Determinants of Foreign Direct Investment from OECD to ASEAN

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Abstract

This paper examines the determinants of foreign direct investment (FDI) from OECD to Southeast Asia referring to the knowledge-capital model. Fixed-effects, random-effects, and Hausman Taylor estimations are used in the regression analysis. The panel dataset includes 31 source OECD countries and 10 host ASEAN countries over the period 1995-2012. Empirical evidence is in line with the predictions of the knowledge-capital model. In particular, the total income and the similarity in market size between the source and host countries encourage horizontal FDI. In contrast, higher differences in relative factor endowments lead to higher vertical FDI. Moreover, distance is negatively related to FDI while the opposite is true for investment freedom and common spoken language of the host nations.

Key words: ASEAN, foreign direct investment, knowledge-capital model, OECD.

JEL Classification codes: F-23.

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1. Introduction

Around fifty years ago, Southeast Asia was a commercial backwater plagued with ethnic conflicts, wars, and economic stagnation. The foundation of the ASEAN, the ongoing macroeconomic and structural reforms of the member countries, the advantages of abundant labor and low wages, and the strong cooperation within the region in both political and economic spheres, have transformed the ASEAN members in a relatively short period of time. There was a shift in economic policy from import substitution to export promotion and openness to foreign direct investment (FDI) in the region. The ASEAN is now considered one of the most successful inter-governmental organizations in the developing world.

Of the contributors to the rapid development of the ASEAN, international investment in Southeast Asia plays a critical role. Since the mid-1980s, Southeast Asian countries have attracted the attention of foreign investors thanks to their policies of encouraging and supporting FDI initiatives. Southeast Asia was the only region that experienced an increasing inward FDI flows in 2012. In addition, in 2013 its FDI inflows exceeded that of China for the first time since 1995 (OECD, 2014).

This research aims to study empirically the determinants of foreign direct investment in Southeast Asia, focusing on FDI from OECD to ASEAN countries. A number of important determinants of OECD's FDI to ASEAN will be addressed so as to contribute to the literature on this topic in the region. To derive testable hypotheses on determinants of FDI, we use the knowledge-capital model proposed by Markusen (2002). The main advantage of this model is that it allows for simultaneous horizontal and vertical motives for direct investment. The hypotheses derived from the theory are validated empirically using a panel dataset of 31 home OECD countries and 10 host ASEAN countries over the period 1995-2012. This is the first empirical study on FDI location in Southeast Asia that includes all member states of ASEAN as destinations for FDI, thanks to improved data availability in the recent years. The empirical analysis employs fixed-effects, random-effects, and Hausman-Taylor estimations to show the significant roles of the similarities in terms of market size and relative endowments, trade costs, investment freedom and common spoken language in FDI location of OECD countries in Southeast Asia. This research also presents recent trends and an up-to-date picture of FDI to ASEAN countries.

The structure of this paper is as follows. Section 2 presents a literature review and describes the value added of this study. Section 3 explains the analytical framework and proposes research hypotheses. The main facts on foreign direct investment in Southeast Asia are presented in Section 4. Section 5 describes statistical data and empirical methodology. This

is followed by Section 6 with estimation results. The final section concludes with the summary of main findings and directions for further research.

2. Literature Review

Literature on foreign direct investment is enormous, especially in the era of globalization which has led to significant increase in international business activity and FDI. Numerous theories attempting to explain the phenomenon of multinational enterprises (MNEs) and FDI have been developed over time. These theories investigated the nature, causes, and consequences of FDI. Therefore, summarizing all previous developments in this field goes beyond the scope of this paper. Instead, in this section we summarize only the empirical literature on the determinants of FDI in the ASEAN countries.

Since the mid-1980s, ASEAN-5 countries (Singapore, Malaysia, Thailand, Indonesia and the Philippines) have attracted the attention of foreign investors thanks to their policies of encouraging and supporting FDI initiatives. From that time on, there have been numerous empirical studies on the success in attracting FDI of ASEAN along with the expansion of the organization from five to ten member states (ASEAN-10).

The eclectic paradigm and the gravity model are among the most popular analytical frameworks that were used in previous empirical studies. Many researchers have employed the gravity equation for FDI bilateral flows, keeping standard-gravity variables such country size, measured by GDP or population, and distance, and adding a number of other explanatory variables such as common language, common border, etc. These studies include Goldberg and Klein (1997), Hemkamon (2007), Hattari *et al.* (2008a, 2008b, and 2009), Changwatchai (2010), Kang (2012).[1] In addition, the effect of economic integration in ASEAN on FDI was analyzed by Ismail et al. (2009) and Masron (2013).

It was shown in the majority of these studies that standard gravity variables had expected results, i.e. market sizes had a positive impact and distances had a negative influence on FDI to Southeast Asia. Besides, a number of other factors were identified to have a statistically significant impact on FDI location in Southeast Asia such as exchange rates, institutional quality, economic integration within the region, low wage rates, labor abundance, FDI agglomeration forces, and economic crises.

[1] Moreover, Changtasasawat et al. (2004) and Eichengreen and Tong (2007) attempted to analyze the effect of China on other Asian countries' FDI, based on the gravity model.

There are also many studies developing their own theoretical frameworks. For instance, Lucas (1993) estimated a model of derived demand for foreign capital by a multiple product monopolist for seven economies: ASEAN-5, South Korea and Taiwan. Empirical evidence showed that the two factors that had a negative impact on FDI were greater incidence of industrial dispute and higher risk of currency depreciation. By contrast, enhanced size of domestic and export markets encouraged FDI inflows. However, concerns for political stability outweighed economic determinants.

Baek and Okawa (2001) examined Japanese FDI in manufacturing in Asia, focusing on the role of exchange rates. Constructing equations of different types of costs (production cost and tariff-adjusted costs) that affected investment decisions, the authors then estimated equations for the aggregate manufacturing and for individual sector of Japanese FDI in Asia from 1983 to 1992. The results showed the significant impact of exchange rates between the Japanese yen and other currencies i.e. Asian currencies and the US dollar.

Also analyzing the role of exchange rates in the competition between countries for FDI, Xing and Wan (2006) modeled the decision of MNEs planning to invest for export purpose in two countries with similar technology. The model showed that the relative FDI inflow was a decreasing function of the relative real exchange rate. Regression results suggested that the relative exchange rate was an important factor affecting the relative inflows of Japanese FDI for manufacturing as a whole and for sub-sectors as well. Additionally, other structural variables were also positively associated with relative FDI, including the relative GDP and relative openness. Relative variables were the ratios between the ASEAN economies and China.

Plummer and Cheong (2008) were the first and so far the only researchers who tried to apply the knowledge capital (KK) model of Markusen (2002) as an analytical tool to study FDI location determinants in the ASEAN.[2] However, their study suffered a number of shortcomings that encourage us to revisit their findings and advance further the analysis of determinants of FDI location in Southeast Asia building on this model.

First, their empirical analysis was very brief without clear explanation of variable choices connected to the KK model. For example, the authors simply included GDP and population of both source and host countries in regression equations, which was very similar to the ad hoc gravity approach rather than the KK model. These variables could not be explicitly related to the similarity or differences between source and host countries in terms of market size. In

[2] Furthermore, there have been many empirical studies on FDI location in other regions that employed the KK model, such as Carr et al. (1998), Markusen and Maskus (2002), Braconier et al. (2002), etc.

addition, variables that captured differences in relative factor endowments were not clearly explained. The authors used three variables for differences in factor endowments, namely the natural logarithm of the home-to-host capital stock ratio; the natural logarithm of the home-to-host skilled-labor ratio; and the natural logarithm of the home-to-host unskilled-labor ratio. However, the main problem of using these variables is the fact that each component of the ratios was heavily affected by the country size. For instance, the ratio between the number of skilled labors in Singapore, a tiny country, and that of China, the most populous country in the world, could be highly likely less than 1 even though Singapore should be relatively more skilled-labor abundance than China. Therefore, these ratios do not allow measuring correctly the differences in relative factor endowments between nations.

Summing up, most previous empirical studies that investigate the determinants of FDI in the ASEAN countries generally suffer from two major shortcomings. First, very few empirical studies have firm theoretical underpinnings and it is difficult to relate their estimating equations directly to theoretical models. Therefore, clear interpretation of their empirical results are not easily derived. Second, most studies focus only on one possible type of FDI. To our knowledge no attempts have been made to investigate the relative importance of horizontal and vertical FDI simultaneously in the context of ASEAN countries. In this paper we aim at filling at least a part of these gaps.

The contribution of our paper to the existing literature is threefold. First, we aim at providing a direct link between the theory and the estimating equation by referring to the well-defined theoretical framework in the FDI literature - the knowledge-capital model of Markusen (2002). Second, we simultaneously include the determinants of both horizontal and vertical FDI in the single empirical setting to examine their relative importance. In particular, we evaluate the role of similarities in terms of size as well as relative endowments between the OECD and the ASEAN countries. In contrast to previous empirical studies we use a measure of differences in relative factor endowments that is directly related to the theoretical model. In addition, a number of other factors that may have significant effects on FDI to the ASEAN countries, such as trade costs, investment freedom and the common language are also identified. Finally, we provide more recent empirical evidence on the determinants of FDI in the context of all ASEAN countries.

3. Analytical Framework and Hypotheses Development

The key step in the development of the modern theory of the multinational enterprise was aimed at combining the horizontal and vertical approaches into a hybrid framework in which firms can choose between national, horizontal and vertical strategies. This has been done by Markusen (2002) who called this integrated framework the knowledge-capital model. His model is currently regarded as the most general theory of the multinational enterprise. The KK model allows national firms, horizontal multinationals and vertical multinationals to emerge endogenously in the equilibrium, depending on various combinations of home and host country characteristics.

The KK model is based on three main assumptions. First, it assumes that creation and services of knowledge-based assets, such as R&D, can be geographically separated from production and supplied to foreign subsidiaries by the headquarter at a fairly low cost. Second, it assumes that headquarter services are more human-capital intensive than production. Third, it assumes that these knowledge-based services have a joint-input characteristic. In other words, they can be simultaneously used by multiple production facilities, giving rise to firm-level scale economies. The first two assumptions provide incentives for the international fragmentation of production and locating various segments of production process where the factors used intensively is each segment are relatively cheap. The third assumption motivates horizontal investment that replicates the same goods or services in different countries.

Unfortunately, the KK model cannot be solved analytically. The analytical difficulties imply that most results have to be derived from numerical simulations.[3] These simulations generate predictions on the relationship between the extent of multinational activity and country characteristics. For example, national firms exporting to each other's market will be the dominant type when countries are similar in economic size and relative factor endowments and trade costs are low. Horizontal multinationals will dominate when countries are similar in economic size and relative factor endowments and trade costs are high. However, if countries are dissimilar in either size or in relative factor endowments one country will be favored as a location of both headquarters and production activities or one of these two activities.

In particular, if countries are dissimilar in size but similar in relative factor endowments then national firms located in the large country will be favored as they can avoid installing

[3] Simulation results of KK model were demonstrated with a series of world Edgeworth box diagrams. The general pattern of regimes over the Edgeworth box is shown in Figure A1 in the Appendix. This figure shows different types of firms according to the relationship between the world endowment of the composite factor (i.e. unskilled labor) and the world endowment of skilled labor.

costly capacity in the smaller market. On the other hand, if countries are similar in size but dissimilar in relative factor endowments vertical multinationals will be the dominant type as there is an incentive to split the production process and locate headquarters in the human-capital abundant country and production in the labor-abundant country, unless trade costs are high. The extent of multinational activity in the hybrid model is the largest when the parent country is moderately small and highly abundant in human capital.

Even though most findings of the KK model are derived from numerical simulations, the model generates a number of testable predictions, relating the extent of multinational activity to country characteristics. The bilateral relationships between firm types and economic characteristics of two countries: country *i* and country *j*, the derived from the KK model are illustrated in Table 1.

Table 1. Firm types and countries' characteristics in KK model

Dominant firm type		Different in size and relative endowment		Similar in size, relative endowment, factor prices	Trade cost	Total income	Note
		Country i	Country j				
Horizontal firms	Type-hi		Not high foreign investment barriers	Yes	High	High	Type-hj will also produce in i
	Type-hj	Not high foreign investment barriers		Yes	High	High	Type-hi will also produce in j
Vertical firms	Type-vi	- Small - Skilled-labor abundant	Not high foreign investment barriers		Not excessive	Low	Trade costs here are costs from the host country back to the parent country
	Type-vj	Not high foreign investment barriers	- Small - Skilled-labor abundant		Not excessive	Low	
National or domestic firms	Type-di	- Large - Skilled-labor abundant					Type di may sell in j if trade cost is not excessive
				Yes	Low		
			High foreign investment barriers				
	Type-dj		- Large - Skilled-labor abundant				Type dj may sell in i if trade cost is not excessive
				Yes	Low		
		High foreign investment barriers					

Source: Own summary based on Markusen (2002).

The predictions of the KK model can be tested using statistical data on FDI from OECD to ASEAN countries. However, it should be noted that Markusen (2002) analyzed bilateral multinational activity, while in our study, we take into account only unilateral multinational activity, i.e. our dataset includes one-way FDI only, from OECD countries to ASEAN countries. This, in turn, will lead to only three types of firms' activity as shown in Table 2. We assume that MNEs are headquartered in parent countries – OECD, which means that OECD countries are the i-country and ASEAN countries are the j-country in the theoretical model. As shown in Table 2, country characteristics have different influence on FDI, depending on the type of FDI. Our research hypotheses on FDI from OECD to ASEAN countries derived on the basis of the KK model can be formulated as follows:

Hypothesis 1: Total income and the similarity in market size between OECD countries and ASEAN countries are associated positively with FDI.

Hypothesis 2: The differences in relative factor endowments between OECD countries and ASEAN countries motivate FDI.

Hypothesis 3: Higher investment freedom in ASEAN leads to higher FDI.

Hypothesis 4: High trade costs between ASEAN and OECD discourage FDI.

In addition, we also include some other typical factors usually shown having effects on FDI in previous empirical studies, namely past colonial links and common language between host and source countries. These variables are proxies for cultural distance between the two nations, which can affect transaction costs in doing business (Kim et al., 2014). Thus, we expect these variables are also positively related to FDI.

Hypothesis 5: Common spoken language encourages FDI

Hypothesis 6: The past colonial relationship is positively correlated with FDI.

Table 2. Types of FDI from OECD to ASEAN and countries' characteristics

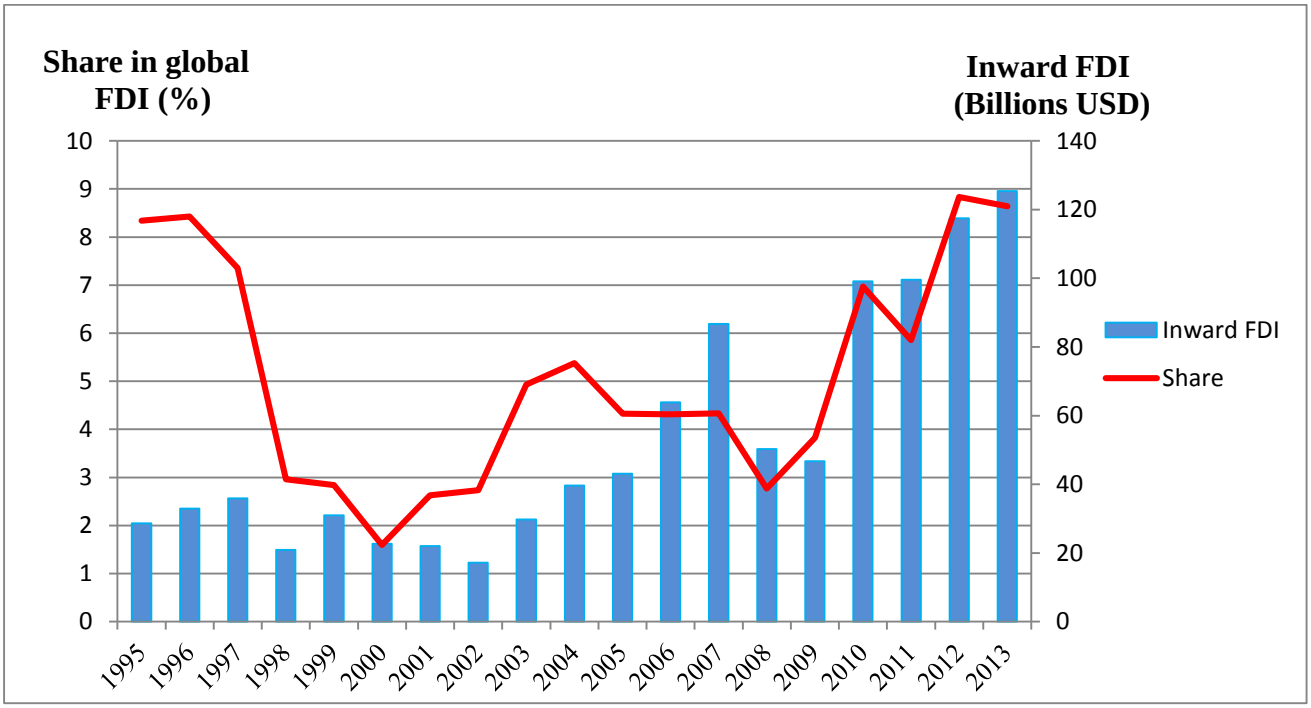
Dominant type of FDI from OECD to ASEAN		Different in size and relative endowment		Similar in size, relative endowment and factor prices	Trade cost	Total income	Note
		OECD countries (i)	ASEAN countries (j)				
Horizontal FDI	Type-hi		Not high foreign investment barriers	Yes	High	High	Trade costs here are costs between ASEAN and OECD countries
Vertical FDI	Type-vi	Small Skilled-labor abundant	Not high foreign investment barriers		Not excessive	Low	Trade costs here are costs from the ASEAN countries back to OECD countries
No FDI (OECD's firms prefer producing domestically)	Type-di	Large Skilled-labor abundant					
				Yes	Low		Trade costs here are costs between ASEAN and OECD countries
			High foreign investment barriers				Domestic firms of OECD may export to ASEAN if trade cost is not excessive

Source: Own summary.

4. Inward FDI in ASEAN: Main facts

The annual FDI inflows into ASEAN between 1995 and 2013 are shown in Figure 2. During this period FDI inflows clearly show a positive trend. The fluctuations of FDI flows to ASEAN during this period were mainly due to two financial crises in 1997 and 2007-2008 as well as political instability following September 11, 2001. Moreover, the share of ASEAN in global FDI was more volatile than the total volume of FDI to ASEAN.

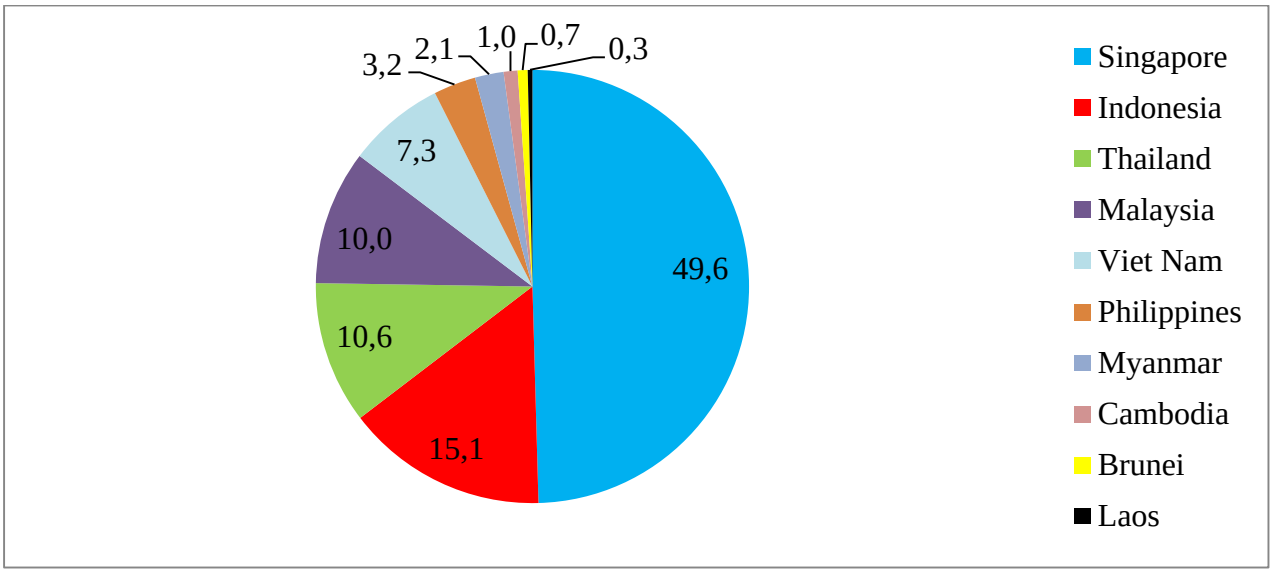
Figure 2. FDI flows to ASEAN



Source: Own calculations based on UNCTAD Stat.

Figure 3 indicates the distribution of inward FDI in the ASEAN countries which is very uneven. In particular, Singapore accounted for by far the largest portion of FDI to the region. Nearly 50% of FDI to ASEAN in fact went to Singapore in 2013. In contrast, Laos, Cambodia, Brunei, and Myanmar were the smallest FDI recipients among the ASEAN countries. The total percentage of these four countries taken together was equal only to that of Vietnam in 2013.

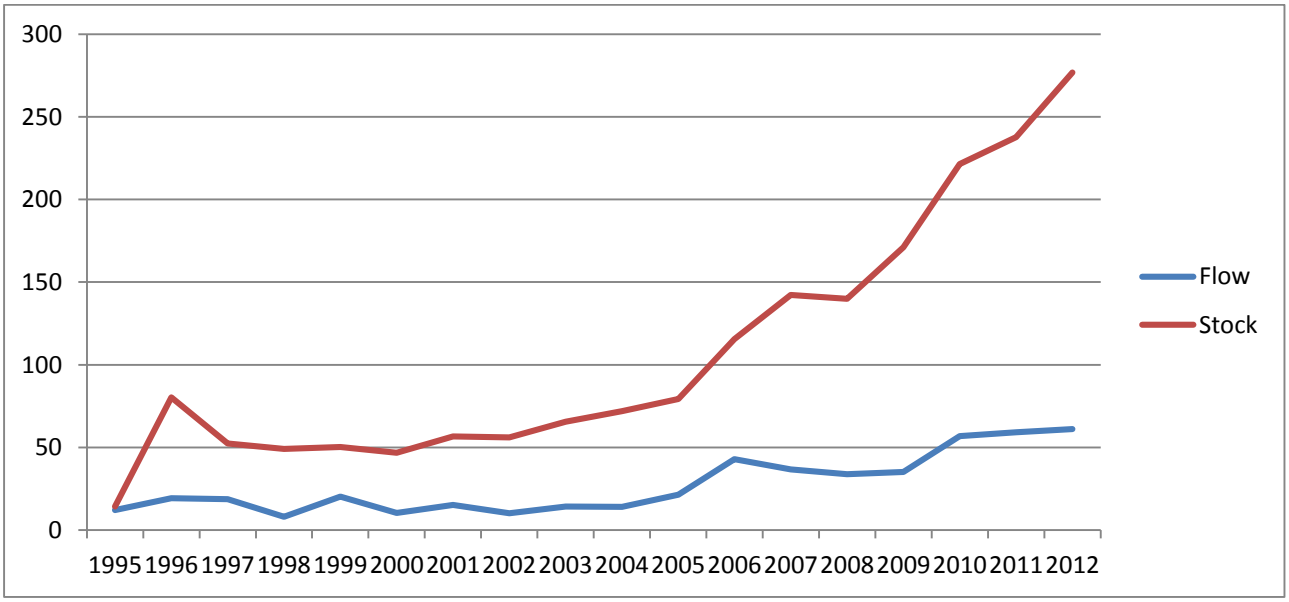
Figure 3. Share of net FDI inflows in Southeast Asia in 2013 (%)



Source: Own calculations based on ASEAN Stat.

Figure 4 demonstrates the FDI flows and stocks from OECD to ASEAN over 18 year period, 1995-2012. Unlike data on total FDI presented before, the aggregate FDI data from OECD to ASEAN did not display significant impacts of the two crises in 1997 and in 2007. There was a clear upward trend in both stocks and flows from OECD to ASEAN, but FDI stocks were much higher than FDI flows over the period.

Figure 4. Total FDI from OECD to ASEAN, billion USD



Source: Own calculations based on OECD Stat.

5. Statistical Data and Empirical Methodology

At present, OECD has a total of 34 members[4], but our dataset contains data for only 31 OECD member countries. Canada, Mexico, and Portugal are excluded due to the lack of FDI data. All ten members of ASEAN are taken into account. List of countries in our dataset are indicated in Table 3 while definitions of particular variables and data sources are shown in Table 4.

Table 3. Host and source economies in the dataset

OECD- Source Countries			**ASEAN- Host Countries**
1. Australia	12. Hungary	22. Norway	1. Brunei
2. Austria	13. Iceland	23. Poland	2. Cambodia
3. Belgium	14. Ireland	24. Slovak Republic	3. Indonesia
4. Chile	15. Israel	25. Slovenia	4. Laos
5. Italy	16. Czech Republic	26. Spain	5. Malaysia
6. Denmark	17. Japan	27. Sweden	6. Myanmar
7. Estonia	18. South Korea	28. Switzerland	7. Singapore
8. Finland	19. Luxembourg	29. Turkey	8. Thailand
9. France	20. Netherlands	30. United Kingdom	9. The Philippines
10. Germany	21. New Zealand	31. United States	10. Vietnam
11. Greece			

Note: Canada, Mexico, and Portugal are excluded due to data unavailability.

Source: Own summary.

5.1. Dependent Variables

In the empirical FDI literature there is no unanimously agreed way of measuring FDI and there are also some disputes about which variable can be a better candidate for FDI. In previous empirical studies on determinants of FDI some researchers used FDI flows while others FDI stocks as their dependent variables. Hence, in this paper, we use both measures of FDI as our dependent variables. This allows us to see whether there is any significant difference in our regression results due to a choice of a different dependent variable.

Our two dependent variables, namely FDI stocks and FDI flows from OECD countries to ASEAN countries, are denominated in current US Dollar similar to all other monetary variables in the panel. These data are drawn from OECD Statistics. It is important to note that we only take into consideration the nonnegative net outward FDI of OECD to ASEAN countries in this study and thus

[4] See: http://www.oecd.org/about/membersandpartners/list-oecd-member-countries.htm

we skip all negative values in our regression analysis.[5] This nature of FDI data leads to an unbalanced panel in our analysis.

5.2. Explanatory Variables

a) Country size-related variables

Nominal GDP is used to construct measures of bilateral the country size as well as the similarity in size. The bilateral country size is simply the sum of income of two countries:

$$SUMGDP = GDP_O + GDP_A$$

where subscript "O" denotes OECD countries while "A" denotes ASEAN countries, and GDP_O and GDP_A are GDPs of OECD and ASEAN countries, respectively.

The similarity in size between OECD and ASEAN countries is measured by the Helpman Size Similarity Index (SSI). In particular, Helpman (1987) defined an index of size similarity for a group (I) of trading partners as follows:

$$SIMILARITY_I = 1 - \sum_{j \in I} (s_j)^2$$

where s_j is country j's share of group I's GDP. It is maximized when all countries are equal in size.

In our analysis we use a bilateral version of this index. Therefore, the Helpman Index (SSI) for each pair of countries in our study is calculated as:

$$SSI = 1 - \left(\frac{GDP_O}{GDP_O + GDP_A}\right)^2 - \left(\frac{GDP_A}{GDP_O + GDP_A}\right)^2$$

The Helpman index is calculated for 310 pairs of countries (31 OECD and 10 ASEAN countries). The value of this index ranges between 0 and 1/2. The higher value of the Helpman Index implies more similarity in market size between the pair of countries.

b) Relative factor endowment difference

Regarding the relative factor endowment difference, we use two different proxy variables. To maintain the comparability with the earlier studies, the first one is the absolute value of difference in GDP per capita adjusted for purchasing power parity:

$$GDPPC = |GDPPC_O - GDPPC_A|$$

Data on GDP and GDP per capita are collected from the World Bank's World Development Indicators.[6]

[5] There are around 10% of FDI flows taking negative value and the number for FDI stocks is approximately 5%. In addition, there are also some missing values on FDI but most of them should be zero or trivial (Hattari et al, 2009).

[6] GDP-related data of Myanmar are not available in this source and we had to cull the data for Myanmar from the IndexMundi data portal. However, this portal claims that their data source is also the World Bank.

The second indicator for differences in relative factor endowments between the source and the host countries is expressed as:

$$SKILL = |SKILL_O - SKILL_A|$$

where SKILL is a measure of the absolute skilled-labor abundance in the OECD country relative to the ASEAN country. $SKILL_O$ and $SKILL_A$ are skilled-labor abundance in OECD and ASEAN, respectively. Data for these variables are derived from the International Labor Organization (ILO). Skilled-labor abundance in each country is measured by the sum of skilled-labor intensive occupations (managers, professionals, and technicians) divided by total employment. Thus, skilled-labor abundance variable of each country ($SKILL_O$ or $SKILL_A$) ranges from 0 to 1 and so does SKILL variable. The main problem of SKILL variable is that it has more missing values compared to GDPPC variable, which in turn leads to a lower number of observations in regressions based on SKILL variable.

c) Investment environment

It has been often argued that the general quality of investment climate in host countries is essential for attracting FDI. The investment climate is, however, determined by a variety of economic and non-economic factors, which makes it difficult to construct an accurate indicator of the investment climate. Fortunately, we found an appropriate index that can be viewed as a reliable proxy for domestic investment climate, which is one component in the annual Index of Economic Freedom, jointly published by The Heritage Foundation and The Wall Street Journal. The Economic Freedom Index is constructed by incorporating ten different components: fiscal freedom, government spending, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom, and financial freedom. These components are weighted equally in determining a country's overall index score. Each component, in fact, can be considered as an independent index reflecting different aspects of an economy. Each index ranges from 0 to 100 as the overall score i.e. the Economic Freedom Index. A higher value of this index implies a higher level of freedom. The index was first introduced in 1995 and now includes data for 186 economies throughout the world. Unfortunately, Brunei is not included in this list. We use the investment freedom component of this index as our indicator for investment environment in the host economy i.e. ASEAN countries (INVA variable).

d) Trade costs

According to the predictions of the theoretical model different trade costs can lead to different types of FDI. The most popular proxy variable for trade costs is probably the distance between the source and host countries so we also include this variable in our model (DIST). This distance is an element in both export costs and investment costs. The distance variables is expressed simply as the

distance between the capitals of two countries. However, geographic distance itself cannot properly indicate trade cost to a single country from the rest of the world since it is calculated for each pair of countries. In order to overcome this problem, we use the trade freedom index from the same source as the investment freedom index to capture trade costs of each country, not each pair of countries, like the simple distance variable. A higher value of the trade freedom index of a country should reflect a lower trade cost of exporting to that country. $TRADE_O$ and $TRADE_A$ variables are trade freedom indexes of OECD and ASEAN countries, respectively.

e) Cultural distance

In addition to trade costs we take into account also indicators for cultural distance between the source and host countries. These include two time-invariant variables: colonial relationship (COL) and common language (LANG) which are dummy variables. They take value of 1 if the two countries were ever in a colonial relationship or have at least one common language and 0 otherwise. The common language variable measures very often refer to the official language only. All previous studies on FDI location in Southeast Asia used a dummy variable for the common official language. However, the common language does not need to be designated by the government as official to serve as a vehicle of communication. Some authors argued that also the set of non-official languages in which people between the two countries are proficient can reduce transaction costs in business between them (Kim et.al, 2014). Hence, in this study, instead of using a dummy variable for a common official language, we use a dummy variable for a common language which is spoken by at least 9% of the population in both countries. This variable has a wider scope than a common official language because generally a common spoken language comprises also a common official language. A common spoken language may have an impact on FDI in the sense that it can lower the transaction costs in business activity between the two countries.

Variables explanations, data sources, descriptive statistics of variables are summarized in Table 4 and Table 5. Additionally, Table 6 presents the correlation matrix between the variables used in the regression analysis. It can be seen from Table 6 that there are no potential problem of correlation between variables in our model.

Table 4. Variable explanation and data source

No	Variable Explanation	Abbreviation	Data source
1	Nonnegative net FDI flows from OECD to ASEAN (Million USD)	FDIflow	OECD Statistics http://www.oecd-ilibrary.org/statistics
2	Nonnegative net FDI stocks from OECD to ASEAN (Million USD)	FDIstock	
3	Total nominal GDP (Billion USD)	SUMGDP	World Bank's World Development Indicators http://data.worldbank.org/frontpage
4	Helpman Index, between 0 and 0.5	SSI	IndexMundi data portal http://www.indexmundi.com/ and Own calculations
5	Difference in GDP per capita (PPP), absolute value (Thousand USD)	GDPPC	
6	Skill difference, absolute value Ratios between 0 and 1	SKILL	International Labor Organization (ILO) and Own calculations http://laborsta.ilo.org/
7	Investment Freedom Index of ASEAN countries, between 0 and 100	INVA	The Heritage Foundation, http://www.heritage.org/index/
8	Trade Freedom Index of ASEAN countries, between 0 and 100	TRADEA	
9	Trade Freedom Index of OECD countries, between 0 and 100	TRADEO	
10	Common language, dummy, 1 if a language is spoken by at least 9% of the population in both countries and 0 otherwise	LANG	CEPII Research Center http://www.cepii.fr/CEPII/en/cepii/cepii.asp
11	Distance between capitals (Km)	DIST	
12	Colonial relationship, dummy, 1 for pairs ever in colonial relationship and 0 otherwise	COL	

Source: Own summary.

Table 5. Variables summary

No	Variables	Abbreviation	Number of observations	Mean	Standard Deviation	Min	Max
1	FDI flows	FDIflow	4100	138.06	688.91	0	15501
2	FDI stocks	FDIstock	4038	492.05	2128.94	0	35967.65
3	Total GDP	SUMGDP	5098	1127.25	2297.79	6.13	17039.92
4	Helpman Index	SSI	5098	0.22	0.18	0	0.50
5	Difference in GDP per capita	GDPPC	5098	24.44	12.99	0.03	88.70
6	Skill difference	SKILL	4111	0.22	0.11	0	0.52
7	Investment Freedom Index of ASEAN	INVA	4435	41.85	22.29	0	90
8	Trade Freedom Index of ASEAN	TRADEA	4435	67.85	11.99	15	90
9	Trade Freedom Index of OECD	TRADEO	4992	79.99	6.23	49.60	90
10	Common language	LANG	5098	0.04	0.20	0	1
11	Distance	DIST	5098	9356.41	2536.98	2615.75	18603.05
12	Colonial relationship	COL	5098	0.03	0.17	0	1

Source: Own calculations.

Table 6. Correlation matrix

	FDIflow	FDIstock	SUMGDP	H	GDPPC	SKILL	INVA	TRADEA	TRADEO	LANG	DIST	COL
FDIflow	1											
FDIstock	0.53	1										
SUMGDP	0.44	0.36	1									
SSI	-0.15	-0.22	-0.43	1								
GDPPC	0.01	0.06	0.20	-0.14	1							
SKILL	-0.18	-0.20	-0.07	-0.15	0.45	1						
INVA	0.19	0.15	-0.01	-0.01	-0.03	-0.28	1					
TRADEA	0.21	0.23	0.08	0.20	0.11	-0.33	0.35	1				
TRADEO	0.10	0.06	0.16	-0.04	0.40	0.18	-0.16	0.24	1			
LANG	0.21	0.08	0.15	-0.01	0.05	-0.13	0.16	0.12	-0.03	1		
DIST	0.07	-0.21	0.20	0.07	0.02	-0.02	0.07	0.06	0.07	-0.06	1	
COL	0.04	-0.02	0.14	-0.12	0.04	0.04	-0.01	-0.04	0.03	0.14	0.09	1

Source: Own calculations.

5.3. Empirical Methodology

The most commonly estimated empirical models of FDI determinants are probably fixed effects (FE) and random effects (RE) models that allow exploiting the panel properties of the dataset. Less frequently, researchers in some studies employ also Hausman-Taylor (HT) estimators. The use of FE, RE, or HT estimators corresponds to complete, no correlation, or some correlation between regressors and individual effects, respectively (Baltagi, 2001). Hence, in our empirical analysis, we use all three types of estimators to estimate determinants of FDI location from the OECD countries in Southeast Asia.

The choice between the RE and FE estimators are based upon the standard Hausman test. However, one of the biggest disadvantages of FE estimator is that it does not allow the estimation with time-invariant regressors. Therefore, in addition to the standard estimates obtained using FE and RE estimators we also present results obtained applying HT estimators. Our estimation equations are expressed as follows:

$$FDI_t = \beta_0 + \beta_1 SUMGDP_t + \beta_2 H_t + \beta_3 GDPPC_t + \beta_4 INVA_t + \beta_5 TRADEA_t + \beta_6 TRADEO_t + \beta_7 LANG_t + \beta_8 DIST_t + \beta_9 COL_t + \lambda_t + \varepsilon_t \quad (1)$$

$$FDI_t = \beta_0 + \beta_1 SUMGDP_t + \beta_2 H_t + \beta_3 SKILL_t + \beta_4 INVA_t + \beta_5 TRADEA_t + \beta_6 TRADEO_t + \beta_7 LANG_t + \beta_8 DIST_t + \beta_9 COL_t + \lambda_t + \varepsilon_t \quad (2)$$

where FDI_t refers to FDI stocks or FDI flows, λ: denotes the unobservable time effects; ε is an error term; and t is time dimension, ranging from 1995 to 2012.

The only difference between the two above equations lies in the use of different proxies for relative factor endowment variables. In the first equation, we use the difference in GDP per capita (GDPPC) while in the second it is replaced by the skill difference (SKILL).

6. Estimation Results

6.1. Estimation Results for FDI Flows

Table 7 reports the estimation results obtained for FDI flows having controlled for individual time effects by including dummy variables for particular years of the sample. The most robust variable is SUMGDP. The estimated coefficient on this variable is positive and statistically significant already at 1% in all six equations. The estimated coefficient on the Helpman Size Similarity Index is statistically significant at 5% level in four out of six equations and also displays a positive sign. Thus, when the two countries are similar in size, more FDI from OECD to ASEAN can be expected. These results generally confirm Hypothesis 1. The results also signal horizontal FDI as indicated in Table 2.

The estimated coefficients on different measures of the relative factor endowment variables reveal similar results. They are statistically significant at 1% level in four out of six equations and

also displays a positive sign, which confirms Hypothesis 2. This means that the bigger the difference in terms of relative factor endowments between the countries, the larger are the FDI flows from OECD to ASEAN countries. These results signal vertical FDI because multinational firms tend to be headquartered in the skilled-labor abundant nations. In this case, the most skilled-labor abundant nations are OECD countries and thus MNEs from OECD countries tend to locate their unskilled-labor intensive stages of production in the ASEAN countries, which results in vertical FDI.

The estimated coefficient on the investment freedom index in ASEAN (INVA) is positive and statistically significant at 1% level only in the equations estimated using the random effects estimator. This result is in line with the expectation stated in Hypothesis 3. The higher value of INVA implies that it is easier to invest in Southeast Asian countries. Hence, if ASEAN countries offer a more liberal investing environment, they should be able to attract more FDI from the OECD countries, irrespectively of the forms of FDI (i.e. horizontal or vertical). However, this result is not robust with respect to other estimation methods.

A similar result is seen in the case of the common language variable which is also positive and highly significant only in the RE models. Our regression results on the common language show that sharing a common spoken language with the host country can lead to higher FDI flows from OECD to Southeast Asia, which confirms Hypothesis 5.[7] However, again this result is not robust with respect to other estimation methods.

Finally, trade freedom indexes for both the ASEAN and OECD countries, distance, and colonial relationships are not statistically significant in all estimated equations for FDI flows. Therefore, our Hypothesis 6 on the importance of colonial ties has to be rejected in the case of FDI flows.

Furthermore, we want to test whether time-effects have any influence on our regression results. Hence, for comparison we also estimate all equations for FDI flows without year dummy variables. The estimation results are shown in Table 8. The first five variables (SUMGDP, SSI, GDPPC, SKILL, and INVA) appear with similar results to the previous case when we controlled for individual time effects. Interestingly, the estimated coefficients on trade freedom indexes are statistically significant in the absence of control for time-effects in some regressions. In particular, the coefficient of trade freedom index of ASEAN countries, TRADEA, is positive and significant at 10% level in one out of

[7] As for the common spoken language, the most popular one is English, which is considered as the global language (David, 2012). Studies showed that the English ability of the local labor force can affect the attractiveness of a country to foreign investors. For example, Vietnam is known to have the advantage of labor abundance and low wage rate. However, the English skills of Vietnamese workers are considered to be significantly lower compared to some other countries within the region such as Malaysia or the Philippines. This makes Vietnam relatively less attractive to foreign investors. Some managers of MNEs in Vietnam have stated that they could hardly interact with Vietnamese employees due to the poor English skills of employees. Also, positions of higher responsibility such as a supervisor which requires the person to be proficient in English, have a limited applicant pool because of the low average levels of English ability of the Vietnamese workforce.

six equations. Why does trade freedom of ASEAN countries motivate FDI from OECD to ASEAN? This may be because when MNEs engage in FDI in ASEAN countries, they also need to import machines, core materials or components to these countries to conduct production there. Consequently, higher trade freedom of ASEAN countries can support those imports to ASEAN and thus attract more FDI. Nevertheless, since this variable is statistically significant in only one equation with a low significance level (10%), our reasoning is supported weakly by the result.

At the same time, trade freedom of OECD countries is negatively associated with FDI flows from OECD to ASEAN at 5% significance level in two out of six equations. In other words, FDI from OECD to ASEAN decreases with the level of trade freedom of OECD countries. This is a surprising result which may need further research because generally trade freedom of OECD should encourage vertical FDI to ASEAN as the KK model has demonstrated. In addition, coefficient of distance variable (DIST) is negative at 10% significance level in one equation, which means further distances discourage FDI from OECD countries.

However, trade freedom indexes and distance are statistically insignificant in the case of control for time-effects in all equations of FDI flows. Thus, distance and trade liberalization depend on time and then they do not influence FDI flows from OECD to ASEAN if time-effects are controlled. This result is reasonable because nowadays with the support of advanced means of transportation, transportation between nations become more convenient and less affected by distance. Also, facts have shown that trade liberalization is developed overtime as well[8].

[8] See UNTACD (2011), "World Development Report 2011", pp. 124-130.

Table 7. Regression results on FDI flows WITH control for time-effects

No	Variables	Expected sign	FE (1)	RE (2)	HT (3)	FE (4)	RE (5)	HT (6)
1	SUMGDP	+	**0.243*** **	**0.147*** **	**0.233*** **	**0.321*** **	**0.180*** **	**0.304*** **
			(0.016)	(0.010)	(0.233)	(0.021)	(0.012)	(0.020)
2	SSI	+	271.118	**310.257** **	**520.207** **	478.330	**422.482** **	**605.863** **
			(264.275)	(138.438)	(520.207)	(357.398)	(172.370)	(306.382)
3.1	GDPPC	+	**8.448*** **	-2.164	**8.671*** **			
			(3.174)	(1.801)	(2.836)			
3.2	SKILL	+				**1550.789*** **	-28.977	**934.674*** **
						(350.985)	(232.307)	(300.501)
4	INVA	+	-0.821	**2.266*** **	0.565	0.091	**3.286*** **	1.339
			(0.955)	(0.789)	(0.870)	(1.323)	(1.056)	(1.200)
5	TRADEA	-	-1.469	1.310	-0.359	-1.150	0.884	-0.574
			(1.275)	(1.207)	(1.228)	(1.714)	(1.590)	(1.637)
6	TRADEO	+	-3.602	-3.877	-3.673	-4.045	-4.545	-4.229
			(2.385)	(2.327)	(2.332)	(3.056)	(2.930)	(2.961)
7	LANG	+		**362.189*** **	318.445		**288.908** **	290.651
				(120.572)	(210.687)		(131.031)	(269.218)
8	DIST	-		-0.010	-0.027		-0.015	-0.035
				(0.011)	(0.018)		(0.012)	(0.026)
9	COL	+		-62.638	-207.355		-92.716	-325.656
				(146.949)	(258.856)		(179.484)	(372.103)
	Constant		40.539	274.117	61.222	-288.865	272.286	105.056
			(266.068)	(240.008)	(296.253)	(204.795)	(310.363)	(398.279)
Number of observations			3527	3527	3527	2473	2473	2473
Number of groups			276	276	276	236	236	236
R-square			0.13	0.20		0.15	0.24	

Significance levels: (*) = 10%, (**) = 5%, (***) = 1%. Standard errors in parentheses.

FE: Fixed Effects; RE: Random Effects, HT: Hausman Taylor estimation.

Source: Own calculations.

Table 8. Regression results on FDI flows WITHOUT control for time-effects

No	Variables	Expected sign	FE (7)	RE (8)	HT (9)	FE (10)	RE (11)	HT (12)
1	SUMGDP	+	**0.241*** **	**0.158*** **	**0.245*** **	**0.323*** **	**0.195*** **	**0.324*** **
			(0.016)	(0.010)	(0.015)	(0.019)	(0.012)	(0.019)
2	SSI	+	328.140	**455.649*** **	**607.581*** **	524.910	**569.502*** **	**658.006** **
			(255.880)	(137.769)	(236.622)	(327.608)	(169.241)	(326.288)
3.1	GDPPC	+	**5.022** **	0.664	**3.939***			
			(2.365)	(1.622)	(2.267)			
3.2	SKILL	+				**1547.88*** **	74.840	**976.683*** **
						(336.412)	(228.458)	(290.129)
4	INVA	+	-0.066	**1.648** **	1.115	0.840	**2.313** **	**1.915***
			(0.909)	(0.758)	(0.834)	(1.147)	(0.951)	(1.067)
5	TRADEA	-	-1.564	**1.897***	-0.646	-1.157	2.163	-0.563
			(1.150)	(1.083)	(1.108)	(1.403)	(1.346)	(1.359)
6	TRADEO	+	**-4.324** **	0.285	**-4.200** **	-3.603	1.425	-3.117
			(2.002)	(1.896)	(1.971)	(2.357)	(2.263)	(2.294)
7	LANG	+		**341.788*** **	293.866		**278.698** **	261.834
				(125.216)	(203.690)		(132.829)	(268.139)
8	DIST	-		-0.015	**-0.034***		-0.021	-0.042
				(0.011)	(0.018)		(0.013)	(0.026)
9	COL	+		-69.966	-201.130		-99.179	-335.146
				(152.875)	(250.615)		(182.106)	(371.561)
	Constant		128.397	-255.725	267.762	-370.878*	-409.398	-11.296
			(162.130)	(172.759)	(224.1972)	(224.903)	(220.509)	(328.139)
Number of observations			3527	3527	3527	2473	2473	2473
Number of groups			276	276	276	236	236	236
R-square			0.14	0.19		0.16	0.23	

Significance levels: (*) = 10%, (**) = 5%, (***) = 1%. Standard errors in parentheses.

FE: Fixed Effects; RE: Random Effects, HT: Hausman Taylor estimation.

Source: Own calculations.

6.2. Regression Results on FDI Stocks

The estimation results obtained for FDI stocks, having controlled for time-effects, are reported in Table 9. The results for the four main independent variables including SUMGDP, SSI, GDPPC, and SKILL are similar to FDI flows in terms of signs but of a higher level of statistical significance. Hence, Hypothesis 1 and Hypothesis 2 are strongly supported for both FDI stocks and FDI flows variables.

However, the estimation results for freedom indexes are different from the case of FDI flows. In particular, the index of investment freedom in ASEAN (INVA) is not statistically significant in any of the estimated equations for the FDI stocks.

The estimated coefficient on TRADEA variable displays the expected negative sign and is statistically significant at 5% level only in the case of one equation estimated using the FE estimator. This means which means that less trade freedom increases FDI stocks from the OECD in the ASEAN countries. This result signals the horizontal form of FDI because when it is easy to export to ASEAN countries, market-seeking MNEs do not need to locate production activities in these countries. Instead, they can benefit from economies of scale by concentrating production in the OECD and then exporting their products to the ASEAN. In other words, higher trade freedom of ASEAN countries may discourage horizontal FDI from OECD. However, this result is not robust with respect to other estimation methods. In contrast, the estimated coefficient of TRADEO is negative and highly significant at the 1% level in all six equations.

Geographic distance is demonstrated to be negatively related to FDI stocks at the 1% level in all equations estimated using RE and HT estimators. The bigger the distance between the two countries, the less FDI stocks from the OECD to the ASEAN countries should be expected. In fact, larger distances should encourage horizontal FDI to save transportation costs. However, the negative coefficient on the distance variable can be also interpreted as an indicator of either transport costs of importing back to home countries which deter vertical FDI or investing and monitoring costs which hinder horizontal FDI. This result confirms Hypothesis 4: higher trade costs measured by further distances reduce FDI stocks from OECD to ASEAN.

Meanwhile, common language (LANG) and colonial relationship (COL) do not seem to be related to FDI stocks. In other words, cultural distances do not affect FDI stocks from OECD countries to Southeast Asia. Thus, Hypothesis 5 and Hypothesis 6 are not empirically supported by regression on FDI stocks.

Moreover, similar to the case of FDI flows, we also ran regression results on FDI stocks with the absence of time-effects but the result is quite similar to the case with control for time-effects. Therefore, we do not report those results here.

Table 9. Regression results on FDI stocks WITH control for time-effects

No	Variables	Expected sign	FE (13)	RE (14)	HT (15)	FE (16)	RE (17)	HT (18)
1	SUMGDP	+	**0.593*** **	**0.441*** **	**0.574*** **	**0.591*** **	**0.492*** **	**0.582*** **
			(0.045)	(0.031)	(0.043)	(0.052)	(0.036)	(0.050)
2	SSI	+	**1742.671*** **	**1372.817*** **	**2076.731*** **	**3849.41*** **	**1479.261*** **	**3580.286*** **
			(632.884)	(420.574)	(590.024)	(855.285)	(516.652)	(778.2066)
3.1	GDPPC	+	**33.351*** **	**10.598** **	**30.245*** **			
			(7.053)	(5.318)	(6.693)			
3.2	SKILL	+				**3862.73*** **	576.380	**2738.728*** **
						(839.251)	(653.652)	(756.050)
4	INVA	+	-3.042	0.719	-2.658	-4.440	1.998	-2.347
			(2.312)	(2.089)	(2.175)	(3.182)	(2.783)	(2.964)
5	TRADEA	-	**-6.245** **	-0.512	-4.162	-6.072	-1.179	-4.809
			(3.126)	(3.048)	(3.028)	(4.199)	(4.031)	(4.029)
6	TRADEO	+	**-41.191*** **	**-42.513*** **	**-41.354*** **	**-51.549*** **	**-51.948*** **	**-51.763*** **
			(5.998)	(5.928)	(5.854)	(7.659)	(7.491)	(7.416)
7	LANG	+		188.289	103.641		30.671	164.847
				(414.152)	(696.275)		(453.340)	(847.616)
8	DIST	-		**-0.266*** **	**-0.287*** **		**-0.297*** **	**-0.329*** **
				(0.038)	(0.064)		(0.043)	(0.084)
9	COL	+		-268.3961	-463.653		-260.914	-130.974
				(508.322)	(862.393)		(573.296)	(1139.262)
	Constant		**2544.71*** **	**5983.326*** **	**5286.664*** **	**2447.4*** **	**7449.555*** **	**6954.116*** **
			(558.741)	(116.361)	(847.1015)	(752.3746)	(850.322)	(1125.918)
Number of observations			3502	3502	3502	2750	2750	2750
Number of groups			270	270	270	233	233	233
R-square			0.09	0.18		0.05	0.22	

Significance levels: (*) = 10%, (**) = 5%, (***) = 1%. Standard errors in parentheses.

FE: Fixed Effects; RE: Random Effects, HT: Hausman Taylor estimation.

Source: Own calculations.

7. Conclusions

This paper examined the determinants of foreign direct investment (FDI) from OECD to Southeast Asia referring to the knowledge-capital model. Fixed-effects, random-effects, and Hausman Taylor estimations were used in the regression analysis. The panel dataset included 31 source OECD countries and 10 host ASEAN countries over the period 1995-2012. Despite the fact that there were some slight differences in regression results between FDI stocks and FDI flows, the main results can be summarized as follows.

First, total income and the similarity in size between source and destination countries were positively related to FDI from the OECD to the ASEAN countries at high significance levels. These results signal horizontal FDI which is in line with the previous studies where market sizes of host and source countries also played an important role (Lucas (1993), Hattari *et al.* (2009), Marson (2013), etc.). However, those studies treated market sizes of home and destination nations as separate independent variables while we took into account the combined income of the source and host countries. Also, to the best of our knowledge, our study is the first study showing the importance of the similarity in market size for inward FDI in Southeast Asia. The previous studies only included GDP or population of both source and host countries in their empirical equations, and they were unable to study explicitly the significance of the role of the size similarity. By contrast, we took into account this characteristic of each country pair in our estimating equations by employing the Helpman Size Similarity Index. The estimated coefficient on this variable turned out to be highly statistically significant and positive in almost all estimated equations.

Second, bigger differences in relative skilled-labor endowments between source and host countries were positively related to FDI from the OECD to the ASEAN countries. These differences were measured by both the absolute differences in GDP per capita and the ratio of skilled-labor occupations in total labor force. These results confirm also the importance of vertical FDI. Our empirical results correspond to the finding of Plummer and Cheong (2008). In their research, they employed the ratios of skilled-labor, unskilled-labor, and capital stocks between source and host countries. Only the ratio of skilled-labor was identified to have positive impact on FDI stocks to ASEAN from 34 home countries. However, as we discussed earlier, components of these ratios were heavily affected by the country size and thus they were not good proxies for differences in relative factor endowments between nations. Interestingly, our regression results are opposite to that of Hattari *et al.* (2008a). In their study on determinants of intra-ASEAN FDI, they found that GDP per capita difference between host and source nations was negatively related to bilateral FDI. However, while we took the absolute value of GDP per

capita difference, Hattari *et al.* (2008a) only used the simple difference. Thus, opposite results between these studies can be attributed to differences in sample sizes, periods of analysis and more importantly variable definitions.

Third, FDI flows from the OECD to the ASEAN countries seem to be increasing with the investment freedom in the ASEAN. This is in line with the results of the previous studies showing that also other factors affecting the investment environment of host countries in the ASEAN, such as economic freedom, corruption, institutional quality, infrastructure, etc., had significant impact on inward FDI to the ASEAN (Kang and Jiang (2012), Masron (2013), etc.).

Fourth, the estimation results for trade freedom indexes of the OECD and the ASEAN countries were ambiguous. In particular, higher trade freedom of ASEAN countries motivated FDI flows but discouraged FDI stocks from the OECD to Southeast Asia. Furthermore, higher trade freedom in OECD led to lower FDI from the OECD to the ASEAN. This result is somewhat surprising and needs more consideration in further research.

Fifth, both geographic distance and cultural distance variables were shown to have an impact on FDI to the ASEAN countries. In particular, geographic distance used as a proxy for trade or investment costs was negatively related to FDI. Moreover, we showed that if there is a common spoken language between the source and the host countries, FDI flows from the OECD to the ASEAN were larger. These results are in line with the results of the previous studies in which geographic distance and the common language were shown to influence inward FDI to ASEAN such as Ismail et al. (2009) and Kang and Jiang (2012) that relied on the simple gravity model. The distinctive feature of our study is the fact that we used a common spoken language as a proxy for cultural distance while all the previous studies on FDI location in ASEAN used the dummy variable for a common official language.

Sixth, in contrast to studies on other regions which have shown the positive impact of past colonial linkages on FDI location, colonial relationships do not really have any statistically significant impact in the case of FDI from the OECD to the ASEAN countries, irrespectively of the measurements of FDI (i.e. stocks or flows).

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OECD, http://www.oecd.org/about/membersandpartners/list-oecd-member-countries.htm
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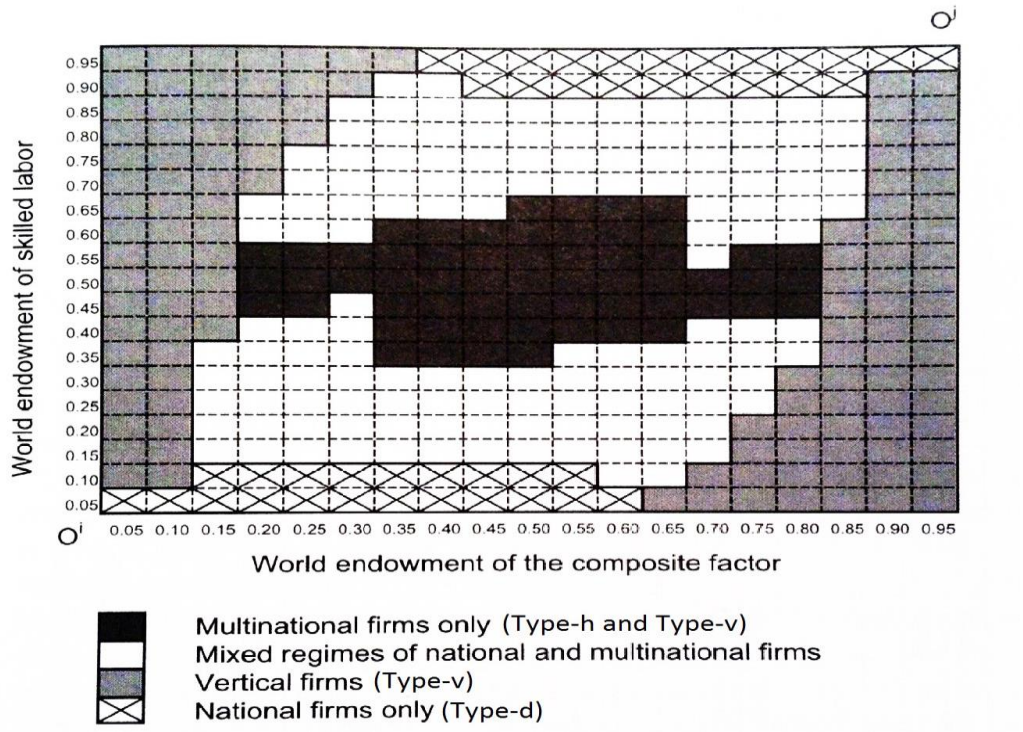
UNCTAD Statistics, http://unctad.org/en/Pages/Statistics.aspx
World Bank's World Development Indicators, http://data.worldbank.org

Appendix

Figure A1. The general pattern of regimes over the Edgeworth box



Source: Markusen (2002), p.143.