Eduvest – Journal of Universal Studies
Volume 4 Number 03, March, 2024
p- ISSN 2775-3735- e-ISSN 2775-3727

THE INFLUENCE OF AGRICULTURAL EXPORTS, HIGH-TECHNOLOGY EXPORTS, INVESTMENT, AND REGULATORY QUALITY ON THE GROSS DOMESTIC PRODUCT OF APEC MEMBER COUNTRIES

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ABSTRACT

Gross Domestic Product (GDP) is one of the macroeconomic indicators that reflects the level of welfare of a country's population. The APEC (Asia-Pacific Economic Cooperation) forum has the main goal of promoting economic growth and enhancing prosperity in the Asia-Pacific region. This is done by encouraging and facilitating more open trade and investment in the region. APEC member countries have different export characteristics, namely agricultural exports and high-technology exports. This study analyzes the influence of agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality on the Gross Domestic Product of APEC member countries. The research data used are secondary data from the World Bank from 2011 to 2020, analyzed using the Fixed Effect Model approach of panel data regression method using E-Views 12. The results show that simultaneously, agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality have a significant influence on the economies of APEC member countries. Partially, high-technology exports and regulatory quality have a positive and significant impact, while agricultural exports and Foreign Direct Investment have a positive but not significant impact on GDP. APEC countries should focus on productivity by harnessing technology and achieving inclusive economies for societal welfare.

KEYWORDS *Agricultural Export, High-tech Export, Foreign Direct Investment, Quality Regulation*

How to cite: Firdaus, A.N et al. (2024). The Influence of Agricultural Exports, High-Technology Exports, Investment, and Regulatory Quality on the Gross Domestic Product of APEC Member Countries. *Journal Eduvest. 4* (3): 1200-1218
E-ISSN: 2775-3727
Published by: https://greenpublisher.id/

INTRODUCTION

Gross Domestic Product (GDP) is one of the macroeconomic indicators that reflects the level of welfare of a country's population. According to Mankiw (2007), the most important macroeconomic variable is Gross Domestic Product. GDP represents the total income and total national expenditure on goods and services output. This research will discuss the member countries of the Asia-Pacific Economic Cooperation (APEC). This forum for economic cooperation among countries in the Asia-Pacific region was formed in 1989 based on the idea of Australian Prime Minister, Bob Hawke. APEC was chosen as the research subject because this forum consists of both developed and developing countries with different export characteristics, namely high-technology exports and agricultural exports. Developed countries produce products with high science and technology, while developing countries produce products highly related to their natural resource potential.

The main goal of the APEC forum is to promote economic growth and enhance prosperity in the Asia-Pacific region. This is achieved by encouraging and facilitating freer and more open trade and investment in the region. International trade is one way pursued by various countries to gain benefits, including foreign exchange earnings and domestic employment opportunities. The driving force behind international trade is that it encourages specialization, and specialization enhances productivity (Samuelson and Nordhaus, 2009). In reality, the export commodities of each country have different characteristics. For developing countries, export commodities are closely related to their natural resources, while developed countries have export commodities based on high technology. Based on this reality, trade interactions between countries result in imbalances. Below are the values of agricultural exports and high-technology exports from APEC countries.

Table 1 Value of Agricultural Exports and High-Tech Exports from APEC Countries in 2020 (In Million US Dollars)

Negara	EXPORT_AGRI	EXPORT_TECH
Australia	3.583	5.597
Canada	16.474	25.572
Chile	3.976	1.368
China	8.540	757.458
Indonesia	8.335	6.408
Japan	3.969	102.751
Korea Selatan	4.571	163.987
Malaysia	3.672	92.100
Mexico	984	71.003
New Zealand	4.009	590
Peru	307	172
Russian	8.334	6.524
Singapore	1.574	159.927
Thailand	8.407	45.837

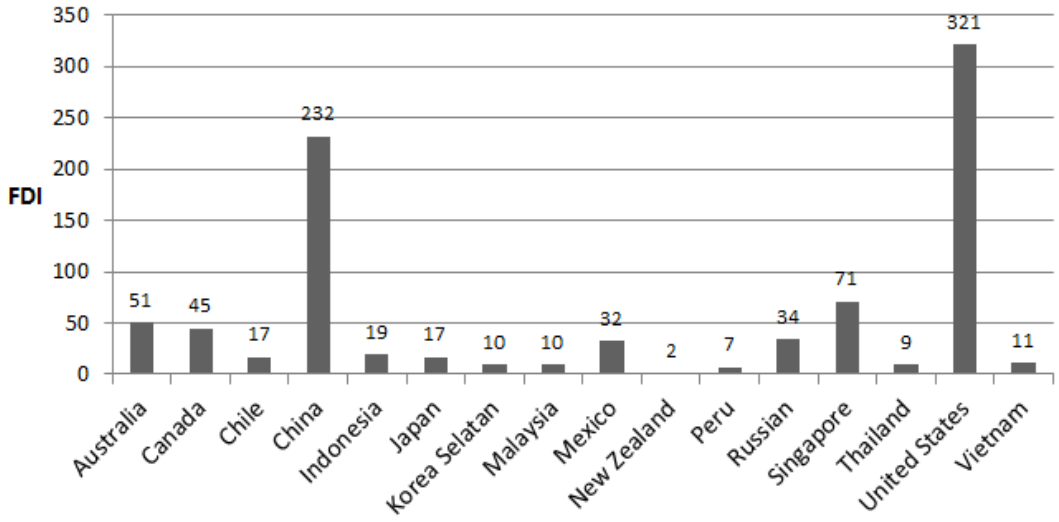
United States	30.448	141.538
Vietnam	4.951	101.534

Source : *World Bank*, 2023

In the data above, it is evident that countries with advanced industries such as China, Japan, South Korea, Singapore, and the United States show significant differences between their agricultural and high-technology exports. These countries have productive output compositions that represent knowledge mastery and integration. High-technology export products consist of chemicals, computers, machinery, aerospace, and electronics. Major exporters of high-technology products are developed countries. This indicates that these countries have high export competitiveness considering their share of high-technology exports. Solow (1956) argues that the relationship between innovation and long-term growth directly impacts economic growth.

For developing countries, export commodities are closely related to the natural resources they possess. In this reality, trade interactions between countries result in imbalances, where the imbalance relates to the quantity and quality of traded goods. Faridi (2012) shows that agricultural exports have a negative and significant impact on economic growth. This study suggests that non-agricultural exports need to be increased. Mehraraa and Baghbanpour (2016) found that the relationship between industrial exports and economic growth is positive and significant, but the relationship between agriculture and economic growth is weak.

High-technology products consist of R&D processes based on high science and technology. Being a force in exporting high-technology products worldwide can help a country's GDP become more advanced. In addition to promoting and facilitating trade, the APEC forum also encourages freer and more open investment in the region. Economies of countries engaging in economic relations with other countries are termed open economies. Mankiw (2007) defines a country with an open economy as one that engages in trade and borrows or lends in the world capital market. Researchers feel it's necessary to include investment variables because investment is crucial in driving economic growth, especially as Foreign Direct Investment (FDI) can be used as a source of financing for domestic economic development and accelerate the industrialization process, thus creating broader job opportunities. Additionally, in relation to agricultural and high-technology products, FDI can help diversify the products produced by a country by bringing production techniques, production technologies, managerial functions, and marketing techniques.

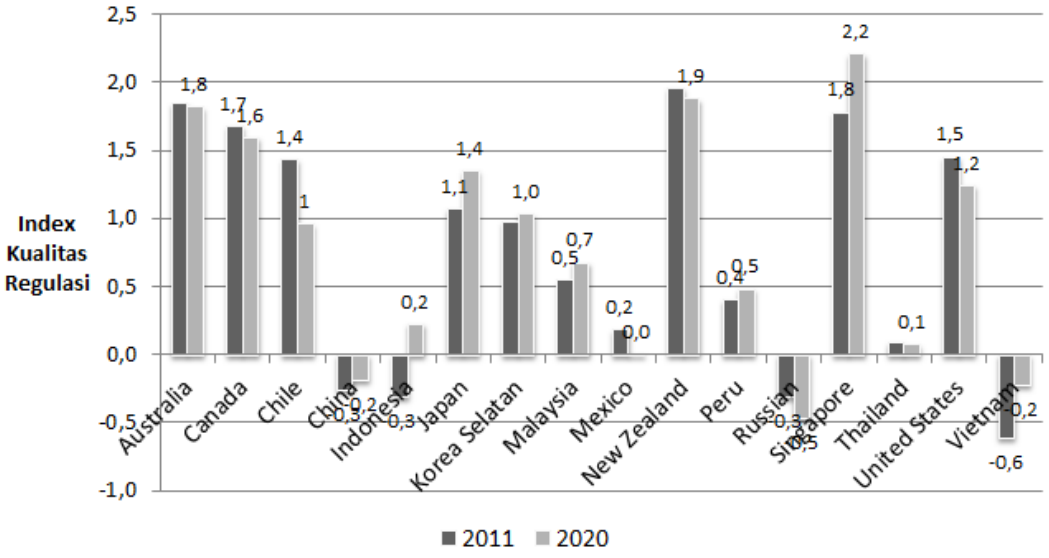


Sumber : World Bank, 2023

Figure 1.1. Average FDI of APEC Member States 2010-2019 (in units of billion US dollars)

Based on the data above, it can be seen that the average Foreign Direct Investment (FDI) among APEC member countries during the period of 2010-2019 varied significantly. There are countries that received FDI below 50 billion US dollars, namely Canada, Chile, Indonesia, Japan, South Korea, Malaysia, Mexico, New Zealand, Peru, Russia, Thailand, and Vietnam. However, there are 4 countries that received FDI above 50 billion US dollars, namely Australia, China, Singapore, and the United States. Foreign Direct Investment among APEC member countries from 2010 to 2019 was chosen with the assumption that investment in the previous year serves as funding for product development and company expansion, which can influence the GDP in the subsequent year.

Another factor is government intervention. Keynesian theory suggests that government intervention can influence a country's economy using policies (Samuelson and Nordhaus, 2009). The Regulatory Quality Index released by the World Bank captures perceptions about the government's ability to formulate and implement good policies and regulations that can promote the development of the private sector.



Sumber : World Bank, 2023

Figure 2. Quality of Regulation of APEC Member States 2011 and 2020

Based on the report released by the World Bank regarding the regulatory quality of APEC member countries, most have improved their quality over the past decade. Singapore stands out as the country with the highest quality among others, also showing the most significant improvement in regulatory quality from 2011 to 2020. Meanwhile, New Zealand (1.9), Australia (1.8), and Canada (1.6) rank 2nd, 3rd, and 4th, respectively. Governments must be able to formulate and implement good policies and regulations that enable and promote the development of the private sector. In fulfilling their role as regulators, governments can establish policies that generally aim to enhance societal welfare.

From the background described above, the author attempts to analyze the relationship between agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality that may affect the Gross Domestic Product (GDP) in member countries of the Asia-Pacific Economic Cooperation (APEC). The aim of this research is to contribute to references and provide recommendations for stakeholders and policymakers in implementing policies related to agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality to enhance the economy.

Literature Review

Theory of Comparative Advantage

David Ricardo introduced the law of comparative advantage. According to him, if one country is less efficient than another in producing both commodities, there is still a basis for mutually beneficial trade (provided that the absolute weakness of the first country relative to the second is not in the same proportion for both commodities). The less efficient country should specialize in the production and export of commodities in which it has a relatively smaller absolute

disadvantage (these become the commodities with comparative advantage), and import commodities in which it has a relatively larger absolute disadvantage (these become the commodities with comparative disadvantage). This law of comparative advantage forms the basis for countries to exchange commodities through exports and imports.

Harrod-Domar Theory

The Harrod-Domar theory was developed by economists Evsey Domar and R.F. Harrod. Domar. Harror first proposed his theory in 1947 in the American Economic Review, while Harrod had presented it in 1939 in the Economic Journal. According to Jhingan (2003), Harrod and Domar emphasize the key role of investment in the process of economic growth. First, investment creates income as a result of demand and enlarges the economy's production capacity by increasing the capital stock as a result of supply. Therefore, as long as investment continues, real income and output will continuously increase. However, to maintain the equilibrium level of income at full employment from year to year, both real income and output must increase at the same rate as the productive capacity of capital increases. In the Harrod-Domar theory, the formation of capital is necessary to grow an economy as additional capital stock. The formation of capital is seen as expenditure that will increase an economy's capability to produce goods and as expenditure that will increase effective demand throughout society.

Endogenous Growth Theory

Romer's (1994) endogenous growth model views science and technology development as having a broader role alongside capital. Science and technology can be the main inputs driving the desired economic growth with the assumption that technology is not only exogenously but also endogenously determined. In an era of openness or globalization, there is an opportunity for developing countries to boost economic growth according to the principles of the endogenous growth model. If a country adopts a higher level of economic openness, it increases the chances for that country to accelerate economic growth, as implied by the endogenous growth model.

Keynesian Theory

As Keynes proposed, government intervention can influence a country's economy using policies (Samuelson and Nordhaus, 2009). The ideas put forth by Keynes serve as a foundation that highlights the importance of the government's role in the economy. Government intervention policies in the economy have evolved, adapting to market conditions. In modern macroeconomics, government intervention depends largely on the conditions of each country. Generally, governments position themselves as regulators and supervisors, while provision is left to the market (the private sector). However, if the market is ineffective, the government must enter as a market player, either directly or through state-owned enterprises.

Agricultural Exports

Agricultural exports involve the exportation of agricultural products from one country to another. The purpose of agricultural exports is to expand sales to foreign markets, thereby increasing sales profits. Additionally, exporting benefits a country by helping to boost its foreign exchange reserves. The determination method for

agricultural exports is developed by the Standard International Trade Classification. This approach classifies agricultural products, including agricultural, plantation, livestock, and fisheries products, from raw to ready-to-use or consume products.

High-Technology Exports

The determination method for high-technology exports is developed by the Organization for Economic Co-operation and Development (OECD) in collaboration with Eurostat. This approach classifies products based on research and development intensity. The classification of high-technology products is based on the OECD's Standard International Trade Classification of 1997. High-technology exports are products with high research and development intensity, such as those in the fields of computers, pharmaceuticals, electrical equipment, chemicals, telecommunications, machinery, and aerospace.

Regulatory Quality

Regulatory quality captures perceptions about the government's ability to formulate and implement good policies and regulations that allow and promote the development of the private sector. The World Bank compiles measures of regulatory quality based on individual data from various sources, which are then combined into the Worldwide Governance Indicators. Kaufmann (2010) describes regulatory quality as the government's capacity to make effective policy decisions to promote private sector growth.

RESEARCH METHOD

Types of Research and Data Sources

This research is a quantitative research with the data used is secondary data taken from the World Bank. The observation time was between 2011 – 2020. The sampling technique in this study is purposive sampling, which is a sampling technique that uses certain criteria. The criteria applied to the sample of countries in this study are that they must be members of APEC. Thus there are 16 APEC member countries observed in this study.

Variable Operational Definition

In this study, economic development is projected with Gross Domestic Product as the dependent variable, while the independent variables include agricultural exports, high-tech exports, Foreign Direct Investment and regulatory quality. The operational definition of variables in this study is presented more clearly in Table 2 below:

Table 2. Variable Operational Definition

Variable Name	Symbol	Currency	Measurement
Gross Domestic Product	GDP	US$	Total economic value produced by a country in a year
Agricultural Export	EXPORT_AGRI	US$	Total export value of Agriculture

High-tech Export	EXPORT_ TECH	US$	Total export value of High Technology
Foreign Direct Investment	FDI	US$	Total FDI export value
Quality of Regulation	RQ	Indeks	-2.5 for the lowest value up to 2.5 for highest score

Analysis Methods

The analysis method in this study uses panel data regression techniques with data processing using E-Views 12, then continued with a series of tests which include model selection tests, classical assumption tests and F and T hypothesis tests. To equalize data units and improve distribution data, all variable data is converted into natural logarithms. Based on the literature review and economic theory in this study, all variables are assumed to affect the economies of APEC countries together, so that the economic equation model is stated as follows:

LN GDPIT = β0 plus β1 LN Export_Agri It Plus β2 LN Export_Take It
+ β3 LN FDI it + β4 RQ it + e it

GDPit = *Gross Domestic Product* (US$) negara i, tahun t
EXPORT_AGRIit = Export Agriculture (US$) negara i, year t
EXPORT_TECHit = Export High Technology (US$) country i, year t
FDIit = *Foreign Direct Investment* (US$) negara i, tahun t
RQit = Regulatory Quality (Index) negara i, tahun t
β0 = Constant
β1 β2 β3 β4 = Regression coefficient of each independent variable
e = Error Factor

RESULT AND DISCUSSION

Result

If we look at the descriptive statistics of research data of 16 APEC member countries analyzed, the average GDP is 2.8 trillion USD, the average agricultural export is 8.2 billion USD, high-tech exports are 95.3 billion USD, Foreign Direct Investment is 57 billion USD and the average regulatory quality index is 0.7811. The highest GDP value was obtained by the United States in 2019 amounting to 21.3 trillion USD while the lowest was obtained by New Zealand in 2011 of 168.2 billion USD.

Table 3. Descriptive statistics of 16 APEC member countries (in United States dollars)

	GDP	EXPORT_AGRI	EXPORT_TECH
Mean	2.868.079.709.725	8.228.252.434	95.354.746.865
Median	1.090.514.966.785	5.462.198.217	40.141.556.044
Maximum	21.380.976.119.000	40.871.117.359	757.458.883.661

Minimum	168.291.357.111	307.820.985	172.740.806
Std. Dev.	5.003.123.596.525	8.461.977.683	157.730.438.014

	FDI	RQ
Mean	57.085.291.766	0,7811
Median	20.564.938.226	0,7164
Maximum	511.434.000.000	2,2553
Minimum	286.306.902	-0,6766
Std. Dev.	92.148.206.765	0,8698

Processed Source Eviews 12

Tes Asumsi Classic

Normality Test

This testing is done to ensure the selected model meets the classical assumptions and the BLUE rule. Based on the normality test, a probability of 0.9058 is greater than α = 5% (0.05), so it can be concluded that the data is normally distributed.

Multicollinearity Test

Table 4 Multicollinearity Test Results

	LN_EXPORT_ AGRI	LN_EXPORT_ TECH	LN_FDI	RQ
LN_EXPORT_ AGRI	1.000000	0.369106	0.376485	0.039854
LN_EXPOR_ TECH	0.369106	1.000000	0.503934	-0.116274
LN_FDI	0.376485	0.503934	1.000000	0.066599
RQ	0.039854	-0.116274	0.066599	1.000000

Source: Output Eviews 12

From the multicollinearity test, it was found that no variable had a coefficient value greater than the value of R2 or 0.85. Therefore, it can be concluded that in the variables used there is no multicollinearity which means there is no linear relationship between independent variables used in this study. Multicollinearity is a linear relationship between independent variables in regression (Widarjono, 2018). The rule of thumb of multicollinearity detection is that if the coefficient value is above 0.85, multicollinearity is suspected in the model used. Based on Table 4 it can be seen that there are no variables that have a correlation value of more than 0.85. So it can be concluded in the regression model that multicollinearity does not occur.

Heteroscedasticity Test

Table 5 Heteroscedasticity Test Results

Prob. F(23,133)	0.0739
Prob. Chi-Square(23)	**0.0865**
Prob. Chi-Square(23)	0.5392

Source: Output Eviews 12

In Table 5 using the Breusch heteroscedacity test, *Pagan Godfrey* shows that all independent variables have a probability value of 0.0865 greater than the value of α = 0.05. This means that it can be concluded that in this study there is no heterokedasticity problem in the equation.

Autocorrelation Test

From the test results, Durbin-Watson values were obtained at 1.9278, while DL = 1.6906 and DU = 1.7930 (n = 160, k = 4 with α = 5%). So that it can be written DU < DW < 4-DU or 1.7930 < 1.9278 < 2.2070, it can be concluded that there is no autocorrelation problem.

Model Selection Test

Panel data regression model selection is done to determine the best model between common effect model (CEM), fixed effect model (FEM) or random effect model (REM). The selection of panel data research models was determined using the Chow Test and Hausman Test.

Chow Test

If the probability value of the F-statistical distribution is more than the value of the specified level of significance, the model used is the *Common Effect Model* and if the probability value of the F-statistical distribution is less than the level of significance, the model used is the *Fixed Effect Model* (Widarjono, 2018).

Table 6 Chow Test Results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	562.116394	-15,137	0.0000
Cross-section Chi-square	649.335631	15	0.0000

Source: Output Eviews 12

Table 6 shows that the value of Prob. Cross-section F of 0.0000 is smaller than the significance (α) of 5%, (0.0000 < 0.05) so it can be concluded that the *Fixed Effect Model* (FEM) method is better than the *Common Effect Model* (CEM)

method to analyze the data in this study. Then testing can proceed to Hausman testing.

Hausman Test

Table 7 Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.027866	4	0.0263

Source: Output Eviews 12

Table 7 shows that the probability value of 0.0263 is smaller than the α significance level of 5% (0.05), so it can be concluded that the *Fixed Effect Model* (FEM) method is better used than the *Random Effect Model* (REM) method in this study. So *Fixed Effect Model* (FEM) is the best method to use in this study.

Panel Data Regression Results

After the classical assumption test is fulfilled, the panel data regression estimate is obtained as follows:

Table 8. FEM Model Panel Data Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.946.260	1.619.895	1.201.473	0.0000
LN_EXPORT_AGRI	0.098597	0.055732	1.769.119	0.0791
LN_EXPORT_TECH	0.217689	0.041577	5.235.814	0.0000
LN_FDI	0.022721	0.017462	1.301.183	0.1954
RQ	0.306174	0.081242	3.768.667	0.0002
Cross-section fixed (dummy variables)				
Prob(F-statistic)	0.000000	R-squared		0.864476
		Adjusted R-squared		0.843703

Sumber: Output Eviews 12

From table 8 regression results can be formed an equation model to estimate the relationship between dependent and independent variables discussed in this study as follows:

LN_GDP = 19,4626 + 0,0985 LN_export_agri + 0,2176 LN_export_agri + 0,0227 LN_FDI + 0,3061 RQ

In addition, the estimation results can be expressed in several indicators that show the relationship between variables, including:

Coefficient of Determination (R2)

Based on Table 8 above, the coefficient of determination (R2) obtained is 0.86, which can be interpreted as the independent variables (agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality) able to explain 86% of the Gross Domestic Product. The remaining 14% can be explained by other variables outside the research model.

F-Test (Simultaneous)

Based on Table 8, the probability value of the F-Statistic is 0.00000, which is smaller than the significance value of 5% (0.05). Therefore, the conclusion is that the independent variables collectively have a significant influence on the dependent variable, meaning that agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality collectively affect Gross Domestic Product significantly at a confidence level of 95%.

T-Test (Individual Significance)

Based on Table 8, the probability value of agricultural exports is 0.0791, which is greater than α at 5% (0.05), meaning that agricultural exports do not significantly affect GDP at a 95% confidence level. Meanwhile, the probability value of high-technology exports is 0.0000, which is smaller than α at 5% (0.05), indicating that high-technology exports significantly affect GDP at a 95% confidence level. Furthermore, the probability value of Foreign Direct Investment is 0.1954, which is greater than α at 5% (0.05), indicating that Foreign Direct Investment does not significantly affect GDP at a 95% confidence level. Lastly, the probability value of regulatory quality is 0.0002, which is smaller than α at 5% (0.05), indicating that regulatory quality significantly affects GDP at a 95% confidence level.

Discussion

Based on the regression results for the agricultural export variable, it shows a positive effect on GDP in APEC member countries with a coefficient value of 0.0985. This indicates that a 1 percent increase in agricultural exports will increase GDP by 0.0985 percent in APEC member countries, all else being equal. This is consistent with the research hypothesis that agricultural exports have a positive impact on GDP in APEC member countries. Additionally, in this test, agricultural exports were found to have a probability value of 0.0791, greater than α at 5 percent (0.05), which means that agricultural exports do not have a significant impact on GDP. Therefore, the regression results for the agricultural export variable show a positive but insignificant effect on GDP in APEC member countries. This aligns with the study by Mehraraa and Baghbanpour (2016), which found that the relationship between industrial exports and economic growth is positive and significant, but the relationship between agricultural exports and economic growth is weak.

Activities in the agricultural economy encompass many aspects such as farming, plantation, animal husbandry, and fisheries. The low value of agricultural

exports compared to high technology leads to agricultural exports not being significant for GDP in APEC countries. There are several reasons for the low productivity of agriculture, including climate change, lack of technological support, availability of fertilizers, and production management. However, in APEC countries, there are also countries with high productivity, including the United States, Canada, Thailand, and Indonesia, which have a high value of agricultural exports. According to the report by the United States Department of Agriculture (2023), the main agricultural exports of the United States are grains, animal feed, soybeans, livestock products, fruits, and vegetables. Technological advancements in agriculture have contributed to increasing agricultural productivity in the United States. Innovations in plant and animal genetics, chemicals, equipment, and agricultural organization have enabled sustainable output growth using less labor and agricultural land. For example, soybean production in the United States utilizes agricultural technology including the use of fertilizers and insecticides in the right amounts over time. Additionally, farmers use genetically engineered seeds planted in almost all soybean farming, contributing to increased yields that offset higher costs, thus improving productivity and competitiveness.

Furthermore, based on the regression results for the high-technology export variable, it shows a positive effect on GDP in APEC member countries with a coefficient value of 0.2176. This means that a 1 percent increase in high-technology exports will increase GDP by 0.2176 percent in APEC member countries, all else being equal. Additionally, in this test, high-technology exports were found to have a probability value of 0.0000, smaller than α at 5 percent (0.05), indicating that high-technology exports have a significant impact on GDP. Therefore, the regression results for the high-technology export variable show a positive and significant effect on GDP in APEC member countries. High-technology exports encompass various sectors including computers, electronics, chemicals, machinery, aerospace, and pharmaceuticals. According to data collected from the World Bank (2023), China, South Korea, the United States, and Singapore are countries with high values of high-technology exports.

China exports high technology including telecommunications equipment, computers, electronics, chemicals, and machinery. China has been the world's largest exporter since 2009. Data from the World Bank shows that China's total high-technology exports amounted to 757 billion USD in 2020. The Chinese electronics industry has grown rapidly following economic liberalization under a national strategic policy to accelerate industrial development. Many large electronics companies come from China such as BBK Electronics, Huawei, Xiaomi, TCL, Lenovo, and DJI. There are also Chinese companies specializing in battery production including BYD Electronics and Contemporary Amperex Technology (CATL).

High-technology exports from the United States were valued at 141 billion USD in 2020. US companies producing high-tech products include Nvidia, Qualcomm, Intel, Tesla, and Apple. Some of the top destinations for US high-technology

exports are Mexico, Canada, China, Japan, Germany, and South Korea. South Korea also exports high technology including telecommunications equipment, computers, semiconductors, and chemicals. South Korea's economy is supported by its large companies that are global players in electronics and chemicals such as Samsung Electronics, LG Electronics, LG Chemical, Hyundai Motor Company, Lotte Company, and SK Group. In 2019, the world was hit by a pandemic caused by the coronavirus, which then resulted in a new disease called Covid-19. Many countries realized that the ability to manufacture vaccines was crucial. Vaccines, considered as pharmaceutical products with modern biotechnology, are produced by the United States and China with products made by Moderna, Pfizer, Sinovac Biotech, and China National Biotec Group (Sinopharm). Through the approach of products based on high knowledge, research, and development intensity, China, the United States, and South Korea can create high-technology products, mass-produce them, export them, and then profit from them. Thus, they have a comparative advantage that increases their competitiveness in the international market.

Having strength in exporting high-technology products worldwide can help a country's GDP become more advanced. In addition to promoting and facilitating trade, the APEC forum also encourages more free and open investment in the APEC region. This FDI can be used as a source of financing for domestic economic development and accelerate the industrialization process, thereby creating broader job opportunities. Based on the regression results for the FDI variable, it shows a positive effect on GDP in APEC member countries with a coefficient value of 0.0227. This means that a 1 percent increase in FDI will increase GDP by 0.0227 percent in APEC member countries, all else being equal. This is consistent with the research hypothesis that FDI has a positive impact on GDP in APEC member countries. Additionally, in this test, FDI was found to have a probability value of 0.1954, greater than α at 5 percent (0.05), indicating that FDI does not have a significant impact on GDP. Therefore, the regression results for the FDI variable show a positive but insignificant effect on GDP in APEC member countries.

A country or company choosing to establish business or invest in another country is a form of Foreign Direct Investment. Based on FDI data collected from the World Bank (2023), the United States, China, and Singapore are countries with high FDI values. The United States recorded fluctuating FDI, with 315 billion USD of FDI inflows into the United States in 2019. The incoming FDI is spread across many industries including information and communication technology, trade, and finance. The country is the largest recipient of FDI in the world, thanks to its large consumer base, predictable and transparent judicial system, productive workforce, adequate infrastructure, and business environment that encourages innovation.

FDI inflows into China amounted to 187 billion USD in 2019. Most of the FDI inflows are in industries related to electronic manufacturing and technology product development. To improve the investment environment, the Chinese government issued a new Foreign Investment Law in January 2020. This law aims to protect the interests of international investors, especially by prohibiting forced

technology transfers, protecting intellectual property rights, and promoting equal treatment. Most FDI inflows into China come through Hong Kong, which is a financial hub that covers more than 50 percent of the total capital, while another 10 percent comes from the United States.

FDI inflows into Singapore increased to 105 billion USD in 2019. Singapore has devoted all its economic efforts to attracting FDI and creating a conducive trading environment. All of its strategies have made Singapore one of the easiest countries in the world to do business. Singapore also positions itself as a business hub in the Asian region. One of the attractions for foreign investors in Singapore is favorable loans for foreign investors, incentives and tax exemptions, pro-business laws, and the city's financial stability. The main economic activities of Singapore's population are industry and services. There are different characteristics in APEC member countries, some of which have low FDI values such as South Korea, but this country has global competitiveness in various fields such as electronics, semiconductors, automobiles, chemicals, and cultural content that drive the South Korean economy. The country has established and implemented economic development plans based on export-based economy and economic development driven by investment in high-technology industrial facilities, thus laying the foundation for high-technology product exports and leading in the fields of displays and semiconductors. One example is Samsung Electronics, which spent around 16.47 billion USD on R&D in total in 2019, exceeding the value of FDI inflows into South Korea, which was 9.6 billion USD. This is consistent with Romer's (1994) theory of endogenous growth, which views science and technology development as having a broader role alongside capital. Science and technology can be the main inputs to drive the desired economic growth. According to Jhingan (2003), Harrod and Domar play a key role in investment in the process of economic growth. First, it creates income as a demand impact and expands the economy's production capacity by increasing the capital stock as a supply impact. Therefore, as long as investment continues, real income and output will continue to grow.

The next factor is government intervention. Based on the regression results for the regulatory quality variable, it shows a positive effect on GDP in APEC member countries with a coefficient value of 0.3061. This means that a 1 percent increase in regulatory quality index value will increase GDP by 0.3061 percent in APEC member countries, all else being equal. Additionally, in this test, regulatory quality was found to have a probability value of 0.0002, smaller than α at 5 percent (0.05), indicating that regulatory quality has a significant impact on GDP. Therefore, the regression results for the regulatory quality variable show a positive and significant effect on GDP in APEC member countries. The Regulatory Quality Index released by the World Bank captures perceptions of the government's ability to formulate and implement good policies and regulations that can promote the development of the private sector. Keynesian theory suggests that government intervention can influence a country's economy using policies (Samuelson and Nordhaus, 2009).

As for some of APEC's efforts towards the agriculture and technology sectors, the agriculture sector is crucial for every country's population to provide basic needs for its people, agriculture is considered a food provider. It plays a vital role through international trade that directly impacts the economic sector by providing jobs and driving economic development. Through The Agricultural Technical Cooperation Working Group (ATCWG), APEC member countries collaborate to enhance the capacity of the agricultural industry to contribute to economic growth, food security, and social welfare in the region. The group's goal is to improve the capacity of the agricultural industry, as well as share information and experiences in agriculture, biotechnology, animal management, and genetic engineering. This working group prioritizes projects and activities in addressing challenges faced by agriculture including climate change, increasing food demand, labor shortages in agriculture, and issues related to plant pests and animal diseases.

Policies based on science, technology, and innovation can drive economic growth in a country. Mastery of science and innovation is crucial in realizing a country's prosperity. The Policy Partnership on Science, Technology and Innovation (PPSTI) is an initiative within the APEC framework. It aims to promote cooperation among APEC member countries in the fields of science, technology, and innovation. The objective of PPSTI is to facilitate the exchange of knowledge and the latest technology among APEC members. This initiative also aims to enhance collaboration in research and development, accelerate technology transfer, and promote innovation as a means for economic growth and sustainable development in the APEC region.

CONCLUSION

This research aims to determine the impact of agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality on Gross Domestic Product (GDP) in APEC member countries. From this study, it was found that agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality have a positive impact on GDP. High-technology exports and regulatory quality significantly influence GDP. However, agricultural exports and Foreign Direct Investment do not significantly affect GDP. The low value of agricultural exports compared to high-technology exports results in agricultural exports not significantly affecting GDP in APEC countries. There are several reasons for low agricultural productivity, including climate change, lack of technological support, availability of fertilizers, and production management.

Regarding Foreign Direct Investment, there are countries with low FDI values such as South Korea, yet this country has global competitiveness in various fields such as electronics, semiconductors, electric vehicles, and chemicals. This is in line with Romer's (1994) theory of endogenous growth, which views science and technology development as having a broader role. All variables in the simultaneous test of agricultural exports, high-technology exports, Foreign Direct Investment, and regulatory quality together have a significant influence on Gross Domestic Product,

maximizing all these variables can realize APEC's vision of inclusive economic and societal well-being in APEC member countries.

Based on the conclusions drawn from the research results, several research recommendations can be made. There is a need to increase agricultural productivity by enhancing agricultural research conducted by both private and government sectors. This includes improving seeds and breeds using genetic engineering to produce superior seeds with good quality. Digital technology with smart farming methods can be used for maintenance, enabling farmers to respond quickly to any problems. By choosing the right technology, farmers can create a more sustainable and productive future for agriculture. Aggressive expansion of agricultural product markets is also needed to ensure that harvests are fully absorbed by the market. Efforts are needed to increase the value of high-technology exports for APEC countries, especially those classified as developing countries. Various agreements, investments, and policies are needed to enhance the value of high-technology exports. Building a domestic industry vision to participate in the global supply chain by producing products that follow the development of the fourth industrial revolution. Efforts are also needed to increase Foreign Direct Investment for APEC countries that do not yet have high-technology companies by providing ease in licensing and tax regulations to investors, providing integrated industrial zones for production efficiency, and building supporting infrastructure such as roads and ports to boost global competitiveness in international trade.

Appreciation and heartfelt thanks are conveyed to all parties who have supported this research, especially lecturers, fellow students, and the journal publisher. Hopefully, this research can contribute to science and economic development.

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