The Impact of Foreign Direct Investment, Urban Population and Renewable Energy on Economic Growth in the ASEAN Region

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ABSTRACT: This study aims to analyze the effect of foreign direct investment (FDI), urban population, and renewable energy on economic growth in the ASEAN region during the period 1993–2022. The method used is Autoregressive Distributed Lag (ARDL) to identify the short-term and long-term effects between variables. The estimation results show that the three variables FDI, urban population, and renewable energy have a positive and significant effect on economic growth, both in the short and long term. FDI contributes through increased capital and technology transfer, urbanization encourages efficiency and economic expansion in urban areas, while renewable energy is an important driver of sustainable economic growth. The significant and negative Error Correction Term (ECT) value indicates that the model has a strong ability to adjust to short-term imbalances. This finding emphasizes the importance of integrated development strategies and policies between investment promotion, urban population management, and clean energy transitions, especially in efforts to encourage inclusive and environmentally friendly growth. in encouraging economic growth in the ASEAN

KEYWORDS-Foreign Direct Investment, Urban Population, Renewable Energy, Economic Growth

I. INTRODUCTION

Sustainable economic growth is a major goal for many countries, especially in the ASEAN region which is undergoing rapid structural transformation and industrialization. In an effort to achieve stable and inclusive growth, several strategic factors that are increasingly being considered are foreign direct investment, urban population and renewable energy development. Foreign direct investment plays an important role as a source of development financing, job creation, and technology and management transfer. Meanwhile, urban population has dual implications: on the one hand expanding the labor market and consumption, but on the other hand can put pressure on infrastructure, the environment and resource distribution. If managed well, urban population can significantly boost productivity and economic growth. Furthermore, renewable energy is a crucial element in realizing environmentally friendly economic growth and resilience to global energy market turmoil. Based on the study(Omisakin et al., 2019)assumes that almost all countries around the world only attract a certain amount of foreign investment that differs in quality and quantity. The positive impact of foreign investment is not only in the country of origin but also in the host country. There are several main reasons why the ASEAN market is a region with great potential. First, the good economic growth of ASEAN member countries. Each country is predicted to have quite high economic growth in the future. The combination of a very large population and relatively high economic growth in conditions of global uncertainty makes for a very promising business opportunity. In addition, ASEAN is filled with developing countries that are heading towards developed country status so that the opportunity is great to continue to grow and many business and investment opportunities are open. ASEAN countries have economic growth that is fluctuating. Economic growth in ASEAN countries can be explained in Table 1.

Table 1 Economic Orowth in ASEAN Countries (70)					
Country	2018	2019	2020	2021	2022
Brunei	0.05	3.86	1.13	-1.59	-1.62
Philippines	6.34	6.11	9.51	5.71	7.58
Indonesia	5.17	5.01	-2.06	3.70	5.30
Laos	8.77	7.93	3.55	3.08	5.10
Cambodia	6.24	5.45	0.50	2.52	2.70
Malaysia	4.84	4.41	-5.45	3.31	8.86
Myanmar	6.26	6.57	-9.04	-12.01	4.03
Vietnamese	7.46	7.35	2.86	2.55	8.12
Singapore	3.51	1.34	-3.86	9.69	3.83
Thailand	4.22	2.11	-6.05	1.56	2.46
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Table 1 Economic Growth in ASEAN Countries (%)

Table 1 presents the trend of economic growth in ASEAN countries in 2018-2022, explaining that ASEAN countries experience fluctuating conditions every year. The highest growth occurred in 2022 at 8.86 percent in Malaysia, while the lowest growth occurred in 2018 at 0.05 percent in Brunei. The cause of the increase in economic growth is due to the increase in the real gross national product in the country. Meanwhile, the decline in the rate of economic growth is due to high inflation. The steps that must be taken by the government to encourage high economic growth are to continue to seek new sources of financing, both domestically and abroad. One of the financing originating from abroad is foreign direct investment (Putra and Radjamin, 2019).

Urban population is an important indicator of economic and social development because it is related to infrastructure, public services, and lifestyle changes. Based on Table 2, developed and small countries (Singapore, Brunei, Malaysia) have high urban population levels. Countries with large populations such as Indonesia and the Philippines are in the growth stage. Countries such as Laos and Vietnam are still predominantly rural but show positive urban population trends. On the other hand, ASEAN has experienced a significant increase in its urban population in recent years. The urban population in the ASEAN region has increased rapidly in the last two decades, as economic growth and structural transformation have driven the movement of people from rural to urban areas. This process has had a significant impact on the dynamics of development, infrastructure, workforce, and energy consumption. In 2020, the average urban population rate in ASEAN was around 37%. By 2022, the ASEAN urban population rate is expected to increase to more than 50%, with countries such as Singapore, Malaysia, Thailand, and Indonesia showing higher urban population rates than other member countries such as Laos, Cambodia, and Myanmar.

Country	2018	2019	2020	2021	2022
Brunei	77.62	77.94	78.25	78.55	78.85
Philippines	46.90	47.14	47.40	47.68	47.97
Indonesia	55.32	55.98	56.64	57.29	57.93
Laos	23.38	23.80	24.23	24.66	25.11
Cambodia	35.04	35.64	36.29	36.93	37.59
Malaysia	76.60	76.60	77.16	77.69	78.21
Myanmar	76.03	76.60	77.16	77.69	78.21
Vietnamese	30.57	30.85	31.14	31.44	31.77
Singapore	97.55	97.89	98.78	100	100
Thailand	50.69	51.43	52.16	52.88	52.60

 Table 2 Development of Percentage of Urban Population (% of total population) 2018-2022

Singapore has the highest urban population (almost 100%), while Cambodia and Myanmar are still below 40%. Indonesia, Vietnam, and the Philippines are showing strong urban population growth, driven by industrialization, expansion of the service sector, and internal migration. Urban populations in the region are creating new economic growth opportunities through industrial agglomeration, increased labor productivity, and efficiency in transportation and distribution. However, urban populations also present significant challenges, such as congestion, social inequality, pressure on infrastructure, and environmental degradation, especially in megacities such as Jakarta, Manila, and Bangkok. In the context of sustainable development, well-managed urban populations can be a catalyst for economic growth through the creation of dynamic labor markets, innovation, and increased investment, including in clean energy and green infrastructure. Therefore, the role of urban populations is becoming increasingly strategic in driving long-term economic growth in the ASEAN region. The United Nations, 2014 projected that by 2030, there will be 41 megacities, and by 2050, 66% of the world's population will live in urban areas with 90% of the increase concentrated in Africa and Asia.

Foreign direct investment is expected to make a major contribution to increasing economic growth. The ASEAN region has become an attractive region as an investment destination, since the economic crisis in 1997-1998 foreign direct investment entering ASEAN has increased almost fourfold, ASEAN has again shown rapid development in attracting foreign investor confidence (Kurniasih, 2020). ASEAN has again shown rapid development in attracting foreign investor trust. In fact, four countries in ASEAN, namely Vietnam, Indonesia, Thailand, and Malaysia are included in the 20 countries that became the four largest recipients of foreign investment during 2010 to 2012. In fact, based on a survey conducted by the United Nations Conference on Trade and Development (UNCTAD) on transnational companies, during 2013-2015, countries in the ASEAN region remained among the priority countries targeted as host countries for foreign direct investment.

Country	2018	2019	2020	2021	2022
Brunei	3.80	2.77	4.71	1.46	-1.75
Philippines	2.86	2.30	1.88	3.04	2.34
Indonesia	1.81	2.23	1.81	1.78	1.87
Laos	13.07	13.52	14.00	12.92	12.12
Cambodia	7.48	4.03	5.09	5.69	4.11
Malaysia	2.31	2.50	1.20	5.41	3.69
Myanmar	2.60	2.31	2.41	3.11	1.98
Vietnamese	4.99	4.82	4.55	4.27	4.36
Singapore	21.75	28.09	23.10	31.62	29.84
Thailand	2.71	1.01	-0.98	2.99	2.26

Table 3 Development of Percentage of Foreign Direct Investment to GDP in ASEAN Countries 2018-2022

Table 3 reports that Singapore is one of the ASEAN countries that is most in demand by investors so that foreign investment inflows are increasing. The proportion of foreign investment to Gross Domestic Product in Singapore is the highest in the 5 ASEAN countries, which is an average of 29.84 percent. Laos and Vietnam are countries with foreign investment inflows that are still quite low among other ASEAN countries, with an average of 12.12 percent and 4.36 percent, where the percentage of foreign investment to gross domestic product averages below 20 percent. This is due to the unstable economic conditions of the country. Foreign investment is an important source of capital for both developed and developing countries. Foreign investment flows have been achieved on a large scale and in a global scope.

With the increasing awareness of the importance of sustainable development, renewable energy is now a major focus in the green economy agenda in the ASEAN region. The energy transition from fossil fuels to clean energy sources is not only important for reducing carbon emissions, but also opens up new growth opportunities through innovation and the creation of green industries.Countries in the ASEAN region still have high costs and large investments in producing renewable energy. Meanwhile, the economic growth stages of ASEAN countries vary greatly.(Salam et al., 2023).Every country is trying to increase economic growth by relying on industrialization, while the use of technology in the industrial sector still uses fossil fuels, which has a major impact on environmental degradation.(Kurnia et al., 2020).

Inadequate investment can hamper economic development, limit employment opportunities, and undermine efforts to achieve energy security goals.(Abdi et al., 2024). Without addressing these issues, ASEAN risks being left behind in the global transition to renewable energy and facing long-term economic and environmental challenges.(Sharmiladevi, 2023). TThere are many studies that discuss the influence of each variable on economic growth, but there is still limited research that comprehensively analyzes the long-term and short-term influence of foreign direct investment, urban population and renewable energy on economic growth, especially in the ASEAN region which has diverse economic characteristics, resources and levels of development. Thus, the results of this study are expected to provide effective policy recommendations for the government and stakeholders in encouraging inclusive and sustainable economic growth in ASEAN.

This study discusses the problem of the influence of foreign direct investment (FDI), urban population and renewable energy on economic growth in the ASEAN region during the period 1993-2022. Based on this, the purpose of this study is to analyze the influence of foreign direct investment (FDI), urban population, and renewable energy on economic growth in the ASEAN region during the period 1993-2022.

2.1. Foreign Direct Investment

II. LITERATURE REVIEW

Foreign direct investment is the trade in services exchanged between individuals or companies within an economy, including services provided through foreign companies from abroad into a country with the aim of making a profit (Harjono, 2020). The data used is the percentage of total foreign direct investment in percent units.

2.2. Urban Population

Urban population is the population living in areas that are administratively, economically and socially covered by urban areas, which are usually mixed with high population density, dominance of the non-agricultural sector, and the availability of relatively complete infrastructure and public services (Yu et al., 2024). The data used is the percentage of the total urban population in percent units.

2.3. Renewable energy

Renewable energy is a source of energy that comes from nature that can be freely regenerated, and can be continuously and infinitely renewed. Renewable energy can be created by utilizing increasingly sophisticated technological developments, so that it can become an alternative energy source (Dharmayanti & Aziz, 2024). The data used is the percentage of total renewable energy consumption in percent units.

2.4. Economic growth

Economic growth is defined as one of the indicators used to measure the success of development in a country. Gross Domestic Product (GDP) data is used by economists to measure economic growth. (Boediono, 2020). The data used is the percentage of total economic growth in percent units.

- Based on the explanation above, the hypothesis in this study is:
- H1: Foreign direct investment (FDI) has an impact on economic growth.
- H2: Urban population has an impact on economic growth
- H3: Renewable energy has an impact on economic growth
- H4: Foreign direct investment (FDI) of urban residents and renewable energy has an impact on economic growth.

III. METHOD

This study uses the population of countries in the Association of Southeast Asian Nations (ASEAN) Region. ASEAN is an association of nations in the Southeast Asian region that was established in 1967 and consists of 10 member countries. Sample selection uses the total sampling method (Sugiyono, 2020). Total sampling is a sampling technique that is the same as the population. So the sample used is 10 countries, namely Brunei Darussalam, the Philippines, Indonesia, Cambodia, Laos, Malaysia, Myanmar, Singapore, Vietnam and Thailand. This study uses a model approach, namely Autoregressive Distributed Lag (ARDL) to determine short-term and long-term relationships. The model in this study is to see the relationship between foreign direct investment, trade openness, renewable energy and economic growth.

IV. RESULTS AND DISCUSSION

4.1. Classical Assumption Test 4.1.1. Cointegration Test

Tuble 4. Comtegration Test Results						
Hypothesized	Fisher Stat.*	Prob.	Fisher Stat.*	Prob.		
No. of CE(s)	(from trace test)		(from max-eigen test)			
None	209.5	0.0000	156.8	0.0000		
At most 1	80.41	0.0000	60.25	0.0000		
At most 2	39.45	0.0059	39.23	0.0062		
At most 3	22.78	0.3000	22.78	0.3000		

Table 4. Cointegration Test Results

The results of the cointegration test in Table 4 indicate a significant cointegration relationship between the tested variables. In the initial hypothesis stating that there is no cointegration, Fisher Stat. from the trace test of 209.5 and from the max-eigen test of 156.8, both with a probability of 0.000, indicate rejection of the null hypothesis at a significance level of 1%. This indicates that there is at least one cointegration relationship. In the "at most 1" hypothesis, Fisher Stat. trace of 80.41 and max-eigen of 60.25, with a probability of 0.000 also indicate rejection of the null hypothesis, confirming the existence of more than one cointegration relationship. The "at most 2" hypothesis with Fisher Stat. trace of 39.45 and max-eigen of 39.23, and probabilities of 0.005 and 0.006 respectively, indicates rejection at a significance level of 5%, meaning there are two cointegration relationships. Finally, the "at most 3" hypothesis with Fisher Stat. trace and max-eigen 22.78, and both with probability 0.300, the null hypothesis is again rejected, indicating three cointegration relationships. Overall, these results confirm that there is a significant long-run relationship between the variables tested in the model.

4.1.2. Correlation Matrix Test

	GDP	FDI	URB	REN	
GDP	1	0.0881	-0.3219	0.2908	
FDI	0.0881	1	0.0618	-0.2391	
URB	-0.3219	0.0618	1	-0.8074	
REN	0.2908	-0.2391	-0.8074	1	

Table 5	Correlation	Matrix	Test Results
Lanc J.	Correlation	Mauin	I Cot Mesulto

Multicollinearity is not seriously indicated, because there is no correlation between independent variables that approaches +1 or -1 (except for urban population and renewable energy which are quite high). The high correlation between URB and REN (-0.8074) needs to be watched out for because it can cause multicollinearity, which can affect the stability of the regression estimate. The correlation between independent variables and GDP (dependent variable) varies, but generally shows a logical relationship. Renewable energy and FDI contribute positively (although weak to moderate), Urbanization has a negative correlation, possibly due to the unorganized management of urban areas or the effects of congestion/social problems.

4.1.3. Unit Root Test

GDP

Table 6. Unit Root Test Results						
Variables	Augmented	l Dickey Fuller	Philip	s Perron		
	Level	1st difference	Level	1st difference		
FDI	73,434***	134,777***	107,607***	347.227***		
URB	19,274	68,636***	62,168**	57,034***		
REN	16,218	66,969***	15,728***	119,471***		

159,688***

Notes:*** = significant at the 1% level (very significant), ** = significant at the 5% level (quite significant) Foreign direct investment and economic growth are consistently stationary at the level based on both tests (ADF and PP), so they can be used directly in the model without transformation. Urban population and renewable energy are not stationary at the level, but become stationary after differencing (I(1)). This means that transformation (differencing) is needed if we want to use them in long-term time series regression (such as VECM or ARDL). Since there are I(0) and I(1) variables, the ARDL (Autoregressive Distributed Lag) model is the right approach, because it is able to accompodate a mixture of integrations.

137,763***

974,863***

4.1.4. Cross Section Dependence (CD) Test

71,140***

Test	Statistics	df	Prob.		
Breusch Pagan LM	44.34785	45	0.4995		
LM scaled message	-0.068743		0.9452		
CD Order	1.491990		0.1357		

Table 7 Results of Cross Section Dependence (CD) Test

The Cross-Section Dependence (CD) test is a statistical test used in panel data to test whether there is cross-dependence between cross-section units, such as countries, firms, or regions in a dataset. Cross-dependence means that there is correlation between cross-section units, such that events in one unit may affect other units. The results of the Cross-Section Dependence test indicate that there is significant cross-dependence between cross-section units in the model. The null hypothesis stating that there is no cross-dependence is strongly rejected based on the very small p-value in all tests. In the Breusch-Pagan LM test, the test statistic value of 44.34785 with a p-value of 0.4995 indicates significant cross-dependence. The Pesaran scaled LM and Bias-corrected scaled LM tests also provide similar results with test statistics of -0.068743 and 0.9452, respectively, indicating correlation between cross-section units. The results of the CD Market Test strengthen this finding, with a test statistic of 1.491990 and a p-value of 0.1357, indicating significant cross-dependence between cross-section units.

4.1.5. Heteroscedasticity Test

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Variable	Coefficient	Std. Error	t-Statistic	Prob.	
С	0.876525	0.349863	2.505341	0.0129	
FDI	0.016661	0.009757	1.707626	0.0889	
URB	-0.001523	0.005014	-0.303775	0.7616	
REN	-0.003613	0.003297	-1.095729	0.2742	

Based on Table 8 if the value of the Problem. (p-value) > 0.05, then it is not significant, meaning that there is no heteroscedasticity in the variable. FDI (Foreign Direct Investment): p = 0.0889 means not significant

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(no heteroscedasticity). URB (Urban population): p = 0.7616 means not significant. REN (Renewable Energy?): p = 0.2742 means not significant. Only the constant (C) is significant (p = 0.0129), but is not the focus in the heteroscedasticity test. All independent variables have a p-value > 0.05, so it can be concluded that there is no indication of heteroscedasticity in this regression model. This means that the conclusion of classical linear regression regarding homoscedasticity is met.

4.2. Model Criteria Selection

Model	LogL	AIC*	BIC	HQ	Specification	
12	-341.702819	3.958453	6.222085	4.868981	ARDL (3, 4, 4, 4)	
16	-332.557589	3.965158	6.367662	4.931546	ARDL (4, 4, 4, 4)	
8	-357.808092	4.006338	6.131096	4.861005	ARDL (2, 4, 4, 4)	
14	-409.956972	4.101623	5.670889	4.732848	ARDL (4, 2, 2, 2)	
10	-421.546455	4.114090	5.544483	4.689454	ARDL (3, 2, 2, 2)	

Table 10, ARDL model selection criteria based on several measures, namely LogL (Log Likelihood), AIC (Akaike Information Criterion), BIC (Bayesian Information Criterion), and HQ (Hannan-Quinn Criterion). The model with the lowest AIC value is the most optimal because it produces the best trade-off between model fit and complexity. From the table, the model with ARDL specifications (3, 4, 4, 4) shows the lowest AIC value of 3.958, making it the most suitable model for this analysis. The ARDL model (3, 4, 4, 4) shows that for each independent variable in the model, there is one lag considered in both the dependent variable (economic growth) and the independent variables (Foreign direct investment, urban population, and renewable energy). This means that this model considers the influence of variables in the current period and the previous four periods (lag 4). Economically, this means that changes in these independent variables do not directly affect economic growth in the current period alone but can also have a delayed effect, that is, affecting the value of economic growth in subsequent years.

Table 10. Panel Autoregressive Distributed Lag (ARDL) Estimation Results

Dependent variable = GDP Selected Model: ARDL (3, 4, 4)				
Variables	Coeff.	Std. Error	t-Stat.	Prob
Long-term				
FDI	0.261	0.116	2.233	0.027
URB	0.184	0.122	3,589	0.000
REN	0.207	0.040	5.148	0.000
Short-term				
Constant	6,072	1,348	4,502	0.000
Δ (FDI)	0.458	0.132	3.463	0.000
Δ (URB)	0.418	0.136	3.075	0.002
Δ (REN)	0.101	0.004	21,684	0.000
ЕСТ	-0.955	0.213	-4,470	0.000

Based on Table 10, the influence of each independent variable on the dependent variable can be explained as follows:

The results of the ARDL model estimation show that both foreign direct investment (FDI) and renewable energy (REN) have a positive and significant effect on economic growth in the ASEAN region, both in the long term and the short term. In the long term, the FDI variable has a coefficient of 0.261 and is significant at the 5% level (p = 0.027), indicating that a 1% increase in FDI will increase by 0.261%. In the short term, the change in FDI (Δ FDI) has a coefficient of 0.458 and is significant at the 1% level (p = 0.000), meaning that an increase in FDI in the short term also provides a strong boost to economic growth.

Urban population (URB) has a coefficient of 0.184 and is very significant (p = 0.000). This means that a 1% increase in urban population will increase GDP by 0.184%. This reflects the positive role of efficient urban population in supporting economic productivity. Δ (URB) has a coefficient of 0.418 with a significance of p = 0.002, indicating that urban population also makes a real contribution to economic growth in the short term.

Meanwhile, renewable energy (REN) also has a positive and very significant effect with a coefficient of 0.207 (p = 0.000), indicating that a 1% increase in renewable energy use will increase economic growth by 0.207%. Changes in renewable energy (Δ REN) have a very significant and large effect with a coefficient of 0.101 Correction (p = 0.000). The Error Correction Term (ECT) value of -0.955 and significant (p = 0.000)

indicates that short-term adequacy will be corrected back to long-term equilibrium by 95.5% in one period, reflecting rapid adjustment dynamics.

V. CONCLUSION

Based on the results of data analysis, this study concludes that there is a positive and significant influence between foreign direct investment and renewable energy on economic growth, both in the short and long term. Foreign direct investment acts as an important source of capital that drives productivity, job creation, and technology transfer. Urban populations play a role in expanding the economic base through concentration of activity and efficiency in urban areas. Meanwhile, the use of renewable energy consistently shows a positive contribution to economic growth by supporting energy cessation and reducing dependence on fossil fuels. These findings emphasize the importance of synergy between foreign investment promotion policies and the transition to clean energy in driving inclusive and sustainable economic growth in the ASEAN region.

This study has several limitations that need to be considered in interpreting the results and drawing conclusions. This study has not fully captured the heterogeneity of economic structures, policies, and institutional capacities among ASEAN countries. The use of a regional aggregate approach may result in the loss of specific contextual nuances that may affect the relationships between variables in each country. This may limit the generalization of the findings to the entire ASEAN region. The model used in this study does not include other control variables that also have the potential to affect economic growth, such as institutional quality, political stability, education level, international trade, and infrastructure. Not taking these variables into account can cause bias in the estimation and reduce the completeness of the analysis. By understanding these limitations, it is hoped that further research can develop a more comprehensive approach, both in terms of methodology and variable coverage, to gain a deeper understanding of the determinants of economic growth in the ASEAN region.

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