CORRELATION OF ECONOMIC GROWTH AND SELECTED ECONOMIC VARIABLES IN ASEAN REGION

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ABSTRACT

Economic growth in each ASEAN member countries differ in terms of investment, consumption, oil prices and external demand. Likewise, potential growth is defined as the maximum rate of growth that the economy can achieve with macroeconomic stability. Growth slowed in 7 of the 10 ASEAN economies, edging down the sub-regional average to 4.4% in 2015. In the study, the government learned various factors that can be used for their policy development and improvement of infrastructure. The researchers determined how Infrastructure Spending, FDI, Employment Ratio and Foreign Aid affect the Economic Growth of the entire Southeast Asian economies. After performing several regression models, it emerged that only Infrastructure Spending was able to significantly predict and cause significant relationship with Economic Growth. More over the value of the R-square relates that 99.4% of the variations in Economic Growth are explained and accounted from Infrastructure Spending. This emphasizes and support theories in Development Economics that indeed, the presence of Infrastructure fuels business activities leading to economic growth. Secondary data pertaining to different economic variables such as growth rate, infrastructure, foreign aid direct investment and employment of ten ASEAN member countries were taken from Bloomberg and other government agencies. The proponents used 30 years as coverage of the study. The researchers utilized regression analysis and Markov for the analysis of data. The study also presented the forecasted values of the different variables of the ASEAN member countries.

KEYWORDS: economic growth, infrastructure, direct investment, foreign assistance, employment

INTRODUCTION

As per ADB, growth in each ASEAN member countries differ in terms of investment, consumption, oil prices and external demand. Likewise, potential growth is defined as the maximum rate of growth that the economy can achieve with macroeconomic stability.

There will be a positive impact on the innovative sector and growth of the economy by moderating the inflow of foreign workers, in order to increase competitiveness (Thangavelu, 2012).

Growth slowed in 7 of the 10 ASEAN economies, edging down the sub-regional average to 4.4% in 2015. In the study, the government learned various factors that can be used for their policy development and improvement of infrastructure.

For the business sector, the results of the study will be significant in determining different strategies to be globally competitive. For the future researcher, findings of the study can be used to replicate using different variables. Researchers will learn the current trends in the performance of the 10 member countries of ASEAN.

This paper looks into the 30 year data of ASEAN countries as to how employment, foreign direct investment, infrastructure and foreign aid affect the economic growth indicators.

Roads, railroad, air transportation and electric supply comprises the infrastructure as part of the overall economy. Infrastructure as it relates to economic growth has a direct impact as it creates more jobs in the construction and related phases (Palei, 2015). As concluded by Kumari& Sharma, in 2017, using a time series analysis of 1995-2013, there is indeed a relationship between the infrastructure and economic development in India. This supports that governments may achieve the desired developmental goals through the physical and social development of infrastructure. In this regard, however, Shi, Guo & Sun, in 2017, present a different perspective wherein among the four types of infrastructure observed - electricity generation, roads, railways and telecommunications - road construction has a negative effect, while the other three posted a positive impact on economic growth. In contrast, the observation for the Middle East and North Africa region (MENA) for the years 2000–2016, was found to establish a positive relationship between the transport infrastructure and economic growth (Saidi, Shahbaz, & Akhtar, 2018).

Using a meta-regression analysis (MRA), 140 samples for the years 1970 to 1990 were taken and was concluded that there exists a relationship between the FDI and economic growth (Iamsiraroj&Ulubaşoğlu, 2015). A quarterly analysis made for the years 2001-2010 was made to establish the relationship between FDI and GDP in Slovakia. Through the cointegration tests, results showed that there is a positive relationship between FDI and GDP (Szkorupová, 2014). A conclusion was derived by analyzing 17 Middle East and North African Countries between 1990 to 2012, through simultaneous-equation models by Abdouli&Hammami in 2017.Among several observations, Algeria, Egypt, Kuwait, Lebanon, Oman, Qatar and Saudi Arabia was found to have proven that there is unidirectional relationship of FDI stocks to economic growth. Through the 124 cross-country data observed between 1971-2010, the results showed a bidirectional relationship between the FDI and economic growth, through the three-staged least squares (Iamsiraroj, 2016). Ali &Mingque in 2018 observed between 1990 to 2014 using the selected Asian developing countries such as Bangladesh, India, Indonesia and Malaysia through cointegration test, concluded that there is no directional interrelationship between FDI and economic growth. However, in the long run, there is an established positive relationship between FDI and GDP, although the values are deemed not significant. In the last three decades, the ASEAN 5 received a significant inflow of foreign direct investments. Among several variables, FDI was taken from the years 1970 to 2013, cointegration in the long-run exists in the Philippines, Thailand, Indonesia and Malaysia. And, FDI was seen to have a positive relationship in Malaysia, Thailand and Indonesia, in terms of economic growth (Ridzuan, Khalid, Zarin, et al, 2018).

In contrast, a study conducted by Alvarado, Iñiguez& Ponce (2017) using 19 Latin American countries over the years 1980 to 2014 was made. The findings were that FDI does not have an effect on the economic growth of Latin American countries, excluding, however, those in the high-income countries, (Chile and Uruguay) through the use of econometric regressions.

By observing several circumstances across different countries, several conclusions were drawn as employment relates to economic performance. OECD (Organisation for Economic Co-operation and Development) member countries were observed between 1990 and 2013 and that labor protection, in general, was found to not have any statistical impact on economic growth (Brancaccio, Garbellini&Giammetti, 2018). This is in contrast with the findings of Taylor, Rezai and Foley (2016), wherein it was concluded that demand is typically driven by profits and wages. This in turn leads to higher activities that require labor which leads to the tightening of the labor market, which tends to drive higher, the generation of income.

In an Iranian review conducted for the years 1965-2011, using cointegration modelling, there exists a relationship between labor and economic growth and capital (Ahmed, Mahalik& Shahbaz, 2016). Further observing the effects of labor on the economic growth as seen in Spain, the reduction of unemployment rate provides an avenue for economic growth,

as evidenced across sectoral performances (Inchausti-Sintes, 2015). Following the study made in Korea, through computable general equilibrium (CGE) modelling, the several points were discussed as to how the employment affects the economic performance. An increase in the research and development investments positively affect economic growth, and likewise that of the aggregate demand for labor. In the same manner, technological innovations affects indirect employment where there jobs created arising from the said innovations (Jung, Lee, Hwang & Yeo, 2017).

By observing 131 countries between 1996-2000, there are less returns coming from foreign aid, as compared to the returns generated foreign loans for the recipient nations (Bandyopadhyay, Lahiri& Younas, 2015). Growth has an estimated life of two years. Diminishing returns were found to be present among recipient countries and that only in a span of two years will foreign aid affect a country's economy by half (Feeny& Fry, 2014). Further, a study in 2016 conducted by Annen, Batu and Kosempel, by observing 85 recipient countries that there is only a small and temporal impact of foreign aids to the overall economic performance.

In contrast to short-term and diminishing returns, foreign aid was found to have a negative effect on growth when 48 countries were observed for 5-year periods between 1970-2010 (Young & Sheehan, 2014). Liu, Zhang & Chao (2014) recommends that in cases of foreign aid, where wealth is transferred in lump sum amount, there can be an increase in the growth of the economy if used in a productive fashion. However, this tends to provide an avenue for lower growth when it causes the individuals to exert less learning and working, and more on leisure

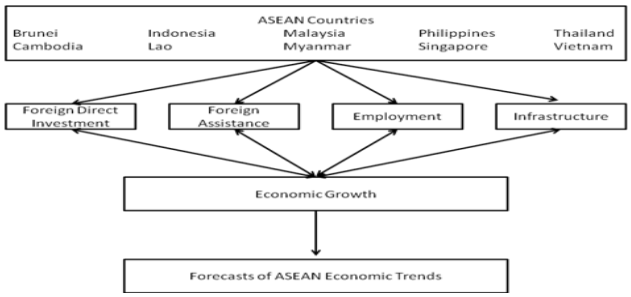

Figure 1: Conceptual Framework

RESULTS AND DISCUSSION

Trend of Macroeconomic Variables

The succeeding discussions present the results for the different macroeconomic variables

Table 1. Linear Trend Model Results for Gross Domestic Product, Infrastructure Spending, Foreign Direct Investment, Employment and Foreign Aid

Variables	Constant t-statistic p-value	Beta Coefficient t-statistic p-value	F-ratio p-value	R-squared
Gross Domestic Product	73,437,090,036.017 0.635 (0.533)	120,503,056,420.63 13.081 (0.000)	171.102 (0.000)	0.900
Infrastructure Spending	63,373,529,865.89 3.375 (0.000)	21,610,560,569.72 14.449 (0.000)	208.782 (0.000)	0.917
Employment Ratio	377.328 12.078 (0.000)	5.247 2.109 (0.048)	4.448 (.048)	0.190
Foreign Aid	3,907,366,809.52 8.216 (0.000)	141,623,883.12 3.739 (0.001)	13.981 (0.001)	0.424
Foreign Direct Investment	-4,234,216,207.40 -0.439 (0.000)	6,278,248,953.55 9.103 (0.000)	82.873 (0.000)	0.813

The table above summarizes the formulated linear tend models for each macroeconomic variable. All five models posted overall significance. This is evident from the p-values of each computed F-ratio. As observed, all F-ratios garnered p-values less than the level of significance of 0.05. Same goes with the individual regression coefficients. All t-statistic generated p-values less than the level of significance of 0.05. Lastly, the values of the R-squared provide information as to how much the variations in the macroeconomic variables are explained by the element of time. Except for Employment and Foreign Aid, results showed that only Gross Domestic Product and Infrastructure Spending have high levels of R-squared. In particular, results showed that 90% of the GDP and 91.7% of the Infrastructure Spending were explained by the element of time. Meanwhile, only 19% variations of Employment and 42.4% Foreign Aid are explained by the element of time.

Results for the individual linear trend model are as follows

Gross Domestic Product = 73,437,090,036.017 + 120,503,056,420.63 time

Results showed that on the average, the value of the Gross Domestic Product among Southeast Asian countries increases at a rate of 120,503,056,420.63 every year. The remaining figure relates that the value of the GDP that is independent from the element of time is 72,437,090,036.17

Infrastructure Spending = 63,373,529,865.89 + 21,610,560,569.72 time

Results revealed that on the average, the amount of Infrastructure Spending among Southeast Asian countries increases at a rate of 21,610,560,569.72 every year. Meanwhile, the value of Infrastructure Spending independent from the element of time is 63,373,529,865.89.

Employment Ratio = 377.328 + 5.247 time

In the case of Employment Ratio, results showed that on the average, an increase of 5.247 is observed. The remaining figure, 377.328 showed the value of Employment Ratio that is independent with the element of time. One should however note that only 19% of the variation in the Employment Ratio is accounted from time.

It can be seen in Figure 1 the focus of the study wherein the different economic variables such as foreign direct investment, foreign assistance, employment and infrastructure of the ten member countries of ASEAN are correlates. The study also determine the forecasting value of each member country in relation to economic growth. Hence the following hypotheses were tested;

H_{a1a}: Infrastructure Spending affects economic growth of ASEAN countries

H_{a1b}:There is significant relationship between Infrastructure Spending and economic growth

H_{a2a}: Foreign Direct Investment affects economic growth of ASEAN countries

H_{a2b}: There is significant relationship between Foreign Direct Investment and economic growth

H_{a3a}: Employment affects economic growth of ASEAN countries

H_{a3b}: There is significant relationship between Employment and economic growth

H_{a4a}: Foreign Aid affect economic growth of ASEAN countries

H_{a4b}: There is significant relationship between Foreign Aid and economic growth.

METHODOLOGY

The study utilized descriptive correlational research design wherein secondary data wad used to answer the objective of the study. The data were taken from government agencies as well as from Bloomberg. The study used 30 year data in order to determine the correlation of economic growth and selected variables among ASEAN member countries. The study used stochastic method and Markovian Analysis in order to identify the relationship of the different variables. Likewise the study utilized regression analysis in order to identify the significant relationship among variables.

Foreign Aid = 3,907,366,809.52 + 141,623,883.12 time

Results showed that on the average, the value of Foreign Aid increases by 141,623,883.12 every year. In addition, the model showed that 3,907,366,809.52 of the value of Foreign Aid, that is independent with the element of time. However, similar with the case of Employment Ratio,only 42.4% of the variations in Foreign Aid are explained by the element of time.

Other than the overall results, the research also presents individual linear trend models for each Southeast Asian country included.

Foreign Direct Investment= -4,234,216,207.40 + 6,278,248,953.55 time

In the case of FDI, results showed that on the average, the Southeast Asia economies experience an increase of 6,278,248,953.55 every year. Results also showed that -4,234,216,207.40 of the economies FDI are not accounted from the element of time. Lastly, the model posted a high goodness of fit. This was evidenced from the value of the R-squared of 0.813. This relates that 81.3% of the variations in FDI is explained by the element of time.

Table 2.GDP Linear Trend Models per Country

	Trend Variable			
Variables	**Constant t-statistic p-value**	**Beta Coefficient t-statistic p-value**	**F-ratio p-value**	**R-squared**
Brunei	2,849,570,320.75 2.431 (0.025)	693,411,335.15 7.428 (0.000)	55.182 (0.000)	0.744
Indonesia	-29,280,564,762.55 -.593 (0.000)	46,965,134,617.96 11.943 (0.000)	142.627 (0.000)	0.882
Cambodia	-434,488,312.47 -0.631 (0.536)	848,463,934.08 15.461 (0.000)	239.032 (0.000)	0.926
Laos	-2,163,199,016.95 -2.495 (0.000)	7,125,263,77.76 10.318 (0.000)	106.46 (0.000)	0.849
Myanmar	-24,585,034,287.92 -4.843 (0.000)	4,500,750,317.13 12.318 (0.000)	151.738 (0.000)	0.910
Malaysia	29,022,449,186.41 2.041 (0.000)	14,370,742,391.91 12.688 (0.000)	160.989 (0.000)	0.849
Philippines	15,772,823,770.37 1.227 (0.235)	12,762,721,891.30 12.469 (0.000)	155.47 (0.000)	0.891
Singapore	30,111,109,624.58 2.283 (0.000)	13,289,870,682.48 12.650 (0.000)	160.031 (0.000)	0.894
Thailand	6,112,201,8548.70 3.267 (0.000)	17,255,719,672.29 11.582 (0.000)	134.138 (0.000)	0.876
Vietnam	-18,314,831,992.33 -2.201 (0.000)	9,721,677,720.60 14.670 (0.000)	215.20 (0.000)	0.919

Overall results showed that all GDP linear trend models for each Southeast Asian economy generated significant results. This is particularly evident from the p-values of the F-ratios. As observed, all p-values have were less than the level of significance of 0.05. This signifies overall significance for each linear trend model. As for the R-squared, all computed coefficients yielded values between 80% to 90%, signifying high accountability of time in explaining the variations of the GDP of each economy. Lastly, the individual regression coefficients also posted significant results. As observed, all constants and beta coefficients have t-statistics with p-values less than the level of significance of 0.05.

The succeeding discussions enumerate and elaborate the individual linear tend models for each country.

GDP (Brunei) = 2,849,570,320.75 + 693,411,335.15 time

Results showed that on the average, Brunei's GDP increases at a rate of 693,411,335.11 every year. The constant, 2,849,570,320.75, signifies that value of the GDP independent of the element of time. Lastly, the value of the R-squared relates that 74.4% of the variations in Brunei's GDP is accounted from the element of time.

GDP (Indonesia) = -29,280,564,762.55 + 46,965,134,617.96 time

In the case of Indonesia, results showed that on the average, its GDP increases at a rate of 46,965,134,617.96 every year. As for the constant, figures showed that -29,280,564,762.55 of Indonesia's GDP is not accounted from the element of time. Further, the value of the R-squared showed that 88.2% of the variations in Indonesia's GDP is accounted from time.

GDP (Cambodia)= -434,488,312.47 + 848,463,934.08 time

On the average, Cambodia's GDP increases at a rate of 848,463,934.08 every year. The value of the constant shows that -434,488,312.47 is Cambodia's GDP that is independent of the element of time. The value of the R-squared strengthens the value of the model as 92.6% of the variations in Cambodia's GDP is accounted from the element of time.

GDP (Laos)= -2,163,199,016.95 + 712,526,377.76 time

Results showed that on the average, the GDP of Laos increases at a rate of 712,526,377.76 every year. The value of the constant showed that -2,163,199,016.95 is the value of the GDP independent of the element of time. As for the R-squared, 84.9% of the variations in Laos' GDP is accounted from the element of time.

GDP (Myanmar) = -24,585,034,287.92 + 4,500,750,317.13 time

Myanmar appeared as another country whose GDP is highly explained by the progression of time. As observed, its linear trend model generated a high R-square value. It appeared that 91 of the variations in Myanmar's GDP is explained by the element of time. Regression coefficients relate that on the average, Myanmar's GDP increases at a rate of 4,500,750,317.13 every year.

GDP (Malaysia) = 29,022,449,186.41 + 14,370,742,391.91 time

In the case of Malaysia, results showed that 84.9% of the variations in its GDP are explained by the element of time. The model results relates the following: on the average, Malaysia's GDP increases at a rate of 14,370,742,391.91 every year. The value of the constant relates that 29,022,449,186.41 is the value of its GDP that is independent from the element of time.

GDP (Philippines) = 15,772,823,770.37 + 12,762,721,891.30 time

Result showed that 89.1% of the variations in Philippine GDP is explained by the element of time. In particular, the linear trend model showed that on the average, GDP increases at a rate of 12,762,721,891.30. The value of the constant showed that 15,772,823,770.37 is the value of the Philippines' GDP that is not accounted from the element of time.

GDP (Singapore) = 30,111,109,624.58 + 13,289,870,682.48 time

Figures relate that on the average, the GDP of Singapore is increasing at a rate of 13,289,870,682.48 every year. Meanwhile, Singapore's GDP that is independent with the element of time amounts to an average of 30,111,109,624.58. Lastly, the R-squared of the regression model relates that 89.1% of the variations in Singapore's GDP is accounted from the element of time.

GDP (Thailand) = 61,122,018,548.70 + 17,255,719,672.29 time

In the case of Thailand, results showed that 87.6% of the variations in its GDP is explained by the element of time. As for the regression coefficients, results showed that on the average, Thailand's GDP is increasing at a rate of 17,255,719,672.29. Lastly, the constant shows that 61,122,018,548.70 is the value of the GDP that is independent of the element of time.

GDP (Vietnam)= -18,314,831,992.33 + 9,721,677,720.60time (0.919)

Results showed that on the average, Vietnam's GDP is increasing at arate of 9,721,677,720.60 every year. While the value of it's GDP that is independent from the element of time is -18,314,831,992.33. Lastly, the formulated model showed that 91.9% of variations Vietnam's GDP is explained by the progression of time.

Table 3. Infrastructure Linear Trend Models per Country

	Trend Variable			
Variables	**Intercept t-statistic p-value**	**Beta Coefficient t-statistic p-value**	**F-ratio p-value**	**R-squared**
Brunei	1,549,760,802.46 1.486 (0.154)	499,657,704.49 6.017 (0.000)	36.203 (0.000)	0.656
Indonesia	-8,994,583,268.056 -0.410 (0.686	19,652,981,400.81 11.254 (0.000)	126.655 (0.000)	0.870
Cambodia	-434,313,457.58 -1.853 (0.079)	234,579,935.362 12.569 (0.000)	157.973 (0.000)	0.893
Laos	-867,683,430.871 -3.343 (0.005)	220,216,074.28 10.255 (0.000)	108.752 (0.000)	0.856
Myanmar	-847,663,330.771 -3.152 (0.005)	219,226,064.27 10.235 (0.000)	104.752 (0.000)	0.846
Malaysia	19,994,442,459.13 3.727 (0.001)	5,297,379,287.53 12.400 (0.000)	153.759 (0.000)	0.890
Philippines	7,750,325,049.32 2.156 (0.044)	3,862,365,246.34 13.491 (0.000)	182.002 (0.000)	0.905
Singapore	16,343,304,583.83 6.100 (0.000)	2,819,147,423.25 13.213 (0.000)	174.585 (0.000)	0.902
Thailand	23,873,821,102.37 3.339 (0.000)	6,430,643,092.29 11.293 (0.000)	127.530 (0.000)	0.870
Vietnam	-4,588,363,328.76 -2.104 (0.000)	3,201,025,520.32 18.249 (0.000)	339.612 (0.000)	0.947

In the case of Infrastructure Spending, results showed that all linear trend models were significant on the overall level. All individual regression coefficients also posted significant results, evident from the p-values of each t-statistic. As observed, all p-values were less than the level of significance of 0.05. Lastly, except for Brunei, all linear trend models yielded high R-squared values.

Infrastructure Spending (Brunei) = 1,549,760,802.46 + 499,657,704.49 time

Results showed that on the average, Infrastructure Spending in Brunei increases at a rate of 499,657,704.49. Meanwhile, the value of Brunei's Infrastructure Spending that is independent of the element of time was 1,549,760,802.46. As for the value of the R-squared, results showed that only 65.6% of the variations in Brunei's Infrastructure Spending is accounted from the element of time.

Infrastructure Spending (Indonesia) = -8,994,583,268.056+19,652,981,400.81 time

In the case of Indonesia, results showed that on the average, Infrastructure Spending increases at a rate of 19,652,981,400.81 every year. The value of the constant reveals -8,994,583,268.056 of Indonesia's Infrastructure Spending is independent from the element of time. Lastly, the R-squared reveals that 87% of the variations in Infrastructure Spending is explained by the element of time.

Infrastructure Spending (Cambodia) =-434,313,457.58+234,579,935.362 time

Results showed that on the average, Cambodia's Infrastructure Spending increases at a rate of 234,579,935.362 every year. The value of Infrastructure Spending that is independent of the element of time was -434,313,457.58. Lastly, results showed that 89.3% of the variations in Cambodia's Infrastructure Spending is accounted from the element of time.

Infrastructure Spending (Laos) = -867,683,430.871 + 220,216,074.28 time

In the case of Laos, results showed that on the average, it's level of Infrastructure Spending increases at a rate of 220,216,074.28 every year. The value of the constant shows that 867,683,430.871 is the amount that is independent from the element of time. Lastly, the value of the R-squared shows that 85.6% of the variations in Infrastructure Spending is accounted from the element of time.

Infrastructure Spending (Myanmar) = -847,663,330.771 + 219,226,064.2 time

Results showed that on the average, Myanmar's Infrastructure Spending amounts to 219,226,064.2. On the contrary, it's level of Infrastructure Spending that is independent from the element of time is 847,663,330.771. Lastly, the value of the R-squared showed that 84.6% of the variations in Infrastructure Spending is accounted from the element of time.

Infrastructure Spending (Malaysia) = 19,994,442,459.13 + 5,297,379,287.53 time

On the average, Malaysia was found to spend 5,297,379,287.53 on Infrastructure. The constant reveals that 19,994,442,459.13 was the value of Infrastructure independent from the element of time. Lastly, the model was found to be of good fit. The value of the R-squared showed that 89% of the variations in Infrastructure Spending is explained by the element of time.

Infrastructure Spending (Philippines) = 7,750,325,049.32+ 3,862,365,246.34 time

In the case of the Philippines, its level of Infrastructure Spending averaged by 3,862,365,246.34 every year. The value of Infrastructure Spending independent from the element of time is 7,750,325,049.32. The model showed high level of fit, evidenced from the value of its R-squared. As observed, 90.5% of the variations in Infrastructure Spending is explained by the element of time.

Infrastructure Spending (Singapore) = 16,343,304,583.83 + 2,819,147,423.25 time

Results showed that Infrastructure Spending in Singapore averaged by 2,819,147,423.25. The value of Infrastructure Spending independent from the element of time was16,343,304,583.83. The model posted a good fit, as related by the value of its R-squared. As observed, 90.2% of the variations in Infrastructure Spending is explained by the element of time.

Infrastructure Spending (Thailand) = 23,873,821,102.37+6,430,643,092.29 time

Thailand's linear trend model exhibited high goodness of fit. As observed, its R-squared value related that 87% of the variations in Infrastructure Spending is explained by the element of time. The value of the regression coefficients showed that on the average, Thailand is spending 6,430,643,092.29 for Infrastructure and 23,873,821,102.37 is the value independent from the element of time.

Infrastructure Spending (Vietnam) = -4,588,363,328.76 +3,201,025,520.32 time (0.947)

Results showed that on the average, Vietnam is spending 3,201,025,520.32 for Infrastructure. The value that is independent from the element of time is -4,588,363,328.76. Lastly, the value of its R-squared showed that 94.7% of the variations in Infrastructure Spending is explained by the element of time. Such figure relates that the linear trend model is of good fit

Table 4. Development Assistance per Country

	Trend Variable			
Variables	**Intercept t-statistic p-value**	**Beta Coefficient t-statistic p-value**	**F-ratio p-value**	**R-squared**
Brunei	1860277.778 2.168 (0.067)	-245,166.667 -1.608 (0.152)	2.586 (0.152)	0.270
Indonesia	1,858,460,000.000 6.682 (0.000)	-82489870.130 -3.724 (0.001)	13.868 (0.001)	0.422
Cambodia	293,474,000.000 8.872 (0.000)	26,299,766.234 9.984 (0.000)	99.67 (0.000)	0.840
Laos	254,536,285.714 11.606 (0.000)	9,652,675.325 5.526 (0.000)	30.540 (0.000)	0.616
Myanmar	-434,506,523.810 -1.335 (0.198)	89,196,480.519 3.441 (0.003)	11.838 (0.003)	0.384
Malaysia	8672047.619 .112 .912	3,124,012.987 0.506 (0.618)	.256 (0.618)	0.013
Philippines	755,188,142.85 7.503 (0.000)	-25,908,792.208 -3.232 (0.004)	10.447 (0.004)	0.355
Singapore	4,594,444.444 1.156 (0.286)	48,666.667 .069 (0.947)	.005 (0.947)	0.001
Thailand	520,444,047.619 2.645 (0.016)	-36,305,779.221 -2.317 (0.032)	5.368 (0.032)	0.220
Vietnam	644,363,714.286 2.872 (0.010)	158,454,467.532 8.867 (0.000)	78.632 (0.000)	0.805

While the GDP and Infrastructure Spending yielded linear trend models that posted high goodness of it, results for Development Assistance revealed different results. As observed from Table ____, only Vietnam, Cambodia and Laos registered high goodness of fit. Although in all countries, the linear trend models generated significant results, the R-squared value relates that the model is weak when using time or trend as a predictor.

The succeeding analyses will only focus on the Vietnam, Cambodia and Laos. As mentioned, these were the three countries whose regression models posted high goodness of fit.

Development Assistance (Vietnam) = 644,363,714.286 +158,454,467.532 time

In the case of Vietnam, results showed that 80.5% of the variations on its Development Assistance is explained by the element of time. The regression coefficients relate that on the average, its level of Development Assistance increases at a rate of 158,454,467.532. Lastly, 644,363,714.286 is the value of Development Assistance that is independent of the element of time.

Development Assistance (Cambodia) = 293,474,000.000 + 26,299,766.234 time

Results showed that 84% of the variations in the Development Assistance received by Cambodia is explained by the element of time. Regression coefficients relate that on the average, the level of Development Assistance in Cambodia increases at a rate of 26,299,766.234 every year. Lastly, the constant shows that 293,474,000.000 is the amount of Development Assistance, independent from the element of time. Development Assistance (Laos) = 254,536,285.714 + 9,652,675.325 time

In the case of Laos, results showed that 61.6% of the variations in Development Assistance is explained by the element of time. On the average, figures relate that the rate of Development Assistance received by Laos increases at a rate of 9,652,675.325 every year. Lastly, 254,536,285.714 is the value of Development Assistance independent from the element of time.

Table 5. Employment Ratio Linear Trend Models

	Trend Variable			
Variables	**Intercept t-statistic p-value**	**Beta Coefficient t-statistic p-value**	**F-ratio p-value**	**R-squared**
Singapore	54.983 36.550 (0.000)	0.546 4.601 (0.000)	21.173 (0.000)	0.540
Vietnam	70.470 86.778 (0.000)	.247 3.882 (0.001)	15.067 (0.001)	0.485
Indonesia	60.975 78.562 (0.000)	.112 1.889 (0.075)	3.607 (0.075)	0.175
Cambodia	73.022 13.456 (0.000)	.476 1.166 (0.271)	1.359 (0.271)	0.120
Laos	92.822 2.381 (0.261)	-1.281 -0.362 (0.779)	.131 (0.779)	0.116
Philippines	58.528 129.594 (0.000)	0.055 1.546 (0.139)	2.390 (0.139)	0.112
Malaysia	61.988 82.691 (0.000)	.073 1.229 (0.234)	1.511 (0.234)	0.074
Thailand	69.952 85.924 (0.000)	0.061 0.935 (0.000)	0.875 (0.361)	0.044
Brunei	-	-	-	-
Myanmar	-	-	-	-

Employment Ratio did not generate significant linear trend models in most countries considered in the study. As observed from the p-values of the F-ratios, only Singapore and Vietnam managed to post overall model significance. In addition, the values of the R-squared showed that Singapore managed to score a decent value of the R-squared. As its value shows, 54% of the variations in Development Assistance is accounted from the element of time. As consequence, the succeeding interpretation will only consider the case of Singapore.

Development Assistance (Singapore) = 54.983 + 0.546 time

The linear trend model for Singapore relates that on the average, the amount of Development Assistance it receives increases at a rate of 0.546. The value of its Development Assistance independent from the element of time amounts to 54.983.

Table 6. Foreign Direct Investment Linear Trend Models

	Trend Variable			
Variables	**Intercept t-statistic p-value**	**Beta Coefficient t-statistic p-value**	**F-ratio p-value**	**R-squared**
Cambodia	-358,663,445.736 -2.620 (0.017)	106,988,037.505 9.813 (0.000)	96.296 (0.000)	0.835
Vietnam	-1,074,742,857.143 -1.326 (0.200)	570,807,792.208 8.846 (0.000)	78.252 (0.000)	0.805
Singapore	-2,884,697,090.476 -0.575 (0.572)	3,281,870,561.545 8.217 (0.000)	67.527 (0.000)	0.780
Myanmar	-621,446,423.841 -2.064 (0.053)	151,998,932.507 6.339 (0.000)	40.178 (0.000)	0.679
Laos	-215,549,744.879 -1.92 (0.070)	46,257,839.402 5.183 (0.000)	26.860 (0.000)	0.586

Indonesia	- 4,317,139,226.204 -1.504 (0.149)	1,112,975,297.507 4.869 (0.000)	23.709 (0.000)	0.555
Malaysia	1,196,667,257.108 0.901 (0.379)	497,127,916.969 4.698 (0.000)	22.067 (0.000)	0.537
Philippines	11,538,035.29 .019 (0.985)	221,706,108.112 4.486 (0.000)	20.125 (0.000)	0.514
Thailand	4,081,327,890.414 2.521 (0.021)	262,204,063.949 2.034 (0.056)	4.137 (0.056)	0.179
Brunei	3,839,387.215 .018 (0.986)	22848825.637 1.546 (0.144)	2.390 (0.144)	0.146

The table above summarizes the linear trend models of each country. Except for Thailand and Brunei, all other countries posted overall significance. This is evident from the p-values of the F-ratios. As observed, all the remaining countries garnered F-ratios with p-values less than the level of significance of 0.05. When the values of the R-squared was considered, results also showed that Thailand and Brunei posted low values. This signifies low level of fit in the linear trend model.

FDI (Cambodia) = -358,663,445.736 + 106,988,037.505 time

In the case of Cambodia, results showed that on the average, its FDI increases at a rate of 106,988,037.505 every year. The value of the constant relates that -358,663,445.736 is the level of FDI that is independent from the element of time. It should however be noted that the value of the constant did not emerge to be significant. Hence, for forecasting and modeling purposes, such can be dropped from the equation.

Lastly, this country received the highest R-square value. This signifies high goodness of fit, more specifically, it signifies that 83.5% of the variations in FDI are explained by the element of time.

FDI (Vietnam) = -1,074,742,857.143 + 570,807,792.208 time

Results showed that on the average, Vietnam's FDI increases at a rate of 570,807,792.208 every year. The value of the constant relates that -1,074,742,857.143 of the FDI is not accounted from the element of time. It should however be noted that the value of the constant did not appear significant. Hence, for forecasting and modeling purposes, such can be dropped from the equation.

Lastly, 80.5% of the variations in Vietnam's FDI are accounted from the element of time.

FDI (Singapore) = -2,884,697,090.476 + 3,281,870,561.545 time

In the case of Singapore, results showed on the average, its FDI increases at a rate of 3,281,870,561.545 every year. Looking at the value of the constant, results showed that -2,884,697,090.476 is Singapore's FDI that is independent from the element of time. Similar to the previous linear trend models, the constant in Singapore's FDI model did not emerge significant. This is evident from the p-value of its t-statistics, that is greater than the level of significance of 0.05.

Lastly, the value of the R-squared showed that 78% of the variations in Singapore's FDI is accounted from the element of time.

Myanmar, Laos, Indonesia, Malaysia and Philippines all generated significant linear trend models. However, the relatively low values of its R-square manifests low goodness of fit. This meant that the element of time or trend cannot be used as a relatively good predictor for the FDI of these countries.

Effects of Infrastructure Spending, Foreign Direct Investment, Employment Ratio and Foreign Aid to Economic Growth

The researchers determined how Infrastructure Spending, FDI, Employment Ratio and Foreign Aid affect the Economic Growth of the entire Southeast Asian economies. After performing several regression models, it emerged that only Infrastructure Spending was able to significantly predict and cause significant relationship with Economic Growth. The result regression model for Economic Growth is summarized below.

Economic Growth = -290,104,789,643.547 + 5.610 Infrastructure Spending

t-statistic = -8.692
55.579
p-value = (0.000)
(0.000)
F-ratio = 3,089.074
p-value = (0.000)
R-squared = 0.994

The resulting regression model generated an F-ratio with a p-value less than the level of significance of 0.05. This relates that the entire regression model is significant. Likewise, the value of the R-square relates that 99.4% of the variations in Economic Growth are explained and accounted from Infrastructure Spending. This emphasizes and support theories in Development Economics that indeed, the presence of Infrastructure fuels business activities leading to economic growth.

The individual regression coefficients in the equation relate the more critical findings. As observed, **-290,104,789,643.547**of the values in Economic Growth is said to be independent from Infrastructure Spending. Lastly, it was found that a unit increase in the Infrastructure Spending of these Southeast Asian Economies results to a 5.610 increase in the level or value of Economic Growth. Predictive Values of Infrastructure Spending, Foreign Direct Investment, Employment Ratio and Foreign Aid to Economic Growth

Table 7. Predicted Values of GDP, Infrastructure Spending and FDI 2018-2036

Year	GDP	Infrastructure Spending	Foreign Direct Investment
	r=0.900	r=0.917	r=0.813
2018	193,940,146,456.65	84,984,090,435.61	2,044,032,746.15
2019	314,443,202,877.28	106,594,651,005.33	8,322,281,699.70
2020	434,946,259,297.91	128,205,211,575.05	14,600,530,653.25
2021	555,449,315,718.54	149,815,772,144.77	20,878,779,606.80
2022	675,952,372,139.17	171,426,332,714.49	27,157,028,560.35
2023	796,455,428,559.80	193,036,893,284.21	33,435,277,513.90
2024	916,958,484,980.43	214,647,453,853.93	39,713,526,467.45
2025	1,037,461,541,401.06	236,258,014,423.65	45,991,775,421.00
2026	1,157,964,597,821.69	257,868,574,993.37	52,270,024,374.55
2027	1,278,467,654,242.32	279,479,135,563.09	58,548,273,328.10
2028	1,398,970,710,662.95	301,089,696,132.81	64,826,522,281.65
2029	1,519,473,767,083.58	322,700,256,702.53	71,104,771,235.20
2030	1,639,976,823,504.21	344,310,817,272.25	77,383,020,188.75
2031	1,760,479,879,924.84	365,921,377,841.97	83,661,269,142.30
2032	1,880,982,936,345.47	387,531,938,411.69	89,939,518,095.85
2033	2,001,485,992,766.10	409,142,498,981.41	96,217,767,049.40
2034	2,121,989,049,186.73	430,753,059,551.13	102,496,016,002.95
2035	2,242,492,105,607.36	452,363,620,120.85	108,774,264,956.50
2036	2,362,995,162,027.99	473,974,180,690.57	115,052,513,910.05
2037	2,483,498,218,448.62	495,584,741,260.29	121,330,762,863.60

Gross Domestic Product = 73,437,090,036.017 + 120,503,056,420.63 time

Infrastructure Spending = 63,373,529,865.89 + 21,610,560,569.72 time

Foreign Direct Investment = -4,234,216,207.40 + 6,278,248,953.55 time

For the prediction of values, the researchers opted to focus on the three macroeconomic variables: GDP, Infrastructure Spending and Foreign Direct Investment. The other macroeconomic variables were discarded from the prediction because of the low R-squared values.

Predicted results showed that a continuously increasing trend is observed for GDP, Infrastructure Spending and Foreign Direct Investment. In particular, results showed that an increase of 15.09% for GDP, 9.86% for Infrastructure Spending and 32.35% for Foreign Direct Investment will be observed. The average value of the GDP will be 1,338,719,182,452.63, 290,284,415,847.95 for Infrastructure Spending and 61,687,397,804.88 for FDI**.**

Continuous increase in GDP can be accounted from (insert explanations here, (together with the other microeconomic indicators)

Table 8. Economic Growth Models for each ASEAN Country

Independent Variable : Infrastructure Spending	Dependent Variable : GDP			
	Constant t-statistic p-value	Beta Coefficient t-statistic p-value	F-ratio p-value	R-square
Country				
Brunei	1,364,072,662.486 4.701 (0.000)	1.293 35.550 (0.000)	1,263.785 (0.000)	0.993
Indonesia	-2,645,813,451.615 -0.255 (0.801)	2.365 55.468 (0.000)	3,076.692 (0.000)	0.994
Cambodia	1,392,239,736.684 3.798 (0.001)	3.498 25.002 (0.000)	625.082 (0.000)	0.971
Laos	618,385,154.160 4.372 (0.000)	3.233 48.634 (0.000)	2,365.259 (0.000)	0.992
Myanmar	5,720,349,204.015 2.203 (0.000)	15.230 13.384 (0.000)	191.371 (0.000)	0.927
Malaysia	-23,805,481,003.188 -4.912 (0.000)	2.695 47.450 (0.000)	2,251.548 (0.000)	0.992
Philippines	-11,060,118,261.287 -7.120 (0.000)	3.329 119.849 (0.000)	14,363.843 (0.000)	0.999
Singapore	-47,057,661,840.110 -9.718 (0.000)	4.717 49.336 (0.000)	2,434.030 (0.000)	0.992
Thailand	-1,250,044,274.322 -0.237 (0.815)	2.665 52.193 (0.000)	2,724.115 (0.000)	0.993
Vietnam	-5,425,606,779.199 -2.382 (0.028)	3.071 49.248 (0.000)	2,425.394 (0.000)	0.992

Table 8 summarizes the different regression models for each ASEAN country. Following the overall finding that Infrastructure Spending serves as a significant predictor of Economic Growth, the researchers determined if the overall model also applies for each ASEAN country.

Figures showed significant results for each ASEAN model. This is particularly evidenced by the p-values of each F-ratio. As observed, all F-ratios generated p-values less than the level of significance of 0.05. Likewise, all models have R-square coefficients that almost reached the 100% mark. This signifies that much of the variations in the GDP are explained by Infrastructure Spending.

The specific regression models for each ASEAN country are as follows.
GDP (Brunei) = 1,364,072,662.486 + 1.293 Infrastructure Spending

Results related that a unit increase in Brunei's Infrastructure Spending leads to a 1.293 increase in the level of its GDP. As for the constant, it relates that 1,364,072,662.486 is the value of Brunei's GDP that is independent of Infrastructure Spending. Lastly, the value of the R-square relates that 99.3% of the variations in Brunei's GDP is explained by Infrastructure Spending.

GDP (Indonesia) = -2,645,813,451.615 + 2.365 Infrastructure Spending

The model relates that a unit increase in Indonesia's Infrastructure Spending increases the value of its GDP by 2.365 units. The constants shows that -2,645,813,451.615 is the level of GDP that is independent from Infrastructure Spending. The value of its R-square shows that 99.4% of the variations in Indonesia's GDP is explained by Infrastructure Spending.

GDP (Cambodia) = 1,392,239,736.684 + 3.98 Infrastructure Spending

Cambodia's r-square yielded a value of 0.971. This signifies that 97.1% of the variations in Cambodia's GDP is explained by Infrastructure Spending. the value of the constant showed that 1,392,239,736.684 is the value of Cambodia's GDP that is independent from Infrastructure Spending.

GDP (Laos)= 618,385,154.160 + 3.233 Infrastructure Spending

Results showed that as the Infrastructure Spending in Laos increases by one unit, its level of GDP increases by3.233 units. The relationship between GDP and Infrastructure Spending is further strengthened by the value of its R-square. As observed, 99.2% of the variations in GDP is explained by Infrastructure Spending. Lastly, 618,385,154.160 is the value of GDP that is independent from Infrastructure Spending.

Infrastructure Spending

Myanmar has recorded the highest effect of Infrastructure Spending to GDP. As observed, a unit increase in Myanmar's Infrastructure Spending is said to bring 15.230 increase in its level of GDP. It's level of GDP that is independent from Infrastructure Spending is 5,720,349,204.15. More importantly, the value of the R-square showed that 92.7% of the variations in Myanmar's GDP is explained by Infrastructure Spending.

GDP (Malaysia) = -23,805,481,003.188 + 2.695 Infrastructure Spending

For Malaysia, 99.2% of the variations in its GDP is explained by Infrastructure Spending. Detailed results of its regression model shows that a unit increase in its Infrastructure Spending leads to 2695 increase in the value of its GDP. Lastly, it was observed that -23,805,481,003.188 is the value of its GDP that is independent from Infrastructure Spending.

GDP (Philippines) = -11,060,118,261.287 + 3.329 Infrastructure Spending

In the case of the Philippines, results showed that a unit increase in its Infrastructure Spending leads to 3.329 increase to its level of GDP. The constant (-11,060,118,261.287) relates that such is the value of the GDP independent from Infrastructure Spending. Lastly, the value of the R-squared relates that 99.99% of the Philippine GDP is explained by the level of Infrastructure Spending.

GDP (Singapore) = -11,060,118,261.287 + 3.329 Infrastructure Spending

Results showed that 99.2% of Singapore's GDP is accounted from its Infrastructure Spending. The constant relates that -47,057,661,840.110 is the level of Singapore's GDP independent from Infrastructure Spending. Lastly, the regression coefficient relate that a unit increase in Infrastructure Spending leads to 4.717 increase in the value of GDP.

GDP (Thailand)= -1,250,044,274.322 + 2.665 Infrastructure Spending In the case of Thailand, results showed that a unit increase in Infrastructure Spending leads to 2.665 increase in its level of GDP. The constant, -1,250,044,274.322, relates that such is Thailand's GDP independent from Infrastructure Spending. Lastly, it was found that 99.3% of the variations in Thailand's GDP is accounted from Infrastructure Spending.

GDP (Vietnam) = -5,425,606,779.199 + 3.071 Infrastructure Spending

Results showed that Vietnam's GDP that is independent from Infrastructure Spending is -5,425,606,779.19. Its beta coefficient relates that a unit increase in Vietnam's Infrastructure Spending leads to 3.071 increase

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