

The persistent effects of COVID-19 on the economy and fiscal capacity of Indonesia

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Abstract

Does the pandemic of COVID-19 have persistent or transitory effects on Indonesia's economy and fiscal capacity? This article addresses the empirical answer to this question by conducting unit root tests on time series data of Gross Domestic Product (GDP), income tax revenue, Value-Added Tax (VAT) revenue, the ratio of income tax revenue to GDP, and the ratio of VAT revenue to GDP covering the period from 1984 to 2019. The results find the presence of unit root process in these time series which imply that the shock from the pandemic may persistently lower the path of economic output and fiscal capacity of Indonesia.

Keywords: unit root, fiscal capacity, persistent effect, pandemic, COVID-19

JEL classification: E60, H20, O40

Abstrak

Apakah pandemi COVID-19 memiliki dampak tetap atau sementara terhadap ekonomi dan kapasitas fiskal Indonesia? Artikel ini menjawab pertanyaan tersebut melalui pendekatan empiris dengan melakukan uji akar unit terhadap data runtut waktu Produk Domestik Bruto (PDB), penerimaan Pajak Penghasilan (PPh), penerimaan Pajak Pertambahan Nilai (PPN), rasio penerimaan PPh terhadap PDB, dan rasio penerimaan PPN terhadap PDB. Data meliputi periode tahun 1984 sampai dengan tahun 2019. Hasil penelitian menunjukkan adanya akar unit dalam data runtut waktu yang diuji; hal ini berarti bahwa efek dari pandemi dapat berdampak tetap terhadap perekonomian dan kapasitas fiskal Indonesia.

Kata kunci: akar unit, kapasitas fiskal, dampak tetap, pandemi, COVID-19

Klasifikasi JEL: E60, H20, O40

INTRODUCTION

The public health impact of the pandemic of coronavirus disease 2019 (COVID-19) may be the most serious that the world has to face since the Spanish influenza outbreak of 1918 (Ferguson et al., 2020). Moreover, the economic impact of the COVID-19 pandemic could be severe. The global economy is currently suffering its deepest recession since the end of the Second World War, with global output for 2020 is projected to contract by 5.2 percent and the economy of the emerging and developing markets is projected to contract by 2.5 percent (World Bank, 2020a, 2020b).

Originating in Wuhan, China, COVID-19 spread globally and until September 2020, has infected more than 30 million people (Google Berita, 2020). Many countries restricted people movement, lockdown large areas, and partly or fully closed their borders to contain the spread

of the disease. These measures have adversely affected the supply and demand sides of many economies. On the supply side, productive capacity and productivity are disrupted due to shutdowns. On the demand side, falling income and the increasing uncertainty cause reductions in consumption, which depress the demand for new investment.

In Indonesia, the first COVID-19 cases were reported in March 2020, whereas at the end of September 2020, the disease has infected 275,213 people. Responding to the pandemic, Indonesia has taken measures to limit its spread. These measures included large-scale social restrictions, which are imposed in several areas, including the capital city of Jakarta. One of the consequences of these containment measures is sharp contractions in the economy. Indonesia's economic growth in

the first quarter of 2020 only reached 2.97 percent (year on year). This level was significantly lower compared to the growth in the first quarter of 2019, which reached 5.07 percent. The impact of the pandemic continues to hit the economy and in the second quarter of 2020, growth contracts to minus 5.32 percent (year-on-year) – as a comparison, growth during the same quarter a year before (2019) reached 5.05 percent (Badan Pusat Statistik, 2020).

Further, the economic contractions have affected Indonesia's public finances. Compared to the same period a year before, nominal tax revenue in the period January-August 2020 shrank by 15.6 percent (Ministry of Finance, 2020). The combination of declining tax collection and the necessary increases in public spending to provide relief from the pandemic-induced economic recession have contributed to expansions in budget deficits. As of August 2020, the deficit increased by 152.9 percent compared to the same period of the previous year and reached 3.05 percent of GDP, with a projected level of deficit at 6.34 percent of GDP by the end of 2020 (CNN, 2020; Fauzia, 2020).

With these backgrounds, it might only be natural to ask whether Indonesia's economy and fiscal capacity would be able to recover to its pre-pandemic levels; or in other words, whether the pandemic has persistent or transitory effects on the economy and fiscal capacity. This article is aimed at answering this question by examining publicly available time-series data. These data were tested for the presence of the unit root process because the presence (absence) of the unit root may imply that the shock from COVID-19 may have persistent (transitory) effects on the economy and fiscal capacity.

LITERATURE REVIEW

Due to the potential adverse impacts of COVID-19 on the economy, understanding the transfer mechanisms through which the pandemic may send shocks to the economy could be important. Carlsson-Szlezak, Reeves, and Swartz (2020a, 2020b) maintained that there are three main transmission channels from which the disease may affect the economy. First, the direct impact

of the pandemic on the economy due to reductions in the consumption of goods and services. The health risks from COVID-19 may keep people at home, holding discretionary spending. Second, the indirect impact of the pandemic on the real economy through shocks in financial markets. As markets contract, households may have some concerns that their wealth would fall; this would increase the savings rate and, in turn, depress consumption. Third, disruptions on the supply side. As the pandemic shuts down productions, the supply chains of businesses would be affected, and this would adversely impact labor demands along the production and distribution channels, thus increasing the levels of unemployment and further depressing aggregate consumption.

The likely sources of economic shocks from COVID-19 is argued by Baldwin and Mauro (2020) to come from three directions. First, infected workers will have to be put into their sickbed, thus reducing aggregate output. Second, reductions in economic activities due to containment measures were taken to flatten the epidemiological curve. Third, reductions in investment and consumption due to the increasing uncertainties brought by the pandemic.

Further, Ozili and Arun (2020) suggested that the health crisis may stifle economic activities through two mechanisms. First, the spread of the virus forced social distancing, which caused shutdowns in financial markets, businesses, and events. Second, the speed of virus contagion and the uncertainty concerning its adverse impacts prompted the flight to financial safety among consumers, investors, and international trading partners.

Many studies have been trying to assess the magnitude of the impact of the COVID-19 pandemic on the economy. Fernandes (2020) estimated that depending on countries, GDP can fall between 10 to 15 percent. Further, Fernandes (2020) argued that each additional month of a continuing pandemic would cost around 2.5 to 3 percent of the world's GDP. Baker, Farrokhnia, Meyer, Pagel, and Yannelis (2020) based their estimation on the real business cycle model and estimated that shocks from COVID-19 would lead to a year-on-year contraction of the GDP of the

United States of America by order of 11 percent by the end of 2020.

As the spread of COVID-19 reaches a global scale, it has the potential to push the world economy to a prolonged path of recession. Mann (2020) suggested that the global recovery from COVID-19 is likely to be U-shaped rather than V-shaped. The crisis may affect different countries differently, with a V-shaped recovery – short and sharp contraction with full recovery to the long-term growth path – for some economic sectors and countries. However, for other sectors and countries, the crisis could be persistent and require a longer time to recover – hence it may take the shape of letter U. At the global aggregate, Mann (2020) argued that the negative impacts of the crisis would be persistent, thus recovery for the world economy may resemble a U shape. Jordà, Singh, and Taylor (2020) analyzed the impact of the COVID-19 on real natural interest rates because they argued that the pandemic would depress investment demand. They estimated that the real natural interest rate would decrease to -1.5 percent within 20 years and would stay depressed for a period of 40 years.

For the case of Indonesia, McKibbin and Fernando (2020) estimated that the economic loss due to Covid-19 could be between 0.2 to 4.7 percent of GDP, depending on the assumed scenario. Suryahadi, Al Izzati, and Suryadarma (2020) estimated that the pandemic would push between 1.3 million to 8.5 million Indonesians to poverty. Further, the International Monetary Fund (IMF) significantly revised Indonesia's year-on-year growth projection for 2020 from 5.1 percent to 0.5 percent (International Monetary

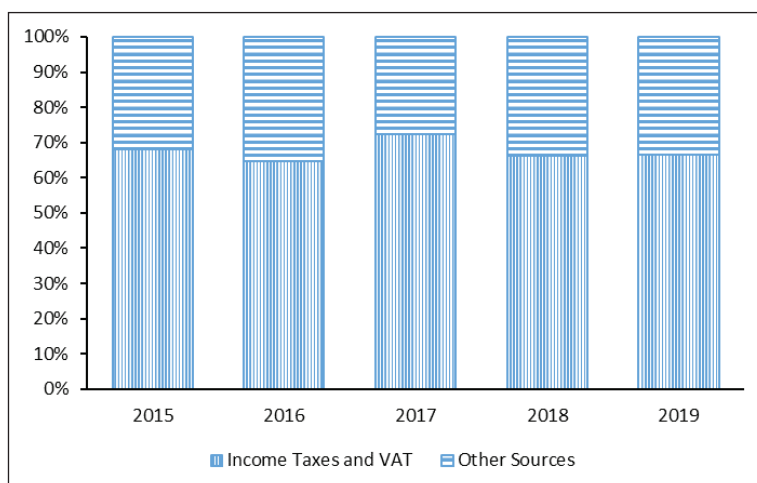
Fund, 2020). The World Bank forecasted that Indonesia's GDP growth for 2020 may be between -3.5 to 0 percent (World Bank, 2020a).

Empirical assessment on the possible persistent effects of shocks from COVID-19 on the Indonesian economy and fiscal capacity, however, is scarce. To the best of the author's knowledge, this article is the first which empirically assess whether the pandemic may have permanent or transitory effects on the Indonesian economy and fiscal capacity. This article also provides some possible explanations for the empirical findings, thus enriching the literature on the mechanisms in which the pandemic may impact the economy and fiscal capacity, particularly in developing countries such as Indonesia.

Indonesian Tax Systems: A Brief Overview

This section provides a brief overview of Indonesia central government tax system. More detailed information on this subject is available elsewhere, such as in International Monetary Fund (2014); World Bank (2016a, 2016b).

In the last several decades, there have been reforms and changes in the Indonesian tax systems. Comprehensive tax reform was formulated in 1983, and it was followed by piecemeal changes in 1994, 2000, 2008, 2009, and 2020. Two major taxes in Indonesian tax systems which fall under the central government's jurisdiction are income taxes and value-added tax (VAT). In the past five years, for instance, these two taxes accounted for an average of 68 percent of total government revenue (Figure 1).



Sources: Badan Pusat Statistik (Various Years); Government of Indonesia (Various Years).

Figure 1. Sources of government revenue, 2015-2019

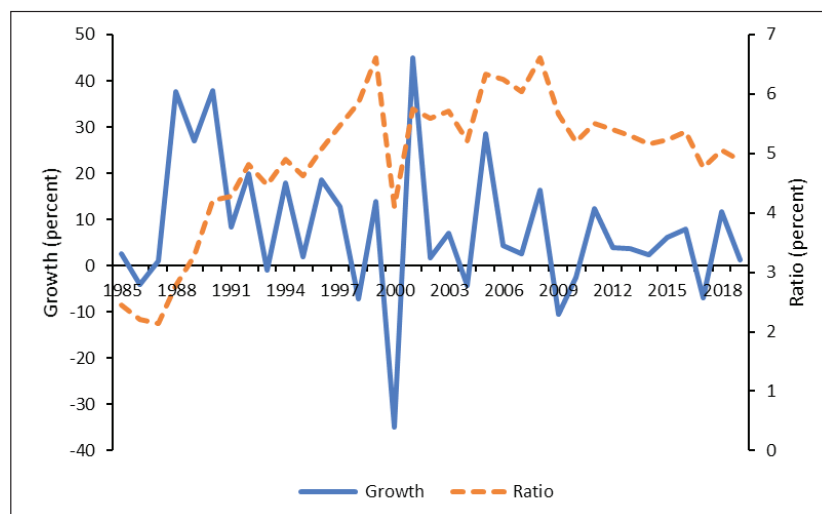
Taxes on income mainly consist of corporate income tax and personal income tax. The corporate income tax is imposed on the net profit of corporations and business entities. There have been significant reductions in the statutory rates for corporate income tax. In 1983 a graduated system of progressive rates was applicable for corporate income, with the top marginal rate at 35 percent. Subsequently, there were reductions in the rate, and since the tax year 2020, a single rate of 22 percent applies. A further amendment to the law concerning income taxation mandated that corporate income tax rate will be reduced further to 20 percent effective in the fiscal year 2022.

The personal income tax is imposed on income from salaries, wages, tips, commissions, and business profits earned by individuals, including sole proprietorships and unincorporated businesses. There are allowable deductions such as standard occupational deductions, pension contributions deductions, and basic personal relief. Progressive tax rates apply with the top marginal rate currently at 30 percent, down from the original 1983 rate of 35 percent. However, the share of the revenue from personal income taxation is relatively small. For example, for the period 2011-2018, revenue from personal income taxes only contributed, on average, 15 percent of the total tax revenue – whereas the share of the revenue from corporate income taxation was 33 percent and revenue from VAT was 32 percent for the same period (OECD, 2020).

Figure 2 presents the performance of income taxes collection for 1985-2019 in real growth (2010 = 100) and as the ratio of GDP.

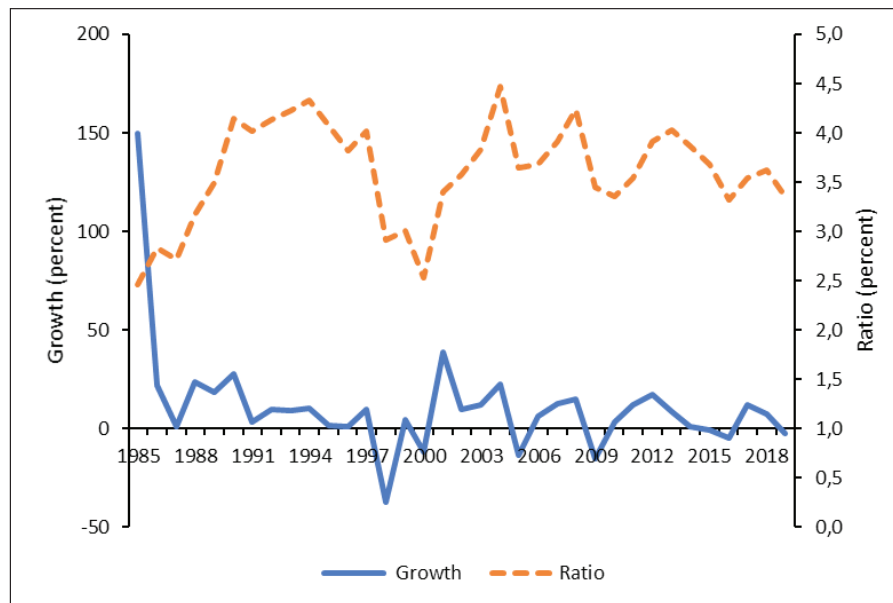
Data in Figure 2 show that growth in income taxes collection during the early years of the reform of 1983 was significantly high, with an annual average of 14.4 percent for the period 1985-1993. Subsequent tax reforms, however, resulted in persistently lower growth in collection: an annual average of 9.7 percent for 1994-1999, 6.2 percent for 2000-2007, and 3.8 percent for 2008-2019. Further, in the period after the Asian financial crisis (AFC) of 1997/1998, growth in income taxes collection reached its peak in 2001 at 44.9 percent, and afterwards, there was a declining trend with the recent growth of only 1.4 percent in 2019 – this was significantly less than the growth rate of the economy which reached 5.0 percent in the same year (2019). In terms of the share of income taxes to the aggregate economic output, the ratio of income taxes collection to GDP was at an annual average of 3.4 percent for 1985-1993, 5.4 percent for period 1994-1999, 5.7 percent for the period 2000-2008, and 5.2 percent for period 2009-2019. After the AFC, the ratio reached its peak at 6.6 percent in 2008; afterwards, it had a consistently declining trend and recently only reached 4.9 percent of GDP in 2019.

For consumption tax, the VAT was imposed on the difference between the outputs (or sales) and the purchased inputs. The tax rate has been stable at 10 percent since its introduction in 1983. The original VAT law (i.e., the law of 1983) imposed the tax on a broad base of goods and services with exemptions were limited only for educational, social, religious, and health services. Amendments to the law enacted in subsequent reforms, however, expanded the tax exemptions



Sources: Badan Pusat Statistik (Various Years); Government of Indonesia (Various Years).

Figure 2. Income taxes collection, 1985-2019 (real growth rate and ratio to GDP)



Sources: Badan Pusat Statistik (Various Years); Government of Indonesia (Various Years).

Figure 3. VAT collection, 1985-2019 (real growth rate and ratio to GDP)

to include no less than 60 items or group of items (Iswahyudi, 2018).

Figure 3 presents the performance of VAT collection for 1985-2019 in real growth (2010 = 100) and as ratio of GDP.

The significantly high growth of VAT collection in 1985, as shown in Figure 3, might reflect the broad-base expansions in taxable goods and services as well as the gains from steep learning curve on the part of tax officers at that time in administering the newly enacted VAT (see Gillis (1989)). During the AFC, the growth of VAT collection deteriorated due to the severity of the crisis. The growth rebounded in the post-AFC period, and the peak was reached in 2001 at 39.0 percent; however, it had a declining trend afterwards. In terms of ratio to GDP, VAT collection after the AFC peaked at 4.5 percent of GDP in 2004. Afterwards, the ratio consistently declined, and recently it only reached 3.4 percent of GDP in 2019.

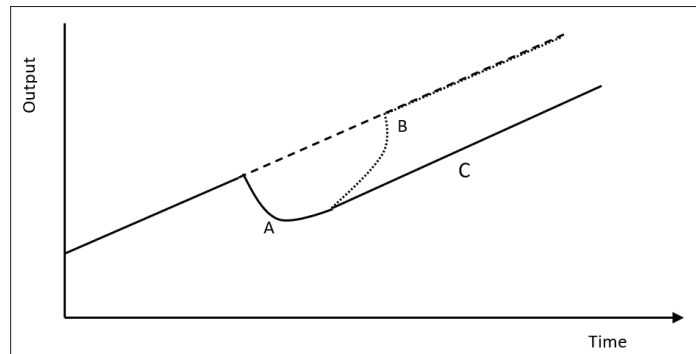
Unit Root in Economic Time Series

In economics, unit root can be defined as a feature of a stochastic trend in a time series. If the unit root is not present in a series, then the series can be characterized as having stationary fluctuations around a long-run deterministic trend, thus the effects from shocks would dissipate over time. On

the contrary, if the unit root is present in a series, then the series can be characterized as having a non-stationary process, without a tendency to return to their long-run deterministic path and thus, the effects from shocks are likely to be permanent (Libanio, 2005).

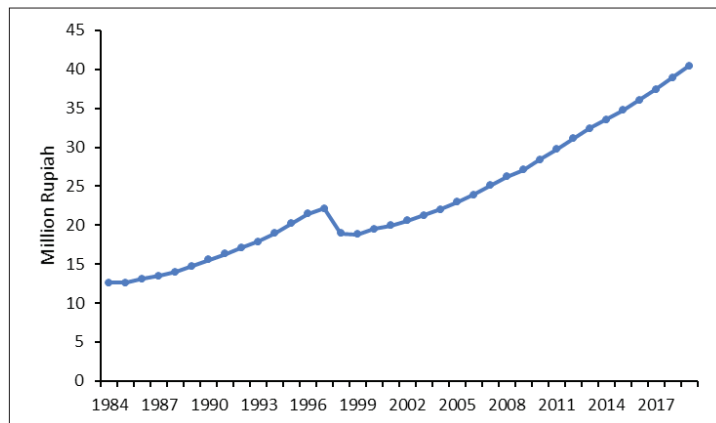
The issue of persistent or transitory fluctuations in economic data was brought to prominence due to the work of Nelson and Plosser (1982). They examined the presence of unit root in various macroeconomic time series for the United States of America, including the Gross National Product (GNP), employment, wages, prices, and interest rates. They concluded that the hypothesis on the presence of the unit root process could not be rejected for most of the series under examination. This conclusion has prompted other studies which employed unit root test as an analytical tool (for some recent examples, see Bauer and Rudebusch (2020); Perles-Ribes, Ramón-Rodríguez, Rubia-Serrano, and Moreno-Izquierdo (2016); Yilanci and Pata (2020).

Figure 4 visualizes the potential effect of the absence or presence of unit root on the dynamics of a time series after a deep recession. In Figure 4, the time series of economic output is used as an example. As the economy is hit by the recession, output falls to A. If the unit root is not present in the series, the path of recovery would follow line B – that is, the levels of output will bounce



Source: Author.

Figure 4. Unit root in time series



Source: World Bank (2020c).

Figure 5. Real GDP per capita, 1984-2019

back to its long-run trend. On the other hand, if the unit root is present in the time series, then the post-recession path of the output will follow line C – that is, the output would be persistently lower than its previous long-term potentials (i.e., line B). In this latter case, the economy may take a considerable time to reach the levels which could otherwise be achieved had the time series did not have a unit root.

It is worth noting that the existence of unit root in a time series does not necessarily mean that after a shock, economic output would cease to grow. On the contrary, as shown in line C in Figure 4, the economic output might still grow after a shock. However, the levels of output might be lower than would have been had the shock did not happen. In other words, after the shock, the economy might grow (bouncing effect), but this growth is achieved at lower levels of output than before the shock happened and for the output to go back to the state before the shock would require a quite significant amount of time; thus the persistence effect.

The economy of Indonesia may have experienced the persistent effects from the shock of the Asian financial crisis. Figure 5 shows the time series of real GDP per capita for Indonesia covering the years from 1984 to 2019. Statistical test¹ for the period 1984-1997 found the presence of unit root in the time series. When the full impact of the Asian financial crisis hit the Indonesia quarter in 1998, real GDP per capita fell, and the crisis broke its long-run trend. As seen in Figure 5, after 1998, the recovery process from the crisis seems to be consistent with the persistent effect of shock when the unit root is present in a time series, as represented by line C in Figure 4.

The presence of unit root in economic time series may have important implications on economic theory and policy. For instance, according to the real business cycle theory, evidence on the existence of unit root in GDP time series may imply that persistent changes in output are due to shocks in real factors such as technological progress, hence monetary policy is argued as ineffective at countering recessions

1 Augmented Dickey-Fuller test with maximum lags of two.

(Nelson & Plosser, 1982). Further, according to the new Keynesian theory, the existence of unit root may imply that after a deep recession, the output may be very slow to revert to its long-run deterministic trend, and the causes for this slow process may relate to rigidities and imperfections that exist in the markets (Libanio, 2005). Hence, under the new Keynesian view, post-recession economic policies should be directed toward reducing these market rigidities and imperfections.

RESEARCH METHOD

This article conducted unit root tests to investigate whether shocks from COVID-19 has persistent effects on Indonesia's economy and fiscal capacity. The general model for testing unit root is expressed in the equation 1:

$$y_t = \alpha + \beta y_{t-1} + \delta t + \zeta_1 y_{t-1} + \dots + \zeta_k y_{t-k} + \epsilon_t \quad (1)$$

where, y_t denotes the value of the time series at time t ; α represents the constant term; δt denotes the time trend; k is the number of lags introduced in the model; ζ is the coefficient for the lagged values; and ϵ is the error term. For all tests, the null hypothesis was that a unit root is present, $\beta = 0$, against the alternative hypothesis of $\beta < 0$.

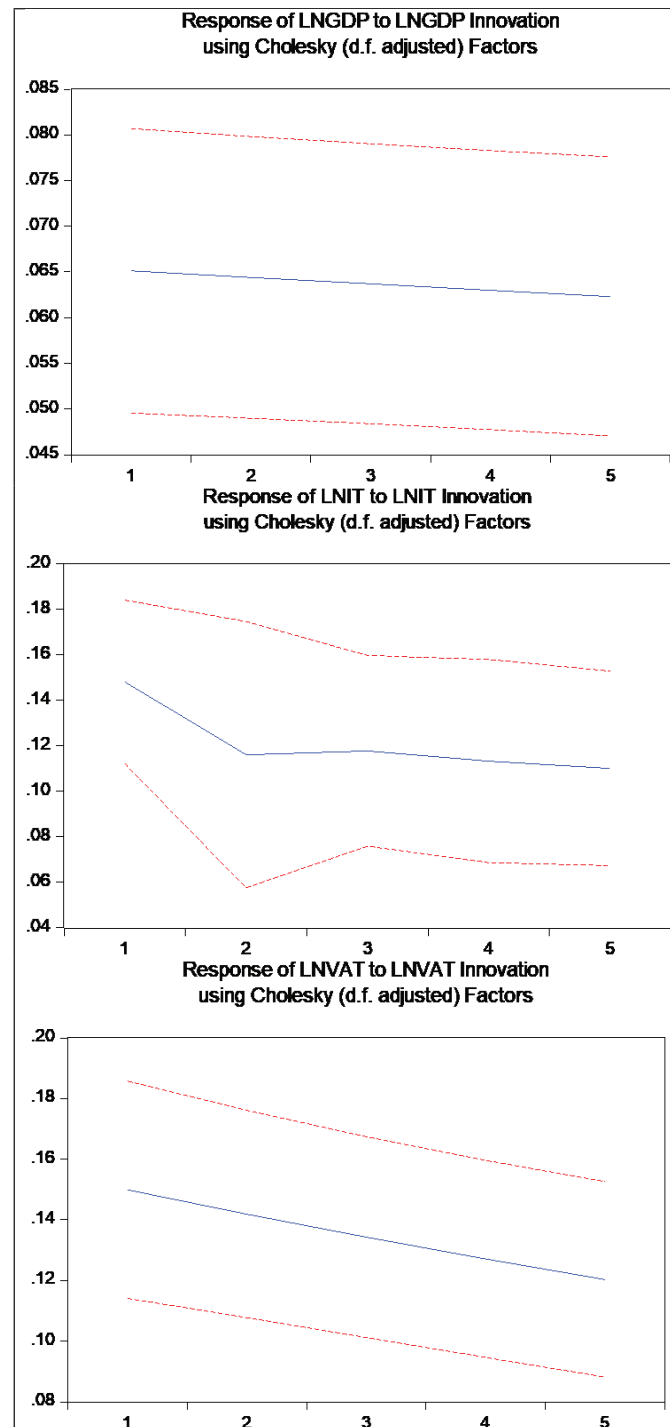
The data which were investigated in this article comprised of time series on the levels of GDP, income tax revenue, VAT revenue, the ratio of income tax revenue to GDP, and the ratio of VAT revenue to GDP. These data were derived from the annual publication of Statistics Indonesia from Badan Pusat Statistik (Various Years), datasets from the World Bank (2020c) and OECD (2020), and the annual financial report of the Government of Indonesia (Various Years). Nominal values of GDP, income tax revenue, and VAT revenue were restated in their natural logarithms. All data covered the period 1984-2019. The year 1984 was chosen as a starting point because this was the year that the laws contained in the first tax reform started to be effective. The year 2019 was chosen as the endpoint simply because this was the year that the latest data were available. Figure A to E in the Appendix presents these time series data in graphical forms. To determine

the optimal lag lengths for each time series, this article employed lag order selection statistics from Akaike's information criterion, Schwarz's Bayesian information criterion, and the Hannan and Quinn information criterion. The criteria with the smallest lag lengths for each time series is selected, and the results were as follows: lag order one for the time series of GDP, VAT revenue, and VAT ratio and lag order two for the time series of income tax revenue and income tax ratio.

The next step was to conduct an out-of-sample forecast for each time series. For this purpose, the starting point was the impulse response function (IRF) of the vector autoregressive (VAR) model of univariate time series of GDP, income tax revenue, and VAT revenue. Results of the IRF for each time series are presented in Figure 6. It can be inferred from the figure that all of the time series show negative responses to shocks, and the effects of these shocks do not dissipate even after five years.

Since IRF measures the response to a one standard deviation shock in the impulse variable, the magnitude (in terms of standard deviation) of shocks from COVID-19 in the time series under study need to be estimated. In this study, the values of one standard deviation for the time series of GDP, income tax, and VAT were derived from the long-run data, i.e., 1984 to 2019. The magnitude of the shock to GDP was estimated from the difference between the economic output projection for the year 2020 made before the pandemic (International Monetary Fund, 2019) and the most recent estimate of 2020 economic output (CEIC, 2021). This result was then compared to the value of one standard deviation of GDP to estimate the magnitude of shock as a ratio of standard deviation. The next step was to apply this ratio to the magnitude of response in the IRF to arrive at forecasts of GDP for the next five years.

The above procedures were duplicated in conducting out-of-sample forecasts for income tax revenue and VAT revenue. However, the magnitudes of the shock of these time series were estimated from the difference between revenue projections or targets to be collected from income taxes and VAT for 2020, which were set before the pandemic (State Budget Law Number 20/2019) against the revenue actually collected in



Source: Author.

Figure 6. IRFs from shocks in GDP, Income Tax, and VAT

2020 from these taxes. Forecasts for the ratio of income tax to GDP and VAT to GDP were quite straightforward since estimates for the values of GDP, income tax revenue, and VAT revenue have been determined previously. On the other hand, forecasts made under the condition of an absence of shock were determined using simple univariate regressions based on the already available historical data for the respective time series.

RESULTS AND DISCUSSION

The statistical results are presented in Table 1 and Table 2, and it could be inferred that the dominant result seems to confirm the null hypothesis of the presence of unit root in each time series under study. Table 1 presents results from testing the presence of unit root in each time series using ADF (Augmented Dickey-Fuller), DF-GLS (Dickey-Fuller Generalized Least Squares), PP

Table 1. Unit root tests

Time Series	Test Statistic				
	ADF	DF-GLS	PP	KPSS	ERS
\log_e GDP	0.354	-0.668	0.356	0.328	37.170
\log_e income tax revenue	-0.161	-1.078	-0.058	0.301	88.180
\log_e VAT revenue	-0.661	-0.062	-4.047**	0.332	122.806
\log_e income tax ratio	-1.427	-1.348	-1.857	0.289	42.470
\log_e VAT ratio	-2.892	-1.599	-4.394***	0.159***	35.417

Notes: *** significant at 1% level, ** significant at 5% level.

Source: Author's calculations.

Table 2. Unit root tests with structural break

Time Series	Test Statistic
\log_e GDP	-2.780
\log_e income tax revenue	-3.159
\log_e VAT revenue	-2.778
\log_e income tax ratio	-3.229
\log_e VAT ratio	-3.350

Note: critical value at 1% level = -4.910; at 5% level = -4.363; at 10% = -4.085

Source: Author's calculations.

(Phillips-Perron), KPSS (Kwiatkowski, Phillips, Schmidt, and Shin), and ERS (Elliott, Rothenberg, and Stock Point Optimal). Data tested were in levels and stated in their natural logarithms, as well as included the trend and intercept in each equation. Except for the time series of VAT revenue (under PP test) and VAT ratio (under PP and KPSS tests), the results are generally not statistically significant to reject the null hypotheses of the presence of unit root.

Table 2 shows the results from tests aimed at checking the robustness of the earlier results reported in Table 1 by conducting the ADF unit root tests with a structural break in each series. The results seem to confirm the presence of unit root in all of the time series examined since none of the test statistics is significant to reject the null hypothesis of the presence of unit root in each time series.

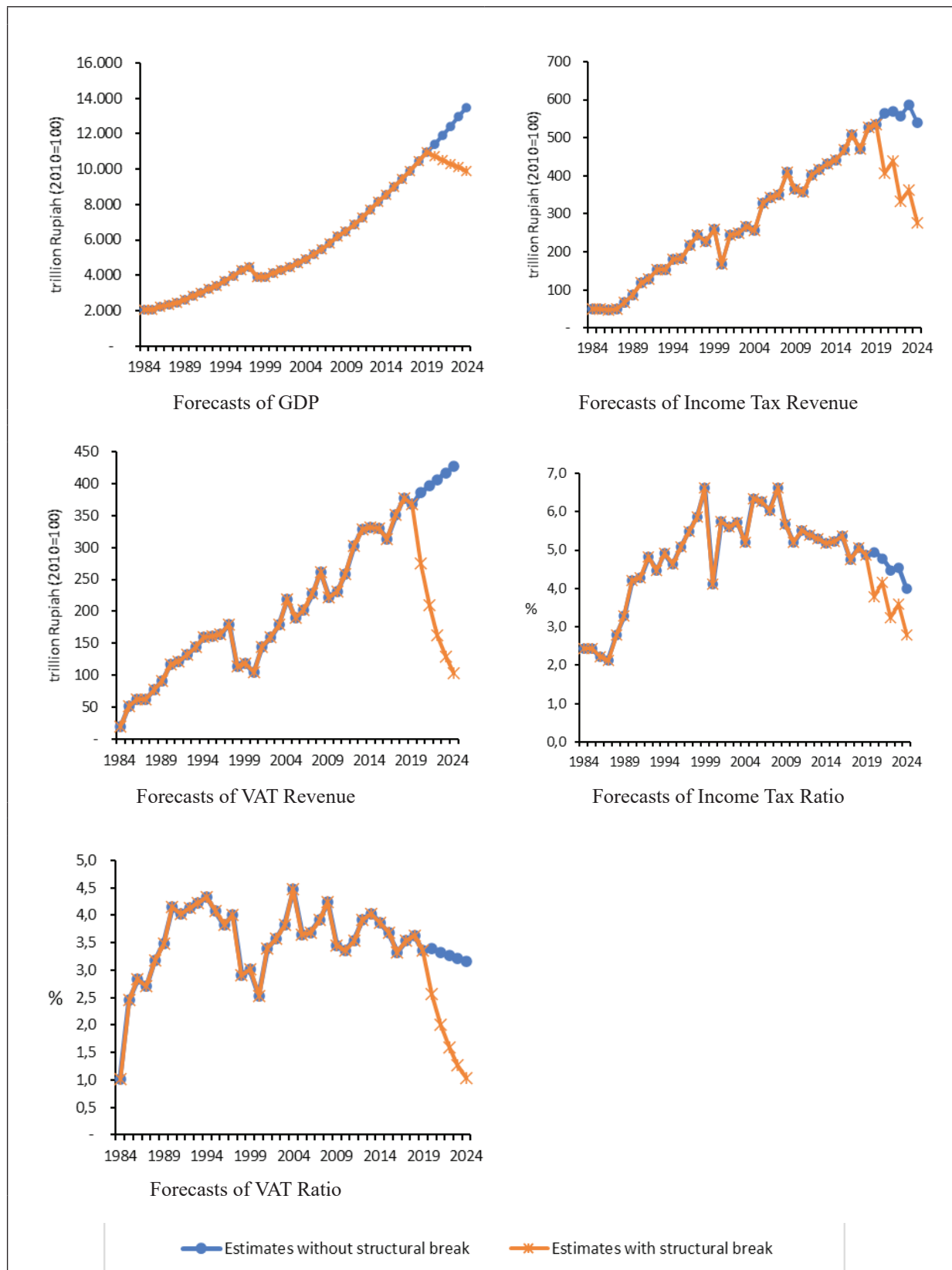
Discussion

This article finds evidence on the presence of unit root in the time series of Indonesia's GDP. This finding may imply that the country's economic output may exhibit path-dependency. This means that significant cyclical deviations from some equilibrium path, such as deep recessions caused by COVID-19, could leave persistent marks in the economy in the form of medium-to-long-term

output that is consistently lower than its potentials (Cerra, Fatás, & Saxena, 2020).

Forecasts derived from the impulse response functions seem to be consistent with the possibility of persistent effects of COVID-19 on the economy and tax capacity. Figure 7 presents out-of-sample forecasts for each of the time series under study.

One of the possible explanations for the persistently lower economic output in the post-shock period is the declining productivity. Collapsing aggregate demand due to COVID-19 and its containment measures may cause a deep recession, hence one of the measures which could be taken by firms is to reduce their research and development expenditures. This, in turn would slow the diffusion of new technologies as well as hamper the adoption of new, best practice production techniques and thus reduce economic productivity (Dosi, Pereira, Roventini, & Virgillito, 2018). This explanation also is consistent with the studies of Anzoategui, Comin, Gertler, and Martinez (2019) and Reifschneider, Wascher, and Wilcox (2015) which concluded that expenditures on research and development are typically pro-cyclical, with reductions generally occurring in times of economic downturns. Moreover, the explanation also is in line with the argument put forward by Dosi, Napoletano, Roventini, and Treibich (2016), who maintained



Source: Author.

Figure 7. Out-of-sample Forecasts

that contractions in aggregate demand might slow the process of technological diffusion and adoption.

Changes in human capital, as well as decelerations in knowledge accumulation and in the process of learning by doing, may also serve as the relevant sources for declining productivity after a deep recession (Fatas, 2000; Stadler, 1986, 1990; Stiglitz, 1993). During prolonged and severe recessions, firms tend to lay off workers, and job vacancies are typically rare, hence a large share of the workforce may experience a long period of unemployment. The skills and knowledge accumulation of these unemployed workers may degrade because they may lose contact with new production techniques and practices as well as lost the opportunity to learn by doing. As a result, when the economy recovers and these workers are finally hired again, their productivity may be lower than previously due to skills deteriorations (Dosi et al., 2018).

Another possible source for the declining economic productivity may come from reductions in the formation of new businesses following a severe recession. In normal times, start-ups may bring the latest technologies in their output generation processes; thus, they may play an important role in promoting innovations (Reifschneider et al., 2015). During economic downturns, however, new business formations may fall. Credit constraints, for example, may reduce the ability of entrepreneurs to provide financial supports for start-ups. The declining number of start-ups may in turn, suppress the introduction of innovations and reduce economic productivity.

This article also finds evidence on the presence of unit roots in the time series of income tax revenue and VAT revenue as well as in the ratio of income tax revenue to GDP and the ratio of VAT revenue to GDP. Hence, it is possible that shocks from COVID-19 have persistent adverse effects on Indonesia's long-term revenue mobilization capacity. One reasonable explanation for this finding may be straightforward: As tax revenue depends on economic conditions, persistent reductions in the economic output below its long-term potentials after the pandemic may also mean that post-pandemic tax collections would be persistently below their potentials.

Further, financial problems experienced by businesses during the recession may cause shrinkages in the tax base due to a possible wave of business exits. Deep and prolonged recession may cause financial stresses for many viable firms which operate in the formal sector of the economy and are part of the tax net. When the financial stresses are severe enough, these firms may have to shut their operations completely; thus, they would permanently exit from the tax net, and as a result, the tax base might permanently shrink.

Another mechanism for the persistent effect of economic shocks on tax collection may relate to the tax policy responses devised during severe economic downturns. In a depressed economy, governments may cut taxes to increase aggregate supply and demand. While aggregate supply and demand may increase and bring the economy out of recession, the tax cuts themselves may become permanent. Hence, when the economy returns to normal, tax collection may be persistently lower than its long-run potential due to, among others, the tax cuts which become permanent.

For the case of Indonesia, one of the responses to the economic downturn due to COVID-19 is straight permanent cuts in corporate income tax. Effective from the tax year 2020 corporate income tax rate is reduced from 25 percent to 22 percent. There is also a significant cut in the fine for late or insufficient payment, thus giving incentives to taxpayers to use taxation as a cheap source of financing. Other measures include expansions in tax exemptions and credits. Other fiscal regulatory responses to the pandemic are intended to be temporary. These include cuts in payroll taxes, gross receipts taxes payable by small and medium enterprises, import taxes, and withholding taxes as well as deferment in monthly tax installments.

In times of recessions, most firms would inevitably experience business downturns, and this may encourage them to muster collective actions to press the government to provide tax stimulus. On the other hand, it may be reasonable for the government to support businesses during recessions by cutting taxes. However, tax cuts introduced to address temporary problems tend to be politically hard to remove later because firms that benefit from these cuts may not want them to be abolished even after the original justification for the cuts is long gone. This way, temporary

tax cuts tend to be permanent because the sunset provisions in these cuts might become the subject of capture from interest groups; hence they might actually never expire (Viswanathan, 2007).

Although tax cuts may help businesses during recessions, however, in practice and in the longer term, when the economy returns to normal, these cuts may not always result in the expansions of the tax base and thus may not improve tax collections. The possibility that tax cuts may have insignificant impacts on economic activity and may have adverse effects on public revenue has been discussed in the literature. For example, Gale, Gelfond, Krupkin, Mazur, and Toder (2019) concluded that the U.S. Tax Cuts and Jobs Act of 2017 has a small long-term impact on GDP, whereas their adverse impacts on public revenue may be significant and thus would exacerbate the problem of income inequality, increase government debts, and put more burdens on future generations. Moreover, after evaluating how corporates may adjust their tax strategies to variations in U.S. states' tax policies, Bruce, Deskins, and Fox (2007) found that the level of corporate income tax rates did not seem to have statistically identifiable effects on the economic activities of the private sector.

Another example, in 2012 and 2013, the state of Kansas made significant changes in its tax structures by eliminating the tax on business income and substantially cutting the tax rates for several sources of income received by individuals. However, after several years these measures failed to boost new business formations and job creations and resulted in plunging tax revenue, forcing the state to cut public expenditures on education and other vital services. The plunging tax revenue also resulted in the downgrading of the state's bond rating, thus further complicating the problems of financing public provisions. So severe was the adverse impacts of the tax cuts on Kansas' economy and public finances that they had to be terminated in 2017: tax exemption on business profits was repealed, and the personal income tax rates were increased back to where they had started (see DeBacker, Heim, Ramnath, and Ross (2019); Mazerov (2018); Turner and Blagg (2018)).

As the pandemic subsides, households which previously forced to save during the lockdown would start to spend; thus a large portion of aggregate demands would come back. However, there are three reasons why demands, and thus the VAT revenue, might not quickly bounce back to its pre-pandemic levels once social distancing measures are lifted (Blundell, Levell, & Miller, 2020). First, a lot of consumers have seen significant falls in their incomes thus they may limit their spending. Second, lingering uncertainty regarding public health issues and economic conditions may persistently curb consumption and investment activities. Third, the job displacement effect due to the pandemic may take time to materialize. Jobs lost due to the pandemic may partly never come back, while new job openings in other sectors of the economy may take time to turn up. As a result, worker-firm mismatch may occur for the foreseeable future. This may alter the spending and working patterns, may be temporarily for some and perhaps permanently for others.

Other possible explanation for the persistent effects of COVID-19 on tax collection may relate to expansions in informal economy following a deep recession. In Indonesia, government-sponsored unemployment benefits are not available thus when workers are unemployed for long period, especially for the blue-collar workers they may have no option other than to have to earn a living by starting their own businesses. These new businesses generally small in size and operate in the informal sector of the economy – for example, illegal street vendors or street hawkers – because these unemployed workers often lack the capital required to do business in the formal sector. When the economy returns to normal, these workers are likely to stay with their informal businesses because their skills might not be up to date with new production technologies and would have to compete for job vacancies with younger, new graduates who are more likely to possess the necessary knowledge and skills to operate the new, advanced production technologies. As a result, the size of the informal sector in post-recession economy may get bigger.

An expanding informal economy may be problematic for tax collection since this sector is

generally hard to tax. Businesses in the informal sector typically do not register voluntarily; thus, they may operate outside the tax net. Even when they are registered as taxpayers (as a result of enforcement efforts, for instance), they often fail to keep proper bookkeeping, file tax returns, and pay the taxes due (Terkper, 2003). With weak tax administration enforcement capacity, the risk of detection of such noncompliance behaviors might at best be modest (Engelschalk, 2007, p. vii). Therefore, if before the recession, these workers may be part of the tax-paying population through their payroll tax withholding, after the recession the tax base may shrink because the now unemployed workers may be going underground and joining the informal economy. Moreover, the failure of informal businesses to pay taxes could be viewed by registered businesses operating in the formal sector to be unfair. This perception of unfairness may be detrimental to the general tax morale and may erode the tax compliance among formal businesses which previously had paid their fair share of taxes. In the end, these conditions may lead to persistent declines in overall tax revenue (Alm, Martinez-Vazquez, & Schneider, 2004).

Another possible source of expansions in the informal economy following the pandemic of COVID-19 may relate to deteriorations in public services. Government revenue may significantly decline during the recession, and this fiscal constraint may lead to reductions in the quality and quantity of public provisions. These deteriorations in public services may not be conducive for businesses and as a result, businesses may choose to go underground because their operations in the formal sector of the economy may be hampered by inefficient public institutions, which itself arise due to the limited fiscal supports for these institutions. Hence, this condition may create a vicious cycle: declining tax revenue prompts the government to cut funding for the provision of public services, the cuts in funding would cause reductions in the quality and quantity of public services, in turn, the deteriorating public services may encourage businesses to migrate to the informal sector. Because businesses in the informal sector typically operate outside of the tax net, government revenue would decline further, forcing more cuts in public provisions.

With these empirical findings, part of the policy options might be, at least, to prevent the break-in long-term output trend from going too deep – in other words, to minimize the depth of output contraction due to the pandemic. The presence of the unit root process in the GDP time series may imply that output losses from the pandemic could be persistent, hence policies aimed at reducing the magnitude of output contraction may be important. These policies might not be able to rapidly recover the output levels back to its former long-run trend; however, they might lessen the severity of the growth derailment and the welfare costs arising from the pandemic.

Moreover, the presence of the unit root process in fiscal capacity time series may imply that it could take years for tax collection to return to its pre-pandemic level. Thus policies aimed at reducing defects in the tax systems as well as policies aimed at addressing limits in tax administration might be necessary to be explored (see Iswahyudi (2020) and Alm (2019)). Although the data show that even in pre-pandemic period the performance of tax collection has a declining trend; however, when carefully designed and implemented, these policies might, at least, minimize the extent or the size of revenue losses in post-pandemic years. Further, one of the consequences of the potentially persistent sub-optimal tax revenue after the pandemic is that the already tight fiscal space would get tighter for Indonesia; hence policies aimed at bettering the management of public expenditure and debt may be most important.

CONCLUSION AND RECOMMENDATION

Using Indonesia as case study, this article finds the presence of unit roots in the time series of GDP, income tax revenue, VAT revenue, the ratio of income tax revenue to GDP, and the ratio of VAT revenue to GDP. These findings imply that shocks from the pandemic of COVID-19 may have persistent effects on Indonesia's economy and fiscal capacity. One of the possible explanations for this persistent impact of the pandemic on economic output might relate to the collapsing productivity.

As tax revenue mainly depends on the state of the economy, persistent reductions in the economic output below its potentials may also mean that post-pandemic tax collections would be persistently below their potentials. Moreover, fiscal regulatory responses to the pandemic and possible expansions in informal business activities in a post-pandemic economy may exacerbate the persistent adverse effect of COVID-19 on tax collection.

One of the policy implications that could be drawn from the findings in this article is that the potentially persistent sub-optimal tax revenue in post-pandemic years would make the already tight fiscal space get tighter. Hence policies aimed at bettering the management of public expenditure as well as the management of public debt may need to be further explored for the future of Indonesia.

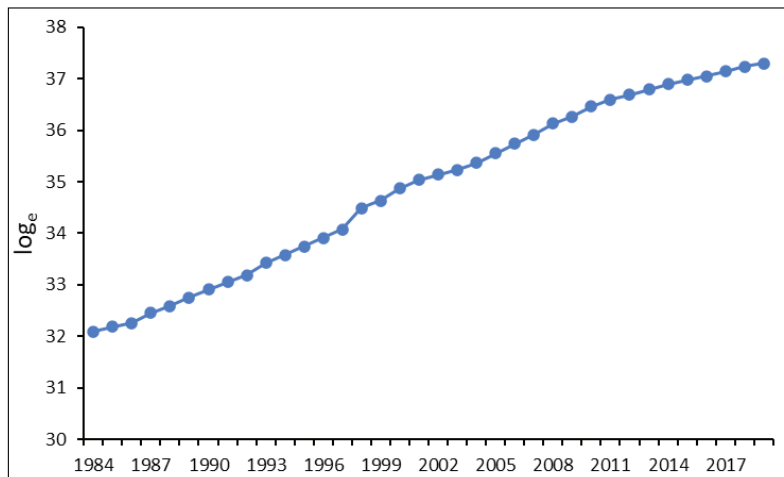
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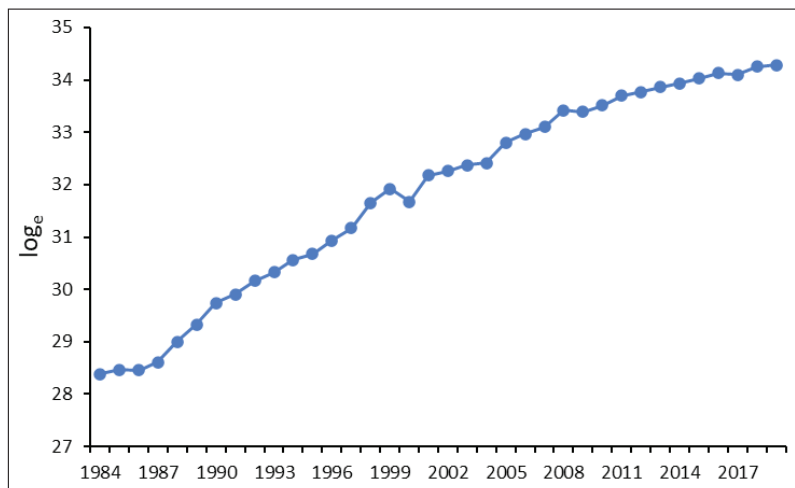
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APPENDIX



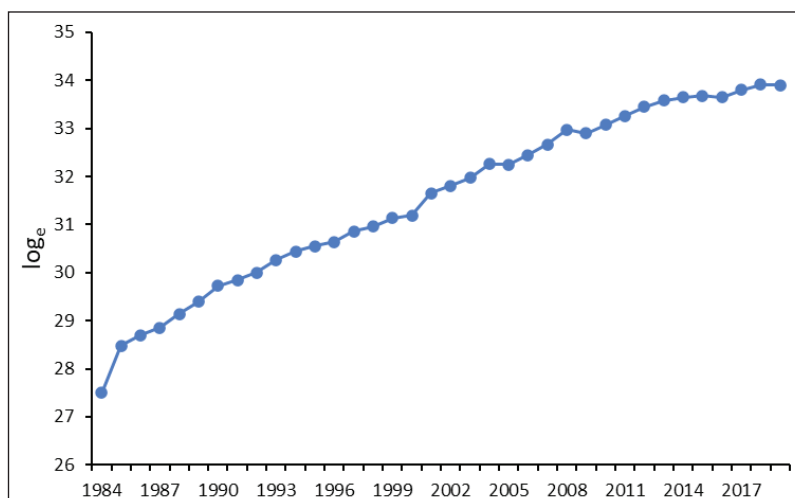
Sources: Badan Pusat Statistik (Various Years); Government of Indonesia (Various Years); OECD (2020); World Bank (2020c).

Figure A. Gross Domestic Product (GDP), 1984–2019, natural logarithms



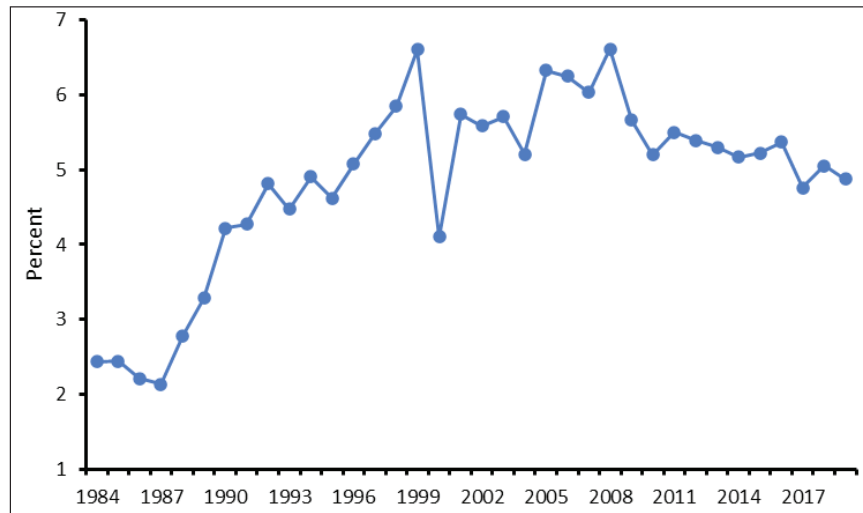
Sources: Badan Pusat Statistik (Various Years); Government of Indonesia (Various Years); OECD (2020); World Bank (2020c).

Figure B. Income tax revenue, 1984–2019, natural logarithms



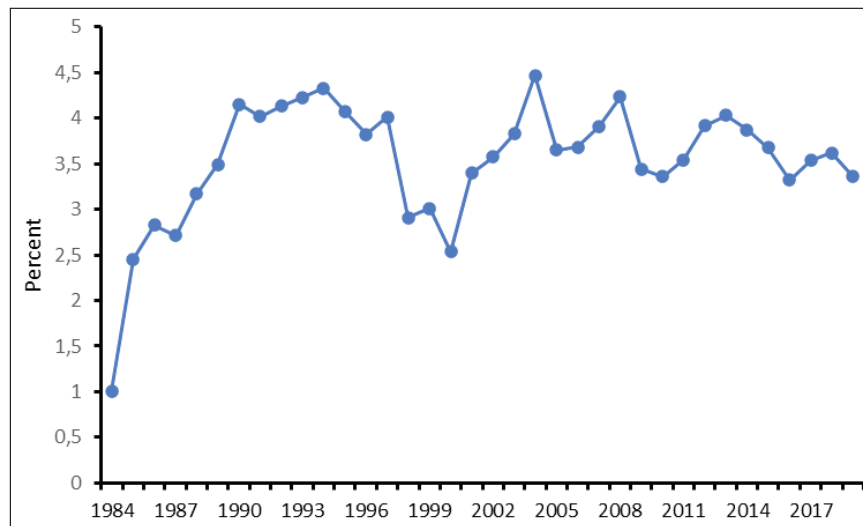
Sources: Badan Pusat Statistik (Various Years); Government of Indonesia (Various Years); OECD (2020); World Bank (2020c).

Figure C. Value-added tax (VAT) revenue, 1984–2019, natural logarithms



Sources: Badan Pusat Statistik (Various Years); Government of Indonesia (Various Years); OECD (2020); World Bank (2020c).

Figure D. Income tax revenue as a percentage of GDP, 1984–2019



Sources: Badan Pusat Statistik (Various Years); Government of Indonesia (Various Years); OECD (2020); World Bank (2020c).

Figure E. VAT revenue as a percentage of GDP, 1984–2019