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The Effects of Digitalization and GDP Per-Capita Growth on Tax Revenue in ASEAN Countries

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ABSTRACT

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Keywords

Digitalization GDP per-capita Tax Revenue ASEAN's digital economy is soaring up every year and bring potential additional tax revenue. In many countries, tax revenues dominate total state revenue but six out of ten ASEAN member countries couldn't optimize its tax revenue hence causing a social inequality and poverty This study aims to analyze the effects of digitalization indicated in internet penetration level and Gross Domestic Product per capita growth on tax revenue in ASEAN countries. Samples consists of 6 countries in ASEAN: Indonesia, Malaysia, Singapore, Cambodia, Philippines, and Thailand; with dataset of 15 years observation from 2005 to 2019. By using data panel multiple regression analysis in Fixed Effect Model, the results indicate that: (1) digitalization has significant and positive influence on tax revenue, (2) GDP per capita growth has significant and negative influence on tax revenue, and (3) simultaneously digitalization and GDP per capita growth have significant influence on tax revenue.

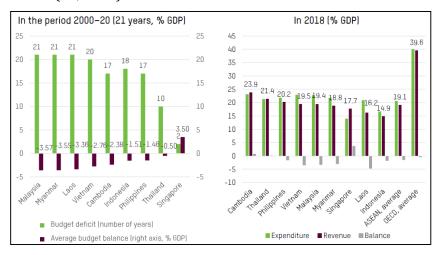
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Introduction

In many countries, tax revenue dominates total state revenue. Even in many occasions, up to more half of total state revenue comes from tax revenue (Phillai, 2016). Tax which is collected by tax authorities is one of the main sources of government revenue and used for providing public services, redistribution of income, and implementing fiscal policies to maintain country's economic growth rate (Putriana, 2020). In ASEAN region, six out of ten ASEAN member countries except Brunei Darussalam couldn't optimize its tax revenue hence there is a state budget deficit as pictured in Figure 1. This causes government to fail providing decent public services such as public health and education services which moreover will bring a social inequality and poverty that has happened in most of ASEAN countries (VEPR, Oxfam in Vietnam, The PRAKARSRA, & TAFJA, 2020).

Various variables has been used in previous research to determine factors affecting tax revenue; such as macroeconomic variable, financial variable, and institutional variables. However, variables related to information technology (IT) development like internet infrastructures are still quite rarely used. As we know, internet has a strong presence because it has the ability to facilitates communication which is the fundamental needs of society (Aryanto & Chrismastuti, 2011; Google, Temasek, & Bain Company, 2019). Internet adoption in economy also could minimize production cost, boost demand and investments, and also bring closer efficiency on allocating resources which can increase level output and economic growth thus can lead to the increase in tax revenue (Vu, 2011).



Source: VEPR, Oxfam in Vietnam, The PRAKARSRA, & TAFJA (2020)

Figure 1. ASEAN Member Countries' State Budget Deficit

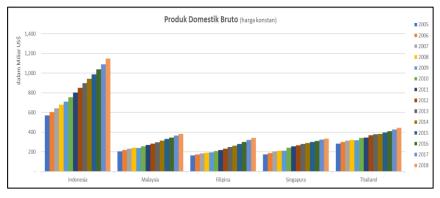
Cüneyt Koyuncu, Rasim Yılmaz, and Mustafa examined the relationship between Information and Communication Technology (ICT) penetration on tax revenues in 157 world countries in the period of 1990-2013. ICT penetration includes four indicators: penetration or number of internet users, cellular phone users, personal computers, and cable internet (fixed broadband) users. Meanwhile, tax revenue is described through three indicators: total tax revenue, goods and services tax (GST) revenue, and Value-Added Tax. This study concludes that the four ICT penetration indicators have a significant positive effect on tax revenue. In addition, this study also uses three independent variables in the form of GDP per capita growth, FDI, and market openness in testing their effect on tax revenue.

On the other hand, internet penetration or level of internet use fundamentally represents digital transformation because internet is main channel towards economic digitalization (Ndulu, Joseph, & Tryphone, 2021). The effects of digitalization could also be seen from the increase of economic inclusion, application of smart agriculture, deployment of online health and education services, e-Commerce, e-Government etc. (Ünver, 2014). ASEAN as one of the most populous region in the world has total Gross Merchandise Value based on internet transaction up to US\$ 100

billion in 2020, and it is estimated to grow up to US\$ 300 billion in 2025 (Google, Temasek, & Bain Company, 2019). It clearly shows that there still are big potential for additional tax revenue to be collected.

In line with that, leaders of ASEAN member countries have also declared ASEAN as a digital community and upfront economic bloc through "ASEAN Digital Masterplan (ADM) 2025" program (Setiawan, 2021). One of the expected outcomes from this program is digitally inclusive ASEAN, indicated by an increase of the number of population who can access internet. Thus, productivity can be increased as well as economic growth rate; in all aspects including business owners, individuals, and also government. From business owners' side, digitalization means less cost, efficiency, and new opportunities. From individual side as a consumer, adoption of internet based technology could increase access to many private or public services and improving their social welfare as a whole. And from government perspective, there are new opportunities to provide better public services, modernized public administration, and improved internal performances' efficiency which could lead to an increase in tax revenue (ASEAN Secretariat, 2021).

Tax authorities in many countries also have adopted IT and its development in their tax administration transformation. As an example, Inland Revenue Authority of Singapore (IRAS) provides MyTax Portal which could be easily accessed by taxpayers via internet to access various tax services provided, such as tax payment through QR code payment. In Indonesia, Directorate General of Tax (DGT) also utilize IT and provide internet based services such as e-Filing, e-Bupot, and online tax consultation through email and twitter. Digitalization of tax administration system could also minimize operational cost of collection of tax as well as cost of compliance arising on the taxpayers' side (Silvani & Baer, 1997). The modernization of tax administration system is done because a good system should be able to provide valid, credible, and real time data, thus could encourage an increase in tax compliance both material and formal (Rohmani, 2021). It's a fact that all these transformation and modernization of tax administration system could only be useful when most of the taxpayers' have a proper access to the internet.



Source: World Bank (2020)

Figure 2. ASEAN Member Countries' GDP

Prior researches with IT development related variables are relatively limited. Koyuncu, Yılmaz, & Ünver (2016) conclude that IT penetration in forms of internet penetration rate has positive effect on tax revenue. On the other hand, Hanrahan (2020) research conclude that digitalization that was indicated in Internet Proxy address has negative impact on tax revenue. Mallick (2021) also concluded that IT infrastructure didn't have any significant impact on tax revenue mobilization. These differences from prior researches are the research gaps which shows that this topic is still need to be studied more and as far as the author know there's still no similar research done in ASEAN countries. In ASEAN countries, digital transformation is going side by side with its economic growth. Gross Domestic Product (GDP) of ASEAN member countries during 2012-2018 periods are increasing yearly as pictured in Figure 2, on the other hand the tax revenue has been fluctuative (World Bank, 2020; IMF, 2020).

Economic growth is indicated by various indicators such as per capita GDP growth. The rising of digital economy and IT infrastructure are empirically in line with economic growth. Pradhan, Arvin, Norman, & Bele (2014) shows that the development of IT infrastructure and an increase to the number of internet users in a long run can stimulate GDP per capita growth. In addition, economic growth is an indicator for the increase of taxpayers' ability to pay taxes (Chelliah, 1975). The increase in GDP per capita also shows the increase of affordability of population on accessing internet and other digital services. Internet accessibility itself is one of the key enablers for a successful digital transformation, especially for middle-lower countries which are not yet fully digitally inclusive (Ndulu, Joseph, & Tryphone, 2021).

Hrushikesh Mallick (2021) conducted a study that examined the role of ICT infrastructure and governance quality on the mobilization of direct and indirect tax revenues in India for the period 1990-1991 and 2017-2018. ICT infrastructure is proxied in the form of an ICT infrastructure index which consists of 6 ICT-related variables: the number of internet users per one million population, the number of cellular phone users per one million population, the number of cable telephone users per one million population, the number of cable internet users (fixed broadband) per one million population, and electricity consumption. These variables are used in the research model to determine their effect on increasing tax revenue, which is hypothesized that ICT infrastructure can control the tax base and the quality of institutional factors such as accountability and regulatory quality. This study concludes that the ICT infrastructure and the quality of the government partially do not have a significant effect on the mobilization of tax revenues. Mallick (2021) also concludes that the adoption of ICT in the taxation system does not have much of an impact on the realization of tax revenues without correcting deficiencies in the tax administration itself.

Research conducted by Benno Ndulu, Cornel Joseph, and Karline Tryphone (2021) entitled Fiscal Regimes and Digital Transformation in Sub-Saharan Africa was published in the Digital Pathways Paper Series report. The object this study is countries located in sub-Saharan Africa and it examined how tax policy through tax incentives is connected with the transformation of the digital economy. This research concludes that it is important to have a trade-off between shortterm tax revenues and the opportunity cost of a higher tax revenues in the future through the use of positive externalities brought from the digital economy. The tax incentives presented to increase internet adoption in sub-Saharan Africa can increase the potential for tax revenue in the long term through economic and social development, although in the short term there is tax revenue that must be lost. Castro & Camarillo (2014) examines the factors that have a significant effect on tax revenues in 34 OECD countries for the period 2001 to 2011. These factors include economic, structural, institutional, and social factors. The results show that GDP per capita, industrial sector, and civil society liberties have a positive influence on tax revenue. In addition, these factors have a greater influence on high-income countries. Based on stated above, the contribution of the study on the effects of digitalization proxied in internet penetration level and GDP per capita growth on tax revenue in ASEAN countries.

Method

This research using quantitative research with dataset consisting of ASEAN member countries that match the criteria, namely having complete data related to research variables with the data observation year for the 2005-2019 period which consist of: Indonesia, Malaysia, Singapore, Thailand, the Philippines, and Cambodia. The independent variables used are digitalization and GDP per capita growth. Digitalization is proxied by internet penetration rate and GDP per capita growth is calculated as an annual percentage (annual growth rate). The dependent variable is tax revenue which is calculated in the proportion of tax revenue compared to GDP (% of GDP). The control variables used are the market openness and Foreign Direct Investment (FDI) to produce more accurate research results. Market openness is the percentage of exports and imports of goods and services in a country's GDP in a certain period. Countries that are more open in their trade, the tax revenues will increase due to an increase in the volume of trade that occurs and are more economically competitive (Gupta, 2007). Meanwhile, FDI is the value of foreign direct investment that enters a country within a certain period. FDI that enters a country increases tax revenues through the economic growth that investment brings (Castro & Camarillo, 2014). The following is the panel model in this study:

$$TR_{it} = \beta_0 + \beta_1 I T_{it} + \beta_2 G D P_{it} + \beta_3 F D I_{it} + \beta_4 O P_{it} + \varepsilon_t \tag{1}$$

Where, TR is tax revenue, IT is the internet access, GDP is the GDP per-capita, FDI is the foreign direct investment, OP is the openness, β_0 is the constanta $\beta_1, \beta_2, \beta_3, \beta_4$ are the value of coefficient variables, i notation for the cross-section, t notation for the time series and ε the value of error term. The research data was obtained from the World Bank's World Development Indicators, UNCTAD, International Telecommunication Union (ITU), and the ASEAN Secretariat which can be accessed publicly. Among three models for panel data regression such as Common Effect Model (CEM), Random Effect Model (REM), and Fixed Effect Model (FEM); analysis used to determine the relationship between research variables is panel data regression with Fixed Effect Model (FEM). FEM was chosen after several tests were carried out to select the best panel data regression model based on the data used such as Chow Test, Hausman test, and Breusch-Pagan Lagrange Multiplier Test. In addition, the F test, t test, and coefficient of determination were also carried out to support the testing and feasibility of the regression model.

Result and Discussion

To know the best panel data regression model, a series of tests were carried out. The chow test is used to determine between CEM and FEM and hausman test is carried out to determine whether FEM or REM is the most suitable model. Table 1 shows that chow test and hausman test that the most suitable model is the Fixed Effect Model (FEM) thus no further testing is needed such as the Breusch-Pagan Lagrange Multiplier Test.

Table 1. Result of Panel Data

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Variables	FEM
IT	0.041
	(3.440)***
GDP	-0.166
	(-2.172)**
FDI	3.70E-07
	(1.782)*
OP	0.033
	(2.881)***
_cons	0.069
	(3.444)***
Diagnostic Tools	
Adj R-Squared	0.469
Prob F-Stat	0.000***
Chow Test	0.000***
Hausman Test	0.000***

Source: processed data

The regression analysis shows that the value of Adjusted R-Square is 0.4690 or 46.90%. This shows that the ability of the independent variable in giving effect to the dependent variable is 46.90%. While the remaining 53.10% is influenced by other variables outside the regression model. The value of Prob(F-statistic) is 0.0000 which is smaller than the significance level of =

0.05. It shows that the independent variables simultaneously or together have a significant effect on tax revenue.

The digitalization variable which is proxied by the level of internet penetration has a Prob value of 0.0009 which is smaller than a significance level of 0.05 so that it can be concluded that it has a significant positive effect with a coefficient of 0.042 on tax revenue. This finding support with Koyuncu, Yılmaz, & Ünver (2016) which concludes that the penetration of Information and Communication Technology (ICT) factors has a positive effect on tax revenue. With the increasingly widespread application of technology including the internet or commonly referred to as digital transformation, companies operate more efficiently by reducing production costs so that the level of output produced also increases. In line with this, there has been economic growth which represents the potential for expansion of the tax base. Directly, digitalization affects the modernization of the tax administration system which makes tax business processes more efficient and increases tax revenue.

The GDP per capita growth variable has a Prob value of 0.0328 which is smaller than the 0.05 significance level and a coefficient of -0.165882. So it can be concluded that GDP per capita growth has a significant negative effect on tax revenue. This contradicts Castro & Camarillo (2014) and Gupta (2007) which show that GDP per capita has a positive effect on tax revenue. Tax revenue is expected to be in line with the GDP of economic development because it is assumed that an increase in people's income means an increase in the ability to pay taxes. Castro & Camarillo (2014) uses the object of OECD countries whose samples are more dominated by developed countries in terms of economic growth and tax capacity, so that the variables used in Castro & Camarillo (2014) have a greater influence on developing countries, high-income countries. Whereas this study, the sample used was 6 ASEAN countries consisting of one high-income country and five middle-income countries. This negative effect can be caused by the tax structure of developing and low-income countries that rely on corporate income taxes rather than consumption taxes and personal income taxes so that the increase in public income does not necessarily correlate with an increase in tax revenue.

However, the anomaly of the results is in accordance with the research of Chaudhry & Munir (2010), Chen & Mei (2011) and Putriana (2020). Chaudhry & Munir (2010) research conducted in Pakistan concluded that tax revenue in the tax-to-GDP ratio indicator decreases with increasing GDP per capita. This is possible when the level of tax evasion is still high and government leadership is not yet optimal. In addition, an increase in people's income will have different impacts on different types of taxes as well. The phenomenon of the growth rate of tax revenue which is higher than the GDP growth rate has been studied by Chen & Mei (2011) who concluded that the influence of government factors such as government quality and tax elasticity of a country plays a significant role in the existence of the negative effect on tax revenue. The quality of government in developing countries in implementing tax regulations that are less good than developed countries may cause the loss of tax potential that exists when the country's per capita income increases so that tax revenues remain sub-optimal.

Conclusion

Digitalization has a significant and positive effect on tax revenues in ASEAN countries. Digital technology brings efficiency in the company and increases production output, in line with this, the economy grows in with tax revenue. In addition, digitalization in tax administration can also bring efficiency in the tax collection process so that tax revenues can increase. Furthermore, GDP per capita growth is concluded to have a significant negative effect on tax revenue. This is partly due to the tax structure of the observed sample of countries, namely 6 ASEAN countries, of which 5 countries are categorized as middle-income countries which generally rely on corporate income taxes rather than individual tax so that the increase in public income does not necessarily correlate with an increase in tax revenues in general. In addition, it is possible that there are other factors such as the quality of government in developing countries that make tax revenues not optimal even though per capita income is growing. However, there are still limitations in this study because digitalization measurements are limited using internet penetration level proxies and this study only covered six countries out of a total of ten ASEAN member countries in the period 2005-2019 due to limited data availability.

For policy makers or tax authorities in ASEAN countries such as the Directorate General of Taxes in Indonesia, it is advisable to consider elements of technological developments in preparing tax policies both in the short and long term. In addition, it the technology adopted in the modernization of the tax administration system should be adapted to the conditions of readiness or digital literacy of the community so that the policy is more effective and efficient. For future research, other indicators in measuring digitalization may be used to add different perspective of the research. Tax revenue can also be measured using additional indicators such as indirect tax revenue to more tax-specific results.

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