Journal of Indonesian Economy and Business
Volume 33, Number 3, 2018, 216 – 242

DO TAX STRUCTURES AFFECT INDONESIA'S ECONOMIC GROWTH?

Heru Iswahyudi

Ministry of Finance of the Republic of Indonesia
(heru.iswahyudi@gmail.com)

ABSTRACT

This paper investigates how changes in the tax structure may affect Indonesia's long-run economic growth. The growth effects of the mix of income taxes and consumption taxes are examined using a set of panel growth regressions, which account for indicators of the tax structure, as well as both the accumulation of physical capital and human capital. The results suggest that income taxes may not exert a statistically significant impact on long-run growth, while consumption taxes may have a positive and statistically significant impact. These results, however, are not robust to changes in the regression's specifications. Hence, although previous studies predict that the mix of direct and indirect taxes may be an important determinant of long-run growth, this paper provides evidence that, in practice, this mix is unlikely to have an impact on the long-run economic growth of Indonesia. It is suggested that policymakers could instead focus their attentions on directing tax reform in Indonesia toward improving tax administration and the equity of the tax system.

Keywords: consumption taxes, economic growth, income taxes, Indonesia, tax structure

JEL Classification: E62, H21, O23

INTRODUCTION

Recently, efforts to reform Indonesia's taxation system have begun. Several proposals have been introduced, and one of them recommends a shift in the main burden of revenue away from income taxes toward consumption taxes. This proposal, if accepted, may result in changes in the structure of taxation. With this background, this paper examines how changes in the tax structure may affect Indonesia's long-run economic growth, based on the available empirical data.[1]

Major tax reform in Indonesia was first enacted in 1983 against the backdrop of declining government revenue from the oil and gas sector. Aimed at diversifying the economy away from its heavy dependence on oil revenues, as the single engine of prosperity, the government devised an 'exit strategy', in which the main emphasis was to promote market-based production structures as the new engines of economic growth (Prawiro, 1998; Usui, 1997). This exit strategy called for broad-based economic reforms which, among others, affected the tax system.

The tax reform depicts a sharp departure from the previous tax system, which was adopted since independence in 1945. The old tax system was argued to be riddled with defects because it was primarily based on outdated legislation, left from more than three centuries of Dutch colonial administration (Gillis, 1989). Before the reform of 1983, efforts to fix these defects were generally unsuccessful, since they were frequently directed to fine tune the tax system for nonrevenue goals such as industrial growth, income redistribution, and regional development. The result was an unusually complex maze of amendments, decrees, and regulations which made the tax system virtually unenforceable, if not incomprehensible. Thus, the old tax system could not generate sufficient revenue, as well as causing substantial economic inefficiencies and inequity (Gillis, 1989).

One of the crucial features in the reform of 1983 was a shift to self-assessment by taxpayers, from the previous, decades-old tradition of an official assessment of tax liabilities. This move was deemed fundamental in the effort to reduce the frequency of direct contact between tax officials and taxpayers, thus lessening the opportunities for collusion. Further, it was expected that the move toward self-assessment would allow for more and better audits of cases promising high revenue payoffs, through reductions in the routine workload of tax officials.

Another significant feature of the reform of 1983 was the introduction of Value Added Tax (VAT) to replace the old sales tax. Due to a high degree of rate differentiation (there were eight tax rates, ranging from 1% to 20%) and a complex structure of exemptions, the sales tax generated low levels of revenue (Gillis, 1989). The new VAT was intended to be a levy on consumption, using a creditable method of collection, based on destination principle and imposed at a uniform 10rcent rate. At the time of its enactment, the VAT was expected to be able to contribute at least 60% of the incremental revenues gained from the reform.

In the area of income taxes, prior to the reform, taxation on the income generated a poor revenue performance, and this condition was partly the result of defects in the regulations and partly as a result of poor administration (Gillis, 1989). Within the old system, large chunks of individual income were untaxed or lightly taxed. For example, interest income was untaxed even though interest expenses were deductible. Further, there were erosions in the income tax base due to overly generous incentives for

[1] This study limits its discussions only to those taxes administered by the central government of Indonesia.

foreign and domestic firms (although these incentives were largely unsuccessful in attracting a significant flow of investment). The reform of 1983 sharply limited the availability of tax incentives, while at the same time reducing the tax rate. These measures were taken with the intention to broaden the tax base.

The original laws contained in the reform of 1983 have undergone several amendments during the subsequent reforms of 1994, 2000, and 2008. These amendments, however, are not significant and generally involve changes in the nominal values (such as changes in the minimum threshold for taxable income in order to keep pace with inflation), as well as changes in tax rates. Other changes involve editorial modifications which seem to be aimed at making the laws clearer and less ambiguous. Thus, the basics of the tax systems established under the reform of 1983 are largely intact.

The mix of various direct and indirect taxes in Indonesia has evolved over time and their revenue performance, as a percentage of Gross Domestic Product (GDP) over the period 1972-2015 is presented in Figure 1.

Data in Figure 1 show that prior to the reform of 1983, the revenue from income taxes reached its highest level at the peak of the oil boom in 1981 when it reached 18.5% of GDP. After the end of the oil boom era, however, the trend declined. This decline continued after the reform and the lowest level was reached in 2007, with income taxes revenue only reaching 2.7% of GDP. Thus, it seems that the reform of 1983 (and the subsequent reforms) have not been able to generate a stable revenue from income taxes. This declining trend may partly be explained by administrative problems (see Brondolo, Silvani, Le Borgne, & Bosch, 2008) and partly due to the existence of various tax incentive schemes (see Wells, Allen, Morisset, & Pirnia, 2001).

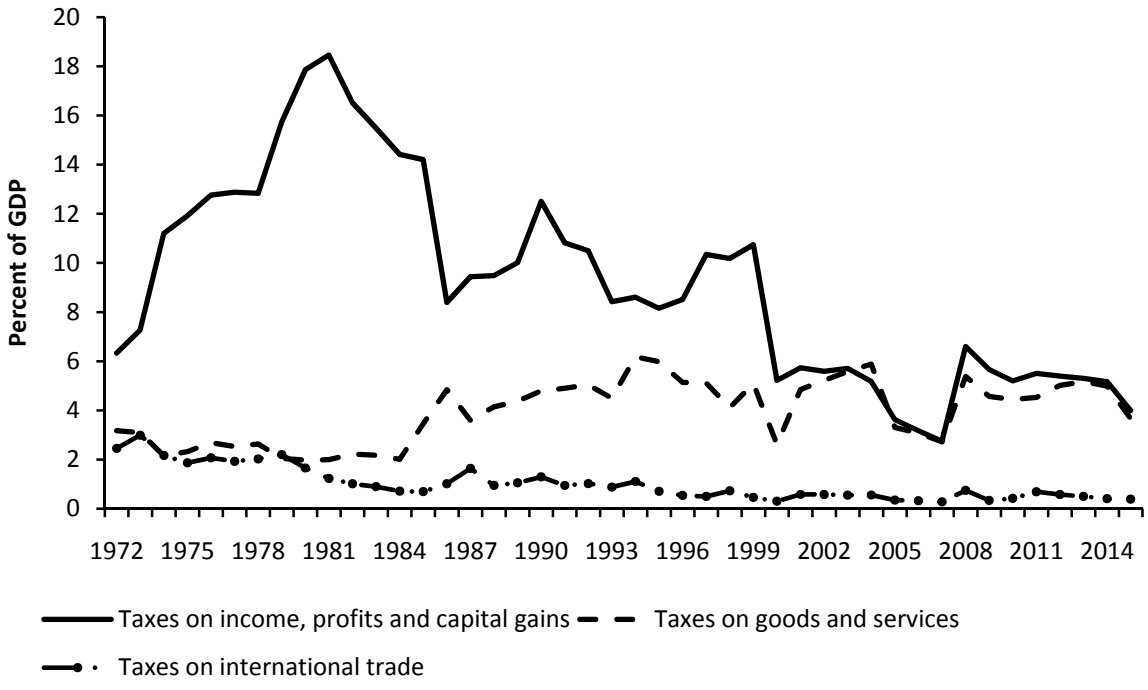

Figure 1. Revenues from income taxes, consumption taxes, and international trade taxes
Source: World Development Indicators (2017)

On the other hand, revenue from consumption taxes shows a generally increasing trend, although its slope is much flatter than the declining slope of income taxes. In other words, increasing revenue from consumption taxes has not been able to offset the declining revenue from income taxes. The highest ratio of consumption taxes revenue to GDP was reached in 1994, at 6.2% of GDP. Although this was not enough to cover the declining income taxes revenue, at least VAT has been able to lessen the adverse impact of the end of the oil boom era on government balance sheets. In fact, in the early years following the reform of 1983, Gillis (1989, p. 110) – as the organizer and director of the technical expatriate team for Indonesian tax reform – argued that the reform would be marked as a failure if not for the revenue success of VAT.

Further, Gillis (1989) maintained that this success could be attributed to, firstly, the simplification of VAT structures and procedures and, secondly, the collection of VAT through several choke points in the economy: the state oil company, customs house, and state-owned companies. Since the reform of 1983 the VAT rate has not changed, it has consistently been levied at 10%.[2]

Data on the performance of total tax revenues show a persistent decline in the ratio of tax revenue to GDP. Figure 2 exhibits time series data on tax revenues, as a percentage of GDP over the period 1984-2015.

Figure 2. Tax revenues as percentage of GDP (1984-2015)
Source: World Development Indicators (2017)

[2] Revenue from taxes on international trade is not significant as a percentage of GDP and its trend is declining. This decline is generally consistent with the declining tariff barriers (see Basri & Patunru, 2012).

As shown in Figure 2, from 1984 until before the start of the Asian financial crisis in 1997, the average tax ratio was 16.1%. In the period 1998-2004, the average tax ratio declined to 13.5%. Nevertheless, it should also be noted that this was a period of political and economic instability following the Asian financial crisis. In the period 2005-2015, political and economic stability was generally achieved. However, the tax ratio declined further, to an average of only 11.6%.

The top income tax rates have also changed considerably since the reform. Figure 3 presents the top income tax rates since 1984. For the period 1984-1994, the top rate for corporate income tax was 35%, which then decreased to 30% until 2000, it then further decreased to 28% for the 2009 tax year, and since the 2010 tax year, the top rate has stayed at 25%. For individual taxpayers, the top rate was 35% for the 1984-1994 tax years, 30% for 1995-2000, 35% for 2001-2008 and 30% since 2009.

Previous empirical research on the relation between taxation and economic growth provides mixed results. On the one hand, studies found that taxes may hamper economic growth. Empirical research supporting this notion can be found, among others, in the works of Barro and Redlick (2011); Dahlby and Ferede (2012); Gemmell, Kneller, and Sanz (2011); Mertens and Ravn (2013). These studies generally point to the adverse effects of taxes on economic output and growth. On the other hand, other studies found that taxes do not affect economic growth, or that the effects of taxes on growth depend on the type of the tax imposed: i.e., non-distortionary taxes do not impede growth and vice-versa. This strand of literature can be found in the empirical works of, for instance, Gemmell, Kneller, and Sanz (2014); Katz, Mahler, and Franz (1983); Widmalm (2001); Worlu and Nkoro (2012).

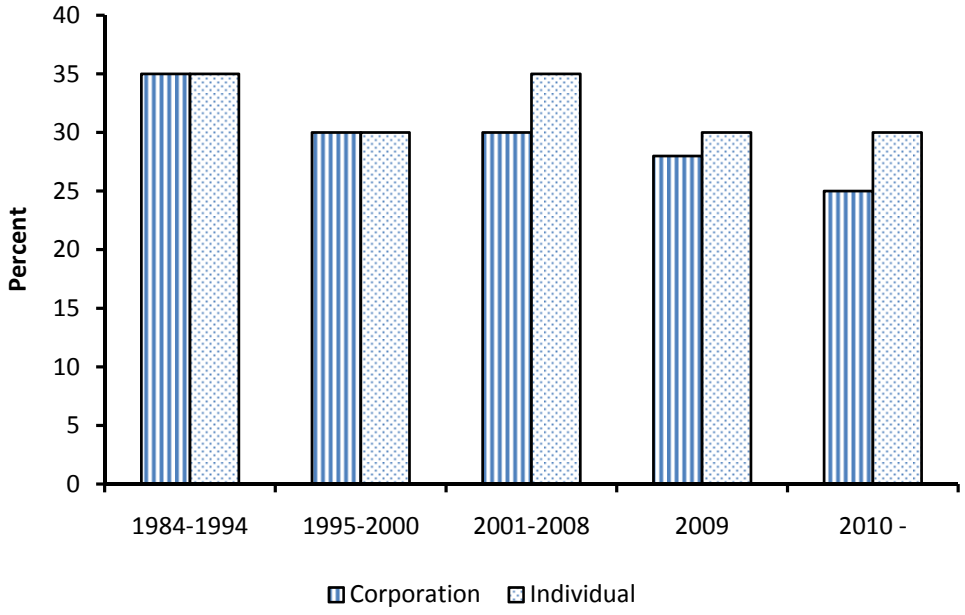

Figure 3. Top rates for income tax

Source: Indonesia Government (2008)

LITERATURE REVIEW

1. Neoclassical and Endogenous Growth Theories: an Overview

The building block of the growth theory is the proposition that sustaining positive, long-run growth in output per capita requires perpetual progress in technological knowledge, in the form of new markets, goods, or processes (Aghion, Howitt, Brant-Collett, & García-Peñalosa, 1998). Within the neoclassical growth theory, this proposition may best be demonstrated using the model developed by Solow (1956) and Swan (1956). Their model shows that without technological progress, economic growth would cease to exist when diminishing returns start to kick in.

The standard neoclassical growth model could be expressed as $Y = K^{\alpha}L^{1-\alpha}Ae^{\mu}$, where Y denotes economic output (GDP), K is the stock of capital, L is the stock of labor, A is a constant which represents the initial state of technology in the economy, α represents capital's share in the total value of output, and e^{μ} represents the rate of change in technological advances which is assumed to be exogenous (Solow, 1956). In this model, increases in the stock of capital will spur additional growth in output for a time. However, as the ratio of capital to labor increases the marginal product of capital will eventually decrease and the economy will evolve back to a steady state. In this steady state, the rate of growth of output, capital stock, and labor will be the same; hence the rate of growth of income per worker will be equal with the rate of growth of μ – i.e., the rate of growth in productivity. Since technological progress in the neoclassical growth model is assumed to be exogenous, the model does not specify the determinants of the size of μ (Pack, 1994).

The endogenous growth theory seeks to redress the determinants of the growth rate of productivity (μ) which is left unexplained within the neoclassical model. The crux of the endogenous growth theory can be formulated as $Y = AK$ (Lucas, 1988; Rebelo, 1991; Romer, 1986). Here, A represents various factors that affect technological progress, while K denotes both human and physical capital. Diminishing returns to capital are absent from the endogenous model since they are assumed to be able to be averted through the invocation of some externality that counteracts any proclivity toward diminishing returns. According to this model, increases in productivity can be achieved through investments in physical and human capitals. Investment increases in the variety or quality of machinery, or the intermediate input for example, would be able to halt and reverse any tendency toward diminishing returns. In this respect, investments in research and development as well as improvements in the skills of the labor force are crucial to sustain long-run economic growth.

Within the neoclassical and endogenous growth theories, the relation between economic growth and taxation may be straightforward. Taxes may reduce the returns to savings, and thus may discourage the accumulation of capital stock. Similarly, since taxes may reduce the reward for work, they may reduce labors' work efforts and thus depress the supply of labor. Reductions in the accumulation of capital stock and the supply of labor may result in lower economic output and growth. By the same token, to secure profitable innovations, corporations expend resources on research and development; thus taxes may affect the optimal amount corporations are willing to spend on these activities. To develop human capital and increase lifetime earnings, individuals invest in education, and since taxes may reduce the returns to education, they also may reduce the accumulation of human capital (Myles, 2007).

Arnold (2008) argued that all taxes – except lump-sum taxes – create distortions which could affect economic growth. Arnold (2008) argued further that the degree of distortion of tax systems depends on two factors: the number of resources extracted from private agents (i.e. the tax levels) and the ways different taxes are combined to raise revenue (i.e. the tax structures).

On the other hand, there are positive aspects of taxation. Some public expenditure – which, among others, are financed by tax revenue – can indirectly contribute to increases in economic growth (Khan & Reinhart, 1990; Myles, 2009). Positive externalities from the provision of public goods such as education, infrastructure and health care may increase the marginal productivity of capital and this would lead to higher economic output (Caballé & Panadés, 1997; Ercolani & e Azevedo, 2014).

2. Taxes and Economic Growth

The general problem of taxation may relate to a large number of economic agents with different characteristics of endowments and tastes (Atkinson & Stiglitz, 1976). If the tax authority could acquire complete information on these characteristics at no cost to itself, a tax could simply be imposed on a lump-sum basis, with a differing amount according to the characteristics of each economic agent. It is due to the difficulties associated with obtaining this information which forces taxes to be imposed based on certain surrogate characteristics. The use of these surrogates, however, give rise to several problems, one of them is the economic distortions created because an economic agent, to some extent, controls many of the characteristics which may be used for the surrogate and these distortions may affect the performance of the economy.

Empirical studies on the link between the levels of taxes and economic growth, however, have led to inconclusive results. Furthermore, the direction of causality may be difficult to determine, even though correlations between these two variables may be able to be robustly identified. Results have ranged from the finding of a robust and significant correlation between the tax level and growth, such as suggested by, for example, Barro (1989), Miller and Russek (1997) and Romer and Romer (2010), to the finding of a weak and fragile relation between the two, as suggested by, among others, Koester and Kormendi (1989), Easterly and Rebelo (1993) and Mendoza, Milesi-Ferretti, and Asea (1997).

Barro (1989) used data on growth, investment, population, and a proxy for human capital from 72 countries, and found that public spending (and, implicitly, the taxes that finance this spending) affected economic growth and investment. Further, consumptive public spending was found to be negatively correlated with growth and investment, while public investment spending had a positive relation with growth and private investment. From a sample of several developed and developing countries, Miller and Russek (1997) concluded that government expenditure which was financed by tax increases might encourage or impede growth, depending on the category of expenditure. Specifically, education expenditure was found to be the only category which had a positive impact on economic growth. Romer and Romer (2010) reviewed U.S. federal tax changes since World War II and examined the behavior of the economic output following these changes. One of the crucial findings in the work of Romer and Romer (2010) was that increases in the level of taxation significantly hampered economic growth.

Koester and Kormendi (1989) examined the effects of average and marginal tax rates on the rate of growth and the level of economic activity from a sample of 63 countries. They found that tax rates only weakly related to economic growth, while reductions in marginal tax rates could be associated with increases in the level of per capita income. Another cross-country study by Easterly and Rebelo (1993) found that marginal tax rates have a statistically insignificant correlation with growth. Examining a time-series panel of 18 OECD countries, Mendoza et al. (1997) concluded that effective tax rates on factor incomes and consumption were not effective in altering long-run economic growth.

Hungerford (2012) investigated changes to the top marginal tax rate in the United States over the past 65 years and how they may affect economic growth. Empirical results of his study suggested that growth appeared to be unaffected by changes in the tax rate over the period under study. Further, Hungerford (2012, p. 16) concluded that "the reduction in the top tax rates appears to be uncorrelated with saving, investment, and productivity growth. The top tax rates appear to have little or no relation to the size of the economic pie."

Using a sample from 70 countries covering the period 1970-1997, Lee and Gordon (2005) studied how tax rates affected the rates of economic growth in these countries. Controlling for various determinants of economic growth, they found that the economic growth rates of the countries being studied were significantly negatively correlated with the levels of the corporate tax rate. They also found, however, that economic growth rates have insignificant correlations with the average tax rate on labor income, and the effective overall marginal tax rates. Their study suggested that the annual rate of economic growth could be increased by 1 to 2% points by cutting the corporate tax rate by 10% points.

Similarly, empirical studies which examined the link between economic growth and tax structures (rather than tax levels) also provide inconclusive results. Kneller, Bleaney, and Gemmell (1999) studied data from 22 developed countries covering the period 1970-1995, and in their study taxes were classified as distortionary (i.e., taxes on income and property) and non-distortionary (i.e., consumption taxes). They suggested that the empirical evidence seemed to support the notion that distortionary taxation impeded growth, while non-distortionary taxation aided growth. Widmalm (2001) found evidence from the cross-sectional data of 23 OECD countries, for the period 1965-1990, that the proportion of personal income tax in the total tax revenue was negatively correlated with economic growth. Widmalm (2001) also found some evidence that consumption tax was growth enhancing and argued that this was due to the relatively less harmful nature of consumption tax on economic growth, compared to other taxes.

Using industry-level data from a set of OECD countries, Vartia (2008) examined the effects of taxation on investment and productivity. Vartia (2008) found evidence that the corporate tax rate was negatively correlated with investment, while productivity responded negatively to the corporate and top personal income taxes. Johansson, Heady, Arnold, Brys, and Vartia (2008) and Arnold et al. (2011) studied how GDP per capita in OECD countries could be affected by changes in tax structures. Empirical results of their studies suggested that different types of taxes may affect long-run GDP per capita differently. They ranked various types of tax instruments from the least distortive to the most distortive as follows: recurrent taxes on immovable property, consumption taxes, personal income taxes, and corporate income

taxes. Based on these results, they argued that shifting part of the revenue base from income taxes to less distortive types of taxes might be necessary when tax reform was intended to be growth-oriented. They argued, however, that increasing taxes on property, though less distortive, tended to be politically unpopular; thus revenue shifts toward consumption taxes were suggested as being more practical.

On the other hand, other empirical studies found that the structures of taxes have a weak effect on long-run economic growth. Harberger (1964a, 1964b) maintained that, in the long run, tax policy is ineffective as an instrument to alter the rate of economic growth. In support of this, Harberger (1964a) pointed to the fact that in the United States, large changes in the tax structure have no effect on the rate of growth of savings and output. Further, within the framework of growth accounting, Harberger (1964b) found that long-run economic growth was not affected by changes in the mix of direct and indirect taxes. Harberger (1964b) maintained that this mix had negligible effects on the growth rates of the labor supply and labor's income share, as well as limited effects on the rates of savings and investment. Hence, Harberger proposed that tax policy is 'superneutral' – it would not affect the long-run rate of economic growth, although it may affect the rate of investment and enhance welfare by way of some efficiency gains.

Mendoza et al. (1997) examined the effects of tax policy within the framework of endogenous growth models, which included human capital accumulation as a driver of economic growth. Their study found that the effects of tax structures on economic growth are highly dependent on the regression specifications used in the models, and the empirical evidence of their study showed negligible growth effects from taxes. This result is principally consistent with Harberger's conjecture. Using quarterly data from the United Kingdom and the United States, Poterba, Rotemberg, and Summers (1986) examined how changes in the mix of direct and indirect taxes affected economic performance. They found that, in the short run, shifts from direct taxation toward indirect taxation increased after-tax wages and prices and reduced real output, while in the long run there is no significant effect which could be observed as a result of these shifts.

Similarly, in an empirical model based on data from 22 OECD countries, Madsen and Damania (1996) investigated the macroeconomic effects of switching the tax burden from direct to indirect taxes. Their study found that a revenue-neutral switch from direct to indirect taxes has no impact on the long-run level of economic activity in the majority of countries in the sample. They argued, however, that this switch may generate efficiency gains and may lead to higher levels of aggregate output in the short run. In a more recent study, Acosta Ormaechea and Yoo (2012) examined panel data from 69 countries and found that while tax structures affect economic growth in high and middle-income countries, they did not find strong evidence on the significance of the impact of changes in tax structures on the economic growth of low-income countries. Thus the literature may suggest that although theory predicts that tax policy is an important determinant of economic growth, certain empirical evidence shows that it may be unlikely to affect long-run economic growth.

For the case of Indonesia, Simarangkir and Nakamura (2010) studied how GDP was affected by direct and indirect taxes for the period 1970-2008, using a demand-side macroeconometric model. They found that both types of taxes negatively affected GDP, with the larger effect coming from direct taxes. This paper

reexamines these hypotheses by investigating the way different types of taxes are combined and designed to generate revenues and their relation to Indonesia's long-run economic growth from the perspective of supply-side economics. Further, it enriches the available literature on the Indonesian economy and public finance through its one crucial feature: estimations of all the specifications, are exercised under a 'government budget constraint' – that is, a reduction in one tax instrument is assumed to be followed by increases in the other tax instruments, in order to maintain the same levels of revenue.

This paper focuses its attention only on Indonesia, because in cross-country studies there are several limitations that need to be raised, despite the analytical rigor and meticulous attention to detail these cross-country studies could provide. Firstly, conceptual and statistical problems could arise by grouping several countries together, due to the country-specific socio-economic differences (Crafts, 1996; Levine & Zervos, 1993; Taylor, 2007). Secondly, due to the broad exogenous differences across countries (such as the differences in human capital, government policy, and natural resources) estimating the factors affecting the rates of economic growth in several countries altogether may not be appropriate (Quah, 1993).

METHOD, DATA AND ANALYSIS

Within the framework of neoclassical growth models, such as in the works of Solow (1956) and Swan (1956), long-run economic growth depends only on the accumulation of capital, labor and the way with which these two-factor inputs are used productively. Tax or any other policies have no direct role in this class of models. The effects of changes in tax structures on economic growth are implicitly assumed to materialize in the transitional period when the economy moves toward a new equilibrium. Nevertheless, the span of time for such transitions is not clear, and it could take decades for an economy to reach a new equilibrium when one considers the sizeable adjustment costs for capital stocks or labors' education (Arnold, 2008). A different perspective, however, is offered by endogenous growth models, such as in the work of Lucas (1988). In these models policies and institutions serve as drivers which can directly affect the long-run rate of economic growth.

Hence, empirical works on economic growth are largely divided between exogenous and endogenous models of growth, because the literature provides no consensus on the theoretical framework (Levine & Renelt, 1992). For this reason and following the works of Arnold (2008) as well as Arnold, Bassanini, and Scarpetta (2007), this paper derived its empirical specification by combining both models – from the Solow-Swan type of augmented model and the Lucas (1988) type of endogenous model.

The approach here starts from the assumption that aggregate production is of the Cobb-Douglas type, where the output is modeled as a function of physical capital, human capital, labor and the efficiency with which they act together. Hence, production at time t can be expressed as:

$$Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta} \quad (1)$$

In Equation (1) Y, K, H and L are output, physical capital, human capital, and labor, respectively. A is the level of economic efficiency and technological progress (assuming constant returns to scale) and is viewed as being able to be broken down into two components: First, institutional and public policy variables which affect economic efficiency and will be denoted by the vector V. Second, the level of technological progress which is assumed as

purely exogenous, and merely a function of time. α and β denote the partial elasticity of output with respect to physical capital and human capital, respectively; whereas t denotes time.

Hence, Equation (1) can be stated in logarithmic growth form as follows:

$$\Delta \ln y_{i,t} = b_{1,i}\Delta \ln s^{K}_{i,t} + b_{2,i}\Delta \ln h_{i,t} + b_{3,i}\Delta n_{i,t} + \sum_{j=4}^{m} b_{j,i}\,\Delta ln V^{j}_{i,t} + \tau_i t + \varepsilon_{it} \quad (2)$$

where y denotes output while s^K, h and n denote the stock of physical capital, the stock of human capital, and working age population, respectively. t and ε denote the function of time and the error term, respectively; whereas b denotes the coefficient of variable i. τ denotes the level of exogenous technological progress, and is assumed to be only a function of time. V represents various institutional and public policy variables (particularly the variables of taxes) which will be interchangeably inserted into the regression models.

The arrangement of V as a vector in Equation (2) allows for the convenient evaluation of different tax policy reforms under the assumption of revenue neutrality: i.e., a reduction in one tax instrument is assumed to be followed by increases in another tax instrument. For example, the variable of income taxes could be dropped out of the equation and the coefficient of the variable of goods and services taxes could be interpreted as the long-run effects on economic growth, if the tax reform were to rely more heavily on the goods and services taxes, while adjusting the level of income taxes so as to keep total tax revenues constant (Arnold, 2008).

Since Equation (2) is based on the endogenous growth theory, the classical assumptions applied to the endogenous model, in general, are also applicable for the equation. One of the basic assumptions is that the rate of savings is assumed to be constant and exogenous. Another assumption is that diminishing returns to scale are not exhibited in the model with the rationale, among others, that capital investment produces positive spillovers to the whole economy, and that technological improvements may lead to further improvements, for example through the process of learning by doing.[3]

Data on y are compiled from Indonesia's GDP, available from the World Bank's World Development Indicators (2017). The levels of gross saving in the economy and the index of human capital are used as proxies for s^K and h, respectively. Data on gross savings are collected from the World Development Indicators, while data on the index of human capital are from the Penn World Table (2017).[4] Data on population are from the World Development Indicators. This dataset covers the number of people between the ages of 15 to 64. This classification is deemed necessary as people between these ages are considered to be the productive workforce; hence the stock of working age population is important for economic growth. Data on $V_t$consist of the central government's revenue from three major sources: taxes on income, profits, and capital gains; taxes on goods and services; and taxes on international trade. These tax revenue data are from the World Development Indicators. Considering the constraints of data availability, all data cover the period 1984-2015[5]. Current values are adjusted

[3] Further exploration on the assumptions employed in the endogenous model are discussed in the works of Barro and Sala-i-Martin (2004); Paul M Romer (1994), among others.

[4] These data are the contribution of Feenstra, Inklaar, and Timmer (2015).

[5] Some missing data are estimated using moving averages of the previous five years.

to constant 2010 prices using the GDP deflator from the World Development Indicators.

This study limits its scope by focusing on the period from 1984-2015 (n=32). This limited sample is due to the availability of data because tax reform in Indonesia only started around 30 years ago (in 1984); previously the tax law adopted the Dutch colonial tax systems. Further, there is a lack of published data on quarterly tax revenues; thus the study uses the available yearly data.

1. Hypotheses Development

The model expressed in Equation (2) suggests the relation between economic output on one side and the stock of physical capital, the stock of human capital, working-age population, and various tax instruments on the other side. Since V_t in the regression specification in Equation (2) includes the sum of revenues across several tax instruments, it would face the problem of government budget constraints – that is, in order to maintain revenue neutrality a change in the revenue collected from one tax instrument would affect the amount of revenue which needs to be collected from the remaining tax instruments (Kneller et al., 1999). Following Arnold (2008), this constraint would be dealt with by omitting one or more tax instruments at a time. The omitted elements would be assumed as residuals, which could be raised (reduced) following decreases (increases) in other tax instruments specified in the model, to maintain the same levels of tax revenue. Thus the omitted tax instruments could be thought of as elements left free to close the system.

Based on the model, there are three null hypotheses, formulated as follows:

$H0_1$: Income taxes do not affect economic growth.

This hypothesis is used to explore the impact of shifts in the burden of revenue toward taxes on income, profits, and capital gains while treating taxes on goods and services and taxes on international trade as residuals, which functions to maintain the total tax revenues. Figure 4 summarizes the relationship between the variables.

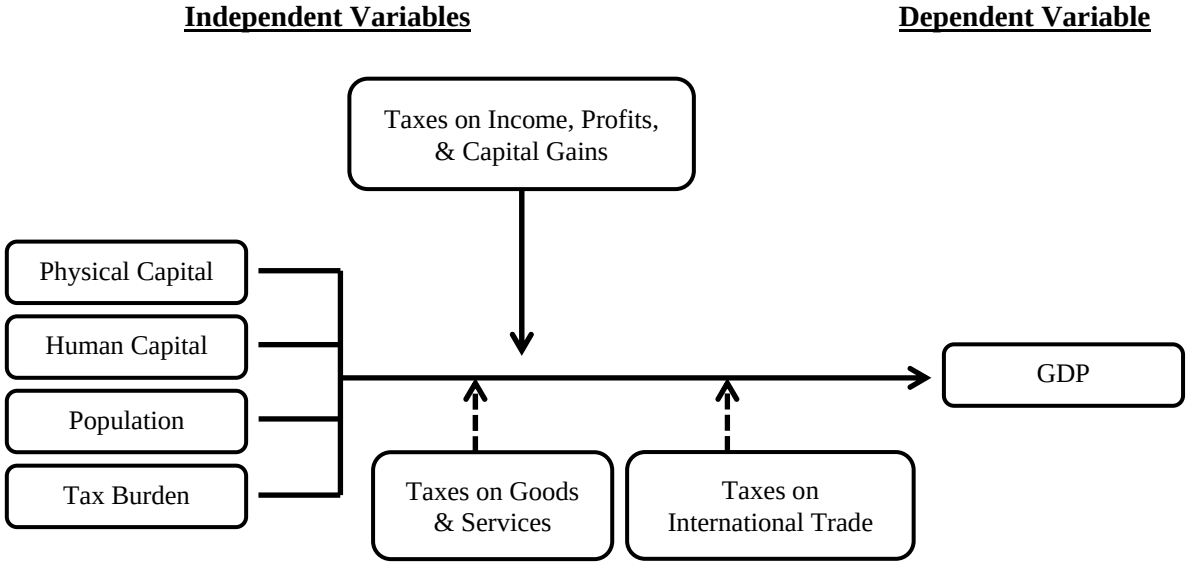

Figure 4. A conceptual framework of Income Taxes – GDP
Source: Author

$H0_2$: Consumption taxes do not affect economic growth.

This hypothesis is employed to study the impact of shifts in the burden of revenue toward taxes on goods and services while treating taxes on income, profits and capital gains and taxes on international trade as residuals, which functions to maintain total tax revenues. Figure 5 depicts this relationship between the variables.

$H0_3$: International trade taxes do not affect economic growth.

This hypothesis is applied to examine the impact of shifts in the burden of revenue toward international trade taxes while treating taxes on income, profits and capital gains and taxes on goods and services as residuals, which functions to maintain total tax revenues. Figure 6 depicts this relationship between the variables.

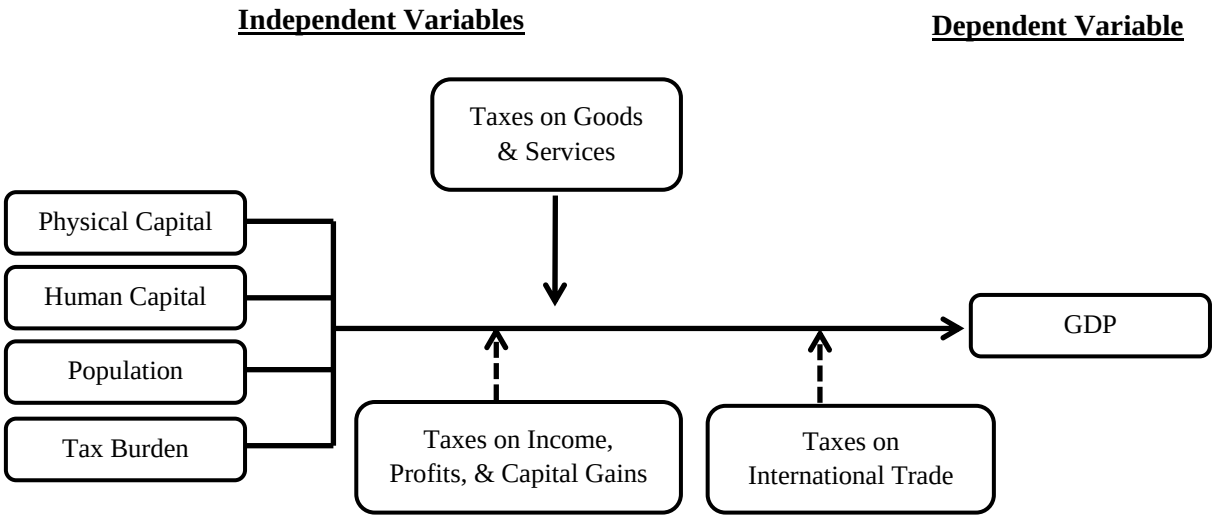

Figure 5. A conceptual framework of Consumption Taxes – GDP
Source: Author

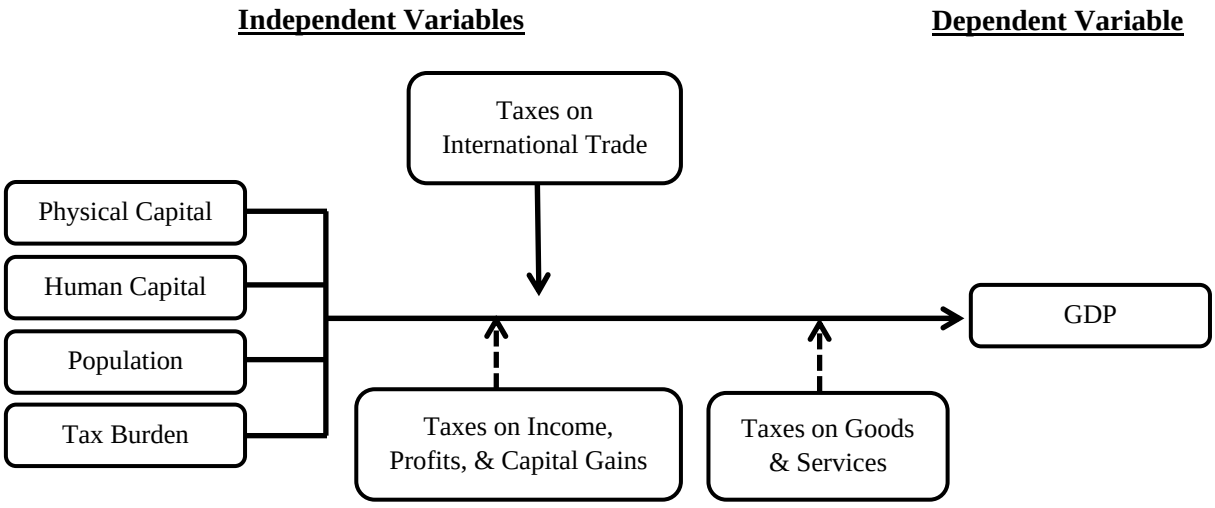

Figure 6. A conceptual framework of Taxes on International Trade – GDP
Source: Author

All of the above-mentioned hypotheses are stated in non-directional forms because this study limits its explorations on whether these various tax instruments have (or do not have) a significant impact on economic growth. It does not explore which tax instrument has a higher impact on economic growth – an aspect where directional forms of hypotheses could be employed and thus could be set as a focus for further studies.

RESULT AND DISCUSSION

Table 1 presents the empirical results of growth's regression, adding taxes as independent variables. Omitted tax instruments are presented in the bottom line and assumed to absorb any changes in revenue from the tax instrument included in the regression, hence maintaining revenue neutrality. Across the specifications, the overall tax burden does not seem to exert a statistically significant effect on economic growth. Nevertheless, this element is essential as a control variable, hence subsequent analyses will retain its presence in the regression specifications.

In the baseline model, it seems that only physical capital has consistently positive and significant effects on long-run GDP growth across the three specifications presented in column (1) to column (3). The variable of human capital has negative coefficients across the three specifications; however, one cannot make too much of this negative sign. At best, all that can be said is that human capital does not seem to exert any significant effects on the long-run rate of economic growth. The coefficient of population growth shows the correct signs across

Table 1. Growth regression

Dependent Variable: GDP	(1)	(2)	(3)
Baseline Model			
Physical Capital	0.07 **	0.08 ***	0.07 **
	(0.03)	(0.03)	(0.03)
Human Capital	-0.01	-0.01	-0.09
	(0.03)	(0.03)	(0.03)
Population	0.05	0.04	0.05 *
	(0.07)	(0.07)	(0.07)
Control Variable			
Overall Tax Burden	0.00	0.00	0.00
(Total revenues/GDP)	(0.01)	(0.01)	(0.01)
Tax Structure Variables			
Taxes on Income, Profits and Capital Gains	0.03		
	(0.03)		
Taxes on Goods and Services		0.04 *	
		(0.02)	
Taxes on International Trade			0.00
			(0.02)
Adjusted R-Squared	0.09	0.15	0.03
Observations	32	32	32
Revenue neutrality achieved by adjusting	Taxes on Goods & Services; Taxes on Int'l Trade	Taxes on Income, Profits & Cap. Gains; Taxes on Int'l Trade	Taxes on Income, Profits & Cap. Gains; Taxes on Goods & Services

Notes: Standard errors are in brackets; * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
Sources: Secondary Data, analyzed

the specifications; excepting when the main burden of revenue is switched to international taxes – as shown in column 3 – then population growth becomes a significant explanatory variable for economic growth.

Column (1) examines the impact on long-run GDP of a hypothetical tax reform which shifts the burden of revenue toward taxes on income, profits and capital gains, while reduces the revenue collected from taxes on goods and services and taxes on international trade. The estimated coefficient suggests a positive but statistically insignificant effect of income taxes on GDP. Further, a coefficient of 0.07 for the independent variable of physical capital might suggest that a 1% change in the growth of capital stock – holding the other independent variables unchanged – would translate into a 0.07% change in the rate of growth of GDP.

Assuming statistically significant results, the coefficients for the other independent variables in column (1) could be interpreted as follows: A coefficient of 0.05 for the variable of population might suggest that a 1% growth in the number of people between the ages 15 to 64 would change the rate of GDP growth by 0.05%. A coefficient of 0.00 for the variable of the overall tax burden might suggest that a 1% growth in the ratio of tax revenues to GDP would translate into a 0.00% change in GDP growth. While a coefficient of 0.03 for the variable of taxes on income, profits, and capital gains could be interpreted as a 1% change in the growth of revenues collected from taxes on income, profits and capital gains might change the growth rate of GDP by 0.03%.

In column (2), the burden of revenue is shifted toward taxes on goods and services while reducing the revenue collected from taxes on income and taxes on international trade. The result shows that taxes on consumption have positive and significant effects on the long-run growth rate of GDP. A coefficient of 0.08 for the independent variable of physical capital might suggest that a 1% change in the growth of capital stock would translate into a 0.08% change in the growth of GDP. A coefficient of 0.04% for the variable of taxes on goods and services might suggest that a 1% change in the growth of revenue from the taxes on goods and services might translate into a 0.04% change in GDP growth.

Reducing taxes on income, profits and capital gains as well as taxes on goods and services while shifting the burden of revenue toward taxes on international trade, as shown in column (3), does not seem to exert any effect on GDP. In this specification, the association between taxes on international trade and long-run GDP is negligible (zero) and not statistically significant. The variable of the population, however, becomes statistically significant with a coefficient of 0.05 – meaning that it can be inferred with some degree of confidence that a 1% growth in the number of people between the ages of 15 to 64 might change the GDPs growth rate by 0.05%.

Bringing together the results in columns (1) to (3), it seems that it is only consumption taxes which have statistically significant effects on economic growth. The positive coefficient of this instrument may be interpreted that tax reform, which is financed by shifting the burden of revenue toward consumption taxes while reducing revenue from income taxes and international taxes, would have a positive impact on economic growth.

Theoretically, one of the possible explanations for the significant effects of consumption taxes on economic growth, relative to other tax instruments (especially the income taxes), might have to do with the relative neutrality of consumption taxes toward economic agents' decisions on savings and investment,

consumption, production, and the labor supply (James, 2015). Consumption taxes may be neutral to savings and investment decisions because under a consumption tax the returns from savings are not the base for the tax's imposition (James, 2015). Hence, this may spur the accumulation of capital stock. Income taxes, on the other hand, may adversely affect savings and investment decisions, since they allegedly tax the returns from savings twice – once at the firm's level when it makes a profit and once again when dividends are shared to shareholders (Ebrill, Keen, Bodin, & Summers, 2001).

Furthermore, consumption taxes could stimulate capital accumulation through their neutrality toward consumption decisions, since they do not interfere with the consumers' decisions to consume now or later. Under an income tax, economic agents are likely to be discouraged from future consumption (hence, it discourages saving) since the use of income as a tax base tends to favor current consumption (Shalizi & World Bank Group, 1991). Consumption taxes, on the contrary, do not distort the choice of current and future consumption, since both will be taxed uniformly. In this way, consumption taxes do not penalize capital accumulation, and this would stimulate economic growth (Gillis, Shoup, & Sicat, 1990).

The neutrality of consumption taxes could also encourage economic output since they would not interfere with agents' decisions regarding production. Businesses would have the incentive to use less capital-intensive production methods if capital was taxed (which could be applied under an income tax system), this would make the relative prices of capital-intensive goods rise (Ebrill et al., 2001). Under a consumption tax, businesses would be free to choose the most efficient production method, because their decisions would be mainly based on market conditions, since capital is not the base for consumption taxes (James, 2015).

Finally, consumption taxes could encourage economic growth through their neutrality toward decisions related to the supply of labor. Under an income tax, progressive tax rates might distort the incentives to increase the hours worked, since the additional income will be taxed at a higher rate. In this case, a shift toward consumption taxes might be unlikely to affect workers' decisions as to whether or not to increase their working hours, since they would only have to pay taxes when they spend their income on consumption – not on the additional hours worked. Hence a shift toward consumption taxes could boost economic growth through its effect on increases in the hours worked (OECD, 2007).

The values of adjusted R-squared of the three model specifications show that the model which shifts the burden of revenue toward consumption taxes may have a more reliable relationship with economic growth. In general, however, the modest fit of the model specifications in columns (1) to (3) might indicate that more explanatory variables are needed to be examined. For this reason, robustness checks might be necessary and the next section examines the degree of sensitivity of the empirical results to changes in regression specifications.

As one tax instrument is omitted at a time and two others evaluated, there may be more combinations than the regressions presented in Table 1. Confidence in the results found in the previous section could nonetheless be increased when the choice of a particular regression set-up is not central to the finding of positive effects of consumption taxes on economic performance. Other than taxes, previous studies have suggested that economic growth is driven by several other variables (see Isaksson, 2007).

To measure the robustness of the findings, these other variables could be introduced into the regression's specifications. However, the algorithm would simply not converge if too many explanatory variables are involved. For this reason, only two instruments of tax will be considered in these robustness checks: taxes on income, profits and capital gains and taxes on goods and services. The other reason is that these two tax instruments are the major sources of revenues for the Indonesian government.[6]

In this study, the variables added for the purposes of robustness checks are the rate of growth of trade openness, financial system, electricity production, and inflation. The justification for adding trade openness in the robustness tests is that the level of openness could spur positive spillover effects in technological advances, from countries or firms with higher levels of technological knowledge to countries or firms with lower levels of technological knowledge (Comin & Hobijn, 2004). The argument for including the variable of the financial system in the robustness tests is that the level of the financial system's development would affect the efficient allocation of resources in an economy. A good financial system would enable the allocation of savings to high-quality investments in economic sectors which provide the highest returns relative to other sectors, and the rate of growth of technological progress could be stimulated by these high-quality investments (Fisman & Love, 2003). Electricity production, whether it is the result of investment by the government or by firms, is essential for an economy to grow, since the degree of adoption of current technology may depend on the availability of electricity (Aschauer, 1989; Comin & Hobijn, 2004). Finally, the justification for including inflation as one of the variables in the robustness tests is that the level of inflation may capture the government's consistencies in maintaining responsible monetary and fiscal policies. This is because large, structural fiscal imbalances could result in debt monetization and higher inflation rates, that adversely affect economic growth (Easterly & Levine, 2003).

Data on international trade are collected from the World Development Indicators and are employed as a proxy for trade openness. These data comprise of the sum of exports and imports of goods and services, measured as a share of GDP. Data on the values of domestic credit provided by the financial sector, as a share of GDP, are used as proxies for the level of development of the financial system and collected from the World Development Indicators. Data on electricity production are also compiled from the World Development Indicators. This dataset consists of the production of power plants and combined heat and power plant less transmission, distribution, and transformation losses, and own use by heat and power plants. Data on inflation, measured by the consumer price index, are also from the World Development Indicators. All data cover the period 1984-2015, and nominal values are measured at constant 2010 prices. Table 2 presents the results for the robustness tests.

Analyses on the Variance Inflation Factor (VIF) of the independent variables presented in tables 1 and 2 show magnitudes ranged between 1.0 and 6.4 (the statistical results are shown in Appendix 3). Although Kutner, Nachtsheim, and Neter (2004) argued that a VIF of more than 10 is generally considered high, however, these magnitudes may show that there exists some degree of multicollinearity between the independent variables in the models employed in this study, which may affect the regression results.

[6] For the period 2010-2015 income tax and value added tax, on average, cover around 61% of total central government revenue (Bank Indonesia, 2017).

Table 2. Robustness checks

Dependent Variable: GDP	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Physical Capital	0.08	***	0.08	***	0.07	**	0.08	***	0.05	*	0.05	**	0.03		0.04	
	(0.02)		(0.02)		(0.03)		(0.03)		(0.02)		(0.03)		(0.03)		(0.03)	
Human Capital	-0.03		-0.03		-0.01		-0.01		0.00		0.00		-0.02		-0.02	
	(0.02)		(0.02)		(0.03)		(0.03)		(0.02)		(0.02)		(0.02)		(0.02)	
Population	0.10	*	0.09		0.04		0.05		-0.10		0.09		0.06		0.05	
	(0.06)		(0.06)		(0.08)		(0.08)		(0.07)		(0.07)		(0.06)		(0.06)	
Overall Tax Burden	0.00		0.00		0.00		0.00		0.00		0.00		-0.01		0.00	
(Total revenues/GDP)	(0.00)		(0.00)		(0.01)		(0.01)		(0.05)		(0.00)		(0.01)		(0.00)	
Taxes on Income, Profits and Capital Gains	0.04				0.04				0.03				0.06	**		
	(0.02)				(0.03)				(0.02)				(0.02)			
Taxes on Goods and Services			0.02				0.04	**			0.02				0.04	*
			(0.02)				(0.02)				(0.02)				(0.02)	
Trade Openness	-0.02	***	-0.01	***												
	(0.00)		(0.00)													
Financial System					0.00		0.00									
					(0.00)		(0.01)									
Electricity Production									0.10	***	0.09	***				
									(0.03)		(0.03)					
Inflation													0.00	***	0.00	**
													(0.00)		(0.00)	
Adjusted R-Squared	0.37		0.34		0.53		0.11		0.36		0.35		0.36		0.32	
Revenue neutrality achieved by adjusting	Taxes on Goods & Services		Taxes on Income, Profits & Cap. Gains		Taxes on Goods & Services		Taxes on Income, Profits & Cap. Gains		Taxes on Goods & Services		Taxes on Income, Profits & Cap. Gains		Taxes on Goods & Services		Taxes on Income, Profits & Cap. Gains	

Notes: Standard errors are in brackets; * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
Sources: Secondary Data, analyzed

In Table 2, interpretations for the coefficients of the independent variables of physical capital; human capital; population; overall tax burden; taxes on income, profits and capital gains; and taxes on goods and services are the same as discussed previously regarding these same coefficients in Table 1 – only their magnitude may be different. One should be cautious, however, in interpreting the results related to the negative coefficients presented in Table 2.

Overall, the robustness tests presented in Table 2 do not seem to confirm the previous findings that income taxes do not have a significant effect on economic growth, and consumption taxes significantly affect economic growth. These previous findings are not robust when additional factors are included as control variables.[7] The variable of trade openness is included as a control variable in columns (1) and (2). In these two columns, the mix of income taxes and consumption taxes do not seem to have a statistically significant impact on long-run GDP growth. Careful measures should be exercised, however, in interpreting the negative coefficient for the independent variable of trade openness in these specifications. It might be incorrect to interpret that the negative coefficient would mean that a higher share of exports and imports in GDP would reduce economic growth; thus alternative explanations on the relationship between trade openness and economic growth – which is beyond the scope of this study – may need to be explored further.

In columns (3) and (4) the maturity of the financial system is included as a control variable. A coefficient of 0.00 for the independent variable of the financial system could be interpreted that a 1% change in the share of domestic credit provided by the financial sector in the economy might change the rate of GDP growth by 0.00%. In these specifications, it is only consumption taxes which show a significant effect on GDP growth. A possible explanation for this phenomenon could be that the more mature an economy's financial system is, the higher would be the consumption in that economy. A well-developed financial system may ease the liquidity constraints facing households, thus raising the level of consumption through a rapid expansion of credit (Boone, Girouard, & Wanner, 2001). In an economy where the financial market is heavily regulated, households may face limits on their ability to borrow due to, for example, low credit limits and high-interest rates. This credit constraint would adversely affect the level of households' consumption. On the other hand, in an economy with liberalization and deregulation of the financial market, relatively higher credit limits and lower interest rates may ease the borrowing constraints faced by households, leaving them with more ability to borrow against their future income to finance current consumption, and thus lead to higher overall consumption. This higher level of consumption may boost economic growth as well as government revenue from consumption taxes.

Columns (5) and (6) add electricity production into the regression equations and found that both income tax and consumption tax do not have a statistically significant impact on economic growth. The interpretation for the coefficient of the independent variable of electricity production is as follows: a 1% change in the output of power plants might change the rate of GDP growth by 0.10% in Column (5) and by 0.09% in Column (6).

Both the coefficients of income taxes and consumption taxes become positive and significant once inflation is introduced into the

[7] Only when the financial system is included in the specification does the result confirm the previous result that only consumption tax affects growth.

equations, as shown in columns (7) and (8). The coefficient of the independent variable of inflation might suggest that a 1% increase in the level of inflation (measured by the consumer price index) could change the rate of GDPs growth by 0.00%. The significant effect of income taxes when inflation is added in these specifications might show the possible decreases in the progressivity of Indonesia's income tax system, relative to inflation. Significant additional tax burdens could arise if income taxes are not adjusted frequently for inflation (Immervoll, 2000).

Hence, it could be inferred that the lack of robust evidence on the effects of tax structures (i.e., the mix between income taxes and consumption taxes) on economic growth seems to confirm the 'super-neutrality conjecture' suggested by Harberger more than 50 years ago.

CONCLUSION

This paper investigates the relation between tax structures and economic growth for the case of Indonesia, over the period 1984-2015, by combining the frameworks of neoclassical and endogenous growth models. Empirical results in this paper found that income tax does not exert any significant effect on economic growth, while consumption tax has a positive and statistically significant impact on growth. However, these results are not robust to changes in the regression's specifications. Hence, although theory predicts that the mix of direct and indirect taxes may be an important determinant of long-run economic growth, this paper provides evidence in support of the claim of Harberger (1964a, 1964b) that, in practice, this mix may be unlikely to affect long-run economic growth. The finding of the lack of a robust relation between tax structures and economic growth in this paper is also consistent with other empirical studies conducted by Acosta Ormaechea and Yoo (2012); Madsen and Damania (1996); Mendoza et al. (1997); Poterba et al. (1986). However, this finding is inconsistent with the studies by (Arnold et al., 2011); Johansson et al. (2008); Kneller et al. (1999); Vartia (2008); Widmalm (2001).

Nonetheless, the finding in this paper does not necessarily imply that efforts to reform the tax system are pointless, since economic growth may not be the only objective of tax reform. Tax policy design may also be influenced by the distributional effects of different tax instruments (its analysis, however, is beyond the scope of this paper). Hence, although the effects of tax structures on economic growth may be minimal, the distributional effects of different taxes could be politically desirable as one of the goals of tax reform. Further, tax reform may also be aimed at improving the tax system's administration since, as Bird (2004) maintained, even the best tax policy would be of little use if it cannot be implemented effectively.

LIMITATIONS AND SUGGESTIONS

Regardless of whether or not tax reform envisages changes to the overall level of the tax burden, identifying the effects of different tax instruments on economic growth may be important for policy design. This identification is particularly useful when the government considers reforming the existing tax structure, in order to minimize the adverse impacts of taxation on economic growth, while maintaining the capacity of the government to finance the desired level of provision of public goods and services.

The finding in this study suggests that there is a lack of evidence on the effects of the mix between income taxes and consumption taxes on Indonesia's long-run economic growth. Hence, policymakers could instead focus their attention to directing tax reform toward improving the tax

system's administration; such as simplifying the tax systems, building trust between taxpayers and tax officials, giving fairer and professional treatment to taxpayers, and facilitating compliance. Another direction for tax reform could also be focused on improving the equity of the tax system.

One of the limitations of this study, however, is that it does not measure the growth rate of technological progress in the economy; as the model assumes technological progress to be purely exogenous and merely a function of time. Hence, further research could be directed toward including the level of technological progress in the model. Another limitation of this study relates to the choice of tax instruments examined in the model. In this case, a further study could expand the model to include the effects of property taxes – particularly recurrent taxes on immovable property – on economic growth. The limited sample of data, due to the reason of availability, may also serve as one of the limitations of this paper; thus further study may be needed when more data are available.

Other avenues of approach for further study might involve offering a quadratic model. However, one should be careful in treating the independent variables of taxes (income taxes, goods and services taxes, and international trade taxes) in the model. This is because taxes may negatively affect economic growth; thus it might not be appropriate to treat them as quadratic variables since doing so may obscure the possibility of the negative effects of taxes in the regression's results.

REFERENCES

Acosta Ormaechea, S., & Yoo, J. (2012). Tax composition and growth: A broad cross-country perspective. *IMF Working Paper, 12*(257).

Aghion, P., Howitt, P., Howitt, P. W., Brant-Collett, M., & García-Peñalosa, C. (1998). *Endogenous growth theory*. MIT press.

Arnold, J. M. (2008). Do tax structures affect aggregate economic growth?: Empirical evidence from a panel of OECD countries. *OECD Economics Department Working Papers, 643*. Retrieved from: http://dx.doi.org/10.1787/236001777843

Arnold, J. M., Bassanini, A., & Scarpetta, S. (2007). Solow or Lucas?: Testing growth models using panel data from OECD countries. *OECD Economics Department Working Papers No. 592*

Arnold, J. M., Brys, B., Heady, C., Johansson, Å., Schwellnus, C., & Vartia, L. (2011). Tax policy for economic recovery and growth. *The Economic Journal, 121*(550), F59-F80.

Aschauer, D. A. (1989). Is public expenditure productive?. *Journal of monetary economics, 23*(2), 177-200.

Atkinson, A. B., & Stiglitz, J. E. (1976). The design of tax structure: direct versus indirect taxation. *Journal of Public Economics, 6*(1), 55-75.

Bank Indonesia. (2017). *Indonesian Financial Statistics*. Retrieved from: http://www.bi.go.id/en/statistik/seki/terkini/keuangan-pemerintah/Contents/Default.aspx

Barro, R. J. (1989). A cross-country study of growth, saving, and government: National Bureau of Economic Research, Inc.

Barro, R. J., & Redlick, C. J. (2011). Macroeconomic effects from government purchases and taxes. *The Quarterly Journal of Economics, 126*(1), 51-102.

Barro, R. J., & Sala-i-Martin, X. (2004). Growth models with consumer optimization. *Economic Growth (Second ed.). New York: McGraw-Hill*, 85-142.

Basri, M. C., & Patunru, A. A. (2012). How to keep trade policy open: the case of Indonesia. *Bulletin of Indonesian Economic Studies, 48*(2), 191-208. doi: 10.1080/00074918.2012.694154

Bird, R. M. (2004). Administrative dimensions of tax reform. *Asia-Pacific Tax Bulletin, 10*(3), 134-150.

Boone, L., Girouard, N., & Wanner, I. (2001). Financial market liberalisation, wealth and consumption. *OECD Economics Department Working Papers*(308). Retrieved from: http://dx.doi.org/10.1787/586625524684

Brondolo, J., Silvani, C., Le Borgne, E., & Bosch, F. (2008). Tax administration reform and fiscal adjustment: the case of Indonesia (2001-07). *IMF Working Papers*, 1-70.

Caballé, J., & Panadés, J. (1997). Tax evasion and economic growth. *Public Finance/ Finances Publiques*, *52*(2), 318-340.

Comin, D., & Hobijn, B. (2004). Cross-country technology adoption: making the theories face the facts. *Journal of Monetary Economics*, *51*(1), 39-83.

Crafts, N. F. (1996). *Endogenous growth: Lessons for and from economic history*. CEPR Discussion Papers.

Dahlby, E. F. B., & Ferede, E. (2012). The impact of tax cuts on economic growth: Evidence from the Canadian provinces. *National Tax Journal*, *65*(3), 563-594.

Easterly, W., & Levine, R. (2003). Tropics, germs, and crops: How endowments influence economic development. *Journal of Monetary Economics*, *50*(1), 3-39.

Easterly, W., & Rebelo, S. (1993). Marginal income tax rates and economic growth in developing countries. *European Economic Review*, *37*(2-3), 409-417.

Ebrill, L., Keen, M., Bodin, J.-P., & Summers, V. (2001). *The modern VAT*. Washington, D.C.: International Monetary Fund.

Ercolani, V., & e Azevedo, J. V. (2014). The effects of public spending externalities. *Journal of Economic Dynamics and Control*, *46*, 173-199.

Feenstra, R. C., Inklaar, R., & Timmer, M. P. (2015). The next generation of the Penn world table. *American Economic Review*, *105*(10), 3150-3182.

Fisman, R., & Love, I. (2003). Financial development and the composition of industrial growth: National Bureau of Economic Research.

Gemmell, N., Kneller, R., & Sanz, I. (2011). The timing and persistence of fiscal policy impacts on growth: Evidence from OECD countries. *The Economic Journal*, *121*(550), F33-F58.

Gemmell, N., Kneller, R., & Sanz, I. (2014). The growth effects of tax rates in the OECD. *Canadian Journal of Economics/Revue canadienne d'économique*, *47*(4), 1217-1255.

Gillis, M. (1989). Comprehensive tax reform: The Indonesian experience, 1981-1988. In M. Gillis (Ed.), *Tax reform in developing countries*. Durham, USA: Duke University Press.

Gillis, M., Shoup, C. S., & Sicat, G. P. (1990). Lessons for developing countries. In M. Gillis, C. S. Shoup & G. P. Sicat (Eds.), *Value Added Taxation in Developing Countries (A World Bank Symposium)*. Washington, D. C.: The World Bank.

Harberger, A. C. (1964a). The measurement of waste. *The American Economic Review*, *54*(3), 58-76.

Harberger, A. C. (1964b). Taxation, resource allocation, and welfare. *The Role of Direct and Indirect Taxes in the Federal Reserve System* (pp. 25-80): Princeton University Press.

Hungerford, T. L. (2012). Taxes and the economy: an economic analysis of the top tax rates since 1945. *CSR Report for Congress*: Congressional Research Service.

Immervoll, H. (2000). The impact of inflation on income tax and social insurance contributions in Europe: EUROMOD Working Paper.

Indonesia Government. (2008). *Undang-Undang Pajak Penghasilan* (Income Tax Law).

Isaksson, A. (2007). *Determinants of total factor productivity: a literature review*. UNIDO Research and Statistics Staff Working Paper, (2). United Nations Industrial Development Organization, Vienna.

James, K. (2015). The rise of the value added tax. New York: Cambridge University Press.

Johansson, Å., Heady, C., Arnold, J., Brys, B., & Vartia, L. (2008). Tax and economic growth. *OECD Economics Department Working Paper*. Paris: OECD.

Katz, C. J., Mahler, V. A., & Franz, M. G. (1983). The impact of taxes on growth and

distribution in developed capitalist countries: a cross-national study. *American Political Science Review, 77*(4), 871-886.

Khan, M. S., & Reinhart, C. M. (1990). Private investment and economic growth in developing countries. *World Development, 18*(1), 19-27.

Kneller, R., Bleaney, M. F., & Gemmell, N. (1999). Fiscal policy and growth: evidence from OECD countries. *Journal of Public Economics, 74*(2), 171-190.

Koester, R. B., & Kormendi, R. C. (1989). Taxation, aggregate activity and economic growth: cross-country evidence on some supply-side hypotheses. *Economic Inquiry, 27*(3), 367-386.

Kutner, M. H., Nachtsheim, C., & Neter, J. (2004). *Applied linear regression models* (4 ed.): McGraw-Hill/Irwin.

Lee, Y., & Gordon, R. H. (2005). Tax structure and economic growth. *Journal of Public Economics, 89*(5), 1027-1043.

Levine, R., & Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. *The American Economic Review*, 942-963.

Levine, R., & Zervos, S. J. (1993). What we have learned about policy and growth from cross-country regressions? *The American Economic Review, 83*(2), 426-430. doi: 10.2307/2117702

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics, 22*(1), 3-42.

Madsen, J., & Damania, D. (1996). The macroeconomic effects of a switch from direct to indirect taxes: an empirical assessment. *Scottish Journal of Political Economy, 43*(5), 566-578.

Mendoza, E. G., Milesi-Ferretti, G. M., & Asea, P. (1997). On the ineffectiveness of tax policy in altering long-run growth: Harberger's superneutrality conjecture. *Journal of Public Economics, 66*(1), 99-126.

Mertens, K., & Ravn, M. O. (2013). The dynamic effects of personal and corporate income tax changes in the United States. *American Economic Review, 103*(4), 1212-1247.

Miller, S. M., & Russek, F. S. (1997). Fiscal structures and economic growth: international evidence. *Economic Inquiry, 35*(3), 603.

Myles, G. D. (2007). Economic growth and the role of taxation: Report for OECD.

Myles, G. D. (2009). Economic growth and the role of taxation-aggregate data: OECD Publishing.

OECD. (2007). Consumption taxes: the way of the future? *OECD Observer*.

Pack, H. (1994). Endogenous growth theory: intellectual appeal and empirical shortcomings. *The Journal of Economic Perspectives, 8*(1), 55-72.

Penn World Table. (2017). *Index of human capital per person*. Retrieved from: http://febpwt.webhosting.rug.nl/Home

Poterba, J. M., Rotemberg, J. J., & Summers, L. H. (1986). A tax-based test for nominal rigidities. *The American Economic Review*, 659-675.

Prawiro, R. (1998). *Pergulatan Indonesia membangun ekonomi: pragmatisme dalam aksi* (Indonesian struggle of economic development: pragmatism in action). Jakarta: Elex Media Komputindo.

Quah, D. (1993). Galton's fallacy and tests of the convergence hypothesis. *The Scandinavian Journal of Economics, 95*(4), 427-443. doi: 10.2307/3440905

Rebelo, S. (1991). Long-run policy analysis and long-run growth. *Journal of political Economy, 99*(3), 500-521.

Romer, & Romer. (2010). The macroeconomic effects of tax changes: estimates based on a new measure of fiscal shocks. *The American Economic Review, 100*(3), 763-801.

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of political Economy, 94*(5), 1002-1037.

Romer, P. M. (1994). The origins of endogenous growth. *Journal of Economic Perspectives, 8*(1), 3-22.

Shalizi, Z., & World Bank Group. (1991). *Lessons of tax reform.* Washington, D. C.: The World Bank.

Simarangkir, G. S., & Nakamura, O. (2010). *The effect of direct tax and indirect tax on gross*

domestic product of Indonesia: macroeconometric model. Universitas Gadjah Mada.

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics, 70*(1), 65-94. doi: 10.2307/1884513

Swan, T. W. (1956). Economic growth and capital accumulation. *Economic Record, 32*(2), 334-361. doi: 10.1111/j.1475-4932.1956.tb00434.x

Taylor, R. J. (2007). *Technical progress and economic growth: an empirical case study of Malaysia*. Cheltenham, UK: Edward Elgar Publishing.

Usui, N. (1997). Dutch disease and policy adjustments to the oil boom: a comparative study of Indonesia and Mexico. *Resources Policy, 23*(4), 151-162. doi: http://dx.doi.org/10.1016/S0301-4207(97)00023-8

Vartia, L. (2008). How do taxes affect investment and productivity?: An Industry-Level Analysis of OECD Countries: OECD Publishing.

Wells, L. T., Allen, N. J., Morisset, J., & Pirnia, N. (2001). Using tax incentives to compete for foreign investment. *FIAS Occasional Paper, 15*.

Widmalm, F. (2001). Tax structure and growth: are some taxes better than others? *Public Choice, 107*(3-4), 199-219.

World Development Indicators. (2017). *World development indicators*. Retrieved from: http://data.worldbank.org/indicator/

Worlu, C. N., & Nkoro, E. (2012). Tax revenue and economic development in Nigeria: a macroeconometric approach. *Academic Journal of Interdisciplinary Studies, 1*(2), 211-223.

Appendix 1. Data Summary

Δln	Minimum	Maximum	Mean	Std. Deviation	Unit & Source
GDP	(0.39)	0.25	0.14	0.11	Rupiah (2010=100), data from the World Development Indicators (WDI)
Physical Capital	(1.52)	2.02	0.15	0.67	Rupiah (2010=100), data from WDI
Human Capital	(0.70)	5.17	1.79	1.38	Index of human capital per person, based on years of schooling and returns to education, data from Penn World Table
Population	1.43	3.02	2.09	0.53	Person, population ages 15-64, data from WDI
Overall Tax Burden	(10.24)	6.56	(0.56)	3.71	Tax revenue as percentage of GDP (this percentage unit is necessary to reflect the 'burden' of the taxes on the overall economy), data from WDI
Taxes on Income, Profits, and Capital Gains	(2.00)	2.86	0.03	0.77	Rupiah (2010=100), data from WDI
Taxes on Goods & Services	(1.87)	2.27	0.21	0.90	Rupiah (2010=100), data from WDI
Taxes on International Trade	(2.42)	3.45	0.09	1.22	Rupiah (2010=100), data from WDI
Trade Opennes	(9.29)	13.44	(0.18)	3.77	The sum of exports and imports of goods and services measured as a share of GDP, data from WDI
Financial System	(2.97)	8.50	1.14	3.23	The values of domestic credit provided by the financial sector as a share of GDP, data from WDI
Electricity Production	(0.01)	3.39	1.53	0.90	The values of production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants, data from WDI
Inflation	(56.50)	122.32	3.40	32.84	Inflation, measured by consumer price index, data from WDI

Appendix 2. Correlation between variables

		GDP	Capital	Human	Population	AllTax	IncTax	ConsTax	TradeTax	Opennes	Financial	Electricity	Inflation
GDP	Pearson Correlation	1	0.402*	0.087	0.116	0.090	0.151	0.211	-0.049	-0.435	0.133	0.463**	-0.566
	Sig. (2-tailed)		0.023	0.637	0.527	0.625	0.408	0.246	0.791	0.013	0.470	0.008	0.001
	N	32	32	32	32	32	32	32	32	32	32	32	32
Capital	Pearson Correlation	0.402*	1	-0.015	-0.064	0.090	-0.134	-0.258	-0.122	0.046	0.036	0.113	-0.472
	Sig. (2-tailed)	0.023		0.937	0.728	0.623	0.465	0.155	0.507	0.802	0.844	0.536	0.006
	N	32	32	32	32	32	32	32	32	32	32	32	32
Human	Pearson Correlation	0.087	-0.015	1	0.863**	-0.012	-0.052	0.116	-0.003	-0.042	0.378*	0.653**	-0.082
	Sig. (2-tailed)	0.637	0.937		0.000	0.947	0.777	0.527	0.987	0.818	0.033	0.000	0.657
	N	32	32	32	32	32	32	32	32	32	32	32	32
Population	Pearson Correlation	0.116	-0.064	0.863**	1	0.059	-0.019	0.132	-0.007	0.093	0.570**	0.786**	-0.052
	Sig. (2-tailed)	0.527	0.728	0.000		0.749	0.916	0.473	0.970	0.614	0.001	0.000	0.778
	N	32	32	32	32	32	32	32	32	32	32	32	32
AllTax	Pearson Correlation	0.090	0.090	-0.012	0.059	1	0.460**	0.034	0.107	0.119	0.259	0.142	-0.291
	Sig. (2-tailed)	0.625	0.623	0.947	0.749		0.008	0.852	0.559	0.518	0.153	0.439	0.106
	N	32	32	32	32	32	32	32	32	32	32	32	32
IncTax	Pearson Correlation	0.151	-0.134	-0.052	-0.019	0.460**	1	0.601**	0.508**	0.040	-0.009	0.022	0.140
	Sig. (2-tailed)	0.408	0.465	0.777	0.916	0.008		0.000	0.003	0.826	0.962	0.906	0.444
	N	32	32	32	32	32	32	32	32	32	32	32	32
ConsTax	Pearson Correlation	0.211	-0.258	0.116	0.132	0.034	0.601**	1	0.500**	-0.271	0.200	0.217	0.051
	Sig. (2-tailed)	0.246	0.155	0.527	0.473	0.852	0.000		0.004	0.134	0.273	0.233	0.783
	N	32	32	32	32	32	32	32	32	32	32	32	32
TradeTax	Pearson Correlation	-0.049	-0.122	-0.003	-0.007	0.107	0.508**	0.500**	1	0.355*	0.052	0.061	0.462**
	Sig. (2-tailed)	0.791	0.507	0.987	0.970	0.559	0.003	0.004		0.046	0.777	0.741	0.008
	N	32	32	32	32	32	32	32	32	32	32	32	32
Opennes	Pearson Correlation	-0.435	0.046	-0.042	0.093	0.119	0.040	-0.271	0.355*	1	0.075	0.001	0.559**
	Sig. (2-tailed)	0.013	0.802	0.818	0.614	0.518	0.826	0.134	0.046		0.683	0.998	0.001
	N	32	32	32	32	32	32	32	32	32	32	32	32
Financial	Pearson Correlation	0.133	0.036	0.378*	0.570**	0.259	-0.009	0.200	0.052	0.075	1	0.781**	-0.140
	Sig. (2-tailed)	0.470	0.844	0.033	0.001	0.153	0.962	0.273	0.777	0.683		0.000	0.444
	N	32	32	32	32	32	32	32	32	32	32	32	32
Electricity	Pearson Correlation	0.463**	0.113	0.653**	0.786**	0.142	0.022	0.217	0.061	0.001	0.781**	1	-0.229
	Sig. (2-tailed)	0.008	0.536	0.000	0.000	0.439	0.906	0.233	0.741	0.998	0.000		0.208
	N	32	32	32	32	32	32	32	32	32	32	32	32
Inflation	Pearson Correlation	-0.566	-0.472	-0.082	-0.052	-0.291	0.140	0.051	0.462**	0.559**	-0.140	-0.229	1
	Sig. (2-tailed)	0.001	0.006	0.657	0.778	0.106	0.444	0.783	0.008	0.001	0.444	0.208	
	N	32	32	32	32	32	32	32	32	32	32	32	32

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Appendix 3. Variance Inflation Factor (VIF)

Independent Variable	Table 1			Table 2						
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Capital	1.066	1.095	1.041	1.070	1.095	1.070	1.116	1.146	1.225	1.312	1.397
Human	4.018	4.022	4.022	4.258	4.264	4.309	4.335	4.052	4.067	4.047	4.048
Population	4.056	4.054	4.056	4.325	4.368	5.502	5.523	6.341	6.452	4.063	4.058
AllTax	1.337	1.034	1.047	1.343	1.045	1.448	1.095	1.347	1.047	1.554	1.125
IncTax	1.326			1.326		1.352		1.328		1.424	
ConsTax		1.091			1.192		1.131		1.176		1.095
TradeTax			1.031								
Openness				1.085	1.186						
Financial						1.756	1.787				
Electricity								2.898	3.120		
Inflation										1.522	1.422