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Men Thi Bui; Ngo, Hang Thi; Giang Thi Cam Nguyen; Duong, Ha Ngan

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Tax Revenue in ASEAN: Impact Factors and Policy Recommendations

Men Thi Bui, Hang Thi Ngo, Giang Thi Cam Nguyen[†], Ha Ngan Duong

Faculty of Finance, Banking Academy of Vietnam, No. 12 Chua Boc Street, Hanoi City, Vietnam

ABSTRACT

Purpose: The paper aims to identify the factors that impact the budget revenues of countries in ASEAN economies. **Design/methodology/approach:** The paper applies fixed effect and random effect models on a 25-year database of ASEAN economies from 1991 to 2020.

Findings: The research reveals that various factors such as trade openness, industry structure, inflation, and tax payment time have a significant impact on tax collection. However, no linkages between tax revenue and foreign direct investment demand and education levels. Factors including industrial proportion (IND), inflation rate (INF), trade openness (IMP), time to pay tax (TIME), and Agricultural added value (AGR) together significantly and statistically affect the tax revenue (TAX). Of these, variables that have a positive relationship with TAX include AGR, IND and TIME while INF is negatively related to tax.

Research limitations/implications: The data from 2021 onwards has not been analyzed due to a lack of necessary data, which could show the impact of the COVID-19 pandemic on production and business and its effect on tax revenue.

Originality/value: After a comprehensive and thorough variable selection and research design tailored for ASEAN economies, other than estimates on IND, IMP, and INF which are significantly consistent with most of the precedent literature, our research has reached some interesting findings recorded in our new variable (TIME), AGR, and FDI.

Keywords: Tax, Policy, Tax Revenue, Foreign direct investment, Panel data

I. Introduction

Tax is an important source of revenue for the state budget. The promulgation and implementation of a specific tax regime in any country in the world is always focused on mobilizing reasonable revenue sources for the state to finance public spending, investment, and social security.

ASEAN economies have faced fiscal pressure in

recent years. Except for Brunei, most economies in the region have significant state budget deficits. The entire ASEAN region recorded an average budget deficit of about 1.5% of GDP in 2018. Nine countries are expected to face an average budget deficit of 4.2% of GDP in 2020. Within the last two decades, seven ASEAN countries have witnessed persistent budget deficits. Countries such as Singapore, Laos, Vietnam, and Malaysia are under great pressure from public debt with its share to GDP surpassing 50%. Fiscal pressures make it difficult for many countries to provide public goods and improve people's welfare. According to the Asian Development Bank, roughly

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[†] Corresponding author: Giang Thi Cam Nguyen E-mail: giangntc@hvnh.edu.vn

23.4 million ASEAN people (accounting for 3.7% of the collective 650 million population) are living in extreme poverty conditions (less than \$1.90 per day) by 2021 (Lema, 2021).

Amidst the context in which governments are facing increasing spending needs and public debt, expanding the tax base or increasing tax rates becomes increasingly difficult. The average budget revenue-to-GDP ratio in the region is 19.1%, this ratio is lower than that of Latin America and the Caribbean, less than half the average level of other OECD countries.

In addition, deep international and regional integration with noticeably increasing trade openness both in size and degree, speeding the removal of tariff barriers, leads to a decline in the import tax revenue. Besides, aiming for investment liberalization under the financial integration process, some countries in the region apply corporate income tax incentives to attract investment capital and support businesses facing difficulties due to the epidemic and this has negatively affected the tax revenue. The region's average corporate income tax rate has decreased from 25.1% in 2010 to 21.7% in 2020. Countries have restructured state budget revenues following the trend of increasing indirect tax collection (value added tax and special consumption tax) to compensate for the decline in revenue from other taxes.

In this regard, identifying important factors affecting tax revenue plays an important role in creating a solid basis for designing appropriate and feasible guidelines and solutions to execute the best taxation practice and exploit appropriate and effective revenue sources from taxes for the state budget.

Although many previous studies focused on clarifying the factors that affect a country's tax revenue, tax research in regional associations such as ASEAN is quite limited, leaving room for further studies and discussion.

Our study's novel contributions include: (1) our study certainly enriches the field of research on tax-related issues; (2) our research model is welldesigned with a careful selection process of potential explanatory variables along with the inclusion of a new expected factor driving tax revenue - tax preparation and payment time ; (3) our findings reveal important factors that have a significant impact on tax revenues and provide valuable results for policymakers as outlined above; (4) The research findings also provide a solid and firm foundation for our proposed solutions to effectively increase tax revenue for the state budget.

The structure of this article is arranged in the following order: The introduction presents the rationale for our study and its novelty; Research overview discuss the results of previous related studies and the identified primary determinants of tax collection; Research model and data collection; Research results and discussion; Conclusion, implications for better tax collection practice in ASEAN economies.

II. Literature Review and Hypotheses

Numerous studies have explored the factors that affect tax revenue, focusing on the differences in tax income across countries. The main cause of differences in tax revenues is the level of development per capita (GDP)(Gupta, 2007; Pessino and Fenochietto, 2010), specialization production or the structure of the economy, as reflected in the contribution of each sector or industry group to GDP (Karagöz, 2013), external factors such as the level of foreign direct investment (FDI) (Gupta, 2007; Bird et al., 2008).

In addition, some recent studies have added factors such as inflation and trade openness that can affect tax revenue. As the integration process deepens, many studies focus on estimating the effect of trade openness on taxes. Trade liberalization is primarily thought to be related to tax collection through its effect on tax revenue from international trade.

Several studies have examined the factors affecting tax revenue in different regions and time periods. Gupta (2007) studied the factors affecting the tax revenue of 105 developing countries from 1980 to 2004. This study concluded that GDP per capita, trade, foreign aid, and other indicators of economic stability have a positive relationship with tax revenue, while the agricultural sector is negatively related to tax revenue.

Bird et al. (2008) investigated the relationship between the tax revenue of 110 developing countries in the 1990s. The analysis showed that GDP per capita, population growth rate, and net import and export rates are negatively related to tax revenue, while the non-agricultural sector and the government accountability index are positively correlated with tax revenue. Ajaz and Ahmad (2010) examined the factors affecting the tax revenue of 25 developing countries in the period 1990-2005, thereby concluding that the industrial sector and good government governance affect the tax revenue of 25 developing countries has a positive effect on tax revenue.

Pessino and Fenochietto (2010) analyzed the factors affecting the tax revenue of 96 countries for the period 1991–2006. They concluded that GDP per capita, the openness of the economy and the rate of public investment in education are positively correlated with tax revenue. The study also showed a negative relationship between inflation, agricultural value-added ratio and tax revenue.

Imam and Jacobs (2014) researched 12 Middle Eastern countries and found that inflation had a positive impact on income from taxes, while GDP per capita had a negative effect on tax revenue.

Ayenew (2016) examined the factors affecting Ethiopia's tax revenue for the period 1975-2013. The results showed that the industrial sector, GDP growth, and foreign aid have a positive impact on tax revenue, while the inflation rate negatively influences tax revenue.

Regarding research data and methodologies, Dioda (2012) used panel data to analyze 32 Latin American and Caribbean countries for the period 1990-2009. The results showed that civil liberties, the number of female workers, age structure, political stability, education level, and population density have a positive impact on tax revenue, while the agricultural sector and the size of the underground economy deteriorate tax revenues. Some recent studies have employed static and dynamic panel data techniques employing

static (pooled Ordinary Least Squares (OLS), fixed effects (FE) model, random effects (RE) model and dynamic panel data (system-generalized method of moments) regression techniques.

Generally, most studies focus on the factors that affect tax revenue; however, there is a lack of clear explanations on the mechanism of impact of these factors in the relationship between taxes and factors. Further research is needed to clarify how different factors impact tax revenue, what factors are responsible for positive or negative relationships with tax revenue, and why. Many countries have made significant efforts to reduce the cost and time of tax compliance, so any tax reforms aimed at saving time or tax compliance costs could affect tax revenue, and therefore, should be studied further.

III. Research Methodology

A. Data Collection

For the regression test, the research team conducted a study based on the World Bank's World Development Indicators data of 9 ASEAN countries including Vietnam, Laos, Cambodia, Indonesia, Thailand, Malaysia, Myanmar, Philippines, and Singapore in a 25-year database, from 1991 to 2020. Due to missing values in the data of Brunei, the study finally works with the data set of 9 out of 10 studied countries. The majority of Southeast Asian countries are characterized by an export-based economy and a relatively high savings-to-GDP ratio of 30% on average.

B. Variable Selection

Specifically, to in the Table 1, to assess the factors affecting state budget revenue from taxes of ASEAN countries, the study uses fixed effects (FEM) and random effects (REM) models based on panel data collected on changes in tax revenue; the ratio of industry and agriculture to GDP; trade openness, inflation; attracting FDI level; tax payment hours; educational level of ASEAN countries.

1. Dependent Variable: Tax revenue (TAX)

Tax revenue is calculated as a percentage of GDP remitted to the state budget from all taxes. It is calculated by dividing the total tax collected by the national GDP.

2. Independent Variables

1) Agriculture's share of GDP (AGR)

Gupta (2007), Pessino and Fenochietto (2010), Dioda (2012), Castro and Ramirez (2014) show that the agricultural sector is negatively correlated with tax revenue since agricultural industry is usually offered different tax incentives, tax exemptions and reductions which deteriorate the tax sources of the government. Meanwhile Ajaz and Ahmad (2010), Imam and Jacobs (2014), and Ayenew (2016) suggest that the agricultural sector even has no impact on tax collection. In detail, Imam and Jacobs (2014) recognized that in developing, low-income countries that are heavily dependent on the agricultural sector comprised from various, fragmented entities with small-sized trades of agricultural products, it is more difficult to collect taxes.

2) Industry to GDP ratio (IND)

The impact of this element on the tax revenue is believed to be objective to that of the agricultural industry's share. Specifically, Castro and Ramirez (2014), and Ayenew (2016) successfully tested a positive relationship between the industrial sector and income from tax.

3) Imports to GDP (IMP)

Previous scholars often use the size of imports and exports to represent trade openness. The size of international trade reflects how open a country is to international trade. This is an important factor in determining tax revenue, as taxes on international trade are one of the important sources of revenue in many countries.

However, we believe that the combination of both import and export in practice are taxed, but the applicable tax rates are different and are often changed in different trends. It is more useful to distinguish the import/GDP ratio instead of calculating the total import/export turnover/GDP. It is like an indicator of the tax base for tariffs.

With the ratio of imports / GDP representing an indicator of the openness of the economy, it partly reflects the competitiveness of domestic enterprises with imported goods in the economy. This approach is also done in the study by Morrissey, O., Von Haldenwang, C., Von Schiller, A., Ivanyna, M., & Bordon, I. (2016).

Studies on the relationship between trade size and tax revenues have shown mixed results. Gupta (2007), and Pessino and Fenochietto (2010) show that an increase in trade volume increases tax revenue, while Bird et al. (2008) reach the opposite conclusion. again. Research by Ajaz and Ahmad (2010), Castro and Ramirez (2014), and Imam and Jacobs (2014) did not find any association between trade volume and tax collection.

4) Inflation Rate (INF)

Castro and Ramirez (2014) pointed out the adverse effects of rising inflation rates on tax revenues.

5) Foreign Direct Investment (FDI)

FDI occurs when an investor from one country (the investor country) acquires real estate in another country (the invested country), along with the right to manage that property. Research by Gupta (2007) and Ayenew (2016) shows that FDI has a positive effect on tax collection, while the study of Castro and Ramirez (2014) shows a negative relationship between FDI and tax collection. Many studies have shown that FDI inflows increase the country's competitiveness and, therefore, increase the tax base.

6) Time to prepare and pay taxes (TIME)The optimization of the tax system to overcome

the risks of eroding the tax base, the amount of tax payable to the state budget and especially the reform of tax administration has been focused on by many countries. To analyze the effectiveness of tax administration and tax burden, several studies have been conducted to improve tax administration. To measure the effectiveness of tax administration, most studies use the time to prepare and pay taxes or time to tax compliance (Kushneruk & Alekseienko, 2020). The results are quite unanimous that good tax management contributes more and more effectively, reducing the risk of tax evasion and thus helping to improve tax revenue.

7) Educational Qualification (SCH)

Dioda (2012) found that the average education level of the population has a positive impact on tax revenue. This makes sense: a country with a high level of education will have quality human resources. with sophisticated production methods lead to production efficiency and hence, increase tax revenue.

Apart from these seven factors that are potentially associated with the national tax value of ASEAN economies, of which TIME and an alternative proxy of trade openness are first examined for ASEAN cases, we have thoroughly assessed and considered the inclusion of some other variables into the regression model - the political stability and the tax reform. We finally decide to not incorporate those expected factors into the model.

For the first variable, we believe that each country has a different political system and way of operating its economy. Therefore, the government will reform the tax system differently, and the country has no single tax system template. Political stability is not the key to tax policy, the stability of taxes as a percentage of GDP tends to be relatively consistent (Tiwari, A. K. 2013). This result is accurate in ASEAN countries, where the state apparatus is divided according to legislative, executive and judicial powers. In which, the highest legislative body (the National Assembly) is responsible for supreme supervision over the activities of the State. When election activities change the ruling team in the government, the State, still collects taxes to ensure the continuous operation of the state apparatus.

For tax reform, to construct a dummy proxy for the tax reform exercise in studied ASEAN economies. we have tried and detected specific time points for each country in the research when the corresponding country experienced significant change or structural so-called change in the tax system. Yet, the problems arise. First, types of tax reform are not uniform. Some countries applied reforms in the tax design (tax rate, taxable income...) like Vietnam, Lao, Philippines, while other countries, like Cambodia, adjusted their administrative rules and procedures. Second, our limited access to countries' tax systems and information has refrained us from tracking their tax reform strategies and roadmap, we could not find any information about Myanmar and Malaysia. For these handicaps, the tax reform is not examined in our case.

C. Methodology

To estimate the regression model according to panel data, three approaches are commonly used fixed effects model (FEM) and random effects model (REM).

We estimate the aforementioned regression equation using three methods including pooled ordinary least squares (OLS), fixed effects (FE) and random effects (RE); of which OLS is performed assuming exogenous regressors, then, the last two models are used to control unobserved country and time-varying characteristics.

The Breusch and Pagan Lagrange Multiplier test is applied to provide us with information to lean towards the simple OLS or the alternative model with the inclusion of random effects. If pooled OLS is suggested by the test to be not a suitable model and simultaneously the random effect is significant for treating our database and research question, we proceed our study with FE, RE models.

Adopting Castro and Ramirez (2014), regression equations for fixed effect and random effect models are formed as:

$$TAX_{it} = \alpha + \beta_1 AGR_{it} + \beta_2 IND_{it} + \beta_3 IMP_{it} + \beta_4 INF_{it} + \beta_5 FDI_{it} + \beta_6 TIM_{it} + \beta_7 SCH_{it} + u_i + \epsilon_{it}$$

where i and t represent country i and year t

Continuously, the Hausman test is proceeded to help us to finalize the best fit model. Besides, to reach appropriate model specification and reliable findings, the study also detects and handles the existence of possible model flaws including multicollinearity, heteroskedasticity and autocorrelation issues by applying VIF test and incorporating robustness options in running regression with panel data.

As for the potential emergence of autoregressive

nature of the tax revenue, we additionally run dynamic panel model specifications with Generalized Method of Moments (GMM) to incorporate the lagged terms of the dependent variable (tax revenue) into the regression equations.

$$TAX_{it} = \beta_0 + \beta_1 TAX_{it-j} + \beta_2 AGR_{it} + \beta_3 IND_{it} + \beta_4 IMP_{it} + \beta_5 INF_{it} + \beta_6 FDI_{it} + \beta_7 TIM_{it} + \beta_8 SCH_{it} + u_{it}$$

Where: j represent lag level of the dependent variable

Notation	Description	References
TAX	TAX is tax revenue, measured as a percentage of the year's tax revenue to GDP. We use the natural logarithm of the tax revenue.	Gupta (2007), Imam and Jacobs (2014)
AGR	AGR is the percentage of value added by the agricultural sector to the GDP	Gupta (2007), Pessino and Fenochietto (2010), Dioda (2012), Castro and Ramirez (2014)
IND	IND is the percentage of industrial value added to GDP	Castro and Ramirez (2014), and Ayenew (2016)
IMP	IMP is the import turnover of goods and services per GDP. We use the natural logarithm of imports relative to GDP	Morrissey, O., Von; Haldenwang, C., Von; Schiller, A., Ivanyna, M., & Bordon, I. (2016); Gupta (2007), and Pessino and Fenochietto (2010); Bird et al. (2008); Ajaz and Ahmad (2010); Castro and Ramirez (2014); Imam and Jacobs (2014)
INF	INF is the inflation rate, as measured by a consumption price index that reflects the annual percentage change in the cost it takes the average consumer to obtain a fixed or unfixed basket of goods and services, changing over specified periods, i.e. annually.	Castro and Ramirez (2014)
FDI	FDI is foreign direct investment, measured as a percentage of FDI inflows to GDP	Gupta (2007) and Ayenew (2016), Castro and Ramirez (2014)
TIME	TIME is the time to prepare tax returns and pay taxes, in Logarithms of the base natural number of hours per year, for tax returns and tax payments (or withhold) of three main taxes: corporate income tax, value-added tax (sales tax) and personal income tax, including payroll taxes and social security contributions.	Kushneruk & Alekseienko, 2020
SCH	SCH is Educational Qualification as measured by the university pass rate	Dioda (2012)

Table 1. Description of variables

IV. Result Discussion

Based on the results of Pearson matrix in the Table 3 (no correlation value surpasses 0.8) and the VIF test result in the Table 4 (all estimated values are below 10), the model shows no existence of multicollinearity among the variables.

Results from the Hausman *test* (Null hypothesis: difference in coefficients not systematic) with probability value of being 0.9981, which is higher than 5% significance level, suggests that the random effect model (REM) is more appropriate for this research design and research question.

We also further employ GMM models to explore the presence of previous tax revenue's effect (L.TAX), yet the conditions of GMM models (AR1, AR2) are not met (AR1 should be statistically significant while AR2 should be not, according to Arellano & Bond (1991)), showing the inappropriate application of GMM model. In other words, there could be a potential of no effect from previous tax revenue. This further confirms the fit of the REM approach to our research design.

The REM model is eventually repeated with a robust cluster approach to eliminate the possibility of varying variance and autocorrelation in the chosen REM model to attain the most reliable and stable estimators of the model (the slope estimates).

From the regression results in the Table 5, it is obviously that while the FDI variable and the education level (SCH) carry no impact on the national tax revenue of researched countries, other factors including industrial proportion (IND), inflation rate (INF), the trade openness (IMP), time to pay tax (TIME), Agricultural added value (AGR) together

variable	Ν	mean	p50	Std.	min	max
TAX	239	14.15	13.80	2.94	7.54	23.40
AGR	240	16.85	13.97	11.74	0.03	51.85
INF	240	6.62	3.98	12.20	-5.99	127.97
IND	240	32.99	33.08	8.16	12.65	48.53
IMP	236	135.98	111.78	93.90	33.19	437.33
FDI	240	5.66	3.56	6.06	-2.76	32.17
TIME	120	5.42	5.27	0.70	3.89	6.96
SCH	225	16.98	13.69	18.00	0.00	91.09

Table 2. Description of data statistics

Source: Authors' estimates

Table 3. Pearson correlation matrix

TAX AGR INF IND IMP FDI TIME SCH TAX 1.00									
TAX 1.00 AGR -0.24*** 1.00 INF 0.00 0.32*** 1.00 IND 0.37*** -0.055*** -0.08 1.00		TAX	AGR	INF	IND	IMP	FDI	TIME	SCH
AGR -0.24*** 1.00 INF 0.00 0.32*** 1.00 IND 0.37*** -0.55*** -0.08 1.00	TAX	1.00							
INF 0.00 0.32*** 1.00 IND 0.37*** -0.55*** -0.08 1.00	AGR	-0.24***	1.00						
IND 0.37*** -0.55*** -0.08 1.00	INF	0.00	0.32***	1.00					
	IND	0.37***	-0.55***	-0.08	1.00				
IMP 0.16** -0.60*** -0.23*** -0.05 1.00	IMP	0.16**	-0.60***	-0.23***	-0.05	1.00			
FDI 0.05 -0.30*** -0.16** -0.31*** 0.75*** 1.00	FDI	0.05	-0.30***	-0.16**	-0.31***	0.75***	1.00		
TIME -0.28*** 0.01 0.07 -0.22** -0.09 0.04 1.00	TIME	-0.28***	0.01	0.07	-0.22**	-0.09	0.04	1.00	
SCH 0.02 -0.16** -0.08 0.32*** -0.03 -0.10 -0.08 1.00	SCH	0.02	-0.16**	-0.08	0.32***	-0.03	-0.10	-0.08	1.00

Note: * p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimates

Variable		P. Squarad		
variable	VIF VIF		Tolerance	K-Squared
TAX	1.21	1.10	0.82	0.18
AGR	3.27	1.81	0.31	0.69
INF	1.44	1.20	0.69	0.31
IND	2.87	1.69	0.35	0.65
IMP	4.09	2.02	0.24	0.76
FDI	2.83	1.68	0.35	0.65
TIME	1.23	1.11	0.81	0.19
SCH	1.19	1.09	0.84	0.16
Mean VIF	2.27			

Table 4. VIF test result

Source: Authors' estimates

Table 5. Model specifications: Pooled OLS, fixed effect and random effect models

	(Pooled OLS)	(REM)	(FEM)	(GMM)	(GMM)
	TAX	TAX	TAX	TAX	TAX
L.TAX				-0.9109 (-0.38)	-1.3438 (-0.83)
AGR	0.2039*** (3.97)	0.2039*** (3.97)	0.1242 (1.06)	-2.577 (-0.78)	-0.6954 (-0.68)
INF	-0.0946* (-2.18)	-0.0946** (-2.18)	0.0402 (0.78)	-0.4158 (-1.53)	0.1054 (0.88)
IND	0.2301*** (4.43)	0.2301*** (4.43)	0.2799* (2.17)	-2.1648 (-1.4)	-0.7617 (-0.67)
IMP	0.0178** (3.50)	0.0178*** (3.50)	0.0159** (2.53)	-0.3114 (-0.53)	-0.0490 (-0.41)
FDI	-0.0015 (-0.03)	-0.0015 (-0.03)	0.0898 (1.37)	0.8733 (0.16)	1.0604 (0.94)
TIME	0.8849** (3.06)	0.8849*** (3.06)	0.1539 (0.23)	36.4968 (1.00)	12.3056 (0.87)
SCH	0.0026 (0.13)	0.0026 (0.13)	0.0127 (1.01)	0.0008 (0.00)	0.1521 (0.48)
Year Dummy	YES	YES	YES	NO	NO
Firm FE	NO	NO	YES	NO	NO
AR1				0.203	0.707
AR2				0.440	0.939
Sargan				0.000	0.000
Hansen				1.000	1.000
_cons	-1.2237 (-0.30)	-1.2237 (-0.30)	0.8742 (0.11)	0.0000 (.)	0.0000 (.)
Ν	120	120	120	116	116
R^2	0.690	0.6068	0.666		

t statistics in parentheses; * p<0.1, ** p<0.05, *** p<0.01 Source: Authors' estimates

significantly and statistically affect the tax revenue (TAX). Of which, variables that have a positive relationship with TAX include AGR, IND and TIME while INF is negatively related to tax.

After a comprehensive and thorough variable selection and research design tailored for ASEAN economies, other than estimates on IND, IMP, INF which are significantly consistent with most of precedent literature, our research has reached some interesting findings recorded in our new variable (TIME), AGR, and FDI.

AGR has a positive effect on tax revenue. Our research results show that AGR is positively proportional to tax, different from the initial hypothesis of this study. As discussed earlier, in developing countries most agricultural development is based on households, so it does not create large taxable surpluses (Gupta, 2007). In addition, policies to support agriculture are under many forms, including incentives, tax exemptions and reductions for income from agricultural products and related services. When this portion is reduced, there is a positive effect on tax revenue (Gupta, 2007). Yet, the share of agriculture to GDP is found to be significantly and positively associated with tax revenue of examined countries.

This can be explained because agriculture is a key sector in Southeast Asian economies. Agriculture accounts for about 11% of ASEAN's gross domestic product (GDP) by 2020. In countries like Cambodia and Myanmar, the sector contributes more than 20% to the national GDP. The differences in support policies and business models of Southeast Asian countries and developed countries are: Due to the scale and overall structure of the economy, the economic structure of developed countries is stable. The agricultural structure grows strongly, it will lead to a narrowing of the industrial and service structure, changing the overall structure of the economy. On the other hand, the industrial and service sectors are sectors that contribute to large GDP for the developed economy, generating a large amount of taxes paid into the State budget. Therefore, in these countries, the AGR variable has a negative impact on tax revenue. On the opposite, for developing countries, the economic structure is still in the process of expansion and growth, when there is a change in the agricultural structure, other sectors are affected very little and there is almost no change. Structural changes in the economy with other sectors should impact in the same direction. In addition, agriculture in Southeast Asia is in a period of technological transformation. For example, smartphones, AI and Big data to control crop management more efficiently, while drones are helping farmers improve farming practices and increase crop vields. Besides technological transformation, urban farms are key to building a stronger food system in cities that tend to rely heavily on food iI imports. These farms provide a buffer for the supply to the market, in case the food supply chain is disrupted. Urban agriculture also allows farmers to grow a variety of produce year-round. By using soilless agricultural systems such as aeroponics or hydroponics. Indoor hi-tech farms can be more productive than traditional farms. Farmers are also using e-commerce platforms to sell directly to urban consumers.

However, the ratio of agriculture to GDP in many ASEAN countries has been following a downward trend for recent years. This calls for government's support to improve the performance of the agriculture sector and consequently the tax revenue of the nation.

IND (industrial proportion) is positively associated with tax revenue: This result is similar to the reported findings in Velaj & Prendi (2014) and Basirat et al. (2014). In most developing countries, the industry is focused on further development and prosperity of the country and there is a large shift of national resources and support from other sectors to the industrial sector. This has led to a promising increase in the added value created by manufacturing firms and related industries, bringing the following increase in tax revenue. Besides, collecting tax revenue from the industrial sector through corporate income tax, sales tax, special consumption tax, and even personal income tax of the labor force in this industry is considerably easier than in fragmented agriculture areas (Gupta, 2007). It is desirable to boost the added value of the manufacturing and industrial products so that the government, in consequence, could collect more taxes.

Import turnover of goods and services (IMP) positively affects tax revenue: This result is consistent with the published studies of Gupta (2007), and Pessino and Fenochietto (2010), showing that an increase in trade volume leads to an increase in tax revenue. Tax incentives for imports into ASEAN are applied in a variety of ways, including the implementation of bilateral and multilateral free trade agreements and the formation of the ASEAN economic community. These policies contribute to promoting the development of trade in goods and services. In many ASEAN countries, tax revenue on goods and services trade is one of the important sources of revenue.

INF (inflation rate) negatively affects tax revenue: This result reinforces the conclusion of Pessino and Fenochietto (2010); Castro and Ramirez (2014); Ayenew (2016). Inflation is used to measure the economic policy environment. It reflects the impact of macroeconomic policy. The literature regarding the impact of inflation on total tax revenues is diverse and difficult to describe. Some previous literature shows that high inflation increases total tax revenue, but recent literature suggests that this situation depends on choosing lags. The combination of high inflation, a relatively long average lag in tax collection, and the inelasticity of the tax system results in a sharp decline in real tax revenues when inflation occurs.

TIME (time to pay tax) positively affects tax revenue: Reforms to shorten tax compliance time contribute to promoting tax compliance of people and businesses, to minimize the risk of tax loss. This has a positive impact on tax revenue. Southeast Asian countries have been striving to improve their business environment and national competitiveness by implementing plenty of reforms. One area of focus has been tax reform, which includes simplifying administrative procedures, introducing online tax collection and payment, adopting electronic invoices, and automating the process of receiving and processing documents. These efforts have led to a reduction in the time taken for tax compliance by individuals and businesses, which in turn has helped to minimize the risk of tax loss and increase tax revenue. The ASEAN-6 group of countries, for instance, has managed to reduce the average tax payment time to about 171 hours per year. This has enabled taxpayers to stabilize, expand and develop their production and businesses, while also creating sustainable revenue sources for the state budget. Moreover, more effective tax management has prevented revenue loss and transfer pricing.

V. Conclusion and Policy Recommendation

After analyzing data from ASEAN countries, we have confirmed that the tax revenue of these countries is influenced by factors such as the share of the industrial sector, inflation, and import turnover. We have also identified a new element, tax payment time, which has a positive impact on tax revenue, suggesting that ASEAN countries' efforts to streamline tax administrative procedures have been successful in reducing tax compliance costs and time for businesses and taxpayers, which can increase tax compliance and tax revenue. Additionally, we have found that agriculture and trade openness play a crucial role in mobilizing tax revenue. As ASEAN countries have a high proportion of agricultural structure to GDP, it is necessary to focus on corporate income tax incentives for the production of machinery and equipment and inputs for the agricultural sector.

To improve tax revenue, we recommend that ASEAN countries focus on expanding the manufacturing sector to meet the growing demand of the aging and fast-growing population. They can also encourage the development of new industries such as logistics and automobile, through policies such as subsidies and tax incentives. Furthermore, it would be beneficial to promote research and development activities in clean agricultural products and high-tech agriculture by providing tax incentives and land duty reductions. Creating a value chain for each type of agricultural product connecting the global consumption system and improving agricultural and rural logistics infrastructure can ensure a sustainable state budget in the long run.

Lastly, ASEAN countries should continue to promote measures to save tax payment time for taxpayers, which would reduce tax compliance costs, increase tax compliance willingness, and prevent tax evasion.

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