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The Impacts of Tax Revenue and Investment on the Economic Growth in Southeast Asian Countries

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Abstract:

Research aims: This study focuses on the correlation between tax revenue, investment, and economic growth, taking into account the non-linear effects of tax revenue.

Design/Methodology/Approach: Macro data of nine countries in ASEAN (including Brunei, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam) in 2000 - 2020 were extracted from the World Bank database. This research employed panel data estimations.

Research findings: This study found statistical evidence of a negative effect of tax revenue on economic growth. However, when considering the non-linear effects of tax revenue, the empirical findings showed that higher tax revenue could reduce the disadvantages of tax impacts to boost economic growth. The negative effect of taxes is as obvious as the economic growth theories, but it depends on the taxation revenue. Lower tax revenue may encourage saving and investment, but it also leads to an increased government deficit, reducing economic growth through government debt, spending and investment. Moreover, this study provides consistent evidence of investment's positive effect on economic growth in ASEAN countries during the research period.

Theoretical contribution/Originality: The theoretical contribution provides evidence on the direct effect of tax revenue and investment on economic growth with a broader understanding of the tax's non-linear effects and investment contributions in the ASEAN. The study confirms the vital role of government activity in regulating the development of the economy through taxation and investment.

Practitioner/Policy implication: The severe impact of the COVID-19 pandemic has increased macroeconomic uncertainties, including uncertainty over savings, investment, and spending, potentially leading to tax revenue and investment losses. It, in turn, affects economic activities, so it requires careful consideration. Learned lessons from this study can prepare for future economic shocks and financial crises to reduce negative impacts on economic growth, including their adverse tax revenue effects.

Research limitation: This study is limited by looking at the tax revenue ratio overview, which ignores the tax structure due to the lack of data collection. The following studies need to clarify the tax structure of ASEAN countries to determine which tax gives a negative impact/and which tax has a positive effect on economic growth.

Keywords: Tax revenue; Investment; Economic growth; ASEAN; Panel data

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Introduction

The role of taxes and investment in economic growth has received much attention from scholars to policymakers because of their essential roles. However, the severe impact of the COVID-19 pandemic has increased macroeconomic uncertainties, including uncertainty over savings, investment, and spending, so it requires careful consideration. From a fundamental perspective, taxes are mandatory payments from companies and households to the government, so all taxes must be based on a valid statute (Olufemi et al., 2018). On the one hand, governments need tax revenue to perform their functions, including providing public goods, maintaining the law and national defense, and ensuring economic development and redistribution of society's wealth (Edame & Okoi, 2014; Olufemi et al., 2018). On the other hand, tax revenue also significantly affects the expansion or contraction of production activities of enterprises, the changes in spending, and the saving of households (Afuberoh & Emmanuel, 2014; Nwanakwere, 2019).

Because of the dual effect of taxes on economic activities, its role is tied to economic growth (Stoilova, 2017). Taxes generate revenue to meet government spending activities (Edame & Okoi, 2014); it also has a profound impact on the performance of the production and consumption sectors because this sector contributes to the majority of government tax revenue (Olufemi et al., 2018). Castles and Dowrick (1990) and Agell et al. (1997) argue that different uses of total government spending affect growth differently, and the same argument applies to tax policy. Therefore, the controversy about the impact of taxes on the economy's performance has never ended, both theoretically and experimentally. First, Blinder and Solow's (1976) neoclassical growth model implies that tax policy will not affect steady-state growth. It means that no matter how distorted, tax policy has no impact on economic growth in the long run. In contrast, Romer's (1986) endogenous growth theory claims that government spending and tax policies can affect long-term or sustainable growth.

From an empirical perspective, previous studies have also provided different evidence; for example, Tosun and Abizadeh (2005) found a positive relationship between taxes and economic growth in 21 member countries of the Organization for Economic Co-operation and Development (OECD), in contrast to the study's findings of Macek (2015) for these countries. Meanwhile, Szarowská (2014) gave a negative relationship between taxes and economic growth of 24 European Union countries in 1995 – 2008. The difference in the relationship was also uncovered in previous studies of Ugwunta and Ugwuanyi (2015) and Jalata (2014), who advocated a positive relationship between taxes and economic growth, while Saibu (2015), Daba (2014), Keho (2013), and Marire and Sunde (2012) advocated negative relationships. This difference stems from the influence of the nature of the tax, country characteristics, and approach. Furthermore, Gale et al. (2015) claim that tax revenue has no stabilizing effect on economic growth in different periods and even reverses the direction of impact in different periods. According to the theory of the non-linear effects of fiscal policy on economic growth proposed by Barro (1990), Scully (1995, 2003) argue that the government can set a tax threshold at which economic growth is maximized.

Specifically, the ASEAN region has a population of 650 million, spread over 4.5 million square kilometers across 20,000 islands and the mainland (Wang, 2017). The population ranges from less than 0.5 million in Brunei Darussalam to over 250 million in Indonesia and spans various ethnicities, histories, languages, religions, and cultures. In terms of growth, the ASEAN economies have performed well over the past three decades, like most of Asia. At the same time, lower-income economies, such as Cambodia, Lao PDR, Myanmar, and Vietnam, have grown faster than their wealthier neighbors – implying a degree of economic convergence within ASEAN (ASEAN, 2021). However, the COVID-19 pandemic with the Delta-variant has blocked the flows of investment and spending due to targeted restrictions. Thus, the Asian Development Bank has forecast a reduction in the economic growth of the economies in the sub-region to 3.0% in 2021 and 5.1% in the following years. In this context, the role of government emerges as the driver of the economy with fiscal and monetary instruments. Nevertheless, considerable diversity exists among the ASEAN Member States regarding their economic, social, and cultural development (Darsono et al., 2021). The size and scope of this diversity pose challenges to analyzing ASEAN as a single, homogenous bloc of nations. Instead, a more nuanced and holistic approach is needed to capture diversity and difference. Using panel data regression for different countries' characteristics, this study is one of the economic studies with such an approach.

Economic development will often create an additional need for tax revenues to finance increased public spending, but it also increases the country's tax burden to meet these needs. It requires governments to establish an optimal tax rate, but, unfortunately, previous tax studies have provided little practical guidance on setting this rate. Due to the complexity of the development and integration process, the concept of optimal tax rates being closely linked to different economies is indisputable. Using both linear and non-linear approaches, this study clarifies the role of tax revenue in the economic growth of ASEAN countries. Given the superiority of this approach over previous ones, this study provides indications for this complex linkage, thereby promoting economic growth with a broader understanding of the tax contributions in the ASEAN. This study is also one of the few on the subject in ASEAN, thus playing an important role in providing empirical evidence-based policy implications for countries in the region.

Moreover, investment plays an undeniable role in economic growth. Indeed, ASEAN countries are characterized by underdeveloped infrastructure and therefore require continuous investment, but they do not have many choices of finance to invest in them. Furthermore, the COVID-19 crises have pushed down countries' economies, leading to a shift in the production activities among countries. In this context, accumulated investment capital, such as domestic investment and foreign direct investment, plays a vital role in economic development (Solow, 1956). On the one hand, it promotes growth, and on the other hand, Firebaugh (1992) mentions that investment has great potential to develop relationships in domestic industries. There is indisputable evidence that investment is one tool that makes economic growth faster and easier to sustain through productivity, capital creation, development progress, and exports (Adams, 2009; Omri & Kahouli, 2014; Tseng et al., 2019). Therefore, investment is considered an important resource for the growth of any economy (Szkorupová, 2015; Marcin, 2008).

Therefore, this study develops a model that focuses on economic investment and taxes to clarify these relationships. The study is structured as follows: Part 1 focuses on the research's essential targets, while part 2 presents a literature review and model development. Part 3 shows data and methodology. Part 4 discusses the main results, and finally, part 5 offers conclusions and some implications.

Literature Review and Hypotheses Development

Many economists believe that tax revenue is one of the most important factors contributing to the growth of a country. Todaro and Smith (2015) describe economic growth as "the steady process by which the productive capacity of an economy is increased over time to increase the level of output and national income". Meanwhile, the role of taxes in economic growth has been recognized in recent theories. In classical growth theory, economic growth depends on limited resources and the growth of the country's population, so economic growth tends to decrease in the long run. In contrast, neoclassical economic growth theory will reach a steady-state with labor, capital, and technology participation. Thus, this theory holds that short-run economic equilibrium can be reached with increased labor and capital, while technology will be an exogenous factor that significantly affects the economy's overall performance (Solow, 1956). This theory, therefore, believes in a more passive fiscal policy approach, in which budget deficits are assumed to create a drag on economic growth because of the crowding-out effect. This theory advocates reducing tax rates, limiting government spending, and reforming the tax system to achieve neutrality; it keeps the average tax rate and the generated tax revenue unchanged. The Laffer curve effect describes this relationship, where the tax revenue (T) is determined by the tax rate (t) and the tax base (Y) (Kakaulina, 2017). The neoclassical theory also believes tax revenue matters more than tax rates since the generated economic growth will bring enough additional tax revenues to make them sustainable.

Next, Barro (1990) and King and Rebelo (1990) laid the foundation for economic growth models to create the space for fiscal policy in which tax policy is a driver in determining growth. Tax policies consistently affect entrepreneurship, technological innovation, and human capital, including personal spending on education and worker motivation. Thus, stable taxes provided developing countries with a predictable and stable fiscal environment to promote growth and finance the necessary physical and social infrastructure for many years. Combined with economic growth, tax revenue reduces long-term dependence on aid and debt, ensuring good governance by promoting openness and accountability by governments to citizens (Romer & Romer, 2010). These impacts and decisions in the accumulation of physical and human capital create the dynamic of growing disparities among economies. However, the impact of tax revenue on economic growth can be divided into three groups, namely, positive, negative, and miscellaneous.

Studies that support the positive effect of taxes on economic growth are conducted by researchers, such as Dreßler (2012), Macek (2015), and Stoilova (2017). Stoilova (2017) argues that taxes help mobilize resources that can be used to finance public spending, as

a tool of income redistribution, to influence the allocation of resources in the economy, which is necessary for economic growth. Meanwhile, Macek (2015) claims that tax revenue increases government resources from which it can be used in various growth-promoting activities, such as infrastructure development, developing human resources, supporting start-up projects, and many other activities. On the negative side, researchers like Ferede and Dahlby (2012) and Poulson and Kaplan (2008) suggest the negative impact of taxes on economic growth. According to Ferede and Dahlby (2012), a high tax rate increases the cost of capital, while a high tax rate discourages domestic and foreign direct investments, thereby negatively affecting the economy's long-term growth (Dackehag & Hansson, 2012). The authors also argue that a high level of income taxes negatively affects labor supply and investment in human resource development, reducing incentives to save and invest. Because of tax increases on disposable income, high taxes often influence household decisions, causing them to spend less and save more. As a result, households often replace highly taxed activities with activities taxed with lower tax rates, engage in less productive economic activity, or at some point, that may decide to completely exit the labor market, leading to a slower growth rate of the country's economy (Poulson & Kaplan, 2008). In this study, we assume that:

H₁: The tax revenue has a negative impact on economic growth.

However, the empirical evidence on the relationship between tax policy and growth seems inconsistent in the conclusions about the effects of taxes on economic growth, such as the study presented above and research by Lee and Gordon (2005), Arnold et al. (2011), and Takumah and Iyke (2017). On the other hand, many previous studies have demonstrated the non-linear relationship between economic growth and taxes. The upward trend in government expenditures for economic growth, which has been seen in most countries and has become commonplace in recent years, also requires financing for these expenditures. The most important sources are taxes and debt, but because debt also brings additional costs, it ranks after taxes in order of preference (Gurdal et al., 2020; Van et al., 2020). In addition, the BARS curve is a theoretical foundation that focuses on the non-linear effects of government size on economic growth, thus giving clues for non-linear effects of tax revenue. Similarly, Gale et al. (2015) suggest that tax revenue and income tax rates do not have a stable impact on per capita income growth in different periods. From the Cobb-Douglas production function formula in the tax case, this study argues an optimal threshold of tax revenue, creating a U-shaped relationship between tax revenue and GDP and economic growth.

H₂: There is a non-linear effect of tax revenue where its impact on economic growth has been changed.

In the neoclassical framework, taxes imposed by the government can impact growth during the transition to the new steady-state if they affect the savings rate and thus the level of investment. Also, the neoclassical theory holds that the total output of an economy is closely related to the total number of labor, human capital, physical capital,

and technological level. Therefore, FDI and GDI contribute positively to economic growth in countries because it meets the needs of capital formation (Firebaugh, 1992; De Mello, 1997). In this study, we test our hypothesis of investment:

H₃*: The increased investment rate positively impacts economic growth.*

Research Method

Model

According to the Cobb-Douglas production function, this study used exogenous growth theory, also known as the neoclassical theory, to evaluate the relationship between taxes, investment, and growth. Based on these arguments in the literature review, the model that considers the effect of tax revenue on economic growth is determined as follows:

$$Y_t = A_t L_t{}^\varepsilon K_t{}^\omega \text{ với } \omega + \varepsilon = 1 \qquad (1)$$

where, Y_t is a gross domestic product, A_t is the factor of total productivity, $L_t{}^\varepsilon$ represents labor force, và $K_t{}^\omega$ is the capital, ε và ω are coefficients according to the gross domestic production of capital and labor, respectively, and they are determined by technological progress.

Then, equation (1) is transformed by natural logarithm:

$$\ln Y_t = \ln A_t + \varepsilon \ln L_t + \omega \ln K_t \qquad (2)$$

We assume that capital K is financed by tax and investment:

$$K_t = \alpha_1 TAX_t + \alpha_2 FDI_t + \alpha_3 GDI_t \qquad (3)$$

Replace K in equation (2), we have:

$$\ln Y_t = \ln A_t + \varepsilon \ln L_t + \omega \ln(\alpha_1 TAX_t + \alpha_2 FDI_t + \alpha_3 GDI_t) \qquad (4)$$

To examine the impacts of tax and investment on economic growth, we develop the below model based on the expanding equation (4):

$$GDPPCG_{it} = \beta_1 TAX_{it} + \beta_2 FDI_{it} + \beta_3 GDI_{it} + \beta_4 OPEN_{it} + \beta_5 INF_{it} + \varepsilon_{it} \qquad (5)$$

where $GDPPCG_{it}$ is economic growth, measured by the growth of gross domestic product per capita (Denison, 1962), TAX_{it} and FDI_{it} and GDI_{it} present the economy's resources, including tax revenue, foreign direct investment, and domestic investment. In addition, this study also included control variables like previous studies of Su and Bui (2017), Phung et al. (2019), and Darsono et al. (2021). Hence, this study employed economic openness, $OPEN_{it}$, to argue that the more comprehensive the openness, the higher the ability to

connect external capital and technology, thereby boosting products. The inflation, INF_{it}, controls the impacts of consumption price on economic growth (Van et al., 2020; Ngoc, 2020).

Therefore, this study proposes a non-linear model to test the threshold effect of tax revenue on economic growth as follows:

$$Y_{it} = \beta'_1 TAX_{it} + \beta'_2 TAX^2_{it} + \beta'_3 FDI_{it} + \beta'_4 GDI_{it} + \beta'_5 OPEN_{it} + \beta'_6 INF_{it} + \varepsilon_{it} \qquad (6)$$

Taking the first derivative of equation (6) according to TAX_{it}, we have:

$$Y' = \beta'_1 + 2\beta'_2 TAX \qquad (7)$$

To find the maximum (or minimum) value of Y by TAX, we have $Y' = 0$. Solving this equation, we have optimal TAX (ζ_0): $\zeta_0 = \frac{\beta'_{01}}{-2\beta'_{02}}$. From threshold value of TAX (ζ_0) (if yes), we determine two different equations following:

$$Y_{it} = \beta'_{1A} TAX_{it} + \beta'_{2A} FDI_{it} + \beta'_{3A} GDI_{it} + \beta'_{4A} OPEN_{it} + \beta'_{5A} INF_{it} + (\zeta_{it} + \varepsilon_{it}), \text{với}$$
$$TAX_{it} < \zeta_0 \qquad (8)$$

$$Y_{it} = \beta'_{1B} TAX_{it} + \beta'_{2B} FDI_{it} + \beta'_{3B} GDI_{it} + \beta'_{4B} OPEN_{it} + \beta'_{5B} INF_{it} + (\zeta_{it} + \varepsilon_{it}), \text{với}$$
$$TAX_{it} \geq \zeta_0 \qquad (9)$$

Data

Research data were macro data of nine countries in ASEAN (including Brunei, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam) in 2000 - 2020, extracted from the World Bank database. It should also be noted that this study did not include Myanmar and East Timor due to data shortages. All data were arranged to panel data for empirical analysis. This study selected the ASEAN countries for the following reasons: (1) ASEAN countries have close geographically and economically linkages. (2) The instability in the economic growth of any member also leads to the general instability of the bloc due to its interconnectedness. (3) Although belonging to ASEAN, the member countries also have their characteristics in economic and trade activities. Therefore, considering the issues of taxation and government spending on economic growth in the context of ASEAN countries, common conclusions can be drawn to apply to the whole countries to maintain the economic growth of the whole ASEAN as necessary. It is very meaningful in the context that developing countries are under pressure from protectionism in major countries and need to strengthen cooperation, strengthen linkages, and determine the right development direction together to overcome difficulties and maintain economic growth.

Methodology

Basically, it is possible to estimate panel data according to cross-regressions for each respective time unit. These estimates represent simple pooled OLS estimation models. This estimate does not take into account effects per unit and overtime and ultimately distorts the true picture of the relationship of the variables studied across cases and over time. Therefore, Gujarati et al. (2017) show that a better estimator for panel data is an estimator that considers time and cases simultaneously to provide more information, more degrees of freedom, and is more efficient by combining the time series and cross observations. Fixed-effects estimation (FEM) and random-effects estimation (REM) represent this method with many advantages over the previous simple pooled OLS estimation.

In addition, when estimating the above models, there is a problem that TAX_{it-1} revenue and FDI_{it-1} (or GDI_{it-1}) investment affect economic growth Y_{it}. However, economic growth Y_{it-1} also determines the TAX_{it} revenue and FDI_{it} (or GDI_{it}) investment. Therefore, Nickell (1981) suggests that due to technical problems occurring during estimation, the lag of Y_{it} will increase the standard error, called endogenous problem. As a result, estimates can be biased and inconsistent.

Thus, in this study, the instrumental-variable regression was intended to provide different estimators to fit the panel data and solve the endogenous problem. The idea of instrumental variable regression is to use an exogenous variable to isolate the direct effect of the independent variable on the dependent variable. Therefore, in 2-steps estimation, the first step would be to regress the independent variables according to the instrumental variable in turn to find the estimate; then use the estimate generated from this correlation in 1st-step regression to estimate the direct effect of the dependent variable. In this regression, the Sargan-Hansen test (J-test) was used to determine whether the instrumental variables were used appropriately. The test was computed from the residuals of the instrumental variable regression by constructing the quadratic form based on the cross-product of the residuals and the exogenous variables. If there is a correlation between an instrument and the residual, the instrumental variable regression is inconsistent. Furthermore, instrumental-variable regression also provides a "fixed" or "random" effect and preserves the properties of panel data.

Result and Discussion

Data and Descriptive Statistics

This section shows the statistics of variables in this research, for example, means, standard deviations, medians, minimum and maximum values. These results are illustrated in Table 1. It can be shown that means of economic growth (GDPPCG) were 3.3964 percent, and its standard deviation was 3.2508, respectively, while its minimum and maximum values were -10.7815 (the Philippines, 2020) and 12.5143 (Singapore, 2010). They showed substantial divergence in economic growth among ASEAN countries.

Also, the mean values of FDI and GDI were 5.6726 and 24.8530 percentage, while their standard deviations were 6.3312 and 5.8003, respectively, implying that the rate of investment in the sample had intensive differences. Moreover, the integration of economies in the region was quite high, as shown by the mean of OPEN reaching 137.611, the maximum value of 437.3267 (Singapore, 2008), and the smallest value of 33,1906 (Indonesia, 2020). Inflation in the region was quite low with an average of 3.655; Brunei in 2002 was a deflationary country with an INF value of -2.3150, and Laos had the highest inflation in 2000 with an INF value of 25.0846. They reflected the diversity among the countries in the sub-region regarding their economy and integration.

Table 1 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDPPCG	189	3.3964	3.2508	-10.7815	12.5143
TAX	189	13.2443	3.8484	5.8000	22.5000
FDI	189	5.6726	6.3312	-2.7574	32.1698
GDI	189	24.8530	5.8003	10.4653	40.8907
OPEN	189	137.6115	90.542	33.1906	437.3267
INF	189	3.6559	4.1659	-2.3150	25.0846

Source: World Bank (2021)

We observe that ASEAN countries' average tax revenue rates have gradually increased over time, while the average economic growth was not stable. Figure 1 shows that average tax revenue increased from 11.75 percent in 2000 to 14.14 percent in 2014 before falling to 13.86 percent in 2020. In contrast, the investment rate (including FDI and GDI) increased from 25.68 percent in 2000 to 33.42 percent in 2020. At the trend, it can be seen that the evolution between INV and GDPPCG is in the same direction, while there is a non-linear relationship between TAX and GDPPCG.
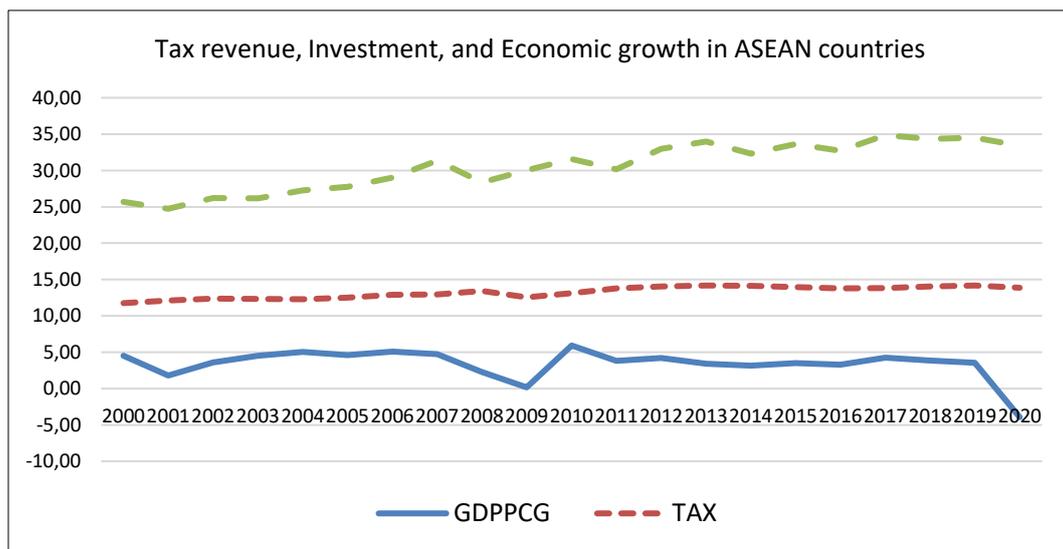

Figure 1 The linear relationship between tax revenue and economic growth
Source: World Bank (2021)

Next, the Figure 2 depict the linear and the Figure 3 shows the non-linear relationship between tax revenue and economic growth. It can be seen that a U-shaped negative relationship represents different impacts of taxes on the economic growth of ASEAN countries with a 95% confidence interval.
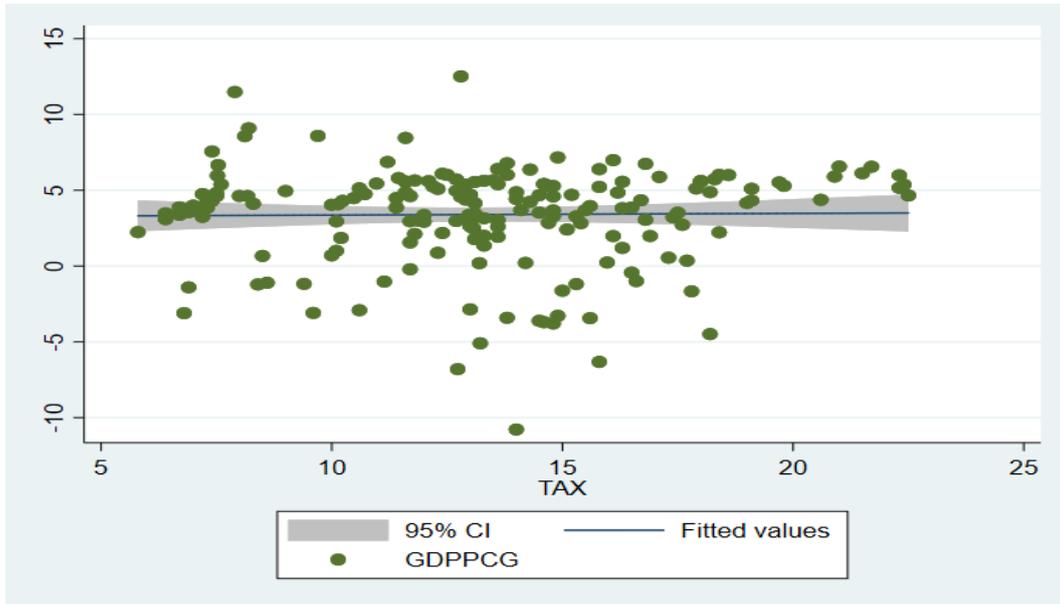

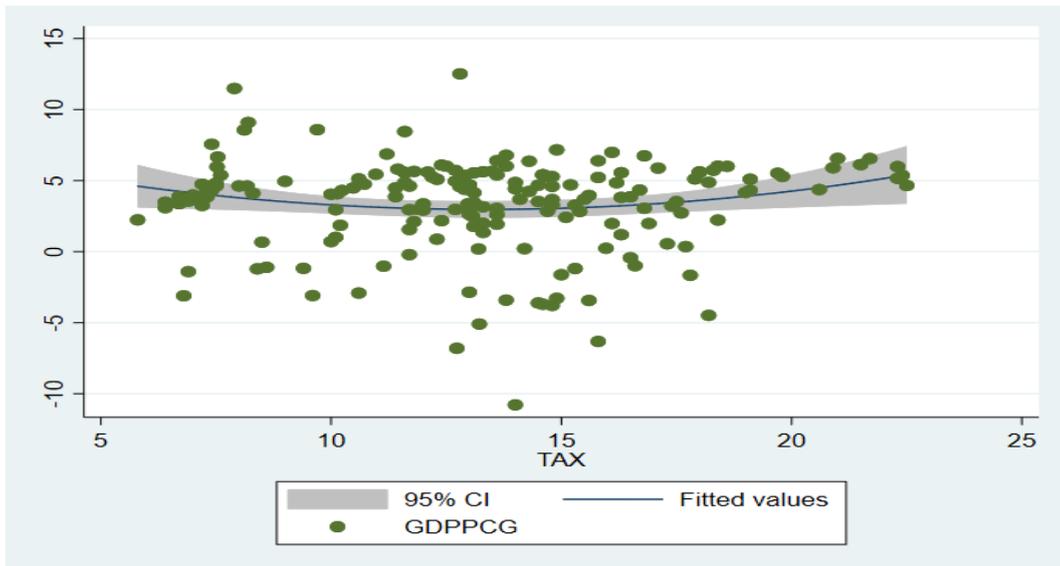**Figure 2** The linear relationship between tax revenue and economic growth

Figure 3 The non-linear relationship between tax revenue and economic growth

Empirical findings

Table 2 shows the estimation results on the effects of tax revenue and investment on economic growth, measured by gross domestic product per capita growth. Regression results with FEM, REM, and IVREG showed that instrumental variable regression with fixed-effect was suitable with the 0.0000 in the p-value of the Hausman test and 0.5636 in the p-value of the Sargan-Hansen test. In addition, all instrument variables were valid, claiming the regression results were credible and estimation problems were solved.

Table 1 Estimation results of tax revenue and investment on economic growth

Independent variables GDPPCG	FEM	REM	IVREG
TAX	-0.3502**	-0.0784	-0.5957***
	(-2.58)	(-0.92)	(-3.21)
GDI	0.1071**	0.0356	0.1757***
	(1.98)	(0.78)	(2.59)
FDI	0.1283*	0.0528	0.1979**
	(1.76)	(0.87)	(2.36)
OPEN	0.0281***	0.0015	0.0345***
	(2.87)	(0.31)	(3.15)
INF	0.0640	0.1297**	0.1188*
	(1.08)	(2.26)	(1.71)
Cons.	0.5482	2.5703**	0.6268
	(0.28)	(1.91)	(0.27)
Observations	189	189	171
Groups	9	9	9
Hausman test	Chi2(6) = 27.59***		
Sargan-Hansen test			0.5636

Note: *, **, *** respectively show the results at the significance level of 10%, 5%, and 1%; ( ) is t-test results.

The regression results revealed that H_1 is accepted, it found that the economic growth was negatively correlated with tax revenue at the significant level of 1%; meanwhile, the investment rate boosted the economy's improvement. The estimated coefficients showed that a one percent increase in total tax revenue reduces economic growth by 0.3502 percent, statistically significant at the 1% level. This result is similar to Ferede and Dahlby's (2012) findings, which found a negative relationship between tax revenue and economic growth. It seems contrary to neoclassical growth theory and is consistent with classical growth theory. This result supports the deadweight loss of tax in economic models when the government tries to increase tax revenue to finance their activities; economic growth is temporary, and it will decline with the increase of population. It can be explained that higher taxes would discourage the accumulated investment; meanwhile, high taxes can reduce the growth of labor supply by discouraging their participation in the productive sector and working hours. Also, higher taxes restrict productivity-enhancing activities, such as research and development (R&D). As a result, the high tax rate slows down economic growth by creating a deadweight loss.

By contrast, investment rates increased economic growth, including FDI and GDI. The estimated coefficients were 0.1757 for GDI and 0.1979 for FDI with 1% significant statistic, respectively. These findings support the research Hypotheses (H_2) and the neoclassical theory, in which economic growth is related to the total number of labor, physical capital, and technological level to achieve a steady situation. Thus, an increased investment rate will contribute positively to economic growth by increasing capital formation and labor demand (Firebaugh, 1992; De Mello, 1997). Moreover, FDI also brings the spillover effects, leading to technology transfers and knowledge spillovers from foreign countries to host countries, leading to economic growth in the long run (Barro & Sala-I-Martin, 1997; Nguyen et al., 2020). Meanwhile, GDI holds a contributor for domestic industries by developing domestic relationships. GDI also helps maintain economic productivity, capital generation, development progress, and exports, which play the primary keys to economic growth (Omri & Kahouli, 2014; Ha & Thuy, 2021).

Next, we estimated the non-linear effects of tax revenue on economic growth by developing the quadratic equation (6). The empirical estimations are presented in Table 3.

Table 3 Estimation results of tax revenue's non-linear effects and investment on economic growth

Independent variables GDPPCG	FEM	REM	IVREG
TAX	-0.3683	-0.3297	-7.4861***
	(-0.63)	(-0.69)	(-3.21)
TAX^2	0.0007	0.0081	0.2555***
	(0.03)	(0.46)	(3.07)
GDI	0.1070**	0.0412	0.1572*
	(1.98)	(0.88)	(1.88)
FDI	0.1287*	0.0486	0.3014**
	(1.74)	(0.78)	(2.55)
OPEN	0.0281***	0.0034	0.0673***
	(2.82)	(0.66)	(3.64)
INF	0.0633	0.1022*	-0.1352
	(1.01)	(1.96)	(-1.13)
Cons.	0.6524	4.0791	39.6639***
	(0.17)	(1.24)	(2.96)
Observations	189	189	171
Groups	9	9	9
Hausman test	Chi2(7) = 22.74***		
Sargan-Hansen test			0.1342

Note: *, **, *** respectively show the results at the significance level of 10%, 5%, and 1%; ( ) is t-test results.

It can be seen that the tax revenue's non-linear effects drew the U-shape curve (Figure 3), in which the optimal tax revenue was determined by $\zeta_0 = \frac{\beta'_{01}}{-2\beta'_{02}}$, getting the value of 14.65 percent with 1% significant statistic. Under this value, it is accepted the H_3, revealed that the impact of tax revenue was strongly negative, but this effect was reduced when

increasing the tax revenue. It has two implications: (1) excessive tax revenue will negatively affect overall economic growth, but (2) keeping tax revenue too low will do the same. On the one hand, as implied by the neoclassical economic growth model, taxes bring about deadweight losses and shift the economic structure. Taxes, on the other hand, are the main revenue to finance government operations. Therefore, keeping an optimal tax rate will help limit its adverse effects on economic growth. The U-shaped curve was also found by Morrissey et al. (2016), who examined the effects of democracy on tax revenue based on the data collected from 131 countries from 1990 – 2008. In this study, we uncovered the optimal level of tax revenue at 14.65 percent. From this level, the negative effects of tax revenue on economic growth were gradually reduced, as shown in results in Table 4.

Table 4 Estimation results of tax revenue's effects and investment on economic growth

Independent variables GDPPCG	IVREG	IVREG
TAX	-2.4417***	-2.6791***
	(-3.64)	(-3.55)
UNDERTAX	-0.2297*	
	(-1.72)	
OVERTAX		0.5164***
		(2.69)
GDI	0.5965***	0.4613***
	(3.51)	(3.40)
FDI	0.5368***	0.4659***
	(3.21)	(3.11)
OPEN	0.0466***	0.0338**
	(2.74)	(2.12)
INF	0.2584**	0.2368**
	(2.28)	(2.21)
Cons.	12.2095**	16.2099**
	(2.16)	(2.54)
Observations	171	171
Groups	9	9
Sargan-Hansen test	0.9621	0.6527

Note: *, **, *** respectively show the results at the significance level of 10%, 5% and 1%; ( ) is t-test results.

The results presented in Table 4 show that when the tax revenue exceeds 14.65 percent, its negative impacts on economic growth will be reduced. Because taxes are an essential source of government revenue, securing this revenue helps relieve the fiscal deficit pressure. This study emphasizes that the shape of the optimal tax is sensitive to the fiscal pressure that the government faces, as in Diamond and Rajan (2001) and Saez (2004). Besides, this study focuses on optimal tax revenue instead of optimal tax rates; thus, economic growth can be achieved as soon as tax revenues increase if they are implemented correctly (Kakaulina, 2017). Also, our results support that maintaining low tax revenue has no benefit to the government's budget balance. It increases public debt pressure if deficit financing is used to finance public spending, causing uncertainty in future investment and targeted growth. Furthermore, lower taxation creates a resource

gap, significantly hindering public investment even in important sectors where the private sector is not particularly interested. Hicks et al. (1963) imply that a change in government expenditure leads to a change in tax revenues based on the tax–expenditure theory. Therefore, our findings support the neoclassical economic growth theory and emphasize that determining the appropriate level of tax revenue in GDP is a key concern to solve fiscal problems and ensure higher growth.

In the rest variables of the models, the openness of the economy (OPEN) was found to affect economic growth positively. Nguyen et al. (2020) emphasize that the openness of the economy increases the flow of capital and technology transfer, important factors of the economic development process. Inflation (INF) was found to affect economic growth positively. In this respect, we note that the average inflation rate in the sample of ASEAN countries in 2000-2020 has never exceeded 3.65 percent, except in 2008 with the financial crisis. Moreover, the inflation rate in the region has tended to decrease in recent years gradually. Consistent with the views of Phiri (2018), Khoza et al. (2016), who believe that target inflation should be kept at 5.4 percent – 8.0 percent, it will boost economic growth. These findings are consistent in all empirical models.

Conclusion

The purposes of our study focus on the relationship between tax revenue, investment, and economic growth, taking into account the non-linear effects of tax revenue. This study used the macro data of nine countries in ASEAN (including Brunei, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam) in 2000 - 2020, extracted from the World Bank database. This study also employed instrumental-variable regression to overcome endogenous problems and autocorrelations that might arise in the research model. This study's theoretical contribution is that it provides evidence concerning the direct effect of tax revenue and investment on economic growth with a broader understanding of the tax and investment contributions in the ASEAN. This study found statistical evidence of an adverse effect of tax revenue on economic growth, implying that higher tax restricts productivity-enhancing activities and discourages accumulated investment and labor participation in the productive sector and working hours. However, when considering the non-linear effects of tax revenue, the empirical findings showed that higher tax revenue could reduce the disadvantages of tax impacts to boost economic growth. Our results support that maintaining low tax revenue has no benefit to the fiscal deficit, increasing public debt pressure if deficit financing is used to finance public spending. Thus, we support that increasing tax revenues can achieve economic growth if implemented correctly. Our findings are similar to prior studies, which suggest that tax revenue did not have a stable impact on economic growth in different periods (Gale et al., 2015; Garcia & von Haldenwang, 2015).

This study uncovered that the improvement in investment could enhance economic growth, including foreign direct investment and gross domestic investment. Notably, investment brings the infrastructure as well as labor demand, technology transfers, and knowledge spillovers. According to the neoclassical theory, its improvement will increase

the economic growth, which is related to the total number of labor, physical capital, and technological level to achieve a steady situation. Thus, investment maintains economic productivity, capital generation, development progress, and exports, which play the primary keys to economic growth (Omri & Kahouli, 2014). As our contributions, this study provides consistent evidence of investment's positive effect on economic growth in ASEAN countries during the research period.

Other contributions of this study are giving some main implications for policymakers. Firstly, to expand tax revenue, a broad-based tax strategy is needed that focuses on all key areas of the tax system with measurable results. We believe that a tax system should focus on the ease and simplicity to implement, prioritizing transparency and efficiency, while the more challenging aspects should be postponed until positive results are recorded. Second, the government needs to improve its tax collection responsibility and ensure taxpayers' compliance, so it must focus on improving management capacity through training. To avoid loss of tax revenue, the government needs to strengthen the inspection and examination of the implementation of solutions to prevent loss of revenue in the e-commerce activities, anti-transfer pricing, and strictly manage tax refunds. Thirdly, transparency is also crucial; therefore, tax revenue and related expense information with detailed breakdowns must be available online to all stakeholders. Finally, investment incentives need to be promoted. Basically, the government needs to reform the institutional environment, create competition, and protect property rights, thereby strongly attracting both domestic and foreign investment flows. In addition, supportive policies on capital, technology, human resources, and markets need to be continuously implemented to encourage increased investment activities. At last, the opening of the economy attracting more foreign direct investment also contribute positively to economic growth.

However, this study was limited by looking at the tax revenue ratio overview, ignoring the tax structure due to the lack of data collection. Thus, the following studies need to clarify the tax structure of ASEAN countries to determine which tax gives a negative impact/and which tax has a positive effect on economic growth.

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