ECON-C4210 Econometrics II

Capstone Project

The effect of foreign direct investment on economic growth: A cross-country analysis

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Abstract

We aim to measure the impact of foreign direct investment (FDI) on the economic growth rate of 11 South East Asian countries with a cross-country regression framework. This report utilizes data on FDI from multiple credible sources to compile a comprehensive dataset that can provide valuable information over multiple years and countries. Our results suggest that FDI has a generally positive impact on the growth of the economy, although the significance and magnitude of such impact is dependent on the combination of factors in the economy.

Keywords: Foreign Direct Investment, Southeast Asian countries, Economic Growth, Panel Data Regression.

I. Introduction

I.1. Backgrounds: Why should we care about FDI?

According to the OECD, foreign direct investment (FDI) is a category of cross-border investment in which an investor resident in one economy establishes a lasting interest in and a significant degree of influence over an enterprise resident in another economy[1]. In our simplified words, it is a foreign investment in a domestic economy.

FDI proves to be a key element in international economic integration because it creates stable and long-lasting links between economies and improves trade by establishing and strengthening economic ties between countries. FDI can help improve the infrastructure in the host country, such as transportation, telecommunications, and energy systems, reducing the costs of production and distribution and making the host country's goods and services more competitive. Host countries can also enjoy better access to capital, allowing local firms to expand their operations and invest in new technology, which can increase their competitiveness and help them to trade more efficiently.

FDI can also serve as an important channel for the transfer of technology between countries, aiding greatly in a process called technology diffusion. Technology diffusion refers to the spread of technological innovations and their adoption across different groups, industries, and geographic regions. It plays a central role in the process of economic development, especially in developing nations that typically lag in terms of technology when compared with leading countries. Therefore, it is reasonable to believe that the economic growth rate of developing countries is highly dependent on the extent of adoption and implementation of existing but new technologies. The spread of ideas through foreign investment in infrastructure and education can help boost the process of technology

diffusion. Fundings from multinational corporations (MNCs) can also improve developing countries' access to technology, as they are among the most technologically advanced firms and financially capable[2]. A multitude of studies have pointed to the importance of MNCs in the "catch-up" process of developing countries[2].

In short, FDI has a substantiated positive impact on the economic development of host countries by increasing investment, improving trade, aiding the technological diffusion process, and encouraging innovation. The aim of this paper is then to find evidence that can support (or disprove) this statement within a selected country set.

I.2. Choice of country set: Why Southeast Asian (SEA) countries?

I.2.1. Regional characteristics.

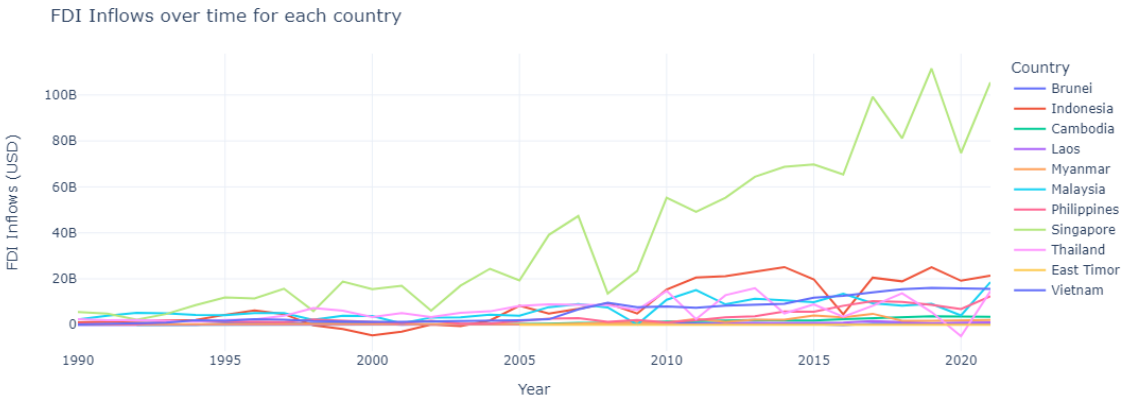
In this paper, the target set of countries include the 11 countries in the SEA region: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, and Viet Nam. The region is home to more than 650 million people and has a combined GDP of over $3 trillion. Over the past few decades, the SEA region has experienced significant economic growth, driven by export-oriented manufacturing, foreign investment, rising domestic consumption… The region has also become increasingly integrated through trade and investment agreements, such as the ASEAN Free Trade Area (AFTA)…

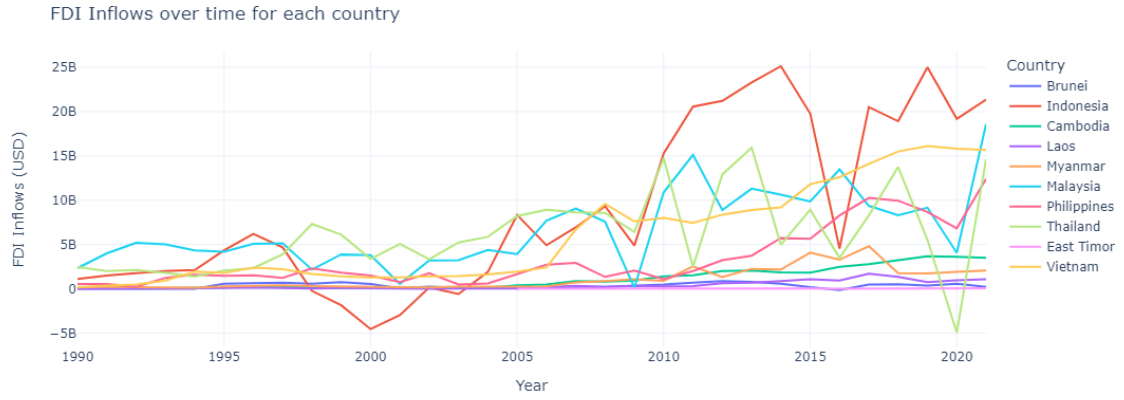
SEA countries are generally considered to be in a geographically advantageous position. Being located at the crossroads of major international shipping lanes with numerous ports makes the region a hub for global trade. Additionally, the region is rich in natural resources, including oil, gas, and minerals, which has greatly contributed to its economic growth. In terms of geopolitical advantage, Southeast Asia sits at the intersection of several major powers, including China, India, Japan, and the United States. This has made the region a key player in regional and global politics.

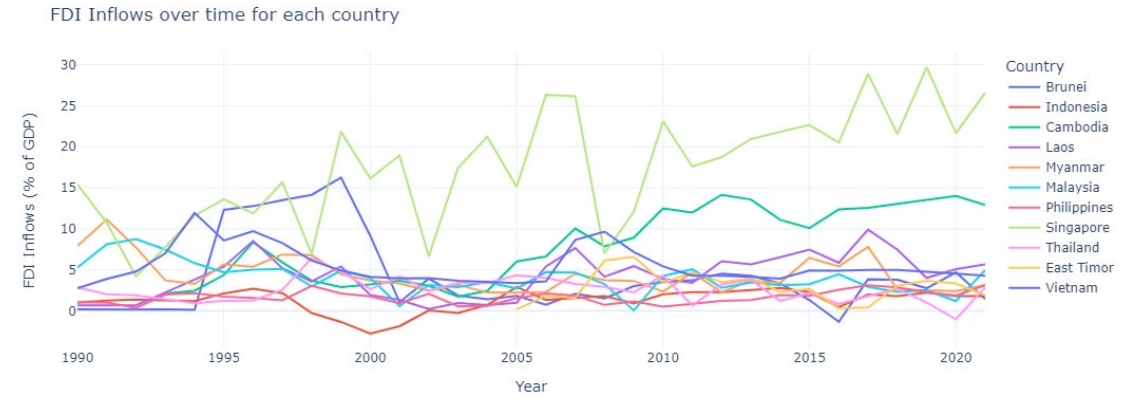
The characteristics of this region make it a hotspot economically and geopolitically, thus attracting global interest to invest and gain impact. Investing in these countries through means like FDI is, then, an effective method of establishing a presence in the region. Investors are likely attracted to the region's abundant natural resources, cheap labor, and large and growing consumer market. These countries have also been actively attracting new flows of FDI by passing favorable policies for foreign investors, ensuring a competitive and healthy market domestically, improving the quality of the labor force, increasing tradability and interconnectivity… By assuring that foreign investment is highly sought after and utilized combined with innate distinct geopolitical characteristics, the SEA region can prove to be a good case for studying FDI's impact on the economy.

I.2.2. FDI's importance for SEA countries: Some more motivation for this report.

To better understand the prominence of FDI in the region, we have constructed graphs of FDI inflows of each country in the region.







Singapore stands out as a bit different from the others. Being the most developed country in the region, Singapore also has the largest volume of FDI inflows in both current USD and % of GDP. The effect of FDI on Singapore's economic development might, therefore, be different from other countries. Generally, the volume of FDI into SEA countries follows an upward trend over the years. However, it also varies greatly during periods of recession or boom, and some countries like Thailand, Malaysia, or Vietnam seem more attractive to FDI flows than others in the region. Meanwhile, FDI inflows as % of GDP seem to stay relatively the same for many countries with large fluctuations. Combining this information with the increasing volume of FDI, we could say that as time goes on, more FDI seems to not have a much more significant impact on economic growth. This can be further discussed in the third section.

I.3. Overview of the report.

In this report, we aim to test the impact of FDI on economic growth in a cross-country regression analysis using the data on FDI inflows from 11 Southeast Asian countries from 1990 to 2021. In our model, we try to control variables that may have a sizeable effect on the GDP growth of an economy. Our results imply that FDI has a generally positive impact on the growth of the economy, although the significance and magnitude of such impact is dependent on the combination of economic factors. There are a few discoveries that we think can be attributed to the special characteristics of Southeast Asia region.

From this point, this report is divided into 3 sections: section 2 explains the research approach, provides a simple model to estimate the effect, and accounts for the data used in the empirical analysis, section 3 describes and interprets the results, and section 4 ends with some concluding comments.

II. Research analysis

II.1. Methodology

This project analyzed the panel data of Southeast Asian countries over a period of 32 years (1990-2021) to measure the impact of FDI (overall) on economic growth. The study also tried to identify the factors which play an important role in augmenting or retarding the influence of FDI and analyzed the nature of their influence. The following sections will discuss the empirical model, variables considered in this study, and the data sources.

II.2. Measure the Impact of Overall FDI

To measure the nature and degree of FDI impact on economic growth, the following empirical models have been selected:

1. Base model:

$$Y_{it} = \beta_0 + \beta_1 \times FDI_{it} + \beta_2 \times K_{it} + \beta_3 \times ET_{it} + \beta_4 \times HDI_{it} + \beta_5 \times P_{it} + \beta_6 \times N_{it} + u_{it}$$

2. Model with lag values:

$$Y_{it} = \beta_0 + \beta_1 \times FDI_{it} + \beta_2 \times FDI_{it-1} + \beta_3 \times K_{it} + \beta_4 \times K_{it-1} + \beta_5 \times ET_{it} + \beta_6 \times HDI_{it} + \beta_7 \times P_{it} + u_{it}$$

Where:

- Y_{it} represents economic growth, measured as GDP growth.
- FDI_{it} represents total FDI inflow, measured by net FDI inflow to GDP ratio.
- K_{it} represents domestic investment, measured by gross domestic capital formation to GDP ratio.
- P_{it} represents annual inflation, measured by GDP deflator.
- ET_{it} represents external trade to GDP ratio, measured by total export, total import, or net export.

- HDI_{it} represents Human Capital in the country, measured by the Human Development Index by the UN.
- N_{it} represents annual population growth.
- u_{it} represents the error term.

II.3 Data

The data for this study is collected from various sources. The World Bank's World Development Indicators (WDI) database provides data on GDP growth, net FDI inflows as a percentage of GDP, gross domestic capital formation as a percentage of GDP, annual inflation based on GDP deflator, total trade (exports and imports) as a percentage of GDP, and annual population growth. The United Nations Development Programme (UNDP) provides the Human Development Index (HDI) data.

The panel dataset is constructed for Southeast Asian countries, including Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste, and Vietnam, covering the period from 1990 to 2021. The dataset is unbalanced, with 32 years of annual observations for each country, resulting in 352 total observations.

II.4 Model Specification and Estimation Technique

We have chosen the Fixed Effects Model (FEM) as our estimation methodologies for the panel data analysis based on the literature and the empirical models described in the report. In order to take into consideration unobserved heterogeneity and potential connections between unobserved country-specific effects and the explanatory variables, these models were chosen. The unobserved country-specific effects are predicted by the FEM to be stable across time and connected with the explanatory variables.

In addition, we examine the panel data for heteroscedasticity, autocorrelation, and multicollinearity. If these problems are discovered, we employ the proper techniques to fix them, such as employing a first-difference transformation or using robust standard errors.

II.5 Diagnostic Tests and Robustness Checks

To ensure the reliability and validity of our empirical results, we perform several diagnostic tests and robustness checks. These include:

- Testing for multicollinearity using the Variance Inflation Factor (VIF): If multicollinearity is detected, we consider dropping or transforming the highly correlated variables to improve the model specification.
- Testing for heteroscedasticity using the Breusch-Pagan test: If heteroscedasticity is present, we use robust standard errors to account for the unequal variances across countries.
- Testing for serial correlation using the Wooldridge test for autocorrelation in panel data: If serial correlation is detected, we apply appropriate techniques such as using the Prais-Winsten or Cochrane-Orcutt estimation methods.
- Performing the Hausman test to choose between the Fixed Effects Model and the Random Effects Model, as mentioned in section II.4.
- Conducting sensitivity analysis by changing the lag structure or including additional control variables to assess the stability of our findings.

III. Interpretation

III.1. First regression table

FDI net inflows: FDI net inflows are consistently positively related to GDP growth rate, and the relationship is significant in several regressions, particularly Regressions 1.4, 1.5, and 1.6. This suggests that attracting FDI is an essential driver of economic growth in Southeast Asian countries. FDI can contribute to technology transfer, knowledge spillovers, and increased productivity through the introduction of new management practices and advanced production techniques. Countries in Southeast Asia, such as Vietnam and Singapore, have successfully attracted FDI, which has positively impacted their economic growth.

FDI and HDI: In Regressions 1.7 and 1.10, an interaction term between FDI net inflows and HDI is included. The coefficients for these interaction terms are not statistically significant, indicating that the effect of FDI on GDP growth rate does not significantly change depending on the level of human development. However, the coefficients for HDI in these regressions are negative and statistically significant, suggesting that higher levels of human development may be associated with lower GDP growth rates.

FDI and Domestic Investments: Regressions 1.8 and 1.10 include an interaction term between FDI net inflows and domestic investments. These interaction terms are not statistically significant, suggesting that the effect of FDI on GDP growth rate does not significantly change depending on the level of domestic investments. However, it is worth noting that domestic investments show a positive but not statistically significant relationship with GDP growth rate in several regression models. This suggests that domestic investments might also contribute to economic growth, but their impact is less clear in comparison to FDI net inflows.

FDI and Inflation + Trade: The coefficients for inflation are, much like HDI, negative, but is statistically insignificant, indicating that the inclusion of inflation doesn't significantly change the relationship between FDI net inflows and GDP growth rate, as the FDI coefficients remain positive and statistically significant in the regressions. This suggests that FDI net inflows can still contribute to economic growth despite the negative effect of inflation. The same can be said about the inclusion of Trade, as the FDI coefficients remain positive and statistically significant in regressions containing trade. This implies that FDI net inflows may have a positive effect on economic growth, even when considering the role of trade.

III.2. Second regression table

FDI net inflows: The positive relationship between FDI net inflows and GDP growth rate is still consistent across Regressions 2.1, 2.3, 2.4, and 2.5, and the relationship is statistically significant. This again emphasizes the importance of FDI in the economic growth of Southeast Asian countries. It is interesting to note that the FDI net inflows lagged by one period (Lag 1) in Regression 2.1, because FDI might not affect the GDP growth rate immediately, but rather after an extended time period. Another reason is that rather than FDI affecting GDP growth, the opposite could be true, as a strong economy would invite more foreign investment. To see the effect that FDI has on GDP growth, we subtract the lag from the original, for example here, the

coefficient of FDI would be 0.2 – 0.14 = 0.06, which proves that FDI impacts GDP and not the other way around.

FDI and HDI: HDI is included in Regressions 2.4 and 2.5. The coefficients for HDI in both cases are negative and statistically significant, again suggesting that higher levels of human development may be associated with lower GDP growth rates but does not seem to be the cause. This could be because countries with higher HDI levels, like Singapore, might have already experienced rapid growth and are now transitioning to a slower growth trajectory, similarly to how a Solow Growth Model works. On the other hand, developing countries like Myanmar have lower HDI, but more room for economic growth. This accumulates into a negative correlation between HDI and GDP growth rate.

FDI and other variables: The coefficients for all the other variables used in our regressions bear similar characteristics to the first table and are statistically insignificant. This indicates that the inclusion of trade, inflation, domestic investments, and population growth doesn't seem to have that much of an effect on how FDI impacts Southeast Asian countries' GDP growth rates.

IV. Conclusion

FDI net inflows have a consistent positive and significant relationship with GDP growth rate in Southeast Asian countries. This implies that an increase in FDI net inflows tends to contribute positively to the economic growth of these countries. FDI can bring in new technologies, capital, and knowledge, which can boost productivity and create jobs, leading to overall economic growth.

The impact of FDI on GDP growth rate remains significant and relatively stable even when considering other variables, such as domestic investments, trade, HDI, and inflation. This suggests that the benefits of FDI are not limited to a specific level of development or domestic investment environment, and foreign investment can continue to play a crucial role in promoting economic growth across various circumstances.

FDI's impact on GDP growth in Southeast Asian countries is extensive and multifaceted, bringing numerous benefits such as facilitating technology and knowledge transfer through the introduction of advanced technologies and management practices, which can boost productivity and competitiveness within local industries. FDI also generates employment opportunities, both directly and indirectly, leading to a more robust and diverse economy. Infrastructure development is another crucial area where FDI contributes, resulting in improved transportation networks, communication systems, and energy supply that ultimately benefit the broader economy.

Furthermore, FDI could help diversify the economy, enhancing human capital through skill development, and stimulate competition and innovation within the domestic market, fostering a more dynamic business environment. Lastly, FDI could lead to increased government revenue through taxation, allowing for investment in public services, infrastructure, and social programs. However, the positive effects of FDI are contingent upon factors such as the quality of institutions, regulatory framework, and overall investment climate in the host country, emphasizing the need for policymakers to create a conducive environment that encourages foreign investments and drives economic growth and development in the region.

	Regression number									
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10
Independent variable	Coefficient (Standard error)									
FDI net Inflows (% of GDP)	0.1182 (0.0872)	0.1408 (0.0828)	0.1278 (0.0867)	0.1968 * (0.0738)	0.2280 ** (0.0631)	0.2136 ** (0.0644)	0.4758 (0.5828)	0.0934 (0.2528)	0.1539 * (0.0668)	1.0019 * (0.4258)
Domestic Investments (% of GDP)		0.0742 (0.0744)	0.0798 (0.0789)	0.0693 (0.0668)	0.0297 (0.0619)	0.0345 (0.0651)		0.0659 (0.0965)		0.0413 (.0700)
Trade (% of GDP)			0.0126 (0.0172)	0.0194 (0.0184)	0.0246 (0.0175)	0.0279 (0.0212)				0.0193 (0.0168)
HDI (Range 0 – 100)				–0.1426 * (0.0519)	–0.2239 *** (0.0511)	–0.2548 ** (0.0753)	–0.0806 (0.0543)		–0.0628 (0.0417)	–0.1398 (0.0850)
Inflation (Annual %)					–0.1975 . (0.1051)	–0.1959 . (0.1016)			–1.3779 (1.0397)	–0.1628 (0.0917)
Population Growth (Annual %)						-0.4266 (0.6439)				–1.3400 (0.8104)
FDI × HDI							–0.0041 (0.0068)			-0.0085 (0.0052)
FDI × Domestic Inv.								0.0019 (0.0094)		-0.0046 (0.0069)
HDI diff. × Pop. Growth									1.6698 . (0.8463)	1.3909 (0.8013)
No. of observation	334	295	294	294	294	294	334	295	325	288
R^2 within	0.0068	0.0240	0.0295	0.0512	0.1616	0.1641	0.0268	0.0242	0.1243	0.2351
R^2 between	0.0284	0.1075	0.0503	0.4354	0.3668	0.4219	0.5247	0.1014	0.5888	0.3674
R^2 overall	0.0096	0.0330	0.0217	0.0824	0.1462	0.1532	0.0878	0.0323	0.1827	0.2071

	Regression number				
	2.1	2.2	2.3	2.4	2.5
Independent variable	Coefficient (Standard error)				
FDI net Inflows (% of GDP)	0.2013 * (0.0769)		0.2064 ** (0.0599)	0.2455 *** (0.0551)	0.2274 *** (0.0510)
FDI net Inflows (% of GDP, Lag 1)	–0.1463 * (0.0583)		–0.1087 (0.0887)	–0.0893 (0.0848)	
Domestic Investments (% of GDP)		0.2411 (0.1492)	0.2091 (0.1668)	0.1930 (0.1722)	0.2028 (0.1325)
Domestic Investments (% of GDP, Lag 1)		–0.1861 (0.1031)	–0.1795 (0.1021)	–0.1740 (0.1195)	–0.1646 (0.1084)
Trade (% of GDP)				0.0205 (0.0199)	
Export (% of GDP)					0.0804 (0.0512)
HDI (Range 0 – 100)				–0.1372 * (0.0575)	-0.2379 ** (0.0591)
Inflation (Annual %)					-0.2046 . (0. 1108)
No. of observation	323	289	284	284	286
R^2 within	0.0135	0.0405	0.0489	0.0723	0.2003
R^2 between	0.0145	0.0961	0.0909	0.3494	0.1090
R^2 overall	0.0146	0.0417	0.0541	0.0945	0.0979

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