

Analysis of the Effect of ICT, Tax and Corruption on Shadow Economy in G20 Countries

Analisis Pengaruh dari TIK, Pajak, dan Korupsi terhadap *Shadow* Ekonomi di Negara G20

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ABSTRAK

Fenomena *shadow* ekonomi telah menjadi perhatian tersendiri dan cukup menarik dari banyak peneliti karena perannya yang tak terlihat kasat mata namun kontribusinya cukup besar dalam perekonomian. Paper ini mengidentifikasi dan menganalisis faktor pengaruh *shadow* ekonomi terkhusus untuk negara dalam G20, yang mana terdiri dari negara ekonomi berkembang dan negara maju. Dari data yang diolah menunjukkan rata-rata besarnya *shadow* ekonomi sebagai proporsi dari GDP pada tahun 2010–2018 di negara berkembang sekitar 27%, sementara di negara maju sekitar 17%. Metode analisis yang digunakan dalam penelitian ini adalah fixed effect melalui data panel pada periode tahun 2010-2018. Penelitian ini menggunakan model MIMIC sebagai ukuran *shadow* ekonomi. Hasil dari penelitian ini menemukan bahwa dampak dari ICT, *Control of Corruption*, dan pajak signifikan memengaruhi *shadow* ekonomi. Hal menarik dan implikasi utama dari studi empiris ini menemukan bahwa *shadow* economy tidak hanya terjadi di EMDE's countries saja, tetapi juga terjadi pada negara-negara maju.

Kata kunci: *shadow* ekonomi, TIK, pajak, korupsi

ABSTRACT

The phenomenon of the shadow economy has become a special concern and is quite interesting from many researchers because of its role that is not visible to the naked eye but whose contribution is quite large in the economy. This paper identifies and analyzes the influence factors of the shadow economy for the G20 countries, which are developing economies and developed countries. The average size of the shadow economy as a proportion of GDP in 2010–2018 in developing countries is around 27 percent, while in developed countries it is around 17 percent. The analytical method used in this study is the fixed effect through panel data in the period 2010-2018. This study uses the MIMIC model as a measure of the shadow economy. The results of this study found that the impact of ICT, Control of Corruption, and taxes significantly affect the shadow economy. The interesting thing and the main implication of this empirical study is that the shadow economy does not only occur in EMDE's countries, but also occurs in advanced economies.

Keywords: *shadow* economy, ICT, taxes, corruption

JEL Classification: E26, H26, D73, O30

INTRODUCTION

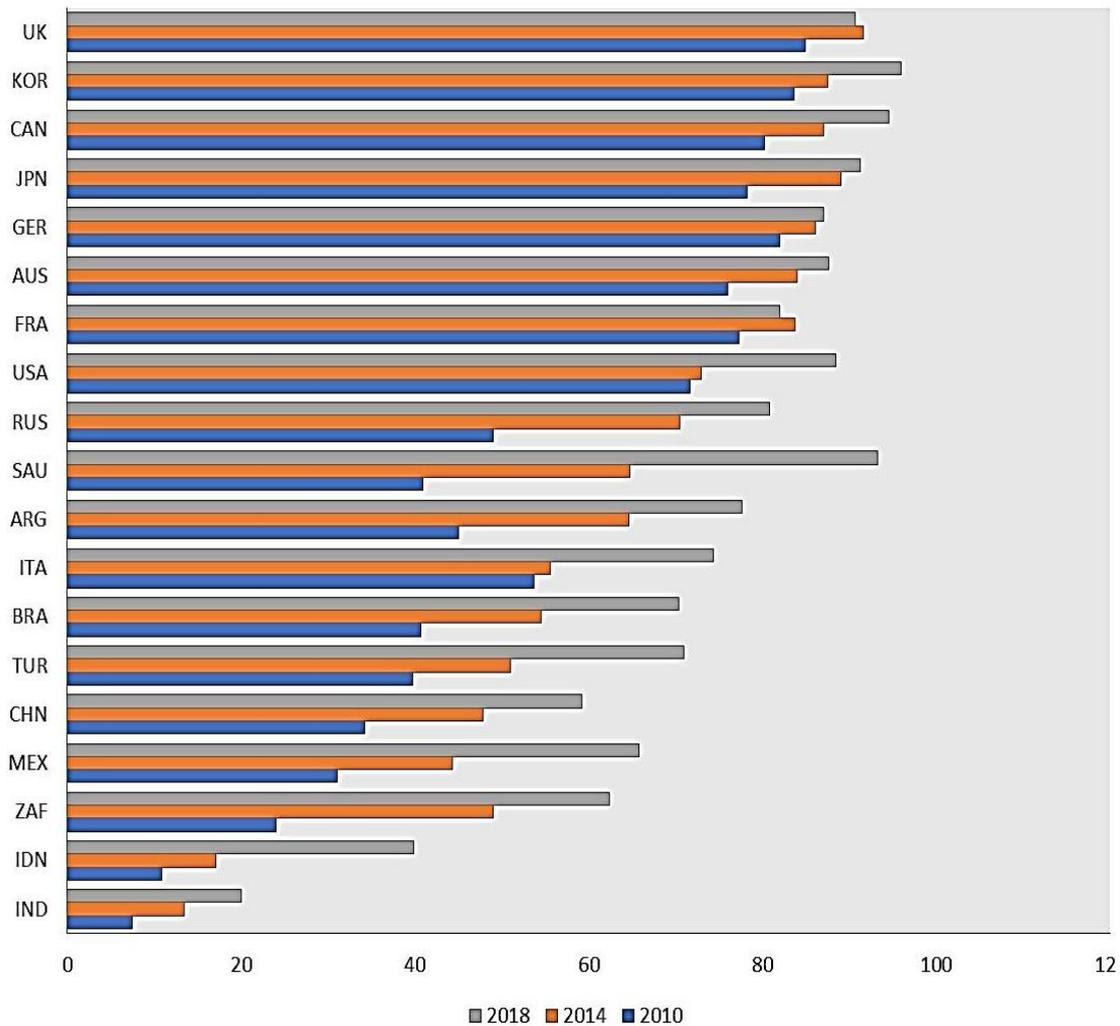
Shadow economy is an integral part of the economic activities of most countries. Shadow economy is economic activities, both legal and illegal, which may be missed from the calculation of Gross Domestic Product (GDP). Shadow economy is often also known by other terms such as underground economy, informal economy, unofficially economy or black economy and this sector has become a global issue (Scheineider & Enste, 2000). This is understood if the increasing number of shadow economy activities causes economic performance which has been measured by the size of Gross Domestic Product (GDP) to be biased or underestimated. This means that the statistics recorded on GDP are ultimately unable to describe the real and comprehensive state of the economy. On the other hand, the growing development of shadow economy activities is also a loss for the state, by missing or not validly registering it, it can also be shown through the amount of lost tax revenue. In general, all activities included in the shadow economy are free from government supervision, in this case the tax authorities, thereby eliminating the obligation to pay taxes from the perpetrators and the impact can cause losses for a country.

Furthermore, the G20 as an economic forum or international cooperation with multilaterals consisting of 19 member countries jointly set goals for a better global economic climate. As the world is currently in the phase of the industrial revolution 4.0 towards 5.0 where the substantial development of information and communication technology is moving very fast. This changes governance and brings many economic and non-economic implications for developed and developing countries, especially in this case the G20. Technological developments, especially in information technology through the digital revolution, can help information transparency in the form of the ability of information systems to create virtual copies of the physical world by enriching digital models with sensor data, including data and information provision. In

addition, the development and improvement of information and communication technology (ICT) can also contribute to reducing cash flow and thereby making monitoring financial transactions easier. So indirectly, ICT can contribute to economic growth and development by reducing the shadow economy. This means that the industrial revolution 4.0 will have many impacts on the economy of a country.

Previous research by Remeikiene et al. (2017) and Nevzorova et al. (2018) looks at the singular relationship in focus between technological developments and the shadow economy, which confirms that the advancement of the technology industry has been able to change the economic structure of both regional and national scales which boosts the economy. However, what his findings suggest is that it also recommends looking at the relationship between the shadow economy and technological progress represented by information and communication technology (ICT), which still requires more comprehensive research. Therefore, this study aims to contribute to increasing the literature related to examining the influence of information and communication technology (ICT) developments on the shadow economy which is a significant determinant of economic growth.

Statistics of digital development and internet usage in G20 countries over the last 9-year period between 2010 and 2018 as shown in Figure 1. The Figure shows that for almost a decade considered in this study. ICT has increased quite drastically and significantly in almost all countries, both developed and developing economies. The most significant ICT developments occurred in Saudi Arabia, South Africa, and Mexico. Meanwhile, progress with only a few intensive changes occurred in the United Kingdom, Germany, and Francis because these three countries have included maximum use of technology and information as a form of digital service. Even so, based on the data in Figure 1, the G20 member countries that have the least use of information technology are India and Indonesia with a percentage below 50%.



Source: ITU (International Telecommunication Union) (Autor’s calculation, 2022)

Figure 1. Development of ICT (Information and Communication Technology) in G20 Countries

Simultaneously with the development of ICT, of course, countries in the world, both developed countries, are not necessarily separated from or finished with economic problems, especially in this shadow economy. Thus, apart from the influence of ICT, this study also aims to explore the shadow economy as the influence of the quality of government institutions. This study tries to include the control of corruption (COC) factor as a proxy for governance indicators where these variable measures the extent to which public power is misused for personal interests by the government, both on a small and large scale of corruption.

Furthermore, apart from ICT and corruption as variables that are thought to affect the shadow economy, this study also includes tax variables. Total tax revenue refers to mandatory transfers to the central government for the public interest. This mandatory transfer is a proxy that can illustrate that the higher the tax revenue, of course, the compliance of the public/taxpayers will increase, or official economic activities will increase which in turn can reduce the shadow economy.

Previously, many studies related to the shadow economy have been carried out both at the national and international levels using different perspectives, methods, and goals.

However, for shadow economic research by including ICT variables at the G20 level, it tries to see the effect that occurs between developed and developing countries using an indirect approach to shadow economics estimation, namely the MIMIC model approach developed by Schneider (2016), with research data this for 9 years start from 2010 to with 2018.

METHOD

In this research, the data used is secondary data with data panel form. Who plays a role as a section here are 19 member countries of the G20. Observation carried out annually for 9 years, namely from 2010 to 2018. Source of data obtained from various institution international and agencies from the countries concerned. For measure variable dependent that is shadow economy based on MIMIC model approach is taken from the World Bank. While the data for measuring variable independent, i.e., ICT is proxied by the number of individual user mobile and internet server from world bank. For measure variable corruption use control of corruption index from the world bank. And other variable control (GDP, Inflation, and population) also source from the World Bank. The estimation model used refers to the theoretical model developed by Schneider (2016).

$$SE_{it} = \alpha_i + \beta_1 ICT_{it} + \beta_2 COC_{it} + \beta_3 Tax_{it} + \beta_4 MACRO_{it} + \varepsilon_{it} \dots (1)$$

Where:

- SE_{it} : *Shadow* country's economy in period t
 ICT_{it} : Proxy of the digital economy of the country in period t
 COC_{it} : Index corruption (control of corruption) state in period t
 Tax_{it} : Reception state tax in period
 $MACRO_{it}$: Condition macro economy as variable control of (GDP, INF, and Population) in period t

ε_{it} : Error

Shadow economy

Smith (1994) defines the shadow economy as all forms of legal and illegal production of goods and services that are not included in the official Gross Domestic Product (GDP) calculation. This illegal activity can be in the form of an illegal market where goods and services are produced, distributed, traded, and consumed illegally. Meanwhile, some legal activities that are included in the shadow economy are in the form of the production of goods and services which may be legal but are deliberately traded in secret with various motives, namely: (i) exist to avoid paying taxpayers; (ii) to avoid paying social protection contributions; (iii) avoiding the standards that have been set such as minimum wages by the government (iv) avoiding the approval of administrative procedures that have been established by laws and regulations.

Shadow economy generally refers to economic transactions that are considered illegal, either because the goods or services produced and traded are hidden and violate the law or because of inaccuracies in economic transactions that are not recorded in government reporting. Shadow economy according to Feige (1990) is an economic activity that falls into the following four groups, namely:

1. The Illegal Economy, namely illegal economic activities contained in the income generated by economic activities that violate the law or are contrary to legal regulations. Activities included in this category in the form of trading stolen goods, piracy, and smuggling are criminal acts that violate the law. Likewise with gambling activities, transactions of illegal drugs and narcotics which are actions that are clearly contrary to the existing law.
2. The Unreported Economy, namely in the form of activities carried out to avoid fiscal

- rules in the tax law, specifically tax avoidance and fraud to gain profits.
- 3) The Unrecorded Economy, namely in the form of economic activities that are not recorded or registered in official statistics. This can result in a difference between the actual total income or expenses and the reported income or expenses.
 - 4) The Informal Economy, namely in the form of income earned by economic agents informally. In other words, it can also be said that manipulation efforts are a form of activity that reduces company costs and violates administrative rules. Economic actors in this sector generally do not have official permission from the authorities.

Although the issue of the shadow economy has been researched for a long time, related to the right measurement methodology to determine the size of the shadow economy, it continues to develop. The literature shows that there are several approaches that can be taken to determine the value of the shadow economy, namely: Direct approach, carried out at the micro level which aims to determine the size of the shadow economy at a certain point in time. Examples of this direct approach are surveys of shadow economic actors or through audits conducted by tax authorities. The indirect approach is carried out by utilizing macroeconomic indicators as a proxy for the development of the shadow economy from time to time. So far, there are 4 macroeconomic indicators used are as follows:

- 1) Monetary approach, this is done by looking at the elasticity of demand for currency against the tax burden (one of the driving factors for the emergence of the shadow economy). The basic assumption is that shadow economy actors tend to use cash more in their transactions, making them more difficult to track when compared to transactions involving banks or financial institutions.

- 2) The discrepancy approach in official statistics is carried out by calculating income and expenditure statistics on the national balance sheet. If there is a difference between the two, it is impossible for the shadow of economic activity in that country to occur.
- 3) The employment statistics approach is carried out by looking at the decline in the employment participation rate in the official sector with the assumption that the overall labor participation rate remains constant.
- 4) The model approach considers the shadow economy as an unobservable variable, this relates to a set of indicators that reflect changes in the size of the economic shadow. MIMIC is a model for estimating the value of the shadow economy. The method examines the relationship between variables that affect one other variable and sees its effect on that variable.

In this analysis, the authors use the most recent measure of the prevalence of the shadow economy based on the Multiple Indicators Multiple Causes (MIMIC) method. After that, the MIMIC method relates the unobservable shadow economy to observable indicator variables (Schneider 2010, 2012).

Information and Communication Technology (ICT)

In the era of revolution 4.0 now, the role of ICT is the most important. So, it should not be ignored that the influence of ICT on the shadow economy as an example of a developing e-banking system reduces cash flow. This is as we know that transactions in the shadow economy are usually done in cash. This means that the proliferation of digital technology-based payment systems can limit access to cash as an easier and more effective payment method. This can reduce the size of the shadow economy. Previous research conducted by Garcia-Murillo and Velez-Ospina in different years 2014 and 2017 suggested that ICT can contribute to reducing

the size of the shadow economy. The results of his research show that ICT is multifunctional for finding information about education, jobs and public services can empower the population and make it easier to access public services which in turn has a significant effect on reducing the shadow economy.

Chacaltana et al. (2018) in his research said that ICT can promote the transition from the shadow economy to the formal economy sector. Although not directly, but at least with the development of ICT or digital it ensures a higher level of transparency and can encourage a gradual change from the shadow economy to the formal economy. In addition, Remeikienė et al. (2022) stated that ICT infrastructure in terms of the number of cellular telephones and broadband is also substantially limited to reduce the size of the shadow economy. Which in his research reveals the fact that even the most modern sources of information, education, and public services can be accessed only through the most sophisticated digital devices. This means that there are other factors such as networks and platforms that are not accessible to most of the population, especially in poor or developing countries. This result is in line with the different view of Bhattacharaya (2019) which states and adds that ICT is rarely used in the informal sector because in the end it will also add more costs and the expected low return on investment, so that it becomes a consideration for economic agents.

Thus, the hypothesis of this research that ICT has a negative effect on the shadow economy means that the development of digital technology and the internet can reduce the shadow economy in a country, *ceteris paribus*.

Control of Corruption

Regarding the effect of corruption on the shadow economy, it was first carried out by Johnson et al. (1997) found that corruption significantly affects the shadow economy by using a sample of 15 countries in their study. In addition, the study also states that under a

condition in the full employment model, workers can be employed in the official sector. As a result, an increase in the shadow economy will always reduce the size of the real economy. Theoretically, corruption can increase the shadow economy because corruption is seen as a form of regulation that provides opportunities for fraud so that it can mobilize illegal economic actors. This opinion is reinforced by Hibbs and Piculescu (2005) who state that a government with a corrupt bureaucratic system can ignore illegal production in exchange for bribes, so that corruption can increase the shadow economy. In the same year, Choi and Thum (2005) present a model in which the choice of entrepreneurs as economic agents shifts to the shadow economy with the consequence of limiting corrupt officials from accepting bribes.

In low- and middle-income developing countries, officials tend to collude with employers and taxpayers in exchange for bribes. So, by colluding with corporations, corrupt bureaucrats can enable them to exploit lucrative opportunities in the illegal sector. In addition, in developing countries there are many companies as economic actors that operate but are not legally registered or registered. For example, a restaurant, bar, barber shop, other small business or even a company that has a larger production. One of the reasons also tends to be that public goods provided by the official sector in developing countries are much less efficient than developed countries (Hibbs and Piculescu 2005).

On the other hand, there is a different mechanism of treatment in developed countries with high-income communities and attempts to bribe officials tend to be difficult. On the other hand, all operating companies are officially registered and have good public services. So that the difference in conditions between developing and developed countries is seen from the increase

in government revenues and strengthening the quality of institutions which will have an impact on the possibility of reducing corruption.

With a bad government system, it is likely that large companies can also escape from taxation and punishment on the condition that they must bribe officials which in turn increases corruption. Furthermore, corruption also often occurs to finance shadow economic activities so that entrepreneurs in the illegal sector will almost certainly not be known by public authorities. That way between corruption and the shadow economy is related because corruption can increase shadow economic activities and at the same time shadow economic activities require bribes and corruption.

Thus, the hypothesis in this study is that there is a negative relationship between corruption and the shadow economy, *ceteris paribus*. This is in accordance with the models of Choi and Thum (2005), Hibbs and Piculescu (2005), and Dreher et al. (2008).

Tax

This tax-related literature shows relevance beyond the neoclassical approach when trying to understand why citizens pay taxes. Some researchers argue that tax morale can help explain the high level of tax compliance which is defined as the moral obligation to pay taxes (Torgler, 2007). This tax morale is also closely related to taxpayer ethics, namely behavioral norms that regulate citizens who are obliged to pay taxes to the government. So, it is very relevant to investigate whether the tax differences reflected in the level of tax revenue in the G20 countries have a real effect on the shadow economy. Schneider (2010) stated that it turns out that the size of the shadow economy can function as a measure of the level of tax avoidance, so that there is a negative correlation between taxes and the shadow economy.

Previous research related to the correlation between taxes and the shadow economy was conducted by Torgler (2006) which focused on researching the region of Europe and the United States. The findings show that there is a strong negative significant correlation between taxes and the shadow economy. That is, if taxes decrease, the shadow economy tends to increase. Previously, Tanzi (2000) stated that informal or shadow economic activities are greater in developing countries than in developed countries because it is easier to carry out illegal activities. This is due to lower income and value added tax exemptions, higher social security taxes and higher barriers to starting activities in the formal economy than in developed countries.

Thus, the hypothesis of this research is that the amount of tax revenue by the state has a negative effect on the shadow economy, meaning that higher tax revenues can reduce the shadow economy in a country, *ceteris paribus*.

As for the model that will be used in study this is *fixed effects* models. *Fixed Effect* model can accommodate heterogeneity between *sections*. In terms of this heterogeneity G20 member countries will be arrested through score intercept. Use says fixed in *fixed effect* model to show that factor reason heterogeneity in each bank is assumed permanent along time observation (Ekananda, 2016).

RESULTS AND DISCUSSION

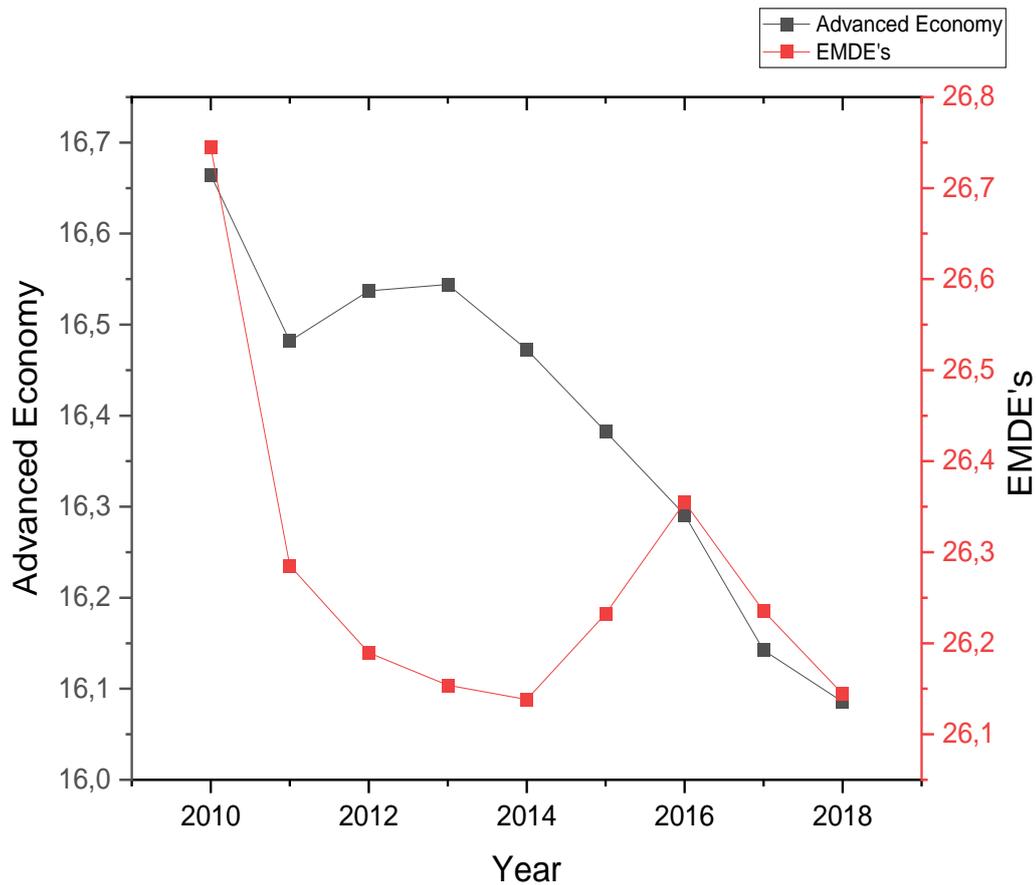
Descriptive analysis

Activities related to the shadow economy are a fact that occur in life throughout the world without developed countries or developing countries. So, it is necessary to understand the shadow economy, and can directly contribute to finding solutions in dealing with everything. This study tries to describe the causes and then explains the influence or response of the G20 countries in the context of developed and developing countries. In this case, to approach the problem of the causes of the shadow

economy is to analyze the development of ICT, corruption control, and tax revenue by a country, especially in the G20 countries.

Now the development of the world of technology, especially digitalization, will lead to a more effective system and management course, which in turn will have an impact on the economy. Furthermore, a government system with good governance with high corruption control can also reduce corruption which is believed to have a significant impact on minimizing the growth of the shadow economy. Third, the tax factor is also an important instrument in influencing the development of the shadow economy.

Figure 2 shows the evolution of the shadow economy based on annual data between developing countries and developed countries that are members of the G20, the trend tends to decrease until 2018. Uniquely, this happens to experience the same phenomenon as in Advanced EMDE's countries. However, what is somewhat more interesting is the observation that there was an increase from 2014 to 2016 for the group of developed countries. That period was marked by a global economic event, namely the fall of world oil that could shake developed countries, although in this case, it was not an influence variable that was included.



Source: Author's calculation, (2022)

Figure 2. *Shadow Economy in Developed Countries and Developing Countries in G20 Countries*

Table 1. Statistics Descriptive Variable

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP	171	3.078	2 712	-3.546	11 200
POP	171	0.910	0.692	-1.854	3.091
INF	171	4.858	6.798	-0.838	42.034
ICTI	171	64.232	23 328	7.5	96.023
TAX	171	16 811	6.443	8 596	31 600
CORRUPTION	171	0.471	0.985	-1.091	2.070
SHADOW	171	21 598	9.483	8 238	44 327
statuscoun~y	171	4 736 842	5 007 734	0	1

Source; Autor's calculation

The lowest shadow economy is at a min value = of 8.238%, namely in the United States (USA) in 2018 and the highest is at 44.327%, namely Russia in 2010. Meanwhile, corruption as a proxy for the corruption control index with the highest scale is at a level of 2.070 in Canada, meaning that corruption was low in 2010, and the lowest scale reached -1.091 in Russia in 2010. From this, it can also be seen explicitly that there is an explicit positive relationship between corruption and the shadow economy. At the same time, the highest corruption was

also the highest in 2010 among the G20 countries. The highest tax proxied by the ratio of tax revenues to GDP with a value of 31.600% was in Japan in 2010 and the lowest with a value of 8.596% in America in 2010. in Korea in 2018 and the lowest was at 7.5% in Indonesia in 2010. The condition between ICT and the shadow economy is also slightly inversely proportional to the negative situation, where the shadow economy tends to fall every year and vice versa of course ICT tends to increase every year.

Table 2. Estimation Results of Shadow Economy

VARIABLES	(1) G20	(2) Advanced Ec	(3) EMDE's
ICT-I	-0.0177*** (0.00553)	-0.0375*** (0.00578)	-0.0233** (0.00891)
TAX	-0.0267 (0.0447)	0.0680** (0.0331)	-0.166** (0.0795)
CORRUPTION	-1 248*** (0.299)	-1 290*** (0.325)	-1 850*** (0.455)
GDP	-0.0753*** (0.0273)	-0.0314 (0.0282)	-0.0623 (0.0397)
POP	-0.100 (0.158)	0.0841 (0.0901)	-1.311** (0.504)
INF	-0.00998 (0.0167)	-0.0260 (0.0338)	-0.00199 (0.0220)
Constant	24.14*** (0.896)	20.00*** (0.873)	31.08*** (1,556)
Observations	171	81	90
R-squared	0.181	0.492	0.243
Number of COUNTRY20	19	9	10

Note: * Significant at the level of real 10%
 ** Significant at level real 5%
 *** Significant on the level real 1%

Amount observation = 171; with Prob > F = 0.00.

Source: Author's calculations

Column 1 of Table 2 presents the fixed effect results of the overall sample of only G20, there are three variables that have a significant effect on the economic shadow, at the 1% level. The shadow economy declines when the information and communication technology infrastructure is more advanced. ensuring control over corruption also reduces the size of the shadow economy. This means that the more effective the government system with a cleaner and more transparent government, the greater the benefits of operating in the official economic sector. In addition, the results are somewhat surprising, that the size of tax revenue is not significant in the overall model.

Furthermore, turning to the results for developed and developing economies in column 2 and column 3, respectively, also shows almost similar results for the significance at the 5% and 10% levels. at least when splitting the sample between developed and developing countries adds one significant variable, namely the effect of taxes on the shadow economy. The results for the sample of developed economies and EMDE are the same as the full sample, with the number of variables in EMDE significant at the 5% level with a negative coefficient direction. This is as expected.

ICT estimation results with *shadow economy*

Model (1) shows the estimation results of all G20 member countries which are reviewed through information and communication technology (ICT), tax revenue (TAX), control of corruption (Corruption), and several control variables such as GDP, inflation, and population on the shadow economy. Therefore, the dependent variable shadow economy is measured based on adopting the MIMIC model in country i and period t . Based on the test results of the estimation of the digital economy variable or information and communication technology, in this case, it is proxied by ICT through the percentage of the individual

population using the internet, which has a significant effect on the shadow economy. The results of the regression carried out show that the ICT variable has a significant negative effect on the shadow economy as measured by the MIMIC model. These results are also consistent for model 2 (developed countries) and model 3 (developing countries), which are negative and significant.

Referring to the t-test results in the estimation table, the ICT variable shows a significant estimation result with a p-value below the 1% significance level in model 1 (G20) and model 2 (developed countries) while significant below the 5% significance level for model 3 (developing countries) and has a coefficient with a negative direction of 0.017, 0.037, and 0.023. That means, when the development of information and communication technology infrastructure increases by 1% in a country, it will be able to reduce the shadow economy in that country by 0.017%, 0.037%, and 0.023%, *ceteris paribus*. The level of influence for developed countries is greater than for developing countries, because developed countries may also be supported by systems and human resources that are much better and more stable. On the other hand, if information and communication technology in the country declines, this can increase the size of the shadow economy. These results are in accordance with the hypothesis in this study and strengthen the findings of Remeikienė, R. et al (2021).

Tax estimation results with *shadow economy*

The efficiency of the public sector also has a direct or indirect effect on the growth of the shadow economy. On the one hand, tax revenue is influenced by taxpayer compliance and on the other hand the country's taxes and taxes. For example, if the tax rate set by the government is high, it can push economic actors out of the official sector, the goal is none other than to shrink the tax base or avoid taxes to ultimately reduce the country's overall tax revenue.

Furthermore, the tax variable in this case is proxied by the proportion of tax revenue to GDP. Of the three estimation models on the shadow economy, the estimation results show that the significant effect is on model 2 (developed countries) and model 3 (developed countries) with a p value at a real level of 5% and has a different coefficient direction, namely in developing countries the effect is negative while positive developed countries. However, when estimated for G20 countries, the results do not show a significant effect. This supports the finding by Hibbs and Piculescu (2005), that high tax rates do not always overshadow large economic improvements, because there are efforts or incentives to avoid taxes. He added more specifically that the agents of production in the shadow economy depend on tax rates relative to the specific benefits available to economic actors who produce in the official sector.

Taxes, which in this case are proxied by the percentage of tax revenue from GDP, will have an effect on the shadow economy after the sample differs between developed and developing countries, this is proven through the t-test test of the independent variable tax for model 2 and model 3 on statistical significance 5%. The estimation results for developing countries show that when taxes increase by 1%, it will reduce the shadow economy by 0.166%. This result is not in accordance with the hypothesis, it could be that the tax proxied by the percentage of tax revenue to GDP is not accurate from the tax itself. Because it could be that tax revenues increase not because of an increase in tax rates but because of the number of participants/taxpayers, on the contrary. Because it uses the ratio of data receipts to GDP, so the figure also depends on the size of the country's GDP, when GDP increases it can result in underestimating numbers and vice versa.

Turning to model 2, for developed countries, based on the coefficient value, the estimation results in developed countries show that when

taxes increase by 1%, it will increase the shadow economy by 0.068%, *ceteris paribus*. These results are in accordance with the hypothesis and research support by Feld and Schneider (2010), Orsi et al, (2014). This means that the tax seen from the proxy of tax revenue to GDP influences the size of the shadow economy, so this also contributes that the fiscal sector is a sector for the existence of the shadow economy. So that later with the existence of this shadow economy, fiscal policy can be inaccurate, because a large increase in shadow economy estimates in a country will have an impact on decreasing government tax revenues. Eventually, this will result in a decrease in the government's ability to finance its public expenditures (Saputra & Nugroho, 2016). Worse yet, the existence of this shadow economy will also have an inaccurate impact on the main economic indicator data such as reported GDP, resulting in errors in overall economic policy making.

Estimated results Corruption with *shadow economy*

Finally, the variable of interest in this study is also investigating corruption which is proxied through the indicator of control of corruption (COC) on the shadow economy both in the G20 as a whole together (model 1), developed countries (model 2), and developing countries (model 3). First, in model 1, the estimation test results show that there is a significant effect seen from the p-value below the 1% level of significance and has a negative coefficient direction. These results are also consistent in that in model 2 and model 3 between developed and developing countries. The results of the estimation test both have a significant effect, seen from the p-value which is below the 1% level of significance and the direction of the coefficient is consistently negative. This means that when efforts to control corruption increase 1% or reduce the number of corruptions in a country, it will be able to reduce the shadow economy in that

country by 1.248%, 1.290%, and 1.850% *ceteris paribus*. On the other hand, if the effort to control corruption decreases which in turn increases the number of corruptions in a country, it will result in an increase in the shadow economy. These results, it shows that corruption has a greater impact on developing countries than on developed countries. These results are in accordance with the hypothesis and confirm the findings of Hassan and Schneider (2016), Williams and Schneider (2016)

The implications of these results prove that the quality of public institutions or government systems is also a major factor in the development of the shadow economy sector. If the government system in a country is good, meaning it is not corrupt and wasteful, then public confidence will increase, so that economic actors will be willing to participate in the formal sector. On the other hand, if the government system in the country is inefficient and highly corrupt, then economic actors have low trust and the possibility of fulfilling their tax obligations is also low. In addition, a corrupt government will also provide an opportunity for economic actors to compromise with officials and authorities by bribing them so that they can give access to illegal activities.

This study also supports research conducted by Johnson et al, (2000) which uses the International Corruption Index to find a relationship between corruption and the shadow economy. The lower the control over corruption, which means that corruption increases in a country, the greater the shadow economy in that country. On the other hand, the higher the control over corruption, which in turn reduces corruption, will have an impact on the decline in shadow economy activities in the country. When viewed from the G20 countries, the level of corruption in developing countries is higher than in developed countries. Thus, this strengthens the results which show that the factor of corruption in developing countries has a greater impact than in developed countries.

CONCLUSIONS

This study aims to analyze the influence of ICT, Taxes, and Corruption on the shadow economy in G20 countries. Referring to the theoretical model developed by Schneider (2000, 2012) with the MIMIC model as a method of measuring the shadow economy. The results of this study indicate that: First, based on the results and analysis in this study, it was found evidence of a significant influence of ICT on the shadow economy. Second, like ICT, the corruption control index also found a significant effect on the shadow economy. Third, different terms for taxes, find significant results when the country sample is separated between developed and developing countries.

The main implication of this empirical study is that the shadow economy does not only occur in developing countries, but also in developed countries. Directly or indirectly, the findings of this study can finally be used as policy recommendations to minimize the shadow economy. However, the size of the shadow economy is recognized as having a negative effect on economic development, such as the weakening of the tax base, causing a budget deficit, distortion of official statistical indicators of unemployment, income, consumption, and investment, and the occurrence of unfair competition between individuals and the official sector. In the end, the existence of this shadow economy can make macro policies in the country less effective.

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