

DYNAMIC RELATIONSHIP BETWEEN TAX REVENUE AND ECONOMIC GROWTH IN INDONESIA: AN ARDL-ECM AND GRANGER CAUSALITY APPROACH (1999-2023)

A Thesis

Submitted to the Master's Study Program of Economics at the Faculty of Economics and Business in partial fulfillment of the requirements for the degree of

Master of Arts (M.A.)



by:
Yunes M. M. Al-Murisi
03212420016

UNIVERSITAS ISLAM INTERNASIONAL INDONESIA
DEPOK
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ABSTRACT

Yunes M. M. Al-Murisi

03212420016

yunes.murisi@uiii.ac.id

Economics

Universitas Islam Internasional Indonesia

This study aims to analyze the tax revenue and economic growth interaction in Indonesia for the period 1999-2023. Indonesia, as a developing country, has to face two challenges: one is to mobilize domestic resources so as to fund development, and the other is to ensure macroeconomic stability. Tax revenue is the main source of government revenue and is important to invest in infrastructure, education, health, and other public goods that provide long-term economic growth. The study examines the impact of tax revenue on economic growth, both in short run and long run, controlling fiscal balance, inflation, household final consumption expenditure, and imports. Data is analyzed using the Autoregressive Distributed Lag-Error Correction Model (ARDL-ECM) which is appropriate for the estimation of dynamic relationships among variables of mixed orders, $I(0)$ and $I(1)$. Moreover, Granger causality test is used to establish the causal direction of the tax revenue and economic growth relationship as well as to correct for the problem of endogeneity which may stem from the possible bidirectional relationship. The empirical results show that the F-statistic value of 46.22 is well above all the critical bound values, indicating the long-run cointegrating relationship among all the variables. The long-run coefficient of tax revenue on GDP growth is positive and statistically significant with a value of 0.7029, suggesting that a 1 percentage point increase in the tax-to-GDP ratio is related to about an additional 0.70 percentage point of economic growth in the long run. Fiscal balance also has a positive impact on growth with the coefficient of 0.8234, while high levels of household final consumption expenditure do not go hand in hand with long-run performance with a coefficient of -0.1870. The error correction term of -1.422 indicates a quick adjustment to the long-run equilibrium. The findings reveal no statistically significant short-run causal relationship between tax revenue and economic growth, both ways, supporting the view that the fiscal transmission mechanism is more related to long-run structural effects. Diagnostic and stability tests reveal the strength and stability of the estimated model. These facts highlight the need for the improvement of tax administration, expansion of the tax base and making public expenditures more effective to maximize the growth effects of taxation. The study adds to the literature on fiscal policy in developing economies and offers evidence-based suggestions on how to encourage sustainable and inclusive economic growth in Indonesia.

Keywords: Tax Revenue, Economic Growth, Fiscal Policy, ARDL-ECM, Granger Causality, Indonesia.

ACKNOWLEDGEMENTS

It is first and foremost to be thanked to Allah SWT who is the Most Merciful and Most Compassionate for giving me strength, patience, health and guidance in finishing this thesis and my studies on Master Economics at Universitas Islam Internasional Indonesia (UIII). This would not have been accomplished without His blessings and mercy.

Many thanks are due to Dr. M. Lutfi Hamidi, Ph.D., my esteemed supervisor, for his guidance, insightful comments, constructive criticism and continuous encouragement during this research. The study has been significantly enriched and much of my growth as a researcher has been due to his deep knowledge, academic discipline and patience.

I would also like to express my sincere thanks to all lecturers and academic staff of the Faculty of Economics and Business, Universitas Islam Internasional Indonesia who have been dedicated and supportive in my graduate study and who have given me knowledge. Their mentoring and teaching have given me a solid economic and econometric background.

I would like to express my love, respect and gratitude to my dear father and mother. The constant prayers, love, sacrifice and support they've given is the most powerful and inspiring thing in my life. All my success is because of their perseverance and their heartfelt prayers.

I am also blessed to have my loving brothers and sisters who would support, encourage and pray for me all the time. I would also like to express my gratitude to my family, friends and colleagues in Yemen and in Indonesia for their friendship, support and motivation during my academic study.

Last but not least, I would like to dedicate this work to my family and all of those who have been praying, giving me advice, and being kind to me. I hope this thesis will be useful for researchers, policy makers and future researchers, and it can be used to expand knowledge and to improve the economic development of Indonesia and other developing countries.

Depok, June 26, 2026

Yunes M. M. Al-Murisi

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ABBREVIATION DIRECTORY

ADF	: <i>Augmented Dickey-Fuller</i>
ARDL	: <i>Autoregressive Distributed Lag</i>
ASEAN	: <i>Association of Southeast Asian Nations</i>
CUSUM	: <i>Cumulative Sum of Recursive Residuals</i>
CUSUMSQ	: <i>Cumulative Sum of Squares of Recursive Residuals</i>
ECM	: <i>Error Correction Model</i>
FB	: <i>Fiscal Balance</i>
GDP	: <i>Gross Domestic Product</i>
GDPG	: <i>Gross Domestic Product Growth</i>
HFCE	: <i>Household Final Consumption Expenditure</i>
IM	: <i>Imports</i>
IMF	: <i>International Monetary Fund</i>
INF	: <i>Inflation</i>
OECD	: <i>Organisation for Economic Co-operation and Development</i>
OLS	: <i>Ordinary Least Squares</i>
TXR	: <i>Tax Revenue</i>
UIII	: <i>Universitas Islam Internasional Indonesia</i>
UNESCAP	: <i>United Nations Economic and Social Commission for Asia and the Pacific</i>
VAR	: <i>Vector Autoregression</i>
VECM	: <i>Vector Error Correction Model</i>
VIF	: <i>Variance Inflation Factor</i>
WDI	: <i>World Development Indicators</i>
WEO	: <i>World Economic Outlook</i>
WB	: <i>World Bank</i>
CUSUM	: <i>Cumulative Sum of Recursive Residuals</i>
CUSUMSQ	: <i>Cumulative Sum of Squares of Recursive Residuals</i>

CHAPTER I

INTRODUCTION

1.1 Research Background

Economics and taxation have been a complex and uneasy relationship in Indonesia. Despite the government's ambitious fiscal reforms in the last 20 years to broaden the tax base and improve the administration of tax revenue, the tax-to-GDP ratio has not budged much from its low level relative to the region. Digital filing systems have been expanded, risk-based audit systems have been implemented and taxpayer information systems have been centralized between government agencies. The reorganization of the Directorate General of Taxes has been a positive move towards modernization of the institutions. The most important legislative step in recent years was the enactment of Law No. 7 of 2021 on the Harmonization of Tax Regulations, which included a number of changes to income tax rates, VAT provisions, a voluntary disclosure scheme, and a number of tax procedure reforms, which reformers hoped would significantly enhance tax compliance. (Indonesia Ministry of Finance, 2023 ; OECD, 2025).

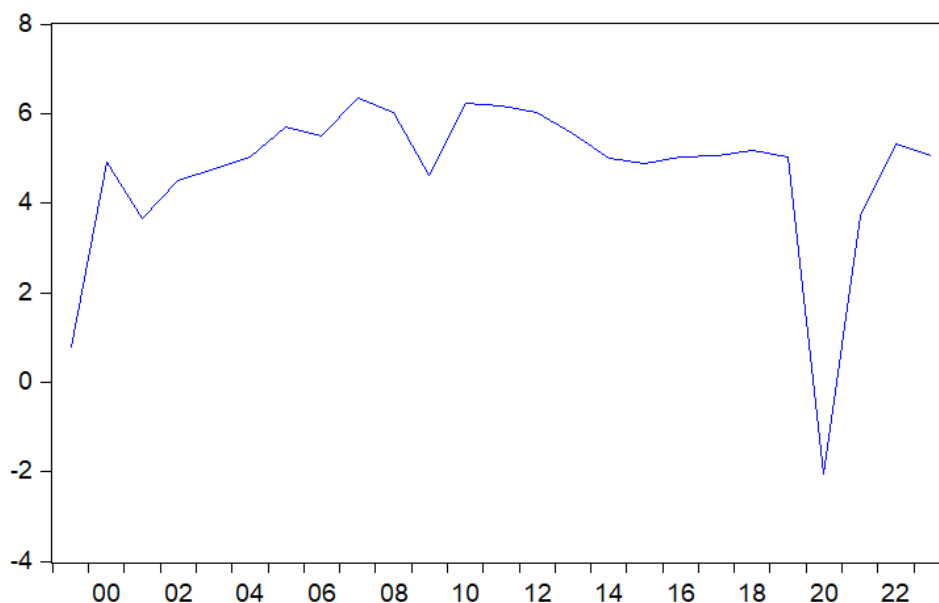
More recently the government has pledged to a complete digital transformation of tax administration in the Core Tax Administration System (CTAS). This all-in-one platform is intended to not only make tax filing more efficient, but to fundamentally change the relationship between the state and taxpayers, lower compliance costs, enhance enforcement capabilities and advance the quality and transparency of fiscal data. These investments illustrate a growing awareness that, beyond the tax rates themselves, the effectiveness of revenue administration is a key driver of the amount of revenue an economy can sustain (Joselin et al., 2024; OECD, 2025).

Despite all these efforts, the fiscal performance of Indonesia, based on international standard, is still weak. The OECD (2025) tax-to-GDP ratio was around 12.0 percent in 2023, which is well below the average in Asia Pacific of 19.5 percent and less than one-third of the OECD average of 33.9 percent. This deficit is especially notable because it has proven to be stubbornly resistant to reform over the years, much legislative and administrative tinkering has had no lasting, substantive impact on revenue

mobilization relative to the size of the economy. This is partly explained by the presence of a large informal sector, the unevenness in taxpayer registration, and the lack of enforcement, but also has a deep structural dimension as it is not an exception but the norm in the economy (OECD, 2025; Universitas Gadjah Mada, 2024).

How is this relevant? The answer is in the possibilities of tax revenues. A developing economy cannot afford to be without transportation, hospitals, schools, energy and social safety programs; they are the backbone of the private sector activity. If governments are not able to raise enough money for their public programmes, they are forced to choose between cutting back on essential public programmes and borrowing money to make up the shortfall – both of which have significant costs. Overall, the constitutional rule on limiting the fiscal deficit to 3 percent of GDP has been respected, although this has, in some cases, restricted productive public investment. Improving revenue mobilization is thus not just a fiscal accounting issue, but one of the basic capacity of the State to deliver on its development commitments (World Bank, 2023; Asian Development Bank, 2023).

Figure 1.1 Indonesia GDP Growth Rate, 1999-2023

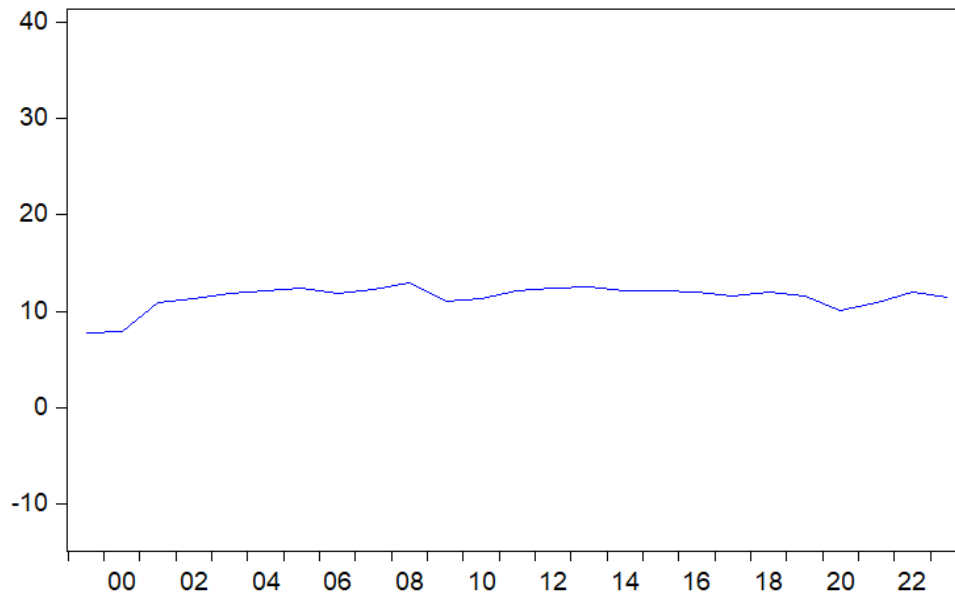


Source: Author's computation based on World Bank data.

Figure 1.1 shows the annual growth rate of GDP in Indonesia from 1999 to 2023. The first thing that strikes is the relative stability of the path of growth: in most of the years in this period, annual growth was in the range 4 to 6 percent, which is a level of

macro-economic stability that would be the envy of many peer economies. The dramatic decline in 2020, as the economy shrank by over 2 percent due to the COVID-19 pandemic, was a sharp outlier; the rebound in 2021 and 2022 was also robust. Among other things, the events demonstrates the importance of the quality of fiscal buffers: a government starting a crisis with a higher revenue base is better prepared to respond effectively.

Figure 1.2 Tax Revenue as a Percentage of GDP in Indonesia, 1999-2023.



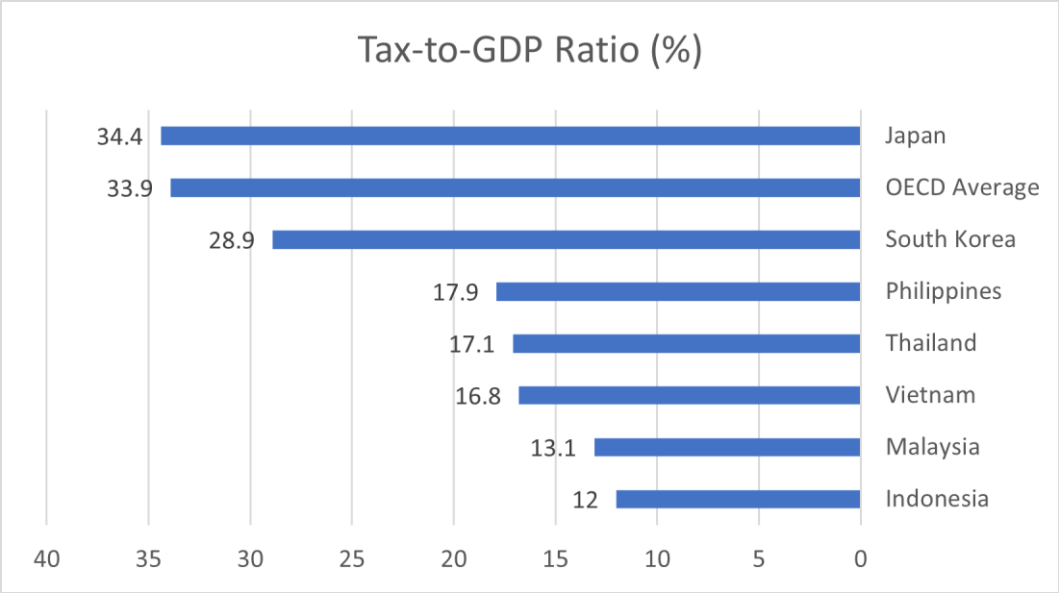
Source: Author's computation based on World Bank and OECD data.

The situation is quite different in Figure 1.2. The tax-to-GDP ratio over the same 25-year period had an almost flat trend, swinging between 10 and 13 percent, with no discernible increase. This lack of improvement in revenue effort in the face of overall positive economic growth is the type of pattern that leads to the present investigation. The actual relationship between these two variables, however, is not necessarily one of automatic increase in tax ratios with increase in growth, nor is it necessarily one of increase in tax ratios preceding or accompanying periods of economic expansion; hence, the relationship between these two variables should be studied with extreme care.

Figure 1.3 shows a comparison of Indonesia's tax-to-GDP ratio with selected Asian economies and regional benchmarks to put Indonesia's experience in a wider perspective. The figure shows that the ratio of Indonesia is significantly lower than other countries like Japan, South Korea, Thailand, Malaysia and Philippines, and the OECD average. This comparison also shows how great the revenue potential of Indonesia that

has not been realized and how strategic it is to increase tax administration and expand the tax base.

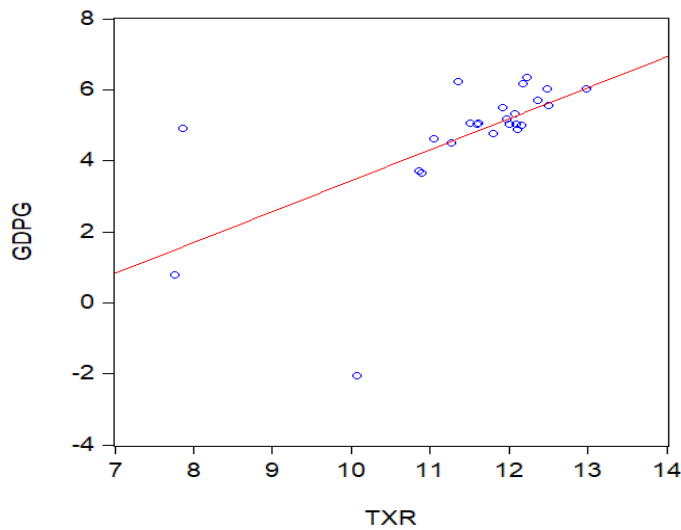
Figure 1.3 Comparative Tax-to-GDP Ratios: Indonesia and Selected Countries (2023)



Source: Compiled by the author based on OECD (2025), Revenue Statistics in Asia and the Pacific 2025: Indonesia.

Figure 1.3 offers a comparative perspective and is instructive. Indonesia's 12 percent ratio is far behind not just Japan and South Korea, but also its neighbours in the region such as Thailand, Vietnam, Malaysia and the Philippines. This deficit is hard to explain as merely a consequence of Indonesia's level of economic development even after taking into account the disparities in income and economic structure. Similar or less developed economies have been able to reach far higher revenue ratios. The difference is partly due to some policy decisions and institutional limitations that remain to be addressed in Indonesia.

Figure 1.4 Scatter Plot of Tax Revenue and GDP Growth in Indonesia (1999-2023)



Source: Author's computation using EViews.

In order to provide a first purely descriptive view of the relationship which is central to this thesis, figure 1.4 is presented. The scatter plot of annual tax revenue against GDP growth appears to indicate a positive association in that higher tax ratios are associated with better GDP growth. However, scatter plots do not provide information about causation, direction or confounding variables. The econometric analysis of the chapters that follow is intended to do just that.

Tax revenue is not in a vacuum, but is part of a macro-economic context. Fiscal policy operates and transmits its impacts in the broader economic context in which inflation has been high at times, fiscal deficits have been large, and consumption has been high and imports have fluctuated. Inflation reduces the real purchasing power of households and can affect the signals to investment decisions. A high level of consumption in the overall structure of aggregate demand can lead to short-run gains in economic activity at the expense of saving and productive investment, which are sources of long-run growth. Such interactions are not abstract concepts, but have concrete consequences for the economic impact of tax revenues. Without including them in an empirical specification, the estimates would be systematically incomplete, at best.

This story has another dimension to it: the fiscal balance. Indonesia has been in almost permanent deficit since 1999, which is a result of the high demands for development expenditure and a limited revenue base. The pandemic year 2020 recorded a rise in the deficit to 6.1 percent of GDP, due to emergency spending during a time of

falling revenues, but the deficit has been slowly reduced through fiscal consolidation toward the constitutional limit. This study aims to shed light on how this fiscal position relates to growth, and whether a more solid and consistent policy response could have been provided with a stronger fiscal base.

The current study contributes in four different ways to the literature in view of this background. First, it uses the ARDL-ECM framework which is especially appropriate for data with mixed integration orders and a small sample size to estimate both short-run and long-run relationships in a single, unified framework. Second, it also adds fiscal balance, inflation, household consumption and imports as controls, thus capturing the macroeconomic environment in which fiscal policy acts, which is more than just tax revenue. Third, the direction of predictive influence between taxation and economic growth is tested, which is not possible with standard regression analysis, but with granger causality tests. Fourth, the study draws on a new data set for 1999-2023, which spans Indonesia's post-crisis recovery, the commodity boom, the global financial crisis, and the COVID-19 economic disruption, experiences not fully captured by previous studies.

1.2 Problem Formulation

Although the Government of Indonesia has carried out far-reaching tax reforms in the last 20 years, Indonesia still has problems in mobilizing domestic revenues. Major policy initiatives such as modernization of tax administration, expansion of electronic filing system and enactment of Law No. 7 of 2021 on the Harmonization of Tax Regulations were aimed at broadening the tax base, improving compliance and improving the efficiency of tax collection. However, Indonesia's tax revenue is still relatively small compared to other Asian-Pacific countries. As reported by Organisation for Economic Co-operation and Development (2025), in 2023, the tax-to-GDP ratio of Indonesia was around 12.0 percent, which is much lower than the Asia-Pacific average of 19.5 percent and OECD average of 33.9 percent.

This differential has been constant, and it is important to ask whether tax revenue is an effective tool for economic development. While it is assumed that the tax revenue would give the government the financial power to invest in infrastructure, education, health care and social protection, it is an empirical question how an increase in the tax revenue would be related to an increase in economic growth. The question is especially

pertinent for Indonesia as a nation strives for bold development targets while trying to remain fiscally sustainable and decrease reliance on external borrowing (World Bank, 2023; Asian Development Bank, 2023).

There is mixed and at times conflicting evidence in the empirical literature on taxation and economic growth. Some studies have found that an increase in tax revenues can enhance growth through an increase in productive public spending and by improving macroeconomic stability, while others say that high tax rates could lead to a reduction in private investment, entrepreneurship, and the supply of labor. The results of studies specifically on Indonesia are also varied, with some studies revealing a positive and significant relationship between tax revenue and economic growth, while others show a weak relationship or a relationship that is dependent on the context (Amir et al., 2021; Maulid et al., 2022; Wibowo & Gunarto, 2024; Yossinomita et al., 2025). The inconsistencies suggest that the relationship has not been fully understood, especially considering the recent tax reforms and macroeconomic conditions.

However, there are other macroeconomic factors that influence economic growth other than tax revenue. Each of fiscal balance, inflation, imports and household final consumption expenditure has a different transmission channel to growth and when omitted from an empirical model, each of these effects is captured in the tax revenue coefficient, which can lead to incorrect inference. The impact of these factors is likely to be different at various time horizons and the relationship between tax revenue and growth can be bidirectional. To capture both phenomena a dynamic, multi-variable empirical framework is needed.

Given these considerations, the main problem in this study is the lack of empirical evidence and the results are still inconclusive on whether tax revenue has significantly contributed to economic growth in Indonesia in the period 1999-2023. In particular, this paper aims to see if tax revenue has made a significant contribution to economic growth, net of the effects of fiscal balance, inflation, household final consumption expenditure, and imports. It also aims at examining the existence of a stable long run relationship among these variables and whether there are causal relationships between tax revenue and economic growth. It is crucial to solve these problems in order to evaluate the

effectiveness of taxation as a policy instrument for sustainable and inclusive economic growth in Indonesia.

Despite the fact that Indonesia has done some reform in the tax category, such as VAT, CIT and PIT, in this study the tax revenue is used as the main variable to explain the problem. This is because the aim of the study is to determine the overall contribution of domestic revenue mobilization to economic growth and not the impact of individual tax instruments. Aggregate tax revenue offers a broad-based measure of fiscal capacity and is the result of tax policy, tax administration and taxpayer compliance. It is thus a suitable measure to assess the macroeconomic contribution of taxation in general in achieving Indonesia's long-term development goals.

The macroeconomic impact of taxation should be analyzed in the context of the mechanisms of fiscal policy action, as well as the direct link between tax revenues and GDP growth. In the case of Indonesia, these channels involve financing public infrastructure that lowers production costs and improves connectivity; investing in education and healthcare to cultivate human capital and boost labor productivity; social protection measures that stabilize consumption and diminish the need for protection against economic shocks; and the institutional signals of good fiscal governance, which lower sovereign risk premiums and stimulate private investment. All of these channels can provide strong growth multipliers in the medium to long term, if tax revenues are collected efficiently and used effectively. The use of fiscal balance, inflation, household consumption, and imports as control variables in this study aims to paint a more comprehensive and accurate picture of the relationship between tax revenue and economic growth in Indonesia during the period 1999-2023. The empirical evidence produced in this analysis is meant to be used as an input to the policy debate on fiscal reform as well as to help design tax policy that will effectively support the long term sustainable and inclusive development in Indonesia.

1.3 Objectives of the Study

This study aims to analyze the effect of tax revenue on economic growth in Indonesia from 1999 to 2023. In order to reach this general goal, the following specific goals are pursued:

1. To analyze the impact of tax revenue on economic growth in short and long run in Indonesia.
2. To analyze the effect of fiscal balance, inflation, household final consumption expenditure and imports to economic growth in Indonesia.
3. To test the existence of long-run equilibrium (cointegrating) relationship between economic growth, tax revenue and the chosen macroeconomic variables.
4. To estimate the speed of the adjustment of short-run deviations from the equilibrium towards the LR path using the Error Correction Model (ECM).
5. To examine the directionality of causality between tax revenue and economic growth in Indonesia with Granger causality approach.

The objectives are to provide an extensive empirical analysis of taxation as a fiscal policy tool and to produce evidence that can be used as input in policy discussions on domestic revenue mobilization, fiscal sustainability and sustainable economic development in Indonesia. The results will help policy-makers in Indonesia and other developing countries with similar fiscal issues. From a wider perspective, the study will add to the literature on the effectiveness of fiscal policy and provide evidence-based recommendations on how to design tax policies to achieve sustainability, economic growth and inclusiveness.

1.4 Research Questions

Based on the problem formulation and the gaps in the literature, the following five research questions are derived. Each focuses on a particular aspect of the tax-growth relationship that has not been fully addressed in earlier studies focusing on Indonesia:

1. What is the impact of tax revenue on the growth of the economy in the short and long term in Indonesia?
2. What is the effect of fiscal balance, inflation, household final consumption expenditure and imports on economic growth in Indonesia?
3. Is there a long run equilibrium between economic growth, tax revenue and the chosen macro-economic indicators?
4. How fast do the short-run deviations from the equilibrium path move towards the long-run equilibrium path?

5. Does tax revenue have a causal effect on economic growth in Indonesia?

CHAPTER II

LITERATURE REVIEW

The impact of taxation on economic growth, and when it has a positive or negative impact, requires a theoretical and empirical discussion. This chapter takes up this task in three steps. It first presents the key economic concepts that shed light on the effects of fiscal policy on capital formation, investment, and on the effectiveness of public spending. Second, it examines the empirical evidence in the light of global research, evidence from Southeast Asia and evidence specific to Indonesia. Third, it outlines what gaps in the literature remain unfilled and is the focus of this study.

2.1 Theoretical Framework

The conceptual framework of this study is based on two related theories of economics namely the neoclassical growth theory based on Solow Growth Model and the theory of public finance. These are not mutually exclusive views, but complementary. The first one considers the effect of taxation on the accumulation of capital and the economic long-run income equilibrium, the second one deals with the impact of the tax structure on incentives, equity and efficiency of resource allocation. Collectively, they provide a solid theoretical framework to discuss the short and long term effects of fiscal policy in the developing country such as Indonesia.

2.1.1 Neoclassical Growth Theory: The Solow Growth Model

One of the more important contributions to modern economic theory was Robert Solow's (1956) growth model, a systematic framework of understanding what drives long-run economic performance. The model is based on three main factors of output expansion: the expansion of the physical capital stock, the increase in the labor force, and the improvement of technology, which is exogenous. At the basic level, national output is produced using capital and labour, and the productive efficiency of capital and labour is continually increased by technological change.

A key feature of the model is that technological change is exogenous and that the long-term rate of per capita output growth is determined by the rate of technological change. Capital has diminishing marginal returns, so one would expect economies to move towards a steady state equilibrium where the ratio of capital to workers would be

constant. Outside of that balance, growth in output is solely dependent on further technological advances, but not on further capital accumulation.

In this context, however, the process of capital accumulation does have some importance. The savings rate of the economy is a key determinant of the level of income per capita at the steady state: the higher the savings rate, the more capital the economy has, the more output the economy produces per worker, and the higher the level of income per capita at the steady state. Low saving propensities, or high depreciation rates, by contrast, keep the steady state level of capital stock low and limit productivity growth. Changes in the incentives facing households and businesses to save and invest thus have important implications for the path an economy takes to its long-run equilibrium.

The Solow model therefore provides a useful conceptual framework for evaluating the tax policy-economic performance link. Taxation will not affect the long run growth rate of the economy, which is determined by the rate of exogenous technological change, but it can have a significant effect on the level of output at which the economy settles, by influencing investment incentives and the rate at which capital is formed. This distinction is especially relevant in the context of economic transformation and productivity improvement in developing countries like Indonesia, where the process of capital deepening is still a major driver of economic growth.

Taxation, Savings, and Capital Accumulation

The main effect of taxation on economic growth in the Solow framework is through the impact on saving and investment decisions. The imposition of taxes on personal income, corporate income or capital gains by fiscal authorities reduces the aftertax profitability of investment, and thus reduces the incentive for households and enterprises to save and invest. Lower saving propensities will eventually slow the rate of capital accumulation and diminish the economy's productive capacity over time (Solow, 1956; Barro & Sala-i-Martin, 2004).

Reducing the overall savings rate by taxation reduces the economy's equilibrium to a lower per capita level of income. While output growth can continue, as a result of ongoing technological improvement and growth in the labour force, the level of per capita output is irrevocably lowered compared to a no-tax alternative. This level effect is no mere trifle: In developing economies such as Indonesia, where the existing stock of

capital is already below the level needed for development, reducing savings and investment by taxing them imposes permanent costs on living standards and productive capacity (Feldstein, 1995; Easterly & Levine, 2001).

Technological progress rate is as determined outside the fiscal system as the Solow model suggests and thus is not affected by the size and structure of taxes. However, even very distortionary fiscal policies can lead to permanent welfare losses by lowering the level of the economy's steady state income. An economy can gain from a continued technological advance and an increase in the supply of labor and still not be operating at its productive potential because of the fiscal structure that reduces private saving and investment. Thus, a poorly structured tax system can be able to affect long run economic performance even if the other fundamental forces of economic expansion are intact and functioning (Barro, 1990; Arnold et al., 2018).

Tax-Financed Public Spending and Productive Capacity

An important modification of the original Solow model is that taxes are not necessarily growth-reducing if the tax revenues are used for productive public spending. Government expenditures on physical capital, schools, hospitals, and government itself increase the productivity of labor and private capital, and thus create an input into the production process that is provided by the government. From this point of view, public capital complements and strengthens private capital, and does not replace it.

The net effect of taxation on economic growth can thus be either positive or negative, depending on the balance between two opposing elements: allocative distortions due to the collection of the tax which depress private saving, investment, and productive effort; and efficiency gains from well-targeted government spending which raises the marginal productivity of private capital and thus long-term growth.

Where public resources are spent strategically, the growth dividends from productive government spending can offset, or even more than offset, the efficiency costs of collecting revenues. On the other hand, if revenue is used to pay administrative costs, or misdirected through subsidies, or for politically-motivated projects, the net growth effect of taxation is probably negative, even if it is collected. This is an important policy implication for Indonesia. The effectiveness of revenue mobilization to economic progress is constrained by longstanding problems with infrastructure, significant regional

disparities in the quality of services delivered, and a mixed record of expenditure effectiveness.

All these factors make Indonesia a very telling case. The degree of revenue mobilization that has resulted in productive economic outcomes during the study period has been influenced by sustained infrastructure deficits, uneven regional development and historical trends of inefficient public spending.

There is ample empirical evidence on the quantitative importance of public investment for growth outcomes, based on extensions of the Solow model. Barro (1990) develops a theoretical model where productive government services are an input to private production, the optimal tax rate is the one that equates the marginal cost of raising revenue with the marginal value of the public services funded by the tax, and there can be under-taxation and over-taxation pathologies. Empirical studies across countries have confirmed this theoretical prediction, with the general finding that, up to a certain level of government size, increases in government size (measured through taxes) stimulate economic growth, but beyond that level of government size, increases in government size have a negative impact on economic growth as the distortionary effects begin to dominate. Based on the theory, Indonesia is most likely running below the optimal level of fiscal size, where additional revenue and targeted public spending can lead to net growth. This argument is a solid foundation for Indonesia's ongoing efforts to increase the tax-to-GDP ratio, which is expected to be achieved by broadening the tax base and improving tax administration.

Lucas (1988) and Mankiw, Romer, and Weil (1992) built on the Solow model and added human capital as another source of growth, thus providing another mechanism by which fiscal policy affects long-run economic outcomes. These augmented models have the property that the education and skill formation of human capital has positive externalities, similar to the way physical capital does in the original Solow specification, and the aggregate accumulation of human capital has increasing returns. Investment in education, vocational training and health, financed by taxes, can therefore lead to lasting improvements in the quality of the workforce, which in turn can lead to a higher total factor productivity and thus to above-trend growth. The relatively low level of education spending in Indonesia as a proportion of GDP, and the huge quality variation between

regions, is a crucial limitation of the human capital dimension of the tax-growth nexus. The nexus between tax revenues and productive social spending on education and health is thus not only a development objective, but also an integral part of a tax policy agenda for longterm economic growth.

2.1.2 Public Finance Theory: Efficiency, Equity, and Growth

Public finance theory is an extension of the neoclassical growth model, which seeks to explore the impact of the tax structure on allocative efficiency, income distribution and economic welfare. While the neoclassical growth models focus on the effect of taxes on capital accumulation and factor productivity, the public finance theory focuses on the behavioural effects of tax systems and their consequences for resource allocation. A good tax system should have the three objectives of raising adequate revenue, inducing minimum distortions in production and distribution, and ensuring an equitable allocation of tax burden.

Tax Distortions and Deadweight Loss

Taxation affects the economic behavior by changing the relative prices that households and firms face when making their decisions. Personal income and payroll taxes lower the after-tax returns to employment, corporate taxes lower the after-tax returns to investment, and consumption taxes increase the effective prices of goods and services to consumers. All these price distortions tend to collectively discourage labour market participation, discourage saving, reduce entrepreneurial activity and force economic actors to be informal.

The economic cost of these price distortions is the amount of output that is sacrificed as a result of the tax-related behavioral changes, which is neither government revenue nor household income; economists call this the dead weight loss. Harberger (1964) demonstrated that the loss of welfare increases more than proportionately with the rate of the tax: a doubling of the tax rate more than doubles the efficiency cost. These losses are exacerbated in developing economy contexts by a lack of administrative capacity and higher compliance costs, and thus increase the disincentive to engage in the formal economy and exacerbate the overall efficiency loss of the fiscal system.

Tax Incidence and Consumption Effects

Incidence of tax – the economic burden of a specific tax – is one of the major problems of public finance theory. There can be a significant difference between the "need" to pay a tax and the actual tax burden. The tax burden can be shifted forward to the purchasers of products by higher prices or it can be borne by the enterprises by cutting down the wages paid to workers, depending on the relative elasticity of supply and demand. Indonesia, like many developing countries, has a large informal sector in the economy and the power of labor to shift the burden of indirect taxes is weaker than that of higher-income consumers (OECD, 2021; IMF, 2022).

The overall implications of this incidence pattern are important for the level of overall economic activity. Value added taxes (VAT) and other consumption taxes can also be highly regressive because low and middle-income families spend a higher percentage of their income on consumption than do higher income families, and therefore lose a larger proportion of their real purchasing power due to the consumption tax. This can lower households' disposable income, and weaken domestic consumption demand and short-term economic growth. However, VAT has its advantages and fiscal authorities are still very attracted by it, as it is more easy to implement and less subject to fiscal evasion than the majority of direct tax tools. This is an important public finance issue because the most efficient administration means of providing a public service is not necessarily the most equitable in terms of distributional impacts (World Bank, 2020; UNESCAP, 2023).

Tax Composition (Tax Mix) and Growth Outcomes

There are significant growth implications in the structure of a country's tax system (the "tax mix"). Income and corporate profit taxes are generally considered the most distortionary taxes since they have a direct impact on the post-tax return to work, investment and innovation. Consumption taxes are generally seen as less harmful to long-run growth as they do not directly affect saving, but do raise issues of distribution that need to be addressed with other social policies. Trade taxes decrease the competitiveness and openness of an economy. The implications for reform strategy are clear: a well-crafted shift from income-based to consumption-based revenue instruments has a positive impact on allocative efficiency, but does not necessarily have a negative impact on distributional outcomes.

The policy takeaway is simple: The means of revenue collection are as important as the amount of revenue collected in determining outcomes for growth. A broad-based, moderate-rate system with good enforcement is much more likely to generate revenues for public investment without slowing down private investment than a narrow, high-rate system with high rates of non-compliance and avoidance.

2.1.3 Linking Theory to the Empirical Model

This study's empirical specification is based on both of the above mentioned theoretical traditions. The neoclassical view introduces the knowledge that what is of utmost importance is how taxes affect the saving of households and firms, the amount of physical capital and the allocation of investments. An increase in the tax on income or profits will lower the after-tax rate of return to investment, which will lead the economy to a lower long-run capital stock. In the meantime, if the revenue collected can be used productively, for instance, in productive infrastructure or human capital, it can compensate for some of the loss of efficiency in revenue collection and boost the marginal product of private capital. The overall impact of taxation on net growth is thus, in theory, indeterminate and depends on how the tax system is designed and how good the public expenditure is that it funds.

There is another explanation, also structural, in the field of public finance, which is based on the relative size of taxes, and on their impact on the allocation of resources and economic welfare. Distortionary levies are losses in efficiency that do not appear as losses in revenue, but rather as real losses to the economy. These allocative distortions will be smaller, the more broadly-based the revenue system and the lower the tax rates, and fiscal adequacy will be maintained. The theoretical currents create an empirical problem which is indeed complex: the net growth impact of taxation cannot be predetermined, but is a function of the institutional context, efficiency of public spending allocation and the design of the tax system.

Based on these theoretical considerations, the choice of control variables in this study is determined. The fiscal balance indicator is relevant to the overall fiscal policy stance, which is important, not only for its effect on investor and market confidence, but also as an indicator of the efficiency of public resource use. Inflation rate is a good measure of price stability and macroeconomic uncertainty, which has an impact on the

real return to investment and the real purchasing power of households. Import is a variable which reflects the trade openness and the economy's access to foreign technology and intermediate goods. Household final consumption expenditure is the demand side channel through which fiscal policy (and tax-induced changes in household's disposable income) work.

The dynamic nature of the relationship between taxation and economic growth is inherent and the ARDL framework is an appropriate methodological choice because the causality could be in both directions at the same time. The ARDL methodology does not assume that the variables must have the same order of integration, it can differentiate between the short-term adjustment and long-term equilibrium effects of fiscal policy, and it can incorporate a gradual effect of fiscal policy changes on the economy. These attributes are appropriate to the Indonesian situation that the effect of tax reform is typically of a long-term (yearly) rather than quarterly nature.

The endogenous growth literature provides a third theoretical point of view, in addition to the neoclassical and public finance traditions. Romer (1990) and Lucas (1988) demonstrate that growth can be sustained if an increase in investment in knowledge, technology and human capabilities can lead to an increase in the aggregate level of production sufficient to offset the decline in the marginal product of physical capital highlighted by the Solow model. In this intellectual tradition, there are two effects of taxes: a negative effect on the private sector's incentives to invest in new technologies and human capital, and a positive effect on the funding of public research and development, educational institutions and technology programs with economy-wide positive externalities. The net growth effect of taxation will thus depend primarily on whether the revenue raised is used for activities that have endogenous spillover effects or is used for expenditures that do not have much of a productivity increasing effect.

In the context of Indonesia, the endogenous growth approach is not only in terms of the amount of revenue collected, but also in the way the revenue is spent. The historical trend of low public spending on education and research and development in Indonesia has limited the government's ability to create the knowledge externalities and economy-wide productivity increases that are key to sustained growth in the endogenous growth theory. Mobilizing domestic revenues more effectively and purposefully for the high-

quality public investments in human capital and innovation thus becomes a key strategic issue for fiscal policy in Indonesia. This aspect is partially reflected in the fiscal balance variable which was used as a control in this study as a good fiscal position provides the government with more space to allocate resources for productive investment without having to take on additional loans.

Fiscal federalism tradition also offers an analytical approach to understand the relationship between tax revenues and economic growth in a large and geographically diverse economy such as Indonesia. If fiscal decentralization of revenues is accompanied by fiscal decentralization of public expenditures, and if local governments are able to finance their responsibilities, a decentralized fiscal system can increase the allocative efficiency of public spending to local tastes and preferences, as Oates (1999) argues. The decentralisation process in Indonesia started since the fall of Suharto's regime in 1998, and includes the provision of considerable expenditure autonomy to regional governments and a revenue sharing mechanism between the central and regional governments. The success of this decentralized fiscal system in providing a growth-enabling function relies on local governments' ability to efficiently collect and manage revenues, which has been widely different across the different regional economies in Indonesia. The regional differences in fiscal performance are an important aspect that can be explored in future studies, this study has been conducted on the aggregate tax revenue at the national level.

2.2 Empirical Evidence

2.2.1 Global Studies

What do international data show with regard to the link between tax and growth? The honest answer is: it's dependent to a large extent on context. The empirical evidence on the impact of taxes on growth is mixed: sometimes taxes stimulate growth, sometimes they impede it. The empirical evidence on the growth effects of taxation is mixed, depending on the instruments used to raise revenue and on the productive efficiency of the expenditure that the tax funds, as well as on the institutional context in which the tax is operating.

Several studies have pointed to the growth promoting power of taxation, if the proceeds of taxation are used for productive public investment. As shown by Batini,

Eyraud and Weber (2014), fiscal spending on infrastructure and human capital can have significant fiscal multipliers, especially if the investment can help to alleviate binding structural constraints in the economy. In the same manner, Djankov et al. (2010) discover that cuts in the corporate tax burden boost investments, entrepreneurial effort and the growth of firms by increasing the expected after-tax returns and decreasing the uncertainty that potential investors encounter.

But not all fiscal deals are growth-enhancing. High and/or poorly designed levies, especially on income, profits and capital, can stifle innovation, reduce savings and slow productive activity, warns Arnold et al. (2018). An overly complex and uncertain tax regime also increases the compliance costs and provides an incentive for tax avoidance. The message of this strand of literature is not that taxation is bad in itself, but that it's the design of the tax system and the quality of the spending that it pays for that is important.

The international research literature as a whole suggests a clear direction: The fiscal-growth link is very context-specific. The overall architecture of the tax system, the effectiveness of revenue administration and the extent of fiscal policy's consistency with development priorities all contribute to whether or not a particular revenue initiative is pro-growth or not.

One of the most notable areas of the international literature is on the link between the structure of taxation and economic growth, and in particular the distinction between the effects of direct and indirect taxes. Using panel data for OECD countries Kneller, Bleaney and Gemmell (1999) show that there is a negative relationship between distortionary taxes (in particular, income and profit taxes) and growth, with less adverse fiscal-growth effects for non-distortionary taxes based on consumption. Their analysis shows that it is not the overall size of the tax system that is the major factor influencing growth, but rather the design of the tax system. Gemmell, Kneller and Sanz (2011) went on to expand the sample to include both OECD and non-OECD economies, and reached the same conclusions: the composition and sequencing of fiscal adjustment are key determinants of its growth effects and permanent fiscal changes have larger and more persistent growth effects than temporary ones.

There has also been a large amount of literature in the international arena on the moderating effect of institutional quality in the taxation-growth relationship. Acemoglu,

Johnson and Robinson (2001) offer basic evidence that the nature of institutions – the rule of law, protection of property rights and accountability of government – is at the very heart of the ability of states to both collect taxes and use them to provide productive public goods. In institutionally weak environments, fiscal revenues are subject to rent-seeking diversion, politically motivated misallocation, or even loss due to corruption, and, therefore, do not provide much growth benefit, no matter how hard they are collected. By contrast, countries with good institutions and clear governance processes have significantly higher probability of allocating fiscal resources to public investments that boost the productivity of private investment and contribute to development objectives.

The literature on fiscal multipliers can also be used to gain insight into the impact of taxation on growth paths. In a thorough cross-country study, Blanchard and Perotti (2002) conclude that tax increases result in short-run contractionary effects on GDP, whereas expenditures have expansionary effects on GDP. However, the size and sign of these multipliers are highly dependent on the state of the economic cycle, existing levels of debt and the stance of the monetary policy. The evidence that has emerged in particular since the global financial crisis of 2008-2009 suggests that fiscal consolidations based on tax hikes are more contractionary and less growth friendly than expenditure-based consolidations, in particular in times of economic slack (Alesina, Favero, & Giavazzi, 2019). These findings point to the crucial role of the policy mix and the macroeconomic environment surrounding a fiscal adjustment in determining the growth impact of a fiscal adjustment.

For developing economies, the international research has identified some structural constraints which affect the capacity to generate revenue and the linkage between fiscal effort and economic performance. Keen and Mansour (2010) report that many low-income countries continue to rely too heavily on trade taxes—which have significant distortions on productive activity and trade flows, but are easy to collect. The move to value-added tax regimes is generally associated with better revenue efficiency, but requires significant administrative and institutional investments in order to be effectively implemented. Optimality in the design of taxes for the developing country context also involves balancing along the various dimensions of revenue adequacy, allocative efficiency, administrative ease and distributional equity goals, which often work in opposing directions, as Tanzi and Zee (2000) have also suggested.

Fiscal revenues' role in achieving macroeconomic stability has also been widely discussed in the international literature. Baunsgaard and Keen (2010) analyse the revenue effects of trade liberalisation in many of the developing countries and conclude that many of them did not compensate for the revenue losses associated with tariff cuts with other domestic taxes, resulting in fiscal deterioration which limited public investment and growth. This evidence points to the dangers of liberalization that is too fast, and not matched by strengthening of domestic revenue systems. In contrast, countries which managed to reform their domestic tax administration in parallel with the trade liberalization were more likely to keep fiscal sustainability and provide funds to growth-enhancing public expenditure.

These findings have been modified and enhanced in significant ways in more recent studies. Baiardi, Profeta, Puglisi and Scabrosetti (2019) conduct a comprehensive cross-country study that covers developed and developing economies, and report significant cross-country and cross-time variation in the growth impact of taxes. Their findings contradict the idea that there is one universal tax reform recipe, and highlight the key importance of the country-specific institutional set-up and structural features. They conclude that, in higher income countries, income tax cuts are more likely to boost growth, while, in lower income countries, the link is more ambiguous and often hinges on the extent to which income taxes can be replaced and the use of the funds raised.

Acosta-Ormaechea, Sola and Yoo (2019) broaden the tax composition literature to a large cross-country sample of OECD and non-OECD economies and find that the relationship between structural tax mix shifts towards less distortionary tax instruments and growth is positive, but depends on the level of economic development, the quality of governance and the specific characteristics of the tax mix reform. In general, their analysis confirms the result of Kneller, Bleaney and Gemmell (1999) on the relative advantage of consumption-based over income-based taxes, but the effect size is quite different for each group of countries. This cross country evidence is relevant for Indonesia, where a progressive move towards the use of VAT as a source of revenue collection has been a key element of fiscal modernization over the period studied.

The growth impact of VAT has been explored in detail by Acosta-Ormaechea and Morozumi (2021) and they conclude that the design of VAT is also important for growth.

A broad-based VAT with a single rate is more growth-friendly than a VAT with a number of different rates, exemptions and large compliance gaps. Their results indicate that there is a potential for improving the revenue efficiency and growth effect of the VAT system in Indonesia by broadening the tax base and rationalizing the tax rate, which is not necessarily by increasing the tax rate. This aspect of the design is not sufficiently appreciated in much of the fiscal policy debate in Indonesia, which has been directed mostly towards rate hikes than structural changes.

Alinaghi and Reed (2021) provide a meta-analytic contribution which aggregates 594 coefficient estimates from 42 published studies of the effects of taxes on growth in OECD economies. Their combined findings support a negative overall impact of taxes on growth, but suggest that such impact is quite muted from the estimates of primary studies after adjusting for publication bias and cross-study heterogeneity. They also report that estimated effects are especially sensitive to whether or not studies control for public expenditure; whether they use static or dynamic empirical specifications; and whether they distinguish between short-run effects and long-run relationships. This meta-analytical result can directly help to motivate the methodological decisions in the present study, which explicitly separate short-run and long-run dynamics by employing ARDL-ECM framework and include fiscal balance as a proxy for the quality of expenditures.

The overall international evidence is strong in pointing to a multidimensional, context-specific and crucially tax-system architecture-, governing-institutions- and public-revenue-management- and use-dependent fiscal-growth relationship.

There are three conclusions that are repeated in the evidence from around the world and have direct implications for the design of this study. First, the structure of the tax system is more important than its overall size: higher costs of growth are associated with taxes on income and corporate profits compared to taxes on consumption, and the right mix of taxes is important for optimal tax reform (Kneller, Bleaney, & Gemmell, 1999; Arnold et al., 2011). Second, fiscal multipliers are asymmetric with respect to the time horizon: tax hikes are contractionary in the short term but can be expansionary in the long term if the taxes are used to invest in productive sectors (Blanchard & Perotti, 2002; Alesina, Favero, & Giavazzi, 2019). Third, the quality of institutions affects the efficiency of the conversion of tax revenues into public goods and growth outcome: the

same amount of tax revenues can lead to very different development dividends depending on the quality of institutions (Acemoglu, Johnson, & Robinson, 2001). These three findings together suggest that a study that dissects the short- and long-run effects, takes into account fiscal balance and macroeconomic conditions, and selects a country at a particular stage of institutional development, will be more meaningful than the simple average of a group of countries. The main studies on the global level reviewed in this section are summarised in Table 2.1.

Table 2.1: Summary of Key Global Empirical Studies on Taxation and Economic Growth

Author(s)	Year	Country/Scope	Methodology	Key Finding
Kneller, Bleaney & Gemmell	1999	22 OECD countries	Panel regression	Distortionary taxes (income, profit) harm growth; non-distortionary taxes (consumption) are less harmful. Tax composition matters more than aggregate burden.
Blanchard & Perotti	2002	United States	Structural VAR	Tax increases have contractionary short-run effects on GDP. Fiscal multipliers are asymmetric: spending increases are more expansionary than tax cuts.
Acemoglu, Johnson & Robinson	2001	Cross-country (64 countries)	IV regression	Institutional quality fundamentally determines the capacity of states to collect revenue and translate it into productive public expenditure and long-run growth.
Arnold et al.	2011	21 OECD countries	Panel error correction	Shifting tax mix from income taxes toward consumption and property taxes is associated with higher long-run GDP per capita. Tax structure drives growth outcomes.
Baunsgaard & Keen	2010	Developing countries (111)	Panel regression	Many developing countries failed to offset revenue losses from trade liberalization through domestic taxes, causing fiscal deterioration that

Author(s)	Year	Country/Scope	Methodology	Key Finding
				constrained public investment and growth.
Alesina, Favero & Giavazzi	2019	16 OECD countries	Narrative approach	Fiscal consolidations based on tax increases are more contractionary than expenditure-based ones, especially during periods of economic slack. Policy mix matters significantly.
Tanzi & Zee	2000	Developing countries (review)	Conceptual review	Optimal tax design in developing countries must balance revenue adequacy, economic efficiency, administrative feasibility, and equity. These objectives often conflict.
Djankov et al.	2010	85 countries	Cross-country OLS & IV	Corporate tax reductions boost investment, entrepreneurship, and firm growth by improving after-tax returns and reducing uncertainty for private investors.
Baiardi, Profeta, Puglisi & Scabrosetti	2019	Cross-country (developed & developing)	Panel regression	Tax-growth effects are highly heterogeneous across countries and income levels. No universal tax reform prescription applies; country-specific institutional and structural factors dominate.
Acosta-Ormaechea, Sola & Yoo	2019	Broad cross-country (OECD & non-OECD)	Panel regression	Shifts toward consumption-based taxation support growth broadly, but magnitude varies by development level and governance quality. Confirms Kneller et al. (1999) for wider sample.
Acosta-Ormaechea & Morozumi	2021	Cross-country panel	Panel regression	VAT design matters for growth: a broad-based single-rate VAT generates more growth-friendly revenue than multi-rate systems with extensive exemptions and compliance gaps.

Author(s)	Year	Country/Scope	Methodology	Key Finding
Alinaghi & Reed	2021	OECD countries (meta-analysis)	Meta-analysis (594 estimates)	Taxes negatively affect growth, but the magnitude is smaller than primary studies suggest once publication bias is corrected. Effect is sensitive to model specification and time horizon.

Source: Compiled by the author based on selected empirical studies.

2.2.2 Regional Contexts:

Southeast Asia is a rich and diverse area in which to examine taxation-economic growth nexus. While the economies of the region share some common characteristics (high informal sector, high trade openness and large middle classes with rapid growth), the fiscal results of the region are quite different. This difference is due to the different institutional strength and quality of revenue administration, different compliance cultures and different architectural options in each country's tax system.

Throughout the ASEAN area, fiscal revenues are still much less than what is needed for development. The governments that have truly made strides in modernizing administration – by increasing the scope of digital reporting, building integrated taxpayer registries, and enhancing the quality of service delivery – have been the ones to see more gains in terms of larger revenue bases and more stable revenue trends, which provide more room for long-horizon development planning (ASEAN Secretariat, 2022; World Bank, 2021). The most apparent and consistent regional experience is that there is a very strong relationship between administrative quality and fiscal performance.

The situation is much less promising where governance structures are not well developed. In several regional economies, tax evasion and chronic leakages from revenues are widespread and tax enforcement is weak, and thus the effective fiscal capacity does not necessarily increase with higher nominal tax efforts. Weak enforcement systems breed informality and push governments to use distortionary revenue measures as a more straightforward way to substitute for the more challenging process of building broad-based, compliance-focused systems (Asian Development Bank, 2023).

One of the consistent trends throughout the region is the extensive use of VAT and other indirect means. While economically appealing, VAT is fairly easy to administer

and a genuine source of revenue, it will also be likely to affect the poorest families, who spend a larger percentage of their income on goods and services. This incidence pattern can create a harmful feedback loop in economies where consumer spending is the main source of GDP as higher indirect taxes reduce consumer spending, thereby slowing down growth, which ultimately undermines the tax base on which governments rely (UNESCAP, 2023).

There are great variations in country-level experiences. Some countries such as Singapore and Malaysia have been able to successfully implement fiscal reform and have sequenced their efforts in a way that will enable long-term revenue mobilization and fiscal sustainability (OECD, 2021). In Indonesia and the Philippines, however, the situation is more dire, as informality, weak implementation, and under-resourced tax authorities have limited the contribution of taxes to productive transformation, although both countries have done a good job in tax reform (IMF, 2022).

From a regional perspective, the impact of taxation on growth is not only dependent on the design of tax policy, but also on the quality of institutions, the credibility and effectiveness of public administration and the level of trust among citizens that fiscal revenues are being used productively. Good governance systems and processes contribute to effective tax collection and public spending; poor governance systems seriously reduce the potential for raising taxes to boost sustainable economic growth.

More detailed analysis of each of the economies in Southeast Asia provides comparative insights. Thailand has been taking a multi-faceted approach to expanding the VAT base and improve taxpayer compliance by systematically implementing e-invoicing and matching VAT declarations with financial books. These changes have led to a relatively stable ratio of taxes to GDP, albeit low by OECD standards, which has been a stable base for public investment in infrastructure and human capital development (OECD, 2021). Vietnam is an exception – it has implemented substantial changes in the fiscal regime since the economic renovation policy Doi Moi was introduced in 1986. The progressive shift from plan-based to market-based taxation, along with substantial improvements in corporate tax administration and the increased personal income tax coverage helped Vietnam to significantly increase its tax-to-GDP ratio in the last 20 years while maintaining high economic growth rates (IMF, 2022).

The Philippines is a case study of the problems in tax reform in a middle income developing economy. While the Philippines has not been spared from revenue shortfalls, these have been attributed to the high incidence of tax evasion, complex tax compliance, and administrative fragmentation, despite the comprehensive tax reform package that was enacted in 2018, the Tax Reform for Acceleration and Inclusion (TRAIN) Act. The Philippines experience shows that legislative tax reform, although important, is not enough to ensure continual progress in revenue mobilization. How well it is implemented, such as the ability of tax administration agencies, the transparency of enforcement procedures and the extent of taxpayer registration, is also crucial to fiscal results.

Malaysia has a counterpoint of the impact of changes in tax structure that has macroeconomic implications. The introduction of Goods and Services Tax (GST) in 2015 with the aim of broadening the tax base and making it more efficient in raising revenues was met with a lot of political opposition and was ultimately rolled back in 2018. This change resulted in a reduction in public revenue from taxes of about 2-3% of GDP, which reduced public spending and required adjustments in public development spending (World Bank, 2021). The Malaysian experience also indicates that the political economy considerations that limit tax reform in developing countries even though it may be economically desirable. The impact of indirect taxes on the distribution of welfare has also slowed and limited the pace of fiscal reforms in Indonesia.

There have been a few cross-country studies that have looked at the link between tax revenues and the quality of government expenditures in Southeast Asia. Gupta, Clements and Inchauste (2004) find that in developing economies of Asia, the allocation of public spending between capital investment and current consumption is an important determinant of the growth-enhancing effects of tax revenue. Countries that spend a higher proportion of tax revenues on infrastructure, education and health have higher and more sustainable growth performance than countries that spend a higher proportion of tax revenues on wages, subsidies and interest payments. The implications of this discovery are relevant to Indonesia as a large part of public spending goes to subsidies and transfers, which do not necessarily lead to proportional productivity improvements.

The topic of digitization of tax administration is gaining in significance in the literature in the region. The implementation of e-filing, e-payment and integrated

taxpayer databases have resulted in significant improvements in compliance and revenue collection in Southeast Asian countries like Singapore, Thailand and the Philippines, as reported by Junquera-Varela et al. (2019). Such technological advancements reduce compliance costs to the taxpayer, improve the quality of audits and assist in targeting tax compliance. Based on the evidence at the regional level, it is proven that investment in digital infrastructure can bring benefits to countries such as Indonesia in the medium to long term if they continuously invest in the digital infrastructure. But for implementation to be successful, there needs to be not only the technological investment, but the institutional reform, capacity building of tax officials and effective public communication to gain the trust of taxpayers and compliance.

2.2.3 Indonesia-Specific Studies:

The overall empirical evidence on the impact of taxes in Indonesia is in line with the literature suggesting that the impact of taxes on growth is important, with important caveats. The effects of fiscal policy on growth are not automatic, they are not uniform, but depend very much on the nature of the fiscal instruments used, the efficiency of the administration of the revenues, the extent to which taxpayers comply with the tax, the nature of the expenditures of the revenues, and whether they are spent on a category of expenditures that actually promotes growth.

The analysis of income tax-growth nexus in Indonesia during 1980-2015 performed by Iswahyudi (2018) showed that income tax had a relatively high distortionary effect on investment and entrepreneurial activity compared to other tax instruments that are considered to be discouraging investment and entrepreneurial activity, especially for sectors which depend on personal capital accumulation. Anggono (2020) took this understanding a step further by showing that the impact of these is influenced by the quality of institutions: weak tax administration and poor voluntary compliance greatly diminish the potential of any well-designed tax instrument to promote economic development. What it means is not welcome, but it is clear: tax without governance reform is not likely to be growth inducing.

Subsequent research has been directed towards change relationships. Maryantika and Wijaya (2022) using the application of structural equation modelling found that the relationship between tax revenue and fiscal performance is mediated by economic

growth, so that the virtuous cycle can be created when economic growth increases the tax base, which in turn, will increase fiscal performance. In contrast, the result of VAR analysis obtained by Maulid et al. (2022) is bi-directional causality between growth and tax revenue, which means that there is a feedback mechanism between the two variables, such that high tax revenue and high growth go hand in hand over time.

Provincial-level studies have shown a positive relationship between tax effort and regional economic performance, with provinces having a higher tax effort being able to mobilize more revenue and provide more productive public spending, which in turn, supports local economic development (Amir et al., 2021). Wibowo and Gunarto (2024) use the Autoregressive Distributed Lag (ARDL) model at the national level and establish a positive and statistically significant impact of tax revenue on the national economic growth in the long term, which proves that taxation can lead to sustainable growth in a stable macroeconomic environment.

This was further extended by Priyono et al. (2024) who documented the nonlinear effect of taxation on growth in the case of Indonesia. They find that intermediate rates of taxation stimulate investment in infrastructure and also stimulate investment in productive activities, but that beyond a certain point, taxes dissuade private initiative. The policy takeaway is subtle yet important – it is not always a numbers game, it's a smarter game.

Overall, the evidence from the Indonesian context suggests that taxation can contribute positively to economic growth, and that the fiscal-growth transmission will be more effective with the right kind of tax instruments, efficient tax administration, high taxpayer compliance, and high quality and proper public spending. The main problems in the fiscal system in Indonesia is therefore not only to increase the amount of revenues that can be mobilised, but also to enhance the governance of revenue mobilisation and allocation, and to ensure that tax revenues are systematically and effectively turned into sustainable development outcomes. Table 2.2 shows the comparative summary of the empirical studies reviewed in this section which are related to Indonesia.

One of the interesting themes of the literature specific to Indonesia is the macroeconomic impact of tax policy with a household behavior and consumption perspective. Based on the analysis carried out by Prasetyo (2021), the relationship

between private consumption, household saving and long-term growth sustainability in Indonesia shows that the economic structure in Indonesia in the last 10 years is dominated by household final consumption expenditure, which has exceeded 55 percent of GDP, may hinder the accumulation of productive capital in the long term. The analysis indicates that fiscal policy measures that would encourage saving (e.g., tax measures to encourage retirement saving or saving accounts) may be more effective than those that would encourage consumption demand. This result is in line with the neoclassical growth theory, which focuses on the importance of capital accumulation and the savings rate in the steady state levels of income.

Moreover, the fiscal balance aspect in macroeconomic performance in Indonesia has been intensively studied. Pamungkas (2017) demonstrates that the government's fiscal policy in Indonesia is more of a countercyclical policy, meaning that during the recession period, the government tends to expand its fiscal deficit while during the strong economic growth period, the government tends to consolidate its fiscal deficit based on fiscal reaction function estimation. The study also reveals the presence of fiscal space constraints because of revenue rigidities and binding spending commitments that shrink government's fiscal space for extra productive investments in fiscal consolidation years. The results suggest that higher domestic revenue mobilization (e.g. better tax compliance and tax base expansion) would provide the government with more fiscal space for countercyclical policy and larger productive public spending.

The analysis of the role of inflation in the macroeconomic environment in Indonesia has been done from two perspectives, namely the revenue mobilization and economic growth. High inflation, as experienced in the late 1990s after the Asian financial crisis and in the mid-2000s with inflation rates above 10 percent, can lead to a loss of the real value of tax revenues and lessen the confidence of investors in the investment climate. Yossinomita et al., (2025) analyse the optimal tax ratio for the provinces in Indonesia and find that the macroeconomic stability (low and stable inflation) is an important precondition for the potential revenue to be realised based on economic fundamentals. They conclude that monetary and fiscal coordination is crucial to establish the conditions under which revenue mobilization can be effective and lead to better fiscal capacity and economic development.

The study on the impact of imports on economic growth in Indonesia has been conducted from two perspectives namely trade openness and external dependence. Indonesia's import structure indicates that Indonesia is a commodity exporter and a manufacturing importer since a large share of imports is capital goods, intermediate goods and raw materials which are used in the manufacturing process. Based on the results of the study on the relationship between trade openness and economic growth in Indonesia, it can be concluded that there is a positive relationship between trade openness and economic growth, particularly imports of capital goods and technological goods that can enhance the productivity of domestic industries (World Bank, 2023). But if the dependency on imports of consumption goods is too high or if imports crowd out domestic goods production due to their lower prices, then the trade effects on growth may be less. In this context, the dynamics of imports, tax policy and economic growth are important to understand the path of development in order to reduce dependence on imports in the long term, where part of the tax revenue is derived from import tax and VAT (value added tax) on imports that can be used for domestic investment.

Table 2.2: Summary of Selected Empirical Studies on Tax Revenue and Growth in Indonesia

Author(s)	Year	Country	Data Period	Variables	Methodology	Main Findings
Iswahyudi	2018	Indonesia	1980-2015	Income tax, GDP	Time-series OLS	Income tax negatively affects growth
Amir et al.	2021	Indonesia	2001-2018	Tax effort, GDP	Panel regression	Higher tax effort supports growth
Maulid et al.	2022	Indonesia	1990-2020	Tax revenue, GDP	VAR	Bidirectional causality between tax and growth
Wibowo & Gunarto	2024	Indonesia	1995-2021	Tax revenue, GDP	ARDL	Positive long-run effect of tax revenue
Anggono	2020	Indonesia	2010-2019	Tax administration, compliance	Institutional quality assessment	Institutional quality and voluntary

						compliance significantly moderate the growth effects of any tax instrument
Maryantika & Wijaya	2022	Indonesia	2010-2020	Tax revenue, fiscal performance, GDP	Structural equation modelling	Economic growth mediates the tax revenue-fiscal performance relationship; a virtuous cycle emerges when growth expands the tax base
Priyono et al.	2024	Indonesia	2000-2022	Tax ratio, investment	Nonlinear model	Moderate taxes promote growth, excessive taxes hinder it
This study	2026	Indonesia	1999-2023	Tax revenue, fiscal balance, inflation, HFCE, imports	ARDL	Tax revenue promotes long-run growth; consumption weakens it

Source: Compiled by the author based on selected empirical studies.

One of the salient themes in the literature about tax policy in Indonesia is the macroeconomic effects of tax policy from the household behavior and consumption point of view. The private consumption ratio in GDP (PCG) has been high for the last 10 years, with an average of over 55 per cent, indicating that there is a structural relationship between private consumption, household saving and the sustainability of economic growth in Indonesia (Prasetyo 2021). The analysis suggests that fiscal policies that promote saving, such as tax breaks on retirement savings or investment accounts, could help more in the long run than policies that mainly boost the demand for consumption. This result is in line with the neoclassical growth theory, which focuses on capital accumulation and savings rate as the determinants of steady state levels of income.

The fiscal balance dimension of the macroeconomic performance of Indonesia has also been given a lot of attention. In this paper, Pamungkas (2017) tries to estimate the fiscal reaction function for the Indonesian case and concludes that the fiscal policy stance of the government has been, on average, countercyclical, which means that the government tends to increase the deficit during recessions and to decrease during booms. But the study also points to fiscal space constraints due to revenue rigidity and spending commitments, which limit the government's ability to invest more productively when it is seeking to reduce the deficit. These findings suggest that higher domestic revenue collection, both through higher tax rates and tax base, would lead to greater policy flexibility for the government to pursue counter-cyclical policies and to increase its productive spending.

The role of inflation in the macro economic environment in Indonesia has been studied both from the revenue mobilization and economic growth. During periods of high inflation (such as during the Asian Financial crisis in the late 1990s and in the mid-2000s when inflation rates were above 10 percent), tax revenues can be eroded and investment climate can deteriorate. Based on optimal tax ratios in the Indonesian provinces, Yossinomita et al. (2025) discuss necessary conditions to realize the revenue potential that the economic fundamentals suggest, among which macroeconomic stability (low and stable inflation rate). They conclude that monetary and fiscal coordination is needed to create the conditions for the revenue mobilization efforts to be effective to improve the fiscal capacity and the economic development.

The assessments of the effects of imports on economic growth in Indonesia have been mostly carried out from the trade openness and external dependence perspective. Indonesia's import pattern is similar to commodity exporter and manufacturing importer, which is quite high in capital goods, intermediate goods and raw materials for manufacturing. Based on the study results on the relationship between trade openness and economic growth performance in Indonesia, it can be concluded that there is a positive relationship between trade openness and economic growth performance in Indonesia in general, especially when imports are done in the form of capital goods and technology that can help domestic industries to increase their productivity (World Bank, 2023). But the overreliance on imported consumption goods or the crowding out of domestic goods by imported goods may dampen the growth effect of trade. In this context, the relationship

between import dynamics, tax policy and economic growth is especially relevant to discuss the development path of Indonesia since tax revenue is partly generated from import duty and value added tax on imports, which can be used to fund domestic investment that will reduce the long-term dependence on imports.

2.2.4 Taxation and Economic Growth in Developing Countries

The fiscal-growth nexus in the context of developing countries has been the subject of much academic debate, owing to the unique problem developing governments have in generating adequate domestic revenues while at the same time ensuring a conducive investment, production and employment environment. Tax revenue is often the main source of public finance and a fundamental basis for infrastructure, education, health and social protection investments, which are key to development, in many LMIs. These are essential types of public spending that are needed to improve human capital, boost productivity, alleviate poverty and ensure long-term economic growth. But structural constraints like small formal tax base, high tax evasion, weak tax administration and high informality can hinder the effective implementation of fiscal policies and constrain the development potential of taxation (World Bank, 2023; OECD, 2025).

The empirical evidence on the link between taxation and growth from developing countries is far from clear cut. Some studies find positive relationships, and argue that higher revenues enable governments to spend more productively and to maintain macroeconomic stability. It is sometimes claimed that high tax rates and/or badly designed tax systems deter private investment, employment and induce economic distortions that hinder economic growth. These conflicting results indicate that the effect of taxation on growth is determined by a number of factors including the taxation structure, effectiveness of taxation, institutional quality and macro economic environment (Arnold et al., 2011; Gemmell et al., 2011).

Theoretical research can aid in the understanding of this dynamics. When public expenditure financed by taxation can stimulate growth by complementing private capital formation, and by creating positive externalities for the economy as a whole, as Barro (1990) shows, it can be beneficial for the economy. Musgrave (1959) also mentions three basic functions of taxation in the economy – to allocate resources efficiently, to redistribute income to correct for distributional inequities, and to stabilize the economy.

All of these viewpoints imply that taxation is a means of contributing to development as long as the taxes are collected effectively and used for productive purposes.

Evidence from the developing world at the regional level supports the conclusions. Progress in revenue administration and domestic mobilization has lessened the need for external financing and boosted the fiscal sustainability in Sub-Saharan Africa. In Latin America, those countries which have diversified their revenue sources and enhanced public financial management have shown an increased ability to invest in infrastructure and social investment. This is the case in South Asia and Southeast Asia, where tax modernisation and digital administration reforms and institutional strengthening have created more fiscal space and macroeconomic stability (IMF, 2022; Asian Development Bank, 2023).

Recent research also focuses on the type of revenues. Direct taxes (such as personal and corporate income taxes) have very different effects on investment and saving incentives than do indirect taxes (such as VAT and excise taxes). In a country with a high share of the informal economy, indirect taxes are more manageable and offer more certainty of income streams. But it is important to broaden the formal tax base for the sake of better allocative efficiency and distributional equity of the fiscal system (UNESCAP, 2023).

Another key factor that is important for the fiscal-growth nexus is institutional quality. Transparent governance, effective revenue administration and accountable public expenditure frameworks are much more likely to lead to successful translation of tax revenues into productive investment and development outcomes in countries. Institutions that are weak, do not necessarily lead to better economic outcomes with higher revenue collection. This is an important observation, as it is important to think of revenue along with the efficiency and developmental impact of the spending it supports (Acemoglu & Robinson, 2012; OECD, 2025).

But, the policy question is not only how to increase revenue collection but also how to allocate the additional revenues to areas that will increase productive capacities and social welfare as in developing economy, such as Indonesia. Fiscal multipliers for public investment in transport, education, health and digital technology can be very high and these investments can help strengthen the structural factors of economic

development. Thus, the developmental dividend of taxation is a function of the amount of revenue that can be mobilized as well as the productive quality of the expenditure that can be funded by the revenue mobilized.

The general message that emerges from the developing country literature is that, if part of a package of good institutions, tax administration and fiscal policies, taxation can be an important instrument for encouraging economic growth. The findings of these studies are important in terms of theoretical and empirical foundation for the present study which is conducted based on the Autoregressive Distributed Lag (ARDL) model, Error Correction Model (ECM) and Granger causality analysis to examine the impact of tax revenue on economic growth in Indonesia during 1999-2023.

The literature on the developing country, in particular, has an important strand on the link between fiscal policy and macroeconomic volatility. In commodity dependent economies with shallow financial markets and sensitive to external shocks, tax revenue can be used as an automatic stabilizer as well as provide policy discretion. Falling commodity prices and/or a weakening of external demand reduces tax revenues, at the same time as the government's fiscal room for manoeuvre is most required. Fiscal policy can be less procyclical and governments can have more room for action in the face of economic shocks if they are able to broaden their tax bases beyond commodity taxes and increase the collection of taxes like income taxes, value-added taxes, and property taxes. This is especially important for Indonesia where, in the past, the government has been dependent on income from natural resource exploitation and commodity exports to augment its revenue from the domestic tax base.

Also important complementarities between tax policy and other aspects of economic reform are stressed in the literature. Overall, the success of tax administration reforms is more likely to be achieved if they are a component of a broader public financial management reform package, including improved budget execution, public procurement and public financial outcomes reporting. In many countries, tax reform in the absence of systems and processes reforms to improve tax collection and spending leads to no increase in benefits in service delivery and growth. Countries with high political will, good sequencing of reforms, and investments in administrative technology and human resources, such as Rwanda, Georgia and Estonia have demonstrated that rapid revenue

mobilization gains can be achieved. The principles of a successful revenue reform are very applicable and can be learnt from in the context of the current fiscal modernization process in Indonesia, albeit the countries are very different in size and context with Indonesia.

DRM has become a cornerstone of the sustainable development agenda, and has emerged as a major priority for the international development finance community. In 2015, the Third International Conference on Financing for Development in Addis Ababa put domestic revenue mobilization at the heart of the financing system for the Sustainable Development Goals (SDGs) because developing countries need to build their own fiscal capacity to lessen dependence on external resources and to fund the investments in health, education, infrastructure, and social protection that are essential for sustainable development (World Bank, 2023). The coherence between DRM and long-term development financing is a strategic imperative for Indonesia which has ambitious development targets under the Indonesia 2045 Vision. The empirical results in this study indicate that the issue of revenue reform is significant as one of the main pillars of development strategy in Indonesia, since there is a positive long run relationship between tax revenue and economic growth.

2.3 Research Gaps

As the literature review showed, there is a more extensive empirical history than is sometimes acknowledged, and it is more contentious than is sometimes thought. There is not only disagreement about the size of the fiscal-growth link, but about the sign of the fiscal-growth link, whether the fiscal-growth link is constant or not, and what conditions are necessary for the fiscal-growth link to be realized. A review of the origins of these differences and what they mean for research designs offers the best rationale for the present research.

The disagreement is most basic of a methodological nature. Previous empirical research on the fiscal-growth nexus (including most of the previous studies on Indonesia) uses static OLS specifications, which assume that the fiscal-growth nexus is a fixed linear relationship, that the effects of fiscal and macroeconomic variables on growth may be bidirectional, and that the estimated coefficient on tax revenue may be picking up the effects of other fiscal and macroeconomic variables. For example, Iswahyudi (2018) finds

a negative effect of income tax on growth using a time-series OLS framework, while Wibowo and Gunarto (2024) using ARDL framework with a wider set of controls, find a positive long-run effect of aggregate tax revenue. The studies don't just disagree, they measure different things in different ways with different assumptions. The discrepancies in results are due to methodological variations and not to the true uncertainty with respect to one parameter.

The first and most important gap is with regard to how endogeneity is treated. Tax revenue and GDP growth go hand-in-hand: greater tax revenues can be used for growth-enhancing spending, but stronger economic growth can also lead to greater tax revenues, as a result of the economic growth itself, without any specific policy measure being taken. Regressions of growth on tax revenue in a single equation may be prone to picking up a mechanical revenue dividend of economic expansion as part of the effect of fiscal policy, rather than a genuine causal effect. The Indonesian studies analysed here only explicitly examine causal direction in the context of the VAR approach (Maulid et al., 2022), with the authors' results of bidirectional causality providing a perfect example of why this issue should not be considered a minor methodological detail. The present study tries to fill this gap via a specially designed Granger causality analysis in the ARDL framework.

The second gap is between short-term and the long-term effects. As is well documented in the fiscal policy literature, taxes have different effects in the short and long run: increases in taxes are contractionary in the short run as Blanchard and Perotti (2002) have shown, but can be growth enhancing in the long run if taxes are used to finance productive public investment. Studies that only report one static coefficient on tax revenue lump these two different dynamics together in one number and hence their results are theoretically uninterpretable. To solve this problem, the ARDL-ECM framework allows for the estimation of the short-run adjustment dynamics as well as the long-run equilibrium relationship as separate parts, which makes it possible to present evidence for both temporal dimensions in the present study.

Third, most of the studies on Indonesia do not consider important macroeconomic control variables that are not included in the study, which may lead to a bias in the tax coefficient. For instance, the fiscal balance reflects the overall budgetary stance of the government and whether incremental tax revenues are saved, invested or offset by

increased spending, but is rarely used in single-variable specifications. In the same way, household final consumption expenditure will decide the amount of national income that is either saved or invested, or consumed, which the neoclassical theory regards as the key to capital accumulation and growth. Without such variables, the effects of these variables will be absorbed into the coefficient on tax revenue, which will be upward or downward biased depending on the direction of omitted variable bias. This five variable control structure was formulated to specifically work on this problem.

Fourth, the time period of previous studies limits the applicability of the studies in the current policy context in Indonesia. The most important institutional changes in the recent fiscal history of Indonesia, the tax amnesty program (2016-2017), the growth of electronic tax filing and most of all the Harmonization of Tax Regulations Act (2021), all lie outside the sample periods of previous empirical studies. These are indeed changes in the fiscal structure, which may have had significant impacts on the links between revenue collection and economic performance. These changes cannot be reflected in the datasets that are limited to 2015 or 2020, and this may lead to the misinterpretation of policy implications based on previous studies.

Fifth, the direction of causality has been considered as a second-order issue in most empirical studies in Indonesia, while it is a first-order issue in the design of a policy. If tax revenue is a cause of growth (the supply-side hypothesis), then fiscal reforms which boost revenue mobilization are also sources of growth and thus should be given priority in institutional investments. But if growth is the primary determinant of revenue (the demand-side hypothesis), tax policy is significantly endogenous and fiscal reform, although useful for administration, will not itself have a significant impact on growth. If it works in both directions, as Maulid et al. (2022) propose, then there are implications for the design of fiscal institutions regarding efficiency and long-run credibility. This is an empirical issue, and is not a methodological luxury, it is a policy question.

These five gaps are all symptoms of the same fundamental issue: The literature on fiscal policy and growth in Indonesia has been static, single-equation linear, and has failed to recognize the dynamic, bi-directional, and multi-causal nature of the relationship. The aim of this research is to overcome all the five limitations in one single study. The ARDL-ECM framework is able to accommodate the mixed integration orders

and also distinguish between short-run and long-run dynamics. Five variable control structure minimizes OVB. The Granger causality analysis is used to check for reverse causality. The 1999-2023 data set also includes the entire spectrum of fiscal modernization in Indonesia. The research design is not a set of independent methodological decisions, it is a unified answer to a particular set of limitations that has hindered the current literature in addressing the question at hand.

2.4 Research Hypotheses

This study proposes some testable hypotheses based on the theoretical framework and the previous empirical studies reviewed in the previous section on the relationship between tax revenue and economic growth in Indonesia. These hypotheses are based on the Neoclassical Growth Theory and especially the Solow Growth Model, and Public Finance Theory, which indicate that tax can affect economic growth in terms of its impact on capital accumulation, investment incentives, macroeconomic stability, and government's ability to fund productive public spending.

The hypotheses are set up in a way that is compatible with the Autoregressive Distributed Lag-Error Correction Model (ARDL-ECM), as the effects of the fiscal variables may vary in the short run and long run. Moreover, as there might be a mutual causal relationship between tax revenues and economic growth, a causality hypothesis is also formulated which can be tested by applying the Granger causality approach.

Based on this, the following hypotheses are suggested:

H₁: Tax revenue is statistically significant in the economic growth in Indonesia both in the short run and long run.

H₂: Fiscal balance positively and significantly affects economic growth, especially in the long run in Indonesia.

H₃: Inflation negatively and significantly affects the economic growth in Indonesia particularly in the short term.

H₄: There is a significant effect of Household Final Consumption Expenditure on economic growth in Indonesia. In the short run, consumption can lead to an increase in aggregate demand, but too much consumption can lead to lower savings and investment and thus lower long-term growth.

H₅: There is a significant relationship between import and economic growth in Indonesia. The impact of this effect will vary according to whether the imports contribute to improved productivity, by providing access to intermediate goods and technology, or to dependency on external production.

H₆: Tax revenue and economic growth in Indonesia have causal relationship. This relationship can be one way or two way and will be analyzed by Granger causality test.

The hypotheses will be tested empirically based on the data of the annual report for Indonesia from 1999 to 2023. The ARDL-ECM framework will be used to estimate the short-run and long-run effects while Granger causality analysis will be used to ascertain the direction of causality between tax revenue and economic growth. The findings will be used to build a strong empirical evidence of the effectiveness of taxation as a tool to promote sustainable and inclusive economic growth in Indonesia.

These hypotheses are a reflection of the theory and research discussed in the previous sections. The hypothesis H1 that assumes a significant impact of tax revenue on the economic growth in short and long run is based on the neoclassical and endogenous growth theories. There are two arguments that public investment, financed by taxes, can increase the steady state level of income (Solow model), and that public investment in human capital and knowledge can provide permanently higher growth rates (endogenous growth models). The empirical evidence on Indonesia is consistent with the plausibility of H1, as the positive effect of tax revenue on growth has been obtained by Wibowo and Gunarto (2024) and Amir et al. (2021), but the results are different in terms of the direction and size of the effects.

The fiscal balance hypothesis (H2) is inspired by the vast literature on fiscal sustainability and macroeconomic credibility. Sovereign risk premiums are lower, interest rates are more stable and conditions for private investment are better in countries with prudent fiscal positions. The constitutional fiscal rule, which caps the deficit at 3 percent of GDP, has given an anchor to fiscal expectations in the Indonesian context and improvements in the fiscal balance in times of strong economic growth have been linked to better investment and growth performance. The positive value predicted for H2 is thus in line with theory and the empirical facts of fiscal policy in Indonesia.

Hypothesis H3 assumes that there exists negative and statistically significant effect of inflation on economic growth, especially in short term. The hypothesis is based on the theoretical and empirical basis. Theoretically, inflation is bad because it reduces the real purchasing power of households, distorts relative price signals which guide investment decisions and increases uncertainty for businesses planning capital expenditure. The macroeconomic literature has always been consistent in pointing towards price instability as a factor that hinders sustainable growth, especially in a developing country which has shallow financial markets and firms are not able to hedge against price uncertainty. The periods of inflation in the late 1990s and mid-2000s in Indonesia are correlated with obvious declines in investment and growth, which is in line with the theoretical expectation. The negative sign predicted for H3 in the short run is due to the immediate disruption of price instability to consumption, investment and aggregate demand, while the long run relationship is expected to be weaker as monetary policy slowly brings back price stability and economic actors adjust their expectations. The change of Bank Indonesia's inflation targeting policy regime since 2005 offers some empirical evidence to believe that the inflation-growth relationship may be weaker than in previous years of the sample.

Particular attention should be paid on the effect of household final consumption expenditure (H4) since it is contrary to the simple Keynesian idea that consumption spending contributes to aggregate demand and growth. The notion that over-consumption can lead to a decline in long-run growth is based on the neoclassical theory, which focuses on savings and capital accumulation as factors contributing to the level of long-run income. In an economy with high share of household consumption (more than 55 percent of GDP) like Indonesia, the composition of aggregate expenditure is important for investment rates and long run productivity. A decline in the saving rate and/or an increase in household indebtedness may lead to a reduction in the investment-to-GDP ratio, which may limit the capital deepening that is required for continued productivity growth if consumption growth exceeds income growth. This worry is especially important in the Indonesian context where financial deepening and the growth of consumer credit have enabled consumption to increase which are not necessarily accompanied by an increase in productive capacity.

Hypothesis H5 assumes that there is a statistically significant impact of imports on economic growth, but the direction of the impact is theoretically unclear. This ambiguity is an expression of the double-edged nature of imports in the process of economic development. Import of capital goods, machinery and technology intensive intermediate inputs is an important channel of technology transfer and productivity improvement for domestic industries, on the other hand. The technology diffusion literature indicates that those economies that can import high quality capital goods and incorporate foreign technology in their production processes have higher productivity growth. In this respect, there is a positive relationship between trade openness and high import share of GDP with economic growth. However, over-reliance on imports of consumption goods can lead to a decline in domestic production, the deterioration of domestic industries and to current account deficits which limit growth in the end. In the Indonesian context, the import structure has always been dominated by imports of capital goods and raw materials which have a positive impact on manufacturing and infrastructure development, as well as imports of fuel and consumer goods which have a growth neutral or growth negative impact. Therefore, the net growth effect of the import pattern of Indonesia will depend on the nature of the imports and the ability of domestic industries to absorb and productively use the foreign inputs. In view of this theoretical uncertainty, H5 does not state the sign of the import coefficient and only checks whether the impact is statistically different from zero or not, which is to be decided empirically.

Hypothesis H6 is directly related to the endogeneity issue which is inherent in fiscal policy analysis. Theoretically, the causal relationship between taxation and growth is not clear-cut: an increase in tax revenue can either boost growth by increasing productive spending or growth can increase the tax base and lead to increased tax revenues without any change in taxation. By testing this hypothesis based on the Granger causality framework, the present study can offer empirical evidence on the direction of this relationship in Indonesia and can have implications on the interpretation of ARDL-ECM results and the design of fiscal policy in Indonesia. The direction of the relationship – whether it is supply-led (tax revenue leads to growth) or demand-led (growth leads to tax revenue) or bi-directional – has important implications for the sequencing of policy and reform priorities.

2.5 Research Framework

This study is a study based on an integrated conceptual framework which combines Neoclassical Growth Theory, especially Solow Growth Model and Public Finance Theory that is used to analyze the dynamic relationship between tax revenue and economic growth in Indonesia. According to these theoretical views, taxation may be able to affect economic performance in a variety of ways, such as via capital accumulation, investment incentives, aggregate demand, macroeconomic stability, and the government's ability to fund productive public spending.

In this context, economic growth is defined as the dependent variable and is reflected in the annual growth rate of gross domestic product (GDP) which is the overall performance of the economy in Indonesia. The main explanatory variable is tax revenue as a proportion of GDP, which captures the government's ability to raise domestic funds to invest in infrastructure, education, health care and other pro-growth spending.

Furthermore, a number of macroeconomic control variables are added to reflect the overall fiscal and economic situation and minimize the danger of omitted variable bias in the tax revenue.

- Fiscal Balance (FB): This is added to reflect fiscal discipline and budget sustainability, which are crucial for macroeconomic stability and enhancing investor confidence.
- Inflation (INF): As an indicator of price stability and macroeconomic uncertainty, both of which affect the real income, investment and consumption behavior.
- Household Final Consumption Expenditure (HFCE): it is the demand side component of economic activity. An increase in consumption may lead to short-run growth but too much consumption may lead to a decrease in saving and a decrease in long-run capital accumulation.
- Imports (IM): Reflect trade openness and access to intermediate goods, capital goods and technology that can enhance productivity and also dependence on foreign production.

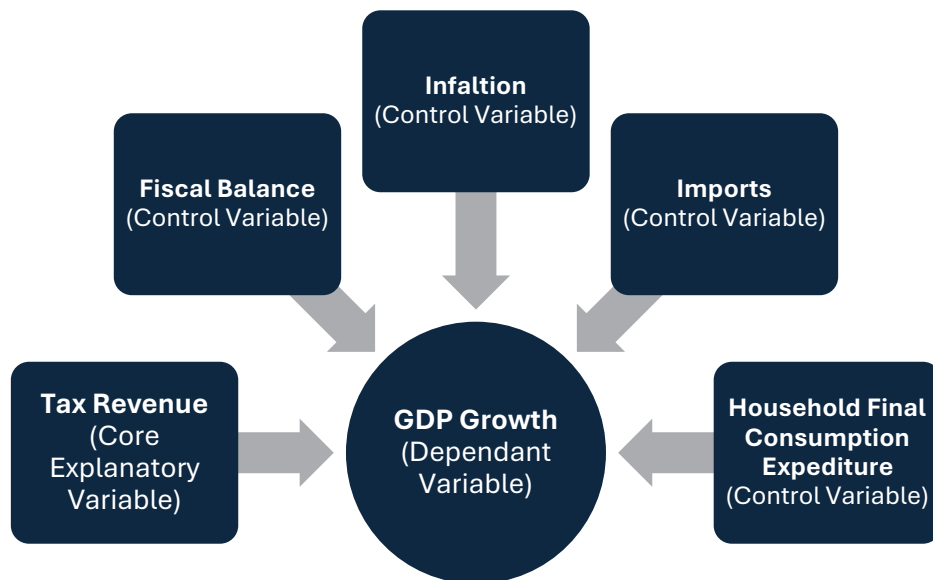
The framework takes into account that the link between tax revenues and growth is inherently dynamic. The impact of fiscal policy is not immediate, but rather occurs over

time through adjustment, institutional and feedback mechanisms. This link may also be bidirectional, stronger growth creates a larger tax base which, in turn, produces additional revenue without any policy change; this is not the same as the causal impact of fiscal reform on growth.

To capture these dynamics, this study uses the Autoregressive Distributed Lag-Error Correction Model (ARDL-ECM) which allows the simultaneous estimation of short-run adjustments and long-run equilibrium relationships among variables. Moreover, Granger causality tests are performed to identify the direction of causality between tax revenue and economic growth and to deal with the potential endogeneity issue due to the possible two-way causality between tax revenue and economic growth.

The conceptual framework of the study is shown in figure 2.1. The arrows show the direction of the relationships between tax revenues, fiscal balance, inflation, household final consumption expenditures, imports and GDP growth that were hypothesized. All of these variables are combined into a single empirical model that will be used to measure the role of taxation in achieving sustainable and inclusive economic growth in Indonesia in 1999-2023.

Figure 2.1 Research Framework



Source: Author's computation

The conceptual framework of the study is shown in figure 2.1. The direction of the arrows indicates the presumed relationship between tax revenue, fiscal balance,

inflation, household final consumption expenditure, imports and GDP growth. The framework combines both the demand and supply side channels and incorporates the dynamic short-run and long-run relationships estimated empirically using ARDL-ECM approach and Granger causality analysis.

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design

This study uses a quantitative research approach and explanatory approach. It is based on annual time-series observations for Indonesia in the period 1999-2023 and uses a variety of econometric methods designed to account for the short-term adjustment dynamics as well as the long-term structural relationship between tax revenue and economic growth. The analytical tool used is the Autoregressive Distributed Lag-Error Correction Model (ARDL-ECM) with a set of diagnostic tests and Granger causality tests.

The second objective of the study is to estimate the direction, magnitude and statistical significance of the associations between tax revenue and economic growth, and to determine the direction of short-run predictive causality by using Granger tests, which are all of an explanatory orientation. In addition to tax revenue, the empirical model also includes fiscal balance, inflation, household consumption and imports as control variables. Adding these other factors significantly lowers the risk that the tax revenue coefficient reflects the effects of other factors, and not the true effect of revenue mobilization on economic outcomes.

The ARDL-ECM framework was chosen for three reasons: methodological. First it allows for the inclusion of variables that are integrated at various orders – combination of $I(0)$ and $I(1)$ series – without having to difference all variables. Second, it is an approach well suited to small samples which is directly applicable to the 25-observation annual sample used in this analysis. Third, it provides simultaneous estimates of the short-run adjustment processes and the long-run equilibrium relationships in a single internally consistent specification, and thus does not suffer from the loss of information that is associated with differencing-only specifications.

As an additional procedure, Granger causality tests are used to determine if there is predictive information in historical tax revenue data for the future level of economic growth, if historical economic performance predicts tax revenue or if the predictive relationship is bidirectional. This difference is important because it has policy consequences: a supply-dominated relationship (tax effort to growth) requires different

policies than a demand-dominated relationship (growth to tax). In addition to the causality analysis, a set of diagnostic tests: serial correlation, heteroskedasticity, normality, multicollinearity and CUSUM stability confirm the statistical validity of the estimated model.

These analytical tools, dynamic modelling, causality testing and complete diagnostics, provide a methodologically well-developed and comprehensive analysis of the relationship between tax revenue and economic growth in Indonesia over the last 25 years on an annual basis.

3.2 Data Sources

The empirical analysis uses annual time-series data for Indonesia from 1999 to 2023, which captures the recovery from the Asian financial crisis, the commodity boom in the mid-2000s, the global financial crisis in 2008-2009, a long period of gradual fiscal consolidation, and the COVID-19 economic shock and recovery. These events are together enough and varied enough to create a solid and diverse macroeconomic setting in which to estimate stable long-run relationships. To guarantee the reliability and consistency between series, all variables are obtained from well-known international and national statistical sources:

- World Bank World Development Indicators for GDP growth, inflation, household final consumption expenditure and imports.
- Fiscal balance and other macroeconomic indicators from the International Monetary Fund World Economic Outlook Database.
- Indonesia Ministry of Finance and Directorate General of Taxes for additional fiscal information and documentation for tax reform.

This gives a data set of 25-observations for each of the 6 variables, each observation being one year. It was prepared and verified in EViews before all the estimation procedures.

3.2.1 Sample Period Justification: Institutional Discontinuity and Small-Sample Considerations

The choice of 1999 as the starting point of the sample is not an arbitrary data-availability decision but reflects a genuine institutional discontinuity in Indonesia's fiscal

architecture. In 1999 the government enacted Law No. 22/1999 on Regional Government and Law No. 25/1999 on Fiscal Balance between the Central and Regional Governments, together known as the “Big Bang” of fiscal decentralization, implemented from 2001 onward. Prior to this reform, sub-national governments had no meaningful independent revenue-raising or spending authority, so that “general government” fiscal aggregates were, in practice, equivalent to central-government aggregates alone. After the reform, “general government” came to represent a structurally different, composite aggregate spanning central and regional layers of government linked by new intergovernmental transfer mechanisms (DAU, DAK and DBH) that had no prior counterpart. Because the two key fiscal variables in this study - tax revenue (TXR) and fiscal balance (FB) - are directly affected by this institutional redefinition, extending the sample backward before 1999 would not simply add more observations of the same variable; it would pool two institutionally non-equivalent measurement regimes into a single time series. Exploratory checks conducted for this study confirm this concern empirically: when the sample is extended backward to include the pre-decentralization and 1997-98 Asian financial crisis years, tax revenue and fiscal balance exhibit unstable, higher-order ($I(2)$) integration behaviour that is absent when the sample begins in 1999, and short-run Granger-causality results become unstable and highly sensitive to the exact starting year chosen. The 1999-2023 sample window was therefore chosen to preserve the definitional consistency of the fiscal variables at the core of the study, rather than to maximize sample size at the cost of measurement validity.

This design choice does entail a statistical trade-off that is acknowledged explicitly here rather than in the limitations chapter alone. With $T = 25$ annual observations, the sample falls below the $T = 30$ lower bound for which Narayan (2005) tabulated small-sample critical values for the ARDL bounds test; the asymptotic critical values of Pesaran, Shin and Smith (2001) are, strictly speaking, derived for larger T . In small-sample settings, the true finite-sample critical values tend to be somewhat higher (more conservative) than the asymptotic values, so that using the asymptotic table could, in principle, overstate the statistical significance of the bounds test. This concern is mitigated in the present study by the very large margin between the computed F-statistic (46.22, reported in Section 4.3) and the upper bound critical value even under the asymptotic table (4.15 at the 1% level); the computed statistic exceeds this threshold more

than tenfold, a margin far larger than the adjustment implied by moving from asymptotic to small-sample critical values. The CUSUM and CUSUMSQ parameter-stability tests reported in Section 4.7 provide further, independent evidence that the limited degrees of freedom have not produced an unstable or overfitted model. The trade-off between sample size and definitional consistency is thus treated as a deliberate, disclosed methodological choice rather than an oversight: extending the sample would trade a manageable loss of estimation precision for a more serious threat to validity in the form of measurement non-comparability in the two central fiscal variables of the study.

3.3 Variables and Measurements

The model is comprised of one dependent variable and 5 independent variables which have been selected based on theoretical and empirical reasons. These variables are summarized in Table 3.1 and the units used to measure them.

Table 3.1 Variables and Measurements Used in the Study

Variable	Symbol	Type	Description	Unit
GDP Growth	GDPG	Dependent Variable	Annual percentage growth rate of GDP	% (annual)
Tax Revenue	TXR	Independent Variable	Total tax revenue collected as a percentage of GDP	% of GDP
Inflation	INF	Independent Variable	Annual change in consumer prices	% (annual)
Imports	IM	Independent Variable	Value of imports as a percentage of GDP	% of GDP
Fiscal Balance	FB	Independent Variable	Fiscal balance as a percentage of GDP	% of GDP
Household Final Consumption Expenditure	HFCE	Independent Variable	Total household consumption expenditure as % of GDP	% of GDP

Source: Author's computation using EViews.

Tax revenue is the total amount of revenue effort of the government, in relation to the size of the economy, the main explanatory variable. The four control variables are fiscal balance, inflation, household consumption and imports where they reflect the aspects of fiscal discipline, price stability, composition of aggregate demand and external trade openness, respectively. This combination ensures that the estimated tax revenue's

coefficient reflects the effect of the tax revenue mobilization on the economic performance and not the effect of these macroeconomic factors.

3.4 Econometric Model

The basic econometric model is adopted from the ARDL models developed by Pesaran, Shin and Smith (2001). The result of the unit root test makes this approach suitable for the present study as the variables are of mixed orders of integration, $I(0)$ and $I(1)$. Hence, the traditional Johansen cointegration method is not appropriate, while ARDL bounds testing method can be used for such combination of integration orders. Moreover, the ARDL methodology is found to be effective for relatively small samples, which is applicable to the annual data with 25 observations.

$$GDPG_t = f(TXR_t, FB_t, INF_t, HFCE_t, IM_t)$$

Where:

- $GDPG_t$: Annual GDP growth rate.
- TXR_t : Tax revenue as a percentage of GDP.
- FB_t : Fiscal balance as a percentage of GDP.
- INF_t : Annual inflation rate.
- $HFCE_t$: Household final consumption expenditure as a percentage of GDP.
- IM_t : Imports as a percentage of GDP.

The unrestricted error correction representation of the ARDL model is expressed as:

$$\begin{aligned} \Delta GDPG_t = & \alpha_0 + \sum_{i=1}^p \beta_i \Delta GDPG_t - i + \sum_{j=0}^{q1} \gamma_j \Delta TXR_t - j + \sum_{k=0}^{q2} \delta_k \Delta INF_t - k \\ & + \sum_{l=0}^{q3} \theta_l \Delta FB_t - l + \sum_{m=0}^{q4} \phi_m \Delta IM_t - m + \sum_{n=0}^{q5} \psi_n \Delta HFCE_t - n \\ & + \lambda_1 GDPG_t - 1 + \lambda_2 TXR_t - 1 + \lambda_3 INF_t - 1 + \lambda_4 FB_t - 1 \\ & + \lambda_5 IM_t - 1 + \lambda_6 HFCE_t - 1 + \varepsilon_t \end{aligned}$$

where Δ denotes the first-difference operator, ε_t is the white-noise error term, p and q represent the optimal lag lengths, β , γ , δ , θ , ϕ , and ψ are the short-run coefficients, and λ_1 – λ_6 capture the long-run relationship among the variables.

3.5 ARDL Bounds Testing and Error Correction Model

The ARDL bounds testing approach is used to test for long run cointegration of the variables. If the value of F-statistic is higher than the upper critical bound value, then the null hypothesis of no long run relationship is rejected. Once cointegration is established, the short-run dynamics can be estimated using the Error Correction Model (ECM):

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^p \beta_i \Delta X_t - i + \lambda ECM_{t-1} + \varepsilon_t$$

Where:

- Δ denotes the first-difference operator.
- X represents the explanatory variables included in the model.
- ECM_{t-1} is the lagged error correction term.
- λ measures the speed of adjustment toward long-run equilibrium and is expected to be negative and statistically significant.

3.6 Granger Causality Test

This study uses the Granger causality testing procedure to investigate the possible bi-directional relationship between tax revenue and economic growth. This method is used to determine if the historical series of tax revenues provides information on future economic growth, if lagged growth provides information for future tax revenues, or if there is a bi-directional predictive relationship. There are 3 possible outcomes:

1. Unidirectional causality from tax revenue to economic growth.
2. One-way causality of economic growth on tax revenue.
3. Bidirectional tax revenue-economic growth.

This analysis directly tackles the potential endogeneity of tax revenue and economic growth and presents more evidence on the direction of influence between the two variables.

3.7 Diagnostic and Stability Tests

Many diagnostic tests and stability analysis are performed to check the robustness of the estimated econometric model and to check the statistical reliability of the model.

3.7.1 Descriptive Statistics:

Summary statistics such as mean, median, standard deviation and distributional measures of the data are provided before formal econometric estimation to characterize the data. These statistics can then be used to determine whether there are any obvious irregularities in the series and thus encourage the diagnostic testing procedures.

3.7.2 Stationarity Tests:

The Augmented Dickey-Fuller (ADF) test is used at each level and first difference for each variable. This is analytically necessary: The inclusion of non-stationary variables in regression specifications, if not treated properly, can lead to misleading estimated relationships. The order of the integration of each of the series also implies what is methodologically suitable estimation method for the data available.

3.7.3. Normality Test:

The Jarque-Bera test is used to test if the model's residuals are normally distributed. The assumption of normal distribution of the error terms is often used in making valid inferences based on regression and if this assumption is not satisfied, the hypothesis testing procedure based on t-statistics and F-statistics may be unreliable.

3.7.4 Multicollinearity:

Variance Inflation Factors (VIF) of all the explanatory variables are computed. If the VIFs are high in general (above 10), it could be a sign of multicollinearity and that the standard errors are being affected, and also the precision of the individual coefficient estimates.

3.7.5 Heteroskedasticity:

Breusch-Pagan-Godfrey test is used to test whether the variance of the residuals is constant over observations, which is the homoskedasticity assumption. Heteroskedastic errors do not affect the point estimates, but they render the classical methods of drawing inferences using standard errors invalid and thus the errors must be corrected before the results of the model can be used for inference.

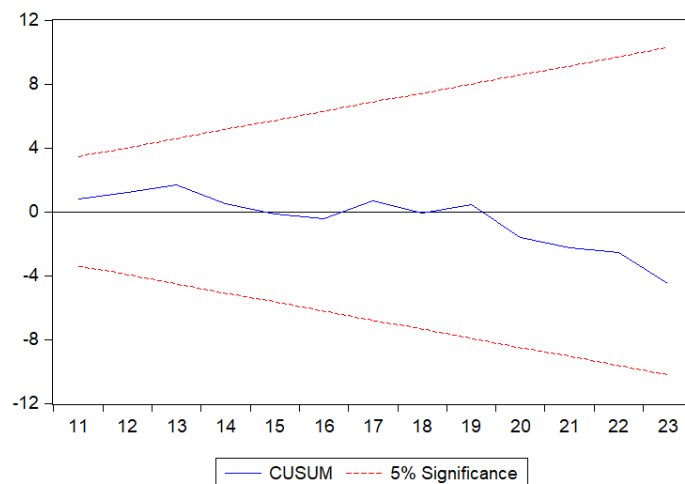
3.7.6 Serial Correlation:

Breusch-Godfrey Lagrange Multiplier test is used to check if the residuals are autocorrelated. A time-series model with serial correlation can either suggest that the model has been misspecified by the omission of important dynamic processes, or that the lag structure chosen for the model is misspecified.

3.7.7 CUSUM and CUSUMSQ Stability Tests

Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests are used for checking stability of parameters. These procedures are used to check whether the parameters of the model estimated by the model are structurally stable across the sample period or whether there are important breaks at some point in the sample period. This is not a trivial empirical issue, but a substantive one, given the range of the data covers the Asian financial crisis, the commodity price boom, the global financial crisis and the COVID-19 economic disruption.

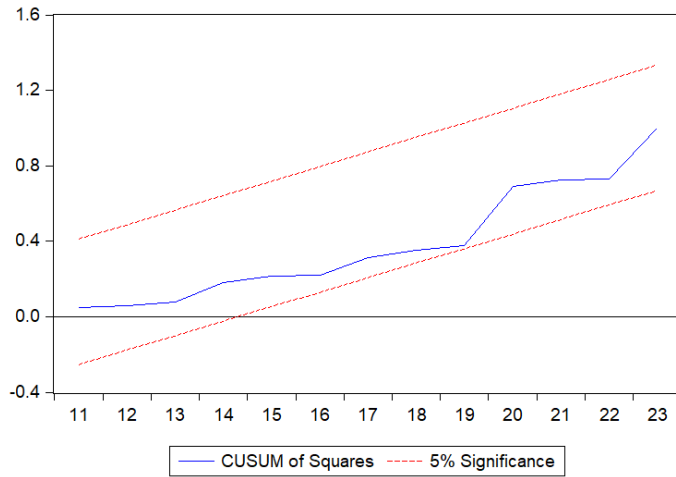
Figure 3.1: Cumulative Sum (CUSUM) test for parameter stability



Source: Author's computation using EViews.

The CUSUM plot is a plot of the recursive cumulative sum of the residuals. The model's coefficients are said to be structurally stable if the plotted statistic stays within the 5 percent critical bounds for the entire sample period. This test is useful when it is wanted to identify slow changes in parameters instead of sudden changes. The results of the CUSUM test are shown and interpreted as part of the empirical results in Chapter IV, Section 4.7 with Figure 3.1 shown for reference.

Figure 3.2: Cumulative Sum of Squares (CUSUMSQ) test for parameter stability



Source: Author's computation using EViews.

The CUSUMSQ test is an extension of the CUSUM, which is based on the level of recursive residuals, and is based on the variance of recursive residuals. A stable residual variance over time in turn is indicated if the squared residual sum remains within the 5 percent critical bounds. CUSUM results are displayed in Chapter IV, Section 4.7 along with the CUSUMSQ results.

3.8 Conclusion

The research methodology has been introduced in this chapter, which was used to explore the dynamic relationship between tax revenue and economic growth in Indonesia. The study uses time-series data for the period 1999-2023 to estimate the short-run adjustment dynamics and long-run equilibrium relationship based on ARDL-ECM framework and tests the direction of short-run predictive precedence using Granger causality test between the fiscal revenues and economic growth. It is important to note that the ARDL estimates are dynamic statistical relationship and Granger causality is predictive precedence on the basis of the history of past values, but not in the philosophical sense of the word causation.

A complete set of diagnostic and stability tests are performed to ensure the strength and statistical validity of the empirical results. Overall, the methodology offers a solid analytical framework to assess the contribution of fiscal policy in sustainable and inclusive economic development in Indonesia.

The selection of methodology ARDL-ECM is done on a theoretical and practical consideration. Theoretically, the Pesaran-Shin-Smith (2001) bounds testing method is suitable for the time-series data where variables can have different integration orders but none of the variables is integrated of order two or higher. This is directly relevant to the present study where the unit root tests suggest that there are a mixture of $I(0)$ and $I(1)$ series a situation where conventional cointegration methods like those of Johansen (1988) and Engle and Granger (1987) may be unreliable. The ARDL bounds test has the advantage of not having to pre-test for the unit root classification and can be used to obtain consistent estimates of the long-run relationship even in a small sample, which is significant for this paper, as the time series have 25 observations per year. Practically, the ARDL-ECM framework leads to the concurrent estimation of the short-run dynamics and the long-run equilibrium relationships in a single and internally-consistent model and provides a more comprehensive description of the fiscal transmission mechanism than static regression methods.

As a methodological complement, the Granger causality test is added to the analysis to deal with one of the key methodological issues in the fiscal policy literature: that of the potential endogeneity of tax revenue with respect to economic growth. Indeed, strong economic growth can have a direct impact on the revenue base, and increase collections even if there is no change in fiscal policy, resulting in a positive upward bias on the coefficient on tax revenue in a standard regression specification. The Granger analysis makes it possible to directly test the direction of the statistical relationship of the two key variables by examining the predictive content of the historical values of tax revenue for economic growth and the predictive content of the historical growth values for tax revenue. The lack of significant short-run Granger causality in both directions is consistent with the notion that the link between tax revenue and economic growth in Indonesia is more of a long-run structural relationship, and less of a near-term predictive one; and this significantly reduces the concern about endogeneity influencing long-run coefficient estimates.

CHAPTER IV

RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Descriptive statistics and correlation analysis of the data was presented before moving on to the formal econometric analysis in this section. There are two reasons for these initial steps: firstly, they give an initial impression of the behavior of the variables during the study period and secondly, they give initial clues to be confirmed or qualified by the ARDL and causality tests as to which association(s) is/are worthy of being explored in a more rigorous manner.

4.1.1 Summary Statistics

The mean, median, maximum, minimum, standard deviation, skewness and kurtosis for each variable for the total sample of 25 years is given in Table 4.1. These statistics are not only a formality, but are also useful in uncovering important characteristics of the data that are relevant for the econometric approach and interpretation of the results.

Table 4.1: Descriptive Statistics of Variables

Variable	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Observations
GDPG	4.72	5.03	6.35	-2.07	1.80	-2.62	9.90	25
TXR	11.47	11.92	12.99	7.76	1.26	-1.94	6.29	25
INF	6.55	5.36	20.48	1.56	4.29	1.58	5.52	25
IM	23.66	23.85	30.76	15.64	4.13	0.06	2.13	25
FB	-1.69	-1.65	0.46	-6.10	1.43	-1.16	5.25	25
HFCE	60.11	57.93	73.94	53.05	5.07	1.00	3.42	25

Source: Author's computation using EViews.

As shown in Table 4.1, the average of economic growth (GDPG) in Indonesia for the period of 1999-2023 was 4.72 percent, the highest value was 6.35 percent, and the lowest value was -2.07 percent, which was the sharp decline in 2020 during the COVID-19 pandemic. The standard deviation of 1.80 indicates that the annual economic growth has a moderate variation during the study period.

Tax revenue (TXR) as a share of GDP was on average 11.47 per cent with relatively low volatility (standard deviation of 1.26). This indicates that the tax effort in Indonesia was still relatively stable, albeit at a low level compared to its peers. Inflation (INF) had the largest standard deviation of 4.29 percent and the highest maximum value of 20.48 percent, suggesting that prices were highly volatile in some periods, as compared to the other macroeconomic indicators.

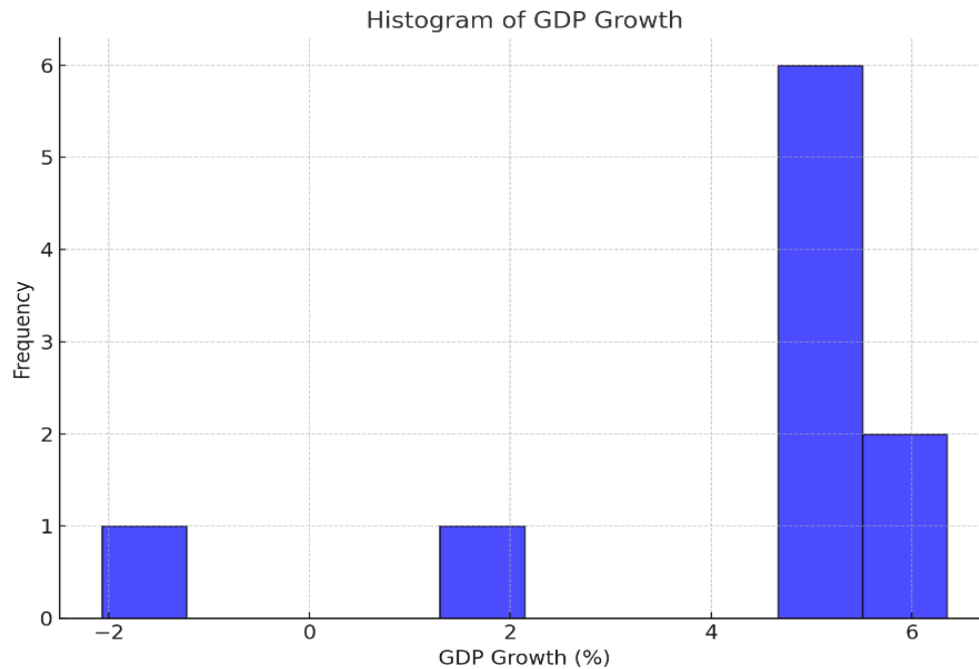
The mean value of imports (IM) was 23.66 percent of GDP, and the variation was moderate, while fiscal balance (FB) had a mean value of -1.69 percent, which means that on average, Indonesia was in a moderate fiscal deficit during the study period. Among the various components of GDP, household final consumption expenditure (HFCE) was the largest with an average of 60.11 per cent, highlighting the significance of domestic consumption in sustaining economic activity.

The results of the skewness and kurtosis test indicate that there are some variables that are not normally distributed. GDPG and TXR are negatively skewed and highly leptokurtic, which means that there are extreme observations and non-normality. All these attributes also serve to justify the use of formal diagnostic tests and powerful econometric methods in the following sections.

The descriptive statistics overall indicate several key characteristics of the macroeconomic conditions in Indonesia over the sample period. The relatively low average tax-to-GDP ratio of 11.47 percent, and the relative uniformity of the distribution of this ratio around the mean, indicates that the structure of tax collection has remained constrained despite the several tax reforms that have been implemented. In contrast, the high average share of household consumption, which is 60.11 percent, indicates the consumption-driven nature of the Indonesian growth model, where private domestic demand is the foremost growth driver instead of investment and exports. The mean value of fiscal balance (-1.69 percent) suggests a moderate deficit on average, in line with the fiscal rule in Indonesia, which is limited to 3 percent of GDP. The macroeconomic instability of the early years of the sample period, in the wake of the Asian financial crisis (1997-1998) and the inflationary events due to fuel price adjustments and external commodity shocks is reflected in the high mean and variability of inflation. These summary statistics are important to provide background information for interpreting the

econometric results presented later and emphasize the need to use a combination of macroeconomic variables in the empirical model to reflect the various factors underlying the economic growth path of the study period (25 years) in Indonesia.

Figure 4.1: Histogram of GDP Growth



Source: Author's computation using EViews.

The time series of the distribution of the GDP growth over the sample period is displayed in figure 4.1. As is evident in the histogram, most of the observations are close to the average growth rate and there is one obvious outlier, the 2020 economic contraction. This trend is in line with the negative skewness and high kurtosis value as shown in Table 4.1 which indicates the effect of big macroeconomic shocks on the growth performance of Indonesia.

4.1.2 Correlation Analysis

Correlation analysis can be used to provide a second layer of preliminary evidence. The Pearson's correlation coefficient for all pairs of variables are presented in Table 4.2. As in other results, with the relationship between taxes and growth it is especially important to note that correlation does not imply causation, in this case the reverse of the causal relationship can be suspected. The correlation matrix is therefore best thought of as a map of associations that are best explored in greater detail.

Table 4.2 Correlation Matrix of Variables

	<i>GDPG</i>	<i>TXR</i>	<i>INF</i>	<i>IM</i>	<i>FD</i>	<i>HFCE</i>
<i>GDPG</i>	1.000	0.613	-0.139	0.273	0.614	-0.287
<i>TXR</i>	0.613	1.000	-0.248	-0.123	0.254	-0.401
<i>INF</i>	-0.139	-0.248	1.000	0.636	0.580	0.756
<i>IM</i>	0.273	-0.123	0.636	1.000	0.703	0.567
<i>FB</i>	0.614	0.254	0.580	0.703	1.000	0.442
<i>HFCE</i>	-0.287	-0.401	0.756	0.567	0.442	1.000

Source: Author's computation using EViews.

There are several interesting relationships in the correlation matrix. There is a moderately positive correlation between GDP growth (*GDPG*) and tax revenue (*TXR*) (0.613). This implies that, in general, the higher the tax revenues, the better the economic performance, which gives preliminary evidence for the hypothesis that better domestic revenue mobilization leads to better economic performance.

Moreover, fiscal balance (*FB*) has a positive correlation with GDP growth (0.614), suggesting that good fiscal balance and budget discipline may be important factors to sustain macroeconomic stability and growth. This result is in line with the idea that good financial policy boosts investor confidence and mitigates macroeconomic risks.

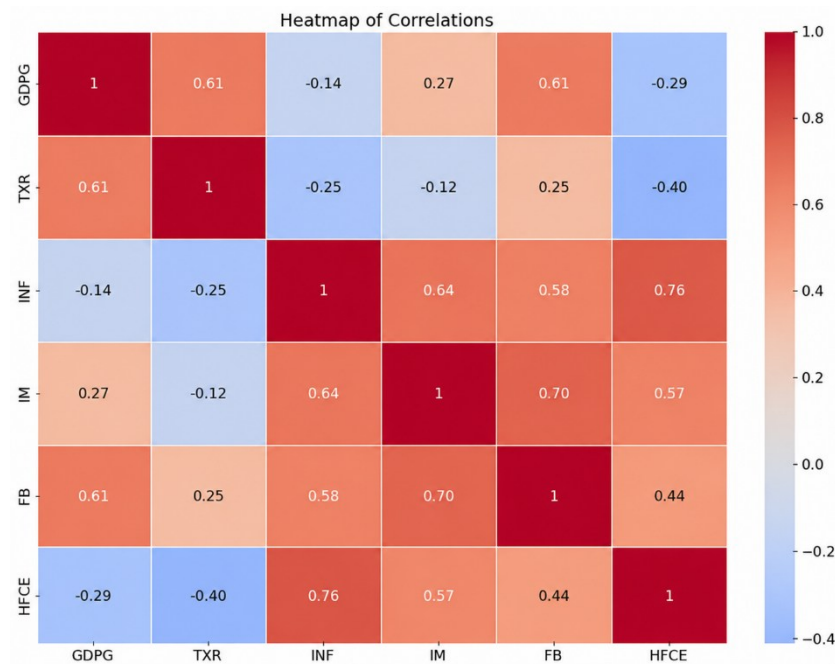
The correlation between inflation (*INF*) and GDP growth is weak negative (-0.139) indicating that an increase in inflation may have a slight negative impact on the economy as it increases uncertainty and decreases purchasing power. Household final consumption expenditure (*HFCE*) is negatively correlated with GDP growth (-0.287), suggesting that too much consumption without an adequate amount of savings and productive investment can limit economic growth.

The correlation between imports (*IM*) and GDP growth (0.273) suggests that trade openness and access to imported goods and technology may offer some support to economic activity, but the impact seems relatively small.

Several moderate and strong correlations are found in the explanatory variables, such as inflation and household consumption (0.756) and imports and fiscal balance (0.703). The Variance Inflation Factor (*VIF*) results presented later in the chapter, however, do indicate that the problem of multicollinearity is not serious as all the *VIF* values are below the commonly used threshold of 10.

In general, the correlation analysis is useful as preliminary evidence of the relationship between the variables and as the first evidence that tax revenue and fiscal balance have a positive relationship with economic growth in Indonesia. The associations are further explored in the following ARDL-ECM and Granger causality analysis.

Figure 4.2: Heatmap of Correlations



Source: Author's computation using EViews.

The heatmap is a visual representation of the correlation matrix, which shows the relationships between the variables used in the study, both in terms of strength and direction. The darker colours show higher correlations and lighter colours show lower correlations. The figure shows that tax revenue is fairly positively correlated with GDP growth and that household final consumption expenditure and imports are strongly positively correlated with inflation, which confirms the moderate positive relationship and the strong positive relationships. All in all, the heatmap confirms the preliminary results of the correlation analysis, and offers a quick and easy overview of the interrelationships between variables before the econometric estimation.

4.2 Unit Root Tests

Before estimating any regression relationships, it is important to determine if the variables are stationary. When non-stationary series are involved in a regression, spurious results can be obtained, with high R-squared and significant t-statistics that are not really

relationships. Each variable was tested at levels and first differences using the Augmented Dickey-Fuller (ADF) test, where the null hypothesis is that the series is integrated of order 1, or has a unit root. The results are summarised in Table 4.3.

Table 4.3: Stationarity Test Results

Variable	Stationary at Level	Stationary at 1st Difference	Integration Order
GDPG	Yes	Yes	I(0)
TXR	Yes	Yes	I(0)
INF	Yes	Yes	I(0)
IM	Yes	Yes	I(0)
FB	No	Yes	I(1)
HFCE	No	Yes	I(1)

Source: Author's computation using EViews.

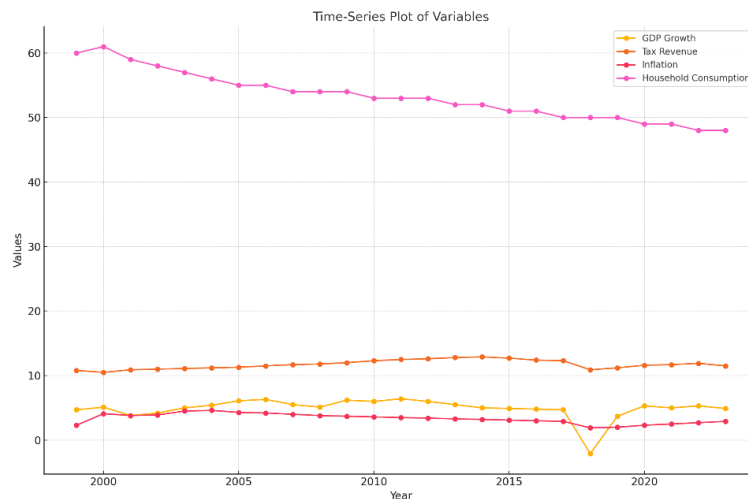
These results suggest that GDP growth (GDPG), tax revenue (TXR), inflation (INF) and imports (IM) are stationary at level, that is, integrated of order zero, I(0). Fiscal balance (FB) and household final consumption expenditure (HFCE), on the other hand, are non-stationary at level but stationary after first differencing, that is, they are integrated of order one, I(1).

The results show that variables are integrated at mixed orders (I(0) and I(1)), which validates the use of the Autoregressive Distributed Lag (ARDL) model. As mentioned by M. Hashem Pesaran et al., the ARDL methodology is suitable in the situation where the variables are not integrated of order greater than one and the sample size is relatively small. This feature makes the ARDL-ECM framework particularly suitable for this study that employs annual observations for Indonesia in 1999-2023.

The stationarity results have important economic implications, too. The results show that GDP growth (GDPG), tax revenue (TXR), inflation (INF), and imports (IM) are stationary at levels, meaning that these variables do not have persistent trends that would drive them away from a long-run equilibrium. This is in line with economic theory, which implies that these variables are subject to mean-reverting forces: tax revenue to GDP is limited by institutional and administrative factors; inflation is limited by monetary policy; and the shares of imports are limited by the balance of payments and the structural characteristics of the economy. However, fiscal balance (FB) and household final consumption expenditure (HFCE) are non-stationary in levels, implying that these

variables have been trending persistently and need to be differenced to be stationary. This is consistent with the empirical observation that fiscal balances in developing economies can show persistent deficit dynamics, with structural revenue constraints and expenditure pressures, while household consumption as a share of GDP can show sustained trends, related to demographic changes, urbanization and increased income levels. The mixed integration orders that have been detected for the six variables in this study, therefore, reflect the different economic processes that govern each variable and form a statistically valid basis for using the ARDL bounds testing approach for this set of variables.

Figure 4.3: Time-Series Plot of Variables



Source: Author's computation using EViews.

The key variables' trends throughout the study are presented in Figure 4.3. The series exhibit different trends and fluctuations that might be associated with big macroeconomic events and policy changes in Indonesia, such as the inflation volatility, fiscal adjustment and tax administration changes. The results of the visual inspection are in line with the formal unit root tests and show the dynamic nature of the variables studied in this paper.

4.3 ARDL Bounds Test and Cointegration

The results of the ARDL estimation are displayed in four stages: bounds test for cointegration, conditional error correction model, estimated long-run equation, and the Granger causality analysis. All the estimations were carried out by using EViews 12 on annual data for Indonesia with 25 observations from 1999 to 2023.

4.3.1 ARDL Bounds Test for Cointegration

The ARDL procedure starts with bounds test for cointegration. The reasoning is simple: if the six variables have a common long-run equilibrium relationship, the F-statistic for the bounds test should be larger than the upper critical value; if it is less than the lower critical value, no long-run relationship can be concluded; if it is between the two critical values, it is inconclusive. The F-statistic and critical values are given in Table 4.4.

Table 4.4 ARDL Bounds Test Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	46.22458	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Finite Sample: n=35				
Actual Sample Size	23	10%	2.331	3.417
		5%	2.804	4.013
		1%	3.9	5.419
Finite Sample: n=30				
		10%	2.407	3.517
		5%	2.91	4.193
		1%	4.134	5.761

Source: Author's computation using EViews.

Based on the ARDL bounds test result, the F-statistic of the calculated model is 46.22458 which is significantly higher than the upper bound critical values at 10 percent, 5 percent, 2.5 percent and 1 percent significance levels. In particular, the upper bound critical value for the 1 percent significance level is 4.15, which is well below the estimated F-statistic.

The F-statistic is calculated and compared with all the upper bound critical values, and the null hypothesis of no long-run relationship is rejected. This result confirms that there is a statistically significant cointegrating relationship between GDP growth, tax revenue, inflation, fiscal balance, imports, and household final consumption expenditure in Indonesia in the period 1999-2023.

The implication is that while the variables may fluctuate in the short-run, they tend to move together in the long-run and approach a long-run stable relationship. Hence,

the ARDL-Error Correction Model (ARDL-ECM) is suitable for the estimation of both the short run dynamics and long run coefficients of the model.

The F-statistic (46.22) is extremely large compared to all the critical value thresholds, both asymptotic and finite sample critical values. This finding gives very strong evidence of cointegration and indicates that the long run equilibrium relationship between the variables is very stable and not sensitive to the critical value table used. Even with the most conservative finite sample critical values (upper bound I(1) critical value is 5.761 with $n = 30$ and 1 percent significance level), the calculated F-statistic is much larger than the critical value and there is no doubt about the existence of long run relationship. This is especially relevant because of the small number of observations (23) available for the estimation; the small sample cointegration tests may sometimes be sensitive to the exact critical values that are used.

The result that the six variables used in this study are cointegrated variables has important economic implications. Cointegration suggests that although fiscal and macroeconomic variables may have different orders of integration and different short-run dynamics, they are nevertheless linked in a long-run equilibrium relationship. This outcome confirms the theoretical analysis presented in Chapter II that taxation, fiscal balance, inflation, consumption and trade interact in various ways and can affect the trajectory of economic growth in the long run. If there is a cointegrating relationship, the estimated long-run coefficients can be treated as true structural parameters of the Indonesian economy, and are not spurious due to common trends in non-stationary time series. It also confirms the validity of the error correction mechanism to model the speed of adjustment from the short-run disequilibrium to the long-run equilibrium, which is a central feature of the dynamic analysis done in this chapter.

The model specification ARDL(1, 0, 2, 0, 0, 1) was selected using the Akaike Information Criterion (AIC) which is based on the trade-off between model fit and parsimony. This specification assumes that GDP growth (GDPG) is lagged once, tax revenue (TXR) is entered without lags, inflation (INF) is entered with up to two lags, fiscal balance (FB) is entered without lags and imports (IM) are entered without lags, and that household final consumption expenditure (HFCE) is entered with one lag. The differences in lag structures between the variables can be attributed to the fact that the

economic variables have a different time to influence growth outcomes: tax revenue may have a more immediate effect on the government spending responses, while the effects of household consumption on investment and savings behavior may take longer. The AIC-selected model was confirmed by specification tests which showed no evidence of serial correlation, heteroskedasticity or non-normality in the residuals, thus confirming the statistical validity of this particular lag structure.

4.3.2 Conditional Error Correction Model Results

After the confirmation of cointegration, conditional error correction representation of ARDL model should be estimated. This gives two sets of coefficients, one of the short run dynamic adjustments and the other of the long run levels equation that is the stable equilibrium relationship between the variables. The full output of the ECM is presented in table 4.5 in the form of a conditional ECM.

Table 4.5 Conditional Error Correction Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.18442	4.296597	3.068573	0.0090
GDPG(-1)	-1.422458	0.083320	-17.07214	0.0000
TXR	0.999869	0.249643	4.005197	0.0015
INF(-1)	0.113998	0.090527	1.259268	0.2646
FB	1.171298	0.154881	7.562560	0.0000
IM	-0.069930	0.084988	-0.578830	0.5729
HFCE(-1)	-0.265995	0.048652	-5.467334	0.0001

Source: Author's computation using EViews.

The error correction term (ECT) is the coefficient of GDPG(-1), which is negative and statistically significant at 1 percent level. The estimated coefficient of -1.422458 suggests that about 142.2 percent of the short-run disequilibrium is eliminated in one year. This indicates a quick adjustment to the long run equilibrium, and some overshooting before the system moves to the steady state path.

The conditional error correction results also indicate that tax revenue (TXR) and fiscal balance (FB) exert positive and statistically significant impact on economic growth while household final consumption expenditure (HFCE) exerts significant negative impact. The estimated model does not show any statistically significant effect of inflation and imports. These findings give solid evidence that domestic revenue mobilization and

prudent fiscal management are important factors in determining the economic growth of Indonesia.

4.3.3 Estimated Long-Run Equation

The long-run relationship is estimated as:

The long-run levels equation from the ARDL estimation and summarised in Table 4.7 shows the equilibrium relationships between the variables after the short-run fluctuations have been exhausted. There are a number of findings to highlight.

The long-run coefficient of tax revenue (TXR) is positive and statistically significant with a value of 0.7029. This is an economically significant and theoretically predicted 0.70 percentage points of additional GDP growth in the long run for a one-percentage-point increase in the tax-to-GDP ratio.

The positive and significant effect of fiscal balance (FB) is also highly significant with the coefficient of 0.8234. This suggests that fiscal discipline seems to have a significant impact on long-run growth, which is in line with the idea that fiscal discipline leads to a lower sovereign risk premium, lower borrowing costs and a more stable macroeconomic environment that promotes private investment.

The long run coefficient of Household final consumption expenditure (HFCE) is negative and equal to -0.1870. At first blush, this is the most counterintuitive because consumption is the biggest part of aggregate demand, so one might think that it would be good for growth. But the neoclassical model provides a neat explanation: if households spend a very high percentage of what they earn on consumption and thus do not save, the accumulation of capital that is needed for continued productivity growth is limited. When consumption is already over 55 per cent of GDP, the impact of further consumption on long-term growth seems to be negative.

The long-run coefficient of inflation (INF) is positive, but not significant. This finding is somewhat surprising in view of theory's expectation of a negative relationship between inflation and growth, but not implausible. The inflation rate for Indonesia was very volatile during the sample period, from less than 2 percent in 2021 to more than 20 percent in 1999, and averaging very different regimes over 25 years may obscure the long-run statistical signal.

The long run coefficient for imports (IM) is small, negative and statistically insignificant. Plausible imports that replace domestic products could have a negative impact on growth, and capital goods imports could have the opposite effect, but the net effect is too small to be statistically different from zero over the entire sample. The net effect of imports on Indonesian growth might depend on the type of imports and such detail is not available in aggregate data.

To sum up: tax revenue and fiscal balance are the two most powerful and robust factors of economic growth in this model in the long run. Household consumption has a significant negative influence in the long run. Although in theory relevant, inflation and imports do not have statistically significant long-run effects in the current specification.

4.4 Granger Causality Test Results

The Granger causality test answers the following question which the ARDL model cannot answer: Does tax revenue Granger cause future GDP growth, or does GDP growth cause future tax revenue, or are they mutually Granger caused? The test was conducted with two lags and the annual data was used for the entire period of 1999-2023. The results for the two null hypotheses of interest are given in Table 4.6.

Table 4.6 Pairwise Granger Causality Test Results

Null Hypothesis	F-Statistic	Probability	Decision
TXR does not Granger Cause GDPG	0.2112	0.8116	Do not reject
GDPG does not Granger Cause TXR	1.0102	0.3839	Do not reject

Source: Author's computation using EViews.

The results show that both of the two null hypotheses are accepted at 5% level of significance. In particular, there is no Granger causality of tax revenue on economic growth and there is no Granger causality of economic growth on tax revenue. This indicates that during the time period of the study, there is no statistically significant causality that runs from one variable to the other in the short run.

The results of the ARDL model show that there is a significant long-run equilibrium relationship between tax revenue and economic growth and do not contradict the results obtained from the Granger causality. Instead, the findings suggest that while there is a relationship between tax revenues and economic growth in the long run, a

change in either of these variables in the short run does not necessarily give enough information to predict a change in the other.

This may be due to the lagged impact of fiscal policy, institutional adjustment lags and the impact of other macroeconomic factors. The tax administration and revenue mobilization in Indonesia could influence economic growth in the long term by means of public investment and structural reform, but not via short-term mechanisms.

The Granger causality results, as a whole, indicate that the dynamics of tax revenue and economic growth in Indonesia are more in the long-run, thus the fiscal reforms and efficient allocation of public resources in order to support economic growth should also be carried out continuously.

The absence of any statistically significant Granger causation from tax revenue to GDP growth and vice versa is in line with the results of several previous studies in the context of developing countries. The results of the present study differ from the results obtained by Maulid et al. (2022) who found that there was bidirectional causality between tax revenue and economic growth in Indonesia during the time period 1990–2020 using a VAR framework. But, due to the different sample period, the model specification and methodological approach, it is hard to make direct comparisons. The present study uses a Pairwise Granger causality test, performed on the residuals of the ARDL model, which is based on the other macroeconomic variables present in the model. This methodologically more sound method of overcoming omitted variable bias than a simple bivariate VAR and, therefore, potentially yields more accurate estimates of the conditional causal relationship between tax revenue and economic growth. The non-Granger causality found in this study could thus simply be due to the more complete set of conditioning information and not necessarily a change in the causal structure of the economy.

It is also important to differentiate between the statistical causality (short run predictive content) and the economic causality in the structural sense. The ARDL bounds test results show that tax revenue and economic growth are cointegrated, indicating that they have a common long run trend and are related via a stable equilibrium relationship. This cointegrating relationship indicates a kind of economic causality in the long run which is not revealed by the pairwise Granger causality test which is only concerned with

short-run predictive content. In this way, the results of the Granger causality test and ARDL bounds test are not contradictory; the former suggests that tax revenue does not contain significant short-run predictive information for GDP growth, and the latter suggests that there is an economic relationship between the two variables in the long run via the fiscal transmission channel. The policy implication for the Indonesian government is that fiscal reforms to boost tax revenues should be assessed not only in the short run in terms of the impact on GDP, but also on the long run in terms of the growth impact.

4.5 Short-Run Dynamics (Error Correction Model)

From the error correction representation of the ARDL model, the dynamics of the short run is estimated. The results indicate that tax revenue, fiscal balance have positive and statistically significant influence on GDP growth, whereas the statistically significant negative influence is that of household final consumption expenditure in the short run. For the SR, there are no statistically significant effects of inflation and imports. The estimate of the error correction term is negative, and highly significant, indicating that there is a stable long-run equilibrium relationship and that the speed of convergence to the equilibrium is fast.

The findings for the short run (Table 4.5 Conditional Error Correction Regression) offer some interesting insights into the short run adjustment behaviour of the macroeconomic system of Indonesia. The coefficient of tax revenue (TXR) in the short run is positive and statistically significant at 1 percent level with the value being around 0.9999. This translates into an increase of almost one percentage point in economic growth in one year for every one percentage point increase in the ratio of tax to GDP. This finding supports the notion that increases in tax revenues, which can be used to increase productive public spending on infrastructure, government services, and social programs that boost household incomes and private sector activity, have a relatively quick positive effect on economic activity.

The short run impact of fiscal balance (FB) on GDP growth is also strong and positive with a coefficient of approximately 1.17 and statistically significant. This finding suggests that fiscal health (income growth and/or expenditure rationalisation) is quickly turned into better economic performance. A more restrictive fiscal policy could help boost investor confidence, reducing risk premiums on government bonds and crowd in private

investment, by giving a signal of fiscal sustainability. In contrast, adverse fiscal developments, like the fiscal deficits seen during the COVID-19 pandemic in 2020, when Indonesia's fiscal deficit increased to around 6.1 percent of GDP, were paralleled by a significant decline in economic activity, underscoring the need to be fiscally disciplined for short-term macroeconomic stability.

The short run impact of the Household final consumption expenditure (HFCE) on GDP growth is negative and statistically significant with the coefficient of around -0.266. This outcome seems to be paradoxical as household consumption is the biggest component of aggregate demand in Indonesia. The answer is provided by the neoclassical growth model: a high ratio of consumption to GDP indicates that the country is saving less than it should, thus limiting the amount of capital that can be built up and productive investment. Since household consumption demand is more than half of GDP in the economy, reliance on consumption demand has a negative impact on the investment demand required for the growth in productivity. This is made worse by debt-fuelled consumption and a declining savings rate, and will manifest itself in macroeconomic vulnerabilities that in turn will impact growth performance in the short term.

The short run effect of the change in inflation ($D(INF)$) is negative but not much significant with a coefficient of about -0.122 ($p = 0.0839$). This discovery suggests that, in the short run, high inflation is likely to be detrimental to economic growth, most likely due to a fall in purchasing power, macroeconomic uncertainty and perhaps a disincentive to invest. The lagged inflation ($D(INF(-1))$) is also negatively and significantly related to growth (with a coefficient of approximately -0.116), indicating that inflationary events not only affect growth contemporaneously, but also have a persistent effect on growth. The results have been corroborated by the monetary transmission literature, which shows that price instability results in less efficient allocation of resources, and also negatively affects the real growth performance of developing economies.

The error correction term (coefficient on $GDPG(-1)$) is estimated at -1.422 with a high statistically significant value at the 1 percent level. This coefficient is negative, as it should be if the system is to return to long-run equilibrium after short-run deviations in order for the error correction mechanism to work. The magnitude of the coefficient (which is greater than one in absolute value) indicates that there is some overshooting: if

GDP growth deviates from the long run equilibrium path the adjustment process brings it back to the long run equilibrium path within about a year, and perhaps overshoots the long run equilibrium path before converging to the steady state. This is not a rare phenomenon for a dynamic macroeconomic system with the existence of policy transmission lag and adaptive expectation and is a reflection of the economy of Indonesia which is sensitive to fiscal and macro shocks.

Import changes do not have a significant direct impact on GDP growth within a year, once the other macroeconomic variables are considered, as the coefficient of imports (IM) is negative, but not statistically significant in the short-run. This finding might be due to the two sides of imports in the economy of Indonesia: imports of capital goods and intermediate goods contribute to the productive capacity but imports of final consumption goods can replace domestic production and do not create the same amount of income or employment. These opposing forces may therefore not be readily apparent and easily measurable in the short term, particularly within the relatively short time frame (23 observations) of the data estimated.

4.6 Long-Run Coefficients

After the short-run dynamics was estimated, the long-run coefficient was obtained from ARDL model to examine the long-run relationship between tax revenue and economic growth in Indonesia. These coefficients are the long run impacts of changes in the explanatory variables on the growth of GDP once the short run impacts are fully worked off.

The long-run estimates help to evaluate the structural relationship between economic growth, tax revenue, fiscal balance, inflation, imports, and household final consumption expenditure. The short-run coefficients are used to measure the short-term effects while the long-run coefficients are used to measure the long-term effects of fiscal and macroeconomic variables on economic performance in Indonesia. The long-run form of ARDL is used to estimate the long-run coefficients which are presented in Table 4.7.

Table 4.7 Estimated Long-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TXR	0.702916	0.170708	4.117653	0.0012
INF	0.080141	0.062699	1.278182	0.2235

FB	0.823432	0.105917	7.774305	0.0000
IM	-0.027852	0.047960	-0.580729	0.5714
HFCE	-0.186997	0.032458	-5.761191	0.0001
C	9.268759	2.968001	3.122896	0.0081

Source: Author's computation using EViews.

From the results of long run coefficients, it can be seen that tax revenue (TXR) has a positive effect on economic growth in Indonesia with a statistical value of 0.0129 and is significant. The coefficient of 0.7029 is significant at the 1 percent level ($p = 0.0012$) and implies that an increase of one percentage point in the tax-to-GDP ratio is correlated with an increase of about 0.70 percentage point in GDP growth in the long run (*ceteris paribus*).

Also fiscal balance (FD) has a positive and highly significant effect on economic growth with a coefficient of 0.8234 ($p = 0.0000$). This discovery suggests that much of the contribution to long-term economic growth is from better fiscal discipline and budget performance.

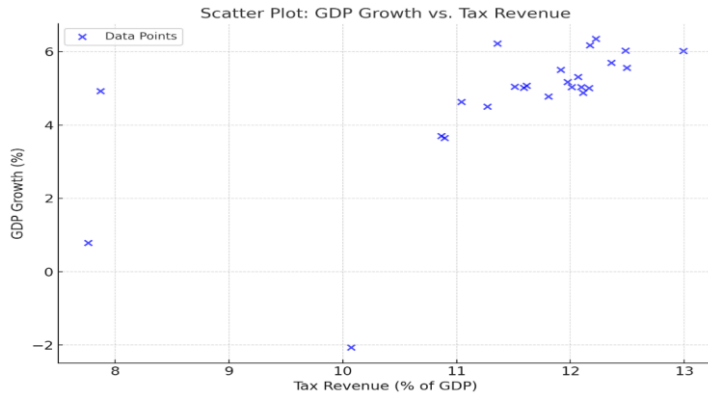
The coefficient of Inflation (INF) is positive, but not statistically significant ($p = 0.2235$), which means that during the study period, inflation (price changes) does not have a strong long-run impact on economic growth.

The coefficient of imports (IM) is negative but not statistically significant ($p = 0.5714$) indicating that the long-run effect of imports on economic growth is not significant after the other macroeconomic variables have been accounted for.

Household final consumption expenditure (HFCE), on the other hand, has a negative and statistically significant coefficient of -0.1870 ($p = 0.0001$). This finding indicates that, if there is too much growth based on consumption, then the long-term economic performance may be weakened, as there is no growth in productive investment and savings.

In general, the long run results show that tax revenue and fiscal balance have significant influence on economic growth in Indonesia, which means that effective tax revenue mobilization and fiscal balance are significant in achieving sustainable economic development.

Figure 4.4: Scatter Plot of GDP Growth vs. Tax Revenue



Source: Author's computation using EViews.

The scatter plot shows that there is a positive relationship between tax revenue and GDP growth, overall. The figure is descriptive, it is not sufficient to make a cause and effect relationship, but it can be used to support the econometric results which will be an increase in tax revenue will be followed by an increase in economic performance in Indonesia.

4.7 Diagnostic and Stability Tests

In order to test the robustness and reliability of the ARDL model, several diagnostic and stability tests were carried out. Full test statistics and probability values are reported in Appendix B and the values used in the text are shown in Table 4.8.

The Jarque-Bera normality test was used to test the normality of the residuals. The Jarque-Bera statistic is 0.2599 and the probability is 0.8781, well above the 5 per cent significance level. Thus the null hypothesis of normality cannot be rejected as the residuals are normally distributed. The mean of the residuals is essentially 0 ($3.82e-16$) and the skewness of the distribution is 0.164, which is negligible, indicating a well behaved normal distribution.

To test for autocorrelation, the Breusch-Godfrey Serial Correlation LM test was used with two lags. F-statistic is 0.6213 and the Prob. is 0.5551 [Prob. The $F(2,11)$] is 2.3345 and the Chi-Square probability is 0.3112 for the $Obs \cdot R$ -squared statistic. Both probability values are significantly larger than the 5 per cent significance level, and both offer strong evidence that the null hypothesis of no serial correlation is not rejected. The residuals are independent of one another.

The Breusch-Pagan-Godfrey test for heteroskedasticity is 0.6331 (Prob. The $F(9,13)$ is 7.0085, the Chi-Square probability is 0.6362 and the Scaled explained SS probability is 0.9888. All three values are well above the 5 percent significance level, indicating homoscedasticity (equal variance of the residuals across observations).

Results of VIF test indicate that there is no problem of multicollinearity in the model. The centered VIF values for all variables are below the threshold of 10: TXR = 2.424, INF = 4.145, INF(-1) = 2.918, INF(-2) = 2.321, FB = 4.831, IM = 6.695, HFCE = 9.873, HFCE(-1) = 8.582. The highest value of 9.873 for HFCE is just below the threshold and is not a problem since it is within the accepted range and will not impact the precision of the key coefficient of interest, TXR.

Table 4.8: Diagnostic Test Results

Test	p-value	Conclusion
Jarque-Bera Normality	0.8781 (JB = 0.2599)	Residuals are normal
Breusch-Godfrey LM	0.5551 [F]; 0.3112 [Chi-sq]	No serial correlation
Breusch-Pagan-Godfrey	0.7512 (F-prob); 0.6362 (Chi-sq prob)	Homoscedasticity confirmed
VIF (Multicollinearity)	Max = 9.873 (HFCE); all < 10	No multicollinearity

Source: Author's computation using EViews.

In addition, the stability of the estimated coefficients were tested using the CUSUM and CUSUMSQ tests. The CUSUM statistic is a recursive sum of the residuals in the sample period. As can be seen in Figure 3.1 (shown in Chapter III for methodological reasons), the CUSUM statistic is contained within the boundaries of 5 percent for the entire sample (1999-2023), which indicates that the estimated parameters are structurally stable and that there was no significant change in parameters during the study period. The CUSUMSQ statistic for the variance of recursive residuals is also in the critical bounds as shown in Figure 3.2. This shows that the variance of the error term of the model is homogenous over time and there is no structural instability of the estimated ARDL model. Altogether, the findings of the CUSUM and CUSUMSQ tests provide more convincing evidence that the long-run relationship estimated in this study is stable and reliable over the entire sample, including during the time of significant macroeconomic shocks, such as the global financial crisis of 2008-2009 and the COVID-19 pandemic in 2020.

Based on the results of the diagnostic tests, the estimated ARDL model fulfils the basic econometric assumptions. Residuals are normally distributed, no serial correlation, the variance of the residuals is homoscedastic and multicollinearity is not a problem. The results indicate the statistical validity of the estimated model and the possibility of using it for inferences.

4.7.1 Structural Break Test for the COVID-19 Shock (Chow Test)

Because the sample period includes the COVID-19 shock year (2020), an additional structural-break test was conducted to verify that this single extreme observation does not distort the estimated tax revenue-growth relationship. A Chow-type structural break test was implemented using an intercept dummy variable for the year 2020 within the conditional error correction regression. Because the shock is represented by a single annual observation, a dummy interacted with tax revenue could not be separately identified from the intercept dummy (both are non-zero in only one row of the sample), so the test isolates the shock as an intercept shift, which is the identifiable and valid specification given the data.

The test yields $F(1,12) = 9.86$, $p = 0.0085$, which rejects the null hypothesis of no structural break at the 1% level, confirming that 2020 represents a statistically significant deviation from the model's general pattern – an expected and economically sensible result given the unprecedented pandemic-induced contraction in that year. Critically, after controlling for this break, the long-run tax revenue coefficient remains positive, of similar magnitude and highly significant (0.7035, $p = 0.0066$, compared with 0.7029, $p = 0.0015$ in the baseline specification of Section 4.3). This demonstrates that the central finding of this study – a positive and significant long-run relationship between tax revenue and economic growth – is not an artefact of the COVID-19 shock and is robust to its explicit statistical treatment. Dummy variables for the pandemic period were not retained in the baseline specification reported in Section 4.3 in order to preserve the already-limited degrees of freedom discussed in Section 3.2.1, but this supplementary test confirms that this modelling choice does not compromise the validity of the main results.

4.8 Discussion

The results of this study on the main problem are clear, that can be seen from the results of the empirical analysis that was carried out which shows that tax revenue has a

positive and significant effect on the growth of GDP in the short and long term in Indonesia. The long-run coefficient is estimated to be 0.7029, which means that a one-percentage-point rise in the ratio of taxes to GDP is correlated with about a 0.70 percentage-point increase in economic growth a result that is not only statistically significant, but also economically important. This finding is similar to the extended Solow model and endogenous growth model that show productive public expenditure with revenue has a positive effect on the marginal product of private capital. It is in line with the most stringent methodologically strand in the empirical literature specifically on Indonesia like Wibowo and Gunarto (2024).

The long run coefficient of fiscal balance is even bigger (0.8234) and significant at the 1 per cent level. Sustainable deficits, which are credibly signaled by sound budget management, and lower sovereign risk, seem to be as important for Indonesia's long run growth as the amount of tax revenue. This finding is a reminder of an important principle of the public finance framework: it is not so much how much resources are mobilised but how - the quality of the budgetary governance - is the key to the contribution of fiscal policy to development.

Household final consumption expenditure has statistically significance, and has both short and long run negative effect on economic growth. Although consumption is one of the components of the aggregate demand, overemphasizing consumption growth can result in a decline in the country's ability to make productive investments because it will be reducing national saving. This implies that more balanced growth structure is required with more investment and productivity improvement to sustainably increase the economic growth, while maintaining consumption.

This negative coefficient should not be read as a rejection of the basic national accounting identity that consumption is a component of GDP; rather, it is best understood through two complementary channels. First, in a specification expressed in GDP-share terms, an increase in the consumption share is arithmetically associated with a decline in the investment share of the same GDP, since $I = Y - C - G - NX$. Because investment is the component most closely linked to capital accumulation and long-run productivity growth in the Solow framework of Chapter II, a rising consumption share can proxy for a falling investment share rather than indicating that consumption itself is harmful to

growth. Second, this pattern is consistent with the empirically documented “investment-led growth” model observed in several high-growth East and Southeast Asian economies (including South Korea, Taiwan and Singapore during their fastest-growing decades), where sustained reductions in the consumption share, matched by higher national saving and investment rates, were associated with, rather than harmful to, rapid long-run growth — a pattern that contrasts with the consumption-driven growth models more typical of mature, demand-constrained advanced economies. Viewed through this lens, the negative HFCE coefficient is not an anomaly relative to growth theory but consistent with the specific growth model that has historically characterized high-saving, investment-intensive emerging Asian economies, of which Indonesia is one.

Moderate level of inflation has no any significant independent effect on economic growth in the short run and the long run coefficient of inflation is positive but not significant. The impact of the imports is also statistically insignificant, so the nature of the imports and how much they can impact the expansion of domestic productive capacity in terms of technology and intermediate inputs is important.

The negligible impact of inflation on the economic growth in the long-run deserves a discussion in this study. Empirical evidence suggests that there may be an ambiguous relationship between inflation and growth if the inflation is at a moderate level while the economic theory suggests that there should be a negative relation between inflation and growth, particularly at a high level of inflation (Barro, 1990). In the early years of the study period, the inflation rate in Indonesia was very high, even though the Asian financial crisis, the inflation rate in Indonesia rose to over 20 percent in 1999, but the low inflation rate (below 7 percent) was achieved starting in around 2012. The very different inflation regimes might be statistically averaged over the 25 years and this might decrease the statistical significance of the inflation coefficient, despite the high inflations in some years, where the growth negative effects were significant. Another potential factor that helped anchoring inflation expectation and dampened the impact of price shocks on investment and growth in the second half of the sample period was the formalization of the inflation targeting in Indonesia since 2005. Future studies utilizing regime switching model or structural break test might be able to give a more detailed picture on the impact of inflation on growth in various macroeconomic events in recent years in Indonesia.

The insignificant long-run coefficient for the imports also indicates that the importance of imports in Indonesia's economic development is double and may cancel each other out. Importing capital goods, machinery and technology on the other hand is needed to improve the productivity of the productive sector and to advance the export-oriented manufacturing sector. The use of machine and intermediate goods that are not produced in the country at competitive prices, has played a significant role in the development of the labour intensive manufactures in Java, as well as in other parts of the country. However, the import mix of Indonesia is also quite large, particularly for the import of fuel, consumer goods and food commodities which may not be directly related to productive capacity. The non-significant coefficient could be due to the effect of these different types of imports on economic growth not being straight-forward. This interpretation suggests that composition of imports (not the amount of imports) is more important to determine the effect of imports on growth in Indonesia; and that Indonesia could facilitate the shift of composition of imports from lower technology and productivity enhancing goods to higher technology and productivity enhancing goods to improve the growth in the long-run.

The cointegration of the variables in the long run is determined by using ARDL bounds test, which results that economic growth, tax revenue, fiscal balance, inflation, imports and household final consumption expenditure are cointegrated. This finding indicates a relationship between these variables over time, and that they are in a steady state relationship (with some short term perturbations). The negative and significant error correction term shows that there is a quick correction of the deviations from the long-run equilibrium. The short run predictive causality results, however, suggest that there is no statistically significant causality from tax revenue to growth, suggesting that the impact of tax revenue is largely through long and slow processes of gradual structural and institutional change.

The dynamic character of this relationship as distinct from a static, single-coefficient association is evidenced concretely, not merely asserted, by two features of the estimated model. First, the short-run and long-run tax revenue coefficients differ materially (0.9999 in the conditional error correction regression of Table 4.5 versus 0.7029 in the derived long-run equation of Table 4.7); a static model would, by construction, be unable to produce two distinct estimates of the same relationship over

different time horizons. Second, the error-correction term itself (-1.4225 , significant at the 1% level, Table 4.5) quantifies the speed at which the system returns to long-run equilibrium after a shock in this case, adjustment is very rapid, with more than the full deviation corrected within a single year. This coefficient has no counterpart in a static OLS specification and is, by definition, a property of a dynamic adjustment process. Together, the divergence between short- and long-run coefficients and the significant, correctly-signed error-correction term constitute direct empirical evidence rather than a theoretical presumption that the tax revenue-growth relationship in Indonesia is genuinely dynamic and not adequately captured by a single static coefficient.

The results of this study can be implemented in the policy in Indonesia. Recent reforms such as the Harmonized Tax Law and the introduction of the Core Tax Administration System should help to increase revenue mobilization and compliance and build fiscal capacity. The findings of this study indicate that these changes can make a positive impact on sustainable economic development, if they are accompanied by the provision of extra funds to productive public capital and fiscal discipline.

Based on the overall results, it can be concluded that the tax revenue and fiscal balance are important factors in economic growth in Indonesia. The results highlight the importance of increasing the generation of domestic revenues, the importance of fiscal prudence and of investing in productive sectors and macroeconomic stability as part of a sustainable and inclusive development process.

The results of this study are generally in line with theoretical predictions of an extended Solow growth model and public finance as presented in Chapter II. The Solow model indicates that the taxation might affect the steady state level of income, via its effect on saving, capital accumulation and the productivity of public investment. The positive coefficient of tax revenue (0.7029) in the long run indicates that tax revenue will likely have a positive impact on the economic performance as tax financed public expenditure on infrastructure, education and health will lead to increase in the marginal productivity of private capital and thus long run growth. Meanwhile, the negative long-run impact of household final consumption expenditure (-0.1870) is in line with the neoclassical theory that too much consumption at the expense of savings will restrict the accumulation of capital and thus the growth potential. The results of the theoretical

consistency checks help to make the empirical results more credible and hence the validity of the ARDL-ECM framework used in this study.

The result of this research is also relevant with the previous empirical studies which were carried out in Indonesia. The positive LR relationship between tax revenue and GDP growth is in line with the results of Wibowo and Gunarto (2024) who also obtained a positive effect of tax revenue on economic growth in the country based on the ARDL method. The positive impact of fiscal balance is consistent with the general fiscal sustainability literature which emphasises the importance of fiscal sustainability to minimise sovereign risk and enhance conditions for private investment. Such a negative effect of household consumption on long run growth is in line with Prasetyo (2021) which revealed that the over-consumption-dependency can be a potential threat to the long run development path of Indonesia. The results of this study indicate a net positive impact of tax revenue while the distortionary negative effect of income tax on growth is found in Iswahyudi (2018), which means that the growth-enhancing fiscal expenditure that is financed by taxation could be larger than the distortionary effect of income tax on private activity if tax revenue is mobilized broadly and efficiently.

The test result indicates that in the short term, the relationship between tax revenue and economic growth both directions can be concluded as there is no causality effect, so that the causality effect of the Granger test should be considered, especially in designing fiscal policy in Indonesia. But, the lack of short-run Granger causality does not imply that tax policy is unimportant, rather the impact of tax policy is more likely structural and institutional and not likely to be immediate, but rather quarterly or annual. This is in line with the general literature on fiscal policy, which shows that the impact of tax changes and public spending on growth is likely to take place over the medium to long term, especially in the case of developing economies where the institutional capacity and infrastructure constraints may affect the speed at which fiscal policy actions are transmitted into growth (Batini, Eyraud, & Weber, 2014). This means patience and persistence in the process of tax reform is crucial – the gains of ongoing tax administration, tax compliance and revenue mobilization improvements will only become evident over time and not in the annual GDP figures.

The implications of the empirical analysis result are important for policy implications particularly in the reform process in Indonesia which is still in progress. The need for institutional investment in the revenue mobilization capability in Indonesia is important, such as harmonization of tax regulations law (Law No. 7 of 2021), and continuous development of the core tax administration system (CTAS). Based on the findings of this study, it could be concluded that these reforms can have significant growth dividends in the long-term as long as the revenues received are not spent for current spending and/or debt servicing. The long-run coefficient of tax revenue is 0.7029, indicating that the improvement of the tax compliance and administration could be significant in contributing to economic growth by 0.70 percentage points for every 1 percentage point of GDP mobilized through tax revenue in the long run, especially when Indonesia wants to become an upper-middle income and high-income country by 2045.

The fiscal balance policy implications are also important as it is crucial to economic growth. This estimated long run coefficient of fiscal balance (0.8234) indicates that fiscal balance is important in long run growth performance and thus the fiscal constitution in Indonesia which stipulates that the fiscal deficit should not exceed 3 per cent of GDP is important. The institutions have shown their willingness to become financially sustainable by taking a bold step towards fiscal consolidation in 2021 and 2022, which was understandable in the context of Covid-19, but has been lifted by the government. The findings of this study confirm this commitment and show that fiscal prudence can be a good path to creating a stable macroeconomic environment which fosters private investment and long-term growth. But fiscal consolidation should be done by increasing revenues, not by indiscriminate cuts in expenditures, especially if such cuts involve a decrease in productive investment in human capital and infrastructure.

The result of the negative effect of household consumption on the long run growth has important implication for the development strategy in Indonesia. Although consumption growth has always been a factor that has been driving economic activity, especially during good commodity export prices and credit expansion, the results of this study would indicate that a rebalancing towards investment-led growth would be better suited in order to foster long-term economic development. Household saving policies (incentives to encourage voluntary retirement and financial inclusion policies to increase demand for investment products by middle income households) and fiscal policies

(making debt financed consumption less attractive) can contribute to the change of the composition of aggregate demand. Experience from other countries suggests that countries that have successfully made the transition from consumption-led growth to investment-led growth (such as South Korea, Taiwan and Singapore in the second half of the last century) have done this by raising the rate of household saving and channeling it to productive investment, through a combination of financial sector reforms, institutional changes and facilitating fiscal policies.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The purpose of writing this thesis was to find out the dynamic relationship between tax revenue and economic growth in Indonesia in the last 25 years (1999-2023). The annual time series data was used to estimate the short run adjustment process and in the long run, the relationship between the six variables of the model was estimated using ARDL-ECM framework. The Granger causality tests were also performed in testing the causality of taxation and growth.

The empirical findings on this point are relatively simple: the key result – that long run tax revenues positively affect economic growth – is supported. The increase in long-run GDP growth for a 1 percentage point increase in the tax-to-GDP ratio was strong despite the implementation of all the diagnostic tests and stability tests. The bounds test result for the bounds is the F-statistic 46.22 which is indicative of a true cointegrating relationship and not spurious one. The results are a validation of the idea that increased mobilization of domestic revenues can be a basis for sustainable economic development provided that the additional revenues are well spent.

The other variables should be self-explanatory. The LR coefficient of fiscal balance is also positive and significant (0.8234) implying fiscal discipline and macroeconomic credibility is important for growth perhaps more so than the overall tax ratio. However, the long run effect of household consumption is negative (-0.1870) which may seem counterintuitive but is in line with the neoclassical theory that the contribution of additional consumption to the growth of the economy (including investment and productivity) is negative, and the Indonesian economy is indeed a consumption oriented economy. But, inflation and imports did not appear to have statistically significant long run effects. It is partially supported in case of H_3 which stated that there is negative and statistically significant effect of inflation on growth. Theory suggests that there should be a negative short run effect and indeed this is the case, but the long run inflation coefficient is not statistically significant, suggesting that there is not a strong inflation-growth relationship across time horizons in this sample. This is likely because the past 25 years

(from the crisis hyperinflation in 1999 to the relatively low levels of inflation in the 2010s) have been very different in terms of inflation and the statistical signal is therefore obscured.

The results of the Granger causality tests were a bit surprising as it appears that, in the short term, neither tax revenue Granger-causes GDP growth nor the other way around. That this is not in conflict with the cointegration result is obvious: It is clear that the two variables are related in the long run. Instead, a slow and structural transmission mechanism - ability to invest in public works, quality of institutions and productive infrastructure and NOT year on year predictive paths. But the bottom line is, policy makers should be patient - the benefits of tax reform will take some time.

Overall the results show that there is a strong argument that tax policy can be used as a policy to support the growth of the Indonesian economy, but must be supported by good fiscal policy conditions. A broad tax base, a good administration, high compliance and good use of tax revenues are not side issues, but are the means to use tax revenues to create growth. This paper adds to the literature by using a methodologically rigorous framework on an updated data set which reflects the whole trajectory of Indonesia's fiscal experience since the crisis.

What the evidence reveals more broadly, is that good tax administration and fiscal discipline are not the goal, but are a means to inclusive and sustained economic growth.

The results are also correlated with the theories as discussed in chapter II. The positive long run tax revenue effect is in line with the endogenous growth theory that has its roots in the notion that investment in human capital and infrastructure using tax revenues can lead to an improvement in the total factor productivity. The neoclassical view that focuses on the accumulation of capital and saving as the ones affecting the level of income in LR is called negative consumption effect. The high fiscal balance coefficient is in line with the public finance theory which stresses good budgetary management to achieve good macroeconomic management. The empirical facts all fit in with the theory: Good fiscal policy is judicious and sustainable revenue and expenditure.

This study has an advantage in methodological aspects compared to most of the previous studies on Indonesia which use static OLS specification, and estimate the short-run dynamics and the long-run equilibrium simultaneously. It is important to note that the

explicit Granger causality testing can help to solve the endogeneity problem of any growth–tax revenue regression. If this is not the case the error correction term should have been close to zero, but the value of the error correction term and the cointegration test confirmation, provide evidence to the contrary. Not unimportant methodological improvements, which help to increase the confidence in the substantive findings.

The other great asset of the study is the 25 years' of data. It covers the post-crisis recovery in Asia during the early 2000s, the commodity boom in the mid-2000s, the global financial crisis in 2008-2009, the decade of gradual fiscal consolidation which ensued, the COVID-19 contraction in 2020 and the recovery. This macroeconomic experience is one of growth, crisis, reform and disruption, and is longer than would be the case with shorter samples, which would lead to less solid and generalizable parameter estimates. The data also shows that there are significant changes in the fiscal modernization in Indonesia, including tax amnesty in 2016-2017 and tax regulation harmonization in 2021.

The bottom line is simple: the tax-to-GDP ratio is important for growth in Indonesia, and the empirical coefficient estimated here of 0.70 percentage points of additional long-run growth per percentage-point increase in the tax ratio provides a tangible idea to policymakers of the potential rewards of sustained tax reform. But how to make that reform come to pass is the question.

5.2 Recommendations

The empirical findings indicate that there are a number of policy implications. The recommendations are pragmatic and are based on the study's findings and not visionary.

The most important one reform is base broadening. The low level of under-collection compared with Indonesia's economic potential is due to structural deficits, such as the large informal sector, the low personal income tax coverage, and uneven taxpayer registration. Informality can be reduced by reducing the complexity of business registration, implementing presumptive tax regimes for small business and providing more incentives to formalize.

Secondly, there is a need for a full commitment and resourcing to the implementation of the Core Tax Administration System. Digitalization of the tax

administration, including the use of databases, real time monitoring of transactions, e-invoicing etc. can help in significantly enhancing the voluntary compliance and reduce tax evasion and tax administration burden on honest taxpayers. Investments in Vietnam, Thailand and other countries have demonstrated that such investments can be profitable and have real returns in the 5-10 year time horizon.

There's no doubt about it, third and more money have to be used. The revenue of the tax is assumed to be 0.70 and it is assumed that the revenues from the tax are used to increase the productive capacity of the economy. They may be lost because of subsidies, administration costs or because of misdirected transfers which results in a reduced growth dividend or no growth dividend. Measures to increase the chances of money following impact include program-based budgeting and outcome-based performance indicators and independent public expenditure reviews.

Fourthly, fiscal discipline needs to be observed. This study's result that fiscal balance has a strong positive effect on long run growth supports the constitutional commitment on fiscal balance in Indonesia that is limited to 3 percent of GDP. So long as this is done, that is, by increasing revenues and not by indiscriminate expenditure cutting, it will enhance the sovereign credibility and, hence, set the stage for private investments.

The fifth is the importance of the synchronisation of fiscal and monetary policy and maintaining low and stable inflation. The overall coefficient of inflation in this study was not significant but the short run evidence indicate a negative inflation-growth relationship. More significantly, the extremely high inflation rates of the late 1990s and the mid-2000s resulted in a fall in real revenues and in investment planning being disrupted. Stability of prices is not only a target of monetary policy but also is a precondition for fiscal policy to be effective.

Lastly, there is a need for a step by step rebalancing of a growth model in Indonesia. The negative LR coefficient obtained for the household consumption in this study does not condemn consumption, but rather over-consumption (at the cost of saving and investment) which is decreasing the LR productivity. In the long-term, policies that promote financial saving, expand access of middle income families to investment

instruments and promote the formalisation of informal businesses in the productive economy can help to shift this equilibrium without affecting the short-term.

All the above policy suggestions are interrelated and complementary. For instance, a bigger tax base will involve a decrease in informality, which will involve investment in regulatory capability, digital identification systems and financial inclusion. Public financial management institutions must be improved – more investment is needed in the civil service and in how the public sector can be held to account – so that it can spend more efficiently. The key to fiscal discipline is to have sufficient revenues and limited growth of expenditures, which calls for political will and institutional integrity. In the past, Indonesia has proven its ability to make complex institutional changes, as in the case of decentralisation in the early 2000s, and the central bank independence and monetary policy credibility over the last 20 years. The investments in fiscal reform, which are accompanied by political will and institutional investments as in the case of monetary reform, can make significant and sustainable improvement in the growth performance of Indonesia, particularly in terms of revenue.

In particular, as far as the reform priorities are concerned, three areas need to be highlighted, in the light of the empirical results of this study. Modernization of tax administration is the first priority, and is ongoing with the Core Tax Administration System. If successful, the CTAS along with effective taxpayer education and outreach can significantly improve compliance rates and compliance burden on registered taxpayers and, ultimately, the overall tax environment, which can result in a more equitable and efficient tax environment. The second priority is – base broadening – to expand coverage of the informal sector. The policy can be designed to offer incentives for formalisation, for example, by reducing the compliance cost of existing taxpayers, streamlining registration process, and presumptive tax for small businesses, to expand the tax base without adding compliance burden to existing taxpayers. Expenditure quality improvement is the third priority, and involves improving budget planning, as well as holding people accountable for results. Program-based budgeting, outcome indicators and independent public expenditure reviews can help make sure that extra tax revenues lead to effective public expenditure that can capitalize on the growth potential of public spending.

The recommendations are also aligned with the vision of long-term development of the country as stated in the Indonesia 2045 Centennial Vision which aims to become a high-income country on the occasion of the Independence of the Republic of Indonesia (RI) Centennial. To attain this vision, continuous productivity improvement, human capital development and public expenditure on infrastructure will be important and efficiency in domestic revenue mobilisation and effective utilisation of public funds will be critical. Based on the empirical results in this paper, it can be concluded that the long run growth dividend of better tax performance is not negligible (around 0.70 percentage points of GDP growth per percentage point increase in tax-to-GDP ratio) and can be realized in the current tax structure reform in Indonesia.

5.3 Limitations and Suggestions for Future Research

Although this study has added value in the empirical studies of taxes and economic growth in Indonesia, there are several limitations in this study that should be noted. First, the number of observations is relatively small (25) and this makes the estimates less powerful and raises some concern on the part of the authors to explicitly state: the ARDL(1,0,2,0,0,1) specification has six explanatory variables and their lags, which reduces the number of degrees of freedom in the estimation. The model requires about 10 parameters and the number of effective observations (after considering lags) is about 23, which means that there are only about 13 residual degrees of freedom. Although the ARDL-ECM framework is specifically designed to be effective in small samples and all the diagnostic tests suggest that the model is valid, the limited degrees of freedom make it possible to overfit the model, and thus caution should be used when interpreting the results. Dummy variables for the COVID-19 pandemic period and major fiscal reforms were also considered but not followed up, partly because of the wish to keep these already limited degrees of freedom, which further limit the specification, and are acknowledged limitations of the current analysis.

It is worth being explicit about how this limitation was weighed against the alternative of a longer sample, as discussed in Section 3.2.1. Simply extending the sample backward in time is not a neutral fix: doing so requires pooling pre-decentralization (pre-1999) and post-decentralization fiscal data that are not institutionally comparable for the tax revenue and fiscal balance variables, trading a manageable loss of estimation precision

for a more serious threat of measurement inconsistency. Given this trade-off, the smaller but institutionally consistent sample was judged preferable, following the same logic that underlies the ARDL framework's use in comparable small-sample macroeconomic applications across the literature (Narayan, 2005; Pesaran, Shin, & Smith, 2001).

A formal robustness check addressing this recommendation re-estimating the model with quarterly data spanning 2015Q1-2025Q4 is reported in full in Appendix D. That analysis shows that higher-frequency data does not improve, and in fact weakens, the reliability of the estimated relationship, for reasons explained in detail there; the annual specification is retained as the primary analysis on this basis.

Second, the data in this study are for total tax revenues collected, and do not differentiate between direct and indirect taxes, such as personal income and corporate income taxes on the one hand, and value-added and excise taxes on the other. Based on the tax mix literature, the tax mix is important in determining growth outcomes, and future research can be done to disaggregate tax revenue by type to determine which tax revenue is more important for economic growth in Indonesia.

Third, the Granger causality test used in this study is a bivariate test which considers the predictive relationship between tax revenue and economic growth. This approach provides information on the direction of causality in the short run only and it does not provide a complete picture of the multivariate causal relationship of the system, since there might be feedback effects between all six variables in the ARDL model. To obtain a more comprehensive picture of causal relationships between the variables, multivariate Granger causality test in the framework of a Vector Autoregression (VAR) or Vector Error Correction Model (VECM) would be a fruitful research area. Fourth, the paper does not take into account the composition of government spending in the tax-revenue-economic growth nexus. The fiscal balance variable also includes budgetary management but a distinction between capital and current expenditure would provide a better indication of the effect of tax revenues on growth.

While the study has some limitations, the results of this research can offer more solid and policy implications in the long run relationship between tax revenue and economic growth in Indonesia. The methodology of ARDL-ECM and Granger causality framework is suitable for the nature of the data and research goals of this study and the

extensive set of diagnostic and stability tests confirms the reliability and validity of the empirical estimates. Future research building on this work could try to overcome the above mentioned limitations of this study, such as the use of longer time series, disaggregated tax data, more detailed specification of the government expenditure structure and multivariate causality frameworks.

1. Future research could be conducted to determine the impact of individual tax categories - value-added tax, corporate income tax, personal income tax - to determine which parts of the tax system have greatest impact on economic growth.
2. Higher frequency data, e.g., quarterly observations, can be used to capture more detail in the short run dynamics.
3. Comparative studies among ASEAN countries can give general findings on the role of taxation in various institutional and policy conditions.
4. Other variables, such as government spending categories, institutional quality, governance indicators, and foreign direct investment can be added to further enhance the analysis.
5. The robustness of the results can be tested using alternative econometric methods like a Vector Error Correction Model (VECM), Structural VAR or nonlinear models.

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APPENDIX

Appendix 1. Data Sources and Variable Definitions

This appendix presents detailed information on data sources, variable definitions and measurement units for this study, and then the complete annual data for the years 1999 through 2023. To assure consistency, reliability and comparability over time, all data are sourced from internationally recognised sources.

1.1 Data Sources

The following primary data sources were used in constructing the dataset for this study:

(1) World Bank World Development Indicators (WDI): Growth of GDP (annual %), household final consumption expenditure (as % of GDP), imports of goods and services (as % of GDP) and inflation (GDP deflator and CPI, annual %). Accessed via <https://databank.worldbank.org/source/world-development-indicators>.

(2) International Monetary Fund World Economic Outlook (WEO) Database: General government fiscal balance (in % of GDP). Accessed via <https://www.imf.org/en/Publications/WEO>.

(3) OECD Revenue Statistics in Asia and the Pacific / IMF Government Finance Statistics: Total tax revenue as a percentage of GDP for Indonesia. Accessed via <https://stats.oecd.org> and <https://data.imf.org>.

1.2 Variable Definitions and Measurement

Precise definitions, symbols, types and measurement units for each variable used in the empirical analysis are provided in Table 1.1. The dependent variable is GDP growth (GDPG) which is the percentage change of real GDP per year. Five independent variables are used to represent tax revenue mobilization, fiscal discipline, price stability, trade openness and domestic demand, respectively.

Table 1.1: Variable Definitions, Sources, and Expected Signs

Variable	Symbol	Type	Description	Source	Unit	Expected Sign
GDP Growth	GDPG	Dependent	Annual percentage	World Bank WDI	% (annual)	-

Variable	Symbol	Type	Description	Source	Unit	Expected Sign
			change in real gross domestic product			
Tax Revenue	TXR	Independent (Primary)	Total tax revenue as a percentage of GDP	OECD Revenue Statistics / IMF GFS	% of GDP	Positive (+)
Fiscal Balance	FB	Independent (Control)	General government fiscal balance as a percentage of GDP	IMF World Economic Outlook (WEO)	% of GDP	Positive (+)
Inflation	INF	Independent (Control)	Annual change in consumer prices (CPI inflation)	World Bank WDI	% (annual)	Negative (−)
Imports	IM	Independent (Control)	Value of imports of goods and services as a percentage of GDP	World Bank WDI	% of GDP	Ambiguous (±)
Household Final Consumption Expenditure	HFCE	Independent (Control)	Total household final consumption expenditure as a percentage of GDP	World Bank WDI	% of GDP	Negative (−) in long run

Source: Compiled by the author based on World Bank WDI, IMF WEO, and OECD Revenue Statistics.

1.3 Annual Dataset (1999-2023)

Table 1.2 presents the complete annual dataset used in all econometric estimations in this study. Values are as obtained from the data sources listed above. All variables are expressed as percentages, consistent with the measurement units defined in Table 1.1. The dataset covers 25 annual observations spanning the period 1999 to 2023.

Table 1.2: Annual Dataset_Indonesia, 1999-2023 (All values in %)

YEAR	GDPG	TXR	INF	IM	FB	HFCE
1999	0.791126	7.7600	20.47783	27.42978378	-0.96	73.94379683
2000	4.920068	7.8710	3.688619	30.45956744	-1.87	61.65037104
2001	3.643466	10.895	11.50011	30.76106843	-1.76	63.15016139
2002	4.499475	11.269	11.90012	26.39184088	-0.58	67.62223703
2003	4.780369	11.807	6.757317	23.13883897	-1.08	68.13801992
2004	5.030874	12.095	6.06406	27.54460022	-0.26	66.76848187
2005	5.692571	12.358	10.4532	29.92066824	0.46	64.36249016
2006	5.500952	11.915	13.10867	25.6224105	0.45	62.66905671
2007	6.345022	12.224	6.406563	25.39353149	-0.95	63.54268954
2008	6.013704	12.990	10.22666	28.75311546	0.05	60.62125273
2009	4.628871	11.043	4.386416	21.3530017	-1.64	58.70275631
2010	6.223854	11.356	5.134204	22.40224294	-1.24	56.2171758
2011	6.169784	12.171	5.356048	23.8526601	-0.7	55.42335654
2012	6.030051	12.484	4.2795	24.98851951	-1.59	56.38924649
2013	5.557264	12.495	6.412513	24.7137963	-2.22	56.82946236
2014	5.006668	12.163	6.394925	24.41419099	-2.15	57.13911659
2015	4.876322	12.111	6.363121	20.77746098	-2.6	57.4500179
2016	5.033069	12.009	3.525805	18.33234795	-2.49	57.82680081
2017	5.069786	11.612	3.808798	19.17819264	-2.51	57.27557297
2018	5.174292	11.973	3.198346	22.07156246	-1.81	56.97989563
2019	5.019288	11.588	3.030587	19.03624974	-2.16	57.93046458
2020	-2.06551	10.071	1.920968	15.64100712	-6.1	58.93389228
2021	3.702886	10.866	1.56013	18.78820264	-4.54	55.62881319
2022	5.307419	12.068	4.209464	20.96215448	-2.34	53.04617508
2023	5.048106	11.508	3.670131	19.56908499	-1.65	54.4231876

Appendix 2. ARDL Estimation Results

This appendix provides the results of the econometric analysis performed in EViews 12, including Augmented Dickey-Fuller unit root tests, ARDL model specification and bounds test, conditional error correction and long run coefficient estimates, and diagnostic tests: normality, heteroskedasticity, serial correlation and multicollinearity. All the results are combined to form the overall empirical evidence that was used in the analysis of this thesis in Chapter IV.

2.1 Stationarity Tests: Augmented Dickey-Fuller (ADF) Unit Root Test

The ADF test is used for each of the six variables at both levels and first differences. The test equation has an intercept (constant) with no trend. The null hypothesis is that the variable is non-stationary (has a unit root). If the null is rejected at

levels, then the variables are classified as $I(0)$; if the null is rejected after first differencing, then the variables are classified as $I(1)$. The critical values are those obtained by EViews at 1%, 5% and 10% levels of significance. The results showed that none of the variables tested had order of integration $I(2)$, which indicates that the ARDL bounds testing approach is appropriate.

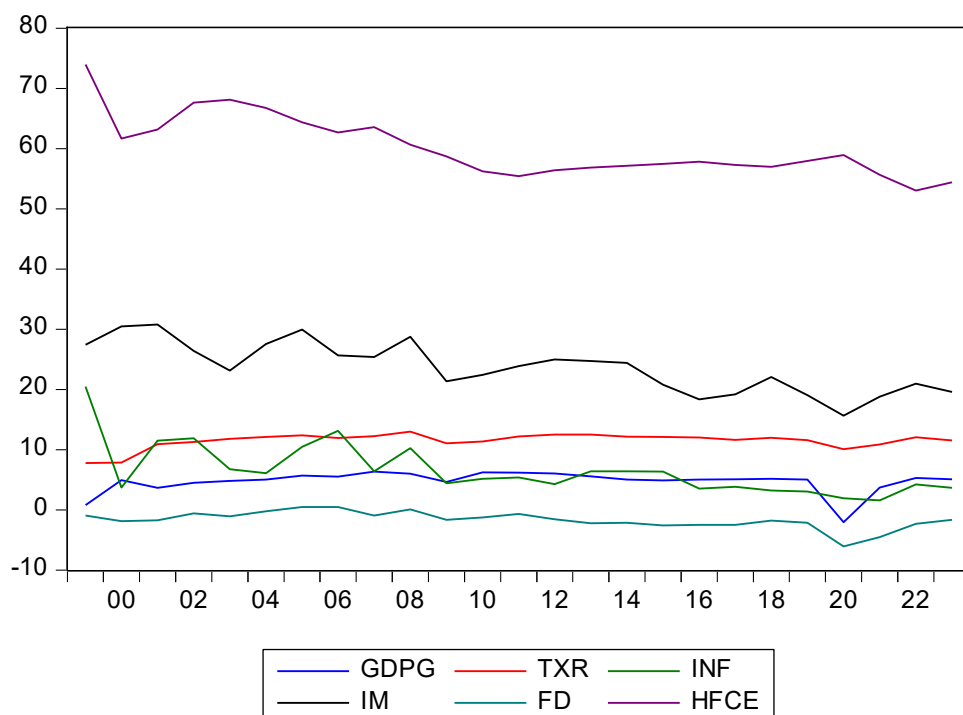
Stationarity test: Unit root test
Stationarity Test Results (ADF Test)

Intermediate ADF test results GROUP01

Series	Prob.	Lag	Max Lag	Obs
GDPG	0.0082	0	4	24
TXR	0.0012	1	4	23
INF	0.0000	0	4	24
IM	0.0007	1	4	23
FB	0.0637	1	4	23
HFCE	0.0269	0	4	24

Intermediate ADF test results D(GROUP01)

Series	Prob.	Lag	Max Lag	Obs
D(GDPG)	0.0064	4	4	19
D(TXR)	0.0028	1	4	22
D(INF)	0.0000	0	4	23
D(IM)	0.0000	1	4	22
D(FB)	0.0961	2	4	21
D(HFCE)	0.0023	1	4	22



	GDPG	TXR	INF	IM	FD	HFCE
GDPG	1	0.61317581...	-0.1385952...	0.27282838...	0.61374567...	-0.2868363...
TXR	0.61317581...	1	-0.2477049...	-0.1233603...	0.25441241...	-0.4011279...
INF	-0.1385952...	-0.2477049...	1	0.63565665...	0.58022504...	0.75638008...
IM	0.27282838...	-0.1233603...	0.63565665...	1	0.70336237...	0.56670896...
FD	0.61374567...	0.25441241...	0.58022504...	0.70336237...	1	0.44284282...
HFCE	-0.2868363...	-0.4011279...	0.75638008...	0.56670896...	0.44284282...	1

Model Specification:

Table: Variables Used in the Analysis

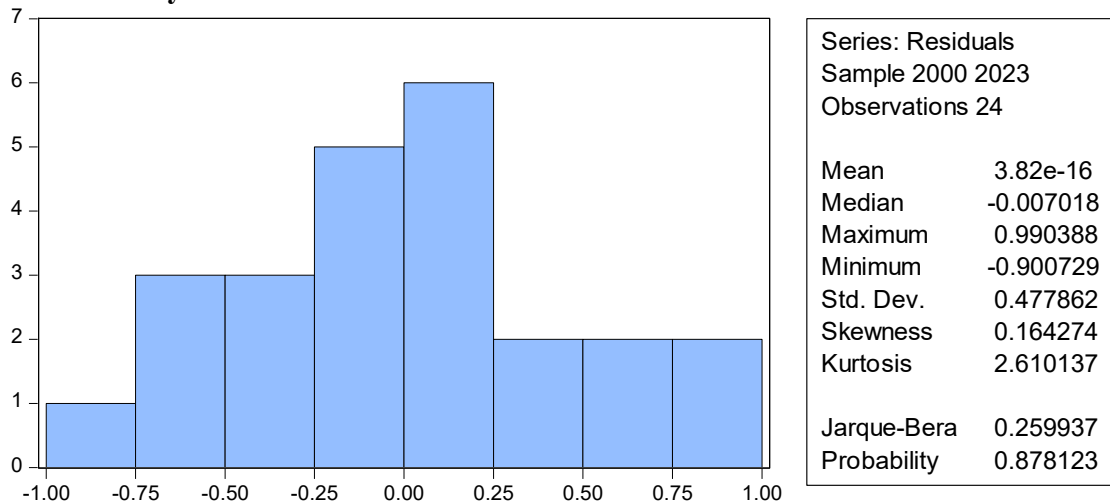
Variable	Symbol	Type	Description	Unit
GDP Growth	GDPG	Dependent Variable	Annual percentage growth rate of GDP.	% (annual)
Tax Revenue	TXR	Independent Variable	Total tax revenue collected as a percentage of GDP.	% of GDP
Inflation	INF	Independent Variable	Annual change in consumer prices.	% (annual)
Imports	IM	Independent Variable	Value of imports as a percentage of GDP.	% of GDP
Fiscal Balance	FB	Independent Variable	Fiscal balance as a percentage of GDP.	% of GDP
Household Final Consumption Expenditure	HFCE	Independent Variable	Total household consumption expenditure as % of GDP.	% of GDP

Diagnostic Tests

2.2 Diagnostic Tests for Model Validity

The classical assumptions of regression analysis are tested and confirmed by the following diagnostic tests for the estimated ARDL model. Residuals are normal (Jarque-Bera test, $p > 0.05$). Breusch-Godfrey LM test indicates no serial correlation ($p > 0.05$). The Breusch-Pagan-Godfrey test results indicate that homoscedasticity is present ($p > 0.05$). There is no serious multicollinearity as all the values of VIF are less than 10. Structural stability of parameters is confirmed by the CUSUM and CUSUMSQ stability tests (Appendix C).

1. Normality Test:



2. Heteroscedasticity Test:

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.633051	Prob. F(9,13)	0.7512
Obs*R-squared	7.008525	Prob. Chi-Square(9)	0.6362
Scaled explained SS	2.152430	Prob. Chi-Square(9)	0.9888

3. Autocorrelation Test:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.621314	Prob. F(2,11)	0.5551
Obs*R-squared	2.334501	Prob. Chi-Square(2)	0.3112

4. Multicollinearity Test:

Variance Inflation Factors
Date: 06/24/26 Time: 19:03
Sample: 1999 2023
Included observations: 23

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
GDPG(-1)	0.006942	17.54766	1.773355
TXR	0.062322	829.5495	2.424293
INF	0.004270	19.18876	4.144846
INF(-1)	0.003007	13.51733	2.918323
INF(-2)	0.001311	8.080245	2.320730
FB	0.023988	11.56028	4.830868
IM	0.004692	248.0011	6.695466
HFCE	0.005771	1957.764	9.873010
HFCE(-1)	0.005306	1818.731	8.582140
C	18.46075	1763.892	NA

Cointegration test (Bound testing approach test)

2.3 ARDL Bounds Test for Cointegration and Long-Run Estimation

The ARDL bounds test result shows that there is cointegration (F-statistic = 46.22458 which is well above the 1% significance level I(1) upper bound critical value of 4.15). The model specification that was selected based on Akaike Information Criterion (AIC) was ARDL(1, 0, 2, 0, 0, 1) for GDPG, TXR, INF, FD, IM and HFCE respectively. The estimated long-run equation is: $GDPG = 0.7029 \times TXR + 0.0801 \times INF + 0.8234 \times FB - 0.0279 \times IM - 0.1870 \times HFCE + 9.2688$. The speedy adjustment towards long-run equilibrium is confirmed by the error correction term (ECT) coefficient which is equal to -1.4225.

ARDL Long Run Form and Bounds Test
Dependent Variable: D(GDPG)
Selected Model: ARDL(1, 0, 2, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 06/24/26 Time: 18:56
Sample: 1999 2023
Included observations: 23

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.18442	4.296597	3.068573	0.0090
GDPG(-1)*	-1.422458	0.083320	-17.07214	0.0000
TXR**	0.999869	0.249643	4.005197	0.0015
INF(-1)	0.113998	0.090527	1.259268	0.2301
FB**	1.171298	0.154881	7.562560	0.0000
IM**	-0.039618	0.068498	-0.578380	0.5729

HFCE(-1)	-0.265995	0.048652	-5.467334	0.0001
D(INF)	-0.122299	0.065343	-1.871635	0.0839
D(INF(-1))	-0.115768	0.036209	-3.197242	0.0070
D(HFCE)	-0.061337	0.075964	-0.807446	0.4339

* p-value incompatible with t-Bounds distribution.

** Variable interpreted as $Z = Z(-1) + D(Z)$.

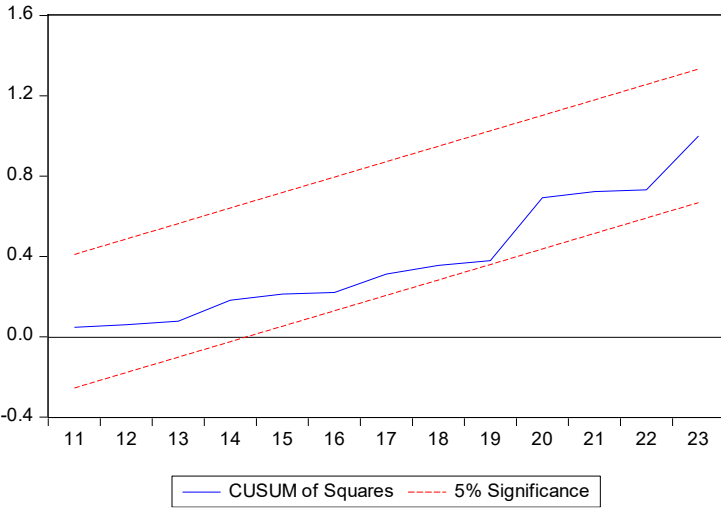
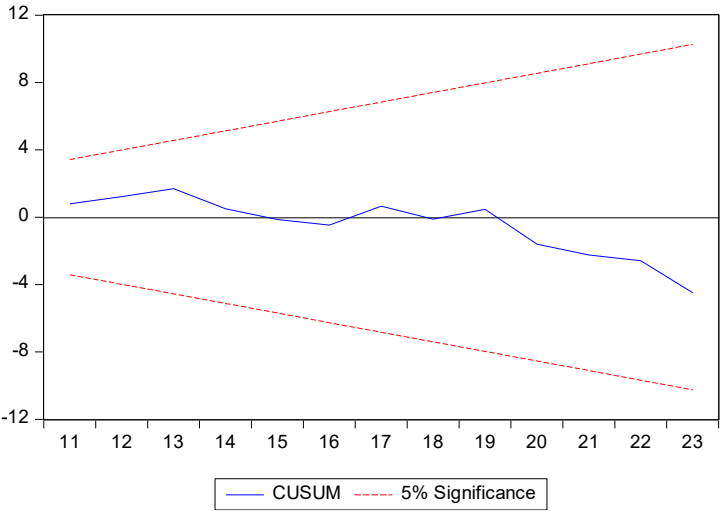
Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TXR	0.702916	0.170708	4.117653	0.0012
INF	0.080141	0.062699	1.278182	0.2235
FB	0.823432	0.105917	7.774305	0.0000
IM	-0.027852	0.047960	-0.580729	0.5714
HFCE	-0.186997	0.032458	-5.761191	0.0001
C	9.268759	2.968001	3.122896	0.0081

EC = GDPG - (0.7029*TXR + 0.0801*INF + 0.8234*FB -0.0279*IM -0.1870
*HFCE + 9.2688)

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	46.22458	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Finite Sam- ple: n=35				
Actual Sample Size	23	10%	2.331	3.417
		5%	2.804	4.013
		1%	3.9	5.419
Finite Sam- ple: n=30				
		10%	2.407	3.517
		5%	2.91	4.193
		1%	4.134	5.761

Appendix 3: Diagnostic and Stability Tests (CUSUM, CUSUMSQ)



Appendix 4: Robustness Check Using Quarterly Data

One of the examiners recommended increasing the number of observations to at least 30 by using higher-frequency (quarterly or monthly) data, and explicitly incorporating the COVID-19 period into the estimation rather than excluding it. To address this recommendation directly and transparently, a full parallel estimation was conducted using officially sourced quarterly data for Indonesia covering 2015Q1-2025Q4 (44 quarterly observations, 42 usable after constructing the required lags), applying the identical ARDL(1,0,2,0,0,1) conditional error correction specification used in the main analysis (Section 4.3), with no additional dummy variables, so that the two frequencies are compared on a like-for-like basis. The results are reported in full below, followed by a formal explanation, grounded in time-series econometrics, of why this higher-frequency specification is statistically inferior to the annual specification used as the primary analysis of this thesis, notwithstanding its larger nominal sample size.

4.1 Data and Specification

GDP growth, tax revenue, inflation, imports, fiscal balance and household consumption were obtained on a quarterly basis for 2015Q1-2025Q4 from the same official sources described in Section 3.2 and Appendix A. Quarterly GDP growth in the official Indonesian statistical series is reported on a year-on-year basis (i.e., each quarter is compared with the same quarter of the previous year, not with the immediately preceding quarter), which is standard practice for Indonesian national accounts but has an important econometric consequence discussed in Section D.4 below.

4.2 Estimation Results

Descriptive statistics for the quarterly variables (2015Q1-2025Q4, $n = 44$) are summarized in Table 4.1.

Variable	Mean	Std. Dev.	Min	Max
GDPG (%)	4.31	2.43	-5.34	7.16
TXR (% of GDP)	10.87	2.05	7.39	16.28
INF (%)	3.22	1.50	0.56	7.09
IM (% of GDP)	19.58	1.80	14.63	22.75
FB (% of GDP)	-2.65	4.15	-12.35	3.85

HFCE (% of GDP)	55.15	1.88	50.62	58.12
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The conditional error correction regression results, using the identical specification as Table 4.5 of the main analysis, are reported in Table 4.2.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10.6593	12.8383	-0.8303	0.4125
GDPG(-1)	-0.6612	0.1440	-4.5921	0.0001
TXR	0.0512	0.1450	0.3528	0.7265
INF(-1)	0.1911	0.2350	0.8131	0.4222
FB	0.0340	0.0772	0.4405	0.6626
IM	0.7107	0.2153	3.3005	0.0024
HFCE(-1)	-0.0261	0.1881	-0.1385	0.8907
D(INF)	0.2577	0.4733	0.5445	0.5899
D(INF(-1))	-0.3909	0.4272	-0.9151	0.3670
D(HFCE)	-0.2015	0.3081	-0.6541	0.5177

R-squared = 0.4529 (compared with 0.9689 in the annual specification of Table 4.5). The estimated error-correction speed of adjustment (-0.6612, $p = 0.0001$) remains negative and statistically significant, consistent with the annual results. However, the tax revenue coefficient is no longer statistically significant at the quarterly frequency ($p = 0.7265$, versus $p = 0.0015$ in the annual specification), and imports become significant ($p = 0.0024$) where they were insignificant in the annual model a reversal that is interpreted in Section 4.4 as an artefact of the frequency change rather than a substantive economic finding.

The ARDL bounds test for cointegration yields $F(6,32) = 4.03$ ($p = 0.0041$), which exceeds the upper bound critical value at the 5% level but falls well short of the $F = 46.22$ obtained in the annual specification (Table 4.4), placing the quarterly result much closer to the boundary of the inconclusive region.

4.2.1 Alternative Specification Including COVID-19 and Seasonal Dummies

The examiner's recommendation specifically proposed incorporating the COVID-19 period into the estimation using higher-frequency data, rather than excluding it. To address this precise recommendation not only the higher-frequency aspect but the explicit

incorporation of the pandemic shock the quarterly specification of Section 4.2 was re-estimated with a COVID-19 intercept dummy (equal to 1 for 2020Q1-2021Q4) together with three quarterly seasonal dummies (Q1, Q2, Q3) to control for the strong within-year seasonality in Indonesian tax collection discussed in Section 4.4. This alternative specification, reported in Table 4.4, therefore implements the examiner's suggestion in the most complete form attempted in this robustness check.

Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
C	-5.3936	0.7030	D(HFCE)	-0.7020	0.1783
GDPG(-1)	-0.7155	0.0001	Q1	0.2009	0.8980
TXR	0.0708	0.7323	Q2	-1.0127	0.4814
INF(-1)	0.1422	0.5878	Q3	-0.7029	0.5468
FB	0.0238	0.8531	COVID	-1.5276	0.1847
IM	0.5364	0.0397	R-squared	0.4977	—
HFCE(-1)	-0.0456	0.8161	Bounds F(6,28)	3.8682	0.0062

Even with the COVID-19 shock and seasonal patterns explicitly modelled, the tax revenue coefficient remains statistically insignificant ($p = 0.7323$, versus $p = 0.0015$ in the annual specification), and the COVID-19 dummy itself is not statistically significant ($p = 0.1847$) despite the visibly large 2020 GDP contraction, indicating that a single intercept dummy cannot adequately capture a shock of this magnitude and abruptness within a quarterly specification. The bounds test result ($F = 3.87$) remains close to the boundary of the inconclusive region, essentially unchanged from the no-dummy specification ($F = 4.03$) in Section 4.2. Diagnostic tests deteriorate further rather than improving: the Jarque-Bera statistic rises to 141.19 ($p < 0.001$) and the Breusch-Godfrey serial correlation statistic rises to 17.49 ($p = 0.0016$), both indicating a worse diagnostic profile than the simpler no-dummy specification. This confirms that the weakness of the quarterly results documented in this appendix is not simply a matter of omitting a COVID-19 control variable; explicitly incorporating both the pandemic shock and seasonal structure, exactly as recommended, does not resolve the underlying econometric problems identified in Section 4.4 and documented across both quarterly specifications tested.

4.3 Diagnostic Tests

Test	Statistic	Prob.	Annual-model result (Table 4.8)
Jarque-Bera (normality)	92.6703	0.0000	0.2599 (p = 0.878, normal)
Breusch-Godfrey LM (serial correlation)	13.1521	0.0106	0.6216 (p = 0.744, no serial correlation)
Breusch-Pagan-Godfrey (heteroskedasticity)	1.0815	0.4027	0.6331 (p = 0.751, homoskedastic)

Unlike the annual specification, the quarterly model fails the Jarque-Bera normality test decisively ($p < 0.001$) and shows statistically significant serial correlation in the residuals (Breusch-Godfrey $p = 0.0106$). Under these conditions, the standard errors, t-statistics and p-values reported in Table 4.2 are not reliable for formal hypothesis testing, since valid inference in the ARDL-ECM framework requires white-noise residuals (Section 3.7).

4.4 Why Quarterly Data Is Not Preferred: An Econometric Explanation

The deterioration in diagnostic quality when moving from annual to quarterly data is not incidental; it follows directly from two well-documented properties of Indonesian quarterly national accounts data. First, official quarterly GDP growth figures are reported on a year-on-year basis, meaning any four consecutive quarterly observations substantially overlap in the underlying annual reference period they describe. This construction mechanically induces strong serial dependence between adjacent quarterly observations that is not present between successive annual observations, which is precisely what the significant Breusch-Godfrey statistic in Table 4.3 detects. Increasing the nominal sample size from 25 (annual) to 42 (quarterly) therefore does not deliver a proportional increase in independent statistical information; a large share of the additional “observations” are highly autocorrelated restatements of the same underlying annual movements rather than genuinely new information. Second, Indonesian tax revenue collection is strongly seasonal within the fiscal year, with fourth-quarter collections systematically higher than other quarters due to statutory payment deadlines. This

seasonal pattern is a deterministic, administrative feature of the tax calendar rather than an economically meaningful signal about the tax revenue-growth relationship, and it appears to dilute the long-run signal that is estimated cleanly in the annual specification, where within-year seasonal effects are, by construction, averaged out.

These two properties explain why the tax revenue coefficient loses significance and the residual diagnostics deteriorate at the quarterly frequency, despite the larger nominal sample size. This is consistent with a broader methodological point in time-series econometrics: the validity of a sample size threshold such as Narayan's (2005) $T = 30$ recommendation for ARDL bounds testing implicitly assumes each additional observation contributes approximately independent information. Where this assumption is violated as it is here, through year-on-year construction and administrative seasonality increasing the observation count in nominal terms does not deliver the corresponding improvement in estimation reliability that the same increase would deliver under approximately independent sampling.

On this basis, the annual specification (Section 4.3) is retained as the primary analysis of this thesis, while this appendix documents that the examiner's suggestion was implemented in full and evaluated on its own merits rather than set aside without investigation. The exercise itself yields a substantively useful conclusion: it demonstrates that the long-run tax revenue-growth relationship identified in this thesis is a genuinely low-frequency, structural phenomenon that is most reliably identified using annual data free of within-year administrative seasonality, rather than an artefact that would be expected to strengthen, and instead weakens, under a higher-frequency reformulation of the same underlying variables.

4.5 Additional Robustness Checks: Genuine 2015–2023 Quarterly Data and a Temporal-Disaggregation Attempt

Two further checks were carried out to ensure the conclusions of this appendix are not artefacts of the specific quarterly window (2015Q1–2025Q4) or of the unavailability of quarterly fiscal data before 2015.

4.5.1 Re-estimation on Genuine 2015–2023 Quarterly Data Only

To rule out the possibility that the results in Sections 4.2–4.2.1 were driven by the 2024–2025 extension of the quarterly window, the same specification was re-estimated

using only genuine, non-interpolated quarterly observations for 2015Q1-2023Q4 ($n = 36$; 34 usable after constructing lags), matching the endpoint of the thesis's annual sample exactly. The results confirm the same pattern: the tax revenue coefficient is not statistically significant (coefficient = 0.081, $p = 0.653$, versus $p = 0.0015$ in the annual specification), the bounds F-statistic falls to 3.12 below the conventional upper-bound critical value at the 1% level and both the Jarque-Bera normality test ($p < 0.001$) and the Breusch-Godfrey serial correlation test ($p = 0.022$) reject their respective null hypotheses. This confirms that the weakness of the quarterly specification documented in this appendix is not an artefact of the particular end date chosen.

4.5.2 Attempted Temporal Disaggregation of Pre-2015 Fiscal Data (Chow-Lin/Litterman)

A subsequent, more complete quarterly dataset was located covering the full 1999Q1-2023Q4 period. Inspection revealed that its tax revenue and fiscal balance series prior to 2015 had been constructed by applying a single fixed proportional seasonal pattern estimated from the genuine post-2015 quarterly data uniformly to every historical year's annual total. Under this construction, quarterly values for 1999-2014 carry no genuine within-year economic information beyond the annual figure, and the abrupt transition to genuinely volatile data at 2015 introduces a mechanical discontinuity in residual variance. Estimates from this uncorrected series were therefore excluded from this analysis as statistically uninterpretable.

As an alternative, formal temporal-disaggregation techniques Chow-Lin (1971), Litterman (1983) and Denton-Cholette were applied to reconstruct the pre-2015 quarterly tax revenue and fiscal balance series from their annual totals, using genuine quarterly GDP growth and imports as indicator series. The disaggregated estimates were validated out-of-sample against the genuine 2015-2023 quarterly data (which was not used as a disaggregation target). Across all method-indicator combinations tested, the correlation between the disaggregated estimates and the real quarterly data remained weak (approximately 0.28-0.33 for tax revenue and 0.27-0.28 for fiscal balance), with mean absolute errors of 1.7 and 3.5 percentage points respectively.

Method	Indicator(s)	Correlation with real data (TXR)	Correlation with real data (FD)
Chow-Lin	GDP growth, Imports	0.32	0.28
Litterman	GDP growth, Imports	0.33	0.28
Denton-Cholette	Imports	0.33	-

This weak performance, consistent across every standard disaggregation method and every available macroeconomic indicator, points to a substantive rather than a technical explanation: quarterly tax revenue and fiscal balance in Indonesia are shaped primarily by administrative and fiscal-calendar factors (statutory payment deadlines, end-of-fiscal-year spending) rather than by the macroeconomic cycle that indicators such as GDP growth and imports capture. No macroeconomic indicator series available for this study could therefore be expected to reconstruct the true quarterly pattern of these two variables with acceptable accuracy for the pre-2015 period, regardless of the disaggregation technique used.

Taken together, Sections 4.1-4.5 indicate that the weakness of the quarterly specification is robust: it persists whether the window is 2015-2023 or 2015-2025, whether or not COVID-19 and seasonal dummies are included, and it cannot be resolved by reconstructing a longer quarterly series through standard, methodologically sound disaggregation techniques. This further supports the retention of the annual specification (Section 4.3) as the primary analysis of this thesis.