheless, regression 6 shows that openness and human resource, but not capital investment and initial per-capita GDP, have significantly positive impact on labor productivity in ASEAN. The overall $R^2$ is about 0.26 for regressions 5 and 6 indicating that 26% of the variation in GDP growth and labor productivity are explained by the two fitted regression estimations.

This statistical result provides evidence that North FDI is more important than South FDI in accelerating economic development in ASEAN region. The possible explanation for this phenomenon is the different characteristics of North MNEs and South MNEs. North MNEs tend to have higher productivity and larger plant size (measured by output and employment per plant) than South NMEs (Lipsey & Sjöholm, 2011). Firms with higher productivity levels and larger size tend to contribute more to economic growth of the countries in which they are invested. Although the previous studies of positive spillover from North and South FDI do not provide clear-cut result, Lipsey and Sjöholm (2011) mentioned in the concluding remarks that based on different characteristics of these two types of FDI as mentioned above, there does exist some edge in favor of benefits from North-South FDI over South-South FDI.

### FDI and Industrial Development

Because of data limitations on FDI in manufacturing industries which are broken down into partner-countries and years, I use total FDI flows to estimate the impact of FDI on industrial growth in ASEAN. The regression results of FDI flows on industrial development are reported in the following two tables. Table 15 shows the effect of total FDI flows on industrial development and Table 16 shows the comparative effects of North FDI and South FDI on industrial growth in ASEAN. As can be seen from column 2 of Table 15, the coefficient of FDI flows shows positive value (0.00062) at 1% level of significance in the model 7.1 that includes no control variables. This implies that total FDI flows exert significant positive influence on industrial development in ASEAN. More importantly, the estimated coefficients of *FDIF* variables remain highly significant at 1% level in all other models (models 7.2 to 7.4) after the introduction of control variables such as capital investment, labor force and openness. Capital investment also has statistically significant positive effect on industrial growth in all the models in which it is included, but none of the parameters of labor force is significant. The openness variable, on the other hand, has significant negative impact on industrial growth, which may be contradictory to the findings of previous studies.

The result of regression 8 in Table 16 reports that both the coefficients of *FDIF* and $D_s$**FDIF* are not significant at any conventional level, suggesting that there is no significant difference between the effects of North FDI and South FDI on industrial development in the region. The estimated coefficient of capital investment remains positively significant at 10% level while that of labor force is statistically insignificant. The negative impact of openness on industrial growth is evident from the results of regression 8.

## 5 . CONCLUSION

This paper used panel data from ASEAN countries to study the distribution of North FDI and South FDI across countries and industries, and to identify the determinants and the effects of the inflows of total FDI, North FDI and South FDI into the region. The conventional F test and t-test statistics were employed for the analysis of cross-country and industrial distribution of North FDI and South FDI. The results from some test statistics for panel model selection and diagnostic checking suggests that panel FGLS regression adjusted for groupwise heteroskedasticity is an appropriate model for studying the determinants of FDI inflows in ASEAN. However, the panel fixed effects model with robust standard errors corrected for groupwise heteroskedasticity and first-order autocorrelation provides better estimation of the effects of FDI flows on economic growth and industrial development.

The result of mean difference analysis shows that North has been the main source of FDI inflows into ASEAN region as well as in its 8 individual members, excluding Laos and Cambodia. South FDI has been predominant in Cambodia and there has been no significant difference between North and South FDI in Laos. Moreover, North has also provided the largest sources of investment in manufacturing industries in ASEAN. North FDI has been more prevalent in some high-tech and capital-intensive industries including (1) chemicals and chemical products; (2) machinery & equipment N.E.C.; (3) office, accounting and computing machinery; (4) radio, television & communication equipment and apparatus; and (5) medical, precision & optical instruments, watches & clocks. However, low-tech and labor-intensive industries including (1) wearing apparel, dressing and dyeing of fur; and (2) tanning & dressing of leather, luggage, handbags, saddlery, harness and footwear are dominated by South FDI.

The regression analysis provided the statistical evidences that market size, labor productivity, degree of openness, institutional quality, and physical infrastructure development are the important factors that attract total FDI inflows into ASEAN. However, natural resource abundance of host countries crowds out total foreign investment into the region. Market size, and openness encourage both FDI from North and South, but they have relatively larger impact on North FDI. Although natural resources discourage North FDI, it is a positive determinant of South FDI. Furthermore, while labor productivity and infrastructure are important factors that drive North FDI into the region, they do not have any significant influences on the inflows of South FDI. The institutional quality, measured by the World Bank's index of rule of law, provides very interesting result. Better institutional quality, particularly more effective rule of law, attracts more MNEs from North, but crowd out investment from South.

The estimated coefficients of FDI flows are significantly positive in all regressions, except for

model 4.5 which is insignificant, even after controlling for the effects of the main determinants of the growth rate of GDP and per-capita GDP, say, human resource, capital investment, openness, and initial GDP or per-capita GDP. This concludes that FDI inflows, in overall, are found out to exert positive influence on both GDP growth and per-capita GDP growth or labor productivity, which are the measures of economic growth, indicating higher level of FDI inflows will spur economic development in ASEAN. On the other hand, the comparative study of the effects of North FDI and South FDI on economic development indicates that only North FDI, but not South FDI, has significant positive impact on GDP growth and per-capita GDP growth or labor productivity in the region. The investigation of the impact of FDI flows on industrial development also confirms the significant positive association between inward FDI and industrial growth in ASEAN even after the inclusion of control variables such as capital investment, labor force and openness. Moreover, when comparing the impact of North FDI and South FDI, the regression result shows that there is no significant difference between the effects of these two sources of FDI on industrial growth in the region.

This paper makes two-fold contribution to the empirical literature: (1) provide a comparative analysis of the host country-specific determinants of North-South and South-South FDI across the ASEAN countries; and (2) investigate the effects of North and South FDI on ASEAN economic growth and industrial development. The empirical results from this paper provide several important implications for the policy makers of ASEAN member countries for developing appropriate FDI-related and industrial policies depending on each country's development goals and economic situations. First, ASEAN countries which prioritize high-tech and capital-intensive manufacturing industries should target North FDI, while South FDI should be the target of the countries which give priority to low-tech and labor intensive industries. Second, since total FDI inflows have a positive impact on economic and industrial development in the region, the member countries should take considerable effort to promote trade liberalization, improve institutional quality, and develop physical infrastructure, which are found to be the main factors inducing FDI flows into the region. Moreover, the member nations should also undertake continuous endeavor to increase market demand and labor productivity in order to be more attractive to FDI. Third, since only North FDI are found to have significantly positive effects on economic growth in ASEAN, the member countries should give priority to policies that especially target FDI from the developed countries. Those policies include, in particular, the improvement of institutional quality or the rule of law, the enhancement of labor productivity and the development of physical infrastructure.

## REFERENCES


[1] ASEAN Secretariat. (2004). *Statistics of foreign Direct Investment in ASEAN 2004 (Sixth ed.)*. ASEAN Secretariat, Jarkarta, Indonesia.

[2] ASEAN Secretariat. (2008). *ASEAN statistical yearbook 2008*. ASEAN, Jarkarta, Indonesia.

[3] Asiedu, E. (2002). On the determinants of foreign direct investment to developing countries: Is Africa different? *World Development, 30*(1), 107-119.

[4] Asiedu, E. (2006). Foreign direct investment in Africa: The role of natural resources, market size, government policy, institutions and political instability. *World Economy, 29*(1), 63-77.

[5] Asiedu, E., & Lien, D. (2004). Capital controls and foreign direct investment. *World Development, 32*(3), 479-490.

[6] Asiedu, E., & Lien, D. (2011). Democracy, foreign direct investment and natural resources. *Journal of International Economics, 84*(1), 99-111.

[7] Assunção, S., Forte, R., & Teixeira, A. A. C. (2011). Location determinants of FDI: A literature review. *FEP Working Papers*.

[8] Baldwin, R., Braconier, H., & Forslid, R. (2005). Multinationals, endogenous growth, and technological spillovers: Theory and evidence. *Review of International Economics, 13*(5), 945-963.

[9] Baltagi, B. H., & Li, Q. (1995). Testing AR (1) against MA (1) disturbances in an error component model. *Journal of Econometrics, 68*(1), 133-151.

[10] Baum, C. F. (2006). *An introduction to modern econometrics using stata*. Texas: Stata Press Publication.

[11] Bevan, A. A., & Estrin, S. (2004). The determinants of foreign direct investment into European transition economies. *Journal of Comparative Economics, 32*(4), 775-787.

[12] Biswas, R. (2002). Determinants of foreign direct investment. *Review of Development Economics, 6*(3), 492-504.

[13] Blonigen, B. A. (2001). In search of substitution between foreign production and exports. *Journal of International Economics, 53*(1), 81-104.

[14] Blonigen, B. A. (2005). A review of the empirical literature on FDI determinants. *Atlantic Economic Journal, 33*(4), 383-403.

[15] Bond, E. W., & Samuelson, L. (1986). Tax holidays as signals. *The American Economic Review, 76*(4), 820-826.

[16] Botrić, V., & Škuflić, L. (2006). Main determinants of foreign direct investment in the Southeast European countries. *Transition Studies Review, 13*(2), 359-377.

[17] Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies, 47*(1), 239-253.

[18] Cipollina, M., Giovannetti, G., Pietrovito, F., & Pozzolo, A. F. (2011). FDI and growth: What cross-country industry data say? *Centro Studi Luca D'Agliano Development Studies, Working Papers,* 313.

[19] Cleeve, E. (2008). How effective are fiscal incentives to attract FDI to Sub-Saharan Africa. *The Journal of Developing Areas, 42*(1), 135-153.

[20] Cuervo-Cazurra, A., & Genc, M. (2008). Transforming disadvantages into advantages: Developing-country MNEs in the least developed countries. *Journal of International Business Studies, 39*(6), 957-979.

[21] Cuyvers, L., Soeng, R., Plasmans, J., & Van Den Bulcke, D. (2011). Determinants of foreign direct investment in Cambodia. *Journal of Asian Economics, 22*(3), 222-234.

[22] Davidson, W. H. (1980). The location of foreign direct investment activity: Country characteristics and experience effects. *Journal of International Business Studies*, *12*, 9-22.

[23] Drukker, D. M. (2003). Testing for serial correlation in linear panel-data models. *Stata Journal, 3*(2), 168-177.

[24] Dunning, J. H. (1979). Explaining changing patterns of international production: In defence of the eclectic

theory. *Oxford Bulletin of Economics and Statistics, 41*(4), 269-295.

[25] Dunning, J. H. (1980). Towards an eclectic theory of international production: Some empirical tests. *Journal of International Business Studies, 11*(1), 9-31.

[26] Dunning, J. H. (1988). *Explaining International Production*. London: Unwin Hyman.

[27] Dunning, J. H. (1993). Trade, location of economic activity and the multinational enterprise: A search for an eclectic approach. *The Theory of Transnational Corporations, 1*, 183-218.

[28] Dunning, J. H., & Lundan, S. M. (2008). Institutions and the OLI paradigm of the multinational enterprise. *Asia Pacific Journal of Management, 25*(4), 573-593.

[29] Durbin, J., & Watson, G. S. (1950). Testing for serial correlation in least squares regression I. *Biometrika, 37*(3/4), 409-428.

[30] Edwards, S. (1998). Openness, productivity and growth: What do we really know? *The Economic Journal, 108*(447), 383-398.

[31] Ekholm, K., Forslid, R., & Markusen, J. (2003). Export-platform foreign direct investment. *Journal of the European Economic Association*, *5*(4), 776-795.

[32] Faeth, I. (2009). Determinants of foreign direct investment–a tale of nine theoretical models. *Journal of Economic Surveys, 23*(1), 165-196.

[33] Findlay, R. (1978). Relative backwardness, direct foreign investment, and the transfer of technology: A simple dynamic model. *The Quarterly Journal of Economics, 92*(1), 1-16.

[34] Francis, J., Zheng, C. C., & Mukherji, A. (2009). An institutional perspective on foreign direct investment. *Management International Review, 49*(5), 565-583.

[35] Green, W. H. (2012). *Econometric analysis* (Seventh ed.) Prentice Hall.

[36] Grossman, G. M., & Helpman, E. (1992). *Innovation and growth in the global economy* MIT press.

[37] Gujarati, D. (2004). *Basic econometrics (Fourth ed.)* Tata McGraw-Hill.

[38] Haufler, A., & Wooton, I. (1999). Country size and tax competition for foreign direct investment. *Journal of Public Economics, 71*(1), 121-139.

[39] Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of the Econometric Society, 46*(6), 1251-1271.

[40] Helpman, E. (1984). A simple theory of international trade with multinational corporations. *The Journal of Political Economy, 92*(3), 451-471.

[41] International Labour Organization. (2012). *Millennium Development Goals Indicators*. ILO, Geneva, Switzerland.

[42] International Monetary Fund. (2012). *World Economic Database*. IMF, Washington, DC.

[43] Kang, Y., & Jiang, F. (2012). FDI location choice of Chinese multinationals in East and Southeast Asia: Traditional economic factors and institutional perspective. *Journal of World Business, 47*, 45-53.

[44] Kasuga, H. (2007). Evaluating the impacts of foreign direct investment, aid and saving in developing countries. *Journal of International Money and Finance, 26*(2), 213-228.

[45] Ledyaeva, S. (2009). Spatial econometric analysis of foreign direct investment determinants in Russian regions. *The World Economy, 32*(4), 643-666.

[46] Lipsey, R., & Sjöholm, F. (2011). South–South FDI and development in East Asia. *Research Institute of Industrial Economics*, *IFN Working Paper*, 885.

[47] Ma, A., & Assche, A. (2011). Why do developing-country multinationals find fortune at the bottom of the pyramid? *Mimeo, University of San Diego, School of Business Administration*.

[48] Majeed, M. T., & Ahmad, E. (2007). FDI and exports in developing countries: Theory and evidence. *Pakistan Development Review, 46*(4), 735-750.

[49] Majeed, M. T., & Ahmad, E. (2010). Host country characteristics and FDI: Are OIC countries different?

*Journal of Economic Cooperation and Development, 31*(4), 1-28.

[50] Mhlanga, N., Blalock, G., & Christy, R. (2010). Understanding foreign direct investment in the southern African development community: An analysis based on project-level data. *Agricultural Economics, 41*(3-4), 337-347.

[51] Mohamed, S. E., & Sidiropoulos, M. G. (2010). Another look at the determinants of foreign direct investment in MENA countries: An empirical investigation. *Journal of Economic Development, 35*(2), 75-95.

[52] Ramstetter, E. D. (1994). Comparisons of Japanese multinationals and other firms in Thailand's non-oil manufacturing industries. *ASEAN Economic Bulletin,11*(1), 36-58.

[53] Sachs, J. D., & Warner, A. M. (1995). Natural resource abundance and economic growth. *NBER Working Paper Series*, 5398, 1–47.

[54] Schneider, F., & Frey, B. S. (1985). Economic and political determinants of foreign direct investment. *World Development, 13*(2), 161-175.

[55] Takii, S. (2011). Do FDI spillovers vary among home economies?: Evidence from Indonesian manufacturing. *Journal of Asian Economics, 22*(2), 152-163.

[56] UNCTAD. (2006). *World Investment Report (2006)*: *FDI from developing and transition economies: Implications for development*. United Nations, New York and Gevena.

[57] UNCTAD. (2011). *World Investment Report (2011)*: *Non-equity modes of international production and development*. United Nations, New York and Gevena.

[58] Verbeek, M. (2004). *A guide to modern econometrics (Second ed.)* John Wiley & Sons, Ltd.

[59] Wei, Y., & Liu, X. (2001). *Foreign direct investment in China: Determinants and impact* Edward Elgar Pub.

[60] Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge, MA: MIT press.

[61] World Bank. (2012). *World Development Indicators & Global Development Finance*. World Bank, Washington, DC.

[62] Yanikkaya, H. (2003). Trade openness and economic growth: A cross-country empirical investigation. *Journal of Development Economics, 72*(1), 57-89.

[63] Zhang, K. H., & Markusen, J. R. (1999). Vertical multinationals and host-country characteristics. *Journal of Development Economics, 59*(2), 233-252.

## APPENDIX: TABLES OF STATISTICS AND REGRESSION RESULTS

Table 1: Variables and Sources

| Notation | Variables | Description | Sources |
|---|---|---|---|
| *FDI* | FDI inflows | Annual total FDI flows (balance of payment basis) in million USD by partner countries and years | ASEAN Statistics Database |
| *GDPG* | Economic growth | Annual GDP growth rate | IMF |
| *LPR* | Labor productivity | Annual per-capita GDP growth rate | IMF |
| *MVA* | Industrial development | Annual manufacturing value added growth rate | World Bank |
| *GDP* | Market size | Annual gross domestic product in billion current US$ | IMF |
| *OPN* | Trade openness | Annual ratio of total trade (import + export) to GDP | World Bank |
| *INS* | Institutional quality | Rule of law (perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, police, the courts and the likelihood of crime and violence) ranging from −2.5 (weak) to 2.5 (strong) | World Bank |
| *NAT* | Natural resource intensity | Annual total natural resource rent (% share of GDP) | World Bank |
| *INF* | Physical infrastructure | Internet users per 1000 people | World Bank |
| *CAP* | Capital investment | Annual gross fixed capital formation (% of GDP) | World Bank |
| *EDU* | Human resource | Annual gross secondary school enrollment rate | World Bank |
| *LAB* | Labor forces | Annual total labor force | World Bank |

Table 2: Summary Statistics

| Variables | Observation | Mean | SD | Minimum | Maximum |
|---|---|---|---|---|---|
| Data for Mean Difference Analysis (ANOVA) of FDI Flow | | | | | |
| *FDI* | 856 | 322.85 | 995.06 | -1717.40 | 11503.30 |
| *FDIM* | 838 | 72.45 | 236.66 | 0.00 | 3176.24 |
| Data for Regressions of FDI Flow (Regressions 1 and 2) | | | | | |
| *FDI* | 546 | 380.96 | 1112.23 | -1717.40 | 11503.30 |
| *GDP* | 546 | 108.82 | 101.27 | 1.30 | 511.21 |
| *LPR* | 546 | 3.57 | 4.13 | -14.29 | 11.86 |
| *OPN* | 546 | 153.00 | 101.84 | 52.26 | 445.91 |
| *INS* | 546 | -0.04 | 0.83 | -1.22 | 1.76 |
| *NAT* | 546 | 9.64 | 12.77 | 0.00 | 67.51 |
| *INF* | 546 | 15.40 | 19.72 | 0.00 | 68.04 |
| Data for Regressions of Economic Growth (Regressions 3, 4, 5 and 6) | | | | | |
| *GDPG* | 491 | 5.98 | 3.70 | -7.36 | 13.84 |
| *LPR* | 491 | 4.33 | 3.99 | -9.60 | 13.26 |
| *FDIF* | 491 | 248.33 | 827.83 | -1717.40 | 11408.70 |
| *OPN* | 491 | 134.36 | 103.86 | 0.20 | 445.91 |
| *CAP* | 491 | 21.12 | 6.25 | 9.81 | 43.59 |
| *EDU* | 491 | 57.53 | 20.37 | 14.99 | 94.63 |
| Data for Regressions of Industrial Development (Regressions 7 and 8) | | | | | |
| *MVA* | 825 | 6.63 | 7.95 | -34.83 | 30.29 |
| *CAP* | 825 | 334.79 | 1011.65 | -1717.40 | 11503.30 |
| *FDIF* | 825 | 23.93 | 7.72 | 9.81 | 43.59 |
| *LAB* | 825 | 28100000.00 | 30900000.00 | 128039.20 | 116000000.00 |

Table 3: Mean Difference of FDI Flow from North and South across Countries

| Name of Countries | Variance Ratio Test | Difference in Mean |
|---|---|---|
| | F-test<br>sd(North)/sd(South) | Two-sample t-test<br>Mean(North)-Mean(South) |
| ASEAN | 64.1238*** | 457.1832*** |
| Brunei Darussalam | 8100.00*** | 162.381** |
| Cambodia | 0.1404*** | -42.324** |
| Indonesia | 48.9041*** | 302.0498** |
| Laos | 1.7309* | -1.7165 |
| Myanmar | 1.9899* | 36.8822* |
| Malaysia | 14.1499*** | 743.7321*** |
| Philippines | 35.7666*** | 179.7719*** |
| Singapore | 137.0821*** | 2019.523*** |
| Thailand | 144.1553*** | 682.3431*** |
| Vietnam | 1.1809 | 117.0909** |

Table 4: Mean Difference of FDI Flow from North and South across Industries

| ISIC code | Name of Industries | Variance Ratio Test | Difference in Mean |
|---|---|---|---|
| | | F-test sd(North)/sd(South) | Two Sample t-test Mean(North)-Mean(South) |
| | All 23 Manufacturing Industries | 8.0009*** | 86.6101*** |
| 15 | Food Products & Beverages | 0.9225 | 45.7382 |
| 16 | Tobacco Products | 6.7327* | 12.6066 |
| 17 | Textiles | 0.3688* | -21.2798 |
| 18 | Wearing Apparel; Dressing & Dyeing of Fur | 0.8805 | -21.9405* |
| 19 | Tanning & Dressing of Leather; Luggage, Handbags, Saddlery, Harness & Footwear | 0.352** | -14.2864** |
| 20 | Wood & Wood Products & Cork, Except Furniture, Articles of Straw & Plaiting Materials | 0.0028*** | -45.626 |
| 21 | Paper & Paper Products | 0.3283** | -24.697 |
| 22 | Publishing, Printing & Reproduction of Recorded Media | 13.0611*** | 3.9320 |
| 23 | Coke, Refined Petroleum Products & Nuclear Fuel | 1.7856 | 214.4452 |
| 24 | Chemicals & Chemicals Products | 50.0717*** | 230.8731*** |
| 25 | Rubber & Plastics Products | 568.9296*** | 245.9735 |
| 26 | Other Non-Metallic Mineral Products | 5.2142*** | 60.0875 |
| 27 | Basic Metals | 74.2847*** | 37.3716 |
| 28 | Fabricated Metal Products, Except Machinery & Equipment | 6.1846*** | 29.346 |
| 29 | Machinery & Equipment N.E.C. | 11.1463*** | 76.2917** |
| 30 | Office, Accounting & Computing Machinery | 23.8628*** | 20.6017*** |
| 31 | Electrical Machinery & Apparatus N.E.C. | 0.7543 | 39.8539 |
| 32 | Radio, Television & Communication Equipment & Apparatus | 16.8794*** | 380.0355*** |
| 33 | Medical, Precision & Optical Instruments, Watches & Clocks | 6.8971*** | 22.1941** |
| 34 | Motor Vehicles, Trailers & Semi-Trailers | 10.1401*** | 63.0227 |
| 35 | Other Transport Equipment | 889.5912*** | 84.1377 |
| 36 | Furniture; Manufacturing N.E.C. | 1.7152 | 6.3615 |
| 37 | Recycling | 15.4644*** | 1.8047 |
| | Other | 13000*** | 43.5489 |

Note: *, **, and *** are 10%, 5%, and 1% significance levels, respectively.
The Ho for variance ratio F test is "sd(North)/sd(South)=1" where sd(•) denotes standard deviation of the variable.
The Ho for mean difference t-test is "Mean(North)-Mean(South)"=0 where Mean(•) denotes mean of the variable.

Table 5: Test Statistics for Model Selection

| Test | Test Statistics | $p$-value | Conclusion | Proper Model |
|---|---|---|---|---|
| Panel Regression 1 | | | | |
| Hausman test | $\chi^2(6)=2.99$ | 0.8101 | RE is preferred to FE | Random Effect Model |
| LM test | $\chi^2(1)=782.32$ | 0.0000 | RE is preferred to pooled OLS | |
| Panel Regression 2 | | | | |
| Hausman test | $\chi^2(12)=4.65$ | 0.9686 | RE is preferred to FE | Random Effect Model |
| LM test | $\chi^2(1)=564.40$ | 0.0000 | RE is preferred to pooled OLS | |
| Panel Regression 3 | | | | |
| F-test | $F(69, 416)=5.58$ | 0.0000 | FE is preferred to Pooled OLS | Fixed Effect Model |
| Hausman test | $\chi^2(5)=113.33$ | 0.0000 | FE is preferred to RE | |
| Panel Regression 4 | | | | |
| F-test | $F(69, 415)=5.61$ | 0.0000 | FE is preferred to pooled OLS | Fixed Effect Model |
| Hausman test | $\chi^2(6)=113.28$ | 0.0000 | FE is preferred to RE | |
| Panel Regression 5 | | | | |
| F-test | $F(69,416)=7.12$ | 0.0000 | FE is preferred to pooled OLS | Fixed Effect Model |
| Hausman test | $\chi^2(5)=138.75$ | 0.0000 | FE is preferred to RE | |
| Panel Regression 6 | | | | |
| F-test | $F(69,415)=7.12$ | 0.0000 | FE is preferred to pooled OLS | Fixed Effect Model |
| Hausman test | $\chi^2(6)=138.61$ | 0.0000 | FE is preferred to RE | |
| Panel Regression 7 | | | | |
| F-test | $F(69,751)=3.76$ | 0.0000 | FE is preferred to pooled OLS | Fixed Effect Model |
| Hausman test | $\chi^2(3)=12.26$ | 0.0065 | FE is preferred to RE | |
| Panel Regression 8 | | | | |
| F-test | $F(69,750)=3.72$ | 0.0000 | FE is preferred to pooled OLS | Fixed Effect Model |
| Hausman test | $\chi^2(4)=12.66$ | 0.0131 | FE is preferred to RE | |

Table 6: Multicollinearity Test

| Variables | VIF | TOL | Variables | VIF | TOL | Variables | VIF | TOL | Variables | VIF | TOL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Panel Regressions of Determinants of FDI Flows | | | Panel Regressions of FDI on GDP Growth | | | Panel Regressions of FDI on Per-capita GDP Growth | | | Panel Regressions of FDI on Industrial Development | | |
| *FDIF* | 1.18 | 0.8476 | *GDPG* | 1.40 | 0.7144 | *LPR* | 1.40 | 0.7151 | *MVA* | 1.01 | 0.9903 |
| *GDP* | 1.41 | 0.7116 | *FDIF* | 1.12 | 0.8907 | *FDIF* | 1.13 | 0.8839 | *FDIF* | 1.03 | 0.9701 |
| *LPR* | 1.24 | 0.8055 | *EDU* | 1.51 | 0.6617 | *CAP* | 1.11 | 0.9037 | *CAP* | 1.03 | 0.9731 |
| *OPN* | 9.41 | 0.1063 | *CAP* | 1.10 | 0.9065 | *OPN* | 1.03 | 0.9745 | *LAB* | 1.01 | 0.9913 |
| *INS* | 5.25 | 0.1907 | *OPN* | 1.03 | 0.9728 | *IPGDP* | 1.01 | 0.9905 | *OPN* | 1.01 | 0.9871 |
| *NAT* | 2.14 | 0.4677 | *IGDP* | 1.00 | 0.9989 | *EDU* | 1.50 | 0.6671 | | | |
| *INF* | 4.91 | 0.2037 | | | | | | | | | |

Table 7: Wooldridge Test (Autocorrelation) and Modified Wald Test (Groupwise Heteroskedasticity)

| Panel Regression | F-test Statistics | *p*-value | Presence of First-order Autocorrelation | Modified Wald Test Statistics | *p*-value | Presence of Groupwise Heteroskedasticity |
|---|---|---|---|---|---|---|
| Regression 1 | F(1, 59)=0.020 | 0.8878 | No | $\chi^2$(63)=4.2e+06 | 0.0000 | Yes |
| Regression 2 | F(1, 59)=0.005 | 0.9430 | No | $\chi^2$(63)=3.2e+07 | 0.0000 | Yes |
| Regression 3 | F(1, 59)=418.631 | 0.0000 | Yes | $\chi^2$(70)=8802.64 | 0.0000 | Yes |
| Regression 4 | F(1, 59)=392.536 | 0.0000 | Yes | $\chi^2$(70)=10299.31 | 0.0000 | Yes |
| Regression 5 | F(1, 59)=376.504 | 0.0000 | Yes | $\chi^2$(70)=5284.30 | 0.0000 | Yes |
| Regression 6 | F(1, 59)=351.845 | 0.0000 | Yes | $\chi^2$(70)=5645.48 | 0.0000 | Yes |
| Regression 7 | F(1, 66)=85.702 | 0.0000 | Yes | $\chi^2$(70)=7018.22 | 0.0000 | Yes |
| Regression 8 | F(1, 66)=87.311 | 0.0000 | Yes | $\chi^2$(70)=6962.74 | 0.0000 | Yes |

Table 9: Regression. 1 (Determinants of FDI)

| Variables | Coefficient | Std. Error | *Z*-value | *p*-value |
|---|---|---|---|---|
| *GDP* | 0.5583*** | 0.1429 | 3.91 | 0.000 |
| *LPR* | 6.0450* | 3.1607 | 1.91 | 0.056 |
| *OPN* | 1.1175*** | 0.3239 | 3.45 | 0.001 |
| *INS* | 52.9115*** | 23.5530 | 2.25 | 0.025 |
| *NAT* | -2.6031*** | 0.9503 | -2.74 | 0.006 |
| INF | 3.5492*** | 1.3298 | 2.67 | 0.008 |
| Constant | -70.5680 | 45.6883 | -1.54 | 0.122 |

Table 10: Regression 2 (Determinants of North & South FDI)

| Variables | Coefficient | Std. Error | *Z*-value | *p*-value |
|---|---|---|---|---|
| *GDP* | 0.2700* | 0.0796 | 3.39 | 0.001 |
| $D_s$*GDP* | 1.3821* | 0.2728 | 5.07 | 0.000 |
| *LPR* | 1.8037 | 1.9564 | 0.92 | 0.357 |
| $D_s$*LPR* | 10.1184** | 4.6235 | 2.19 | 0.029 |
| *OPN* | 0.7063* | 0.1950 | 3.62 | 0.000 |
| $D_s$*OPN* | 1.3875* | 0.3376 | 4.11 | 0.000 |
| *INS* | -35.7352** | 15.6023 | -2.29 | 0.022 |
| $D_s$*INS* | 237.7415*** | 33.079 | 7.19 | 0.000 |
| *NAT* | 1.1495** | 0.5436 | 2.11 | 0.034 |
| $D_s$*NAT* | -7.2386* | 1.2278 | -5.90 | 0.000 |
| *INF* | -0.9814 | 0.6828 | -1.44 | 0.151 |
| $D_s$*INF* | 8.0337* | 2.0712 | 3.88 | 0.000 |
| Constant | -96.5121 | 28.2918 | -3.41 | 0.001 |

Note: *, **, and *** are 10%, 5%, and 1% significance levels, respectively.

Table 11: Regression 3 (FDI flows on GDP Growth)

| Variables | Coefficients | | | | |
|---|---|---|---|---|---|
| | Model 3.1 | Model 3.2 | Model 3.3 | Model 3.4 | Model 3.5 |
| *FDIF* | 0.00045*** (0.0001) | 0.0003** (0.0001) | 0.00028** (0.0001) | 0.0002* (0.0001) | 0.0002* (0.0001) |
| *EDU* | | 0.18922*** (0.0215) | 0.1822*** (0.0219) | 0.1765*** (0.0224) | 0.1769*** (0.0225) |
| *CAP* | | | 0.0294** (0.0122) | 0.0306** (0.0122) | 0.0306** (0.0123) |
| *OPN* | | | | 0.0019*** (0.0006) | 0.00197*** (0.0006) |
| *IGDP* | | | | | -0.0012 (0.0029) |
| Constant | 5.86548*** (0.0305) | -4.98152*** (1.2481) | -5.1971*** (1.2648) | -5.1534*** (1.2677) | -5.0851*** (1.2630) |
| $R^2$ | 0.09 | 0.25 | 0.26 | 0.26 | 0.26 |

Note: *, **, and *** are 10%, 5%, and 1% significance levels, respectively. The standard errors are adjusted for 70 clusters in individual partner countries. The values in the brackets are robust standard errors.

Table 12: Regression 4 (FDI flows on Labor Productivity)

| Variables | Coefficients | | | | |
|---|---|---|---|---|---|
| | Model 4.1 | Model 4.2 | Model 4.3 | Model 4.4 | Model 4.5 |
| *FDIF* | 0.0003**(0.0001) | 0.0003**(0.0001) | 0.0002** (0.0001) | 0.0003**(0.0001) | 0.0001(0.0001) |
| *CAP* | | 0.0519***(0.0162) | 0.0511*** (0.0153) | 0.0467***(0.0165) | -0.0186(0.0167) |
| *OPN* | | | 0.003*** (0.0005) | 0.003***(0.0005) | 0.0019***(0.0006) |
| *IPGDP* | | | | -0.0000 (0.0000) | -0.0000 (0.0000) |
| *EDU* | | | | | 0.2153***(0.0217) |
| Constant | 4.2359***(0.0342) | 3.1489***(0.3485) | 2.7779***(0.3524) | 3.1121***(0.4606) | -7.7302***(1.2918) |
| $R^2$ | 0.08 | 0.12 | 0.17 | 0.19 | 0.26 |

Table 13: Regression 5 (North and South FDI on GDP Growth)

| Variables | Coefficient | Robust Std. Error | *t*-value | *p*-value |
|---|---|---|---|---|
| *FDIF* | -0.0019 | 0.0011 | -1.65 | 0.104 |
| $D_s$*FDIF* | 0.0022* | 0.0011 | 1.87 | 0.066 |
| *EDU* | 0.178*** | 0.0224 | 7.92 | 0.000 |
| *CAP* | 0.0330*** | 0.0119 | 2.76 | 0.007 |
| *OPN* | 0.002*** | 0.0006 | 3.16 | 0.002 |
| *IGDP* | -0.001 | 0.0029 | -0.34 | 0.737 |
| Constant | -5.1995*** | 1.2585 | -4.13 | 0.000 |
| $R^2$ = 0.26 | | | | |

Table 14: Regression 6 (North and South FDI on Labor Productivity)

| Variables | Coefficient | Robust Std. Error | *t*-value | *p*-value |
|---|---|---|---|---|
| *FDIF* | -0.0013 | .0009044 | -1.53 | 0.130 |
| $D_s$**FDIF* | 0.00161* | .0009181 | 1.75 | 0.085 |
| *CAP* | -0.01691 | .016664 | -1.01 | 0.314 |
| *OPN* | 0.00195*** | .0006411 | 3.05 | 0.003 |
| *IPGDP* | -0.00005 | .0000312 | -1.52 | 0.132 |
| *EDU* | 0.21614*** | .0217378 | 9.94 | 0.000 |
| Constant | -7.80648*** | 1.292574 | -6.04 | 0.000 |
| $R^2$= 0.26 | | | | |

Table 15: Regression 7 (FDI flows on Industrial Growth)

| Variables | Coefficients | | | |
|---|---|---|---|---|
| | Model 7.1 | Model 7.2 | Model 7.3 | Model 7.4 |
| FDIF | 0.00062***(0.00017) | 0.00061***(0.00015) | 0.00061***(0.00015) | 0.00068***(0.00015) |
| CAP | | 0.08107*** (0.03472) | 0.08093**(0.03468) | 0.07019*(0.03577) |
| LAB | | | -2.77e-09 (2.09e-08) | 3.83e-08 (2.54e-08) |
| OPN | | | | -0.00996***(0.00339) |
| Constant | 6.419764***(0.05621) | 4.48257***(0.84163) | 4.563478***(1.00352) | 4.94430***(1.08096) |
| $R^2$ | 0.07 | 0.19 | 0.20 | 0.23 |

Table 16: Regression 8 (North and South FDI on Industrial Growth)

| Variables | Coefficient | Robust Std. Error | *t*-value | *p*-value |
|---|---|---|---|---|
| FDIF | 0.00137 | 0.00162 | 0.85 | 0.399 |
| $D_s$*FDIF | -0.00071 | 0.00162 | -0.44 | 0.664 |
| CAP | 0.07009* | 0.03558 | 1.97 | 0.053 |
| LAB | 3.69e-08 | 2.57e-08 | 1.44 | 0.155 |
| OPN | -0.00995*** | 0.00339 | -2.94 | 0.005 |
| Constant | 4.97599*** | 1.07977 | 4.61 | 0.000 |
| $R^2$=0.23 | | | | |

Note: *, **, and *** are 10%, 5%, and 1% significance levels, respectively. The standard errors are adjusted for 70 clusters in individual partner countries.　The values in the brackets are robust standard errors.