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Macroeconomic, Institutional, and Energy Consumption on Economic Growth APEC Members

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Abstract

Economic growth is a shared goal pursued by every country across various regions worldwide, including the member nations within the APEC organization. However, APEC member countries still encounter several economic challenges to achieve optimal economic growth. First, macroeconomic issues such as regulatory barriers limit both FDI inflows and trade. Furthermore, unemployment remains an unresolved issue. Second, based on the World Bank's average estimates, most APEC countries exhibit low institutional quality. This is due to corruption, weak law enforcement, and lack of government transparency. Third, there is the issue of limited energy supply and increased carbon emissions due to non-renewable energy consumption. This research aims to determine the influence of macroeconomics, institutional quality, and renewable energy consumption on the economic growth of APEC member countries. The analysis method for this research is PVECM regression. The data used is panel data from 2005-2019. The research results show that the variables FDI, Trade, Labor, REC, and IQ have long and short-term influences on the economic growth of APEC countries. Suggestions that can be given are to improve the quality of APEC country institutions because, as seen from the average indicator estimates by the World Bank, Most APEC countries have low institutional quality. This improvement is needed to make policies more effective and efficient. Each country is also expected to increase the amount of renewable energy consumption.

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INTRODUCTION

Numerous countries are competing to enhance their economic growth. Economic growth has become a benchmark for a country's progress in the last few decades. A country can be considered developed if it exhibits relatively high level of economic growth. According to Mankiw et al. (2014), economic growth can indicate either positive or negative economic performance. Theirfore, the better the economic performance, the more benefits a country can obtain.

A country can enhance economic growth in various ways, including establishing regional economic cooperation such as APEC. APEC is illustration of regional-level economic cooperation in the Asia Pacific region. Founded in 1989, APEC currently comprises 21 member economies. APEC collectively oversees 61% of the global GDP, equivalent to 53 trillion USD, and accounts for 48% of global trade.

Three production factors also need to be considered in efforts to increase growth. According to Robert Solow and Trevor Swan's neo-classical economic growth theory, capital, labor, and technology are the three crucial production factors (Prescott, 1988). This theory also states that economic output growth originates from the existing factors, such as an increase in the quantity and quality of labor (population growth and improvements in education), capital investment (with investment and savings), and the use of technology Perfected (Nizar et al., 2013).

Capital is essential to support economic growth. FDI or Foreign Direct Investment is a type of capital that is often used. FDI contributes to economic growth by increasing capital flows, creating jobs, increasing exports, and transferring technology (Liang et al., 2021). In addition, FDI impacts financial market development and influences other aspects of economic performance. APEC members are among the popular destination countries for FDI from other countries. In 2019, APEC FDI reached 52.9% of the global FDI inflow. However, let us look at the available data. The distribution of FDI inflow into APEC is uneven, with more investments flowing into advanced countries like the United States, China, Singapore, Hong Kong, and Canada.

On the other hand, the limited FDI inflow into developing countries in APEC is due to political issues and economic instability, making security concerns a crucial consideration for investors. The distribution of FDI in APEC is indeed uneven, but it cannot be denied that FDI plays a significant role in the economies of APEC countries. FDI is crucial for APEC because it is a catalyst for economic growth. Gunby et al. (2017) found that FDI positively influences economic growth in China. Chaudhury et al. (2020) also state that FDI (Foreign Direct Investment) significantly influences economic growth in South Asian countries.

Labor, often called human capital, is the driving actor in the economy. Labor is essential because it increases a country's ability to produce goods and services. APEC has a significant advantage in terms of labor because its population reaches 38% of the global population. Moreover, most APEC countries have a demographic bonus where the productive age population is greater than the unproductive population. So, the higher the labor force participation rate, the more people's income will increase, and the economy can improve. Haque et al. (2019) found that labor force participation positively influences economic growth in Bangladesh.

APEC member countries, like any group of diverse economies, face various trade-related challenges, such as trade barriers that include tariffs, non-tariff barriers, and trade restrictions that can hinder the flow of goods and services between APEC member countries; there is a trade imbalance which causes several APEC countries to experience trade imbalances, such as trade deficits or surpluses, which can influence their economies; infrastructure and connectivity are critical to facilitate trade but some APEC members face challenges related to infrastructure development, which can affect the movement of goods; problems related to market access where some APEC countries limit access to specific

markets, especially in sectors such as agriculture, services and technology, thus creating challenges for foreign companies wishing to enter these markets. For this reason, APEC member countries work together to address these challenges through various means, including negotiations, agreements, capacity-building initiatives, and policy reform. The APEC Forum provides a platform for dialogue and cooperation to find common solutions to these trade issues and promote regional economic integration.

On the other hand, international platforms like APEC provide access to domestic products that can be marketed more widely to increase exports. It also opens up access to meet needs that cannot be produced independently through import schemes. These export and import activities are also included in international trade. Helpman and Krugman (1989) stated that export growth can also drive economic growth. Bhagwati (1986) also argued that exports stimulate economic growth from both the supply and demand sides. Imports also positively influence long-term economic growth by serving as a primary source of new technology and physical capital investment (Zestos and Tao, 2002).

A study examining the impact of international trade on economic growth in Central-East European (CEE) countries between 1995-2013 found that the magnitude of international trade activity is positively associated with economic growth. This suggests the benefits of trade integration through exports and increasing imports from technologically and economically advanced EU countries to less developed CEE countries (Silajdzic and Mehic, 2018). Similar results were also found by Schmitt et al. (2019), which discovered a positive influence of trade on GDP. International trade greatly influences growth by creating better jobs, reducing poverty, and increase economic opportunities.

Economic growth is influenced not only by macroeconomic factors such as investment, labor, and international trade but also by institutions. Institutions regulate how society behaves with rules or policies. The existence of institutions has significant implications for harmonizing the political, social, and economic fields. The quality of institutions in a country is considered, together with the political situation and democracy, to be determining factors for foreign companies to invest (Septiantoro et al., 2020). Many studies have demonstrated that the quality of institutions influences economic growth. Nguyen et al. (2018) found a significant positive effect of institutional quality on economic growth. Similar results were also found in the study conducted by Salman et al. (2019), where institutional quality, energy use, and trade openness stimulate economic growth in East Asian countries.

The quality of institutions can be measured by examining estimates from six indicators provided by the World Bank. These six indicators are Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. The estimated values of these indicators range from -2.5 (poor) to 2.5 (good), with higher values indicating better institutional quality in a country. Based on the average estimates of the indicators provided by the World Bank, the quality of institutions in most APEC countries remains low. This can be a concern because it affect economic growth.

In their efforts to improve the economy, state institutions face environmental issues. Economic growth based on industrialization has caused a significant increase in carbon emissions. This is because industrialization requires a lot of fossil energy consumption, which is the main contributor to carbon emissions. Continuous fossil energy consumption causes many countries to experience an ecological deficit because these resources cannot be renewed (Jie et al., 2023). This is exacerbated by the demand for energy supplies, which continues to increase as the world's population increases (Mutezo and Mulopo, 2021)

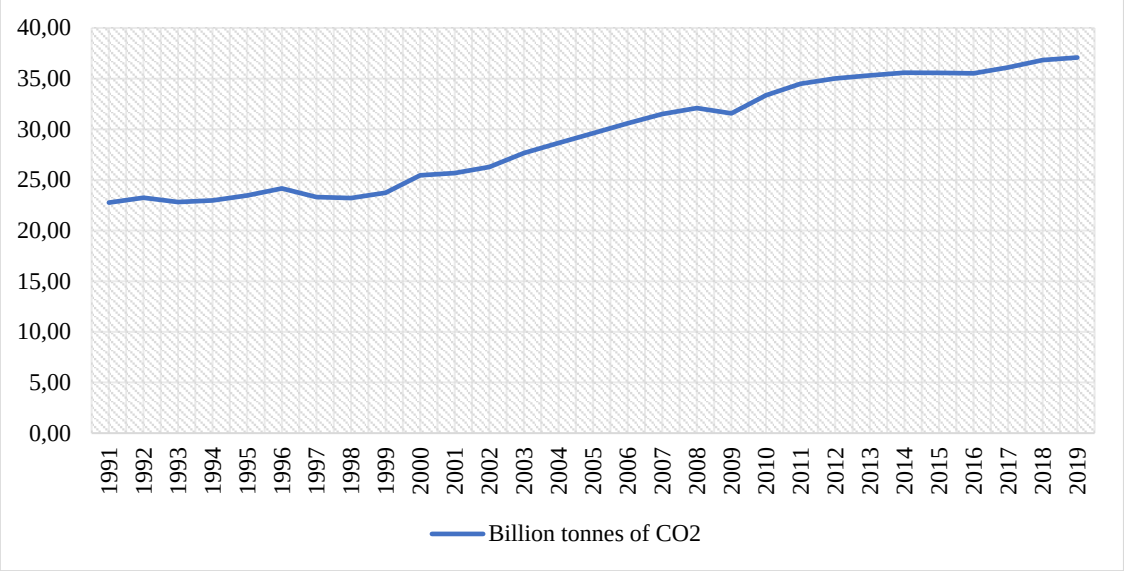

Figure 1. Total Global Carbon Emissions
Source: APEC Energy Statistics , 2020 (Processed)

Several efforts have been made to reduce pollution due to carbon emissions. One of them is signing international agreements. The Kyoto Protocol and the Paris Agreement. These international agreements set long-term goals, inviting countries to commit to tackling climate change and global warming. The latest agreed international agenda is net zero emissions. This agenda aims to reduce emissions by 45% by 2030 and achieve zero emissions by 2050. Reducing carbon emissions is also a step in supporting the sustainable development movement or The Sustainable Development Goals (SDGs), promoted by the UN since 2015.

Sustainable economic growth by implementing clean energy is one of the SDG goals that is highly echoed. Sustainable economic growth aims to focus not only on how to increase a country's economic growth but also on improving the environment. Sustainable economic growth can also be understood as growth that is based on energy and environmental constraints (Wang and Jia, 2022). In this case, sustainable economic growth involves managing resources so they do not run out and are accessible to future generations (Zhang et al., 2023).

APEC countries have agreed to use renewable energy to achieve sustainable economic growth. Renewable energy has the advantage because it can be replenished naturally, and the amount is unlimited. This type of energy is also very environmentally friendly, so it is hoped that it will be a solution to reducing carbon emissions. With the various advantages, it is not surprising that many countries are starting to research renewable energy development and creating relevant programs to encourage investment in the renewable energy sector. Research on the influence of renewable energy on economic growth has been conducted extensively. For example, Gyimah et al. (2022) found a mutually reinforcing relationship between renewable energy and economic growth in Ghana. Similar results were also found by Bhattacharya et al. (2016) across 38 countries. This study indicates that renewable energy capacity significantly affects economic output for 57% of the countries examined, equivalent to 23 countries.

This study innovates by adding institutional quality, macroeconomics, and energy consumption as independent variables. Most previous studies focused on the relationship between macroeconomics and renewable energy consumption concerning economic growth. However, institutions also play a crucial role in determining macroeconomics and renewable energy consumption policies. Therefore, institutional quality is considered essential in

influencing economic growth. Improved institutional quality correlates with more effective and efficient government performance in managing economic matters and beyond.

RESEARCH METHODS

This research uses panel data from 19 APEC member countries from 2005 to 2019 obtained from World Bank data. The data used are secondary in panel data (a combination of time series and cross-sectional data). The variables used in this study can be observed in the table 1.

Table 1. Operation Definition of Variable

Conceptual Variable		Operational Definitions
Dependent Variable	Economic Growth(GDP)	According to the World Bank, GDP is the annual percentage growth rate at market prices based on constant local currency.
Independent Variable	Foreign Direct Investment (FDI)	According to the World Bank, FDI is the flow of equity investment in direct economic reporting. The FDI used for this research is the net inflow (new investment inflow minus disinvestment) from foreign investors in the reporting economy, divided by GDP.
	Labor	For this variable, the labor force participation rate is used. According to the World Bank, the labor force participation rate is the proportion of the population aged 15 and older that is economically active. The labor force participation rate is calculated as the labor force divided by the total working-age population.
	Trade	The variable "trade" uses the percentage of the total international trade in relation to GDP. According to the World Bank, trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.
	Institutional Quality (IQ)	The variable "institutional quality" uses the WGI (World Governance Indicators) index produced by the World Bank to assess the quality of government or institutions. The data is obtained by averaging the estimates of all the indicators.
	Renewable Energy Consumption (REC)	According to the World Bank, renewable energy consumption refers to the proportion of renewable energy consumed as the final source of the overall energy consumed.

Source: Data Processed, 2023

This research will create a hypothesis regarding the influence of each independent variable on the dependent variable. Investment is one of the critical factors that support the economic growth of a country. Nistor (2014), Chaudhury et al. (2020), and Liang et al. (2021) indicate that FDI has a positive influence on economic growth. Dinh et al. (2019) found that FDI helps stimulate long-term economic growth, although it may have a negative short-term influence on the countries studied. On the other hand, Ek (2007) found that FDI does not significantly influence growth in China. In conclusion, the influence of FDI on GDP is positive. (H1 = FDI has a positive influence on GDP).

Labor is one of the three crucial factors of production in an economy (Prescott, 1988). It represents the human capital that acts as the driving force. The research conducted by Nurul et al. (2018) found that labor force participation positively but not significantly influences economic growth in Riau. Ul Haque et al. (2019) found that labor force participation positively influences economic growth in Bangladesh. On the other hand, the study by Yakubu and Akanegbu (2020) found that labor force participation negatively influences economic growth in Nigeria. Based on the research results above, it can be concluded that the influence of labor force participation on economic growth is positive. (H2 = Labor has a positive influence on GDP)

Trade promotes the economic transmission of technology and knowledge, creates job opportunities, and encourages local private-sector competition to enhance performance. Oppong-Baah et al. (2022) show that international trade positively and significantly influences economic growth in Ghana and Nigeria. Sunde et al. (2023) found that exports and trade positively influence economic growth in Namibia. Based on the research results above, it can be concluded that the influence of international trade on economic growth is positive. (H3 = Trade has a positive influence on GDP).

Many countries are increasingly using renewable energy to support sustainable economic growth while considering the environment. Soava et al. (2018) found that the consumption of renewable energy positively influences economic growth in European Union countries. Shahbaz et al. (2020) and Yang et al. (2022) also found that the consumption of renewable energy positively influences economic growth. However, Zhe et al. (2021) found different results where renewable energy consumption does not influence economic growth. Based on the research results above, it can be concluded that the influence of renewable energy consumption on economic growth is positive. (H4 = Renewable Energi Consumption (REC) positively influences GDP).

The quality of institutions is a fundamental factor supporting economic growth. Many empirical studies state that institutional quality is essential for long-term sustainable investment and economic growth. Kacho and Dahmardeh (2017) show that institutional quality positively and significantly affects economic growth in selected countries. Abera et al. (2019) and Sari and Prastyani (2021) also found that institutional quality positively impacts economic growth. Based on the research results above, it can be concluded that the impact of institutional quality on economic growth is positive. (H5 = Institutional Quality (IQ) positively influences GDP).

As a result, the primary goal of the current study is to figure out the relationship between GDP, FDI, Labor, Trade, REC, and IQ. The subsequent model was put together to achieve the goal of the present research:

$$EG = f(FDI, Labor, Trade, REC, IQ) \quad \ldots\ldots\ldots (1)$$

EG is economic growth, FDI is foreign direct investment, Labor is labor force participation rate, Trade is international trade, REC is renewable energy consumption, and IQ is institutional quality. For the present empirical analysis, we use GDP as a proxy for economic growth, FDI, Labor, and Trade for macroeconomics, renewable energy consumption as proxy for energy consumption, and institutional quality as a proxy for assessing the government's performance as an institution.

This work applies Vector Autoregression (VAR) to study the nexus between macroeconomics, energy consumption, institutional quality, and economic growth. This test, however, is very conditional on the stationarity of the time series variables involved. If the underlying time series are non-stationary, the stability condition required of VAR is not met. If variables are non-stationary, cointegration and Vector Error Correction Model (VECM) are recommended to investigate the relationship between such variables. So, the first and prime condition for using VAR would be to test the stationarity of the variables. The

Augmented Dickey-Fuller (ADF) test is used to test for detecting unit roots. This test equation is:

$$\Delta Yt = \beta 1 + \beta 2 + \delta Yt - 1 + \alpha i \sum_{j=1}^{m} \Delta Yt - 1 + ut \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Stationary testing can use a unit root test where the hypothesis is that if the calculated t value is smaller than 0.05 or 5%, the data is stationary. The second stage is to determine the optimal lag order. In practice, the LR, FPE, AIC, SC, and HQ information criteria are usually used as the principles to determine the optimal lag order of VAR.

The next step is the cointegration test, which determines whether there is a long-term influence on the variables studied (Basuki and Nano, 2019). To see the presence of cointegration, look at the probability. If the value is less than 0.05, there is cointegration; if the value is more than 0.065, there is no cointegration.

Johansen Cointegration used the Maximum Eigenvalue and Trace tests to determine the number of cointegration vectors. For r = 0, 1, 2, …, n-1, the greatest eigenvalue compares the null hypothesis of r cointegrating relations to the alternative of r+1 cointegrating relations. These test statistics can be computed in the form of:

$$\lambda trace = -T \sum_{i=r+1}^{K} \log(1 - \lambda i) \quad \ldots\ldots\ldots\ldots (3)$$

Where λ is the maximum Eigenvalue and T is the sample size. Trace statistics investigate the null hypothesis of r cointegrating relations against the alternatives of n cointegrating relations where n is several variables in the r = 0, 1, 2, A_1, A_2, ……, A_n are coefficient matrices for lagged value of up Y_t to lag p. The following equation is used for the maximum eigenvalue test:

$$\lambda max = -T \log(1 - \lambda_{r+1}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

After observing the cointegration test results, we can determine the most suitable model for analysis. The Vector Error Correction Model (VECM) must be used if cointegration exists. However, the following VAR analysis must be used if there is no cointegration. The general form of the VAR (Vector Autoregressive) model is:

$$Yt = c + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{p-1} + \varepsilon t \ldots (5)$$

Where, Y_t is a vector of endogenous variables at time *t, c* is a constant or intercept term, p denotes the lag order of the model, and εt is a vector of error terms at time t.

The general form of the VECM is an extension of the VAR model and can be represented as follows:

$$\Delta Yt = \pi Y_{T-1} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \ldots + \Gamma_p \Delta Y_{t-p} + \varepsilon t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where, ΔYt represents the differenced endogenous variables at time t, π is the matrix of coefficients capturing the long-run relationships (cointegrating vectors) among the variables., Γ_1, Γ_2 are coefficient matrices for lagged differenced variables up to lag *p-1*, p denotes the lag order of the model, and εt represents the vector of error terms at time t.

RESULTS AND DISCUSSION

Table 2 shows that the TO, REC, and IQ variables are not stationary at the level because the prob value is greater than the alpha value of 0.05, so differentiation is carried out. It can be seen that all variables are stationary where the prob value is smaller than the alpha value of 0.05 at the 1st Different level. So, one of the requirements in the PVECM method, namely stationary at level 1, has been fulfilled, and the model in this research is free from problems, spurious regression, or pseudo/fake regression.

Table 2. Unit Root Panel Test Results

ADF-Fisher Root Unit.		
Variable	**Prob**	
	Levels	**1st Diff**
GDP	0.0000*	0.0000*
FDI	0.0000*	0.0000*
Labor	0.0006*	0.0000*
Trade	0.2545	0.0000*
REC	0.2721	0.0000*
IQ	0.7569	0.0000*

Note: *) significant at alpha 5%
Source: Data Processed, 2023

Table 3. Optimum Lag Test Results

Lag	**LogL**	**L.R**	**FPE**	**AIC**	**S.C**	**HQ**
1	-1824.212	NA	12.85903	19.58118	20.19641*	19.83040*
2	-1770.053	101.4772	10.63108	19.39003	20.62048	19.88847
3	-1730.780	71.10467	10.29583	19.35558	21.20126	20.10324
4	**-1679.325**	**89.91055***	**8.791425***	**19.19290***	**21.65380**	**20.18978**

Note: * Indicates optimal lag
Source: Data Processed, 2023

Based on Table 3, the most * signs are in the fourth lag. The LR, FPE, and AIC values are the smallest lags. So, the model used in this research is PVAR/PVECM with lag 4.

Table 4 shows that the At most values 1 to 5 have a prob value smaller than the alpha value of 0.05. This means that the variables FDI, Labor, REC, and IQ have long-term cointegration between variable.

Table 4. Cointegration Test

Hypothesized No. of CE(s)	**Fisher Stat.* (from trace test)**	**Prob.**	**Fisher Stat.* (from max-eigen test)**	**Prob.**
None *	0.487393	310.3551	95.75366	0.0000
At most 1*	0.392184	196.0852	69.81889	0.0000
At most 2*	0.251035	110.9471	47.85613	0.0000
At most 3*	0.183571	61.51731	29.79707	0.0000
At most 4*	0.113839	26.83597	15.49471	0.0007
At most 5*	0.035436	6.169523	3.841466	0.0130

Source: Data Processed, 2023

To determine the significant relationship, look at the t-count > t-table value. The t-table values used in this research are as follows: The 5% significance level is 1.968503, and the 10% significance level is 1.650333.

Table 5. Vector Error Correction Model (VECM) Panel

		Short Term							
		D(DGDP)		D(DGDP)		D(DGDP)			D(DGDP)
DGDP(-1)	1.000.000	D(DGDP(-1))	0.513657	D(DFDI(-4))	0.113322	D(DTRADE(-3))	-0.064479	D(DIQ(-2))	1.247.694
			[2.55531]		[2.61045]*		[-4.10591]*		[0.52793]
DFDI(-1)	0.042692	D(DGDP(-2))	0.312750	D(DLABOR(-1))	-0.097195	D(DTRADE(-4))	-0.023431	D(DIQ(-3))	1.956.144
	[0.74668]		[2.19764]		[-0.87723]		[-2.10350]*		[0.78494]
DLABOR(-1)	-0.138970	D(DGDP(-3))	0.139477	D(DLABOR(-2))	-0.333790	D(DREC(-1))	-0.224184	D(DIQ(-4))	0.560318
	[-2.01767]*		[1.53642]		[-2.80408]*		[-2.58464]*		[0.30003]
DTRADE(-1)	-0.064877	D(DGDP(-4))	0.025044	D(DLABOR(-3))	-0.246139	D(DREC(-2))	-0.187599	C	-0.958957
	[-6.55015]*		[0.55976]		[-2.11994]*		[-1.92773]**		[-6.18523]
DREC(-1)	-0.118279	D(DFDI(-1))	0.046696	D(DLABOR(-4))	-0.111505	D(DREC(-3))	-0.237501		
	[-1.96698]**		[1.27934]		[-1.06014]		[-2.17079]		
DIQ(-1)	-3.217.888	D(DFDI(-2))	0.030689	D(DTRADE(-1))	-0.111569	D(DREC(-4))	-0.034470		
	[-1.89757]**		[0.66106]		[-7.33185]		[-0.34158]		
C	-0.473148	D(DFDI(-3))	0.074432	D(DTRADE(-2))	-0.100158	D(DIQ(-1))	-2.161.869		
			[1.86352]**		[-6.32625]*		[-1.05243]		

Note: *) significant at 5% alpha, **) significant at 10% alpha
Source: Data Processed, 2023

In the short term, trade has the potential to boost GDP growth through an increase in exports (Balassa, 1978). This is achieved by elevating foreign exchange earnings, stimulating production, and strengthening overall economic activity. Keho (2017) found that trade positively affects economic growth in Cote d'Ivoire.

Over the last 1-3 years, the REC variable has had a significant positive effect on the GDP of APEC member countries. Since several years ago, APEC countries have hastened their initiatives to shift towards utilizing renewable energy sources. Renewable energy use increases the country's image because it is aligned with the global goal of decreasing carbon emissions. This situation will contribute to the arrival of foreign investments in the country (Zhe et al., 2021). In the short run, these investments have the potential to boost economic activity, generate employment opportunities, and contribute to GDP growth. (Oh et al., 2020)

The IQ variable has no short-term influence on the GDP of APEC member countries. Short-term effects on GDP might not be immediately apparent as institutional improvements often need time before achieving measurable economic outcomes. This result is in line with Har and Sin (2023), who found that institutional quality did not affect economic growth, either directly or indirectly.

The current and future impact of the GDP variable caused by shocks or shocks to other variables can be depicted through the impulse responses variant graph as follows:

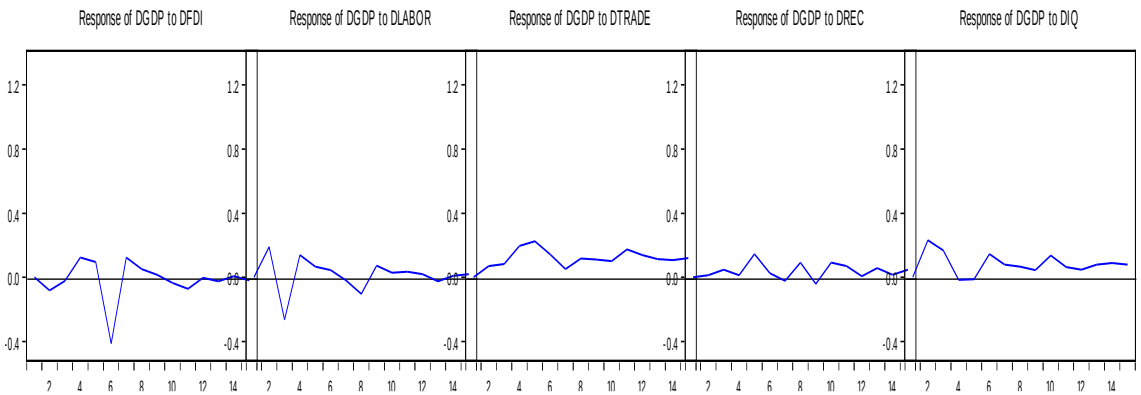

Figure 2. Impulse Responses Variant Graph
Source: Data Processed, 2023

From the graphic image above, it can be seen that the response of the GDP variable to the FDI shock shows a decline in the second and third years. However, it began to rise in the following years. Then, they experienced another quite large shock in the 6th year and began to recover positively in the following year but experienced another decline in the 10th to 12th years.

The GDP response to the Labor year shock resulted in a decline in year 3. The decline also occurred in years 7 and 8. Meanwhile, other years tended to show an optimistic upward trend.

GDP response to trade shocks is consistently positive. Additionally, over the past 15 years, the GDP has tended to increase.

GDP response to REC shocks tends to fluctuate over 15 years. Where a negative decline occurred in the seventh and ninth years. Apart from that year, ups and downs are still considered positive

The GDP response to IQ shocks was consistently positive at the beginning of the year. Then it decreased in years 4 and 5. However, it again showed an increasing positive trend in the following years.

Table 6. Variance Decompositions Results

Period	DFDI	DLABOR	DTRADE	DREC	DIQ
1	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.280507	1.557596	0.206531	0.009258	2.273682
3	0.284671	4.323985	0.481745	0.099257	3.340643
4	0.880909	4.975899	2.013624	0.105370	3.243787
5	1.181165	4.912926	3.819650	0.916191	3.098207
6	6.879716	4.551604	4.191361	0.860646	3.561922
7	7.193613	4.429358	4.153399	0.851560	3.678195
8	7.129230	4.679243	4.522666	1.114993	3.743189
9	7.064902	4.812153	4.883140	1.155827	3.770716
10	6.961821	4.745266	5.125519	1.403205	4.286148
11	6.975332	4.685459	5.957540	1.524252	4.321275
12	6.852466	4.616949	6.436591	1.499785	4.315727
13	6.765667	4.561488	6.723931	1.576457	4.435567
14	6.673236	4.500736	6.981839	1.562660	4.603348
15	6.590884	4.448878	7.303643	1.608095	4.729740
16	6.517122	4.396730	7.693782	1.669920	4.804147
17	6.429001	4.350428	8.041381	1.674481	4.899315
18	6.348861	4.288423	8.405684	1.706233	5.002617
19	6.274233	4.233541	8.708873	1.727264	5.091354
20	6.196235	4.184691	8.993575	1.743987	5.174005

Source: Data Processed, 2023

Table 6 shows the forecast of the independent variable for the GDP variable. The trade and IQ variables are more capable of explaining GDP than the FDI, labor, and REC variables. This is because the Trade and IQ variables show a stable increasing trend every year.

Based on Table 5, it is known that FDI only has a short-term influence on the GDP of APEC member countries. However, based on Figure 2, FDI shocks also affect GDP in the long term. So, it can be concluded that in the long and short term, FDI affects the GDP of APEC member countries. According to Susic et al. (2017); Mamingi and Martin (2018) reported that FDI has a strong and positive influence on economic growth.

In the short term, FDI increases capital flows so that production in APEC countries can increase. In 2019, the total FDI entering APEC

was USD 815.1 billion, or around 52.9% of global FDI inflows. Apart from the inflow of FDI capital, it also brings technology transfer from other countries to APEC countries, the majority of which are developing countries. In the long term, the transfer of this technology significantly contributes developing industrial modernization in developing countries. Increasing production will indirectly absorb labor so that unemployment is reduced.

Based on Table 5, it is known that Labor has a long-term and short-term influence on the GDP of APEC member countries. Utami et al.(2021) found that labor force participation (Labor) had a positive effect on economic growth in OIC (Organization of Islamic Cooperation) countries. Similarly, Fauzi and Suhaidi (2022) believed that labor force participation positively affected economic growth in Indonesia.

APEC is home to 38% of the global population, and its five member countries are among the ten countries with the largest populations. Most of the APEC population is of productive age, which provides advantages in terms of labor. A high level of labor force participation is fundamental, especially in developing countries, such as most APEC members. The higher the level of participation, the higher the community's average income. Rising income will also increase people's purchasing power, increasing GDP. A significant labor participation rate also plays a role in reducing unemployment so that the social costs borne by GDP can be reduced.

Based on Table 5, it is known that Trade has a long-term and short-term influence on the GDP of APEC member countries. The finding is consistent with the findings of Fetahi-Vehapi et al. (2015), Ozturk and Radouai (2020), and Nguyen and Bui (2021), who reported that there is a positive effect between trade and economic growth.

Through trade, countries have benefits such as increasing technology transfer and skills transfer, especially for developing countries like most APEC members. APEC itself has long been involved in multilateral trade in the regional scope. In 2015, it committed to reducing tariffs to 5% or less and forming public-private partnerships to overcome non-tariff barriers in this sector. APEC is also developing FTAAP (Free Trade Area of the Asia-Pacific), initiated in 2014.

Another advantage of trade between countries is the increase in the quantity of a country's exports in line with increased productivity, which also causes an increase in employment. Trade between countries allows countries to expand their markets and access goods and services that may not be available domestically. So, as a result, the market becomes more competitive.

Based on Table 5, it is known that REC has a long-term and short-term influence on the GDP of APEC member countries. According to Syamni et al. (2021), Sahlian et al. (2021), and Alfisyahri et al. (2022) reported that renewable energy consumption has a positive effect on economic growth.

In 2019, 86% of APEC countries' energy supply came from fossil energy (APEC, 2022). This large amount of supply indicates that APEC countries still depend on the use of fossil energy to run their country's economy. Of course, this raises concerns, especially regarding the limited non-renewable energy supply. Apart from that, environmental issues such as carbon emissions are also a concern. Many APEC countries also import energy due to this dependence, causing state spending to increase.

To overcome this, APEC leaders agreed to start implementing sustainable development using renewable energy. Using renewable energy in stages can be a concrete solution in replacing limited fossil energy and meeting increasing energy needs. Renewable energy production needs to be increased using public-private partnerships to increase the amount (Zafar et al., 2019). Energy production from renewable sources reduces dependence on imported energy sources, which burdens state expenditures. Renewable energy production is also expected to attract investor interest to increase job opportunities and reduce the unemployment rate.

Based on Table 5, it is known that IQ only has a long-term influence on the GDP of APEC member countries. However, based on Figure 2, IQ shocks also affect GDP in the short term. So, it can be concluded that IQ affects the GDP of APEC member countries in the long and short term. The finding is consistent with the findings of Valeriani and Peluso (2011), Nawaz et al. (2014), and Siyakiya (2017), who found that institutional quality has a positive influence on economic growth.

Institutions determine the direction of a country. Therefore, having a quality institution is very necessary. Institutional quality is also one of the basic factors in supporting economic growth. Quality institutions are seen to reduce uncertainty and promote efficiency, thereby contributing to stronger economic performance (IMF, 2003). Institutions influence economic performance primarily by making better policy choices.

The institution's quality is important because it is a consideration for investment entry. With investment, the country's ability to adopt technology from outside will increase and be helpful for the development process. In addition, quality institutions can create an institutional environment that supports the market, for example, protecting property rights, enforcing contracts, and determining prices in the market (IMF, 2003). Strong institutions protect property rights, ensuring that investments are secure and not arbitrarily expropriated. This stability encourages domestic and foreign investors to invest their capital with confidence. Chen and Jiang (2023) found that institutional quality attracts FDI inflows by increasing trade openness, accelerating industrial structure optimization, and encouraging technological innovation.

The quality of institutions concerning economic growth aligns with the thinking of Douglass C. North (1986) in "The New Institutional Economics and Development." North asserts that institutions are crucial because they serve as decision-makers regarding the involvement of individuals and businesses in economic activities. Institutions also play a vital role in attracting inbound investments by acting as security providers for investors. Institutions are expected to have good quality and can evolve to adapt quickly to changing economic and social conditions. More adaptable institutions are expected to perform better in the long run.

CONCLUSION

Foreign Direct Investment (FDI) has a long-term and short-term influence on the economic growth of APEC member countries. FDI plays a role in increasing capital flows so that production in APEC countries can increase. FDI also plays a role in technology transfer, which makes a major contribution to developing industrial modernization developing countries. Increasing production will indirectly absorb labor so that unemployment is reduced.

Labor (Labor), represented by the level of labor force participation, has a long and short-term effect on economic growth. Labor force participation rates are increasing in line with the expansion of industrialization in many APEC countries. The higher the labor force participation rate, the higher the average income of society. Increasing income then increases the amount of consumption, which ultimately affects economic growth.

International trade (Trade) has a long-term and short-term influence on the economic growth of APEC member countries. This is because economic openness encourages increased transfer of technology and skills. APEC countries are also aggressively improving their industry to increase productivity and exports, which also causes employment.

Renewable energy consumption (REC) has long-term and short-term effects on economic growth. Renewable energy is gradually becoming a solution to replace limited fossil energy and meet the increasing energy needs for production. This can also reduce APEC countries' dependence on energy imports from other countries. Apart from that, renewable energy development can also attract investors so that economic growth can develop further.

Institutional quality (IQ) has a long-term and short-term influence on the economic growth of APEC member countries. Institutional quality is a basic factor in supporting economic growth. Quality institutions are seen as reducing uncertainty and promoting efficiency, thereby contributing to stronger economic performance. Institutions influence economic performance primarily by making better policy choices. The quality of institutions is important because it is a consideration for the entry of foreign investment into APEC countries.

REFERENCES

Alfisyahri, N., Abdi Prawira, I., & Harmain, I. (2022). Renewable Energy Consumption and Economic Growth in Indonesia: Evidence from VECM Causality. *Sustainability: Theory, Practice and Policy*, 2(2), 111–222.

APEC. (2022). APEC Energy Statistics 2019. 1–23.

Balassa, B. (1978). Exports and economic growth. Further evidence. *Journal of Development Economics*, *5*(2), 181–189. https://doi.org/10.1016/0304-3878(78)90006-8

Balasubramanyam, V. N., Salisu, M., & Sapsford, D. (1996). Foreign Direct Investment and Growth. *The Evidence and Impact of Financial Globalization*, *106*(434), 299–309. https://doi.org/10.1016/B978-0-12-397874-5.00016-6

Basuki, AT, & Nano, P. (2019). *Regression Analysis in Economics and Business Research*. In PT Rajagrafindo Persada, Depok (Vol. 18, Issue 3).

Bhagwati, J. N. (1986). *Discussion Paper Development Policy Issues Series Export Promoting Trade Strategy: Issues and Evidence*. *October*.

Bhattacharya, M., Paramati, S. R., & Bhattacharya, S. P. (2016). The effect of renewable energy consumption on economic growth : Evidence from top 38 countries. *Applied Energy*, *November 2018*. https://doi.org/10.1016/j.apenergy.2015.10.104

Bornschier, V., & Chase-Dunn, C. (1985). *Transnational Corporations and Underdevelopment*. Praeger Press.

Bryant, J., Jacobsen, V., Bell, M., & Garrett, D. (2004). Labour Force Participation and GDP in New Zealand. *Labour*, *04*.

Chaudhury, S., Nanda, N., & Tyagi, B. (2020). Impact of FDI on Economic Growth in South Asia: Does Nature of FDI Matters? *Review of Market Integration*, *12*(1–2), 51–69. https://doi.org/10.1177/0974929220969679

Chen, F., & Jiang, G. (2023). The impact of institutional quality on foreign direct investment: empirical analysis based on mediating and moderating effects. *Economic Research-Ekonomska Istrazivanja* , *36*(2). https://doi.org/10.1080/1331677X.2022.2134903

Dinh, T. T.-H., Vo, D. H., The Vo, A., & Nguyen, T. C. (2019). Foreign Direct Investment and Economic Growth in the Short Run and Long Run: Empirical Evidence from Developing Countries. *Journal of Risk and Financial Management*, *12*(4), 176. https://doi.org/10.3390/jrfm12040176

Ek, A. (2007). *The Impact of FDI on Economic Growth. The Case of China* (Issue June). http://www.diva-portal.org/smash/get/diva2:3474

Ennin, A., & Wiafe, E. A. (2023). The impact of mining foreign direct investment on economic growth in Ghana. *Cogent Economics and Finance*, *11*(2). https://doi.org/10.1080/23322039.2023.2251800

Fauzi, & Suhaidi, M. (2022). Analysis of the Influence of Exports, Labor and Investment on Indonesia's Economic Growth from an Economic Perspective. *Scientific Journal of Islamic Economics*, 8(03), 2802–2818. http://dx.doi.org/10.29040/jiei.v8i3.6770

Fetahi-Vehapi, M., Sadiku, L., & Petkovski, M. (2015). Empirical Analysis of the Effects of Trade Openness on Economic Growth: An Evidence for South East European Countries. *Procedia Economics and Finance*, 19(15), 17–26. https://doi.org/10.1016/s2212-5671(15)00004-0

Gunby, P., Jin, Y., & Robert Reed, W. (2017). Did FDI Really Cause Chinese Economic Growth? A Meta-Analysis. *World Development*, *90*, 242–255. https://doi.org/10.1016/j.worlddev.2016.10.001

Gyimah, J., Yao, X., Awe, M., & Sam, I. (2022). Renewable energy consumption and economic growth : New evidence from Ghana. *Energy*, *248*(7), 123559. https://doi.org/10.1016/j.energy.2022.123559

Har, W. M., & Sin, M. C. (2023). *Effect of Sustainable Development and Institutional Quality on Growth Wpływ*. *21*(4), 1–23.

Helpman, E., & Krugman, P. (1989). *Trade policy and market structure*. MIT Press.

IMF. (2003). World Economic Outlook (Vol. 59, Issue 2).

Imoudu, E. C. (2012). The Impact of Foreign Direct Investment on Nigeria's Economic Growth ; 1980- 2009 : Evidence from the Johansen's Cointegration Approach. *International Journal of Business and Social Science*, *3*(6), 122–134.

Kacho, A. A., & Dahmardeh, N. (2017). The effects of financial development and institutional quality on economic growth. *International Journal of Economics and Financial Issues*, *7*(3), 461–467.

Keho, Y. (2017). The impact of trade openness on economic growth: The case of Cote d'Ivoire. *Cogent Economics and Finance*, *5*(1), 1–14. https://doi.org/10.1080/23322039.2017.1332820

Liang, C., Shah, S. A., & Bifei, T. (2021). The Role of FDI Inflow in Economic Growth: Evidence from Developing Countries. *Journal of Advanced Research in Economics and Administrative Sciences*, *2*(1), 68–80. https://doi.org/10.47631/jareas.v2i1.212

Markusen, J. R. (1995). The Boundaries of Multinational Enterprises and the Theory of International Trade. *Journal of Economic Perspectives*, *9*(2), 169–189. https://doi.org/10.1257/jep.9.2.169

Mamingi, N., & Martin, K. (2018). Foreign direct investment and growth in developing countries: Evidence from the countries of the Organization of Eastern Caribbean States. CEPAL Review, 124, 79–98. https://doi.org/10.18356/e270b670-en

Mankiw, N.G., Quah, E., & Wilson, P. (2014). *Introduction to Macroeconomics*: Asian Edition. Salemba Empat.

Mincer, J. (1958). Investment in Human Capital and Personal Income Distribution The Journal of Political Economy Volume LXVI AUGUST 1958 Number 4 Investment In Human Capital And Personal Income Distribution. *Source: Journal of Political Economy*, *66*(4), 281–302.

Nawaz, S., Nasie, I., & Khan, M. A. (2014). The Influence of Institutional Quality on Economic Growth: Panel Evidance. *The Pakistan Development Review*, 15–31.

Nguyen, C. P., Su, T. D., & Nguyen, T. V. H. (2018). Institutional Quality and Economic Growth: The Case of Emerging Economies. *Theoretical Economics Letters*, *08*(11), 1943–1956. https://doi.org/10.4236/tel.2018.811127

Nguyen, M. L. T., & Bui, T. N. (2021). Trade openness and economic growth: A study on asean-6. *Economies*, *9*(3). https://doi.org/10.3390/economies9030113

Nistor, P. (2014). FDI and economic gro owth , the case of Romania. *Procedia Economics and Finance*, *15*(14), 577–582. https://doi.org/10.1016/S2212-5671(14)00514-0

Nizar, C., Hamzah, A., & Syahnur, S. (2013). The Influence of Investment and Labor on Economic Growth and Their Relationship to Poverty Levels in Indonesia. *Journal of Economic Sciences*, 1(2), 1–8.

North, D. C. (1986). The New Institutional Economics and Development. *Journal of Economic History*, *57*(3), 718–721. https://doi.org/10.1017/S0022050700019112

Nurul, A., Idris, & Marwan. (2018). *The Labor Force Participation Rate, Export, and The Educational Investment Impact for The Economic Growth in Riau*. *57*(14), 63–65. https://doi.org/10.15900/j.cnki.zylf1995.2018.02.001

Oh, I., Yoo, W. J., & Kim, K. (2020). Economic effects of renewable energy expansion policy: Computable general equilibrium analysis for Korea. *International Journal of Environmental Research and Public Health*, *17*(13), 1–21. https://doi.org/10.3390/ijerph17134762

Oppong-Baah, T., Bo, Y., Twi-Brempong, C., Amoah, E. O., Prempeh, N. A., & Addai, M. (2022). The Impact of Trade Openness on Economic Growth: The Case of Ghana and Nigeria. *Journal of Human Resource and Sustainability Studies*.

Ozturk, O., & Radouai, N. (2020). Does trade openness contribute to economic growth and development of macro? *Journal of Economics, Business & Organization Research*, 443–453.

Prescott, E. C. (1988). Robert M . Solow ' s Neoclassical Growth Model : An Influential Contribution to Economics. *The Scandinavian Journal of Economics*, *90*(1), 7–12.

Sahlian, D.N., Popa, A.F., & Cre¸tu, R.F. (2021). *Does the Increase in Renewable Energy Influence GDP Growth?* An EU-28 Analysis.

Salman, M., Long, X., Dauda, L., & Mensah, C. N. (2019). The impact of institutional quality on economic growth and carbon emissions: Evidence from Indonesia, South Korea and Thailand. *Journal of Cleaner Production*, *241*, 118331. https://doi.org/10.1016/j.jclepro.2019.118331

Sari, V. K., & Prastyani, D. (2021). The Impact of the Institution on Economic Growth: An Evidence from ASEAN. *Jurnal Ekonomi Pembangunan*,

19(1), 17–26. https://doi.org/10.29259/jep.v19i1.12793

Schmitt, C., Imhof, N., & Nechmad, T. (2019). *Analyzing the Relationship Between Trade and Economic Growth*.

Schultz, T. W. (1961). *Intvestmenr in Human Capital : Reply*. *51*(5), 1035–1039.

Shahbaz, M., Raghutla, C., Chittedi, K. R., Jiao, Z., & Vo, X. V. (2020). The effect of renewable energy consumption on economic growth: Evidence from the renewable energy country attractive index. *Energy*, *207*, 118162. https://doi.org/10.1016/j.energy.2020.11816

Silajdzic, S., & Mehic, E. (2018). Trade Openness and Economic Growth: Empirical Evidence from Transition Economies. *Trade and Global Market*, *25*(4). https://doi.org/10.3747/co.25.3884

Siyakiya, P. (2017). The Influence of Institutional Quality on Economic Performance: An Empirical Study of Turkey and 28 Countries in the European Union. *World Journal of Applied Economics,* 3(2), 3–24. https://doi.org/10.22440/wjae.3.2.1

Soava, G., Mehedintu, A., Sterpu, M., & Raduteanu, M. (2018). Impact of renewable energy consumption on economic growth: Evidence from European Union countries. *Technological and Economic Development of Economy*, *24*(3), 914–932. https://doi.org/10.3846/tede.2018.1426

Sunde, T., Tafirenyika, B., & Adeyanju, A. (2023). the Role of Exports, Development, Imports, and Trade Openness on the Economic Growth in Iraq: Assessment Using the Ardl Cointegration Method. *International Journal of Economics and Finance Studies*, *15*(1), 80–100. https://doi.org/10.34109/ijefs.202315106

Susic, I., Stojanovic-Trivanovic, M., & Susic, M. (2017). *Foreign direct investments and their influence on the economic development of Bosnia and Herzegovina.* IOP Conference Series: Materials Science and Engineering, 200(1). https://doi.org/10.1088/1757-899X/200/1/012019

Syamni, G., Wardhiah, Zulkifli, Siregar, MJA, & Sitepu, YA (2021). *The relationship between renewable energy and sustainable development in Indonesia*. IOP Conference Series: Earth and Environmental Science, 922(1). https://doi.org/10.1088/1755-1315/922/1/012034

Utami, F., Putri, FME, Wibowo, MG, & Azwar, B. (2021). The Effect of Population, Labor Force on Economic Growth in OIC Countries. *Journal of REP (Development Economic Research),* 6(2), 144–156. https://doi.org/10.31002/rep.v6i2.3730

Ul Haque, A., Kibria, G., Selim, M. I., & Yesmin Smrity, D. (2019). Labor Force Participation Rate and Economic Growth: Observations for Bangladesh. *International Journal of Economics and Financial Research*, *5*(59), 209–213. https://doi.org/10.32861/ijefr.59.209.213

Valeriani, E., & Peluso, S. (2011). The Influence of Institutional Quality on Economic Growth and Development: An Empirical Study. *Journal of Knowledge Management, Economics and Information Technology Issue*, 6. https://doi.org/10.30541/v53i1pp.15-31

Yakubu, M. M., & Akanegbu, B. N. (2020). Labour Force Participation and Economic Growth in Nigeria. *Advances in Management & Applied Economics*, *10*(1), 1792–7552

Yang, X., Ramos-Meza, C. S., Shabbir, M. S., Ali, S. A., & Jain, V. (2022). The impact of renewable energy consumption, trade openness, CO2 emissions, income inequality, on economic growth. *Energy Strategy Reviews*, *44* (November), 101003. https://doi.org/10.1016/j.esr.2022.101003

Zafar, M.W., Shahbaz, M., Hou, F., & Sinha, A. (2019). From non-renewable to renewable energy and its influence on economic growth: The role of research & development expenditures in Asia-Pacific Economic Cooperation countries. *Journal of Cleaner Production,* 212, 1166–1178. https://doi.org/10.1016/j.jclepro.2018.12.081

Zhe, L., Yüksel, S., Dinçer, H., Mukhtarov, S., & Azizov, M. (2021). The Positive Influences of Renewable Energy Consumption on Financial Development and Economic Growth. *SAGE Open*, *11*(3). https://doi.org/10.1177/21582440211040133.