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FOREIGN DIRECT INVESTMENTS IN ASEAN: DOES DISTANCE MATTER?

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ABSTRACT

This paper examines the role of distance or transportation costs on the inflow of foreign direct investments into ASEAN countries. Using a gravity model, our panel data analysis include ten ASEAN nations, namely, Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. Our data spans five years, from 2011 to 2015. We analysed the effects of distance, gross domestic product, population and trade on foreign direct investments from three source countries: Japan, the European Union and the United States of America. Our results show that distance does affect foreign direct investment inflow into ASEAN, but the relationship seems ambiguous. In the case of foreign direct investment inflows from Japan and United States of America, the results indicate that as distance increases, foreign direct investment also increases. In the case of the European Union, distance between host countries in ASEAN and the source country affect foreign direct investment inflows negatively, that is, as distance increases, foreign direct investment decreases. Evidence also suggests that gross domestic product, population and trade are statistically significant in their effects on ASEAN foreign direct investment inflows.

Keywords: Foreign direct investment, Gravity model, ASEAN, Panel data, Distance, Transportation cost.
JEL codes: F14, F21, F23

1.0 Background

Foreign direct investments have long been recognized as an important factor in aiding the economic growth of developing nations. Investments that flow from developed and richer nations impart not only financial resources into the developing world, but also disseminate business expertise, technology and financial returns to receiving countries. The international factor movement of capital by multinational corporations have benefitted both the source and host nations; in countries like Malaysia, foreign direct investment (FDI) is 3.7 percent of its gross domestic product in 2015 (World Development Indicators, 2017). The ASEAN countries, which comprises of Brunei Darussalaam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam, have been receiving hundreds of millions (in US dollars) in foreign direct investments from extra-ASEAN source nations: in 2013, total net inflows of foreign direct investments into ASEAN was valued at US$105,302.3 millions, in 2014, it was US$107,860.6 millions, and in 2015 US$98,586.6 millions (Association of Southeast Asian Nations, 2016). The share of Extra-ASEAN inflows to the total of both Intra-ASEAN and Extra-ASEAN was 81.6 percent in 2015. These statistics indicate that most FDI inflows into ASEAN are coming from countries outside of ASEAN nations.

The three major FDI source countries of ASEAN foreign-direct investment inflows, in descending order, are the European Union 28, Japan, and the United States of America. Respectively, in the years 2013, 2014 and 2015, EU contributed 19.6 percent, 19.2 percent and 16.7 percent of share to total net inflows, while Japan contributed 19.8 percent, 12.1percent and 14.5 percent in the same years respectively, and the U.S.A contributed 5.7percent, 11.3 percent and 11.3 percent (Association of Southeast Asian Nations, 2016). The data indicate that for ASEAN countries, foreign direct investment inflows originate mainly from developed countries that could provide capital and technology to boost the economic growths of the developing economies.

Foreign direct investment provides macroeconomic stimulus through the provision of production facilities and inflow of capital to support economic activities. Additionally, foreign direct investment raises total productivity and generally increases the efficiency of resource use in the host countries. Factors that may influence the decision to invest in the host country include a developed financial market, high rates of economic growths, skilled and able labour force, openness to international trade, language and culture, political stability and geographical distance from the source country.

Literature seems to support the hypothesis that distance affects foreign direct investment as greater distances require greater transaction costs in terms of shipping and transportation of goods and services. Tinbergen (1962) postulated that market size and the distance between host and source countries are the basic requirements for a gravity estimation equation. His gravity equation for trade states that countries with larger gross domestic products or GDPs, or that are closer together in proximity, would have more trade between them. Just as the force of gravity is strongest between two larger objects, the monopolistic competition model predicts that large countries, as measured by their gross domestic products, should trade the most with each other.

2.0 Data and Methods

The main hypothesis investigated in the current study is that foreign direct investment is affected by proximity or the distance between the host and source countries. In the case of ASEAN nations, three source countries are considered, namely, Japan, The European Union 28 (EU28), and the United States of America (U.S.A). In terms of distance, Japan is nearest source country to ASEAN, and the European Union represented by the country of Germany is second nearest, and the farthest country is the United States of America.

Data on foreign direct investment inflows is acquired from the ASEAN website of Association of Southeast Asian Nations online. Population data, as well as gross domestic product per capita, and the number of mobile phones in each country are sourced from the World Bank's World Development Indicator (WDI) database online. Data on the distance between two countries are obtained from the distance calculator on the website of Distance Between Countries (2017).

A panel data of consisting of ten countries for the years 2011 to 2015 was estimated using pooled ordinary least squares (POLS), random effects (RE) and fixed effects (FE). A parsimonious empirical equation based on the Gravity Model of international trade is used to estimate the effect of distance on the inflow of foreign direct investment into each of the ten ASEAN countries. The Gravity model, based on Newtonian physics, has since been applied in various fields and specifications across national and regional boundaries under different circumstances since the 1940's. Newton's law of gravity states that two bodies attract each other proportionally to the product of each body's mass divided by the square of the distance between their respective centres of gravity. Tinbergen (1962) introduced the gravity equation in international economics. The basic Gravity equation can be written as follows:

$$F_{ij} = C\frac{Y_i^{\alpha}Y_j^{\beta}}{D_{ij}^{\varphi}} \qquad (1)$$

F_{ij} is the flow from the country of origin, *i*, to the country of destination, *j*. Alternatively, F_{ij} can also represent the total volume of interactions between countries *i* and *j*, such as flows from both directions, $\widehat{F_{ij}} = F_{ij} + F_{ji}$. The flows can be exports, imports, the sum of exports and imports values, the size of migration, and foreign direct investments. Y_i and Y_j may represent economic values between two locations, such as gross domestic products (GDP), population sizes, endowments of labour, land or capital. D_{ij} represents distance between two locations, usually between the countries' economic centres or capital cities. Finally, C is the gravitational constant depending on the units of measurement for mass and force.

Equation (1) shows that bilateral flows are directly proportional to the size of the economies of the trading partners, and are inversely proportional to the distance between them. The sizes of the economies are represented by real income (Y). We take the natural logarithm of the elements in the multiplicative gravity equation to obtain a linear relationship between foreign direct investment flows and the size of the economies and distance, to obtain the following:

$$lnF_{ij} = C + \alpha lnY_i + \beta lnY_j - \varphi lnD_{ij} + \varepsilon_{in} \qquad (2)$$

We extend the basic model from equation (1) to include other variables in the estimation of the effects on foreign direct investment. In this case, we use the following model:

$$F_{ij} = \alpha Y_{it}^{\beta 1} Y_{jt}^{\beta 2} N_{it}^{\beta 3} N_{jt}^{\beta 4} D_{ij}^{\beta 5} MP_t^{\beta 6} \quad (3)$$

such that we use the Gravity model of bilateral foreign direct investment (see Gopinath and Echeverria 2004) estimating equation in linear form, at year t, as:

$$F_{ijt} = \alpha + \beta_1 (Y_{it} Y_{jt}) + \beta_2 (N_{it} N_{jt}) + \beta_3 (D_{ij} Y_{jt}) + \beta_4 MP_{jt} + \varepsilon_{ijt} \quad (4)$$

where F_{ijt} is the foreign direct investment from the source country *i* to host *j*, the ASEAN county, in year *t*; Y_{it} is the GDP per capita of the source country *i* in year *t*, Y_{jt} is the GDP per capita of the host country at year *t*, N_{it} is the population of the source country *i* at year *t*, N_{jt} is the population of the host country *j* at year *t*, D_{ij} is the distance between the host and source countries, MP_{jt} is the number of mobile phone users in the host country *j* at year *t*, and ε_{ijt} is the idiosyncratic error term. Note that distance is a time invariant variable, thus it is interacted with GDP per capita of the host country in the empirical model.

Data on foreign direct investment inflows is in the current analysis are obtained from the Association of Southeast Asian Nations (2017), data on GDP per capita and population are obtained from the World Development Indicators (WDI) of World Bank (2017), and data on distance are obtained from the online source (see reference on the link to the website).

The regression analyses on our panel data set include three methods: pooled ordinary least squares (Pooled OLS), random effects (RE) and fixed effects (FE). We test for the appropriate method of analysis using the Breusch-Pagan Lagrangian Multiplier test and the Hausman test. The null hypothesis of the Breusch-Pagan Lagrangian Multiplier test is that the variance of the unobserved fixed effects is zero. The Hausman test allows the decision to choose either the random effects or fixed effects model. The null hypothesis is that the random effects model is preferred where the unique error term is not correlated with the regressors, while the alternative hypothesis implies the fixed effects model is preferred,
when the error term is correlated with the explanatory variables.

The advantage of a panel data set is that it allows for modeling the differences across individual behaviour. Panel data analysis includes the heerogeneity or individual effects to be accounted for in the regression estimation. The basic regression model for a panel data is as follows:

$$y_{it} = X'_{it}\beta + Z'_{it}\alpha + \varepsilon_{it} = X'_{it}\beta + c_i + \varepsilon_{it} \quad (5)$$

where there are K regressors in X_{it}, not including the constant term. The heterogeneity is $Z_{it}\alpha$ where Z_i contains a constant term and a set of individual or group-specific variables, which may be observed such as race, sex and location, or unobserved effects such as family characteristics, individual skills or preferences which are taken as constant over time. If Z_i is observed for all units or individuals, then the model can be treated as an ordinary linear model and fit by least

squares. However, if c_i is unobservable, then complications arise. For example, the effects of education and experience on earnings that may be based on "ability" which is unobservable and will be missing from the data.

In the pooled OLS method, all data for different individual entities are pooled together. The pooled OLS estimator ignores the panel structure of the data. In the pooled regression, Z_i contains only a constant term, and thus ordinary least squares will provide consistent and efficient estimates of the common α and the slope vector β.

However, if the Z_i is unobserved, but uncorrelated with X_{it}, then the OLS estimator of β is biased and inconsistent due to omitted variable/s. In the fixed effects case, the model is $y_{it} = X_{it}\beta + \alpha_i + \varepsilon_{it}$ where $\alpha_i = Z_i'\alpha$ represents all observable effects and specifies an estimable conditional mean. The fixed effect estimator takes α_i to be a group-specific constant term, that is, it is fixed in correlation to c_i and X_{it}, and not that c_i is non-stochastic.

In the random effects model, the unobserved individual heterogeneity can be assumed to be uncorrelated with the included variables, and can be formulated as $y_{it} = X_{it}'\beta + E[Z_i'\alpha] + \{Z_i'\alpha - E[Z_i'\alpha]\} + \varepsilon_{it} = X_{it}'\beta + \alpha + u_i + \varepsilon_{it}$. This is a linear equation model with a compound disturbance term that may be consistently, but inefficiently, estimated by least squares. This random effects model specifies that u_i is a group-specific random element, similar to ε_{it}, but for each group, there is a single draw that enters the regression identically in each period. The distinction between the random and fixed effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model.

3.0 Result and Discussion

3.1 FDI Inflow from Japan

Table 1 shows the estimated results of the regression of foreign direct investment inflows into ASEAN countries from the source country, Japan. The Breusch-Pagan Lagrangian Multiplier test statistic indicates that we can reject the pooled OLS model, and the Hausman test implies that the random effects model is preferred over the fixed effects model. The coefficients of gross domestic product (GDP) per capita, population and the interaction variable, distance*GDP per capita, are statistically significant at the five percent level of significance. These results imply that GDP per capita, population and proximity of ASEAN countries to the source country, Japan affect the inflow of foreign direct investments into host countries in ASEAN.

Hence, there is evidence to suggest that as GDP per capita rises, foreign direct investment inflows into ASEAN countries from Japan also rise, and as the ASEAN population grows, so too foreign direct investments from Japan grow. These findings are consistent with theoretical expectations. GDP per capita indicates the economic performance of the country; the better the performance, the more encouraged are foreign investors to direct funds into the economy. As population rise, the number of workers is expected to increase, and thus investment in business activities can be assured of workers that can be employed in business operations. We used the rate of mobile phone users in the country as **condition** variable that can indicate the level of

technology, consistent with the expectation that foreign investors would be more confident to invest in an economy that has technological infrastructure. However, in this case, our result indicates that the coefficient is not statistically significant.

Table 1: FDI Inflow from Japan

Dependent Variable: **FDI (ASEAN)**				
RANDOM EFFECTS (robust standard error)				
	Coefficient	Robust Std. Error	z	Prob >| z |
GDP per capita	4.034805**	1.716992	2.35	0.019
Population	.1715241***	.021488	7.98	0.000
Distance*GDP per capita	.0009785**	.0003907	2.50	0.012
Mobile Phone	10.13074	11.96508	0.85	0.397
Constant	109221	823.8456	1.33	0.185
Number of Observations	50			
sigma_u	1346.1245			
sigma_e	1436.872			
rho	.46742678			
Wald chi2 (4)	722.61			
Prob(F-statistic)	0.0000***			
Hausman Test	chi2(3)	4.42		
	Prob > chi2	0.2195		
Breusch and Pagan Lagrangian Multiplier Test	chibar2 (01)	4.14		
	Prob > chibar2	0.0210**		
POOLED ORDINARY LEAST SQUARES (POLS)				
	Coefficient	Robust Std. Error	t - stat.	Prob >| t |
GDP per capita	3.531478*	1.813229	1.95	0.058
Population	.1641761***	.0233565	7.03	0.000
Distance*GDP	.0008201*	.0004334	1.89	0.065
Mobile Phone	15.44012**	6.53792	2.36	0.023
Constant	1502.382	395.5152	3.80	0.000
Number of Observations	50			
R-squared	0.4788			
Root MSE	1850.7			
F (4,45)	28.03			
Prob > F	0.0000***			

Note: *** indicates significance at the 1 percent significance level, ** indicates significance at the 5 percent significance level, * indicates significance at the 10 percent significance level.

For the variable of interest, that is distance or proximity of a host country to the source country, the variable is interacted with GDP per capita to lend variability to distance which is a fixed number. We find that our variable coefficient is statistically significant, with a positive sign on the coefficient. This finding is contrary to expectations; the positive sign implies that the greater the distance, the greater the inflow of foreign direct investment from Japan into ASEAN countries. If distance measure transportation costs, then the result would imply that as transportation costs increases, so does foreign direct investment. We can stipulate that in this case, the source for the country Japan, distance may not measure transaction costs, or be associated with foreign direct investments decisions. In addition, we could theorize that for

Japan, other factors pose greater incentives in the decision to invest in ASEAN countries despite the transportation costs.

The variables GDP and population are found to be statistically significant at 5 percent and 1 percent significance levels respectively. Gross domestic product per capita indicates not only economic growth and also income levels of the host country. The higher the GDP, the more likely is the country able to provide skilled labour, technological know-how and infrastructure, and the more likely is the country to be politically stable. A higher GDP per capita would also signal a higher income level and standard of living, factors that would be important in ensuring affordability of the goods to be marketed domestically. In the case of population, as population grows, the size of productive labour force and product market also grow. The former provides availability of workers in the production facility of foreign multinationals in the host country, while the latter ensures that products can be marketed to domestic consumers.

On the other hand, we found that the number of mobile phone use in the host country does not influence the amount of foreign direct investment inflows into ASEAN. The coefficient of this variable is not statistically significant in our analysis. This result may imply that sophisticated telecommunication and perhaps the level of technology used in communication is not an important consideration for Japan's FDI in ASEAN countries. The result could be explained by the fact that ASEAN composes of developing countries that are not expected to have as many mobile phone or technology users in developed countries like Japan.

3.2 FDI Inflow from United States of America

In the case for United States of America (U.S.A), our findings show that all the coefficients of the independent variables are statistically significant at the 1 percent level of significance. However, similar to the finding for Japan, for our variable of interest that is the interacted variable, distance with GDP, we find it has a positive relationship with foreign direct investment inflow from the U.S.A.

Table 2 shows that the Breusch-Pagan Lagrangian Multiplier test statistic indicates we cannot reject the pooled OLS model. However, we have included inthe same table the results from Random Effects estimation only for comparison purpose. The effect of distance on American FDI flows to ASEAN is positive, which implies that as distance grows, FDI increases for the countries in our study sample. This finding is a contradiction to theoretical expectations; in particular, should distance signify transportation costs, then the finding suggests that as transportation costs increases, FDI increases as well. Similar to the case for Japan, the reason why the result contrasts with expectation could be due to the possibility that other factors that determine FDI overwhelms the effect that distance has on FDI decision, thus regardless of the increase in transportation costs, FDI inflows occur for reasons other than distance or costs.

Table 2: FDI Inflow from United States of America

Dependent Variable: **FDI (ASEAN)**				
RANDOM EFFECTS (RE)				
	Coefficient	Robust Std. Error	z	Prob >| z |
GDP per capita	59.14284***	7.769894	7.61	0.000
Population	.0229645***	.0054462	4.22	0.000
Distance*GDP	.0041851***	.0005166	8.10	0.000
Mobile Phone	15.68585***	4.668102	3.36	0.001
Constant	30435.38***	3774.941	8.06	0.000
Number of Observations	50			
sigma_u	356.08304			
sigma_e	1534.3847			
rho	.05110375			
Wald chi2 (4)	768.70			
Prob(F-statistic)	0.0000***			
Hausman Test	chi2(3)	1.68		
	Prob > chi2	0.6412		
Breusch and Pagan	chibar2 (01)	0.45		
Lagrangian Multiplier Test	Prob > chibar2	0.2512		
POOLED ORDINARY LEAST SQUARES (POLS)				
	Coefficient	Robust Std. Error	t - stat.	Prob >| t |
GDP per capita	59.4049***	10.67482	5.56	0.000
Population	.0228195***	.0070014	3.26	0.002
Distance*GDP per capita	.0042021***	.0007517	5.59	0.000
Mobile Phone	16.35754***	3.841173	4.26	0.000
Constant	30502.27***	5470.708	5.58	0.000
Number of Observations	50			
R-squared	0.7923			
Root MSE	1528.1			
F (4,45)	8.51			
Prob > F	0.0000***			

Note: *** indicates significance at the 1 percent significance level, ** indicates significance at the 5 percent significance level, * indicates significance at the 10 percent significance level.

For the variables GDP and population, similar explanation as for Japan can be argued in the U.S.A case. Our findings show that as GDP per capita increases, and as population rises, so does FDI from U.S.A to ASEAN. However, additionally, the results in Table 2 show that the quantity of mobile phone usage is statistically significant, which may suggest that America pays particular consideration to the issue of telecommunication or technology usage in the host countries. As the number of mobile phone users increases, the inflow of FDI from U.S.A also increases.

3.3 FDI Inflow from European Union

Table 3 shows our findings on the regression of FDI from European Union 28 for ASEAN countries. The Breusch-Pagan Lagrangian Multiplier test statistic indicates we should reject the pooled OLS model, and the Hausman test indicates that we cannot reject the Random Effects as the more appropriate method of analysis. While we find the sign on the distance variable that is

interacted with GDP to be negative in sign and consistent with theoretical expectation, the coefficient is not statistically significant, as do all the other coefficients in the regression estimation.

Therefore, in the case of European Union 28 (EU-28), we find no evidence to support any relationship between distance, GDP per capita, population, the number of mobile phone users, and the FDI inflows from EU-28.

One reason we could think of for the result is that unlike in the case of Japan and United States of America which are single individual countries, the EU-28 is composed of 28 European Union countries that may have varying economic policies and interests in their decisions to conduct FDI into ASEAN countries.

Table 3: FDI Inflow from European Union

Dependent Variable: **FDI (ASEAN)**				
RANDOM EFFECTS (RE)				
	Coefficient	Robust Std. Error	z	Prob >| z|
GDP per capita	40.14334	32.21765	1.25	0.213
Population	-.0097413	.0173576	-0.56	0.575
Distance*GDP	-.0033569	.003356	-1.00	0.317
Mobile Phone	-9.155887	8.858023	-1.03	0.301
Constant	-11263.37	11320.54	-0.99	0.320
Number of Observations	50			
sigma_u	2922.3316			
sigma_e	3165.7177			
rho	.46008611			
Wald chi2 (4)	12.53			
Prob(F-statistic)	0.0138**			
Hausman Test	chi2(3)	1.13		
	Prob > chi2	0.7697		
Breusch and Pagan Lagrangian Multiplier Test	chibar2 (01)	5.60		
	Prob > chibar2	0.0090***		
POOLED ORDINARY LEAST SQUARES (POLS)				
	Coefficient	Robust Std. Error	t - stat.	Prob >| t|
GDP per capita	39.14622**	18.52734	2.11	0.040
Population	-.0120356	.008832	-1.36	0.180
Distance*GDP per capita	-.0033052*	.0018156	-1.82	0.075
Mobile Phone	-4.666557	8.867531	-0.53	0.601
Constant	-11328.25*	5970.496	-1.90	0.064
Number of Observations	50			
R-squared	0.4751			
Root MSE	3881.5			
F (4,45)	2.78			
Prob > F	0.0381**			

Note: *** indicates significance at the 1 percent significance level, ** indicates significance at the 5 percent significance level, * indicates significance at the 10 percent significance level.

4.0 Conclusion

Our findings show that distance does affect FDI inflows from Japan and the United States of America. However, the evidence in the current study suggests that there is a positive relationship, that is, as distance grows, so does FDI from the source countries to ASEAN. This result implies that the further the ASEAN countries are from Japan and U.S.A, the more FDI the two source countries would invest in the ASEAN country. We surmise that either distance does not represent transportation costs that is incurred where the greater the proximity, the higher the costs of transportation, or that regardless of the increasing costs due to distance, source countries appear to prefer to invest more in the more distant host country in our study.

Meanwhile, in the case of European Union-28, we find no evidence of a relationship between distance and FDI inflows into ASEAN. We attribute this finding to the possibility that aggregate data for 28 countries may not reflect a reliable description of the FDI relationship between EU-28 and ASEAN, as each country in the EU-28 has different economic policies and varying degrees of interest not be represented by the same measure of distance or transportation costs.

For further research, we suggest more comprehensive data sets, and in particular, analyses that use micro data rather than aggregate data to represent may countries at once.

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