US FDI FLOWS TO ASEAN-5: DO GEOGRAPHIC NEIGHBORS MATTER?
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Abstract
This paper investigates the possibility of interdependence between flows of US FDI to the ASEAN region. The study incorporates information asymmetry into an FDI model to examine the influence of geographic neighbors on new flows of FDI from the United States. Spillovers are modeled using the cost structure of a multinational investing in a region where US firms are already present. The results show that there are negative spillovers of US FDI in the ASEAN region affecting mostly the non-manufacturing sector.

JEL Classification: F21, F23, C33
Keywords: Foreign Direct Investment, Spillovers.

1. Introduction
Foreign Direct Investment (FDI) has played a key role in the advancement of the Association of South East Asian Nations (ASEAN). Since the 1970s, ASEAN members have attracted large inflows of FDI, especially through major Multi National Corporations (MNCs) from the US, Japan, and the European Union (EU). This study examines flows of United States (US) FDI to five ASEAN countries (ASEAN-5 hereafter): namely Malaysia, Singapore, Thailand, Indonesia and the Philippines. Cheap productive labor, abundant raw materials, fiscal and economic incentives such as free trade zones (FTZ), and preferential trade agreements have attracted many foreign firms, which have relocated their operations to ASEAN countries. From 1980-1997, FDI inflows increased almost 800%. As massive FDI inflows entered the region, ASEAN countries began to benefit in terms of employment opportunities, human capital development, higher wages, technology transfer, and infrastructure improvement.

The countries under analysis in this study are the senior members of ASEAN with spectacular economic growth rates before the 1997 financial crisis (on average 7-10%). These are the nations that catch the attention of major MNCs, for example electric and electronic companies, consumer goods such as household cleaning products, shampoo and cosmetic items, and batteries. The MNCs looking for low cost offshore production sites have found the ASEAN-5 very attractive in the last 20 years. The US has constantly been one of the major FDI source countries in ASEAN. Dell Computers, Motorola, Texas Instruments, Intel, Western Digital, Exxon/Mobil, Caltex, Conoco Phillips, Dow Chemical and Baxter International are some of the examples of major US MNCs venturing in ASEAN. A number of these firms are involved in upstream and downstream activities, while others concentrate on certain components only.

Since the 1997 financial crisis, however, the macroeconomic instability exposed the vulnerability of the region to short term investment flows. At the same time, China and India opened their markets to foreign investors by relaxing foreign equity ownership.

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limits and currency exchange, and opening more industries and sectors for FDI. As the countries under investigation gradually progress into developed nations, on the road to recovery from financial crisis and facing new competition, it is important to examine the influence of geographic neighbors on flow of FDI going to individual countries of ASEAN-5. This paper investigates the interdependence between US FDI flows to five senior members of ASEAN.

This paper was guided by three research objectives that differ from other studies: First it investigates the possibility of interdependence between flows of US FDI to the ASEAN-5 as a region using dynamic panel data; Second, it incorporates information asymmetry into an FDI model to examine the influence of geographic neighbors on new flows of FDI to ASEAN-5 from the US; Last, it analyzes the geographical spillover of manufacturing and non-manufacturing FDI in the ASEAN-5. There is very little empirical work in the literature concentrating on the ASEAN-5 as a group using dynamic panel data model. This paper successfully fills this void.

2. Theoretical framework.

A modified version of the FDI model used by Barrel and Pain (1996), Love (2003), and Rubio and Ribero (1994) is applied in this paper. The objective is to show that a high stock of investment in neighboring countries affects the likelihood of new flows into the host country. Here, monitoring costs reflect geographical spillover from investment stock in countries neighboring the host country.

2.1 The Multinational Product Maximization

A MNC producing a product at home and abroad is unable to fully monitor agents in the foreign country. Theoretically, the inability to observe the agent can be solved in three ways. First, an efficient level of investment going to the agent can internalize the agency issue; the agent feels compelled to adopt a proper behavior fearing to lose a relatively generous source of funding (Markusen, 2002; Silbeberg and Suen, 2001). Second, the principal can pay to monitor the agent, adding the cost of spending additional resources for that monitoring. In this case, the burden of information asymmetry rests upon the principal. Third, a combination of efficient investment and monitoring costs divides the burden of production difficulties between the principal and the agent (Silbeberg and Suen, 2001; Markusen, 2002). When additional resources are used to monitor the agent, the cost function of the MNC must be modified to account for the additional expenditure. Factors needed to produce abroad can be given by

\[ Q_2 = f(L_2, M, N, \pi), \]

where \( Q_2 \) is production abroad, \( L_2 \) is labor hired abroad, \( M \) is input abroad financed by means of FDI, \( N \) is other non-labor inputs financed by borrowing from third parties located outside the source country, and \( \pi \) is the effort of the agent necessary to produce \( Q_2 \). Assuming that resources allocation decision are made, the MNC profit is given by

\[ \Pi = P_1(X_1)X_1 + P_2(X_2,Q_2)X_2 - TC_1(Q_1) - TC_2(Q_2) - \lambda(X_1 + X_2 - Q_1 - Q_2). \]

\[ Q_1 = f(K_1, L_1); \quad X_2 > 0; \quad X_1 + X_2 = Q(K, L), \]

where \( Q_1 \) is the production in the domestic country (the source country), \( P_1 \) and \( X_1 \) are price and sales in domestic market respectively, \( P_2 \) and \( X_2 \) are price and sales in foreign
market (the agent’s country) respectively, \( Q \) represents total output, \( K \) and \( L \) are capital and labor inputs respectively, and \( TC \) is the total cost incurred.

Assuming that all costs are denominated in a common currency, the first order conditions for profit maximization are

\[
\Pi_{x_1} = MR_1 - \lambda = 0, \quad (3a)
\]

\[
\Pi_{x_2} = MR_2 - \lambda = 0, \quad (3b)
\]

\[
\Pi_{Q_1} = -MC_1 + \lambda = 0, \quad (3c)
\]

\[
\Pi_{Q_2} = X_2(\delta P_2 / \delta Q_2) - MC_2 + \lambda = 0. \quad (3d)
\]

Equations 3a and 3b indicate that marginal revenue are equal in the two markets, and equations 3c and 3d indicate that marginal cost differs:

\[
MC_1 = MC_2 - X_2(\delta P_2 / \delta Q_2). \quad (4)
\]

Assuming that these marginal conditions include the optimal amount of effort from the agent and assuming that the four marginal conditions are invertible, unknown variables \( X_1, X_2, Q_1 \), and \( Q_2 \) can be implicitly solved in terms of the exogenous factors determining them (Barell and Pain, 1996).

### 2.2 The Multinational Cost Minimization

The problem of the MNC is to minimize the total cost of production, which is expressed as follows:

\[
TC = TC_1 + TC_2, \quad (5a)
\]

where

\[
TC_1 = w_1 L_1 + rK_1, \quad (5b)
\]

\[
TC_2 = w_2 L_2 + c_{2M} M + c_{2N} N + e(\pi) \quad (5c)
\]

and where \( w_1 \) and \( w_2 \) are home and host country wage rates, respectively, \( c_{2M} \) represents the cost of capital funded by FDI, \( c_{2N} \) represents the cost of non-labor input used abroad and not funded by FDI, and \( e(\pi) \) is the value of resources used to incite the agent to exert additional effort. The minimization solution gives us a set of six endogenous variables: \( L_1, K_1, M, N, L_2, \) and \( \pi \). The problem, however, is \( \pi \) is not observable. Nonetheless, it is an important input in the production and its level depends on the incentive system set up by the MNC headquarters.

From the perspective of the MNC headquarters, headquarters resources and non-headquarters resources are used to fund production in foreign countries. Total headquarter resources is given by

\[
E = M_i + R(\varepsilon), \quad (6)
\]

where \( R(\varepsilon) \) is the total value of resources that can be used to monitor investments in a geographic region. The regional characteristic \( \varepsilon^1 \), is a probability associating agent’s efforts (\( \pi \)) to monitor capacity in the region (\( \delta \)). The monitoring capacity is the proportion of headquarters investments in the region. Thus, the chances for headquarters to detect inappropriate efforts are given by the regional characteristic \( \varepsilon = \pi \delta \).

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1 The value is theoretically constrained to be between 0 and 1.
Under these conditions, the MNC headquarters can design its expenditures to incite optimal effort by the agent. For that purpose, the MNC headquarters choose $M$ and $\varepsilon$ to minimize its expenses. In the Annex we analyze “Headquarters Incentives Design and Cost Minimization with Optimal Incentives”.

3. Data and Empirical Methodology.
3.1 Definition of Variables
Equation 24 can be rewritten in an estimable form as

$$\begin{align*}
\text{FDI}_{it} &= \beta_0 + \beta_1 \text{SIZE}_{it} + \beta_2 \text{COSTK}_{it} + \beta_3 \text{COSTL}_{it} + \\
&\quad \beta_4 \text{CHER}_{it} + \beta_5 \text{PR}_{it} + \alpha \text{STOKIN}_{it-1} + \text{NEIGHB}_{jt-1} + \varepsilon_{it}
\end{align*}$$

(25)

$\text{FDI}_{it}$ is the annual flow of FDI from the US to country $i$ at year $t$. $\text{FDI}_{it}$ is used as an endogenous variable. It represents funds that US parent companies provide to their foreign affiliates. Provision of funds to foreign affiliate takes 3 forms: equity capital, inter-company debt, and reinvested earnings. Data were obtained from the Bureau of Economic Analysis (BEA) website. Publicly available BEA data excludes countries where less than $500,000 is invested and avoids disclosure of individual firm data. The definition of FDI in this paper is consistent with the IMF definition of FDI flows (IMF Balance of Payment Manual 1993, p.41, item 177). Various studies in the macro-view perspective of FDI analysis look at aggregate flows and rely on similar definitions (Love, 2003; Barel and Pain, 1996; Rubio and Ribero, 1994). FDI is also divided into FDI flows to the manufacturing sector (FDIM) and FDI to the non-manufacturing sector (FDINM). FDIM and FDINM are used as alternate endogenous variables.

Independent variables consist of seven variables obtained from various sources. Appendix A and B provide data source, acronyms, descriptions, expected signs, and justifications for using the variables. First, $\text{SIZE}_{it}$ (size of country $i$ at year $t$) represents the market size in the host country. $\text{GDP}_{it}$ is a proxy for $\text{SIZE}_{it}$, which data is obtained from the IMF. Second, $\text{COSTK}_{it}$ is the ratio of host country to US cost of capital $i$ at year $t$. Data for COSTK are computed following Love (2003) and Rubio and Ribero (1994):

$$c_i = (K_d / GDP_d) \times (\zeta + 0.10 - \chi),$$

(26)

where $K_d$ is the gross fixed capital formation deflator, $GDP_d$ is the gross domestic product deflator, and $\zeta$ the medium run nominal interest rate. Data on $K_d$ and $GDP_d$ are obtained from OECD data, while data on $\zeta$ are obtained from the IMF.

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2 “Food and kindred products, chemical and allied products, primary and fabricated metal, industrial machinery and equipment, electric and electronic equipment, transportation equipment, and other manufacturing” <http://www.bea.doc.gov/bea/di/usdia.htm>.

3 FDI to the remaining sectors, including petroleum, wholesale trade, depository institutions, finance (except depository institutions insurance and real estate), services, and other industries.

4 Population$it$ was also used as proxy for country size. However, its coefficient displayed expected signs in the static model but counter intuitive signs more often than GDP in the dynamic model. This is not surprising since most ASEAN countries have more or less similar population.
depreciation rate is 0.10 by assumption, and \( \chi \) is the rate of change in \( K_d \) one year ahead. Third, \( COSTL_{it} \) is the relative cost of labor in the host country. \( COSTL_{it} \) is defined as the ratio of host country to US wage, in dollar per hour, published in the International Labor Office yearbook. Fourth, \( CHER_{it} \) is one period change in the real exchange rate between the country \( i \) currency and the US dollar at year \( t \). The real exchange rate (\( RER \)) is defined as

\[
RER = \left( \frac{E_{it} \times 100}{P_{it}} \right) / \left( \frac{US_{it} \times 100}{USPPI_{it}} \right),
\]

where \( E_{it} \) is the host country’s nominal exchange rate in dollar, \( P_{it} \) is host country’s price deflator, \( USPPI_{it} \) is the US producer price index. All necessary data (country level data) are obtained from the IMF. Fifth, \( PR_{it} \) is the firms’ profit in country \( i \) at year \( t \), proxy by firm’s market value. Sixth, \( STOKIN_{it} \) is the lag level of K stock (\( M_{it-1} \)). Seventh, \( NEIGHB_{it} \) is the sum of lagged US investment stock in the neighboring country to the host country \( i \) computed as \( NEIGHB_{it} = \sum_{i \neq i} wM_{jt-1} \). Therefore, \( M_{jt-1} \) is the stock of investment at time \( t-1 \) in country \( j \) within 1000 miles from country \( i \).

The study uses annual data from 1982 to 2000. Summary statistics for the data are provided in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI</td>
<td>94</td>
<td>505.448</td>
<td>805.574</td>
<td>-470</td>
<td>3863</td>
</tr>
<tr>
<td>FDINM</td>
<td>93</td>
<td>264.892</td>
<td>467.009</td>
<td>-318</td>
<td>2088</td>
</tr>
<tr>
<td>FDIM</td>
<td>94</td>
<td>242.212</td>
<td>542.180</td>
<td>-703</td>
<td>3648</td>
</tr>
<tr>
<td>SIZE</td>
<td>95</td>
<td>22123.41</td>
<td>14996.35</td>
<td>4759.376</td>
<td>73913.23</td>
</tr>
<tr>
<td>COSTK</td>
<td>91</td>
<td>3.061</td>
<td>3.368</td>
<td>1.043</td>
<td>20.999</td>
</tr>
<tr>
<td>RCOSTK</td>
<td>90</td>
<td>1.289</td>
<td>1.344</td>
<td>0.0076</td>
<td>4.507</td>
</tr>
<tr>
<td>COSTL</td>
<td>95</td>
<td>4.627</td>
<td>4.473</td>
<td>0.0005</td>
<td>16.417</td>
</tr>
<tr>
<td>RCOSTL</td>
<td>94</td>
<td>14.753</td>
<td>2.57205</td>
<td>9.848</td>
<td>18.889</td>
</tr>
<tr>
<td>PR</td>
<td>55</td>
<td>74.218</td>
<td>30.993</td>
<td>4.31925</td>
<td>120.35</td>
</tr>
<tr>
<td>STOKIN</td>
<td>95</td>
<td>4264.40</td>
<td>4315.666</td>
<td>780</td>
<td>24133</td>
</tr>
<tr>
<td>RER</td>
<td>95</td>
<td>0.215</td>
<td>0.2333</td>
<td>0.00004</td>
<td>0.7211</td>
</tr>
<tr>
<td>CHER</td>
<td>95</td>
<td>-0.0073</td>
<td>0.0319</td>
<td>0.1438</td>
<td>0.0507</td>
</tr>
<tr>
<td>NEIGHB</td>
<td>95</td>
<td>12560.68</td>
<td>9346.521</td>
<td>2941</td>
<td>38861</td>
</tr>
</tbody>
</table>

3.2 Econometric Methodology

The base equation contains only host country characteristics consistent with traditional analysis of FDI determinants. Long-term investment relationships (historical stock) and influence of neighbors are progressively added. The neighbor’s influence term seeks to capture the geographic diffusion of flows and stock of FDI over time. \( NEIGHB \) term simulates the spillover variable because it tests the extent to which important stock of
investments in neighboring countries affects flows to the host country. A neighbor is defined as a country within a geographical distance of 1000 miles from the host country. To check the sensitivity of the conclusion to the definition of neighbor, a robustness check was conducted for distances from 500 miles to 3000 miles. In terms of estimation technique, most studies of the relationship between FDI and its determinants are done using time series analysis (Barrel and Pain, 1996; Rubio and Ribeero, 1994). Although some recent contributions used panel data analysis (Wheeler and Mody, 1992; Braunerhjelm and Svesson, 1996; Filipaios, Papanastassiou, and Pearce, 2003; Love, 2003), dynamic panel data analysis is rare.

The dataset in our study allows the development of a model with one cross section dimension \((i = 1, 2, \ldots, N)\), one time dimension \((t = 1, 2, \ldots, T)\), and one spatial term.

\[
I_{it} = \beta X_{it} + \alpha M_{t-1} + \varphi \sum_{i \neq i} wM_{jt-1} + \varepsilon_i
\]

\[
v_{it} = \mu_i + \nu_{it}
\]

where \(I_{it}\) is the net annual FDI from US to a host country \(i\) at time \(t\), \(X_{it}\) is the vector of exogenous variables which vary in cross section and time dimension such as profits and factor costs elements, \(M_i\) is the stock of investment in the country \(i\) at time \(t\), \(\sum_{i \neq i} wM_{jt-1}\) is the stock of US FDI in the neighboring countries. Equation (31) describes the typical error structure; \(\mu_i\) is the fixed effect (country specific effect), and \(\nu_{it}\) is the stochastic error term.

By incorporating lagged flows of investment into equation (30), it can be rewritten as

\[
I_{it} = \alpha_1 I_{t-1} + \beta X_{it} + \alpha_2 M_{t-2} + \varphi \sum_{i \neq i} wM_{jt-1} + \varepsilon_i
\]

which is clearly a dynamic equation. Nickel (1981) argues that in this situation two basic econometric problems are created by the presence of a lagged dependent variable among the regressors. Those are the autocorrelation of the error term with the lagged dependent variable, and heterogeneity. Nickel (1981) adds that in this situation usual panel data technique are not appropriate because it will yield biased and inconsistent estimates, however, as the sample size increases the bias generated by the presence of lagged dependent will become small. Two major estimation techniques generally used to account for the estimation problem mentioned above. The Arellano and Bond (1991) GMM estimation technique is known to be more efficient, and the Anderson Hsiao estimator is known to be more consistent (Kiviet, 1995). Arellano and Bond dynamic panel data estimation technique is used in this study.

4. Empirical results.

The first three columns of Table 2 provide estimates for the determinants of total FDI flows. The next three columns provide estimates for determinants of FDI to the manufacturing sector, and the last three columns provide estimates for the determinants of investment to the non-manufacturing sector. Each group of three columns includes host country characteristics, neighboring country effect, and an interaction variable added to

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5 See Keller (2004) for a literature review on international diffusion of technology.
control for country size and stock of investments in neighboring countries. Following Arellano and Bond dynamic panel data estimation procedure, the lag levels are used as instruments for all variables. The coefficient of the spatial term reflects shocks (accumulated over time) to neighboring countries that attract FDI to the host country. Because the spatial variable is a stock of flows accumulated over time, it carries the idea of spillover that takes time to integrate into the host country’s economy.

The relevant diagnostic tests are shown at the bottom of the table. The three models adequately fit the data; as the values of the Wald statistics are high. Moreover, it is not possible to reject the null hypothesis of invalid additional restrictions; since the Sargan test is not significant. Furthermore, first order autocorrelation in the differenced residuals is not present, which suggests that the estimates are not inconsistent.

With the exception of the coefficients of COSTL and COSTK, all host country characteristics carry the expected signs. Furthermore, the inconsistency of the SIZE coefficient exists only in the most restricted formulation of the model. The variation of the sign of factor cost suggests different sensitivity of various type of FDI to host country characteristics. It may be argued that the specificities of neighbors strongly affect US investment decisions in ASEAN. This may be due to the presence of a very large country; Singapore or Malaysia in the sample.

Table 2. Regression results for the ASEAN-5

<table>
<thead>
<tr>
<th></th>
<th>FDI</th>
<th>FDI manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>CONSTR</td>
<td>-.874 (.88669)</td>
<td>48.71 (89.155)</td>
</tr>
<tr>
<td>FDI(-1)</td>
<td>-.421*** (.101)</td>
<td>-.366*** (.102)</td>
</tr>
<tr>
<td>SIZE</td>
<td>-.017 (.02)</td>
<td>.049 (.041)</td>
</tr>
<tr>
<td>RCOSTK</td>
<td>-1.705* (1.031)</td>
<td>-4.253** (1.72)</td>
</tr>
<tr>
<td>RCOSTL</td>
<td>-2082.742 (1634.99)</td>
<td>4340.31** (2001.15)</td>
</tr>
<tr>
<td>CHER</td>
<td>-3806.61 (2726.13)</td>
<td>-2227.433 (2750.53)</td>
</tr>
<tr>
<td>PR</td>
<td>9.93 (8.2)</td>
<td>9.103 (7.859)</td>
</tr>
<tr>
<td>STOKIN</td>
<td>.324*** (.047)</td>
<td>.359*** (.049)</td>
</tr>
<tr>
<td>NEIGHB</td>
<td>-.124* (.068)</td>
<td>-.235** (.099)</td>
</tr>
<tr>
<td>RSIZE</td>
<td>.003 (.002)</td>
<td>.001 (.001)</td>
</tr>
</tbody>
</table>

Wald  220.21  243.82  285.64  127.43  122.31  114.27
Sargan 26  25.13  27.11  31.5  28.73  26.49
Ar-bond(1) -2.19 -1.96 -1.6 -2.11 -2.03 -2.19
Ar-bond(2) -.39 .17 .51 .28 .09 .16
Interpreting these results in terms of relative change in the independent variable leads to two points. First, the effect of a neighboring country is of comparable magnitude for both manufacturing and non-manufacturing investments. However it is statistically insignificant for manufacturing investments, which is expected, because most of US FDI is in the non-manufacturing sector. Second, relative wage rates negatively affect manufacturing investments, and relative lower wages seem to increase non-manufacturing investments in the ASEAN region. Third, higher US cost of capital increases non-manufacturing investments in the ASEAN countries; this result may be justified by the composite nature of US FDI, which includes equity, reinvested earning and inter-company debt. Fourth and most importantly neighbors negatively affect flows of investments to the host country. An increase in the stock of investment equal to $1000 in neighboring countries reduces flows to the host country by about $124. Further, we perform a robustness check on the sensitivity of the results to the use of alternative measure of the SIZE variable. The empirical estimation results are presented in Table 3.

The empirical estimation shows the negative relationship between absolute level of investments in neighboring countries and flows of FDI to the manufacturing and non-manufacturing sectors. Checking the sensitivity of the results with respect to various definitions of geographic neighbors leads to the same conclusion.
Table 3 Robustness Check

<table>
<thead>
<tr>
<th></th>
<th>FDI</th>
<th>FDI manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSTANT</td>
<td>-.874 (38.89)</td>
<td>83.106 (51.01)</td>
</tr>
<tr>
<td>FDI(-1)</td>
<td>-.421*** (.049)</td>
<td>-.152 (.132)</td>
</tr>
<tr>
<td>SIZE</td>
<td>-.017 (.025)</td>
<td>-.014 (.026)</td>
</tr>
<tr>
<td>RCOSTK</td>
<td>-1.705* (1.029)</td>
<td>-4.41 (.1039)</td>
</tr>
<tr>
<td>RCOSTL</td>
<td>-2082.742 (2247.05)</td>
<td>-5366.86 (1473.17)</td>
</tr>
<tr>
<td>CHER</td>
<td>-3806.61* (2177.41)</td>
<td>-1026.324 (1739.20)</td>
</tr>
<tr>
<td>PR</td>
<td>9.93 (7.57)</td>
<td>-3.921 (5.042)</td>
</tr>
<tr>
<td>STOKIN</td>
<td>.324*** (.049)</td>
<td>.304*** (.02)</td>
</tr>
<tr>
<td>NINV</td>
<td>-.124*** (.042)</td>
<td>-.068 (.043)</td>
</tr>
<tr>
<td>RSIZE</td>
<td>.003 (.002)</td>
<td>-4.253*** (.651)</td>
</tr>
</tbody>
</table>

| Wald | 129 | 463.37 | 31.61 | 62 |
| Ar-bond(1) | -1.29 | -1.46 | -1.51 | -1.53 | -1.68 |
| Ar-bond(2) | -1.06 | 0.65 | 0.77 | 1.56 | 0.88 |

<table>
<thead>
<tr>
<th></th>
<th>FDI non Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSTANT</td>
<td>-65.139(57.111)</td>
</tr>
<tr>
<td>FDI(-1)</td>
<td>-.817***(.042)</td>
</tr>
<tr>
<td>SIZE</td>
<td>-.003(.009)</td>
</tr>
<tr>
<td>RCOSTK</td>
<td>-2.234***(.683)</td>
</tr>
<tr>
<td>RCOSTL</td>
<td>3240.471***(1167.044)</td>
</tr>
<tr>
<td>CHER</td>
<td>-2484.334***(615.023)</td>
</tr>
<tr>
<td>PR</td>
<td>9.546(6.166)</td>
</tr>
<tr>
<td>STOKIN</td>
<td>.031 (.026)</td>
</tr>
<tr>
<td>NINV</td>
<td>-.041*(.023)</td>
</tr>
<tr>
<td>RSIZE</td>
<td>.003***(.001)</td>
</tr>
</tbody>
</table>

| Wald | 48.49 | 10.47 | 38.78 |
| Ar-bond(1) | -1.61 | -1.49 | -1.32 |
| Ar-bond(2) | -1.35 | -1.12 | 1.15 |

Note: *** , **, and * denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses.

An Institute of Developing Economies (2003) study revealed that ASEAN members are competing among themselves in producing similar manufacturing products. This is one of the reasons for the staggering FDI attraction into the region. The study suggests that each member nation should upgrade the sectors/industries where it has a comparative advantage.
advantage. Instead of competing with each other, concentrating on the industries where a country has a comparative advantage will prepare ASEAN-5 to compete with China and India. ASEAN-5 as a group should also devise a new set of regulations as well as incentives to retain current FDI and attract new FDI. ASEAN-5 should study carefully the advantages each member nation has in terms of foreign investments and concentrate on particular industries. Minimizing of competition with other ASEAN countries will benefit the region in the long run, given the trends in FDI.

The ASEAN-China Free Trade Area and ASEAN-Japan Comprehensive Economic Partnership agreements show that progress is on track for globalization and liberalization of the region. Furthermore, the US, Korea, India, and some EU countries have expressed their interest in forming a Free Trade Area (FTA) with ASEAN. ASEAN-5 is still capable of attracting FDI, provided all the countries in the region want such investments as to facilitate their development process. It is time for ASEAN-5 members to develop a plan to further improve their cooperation with each other, especially concentrating on sectors/industries where each of them has a comparative advantage.

5. Conclusion.

In summary, both stock of investments located inside the host country and outside the host country are relevant for US FDI location decisions in the ASEAN region. The results in this paper imply that flows going to individual countries are reduced by the presence of high stock of investments in neighboring countries. Moreover larger countries seem to receive more investments. Economically, it is possible that firms in the ASEAN region use resources in neighboring country to monitor FDI. It is also possible that they view two countries as substitute locations. However, if the assumption of randomness in the distribution of countries (underlying usual models) holds, there is no possible diffusion of investment from one country to the other because diffusion implies spatial contagion. Nevertheless, this paper shows that spatial diffusion happens in the ASEAN region. Thus analysis of the determinants of US FDI should consider diffusion from neighboring countries. To create a better investment climate in the ASEAN region, all member countries should form closer ties and work together to improve industrial endowments, technological capability, high-quality infrastructure and human resource development. In addition, minimizing competition between members in attracting FDI to similar industries will make the region stronger economically.

Bibliography


Kemegue, F. and Mohan, R. US FDI flows to ASEAN-5: Do Geographic Neighbors Matter?


### Appendix A: Variable Description and Data Source

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment flows by country in millions of dollars</td>
<td>US Bureau of Economic Analysis</td>
</tr>
<tr>
<td>FDINM</td>
<td>Foreign Direct Investment flows non manufacturing by country in millions of dollars</td>
<td>US Bureau of Economic Analysis</td>
</tr>
<tr>
<td>FDIM</td>
<td>Foreign Direct Investment flows manufacturing by country in millions of dollars</td>
<td>US Bureau of Economic Analysis</td>
</tr>
<tr>
<td>SIZE</td>
<td>Gross Domestic Product in millions of dollars</td>
<td>IMF</td>
</tr>
<tr>
<td>DIST</td>
<td>Distance as crow fly from Washington DC to the host country capital city</td>
<td>Indo.com</td>
</tr>
<tr>
<td>STOKIN</td>
<td>Foreign Direct Investment stock by country in millions of US dollar</td>
<td>US Bureau of Economic Analysis</td>
</tr>
<tr>
<td>NEIGHB</td>
<td>Sum of neighbors’ stock of investment intensity in millions of US dollar</td>
<td>US Bureau of Economic Analysis</td>
</tr>
<tr>
<td>COSTK</td>
<td>Index computed following Bajo and Rivero Sosvilla (1994, p18) and Love (2003, p1267) as (Kd/GDP)*([I+.10- π1) Kd is the gross fixed capital formation deflator. I is the medium run nominal interest rate .10 is a depreciation rate π1 is the rate of change of Kd one period ahead.</td>
<td>Computed using IMF data, Computed from World Bank data</td>
</tr>
<tr>
<td>COSTL</td>
<td>Labor cost in dollar per hour</td>
<td>Yearbook of labor statistics. ILO</td>
</tr>
<tr>
<td>RER</td>
<td>Real Exchange Rate in local currency per dollar defined as (E*USPPI)/(M) E is the nominal exchange rate USPPI is the US producer price index P is the host country price level</td>
<td>IMF, World Bank</td>
</tr>
<tr>
<td>CHER</td>
<td>Change in real exchange rate</td>
<td>calculated</td>
</tr>
<tr>
<td>PROFIT</td>
<td>US firms profits</td>
<td>IMF</td>
</tr>
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</table>

### Appendix B- Variables and Expected Signs

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Variable Description</th>
<th>What it captures</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE</td>
<td>GDP</td>
<td>Size of the country Larger countries attract more FDI</td>
<td>+</td>
</tr>
<tr>
<td>RCOSTK</td>
<td>Relative capital cost (c1/c2)</td>
<td>Factor cost motive for FDI</td>
<td>+/-</td>
</tr>
<tr>
<td>RCOSTL</td>
<td>Relative labor cost (w1/w2)</td>
<td>Factor cost motive for FDI</td>
<td>+/-</td>
</tr>
<tr>
<td>RSIZE</td>
<td>GDP times neighbor’s investment</td>
<td>Multiplicative effect of the neighbors and the size of the host country</td>
<td>+/-</td>
</tr>
<tr>
<td>CHER</td>
<td>Change in Exchange rate (Δe)</td>
<td>Price of goods and services in the host country relative to the US</td>
<td>+/-</td>
</tr>
<tr>
<td>PR</td>
<td>Firms profits</td>
<td>Profit motive for FDI</td>
<td>+</td>
</tr>
<tr>
<td>STOKIN</td>
<td>Lag level of K stock (M_{t-1})</td>
<td>Effects of prior US presence in the host country</td>
<td>+/-</td>
</tr>
<tr>
<td>NEIGHB</td>
<td>Neighbor’s Investment</td>
<td>Neighborhood investment intensity</td>
<td>-</td>
</tr>
</tbody>
</table>

On line Annex at the journal Website: [http://www.usc.es/economet/aeid.htm](http://www.usc.es/economet/aeid.htm)
Annex: Headquarters Incentives Design and Cost minimization with optimal incentives

A.2.2.1 Headquarters Incentives Design.

Headquarters selects a location for investment by setting up a scheme that incorporates available information about the host country and the region where the host country is located. Assuming that FDI recipients are interested in attracting more FDI, new flows going to a same location can be interpreted as reward for a good performance. To induce FDI recipients to supply a level of effort necessary to return an expected level of profit $P^*$, headquarters should devise a form of contract where the FDI recipient can either receive a standard level of investment $M$ or a penalty level of investment $M_0$. If the FDI recipient supplies less than the agreed upon effort, it can be detected with a probability $\varepsilon$. If the FDI recipient behaves properly, or not detected when shirking, the investment level is $M$. If the FDI recipient shirks and detected, the investment level is $M_0$. $M_0$ is assumed to be positive at least in the short run. The value of monitoring resources $R(\varepsilon)$ is assumed to increase and to be convex in $\varepsilon$. Headquarters and the FDI recipients are assumed risk neutral; headquarters chooses $\varepsilon, M_i, M_0$ to minimize the total expenditure. The problem can be stated as minimizing

$$E = M_i + R(\varepsilon),$$

where $E$ is the total sum of headquarters resources engaged in producing in the host country, $M$ is inputs in the host country financed by FDI, $R$ is the marginal value of resources engaged in monitoring investments in the whole region, and $\varepsilon$ is the investment characteristics in the region where the host country is located. The problem is subject to three constraints. Headquarters considers that the FDI recipient faces a participation constraint. The difference between the financing that the recipient receives from the headquarters and the cost of the recipient efforts should at least be equal to private utility.

$$M - k(P^*) \geq U_a,$$  \hspace{1cm} (7)

where $k(P^*)$ is the cost $k$ of bearing an amount of effort necessary to produce an expected level of profits $P^*$, and $U_a$ is the private utility of the managers of the unit abroad.

Therefore, the investment is viable if the motivation of headquarters is compatible with the motivation of the recipient.

$$M - k(P^*) \geq \varepsilon M_0 + (1-\varepsilon)M.$$  \hspace{1cm} (8)

And finally, the investment stability constraint gives the lower bound for FDI:

$$M_0 \geq 0.$$  \hspace{1cm} (9)

If $P^* = 0$, the expected FDI is $\varepsilon M_0 + (1-\varepsilon)M$, while the cost for the host country to produce is $k(0)$. Assuming that agents prefer supplying effort necessary to return $P^*$ to

---

no effort (which corresponds to no additional investments), the incentive compatibility constraint can be rewritten as
\[ \epsilon(M - M_0) \geq k(P^*) . \] (10)

This confirms that the uncertainty \( \epsilon \) is positive. The optimal amount can be found by setting up a Lagrange function as follows:
\[ L = M + R(\epsilon) - \lambda_1(M - k(P^*) - U_0) - \lambda_2(M - k(P^*) - \epsilon M_0 - (1 - \epsilon)M) - \lambda_3 M_0 . \] (11)

The first order-conditions for \( M, M_0, \) and \( \epsilon \) are
\[
\begin{align*}
L_M &= 1 - \lambda_1 - \lambda_2 \epsilon = 0 , \\
L_{M_0} &= \lambda_2 \epsilon - \lambda_3 = 0 , \quad \text{and} \\
L_\epsilon &= R'(\epsilon) - \lambda_2(M - M_0) = 0 .
\end{align*}
\] (12a) (12b) (12c)

The inequality constraints hold with complementary slackness. Finally, from the third first-order condition, we get
\[ \lambda_2 = \frac{R'}{M - M_0} > 0 . \] (13)

Therefore, the incentive compatibility constraint binds. Furthermore, \( \lambda_2 > 0, \epsilon > 0, \lambda_3 > 0 \). If the penalty flow level is constrained to be zero, \( M_0 = 0 \), we get the optimal regional characteristics:
\[ \epsilon = \frac{k(P^*)}{M} . \] (14a)

Thus, since \( \epsilon = \pi \delta \), the equation can be rewritten as
\[ \pi = \frac{k(P^*)}{\delta M} , \] (14b)

Equation (14b) is a good proxy for the level of effort of the FDI recipient, which can be included in the cost minimization problem.

A.2.2.2 Cost Minimization with Optimal Incentive

The information that headquarters uses to determine the location of the investment and induced optimal effort from the agent can be included in the original cost minimization problem. Plugging (14b) into (5c), we get
\[ TC_2 = w_2 L_2 + c_{2M} M + c_{2N} N + r \left( \frac{k(P^*)}{\delta M} \right) . \] (15)

Marginal costs can be implicitly obtained from (15) and modify (3a) and (3d) above as follows:
\[
\begin{align*}
MR_1(\psi_1) &= MC_1(c_1, w_1) , \quad \text{and} \\
MR_2(\psi_2) &= MC_2(c_{2M}, c_{2N}, w_2, k, \tilde{\delta}) - X_2(\psi_2) \left( \delta P_2 / \delta Q_2 \right) .
\end{align*}
\] (16a) (16b)
Kemegue, F. and Mohan, R.  

US FDI flows to ASEAN-5: Do Geographic Neighbors Matter?

\( \hat{\delta} \) is expected to appear as the inverse of \( \delta \) (the monitoring capacity) ; thus, it can carry a value higher than 1. If we proxy \( \hat{\delta} \) by \( \sum_{i \neq j} w_{ij} M_j \), the total stock of investment in neighboring countries, with \( w \) as a weight matrix capturing the geographical neighbors, the result in (14b) can be interpreted as positive agglomeration economies effects. This is due to the fact that for the expression to be less than 1, the monitoring capacity times the flow of investment to the host country must be high. This suggests that the agent’s effort will make sense when there are positive agglomeration effects either from the host country or from the neighboring countries (Wheeler and Mody, 1992).

In the relationship above, \( \psi_1 \) and \( \psi_2 \) represent the overall level of demand at home and abroad. These marginal conditions can be solved for all endogenous variables (\( Q_1, Q_2, X_1, X_2, L_1, L_2, K_1, K_2, \) and \( M \)) in term of exogenous variables. Thus, \( M \) can be written as

\[
M = f^+ (\psi_1, \psi_2, c_1, c_2, w_1, w_2, k, \hat{\delta}) .
\]  

This result can be further modified. For example, adding the relationship between optimal factor ratio and factor price ratio, and modifying capital cost to account for exchange rate, depreciation and capital control regulations consistent with Barel and Pain (1996), we get the expression for the cost of capital as

\[
c_i(\bar{p}_i, r_i, \tau_i, \Delta e, p_i^k, e_i) ,
\]

where \( p_i^k \) and \( \bar{p}_i \) are the nominal and real costs of capital goods in country \( i \) respectively, \( r_i \) is the interest rate, \( \tau_i \) is the rate of depreciation, \( \Delta e \) denotes the one period rate of change in the dollar effective exchange rate, and \( e_i \) is the bilateral dollar exchange rate with the currency of country \( i \) (number of units of foreign currency per dollar). Equation (17) can be rewritten as

\[
M = f^+ (D, c_1/c_2, w_1/w_2, \Delta e, PR, \hat{\delta}) ,
\]

where PR is the real level of US corporate profits, \( D = (\psi_1 + \psi_2) \) is the total demand, and \( \hat{\delta} \) is \( \sum_{i \neq j} w_{ij} M_j \), the total stock of investment in neighboring countries. Since only the host country demand varies (single source country), we can normalize the demand to be the size of the host country.

Furthermore, equation 19 can be interpreted as the desired level of FDI, because delivery lags delay finding suitable investment abroad and also delay in obtaining planning permission.

\[
M_t^* = f^+ (D, c_1/c_2, w_1/w_2, \Delta e, PR, \hat{\delta}) .
\]

Using a partial adjustment process (Barrel and Pain, 1996; Love, 2003), we can write

\[
M_t - M_{t-1} = \lambda (M_t^* - M_{t-1}) ,
\]
where $\lambda$ is a distributed lag function, and

$$I_t = \lambda(M^*_t - M_{t-1}), \tag{22}$$

Equation (22) can be rewritten as

$$I = g(D, c1/c2, w1/w2, R, \Delta e, PR, \delta, M_{t-1}) \tag{23}$$

Thus, the flow of FDI depends on both the determinants of optimal capital abroad financed by FDI, the lagged level of optimal capital abroad financed by FDI, and the stock of investment in neighboring countries. This equation can be transformed into an empirically testable form as follows:

$$I_{it} = \beta X_{it} + \alpha M_{t-1} + \varphi \sum_{i \neq j} w_{ij} M_{jt-1} + \epsilon_{it} \tag{24}$$

where $X_t$ is the matrix of common determinants of foreign FDI, the second term on the right (with coefficient $\alpha$) represents the persistence in the flows of FDI, and the third term on the right (with coefficient $\varphi$) is the spatial effect that captures geographic spillover.

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