The Dynamics Of Value Added Tax Revenue, Shadow Economy,And Fiscal Deficit: Moderating Effect Of Government Effectiveness

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ARTICLE INFO	ABSTRACT
	This study aims to determine the simultaneous and partial effects of the shadow economy and fiscal deficit on Value Added Tax (VAT) revenues in 14 G20 member countries using Government Effectiveness as moderation. Using quantitative descriptive research methods, data processing is done by panel data regression analysis and the econometric model used is Panel Corrected Standard Errors (PCSE). The results showed that the shadow economy, fiscal deficit, and the interaction of shadow economy and fiscal deficit with government effectiveness simultaneously have a significant effect on tax revenue in G20 member countries. Partially, the results show that the shadow economy has a negative and significant effect on VAT revenue, while the fiscal deficit has no effect on VAT revenue. The results of the interaction with government effectiveness weaken the negative and significant effect of the shadow economy on VAT revenue, and the interaction between fiscal deficit and government effectiveness has a positive and significant effect on VAT revenue in G20 member countries. Based on the results of this study, in an effort to optimize VAT revenue, the government needs to pay attention to the shadow economy, fiscal deficit, and government effectiveness. Effectivity of government Good can increase the potential for tax revenue in the shadow economy while optimizing the fiscal deficit.

Keywords: G20, Fiscal Deficit, Government Effectiveness, Shadow Economy, VAT Revenue. |

INTRODUCTION

The economy has become an interesting topic in scholarly studies, one of which is in the form of the shadow economy phenomenon. Dahlan (2020) in his research showed that shadow economy transactions in Indonesia are equivalent to 8-9% of Gross Domestic Product (GDP), and its existence has reduced Indonesia's GDP by an estimated 25% per year. In the scope of the G20, the average size of the shadow economy from 2010 to 2018 was around 27% in developing countries and 17% in developed countries (Silalahi, 2022).

The G20, an abbreviation for the Group of Twenty, is an international cooperation platform consisting of 19 member countries plus one economic zone, namely the European Union (Mochklas et al., 2023). The nineteen member countries are South Africa, the United States, Saudi Arabia, Argentina, Australia, Brazil, India, Indonesia, the United Kingdom, Italy, Japan, Germany, Canada, Mexico, South Korea, Russia, France, China, and Turkey. Established in 1999 after the Asian financial crisis, the G20 serves as a forum for Finance Ministers and Central Bank Governors to discuss global economic and financial issues (G20 India, 2023). According to Habiba et al (2021), the G20 places emphasis on global economics and significant issues such as climate change, demographic challenges, and global energy transitions. Comprising both developed and developing countries, the G20 also faces challenges arising from shadow economy activities.

The average size of shadow economy activities that occurred during the period 2010-2018 in 14 G20 member countries. It's worth noting that Australia had the highest shadow economy activity, while Italy had the lowest compared to the other 12 countries. In response to this situation, the Australian tax authorities formed a special task force to address the shadow economy. However, unfortunately, the process faced difficulties in reporting

shadow economy activities, leading to ineffective regulations. Indonesia, on the other hand, ranked fourth with the lowest shadow economy activity.

Furthermore, based on the estimated average values of the shadow economy in G20 countries, there has been a gradual decline since 2010, with the decrease ranging from 32% to 31%. The minimal reduction in the shadow economy indicates high levels of shadow economy activity, which is one of the reasons for not achieving optimal tax revenue targets (Kartiko, 2020). Endaryati (2023) mentioned the multitude of shadow economy activities and the challenges tax authorities face in reaching this sector, making tax regulations increasingly difficult to enforce. As a result, potential tax revenues are left uncollected. However, tax revenues from shadow economy activities are significant and are believed to be able to offset the tax revenue shortfall each year (Azwar & Mulyawan, 2017). For example, from 2001 to 2013, Indonesia lost tax revenue potential amounting to 11.7 trillion rupiahs or approximately 1% of the national quarterly GDP on average due to shadow economy activities (Samuda, 2016).

Various empirical studies have confirmed the impact of shadow economy activities, which not only put pressure on the fiscal and monetary sectors but also affect the real economy through tax revenue (Maulida & Darwanto, 2018). State revenue leakage due to the shadow economy is a critical issue. In most developing countries with inadequate administrative systems, there is a significant difference between actual tax collection and the tax obligations that should be paid (tax gap). Furthermore, the tax gap and the financing of government operations result in fiscal deficits. Therefore, governments design various tax frameworks to control and reduce the shadow economy and tap into its taxation potential. One of the optimization efforts for taxing shadow economy activities is the imposition of indirect taxes such as Value Added Tax (Keen, 2007). G20 India (2023) reveals that G20 member countries with low tax revenues tend to rely on Value Added Tax (VAT) and other consumption taxes. Here's the contribution of VAT to the total tax revenue in G20 countries.

During the period from 2010 to 2018, Value Added Tax (VAT) revenue (% of GDP) in G20 member countries ranged from 2.5% to 7.6%. Broadly speaking, the trend in VAT revenue in G20 countries experienced positive growth, albeit at a relatively low level. VAT revenue in Indonesia and Australia contributed to less than 4% of their national GDP. In contrast, VAT contributions in the United Kingdom, France, and Germany ranged around 7% of GDP. When viewed in terms of VAT contributions, there is a significant difference among G20 member countries. However, what is interesting is the positive growth trend in VAT revenue in China, which reached its highest level of 7.6% in 2017. According to the OECD (2017), this trend is attributed to VAT reform in China, which altered VAT rates and simplified the tiered VAT rates. Additionally, VAT revenue in Japan also significantly increased in 2014. In line with the VAT rate reforms in China, the increase in VAT revenue in Japan was a consequence of raising the VAT rate from 5% to 8% in April 2014 (Cashin & Unayama, 2016).

As economic issues have evolved, researchers have started linking the size of the shadow economy to fiscal deficits in tax revenue. Understanding fiscal deficit behavior has become a continually developing research agenda and is crucial from a policy perspective, especially for other developing countries experiencing continuous budget deficits (Soomro, 2020). Furthermore, concerns about increasing fiscal deficits have prompted empirical studies on the relationship between government spending and government revenue, especially from taxation.

In relation to shadow economy activities, the effectiveness of the government has been shown to have a significant influence (Saputra & Nugroho, 2016), as does the relationship between government effectiveness and tax revenue. Empirical studies on the determination of government effectiveness on tax revenue have shown positive and significant results (Gunay & Topal, 2021; Permadi, 2021; Rodríguez & Mauricio, 2018; Sarmento et al., 2016). In other words, government effectiveness becomes a highly influential variable in tax revenue. Conversely, the study by Godin & Hindriks (2015) found no significant impact of government effectiveness on tax revenue. These contradictory research findings are intriguing and warrant further investigation. Additionally, the role of government effectiveness as a moderator has been examined previously by Yousefinejad et al (2022), with findings that government effectiveness moderates the relationship between taxation and economic freedom.

There is a research gap between this study and previous research. In broad terms, previous research has focused on economic factors, but discussions regarding the shadow economy and VAT revenue are still limited. Similarly, the relationship between fiscal deficit variables and VAT revenue, including interaction effects, has been rarely studied. Moreover, this research uses one of the indicators of governance as a moderating variable that affects VAT revenue. Another difference, especially in the selection of the research subjects conducted in several countries. Most studies on VAT use multi-country research subjects in regions such as Europe, Asia, and the OECD. Studies on VAT determinants in G20 member countries are still limited. On the other hand, determinants of VAT revenue between one economic regional area and another may have differences. This could provide interesting new insights, especially regarding their application in individual countries.

This study aims to analyze the influence of independent variables, namely the shadow economy, fiscal deficit, and government effectiveness, on VAT revenue. By observing 14 G20 member countries, this research seeks to understand the determination of independent variables and their interaction with moderating variables in influencing VAT revenue. The selection of the G20 as the research object is because G20 member countries contribute more than 60% of the world's population, 75% of global trade, and 80% of global GDP (Bishop & Payne, 2021). As one of the largest economic forces in the world, increasing tax revenue in G20 member countries is crucial to meet the rising fiscal demands for sustainable development.

LITERATURE REVIEW

Spend-Tax Hypothesis

The Spend-Tax hypothesis is one of the four hypotheses used to examine the relationship between tax revenue and government spending. The other three theories are the Tax-Spend hypothesis, Fiscal Synchronization, and Institutional Separation. The Spend-Tax hypothesis views the government as setting the level of government spending first and then planning tax revenue to finance those expenditures (Supriadi, 2013). According to Tashevska (2018), the Spend-Tax hypothesis, also known as the expenditure-income hypothesis, occurs when the government determines its spending and adjusts sources of income to finance those expenditures. This hypothesis aligns with Barro (1979) view that deficit-financed spending creates higher future tax obligations, following the Ricardian equivalence proposition.

Pioneered by Peacock and Wiseman in 1979, the Spend-Tax hypothesis is based on the idea that governments always strive to increase government spending, while citizens are not willing to voluntarily pay taxes to finance that spending (Kurniawan et al., 2020). Furthermore, Peacock and Wiseman argued that there is a tolerance for taxation within society, which indicates the extent to which people are aware of the taxes collected by the government to finance government spending. It can be said that Peacock and Wiseman's theory explains the relationship between government spending and tax revenue, where an increase in government spending is followed by an increase in tax revenue (Kurniawan & Irmawati, 2021).

Studies on the relationship between government spending and tax revenue are an intriguing issue. Earlier research conducted by Hondroyiannis & Papapetrou (1996) and Richter & Dimitrios (2013) revealed the influence of government spending on the amount of tax revenue in Greece. In Indonesia, research by Kurniawan et al (2020) provided empirical evidence of the applicability of the Spend-Tax hypothesis, where the realization of government spending was found to have an impact on tax revenue, and any shocks to government spending would be positively responded to by tax revenue.

Shadow Economy

The shadow economy refers to economic activities that produce legal and market-based goods and services deliberately hidden from public authorities with the intent of avoiding tax payments, social security contributions, and certain employment obligations (Schneider et al., 2010). Smith (1994, in Samuda, 2016) defines the shadow economy as economic activities, whether legal or illegal, that are not included in Gross Domestic Product (GDP) calculations. Researchers attempting to measure shadow economy activities have faced challenges in defining shadow economy itself, leading to various similar terminologies such as the hidden economy, informal economy, underground economy, gray economy, black economy, cash economy, or unobserved economy (IMF, 2018). On a national level, BPS (2014) uses the terminology "informal sector" to describe economic activities that are observed and unobserved.

Feige (1990, in Rezky, 2020) categorizes shadow economy activities into four groups. First, the illegal economy consists of economic activities that are illegal because they involve actions that violate or contravene legal regulations, such as theft and smuggling. Second, the unreported economy refers to income that is not reported to the government, especially tax authorities, with the aim of evading tax obligations. Third, the unrecorded economy involves income that is left out of government records, resulting in discrepancies in income or expenditures. Finally, the informal economy encompasses income derived from the informal sector, which lacks official authorization from authorities.

Emerging in the 1970s due to financial crises, the shadow economy has continued to grow rapidly. Schneider & Medina (2018) state that the phenomenon of the shadow economy persists to this day, both in developing and developed countries. This has caused GDP calculations to be inaccurate, leading to biases (Rezky, 2020). Additionally, the shadow economy fosters unhealthy competition and reluctance to comply with government regulations (Paramita, 2020), such as tax avoidance practices that can further result in losses for the government in the form of potential lost tax revenue (Dahlan, 2020).

The increase in the size of the shadow economy and its dynamic nature indicate the complexity and intensity of global transactions that result in losses for developing countries like Indonesia (Lestari et al., 2022). Kartiko (2020) mentions that the size of the shadow economy and the potential loss of tax revenue in Indonesia are significant, and they should be able to offset the shortfalls that occur. In 2017, the estimated shadow economy was 536 trillion rupiahs, with a tax reduction of 487 trillion rupiahs. Therefore, the first hypothesis in this research is as follows:

H_1: Shadow economy has a significant negative impact on Value Added Tax (VAT) revenue.

Government Deficit

Government deficit, also known as budget deficit, is the difference between government revenue and government spending. Cempakasari & Kuntadi (2022) define government deficit as a budget with expenditures exceeding revenue, where routine revenue and development revenue are insufficient to cover government expenses. Similarly, Anwar (2014) defines government deficit as a government policy where spending exceeds the nation's income, with the aim of providing economic stimulus, typically used during recessions.

To finance a government deficit, the government has two options: increasing national revenue or borrowing from foreign sources. Mankiw (2018) explains that financing a government deficit can take the form of borrowing through bonds or government debt. A high government deficit may be caused by low tax revenue, but it can also lead to increased tax rates, resulting in higher tax revenue (Sarmento et al., 2016). According to Keynesian theory, a government deficit in the short term can bring various benefits to the economy, as it can boost income, consumption, and overall well-being in a country (Putri & Wahyudi, 2022). Lusiana & Soebagiyo (2023) add that both developed and developing countries typically implement government deficit policies to accelerate economic growth and income distribution. However, neoclassical theory views government deficit policies as detrimental to the economy because they lead to higher interest rates, which in turn reduce investment and slow economic growth (Yusuf & Mohd, 2023).

Despite differing views on government deficits, Barro (1979 in Purwiyanto, 2013) identified several reasons for implementing government deficit policies, including accelerating economic growth, income redistribution, addressing currency depreciation, increased spending due to economic crises, deviation from realization, and increased spending due to inflation.

Building on the Spend-Tax hypothesis, the study of the impact of government deficit policies on tax revenue has attracted the interest of researchers. Sarmento et al (2016) examined the main determinants of Value Added Tax (VAT) revenue, with one independent variable being government effectiveness. The research results showed that government deficit has a negative and significant impact on Value Added Tax (VAT) revenue. Therefore, the second hypothesis in this study is as follows:

H_2: Government deficit has a significant negative impact on Value Added Tax (VAT) revenue.

Government Effectiveness

Good governance is one of the key elements that drive economic growth and development (Turner, 2011). In achieving this, governance has evolved in line with the dynamism of the times. The World Bank's World Governance Indicator (WGI) assesses the success of governance through six indicators, including Voice and Accountability, Government Effectiveness, Regulator Quality, Rule of Law, Control Corruption, and Political Stability and Absence of Terrorism.

Government effectiveness is an issue that concerns both the government and society. Kaufmann et al (2007) define government effectiveness as an indicator used to assess the government's ability to provide public goods, public facilities, and formulate and implement good regulations. Meanwhile, Kim & Voorhees (2011) view government effectiveness as a measure of the quality of output and how well government policies are formulated to achieve their goals. Government effectiveness can be achieved by ensuring that all services are citizen-centered and by enhancing government accountability (Duho et al., 2020). Therefore, government effectiveness encompasses good policy formulation, proper policy implementation, and policies that are generally citizen-centered.

The level of government effectiveness included in The World Bank's Worldwide Governance Indicators is expressed in the form of a government effectiveness index with a score range from -2.5 to +2.5. In other words, the higher the government effectiveness index, the more effective the governance in that country. Furthermore, Sacks & Levi (2010) consider government effectiveness to be directly related to social well-being, making the government effectiveness index a crucial performance indicator for improving the welfare of the population.

Permadi (2021) notes that the government effectiveness index also reflects the level of effectiveness in tax administration. In this context, an ineffective tax administration system and tax avoidance practices reduce tax revenue (Jenkins & Kuo, 2000). Therefore, the government's success in collecting tax revenue is determined by the government effectiveness index. Empirical studies conducted by Godin & Hindriks (2015) demonstrate a relationship between government effectiveness and tax revenue. Furthermore, Sarmento et al (2016) and Permadi & Wijaya (2022) prove the positive and significant impact of tax administration effectiveness on Value Added Tax (VAT) revenue. Therefore, the third hypothesis in this study is as follows:

H_3: Government effectiveness has a significant positive impact on Value Added Tax (VAT) revenue.

In relation to the shadow economy, Gasparėnienė et al (2016) mentioned determinants of the shadow economy, including the quality of regulations, human resources, and government effectiveness. Furthermore, an empirical study by Saputra & Nugroho (2016) demonstrated the significant impact of government effectiveness on the shadow economy in Indonesia and BRICS countries. Moreover, as a moderating variable, government effectiveness has been shown to influence tax revenue and economic freedom (Yousefinejad et al., 2022). Therefore, the fourth hypothesis in this study is as follows:

H_4: The interaction of government effectiveness weakens the negative impact of the shadow economy on Value Added Tax (VAT) revenue.

Several studies on the determinants of VAT revenue have been conducted by previous researchers. Sarmento et al (2016) and Permadi & Wijaya (2022) examined the impact of fiscal deficits, government effectiveness, and other factors on VAT revenue with significant results. Another study by Saputra & Nugroho (2016) showed the impact of shadow economy activities, which not only harm the economy in terms of GDP but also result in lost tax revenue potential that can increase fiscal deficits in a country. Based on the theoretical foundation and previous empirical studies, the fifth and sixth hypotheses in this study are as follows:

H_5: The interaction of government effectiveness weakens the negative impact of fiscal deficits on VAT revenue.
H_6: Shadow economy, government deficits, and government effectiveness collectively influence VAT revenue.

RESEARCH METHODOLOGY

This research is a quantitative study that produces new findings achievable by using statistical procedures or other quantitative methods (Ali et al., 2022). Utilizing time series and cross-sectional data, the research data processing was conducted using panel data regression methods (Sihombing, 2022).

The research's object of study, serving as the dependent variable, is the Value Added Tax (VAT) revenue in 14 G20 member countries during the period 2010-2018. The selection of these 14 countries is based on data availability for the research. Meanwhile, the independent variables used include the size of the shadow economy, government deficit, and institutional factors. Additionally, control variables are employed in the research, such as the standard VAT rate, import levels, and unemployment rates.

The selection of variables, whether dependent, independent, or control, is based on previous research conducted by Bikas & Andruskaite (2013), Sarmento et al (2016), Andoh (2017), Wawire (2017), and Permadi & Wijaya (2022). The data used are secondary data obtained from three data sources: the size of the shadow economy from The World Bank, government deficit data from OECD, and institutional factors from the Worldwide Governance Indicator provided by The World Bank. Data processing for the research was carried out using STATA 16 software, and basic descriptive data analysis was performed using Microsoft Excel. The fundamental model in this research is as follows:

$$VAT = f(MIMIC, DEF, EFF, MIMIC * EFF, DEF * EFF, RATE, UNEMP, IMP)$$

The regression equation model for this research is as follows:

$VAT_{it} = \beta_0 + \beta_1 MIMIC_{it} + \beta_2 DEF_{it} + \beta_3 EFF_{it} + \beta_4 MIMIC*EFF_{it} + \beta_5 DEF*EFF_{it} + \beta_6 RATE_{it} + \beta_7 UNEMP_{it} + \beta_1 IMP_{it} + \varepsilon$

Details:

VAT_{it}	:	The Value Added Tax (VAT) Revenue in year t
$MIMIC_{it}$	:	*Shadow economy* in year t
DEF_{it}	:	Government deficit in year t
EFF_{it}	:	Government effectiveness in year t
$MIMIC*EFF_{it}$	:	Interaction of *shadow economy* and government effectiveness in year t
$DEF*EFF_{it}$	:	Interaction of government deficit and government effectiveness in year t
$RATE_{it}$	:	VAT standard rate in year t
$UNEMP_{it}$	:	Unemployment rate in year t
IMP_{it}	:	Import in year t
ε	:	error

In general, research must have research variables that serve as the subject of observation or investigation, which will subsequently be measured by the researcher. Table 1 presents data regarding the variables used in the study.

Table 1 Operational Research Variable

Variable	Units	Source
Dependent Variable		
Value Added Tax (VAT) Revenue	Percentage	OECD
Independent Variable		
Shadow Economy (MIMIC)	MIMIC	The World Bank
Government Deficit (DEF)	Percentage	OECD
Moderating Variable		
Government Effectiveness (EFF)	Index	The WGI
Control Variable		
VAT Standard Rate (RATE)	Percentage	The World Bank
Unemployment Rate (UNEMP)	Percentage	The World Bank
Import (IMP)	Percentage	The World Bank

Source: Compiled by the author, 2023.

RESULT AND DISCUSSION

Descriptive Statistical Analysis

Descriptive analysis provides an overview of the research data. Table 2 presents a descriptive analysis of both dependent and independent variables, including the number of observations, means, standard deviations, minimum values, and maximum values.

Table 2 Descriptive Statistics for Dependent and Independent Variables

Variable	Obs	Mean	Std. Dev	Min	Max
VAT	126	5.22	1.44	2.5	7.6
MIMIC	126	21.11	8.74	10.21	40.16
DEF	126	-2.57	2.67	-9.25	3.02
EFF	126	0.74	0.69	-0.45	1.82
MIMIC*EFF	126	16.83	19.04	-7.91	66.56
DEF*EFF	126	-2.02	3.84	-14.51	3.58
RATE	126	14.72	5.26	5	22
UNEMP	126	7.61	5.006	2.47	24.22
IMP	126	27.81	8.477	11.8	52.23

Source: Processed Data from STATA, 2023.

On average, the value of VAT revenue in G20 member countries is 5.22%, with the highest percentage of VAT revenue in China in 2017 at 7.6%, while the lowest VAT revenue percentage in Japan in 2010 and 2011 was 2.5%. The MIMIC variable has an average of 21.11%, with the highest value being 40.16% and the lowest being 10.21%. Australia is noted as the country with the highest shadow economy, while Italy has the lowest shadow economy during the period of 2010-2018. The fiscal deficit variable has an average value of -2.57, with the lowest value of -9.25 achieved by the United Kingdom in 2010 and the highest value of 3.02 by South Korea in 2018. Furthermore, the government effectiveness index variable has an average of 0.74, with the highest value of 1.82 and the lowest of -0.45. In 2018, Brazil had a government effectiveness index of -0.45, while the value of 1.82 was the government effectiveness index of Japan in 2016. The interaction between the shadow economy and the moderating variable, the government effectiveness index, has an average value of 16.83, with a distribution of the highest value of 66.56 and the lowest value of -7.91. Furthermore, the interaction between the fiscal deficit and the government effectiveness index has an average value of -2.02, with a distribution of the highest value of 3.58 and the lowest value of -14.51.

The choice of the Panel Data Regression Model
There are three types of estimation models in panel data regression: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). In determining the best model for the study, three model tests are conducted: the Chow Test, the Hausman Test, and the Lagrange Multiplier (LM) Test. If a model is selected twice, it is chosen as the research model.

Table 3 The Selection of Panel Data Model

Model Test	Prob. Value		Conclusion
Uji *Lagrange Multiplier*	Prob>chibar2 0.0000	=	The prob>chibar value is less than 0.05, then H_0 is rejected, and H_1 is accepted, thus leading to the selection of the Random Effect Model.
Uji Chow	Prob>F0.0000		The prob values is 0.0000 < 0,05 then H0 is rejected, and H1 is accepted, thus leading to the selection of Fixed Effect Model.
Uji Hausman	Prob>chi2 0.0130	=	The prob>chi2 value is smaller than 0,05 then H0 is rejected and H1 is accepted, thus Fixed Effect Model is the chosen one.

Source: Processed Data from STATA, 2023.

Based on the model selection test that has been conducted, it is found that the most appropriate model to be used in this research is the Fixed Effect Model.

The Result of Classical Assumption Tests
To ensure that the research sample is free from violations, classical assumption tests are needed to examine normality, heteroscedasticity, multicollinearity, and autocorrelation. If any of the assumption tests do not meet the standards, it can lead to bias in hypothesis testing using the F-test and t-test.

Table 4 Classical Assumption Test

Model Test	Prob. Value	Interpretation
Normality	0.1080	Data is normally distributed
Multicolinearity	6.42	Data is free from multicollinearity
Heteroskedasticity	0.0166	There is evidence of heteroskedasticity
Autocorrelation	0.0003	There is evidence of autocorrelation

Source: Processed Data from STATA, 2023.

Based on the results of the classical assumption tests in Table 4, the data used in the study have passed the normality test with a probability value greater than the research significance level (α) of 5%. With an average

Variance Inflation Factor (VIF) value of less than 10, the data has passed the multicollinearity test. However, partially, there are still two independent variables that show symptoms of multicollinearity with VIF values greater than 10. Because this study uses panel data that combines time series and cross-sectional data, which is one of the rule of thumbs, the multicollinearity issue can be disregarded (Gujarati, 2003). On the other hand, with a Prob value of 0.0166, it indicates heteroskedasticity in the research data, where there are differences in residual variance between one observation and another. Similarly, the autocorrelation test shows a Prob value smaller than 0.05, indicating that variables at time t are correlated with variables at time t-1. To address the issues of heteroskedasticity and autocorrelation that occur in the model, the Panel Corrected Standard Error method, abbreviated as PCSE, is used (Greene, 2018).

The Result of Hypothesis Test

Hypothesis Testing Results Partial or t-test, also known as t-test, aims to determine whether there is an individual or partial influence of independent variables on the dependent variable (Ghozali, 2009). The decision-making process for the t-test is done by using probability tests. The results of the hypothesis testing can be seen in the table below.

Table 5 Partial Hypothesis Testing for Panel-Corrected Standard Error (PCSE) Model

VAT	Panel-Corrected		P>|z|
	Coefficient	Std. Error	
MIMIC	-.0369352	.006376	0.000
DEF	-.0128355	.0394705	0.745
EFF	2.217473	.413193	0.000
MIMIC*EFF	-.0518137	.0109238	0.000
DEF*EFF	.1567453	.0448646	0.000
RATE	.1191681	.0118234	0.000
UNEMP	.0893132	.0064828	0.000
IMP	-.0395384	.0095321	0.000
R-squared	0.8437		
Prob > chi2	0.0000		

Source: Processed Data from STATA, 2023.

Based on the partial hypothesis testing in Table 5, it is known that the shadow economy variable has a significant negative effect on VAT revenue in G20 member countries. In contrast to the shadow economy, the fiscal deficit variable does not have a significant effect on VAT revenue in G20 member countries. The interaction between the shadow economy variable and the moderating variable, the government effectiveness index, has a significant negative effect on VAT revenue. Meanwhile, the fiscal deficit variable, moderated by the government effectiveness index, has a significant positive effect on VAT revenue. The government effectiveness index variable, which acts as a moderating variable, has a significant positive effect on VAT revenue.

The testing results in Table 5 also show that the shadow economy variable, the fiscal deficit variable, and the interaction between the shadow economy and fiscal deficit variables with the government effectiveness index have a significant simultaneous effect on VAT revenue in the G20 countries. This can be seen from the Prob > chi2 value of 0.0000, which is smaller than the research significance level (α) of 5%.

In addition to the F-test and T-test, the testing results also indicate the coefficient of determination. The coefficient of determination provides an overview of the magnitude of the influence of independent variables on the dependent variable. Based on the testing results in Table 5, the coefficient of determination (R^2) in this study is 0.8437. This means that the shadow economy variable, the fiscal deficit variable, the moderation of government effectiveness on the shadow economy and fiscal deficit variables, as well as control variables such as VAT rates, import levels, and unemployment rates, collectively influence VAT revenue in G20 countries by 84.37%. The remaining 15.63% is influenced by other variables not examined in this study. The panel data regression equation in this study is as follows.

$$4.176 \ VAT_{it} = \beta_0 - 0.037 \ MIMIC_{it} - 0.013 \ DEF_{it} + 2.217 \ EFF_{it} - 0.052 \ MIMIC*EFF_{it}$$
$$+ 0.157 \ DEF*EFF_{it} + 0.119 \ RATE_{it} + 0.089 \ UNEMP_{it} - 0.039 IMP_{it}$$

The VAT revenue variable with a constant value of 4.176 means that without the presence of the shadow economy, fiscal deficit, and the moderation of government effectiveness, the VAT revenue will reach a ratio of 4.176%. The shadow economy and fiscal deficit variables have negative signs, indicating an inverse relationship between these variables and VAT revenue in G20 countries. The shadow economy variable has a constant of 0.037 with a negative direction. Assuming ceteris paribus, a 1% increase in the shadow economy variable will lead to a decrease in VAT revenue of 0.037%. On the other hand, the fiscal deficit variable has a constant of 0.01 with a negative sign. This means that a 1% increase in the fiscal deficit variable will result in a 0.01% decrease in VAT revenue.

In contrast to the shadow economy and fiscal deficit variables, which are negatively related to VAT revenue, the government effectiveness index variable has a positive sign with a constant of 2.217. Thus, if the government

effectiveness index increases by 1%, VAT revenue will also increase by 2.217% (assuming ceteris paribus). The moderating effect of the government effectiveness index on the shadow economy variable results in a constant of 0.052 with a negative sign. It can be said that the presence of the government effectiveness index strengthens the negative impact of the shadow economy variable on VAT revenue. Assuming ceteris paribus, a 1% increase in the interaction between the shadow economy and the government effectiveness index will lead to a 0.052% decrease in VAT revenue in G20 member countries. Meanwhile, the moderating effect of the government effectiveness index on the fiscal deficit variable results in a constant of 0.157 with a positive sign. The interaction of the government effectiveness index variable has been shown to weaken the negative and non-significant impact of the fiscal deficit variable on VAT revenue, turning it into a positive and significant effect. In other words, if the interaction between the government effectiveness index variable and the fiscal deficit variable increases by 1%, VAT revenue will increase by 0.157% (assuming ceteris paribus).

The Shadow Economy's Impact on VAT Revenue

The shadow economy is an intriguing aspect that is inseparable from both developed and developing countries' economies. Testing the research model reveals a significant negative influence of the shadow economy variable on VAT revenue in G20 member countries from 2010 to 2018. This indicates that the shadow economy can be used as one of the parameters in measuring VAT revenue.

Consistent with empirical studies by Keen & Lockwood (2010) and Qibthiyyah & Arrachman (2018), higher shadow economy activities lead to lower VAT revenue. This condition is attributed to the limited room for government tax effort in revenue collection (Lukito et al., 2023). Additionally, the difficulty in measuring the shadow economy and the lack of oversight by tax authorities contribute to tax evasion by shadow economy participants, resulting in losses for the state (Samuda, 2016). Furthermore, shadow economy activities reduce the effectiveness of VAT imposition due to the prevalence of economic actors choosing to operate informally (Qibthiyyah & Arrachman, 2018). Informal businesses are not registered in the VAT administration system, making it impossible to apply input and output tax credit mechanisms. Business operators also tend to transact with other operators of the same status. These factors collectively drive businesses to shift their operations toward the informal sector, which is exempt from taxation (De Paula & Scheinkman, 2010).

The existence of the shadow economy is closely related to tax morale, where an increase in tax morality is inversely proportional to shadow economy activities (Horodnic & Williams, 2016). Kartiko (2020) believes that tolerance for the shadow economy increases taxpayers' reluctance to fulfill their tax obligations. Consequently, clear and stringent regulations are required for shadow economy participants proven to harm the state by evading their tax responsibilities.

Government Deficit's Impact on VAT Revenue

Results of the research model testing indicate that government deficit does not have a significant impact on VAT revenue in G20 member countries for the period 2010-2018. This finding contradicts the developed hypothesis, leading to its rejection. Descriptive statistical analysis, on the other hand, shows that the average government deficit is closer to the maximum value than the minimum. Additionally, the average value is also close to its midpoint. It can be said that the government deficit that occurs tends to be high, representing the government's efforts to maintain economic stability in line with Keynesian theory as proposed by Brown-Collier & Collier (1995).

The findings of this research align with the studies conducted by Keen & Lockwood (2010) and Permadi & Wijaya (2022), which revealed that government deficit does not influence VAT revenue significantly, and the magnitude of the government deficit represents the government's efforts to maintain economic stability. Furthermore, Permadi & Wijaya (2022) added that it is possible that the deficit occurring within a country is not financed by tax revenue but rather through other means such as government debt. Therefore, government deficit policies do not necessarily lead to an increase or decrease in tax revenue.

This argument is not in line with the research by Sarmento et al (2016) on 27 European Union countries, which showed a positive and significant influence of government deficit on VAT revenue. However, the results of this research share the same direction of the relationship as Sarmento et al (2016), which is a negative relationship between government deficit and VAT revenue, meaning that an increase in government deficit will reduce VAT revenue. Still, in this research, this negative impact is not significant in explaining changes in VAT revenue as a result of government deficit policies.

Government Effectiveness' Impact on VAT Revenue

Governance is one of the aspects that is often studied for its influence. In this research, government effectiveness has a positive and significant impact on VAT revenue in G20 member countries for the period 2010-2018. When looking at the descriptive statistical analysis, the average value of the government effectiveness variable is in the middle of the minimum and maximum values and is close to its midpoint. In other words, G20 member countries have a relatively good level of government effectiveness with a value close to +2.5, which is the maximum value. This value is considered to have a significant influence on VAT revenue. This finding aligns with empirical studies by Sarmento et al (2016) and Permadi & Wijaya (2022), where government effectiveness has been proven to impact VAT revenue. Not limited to VAT revenue, government

effectiveness, in fact, has a significant impact on overall tax revenue (Ankabi, 2019; and Epaphra & Massawe, 2017).

The concept of government effectiveness is related to the quality of the tax administration system in place. Godin & Hindriks (2015) state that a quality tax administration system provides ease and simplicity for taxpayers to fulfill their tax obligations, thereby maximizing tax revenue. Additionally, effectiveness here also relates to the formulation and implementation of tax regulations. The implementation of an effective tax administration system will increase tax revenue, as per the theories of Tanzi & Zee (2000) and Cnossen (2005). On the other hand, poor governance will lead to bureaucratic delays and a decrease in tax revenue (Jenkins & Kuo, 2000). In Indonesia, the government has issued Law Number 7 of 2021 on Tax Regulation Harmonization, which serves as the legal framework for optimizing tax revenue. Through this law, tax authorities have closed various loopholes that are often used for tax avoidance, adapted to the development of the digital economy, and expanded the tax base (Pertapsi, 2022). Similarly, the Japanese government has carried out tax reforms, including an increase in the VAT rate and simplification of VAT rate layers. As a result, VAT revenue in Japan has significantly increased. Therefore, it can be concluded that the tax administration systems in G20 countries have been effective in collecting tax revenue.

Government Effectiveness in Moderating the Impact of the Shadow Economy on VAT Revenue

The research findings indicate that the moderating variable, in this case, government effectiveness, has been proven to weaken the negative and significant influence of the shadow economy on VAT revenue. From a descriptive analysis perspective, the interaction between the shadow economy and government effectiveness has an average value closer to the minimum than the maximum. Additionally, the average value is smaller than the standard deviation, suggesting the limited impact of government effectiveness on the shadow economy and VAT revenue.

Specifically, tax revenue is directly correlated with the scope of shadow economy activities. High shadow economy activity limits tax revenue and generates other negative impacts on the economy. In this context, government effectiveness reflects the effectiveness of the tax administration system. Therefore, there is an urgent need to build an effective and efficient tax administration system. An effective tax administration system provides ease for taxpayers to fulfill their tax obligations (Tanzi & Zee, 2000). This is achieved through improving the quality of human resources in tax authorities and formulating and implementing better policies (Godin & Hindriks, 2015). On the other hand, tax administration reform also has positive effects in attracting foreign investment, maintaining government financial system stability, and reducing the shadow economy (Trasberg, 2005). In other words, an effective tax administration can reduce the shadow economy, ultimately increasing the potential for tax revenue.

In principle, Value Added Tax (VAT) has the characteristics of an indirect tax, making its tax administration relatively easier (Permadi, 2021). This argument aligns with Keen (2007) assertion that taxing the shadow economy is easier when done in the form of indirect taxes, such as Value Added Tax (VAT). Consequently, this explains the limited change in the influence of the shadow economy on VAT revenue after interacting with government effectiveness.

Government Effectiveness in Moderating the Impact of Government Deficit on VAT Revenue

Based on the research findings, after the moderation of government effectiveness, the government deficit has a positive and significant impact on VAT revenue. This finding indicates that the moderation of government effectiveness weakens the negative influence of the government deficit on VAT revenue. Therefore, it can be said that an increase in the interaction between government effectiveness and the government deficit will lead to an increase in VAT revenue.

Furthermore, descriptive analysis shows that the interaction between the government deficit and government effectiveness has an average value closer to the maximum than the minimum. This means that the value of the interaction between the government deficit and government effectiveness tends to be high, thus capable of influencing VAT revenue.

As a government policy, the government deficit is one of the government's intervention instruments in the economy. The significant impact of the government deficit after the moderation of government effectiveness may be due to government policies aimed at increasing expenditures, both in the form of government spending and large expenditures that stimulate consumption in society (Permadi & Wijaya, 2022). In principle, all government spending activities will increase tax revenue, such as spending on goods subject to VAT, employee salaries subject to Income Tax (PPh), and further, the income of these employees will be spent on consumption subject to VAT (Kurniawan et al., 2020). Thus, it can be concluded that an increase in the government deficit in the form of increased government spending will create a multiplier effect in the economy, leading to an increase in tax revenue.

CONCLUSSION

This research aims to analyze the influence of the shadow economy, government deficit, and government effectiveness on VAT revenue in G20 countries during the period 2010-2018. Using a quantitative approach, data processing in this study was conducted using a panel data regression model and the Panel-Corrected Standard Error (PCSE) estimation method. Through all the empirical testing stages performed, this research shows that the shadow economy, government deficit, and government effectiveness simultaneously affect VAT revenue in G20 member countries during the period 2010-2018. Partially, the shadow economy has a significant negative effect on VAT revenue, while the government deficit does not significantly affect VAT revenue. After the moderation of government effectiveness, the shadow economy has a significant negative effect, and the government deficit has a significant positive effect on VAT revenue. These findings imply that to optimize VAT revenue, in addition to focusing on the shadow economy and the government deficit, the government also needs to consider government effectiveness. Good government effectiveness can increase the potential for tax revenue in the shadow economy and optimize the government deficit.

This study has several limitations. First, the use of the shadow economy variable with the MIMIC proxy and the limited data for the government deficit up to the year 2018. Future research could use different proxies and include additional variables for investigation. Second, in the context of the influence of a variable, there are short-term and long-term effects. Therefore, future research could use Error Correction Models or Vector Autoregressive methods to provide more comprehensive results.

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