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EXPLORING THE IMPACT OF PER CAPITA INCOME AND POPULATION SIZE ON VAT REVENUE IN APEC MEMBER COUNTRIES

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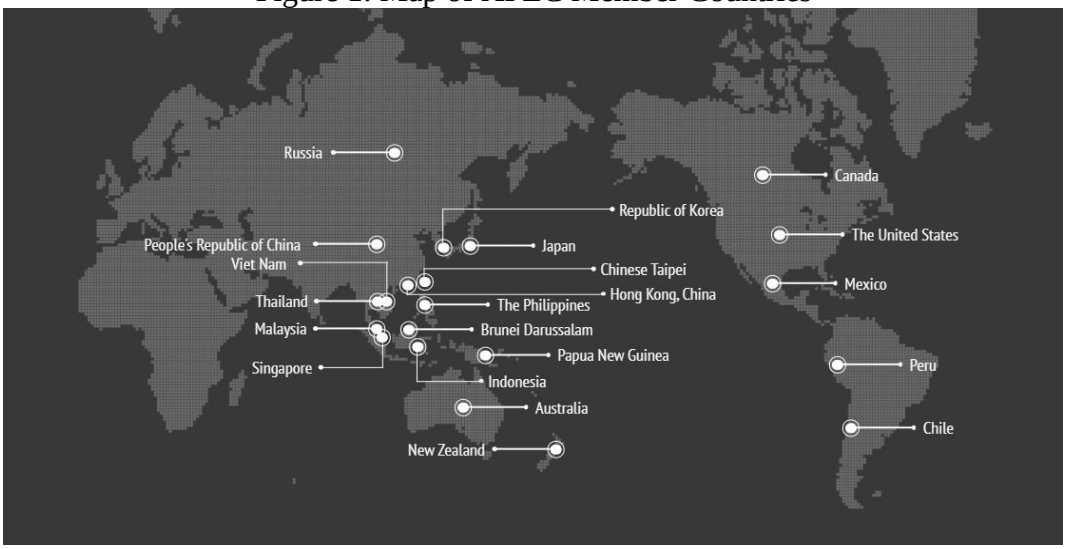
Abstract
This research aims to evaluate how per capita income and population size impact Value Added Tax (VAT) revenue, considering corruption control variables as moderating factors. VAT revenue is the dependent variable in this study, while per capita income and population size are the independent variables. The influence of corruption control variables is also explored as interacting with the independent variables in affecting VAT revenue. The data used is sourced from World Bank Data, covering the period from 2008 to 2020. The analytical method employed is panel data regression using the panel-corrected standard error (PCSE) model. The research results indicate that per capita income has a negative influence on VAT revenue, meaning that as a country's per capita income increases, VAT revenue tends to decrease. Meanwhile, population size has a positive impact on VAT revenue, indicating that as a country's population size grows, VAT revenue tends to increase. Furthermore, it is found that the influence of corruption control variables interacts with per capita income. This interaction strengthens its impact on VAT revenue. However, when corruption control variables interact with population size, their influence on VAT revenue becomes weaker.
Keywords: Corruption Control, Per Capita Income, Population Size, VAT Revenue

INTRODUCTION

The Asia-Pacific Economic Cooperation (APEC) is an economic cooperation forum among countries in the Asia-Pacific region. Established in 1989, APEC aims to promote economic growth, trade, and investment in the region. Its membership consists of 21 member economies, including advanced economies like the United States, Japan, and Australia, as well as developing economies such as Indonesia, China, and Vietnam. APEC serves as a platform for economic leaders to engage in discussions, coordinate efforts, and address regional economic issues while strengthening economic integration and cooperation among member nations. Through APEC, various initiatives and programs have been implemented to facilitate free trade, improve the investment climate, and enhance connectivity among countries in the Asia-Pacific region.

Figure 1: Map of APEC Member Countries

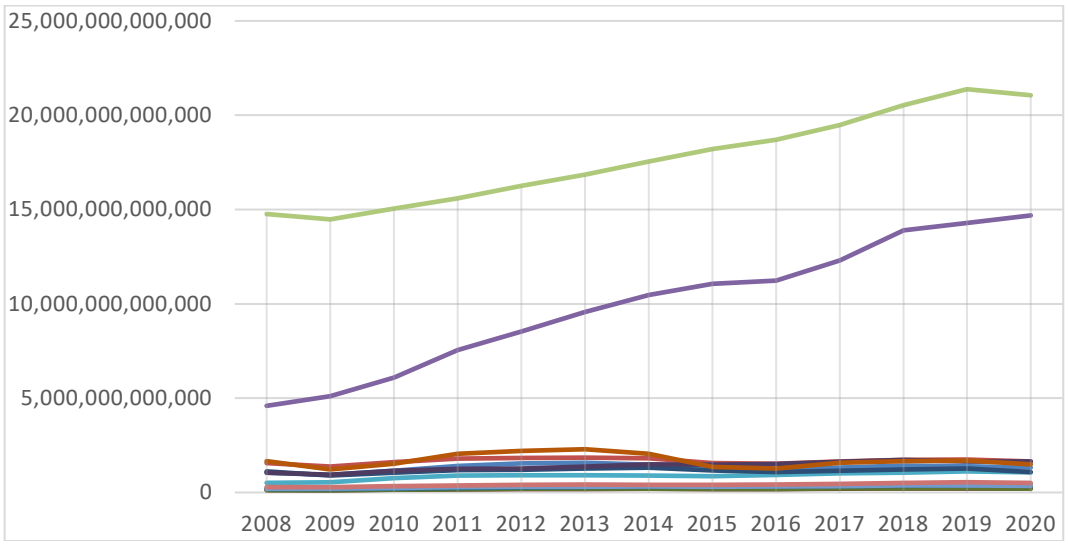


Source: APEC

APEC ensures that the trade of goods, services, investments, and the mobility of people flow smoothly across national borders. APEC member countries facilitate this trade by implementing faster customs procedures at their borders, creating a more favourable business environment within their regions, and harmonizing regulations and standards throughout the area. For example, APEC's initiative to synchronize regulatory systems is a crucial step in integrating the Asia-Pacific economy. With a common set of standards across all member countries, products can be more easily exported.

Based on Gross Domestic Product (GDP) data from APEC member countries in 2020, there is a significant variation in the economic size of these nations. China had the highest GDP at $14.687 trillion US dollars, followed by the United States with a GDP of $21.060 trillion US dollars. Meanwhile, other countries like Australia, Canada, and South Korea also had substantial GDPs, approximately $1.3 trillion US dollars, $1.6 trillion US dollars, and $1.6 trillion US dollars, respectively. On the other hand, countries with smaller economies like Chile, Peru, and Thailand had lower GDPs, around $0.254 trillion US dollars, $0.202 trillion US dollars, and $0.348 trillion US dollars, respectively. Indonesia also had a relatively large GDP, approximately $1.059 trillion US dollars, indicating significant economic growth in the Southeast Asian region.

Chart 1: Overview of GDP of APEC Member Countries

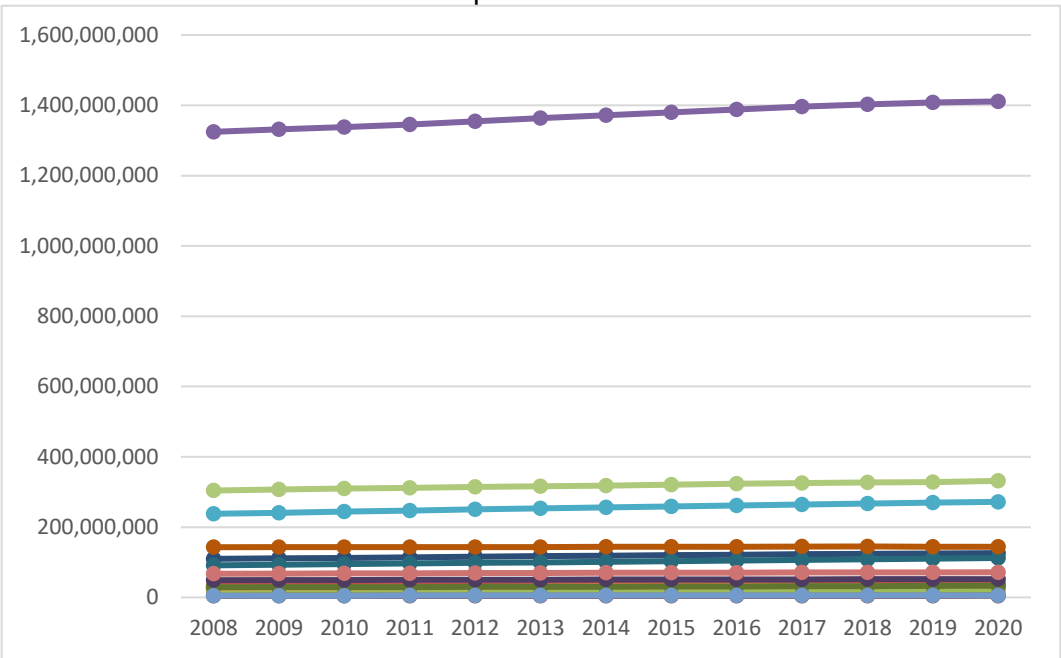


Source: Compiled by the author

This data also illustrates the importance of the economies of APEC member countries in the global economy, especially China and the United States, which are major players in trade and investment in the Asia-Pacific region. The GDP data provides an overview of each country's contribution to driving regional economic growth and influencing economic cooperation and trade in the Asia-Pacific region.

Based on population data from APEC member countries in 2020, there is significant variation in the population sizes of each nation. China has the largest population, with approximately 1.411 billion people, making it the most populous country in the world. Meanwhile, the United States has a population of approximately 331.511 million people, making it the second most populous country within APEC. Other countries like Indonesia, Brazil, and Russia also have substantial populations, approximately 271.858 million people, 211.049 million people, and 144.073 million people, respectively. On the other hand, countries with smaller populations include Singapore, New Zealand, and Malaysia, with populations of approximately 5.686 million people, 5.090 million people, and 33.200 million people, respectively.

Chart 2: Overview of the Population of APEC Member Countries

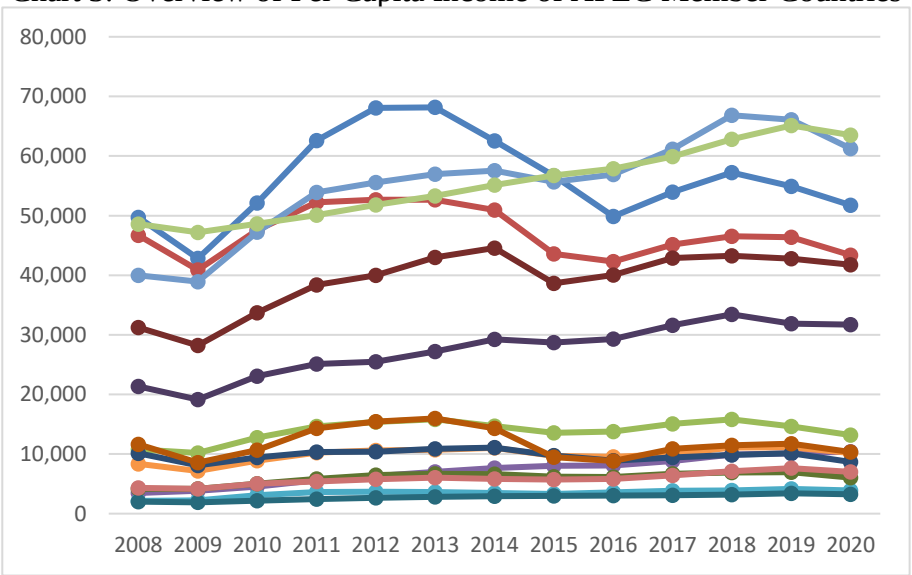


Source: Compiled by the author

This data provides an overview of the population sizes in each of the APEC member countries, which in turn can influence market potential, demand for goods and services, as well as opportunities for investment and economic growth. This information is crucial for understanding the economic and social dynamics in the Asia-Pacific region and influencing relevant policies in trade, investment, and development in the area.

Based on per capita income data from APEC member countries in 2020, there is significant variation in the average income levels of the population in each country. Advanced economies like Australia, Canada, and Singapore have high per capita income levels, approximately $51,722 US dollars, $43,350 US dollars, and $61,274 US dollars, respectively. Meanwhile, countries with lower per capita income levels include Indonesia, Thailand, and Peru, with approximately $3,896 US dollars, $7,002 US dollars, and $6,064 US dollars, respectively. China, as the most populous country, has a per capita income level of around $10,409 US dollars, indicating rapid economic development in the nation.

Chart 3: Overview of Per Capita Income of APEC Member Countries



Source: Compiled by the author

This data provides an overview of the economic well-being of the population in each APEC member country, indicating whether it is high or low. This information is crucial for analyzing economic disparities among countries and understanding the socio-economic conditions in the Asia-Pacific region. Additionally, per capita income data can serve as an important indicator for assessing a country's economic progress and growth, as well as the policies that can be implemented to enhance the well-being of the population.

This research aims to investigate the relationship between Value Added Tax (VAT) revenue in APEC member countries and the variables of per capita income and population size. Using panel data from APEC countries for the period 2008 to 2020, this study will analyze the influence of per capita income and population size on VAT revenue in these countries. Additionally, the research will also explore the role of the corruption control index variable as a moderating variable to be included in the analysis. The research questions to be answered include: a) whether per capita income and population size have an impact on tax revenue in APEC countries? b) whether the corruption control index variable influences the relationship between per capita income and population size with tax revenue in APEC countries? Thus, this research is expected to provide valuable insights into the factors affecting VAT revenue and the influence of corruption control in the context of APEC countries.

LITERATURE REVIEW

According to Mankiw (2013), consumption is the act of using goods or services to meet needs and achieve satisfaction. It involves the utilization and depletion of a portion or the entirety of the quantity or value of goods or services to satisfy living needs and achieve satisfaction (Nurhasanah, 2018).

Nurhasanah (2018) explains that consumption expenditure consists of two components, namely government consumption and household consumption. Household income has a significant influence on the level of consumption. Generally, as income levels increase, consumption tends to rise. This is because when income increases, households have a greater ability to purchase various consumption needs or may adopt a more consumptive lifestyle, demanding at least better quality. A large population will also contribute to the total consumption expenditure, even though the average expenditure per individual or family may be relatively low. A country's consumption expenditure will become significant if it has a very large population and a high per capita income.

Value Added Tax (VAT)

Value Added Tax (VAT) was first introduced by France in 1954 and served as a model for other countries to adopt. VAT is a consumption tax levied at every stage of the production and distribution of goods and services (Ebrill et al., 2001). The fundamental idea behind VAT is to impose tax only on the value added at each stage of the production process, so that the tax paid by the final consumer reflects the cumulative tax from the entire production chain. VAT is easier to monitor compared to other tax systems because it is applied at every stage of the supply process where all traders are required to maintain careful records of purchases, sales, and inventory of goods (Cole, 2023).

Ebrill et al. (2001) define VAT as follows: "A broad-based tax levied on commodity sales up to and including, at least, the manufacturing stage, with systematic offsetting of tax charged on commodities purchased as inputs—except perhaps on capital goods—against that due on outputs." This definition leaves room for debate but still highlights the main features of VAT considered essential: that it is imposed and collected throughout the production process, with the possibility of reducing the tax to be paid based on the tax already paid on purchases.

This definition is broad and encompasses not only the dominant "invoice credit" form of VAT but also deduction methods.

Previous Research

Many studies have been conducted worldwide on the topic of VAT revenue, including research by Rodríguez (2018), Bikas & Andruskaite (2013), Sarmento (2016), Godin & Hindriks (2015), and Keen & Lockwood (2007). These studies typically use per capita income as an independent variable. Previous research has yielded varying results, where studies conducted by Bikas & Andruskaite (2013) and Sarmento (2016) indicate that an increase in per capita income will also increase VAT revenue in a country. In contrast, research by Rodríguez (2018) and Keen & Lockwood (2007) suggests that an increase in per capita income in a country will reduce its VAT revenue. Different results were also found by Godin & Hindriks (2015), where there was no significant impact of per capita income on VAT revenue.

In addition to per capita income, population size is another variable that has been studied previously. Research by Masyitah (2019) and Simarmata & Bastari (2018) suggests that an increase in a country's population will lead to an increase in VAT revenue from that country. A larger population in a country means more individuals making expenditures to meet their living needs, resulting in an increase in the number of transactions subject to VAT. However, Keen & Lockwood (2007) found different results, indicating that changes in the population size of a country do not affect its VAT revenue.

The inconsistency in the findings of previous research and the limited research focused on APEC member countries have led the author to believe that further research on the determinants of VAT revenue in these countries is necessary.

Hypotheses

H_{01} : There is no simultaneous influence of Per Capita Income, Population Size, and Corruption Control on VAT Revenue.

H_{a1} : There is a simultaneous influence of Per Capita Income, Population Size, and Corruption Control on VAT Revenue.

H_{02} : There is no partial influence of Per Capita Income on VAT Revenue.

H_{a2} : There is a partial influence of Per Capita Income on VAT Revenue.

H_{03} : There is no partial influence of Population Size on VAT Revenue.

H_{a3} : There is a partial influence of Population Size on VAT Revenue.

H_{04} : There is no partial influence of Corruption Control on VAT Revenue.

H_{a4} : There is a partial influence of Corruption Control on VAT Revenue.

H_{05} : Corruption Control does not affect the relationship between Per Capita Income and VAT Revenue.

H_{a5} : Corruption Control affects the relationship between Per Capita Income and VAT Revenue.

H_{06} : Corruption Control does not affect the relationship between Population Size and VAT Revenue.

H_{a6} : Corruption Control affects the relationship between Population Size and VAT Revenue.

METHODS

To address the research objectives, this study employs a quantitative research method that utilizes data on VAT revenue, per capita income, population size, and corruption control in APEC member countries during the period from 2008 to 2020, obtained from the World Bank.

The dependent variable used in this research is tax revenue. Tax revenue data is sourced from the World Bank for the years 2008 to 2020. This study utilizes two independent variables:

per capita income and population size from APEC member countries. Per capita income is calculated as the Gross Domestic Product of a country divided by its population. Meanwhile, population size represents the total population of a country for each year. The data used in this study is secondary data obtained from the World Bank Data website.

Table 1: Research Variables

No.	Variables	Variable Definition	Description
1	VAT Revenue	VAT Revenue (% of tax revenue)	-
2	Per capita income	Gross Domestic Product divided by population	Natural Logarithm
3	Population	Population of a country	Natural Logarithm
4	Corruption control	Corruption Control Index	Moderator Variable

Source: Compiled by the author

The research model used in this study employs a panel data regression model. Panel data regression is a type of regression that combines cross-sectional data with time series data, resulting in data consisting of a combination of multiple individuals observed over a specific period (Sihombing, 2021). Panel data regression includes three types of modelling: Common Effect Model, Fixed Effect Model, and Random Effect Model.

The regression model in this study is represented by the following regression equation:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 Z_{it} + \beta_4 X_{1it} Z_{it} + \beta_5 X_{2it} Z_{it} + \varepsilon_{it}$$

Y = VAT Revenue
X1 = Per Capita Income
X2 = Population Size
Z = Corruption Control
β_0 = Constant
$\beta_1, \beta_2, \beta_3, \beta_4$ = Regression Slope Coefficients

RESULTS AND DISCUSSION

Descriptive Statistics

Descriptive analysis of both the dependent and independent variables provides the minimum, maximum, mean, and standard deviation values for the variables to be tested. The average VAT revenue from APEC countries from 2008 to 2020 stands at 27.2% of tax revenue. This indicates a significant contribution of VAT revenue to a country's economy. The growth in VAT revenue can drive economic growth in a country. In 2020, APEC member countries had an average per capita income of $14,418 USD, marking a 2.4% increase from 2019, indicating economic growth among APEC member countries.

Table 2: Descriptive Statistics

Variables		Mean	Std. Dev	Min	Max	Observation	
VAT Revenue	Overall	.2721412	.1230027	.0232575	.6337455	N =	195
	Between		.1194214	.0278837	.4647485	n =	15
	Within		.0418371	.1282704	.4427296	T =	13
Per capita income	Overall	9.583081	1.036957	7.5461	11.1296	N =	195
	Between		1.055835	7.907446	10.92809	n =	15
	Within		.1716044	8.907349	10.00635	T =	13
Population	Overall	17.86239	1.468428	25.58376	30.28988	N =	195
	Between		1.515401	26.50894	29.35471	n =	15
	Within		.0434399	26.60969	28.88291	T =	13
Corruption control	Overall	.4951608	1.147103	-1.141307	2.380319	N =	195

Variables		Mean	Std. Dev	Min	Max	Observation	
	Between		1.175877	-.9734156	2.266608	n =	15
	Within		.1366982	.1756196	.8676893	T =	13
Ln.PCIxCorr	Overall	5.756175	11.76421	-10.53416	24.90105	N =	195
	Between		12.07644	-9.112687	23.94191	n =	15
	Within		1.255881	2.372996	9.165354	T =	13
Ln.PopxCorr	Overall	7.759526	19.54742	-21.43015	36.35873	N =	195
	Between		20.01958	-18.2832	34.76501	n =	15
	Within		2.471619	1.61893	14.71732	T =	13

Source: Compiled by the author

The selection of the regression model in this study was conducted using three approaches: the Chow Likelihood Ratio test, the Lagrange Multiplier Breusch Pagan test (LM-BP), and the Hausman test. Based on the test results, the best model to be used in this study is the Fixed Effect model. The Fixed Effect model assumes that the characteristics of each observed individual will vary across different time periods, resulting in different intercept values in the estimation model for each individual (Sihombing, 2021).

Table 3: Results of Classical Assumption Tests

Test	Prob	Model
Chow Likelihood Ratio	0.0000	Fixed Effect Model
Lagrange Multiplier Breusch Pagan	0.0000	Random Effect Model
Hausman	0.0004	Fixed Effect Model
Selected Model		Fixed Effect Model

Source: Compiled by the author

In this model, classical assumption tests were conducted on the variables used. Testing classical assumptions is essential to determine whether regression parameters are Best Linear Unbiased Estimators (BLUE). The testing was performed using the Skewness and Kurtosis Test, the Breusch-Pagan/Cook-Weisberg Test, Variance Inflation Factor, and the Wooldridge Test.

Normality Test

According to Gujarati (2006 in Sihombing, 2021), the statistical testing assumes that error values are normally distributed. If these values are not normally distributed, regression coefficients will yield biased results with increasing errors. The normality test was conducted using the Skewness and Kurtosis Test.

Table 4: Normality Test Results

Prob>chi2	Result
0.1676	Normally distributed

Source: Compiled by the author

Heteroskedasticity Test

Heteroskedasticity testing aims to determine the presence of unequal residual variances occurring from one observation to another. If the variances differ from each other, it can be concluded that there is a heteroskedasticity issue in the model. In this study, heteroskedasticity testing was conducted using the Breusch-Pagan/Cook-Weisberg Test.

Table 5: Heteroskedasticity Test Results

Prob>chi2	Result
0.0000	Heteroskedasticity

Source: Compiled by the author

Autocorrelation Test

Autocorrelation testing aims to identify whether there is a correlation between errors in period t and errors in the previous period in a linear regression model for time series data or between locations (units) in spatial cross-sectional data. In other words, this test aims to determine if there is a statistically significant relationship between error values at nearby times or locations in the regression model. If autocorrelation is found, it can affect the validity of estimation results and the interpretation of the regression model. Therefore, autocorrelation testing is important to ensure that the assumptions of the regression model are met, and the analysis results can be trusted.

Table 6: Autocorrelation Test Results

Prob>F	Result
0.0000	Autocorrelation

Source: Compiled by the author

Multicollinearity Test

Multicollinearity that occurs in a model indicates a linear relationship between independent variables. Detecting multicollinearity in regression analysis can be done by examining the correlation values among the independent variables; if there is high correlation, i.e., greater than 0.8, there may be multicollinearity. Additionally, Variance Inflation Factor (VIF) can be used, which indicates multicollinearity issues if its value exceeds 10 for independent variables.

Table 7: Multicollinearity Test Results

Variabel	VIF	1/VIF
Per capita income	4.19	0.238647
Population	2.40	0.416431
Corruption control	742.96	0.001346
Ln.PCIxCorr	352.93	0.002833
Ln.PopxCorr	215.60	0.004638

Source: Compiled by the author

Based on the assumption test results, it can be observed that in this study, the model only passed the normality test, while there were issues with the model in other tests. According to Gujarati (2006), panel data regression allows researchers to study more complex models, eliminating the need for testing in panel data models. However, the author still conducted tests to determine whether this model is a Best Linear Unbiased Estimation (BLUE) model.

According to Sihombing (2021), if a regression model meets the normality assumption but violates the assumptions of non-autocorrelation and heteroskedasticity simultaneously, the solution is to use a panel-corrected standard error (PCSE) model. By applying PCSE, we can address the heteroskedasticity and autocorrelation issues in panel data, resulting in more accurate and efficient parameter estimates. PCSE is one of the popular methods in panel data analysis as it addresses several assumption problems in panel data regression models.

Regression Results

This study aimed to examine the impact of per capita income and population on VAT revenue, with corruption control as a moderating variable. Based on the regression analysis results, it can be concluded that the independent variables collectively have a significant impact on VAT revenue, as indicated by the Prob > F value smaller than 0.5. Furthermore, based on

the adjusted R-squared, the variability of VAT revenue in APEC member countries can be explained by the modeled independent variables at around 58.17%, while the remaining 41.83% is influenced by other factors not included in this study.

Table 8: Regression Results

Variables	Coefficient	z	P > | z |
Cons	0.7486592	4.98	0.000
Per capita income	-0.0887728	-17.06	0.000
Population	0.0208472	2.67	0.008
Corruption control	1.350396	15.05	0.000
PCIxCorr	-0.0678645	-10.98	0.000
PopxCorr	-0.0355956	-12.09	0.000
Adjusted R-squared			0.5817
Prob > F			0.0000

Source: Compiled by the author

Based on the table above, the regression equation can be obtained as follows:

$$Y = 0.7486592 - 0.0887728X_1 + 0.0208472X_2 + 1.350396Z_{it} - 0.0678645X_{1it}Z_{it} - 0.0355956X_{2it}Z_{it} + \varepsilon_{it}$$

The Impact of Per Capita Income on Tax Revenue

The test results indicate that the per capita income variable has a P-value > |z| of 0.000, which is smaller than the alpha value of 0.05. Therefore, the alternative hypothesis is accepted, meaning that per capita income significantly affects VAT revenue. The negative effect of per capita income indicates that an increase in per capita income will lead to a decrease in VAT revenue. These research findings align with previous studies conducted by Rodríguez (2018) and Keen & Lockwood (2007), which showed a negative impact of per capita income on VAT revenue.

Most APEC member countries implement low or even zero tariff trade policies for goods and services traded among them. This is intended to boost trade and investment in the region. With low tariffs, VAT revenue from imported goods may be lower because the VAT imposed will also be lower.

The Impact of Population on Tax Revenue

Based on the statistical test results, the Population variable has a P-value > |z| of 0.008, which is smaller than the alpha significance level set at 0.05. Therefore, the alternative hypothesis can be accepted, indicating that the Population significantly affects VAT revenue. The influence of the Population on VAT revenue is positive, meaning that an increase in the population will lead to an increase in VAT revenue. This finding is consistent with previous research conducted by Masyitah (2019) and Simarmata & Bastari (2018), which showed a positive impact of the Population on tax revenue.

The positive impact of the population on VAT revenue in APEC member countries can be explained by several factors. First, with a large population, a broad market for products and services is created, increasing transactions subject to VAT. Second, a large population can stimulate economic growth and consumption, thereby increasing VAT revenue from economic activities. Third, strong economic growth is accompanied by an increase in the population due to urbanization and migration, which has a positive impact on VAT revenue.

The Impact of Corruption Control on Tax Revenue

From the test results, the Corruption Control variable has a P-value > |z| of 0.000, which is smaller than the alpha of 0.05. This means that corruption control has a positive impact on VAT revenue. This finding is consistent with the research by Sarmento (2016), which also found a positive impact of corruption control on tax revenue in a country.

Better corruption control can reduce corrupt practices in the tax process, thereby increasing tax compliance and VAT revenue from sectors that may have previously been affected by corruption. Effective corruption control can also enhance public trust in the government, encouraging tax awareness and compliance. Furthermore, effective corruption control can create a more transparent and fair business environment, promoting economic growth and increased consumption, which, in turn, contributes to increased VAT revenue.

The Influence of the Interaction between Per Capita Income and Corruption Control on VAT Revenue

The regression results for the PCIxCorr variable show a coefficient of -0.0678645. This negative coefficient indicates an inverse relationship between the moderating interaction between corruption control and per capita income on VAT revenue. This moderating interaction strengthens the negative impact of per capita income on VAT revenue. In other words, when per capita income increases, its negative effect on VAT revenue becomes even stronger. This could be due to the fact that when per capita income rises, the consumption of goods and services by the public tends to increase.

The Influence of the Interaction between Population and Corruption Control on VAT Revenue

The regression results for the PopxCorr variable indicate a negative coefficient of -0.0355956, meaning there is a negative impact of the interaction between population and corruption control on VAT revenue. The negative impact of this interaction can be interpreted as follows: when the population of a country increases, and at the same time, corruption control improves, VAT revenue in that country tends to decrease.

With an increasing population, there is a possibility of more transactions and economic activities taking place. However, if corruption control is not effective enough, some of these transactions may involve corruption or tax evasion, negatively impacting VAT revenue. A large population can also lead to complexity in tax management and oversight. If corruption control is not effective in addressing this issue, there may be difficulties in collecting taxes accurately and efficiently.

CONCLUSION

The regression results from the table above reveal several important findings regarding the factors influencing VAT revenue in APEC member countries. Per capita income has a significant negative impact on VAT revenue, indicating that an increase in per capita income can lead to a decrease in VAT revenue. Meanwhile, the population has a significant positive impact, suggesting that population growth contributes to an increase in VAT revenue. Corruption control also plays a crucial role, with a significant positive impact, indicating that effective efforts to control corruption can enhance VAT revenue. Furthermore, the interactions between per capita income and corruption control, as well as between population and corruption control, also have significant negative effects on VAT revenue. These findings provide valuable guidance for fiscal and taxation policies in optimizing VAT revenue in APEC member countries, with an emphasis on the crucial role of corruption control in enhancing tax revenue.

Future research could consider the use of other variables such as inflation rates, economic structure, or industrialization levels that may contribute to VAT revenue. Extending the time period of the study can provide a clearer picture of long-term trends in VAT revenue in APEC member countries. Regional analysis can also be conducted by grouping countries based on regions or economic characteristics to gain a deeper understanding of the role of corruption control in various contexts among APEC member countries.

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