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## Growth-enhancing taxes

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# GROWTH-ENHANCING TAXES

*David de Padua, Mae Hyacinth Kiocho, and Donghyun Park*

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and Donghyun Park

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## **ABSTRACT**

We investigate the conditions under which tax revenues can enhance economic growth. Using a newly constructed dataset consisting of 135 economies and spanning the period 1990–2019, we study how changes in tax revenues impact economic growth using a panel vector autoregression (PVAR) model. Tax revenues have a persistent positive impact on growth, and the association is especially pronounced in emerging economies. Strict inflation targeting, low-inflation, flexible exchange rates, a more developed financial sector, higher investment rates, and strong governance reinforce the growth-enhancing effect of taxes, but these results are conditional on the income level of the economy. Our findings imply that the effect of taxes on growth should be evaluated within macroeconomic and structural constraints.

**Keywords:** taxes, growth

**JEL code:** H20

## 1. Introduction

Tax revenues are essential for economic development. Taxes provide governments with the resources to fund healthcare, education, infrastructure, and other growth-promoting public goods. Taxes can also be a means to achieve other policy objectives, such as redistributing income, improving the efficiency of markets, and influencing the behavior of society. However, it is well-known that taxes create distortions and produce deadweight losses. While higher public spending financed by higher taxes can enhance growth, the distortions from higher taxes can stifle growth. The relationship may depend on the income level of the economy given differing policy and structural constraints.

This paper aims to contribute to the existing literature by examining whether various macroeconomic policies and structural factors influence the impact of taxes on growth. Taxes affecting economic growth and economic growth affecting taxes complicate the estimation of this relationship.<sup>1</sup> We address this issue by employing a panel vector autoregression (PVAR) model, which allows for endogeneity among variables. In addition, we analyze subsamples of different economy groups (e.g., advanced and emerging economies), following Qureshi and Liaqat (2020) and Lof and Malinen (2014). Qureshi and Liaqat (2020) examine the relationship between external debt and economic growth for economy groups at different income levels. Similarly, Lof and Malinen (2014) study the link between sovereign debt and economic growth for economy groups with different levels of debt-to-gross domestic product (GDP) ratio. In this study, we introduce macroeconomic policies, structural factors, and the

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<sup>1</sup> According to Arnold (2008), "In an additional set of robustness checks, an attempt is made to control for the fact that most of the tax indicators used in the analysis are derived from Revenue Statistics and from National Accounts. This could lead to an endogeneity bias insofar as tax revenues increase in expansions and decline in recessions, even though short-run dynamics are accounted for in the regressions."

macroeconomic environment to analyze whether these factors influence the relationship between taxes and growth. Such an analysis can help identify the conditions in which taxes facilitate growth. This can help inform government strategies, which optimize the impact of taxes on growth.

Several studies, which find that tax increases harm growth (Gemmell et al. 2011, Arnold et al. 2011, Alesina and Ardagna 2010), focus on Organisation for Economic Co-operation and Development (OECD) countries. The empirical findings of this paper suggest that the impact of tax revenues to economic growth is not straightforward. More specifically, the tax–growth relationship can be influenced by macroeconomic policies, structural factors, and the macroeconomic environment. These factors help determine the impact of tax revenues on growth. The baseline results show that tax revenues have a positive impact on growth. The relationship differs for advanced and emerging economies. Taxes have a negative effect on growth in the former but potentially positive effect in the latter.

The empirical results confirm that macroeconomic policies, structural factors, and macroeconomic factors influence the tax–growth nexus. For advanced economies, taxes become growth-friendly under a strict inflation-targeting scheme and substantial level of investments. Across the exchange rate regimes and the levels of inflation, the adverse effect of taxes on growth is still observed. However, there are some differences in the persistence and magnitude of the impact. The negative shock is less persistent under a flexible exchange rate regime relative to a fixed exchange rate regime, and the negative impact is greater at high levels of inflation. For emerging economies, taxes harm growth under a strict inflation-targeting scheme and at high levels of inflation. In the full sample,

taxes hurt growth when the financial sector is less developed. This suggests that a well-developed financial sector enhances the growth-promoting effects of taxes. Finally, strong governance is vital for a significant positive impact of taxes on growth.

The results of this paper improve our understanding of the relationship between taxes and growth. We find that the relationship depends on macroeconomic and structural factors, which can either amplify or dilute the growth effect of taxes. That is, taxes on growth should not be viewed alone but with macroeconomic and structural factors.

The existing empirical evidence is ambiguous. Kneller et al. (1999) find adverse effects of some taxes on growth. The study classifies taxes into distortionary and non-distortionary taxes and find that distortionary taxes lower growth while non-distortionary taxes do not. Angelopoulos et al. (2007) and Arnold (2008) show that the relationship depends on the tax structure. Labor income tax is negatively associated with growth. On the other hand, property tax, consumption tax, and personal income tax are more growth-friendly. Meanwhile, the link between corporate income tax and growth differs in the two studies. Angelopoulos et al. (2007) find corporate income tax to be positively related to growth, while Arnold (2008) finds a large negative association. Other studies observe a non-linear relationship between taxes and growth. Gaspar et al. (2016) estimate a tipping point of the tax-to-GDP ratio that would speed up growth and development. Economies whose tax-to-GDP ratio is above 12.75% have a GDP per capita that is 7.5% greater than economies whose tax-to-GDP ratio is below 12.75%. For European economies, Esen and Aydin (2019) similarly estimate a threshold level of taxes that fosters economic growth.



Other factors can influence the relationship between taxes and growth. For example, Phuc Canh (2018) shows that the effect of fiscal policy on growth varies among emerging economies because of differences in institutions and external debt levels. The study finds that high debt weakens the positive impact of fiscal policy on growth, while better institutions magnify the positive impact. Governance-related factors, such as corruption, accountability, rule of law, and economic freedom, are observed to influence tax efforts (Bird et al., 2008) and affect the main impact of taxes on growth (Baldacci et al., 2004). Furthermore, the burden of taxes on growth can be influenced by financial sector developments, such as better credit information sharing and greater financial access, which reduce tax evasion (Beck et al., 2014).

The rest of the paper is organized as follows: Section 2 explains the PVAR approach and describes the panel data. Section 3 presents the baseline PVAR estimation results of the tax–growth relationship. Section 4 examines the impact of macroeconomic policies, structural factors, and the macroeconomic environment. Section 5 investigates the effect of taxes on investment, an important channel through which taxes can affect growth. Section 6 discusses thresholds and Section 7 concludes the paper.

## **2. Methodology and Data**

### **2.1. Panel Vector Autoregression Approach**

We used the PVAR model to facilitate our analysis of the relationship between taxes and growth. An advantage of the PVAR model is that it assumes all variables to be endogenous and interdependent. In addition, it has a cross-sectional dimension, which takes the cross-sectional heterogeneity into account.

We consider a  $k$ -variate homogeneous PVAR of order  $p$  with panel-specific fixed effects represented by the following system of linear equations:

$$\mathbf{Y}_{it} = \mathbf{Y}_{it-1} \mathbf{A}_1 + \mathbf{Y}_{it-2} \mathbf{A}_2 + \cdots + \mathbf{Y}_{it-p+1} \mathbf{A}_{p-1} + \mathbf{Y}_{it-p} \mathbf{A}_p + \mathbf{u}_i + \mathbf{e}_{it}$$

$$i \in \{1, 2, \dots, N\}, t \in \{1, 2, \dots, T_i\} \quad (1)$$

where  $\mathbf{Y}_{it}$  is a  $(1 \times k)$  vector of dependent variables, and  $\mathbf{u}_i$  and  $\mathbf{e}_{it}$  are  $(1 \times k)$  vectors of dependent variable-specific panel fixed-effects and idiosyncratic errors, respectively. The parameters to be estimated are the  $(k \times k)$  matrices  $\mathbf{A}_1, \mathbf{A}_2, \dots, \mathbf{A}_{p-1}, \mathbf{A}_p$ . It is assumed that  $\mathbf{E}(\mathbf{e}_{it}) = 0$ ,  $\mathbf{E}(\mathbf{e}'_{it}\mathbf{e}_{it}) = \Sigma$  and  $\mathbf{E}(\mathbf{e}'_{it}\mathbf{e}_{is}) = 0$  for all  $t > s$ .

In estimating the relationship of taxes and growth, the tax revenues as percentage of GDP and the per capita GDP growth rates are used. The estimated PVAR model is as follows:

$$y_{it} = \mathbf{A}y_{it} + u_i + e_{it}$$

$$i \in \{1, 2, \dots, N\}, t \in \{1, 2, \dots, T_i\} \quad (2)$$

The impulse response functions (IRFs) are obtained after estimating the PVAR model to observe the impact of the tax burden on growth. The IRFs allow us to isolate the effect of tax burden on growth, holding other variables constant. We perform 200 Monte Carlo simulations to estimate the confidence intervals of the IRFs.

Several studies have used PVAR models to examine different relationships among macroeconomic variables. For instance, Lof and Malinen (2014) analyze the relationship between sovereign debt and economic growth. They find that debt has no effect on growth even at higher levels of debt, and the negative correlation between the two is due to the negative impact of growth on debt. Jawadi et al. (2016) examine the impact of fiscal and

monetary policies on GDP, price, and liquidity conditions. A positive interest rate shock or a monetary contraction leads to reduced economic activity, a fall in prices, and a tightening of liquidity conditions, while a positive shock on government spending results in greater economic activity, higher prices, and no increase in the interest rate. Apostolakis and Papadopoulos (2019) employ the PVAR model to investigate the linkages among financial stability, inflation, and growth. They find that inflation and growth are adversely affected by a positive shock to financial stress. Olaoye et al. (2020) analyze the relationship of government spending and economic growth on the Economic Community of West African Studies. The results find no evidence of any causal relationship, unidirectional or bidirectional, between government expenditure and economic growth.

Aside from tax revenues and economic growth, the other variables in the vector of dependent variables include labor productivity growth rate, total investment as percentage of GDP, trade as percentage of GDP, research and development (R&D) as percentage of GDP, and the rate of inflation. Following Kneller et al. (1999) and Angelopoulos et al. (2007), the standard growth determinants, labor productivity growth, and total investments as percentage of GDP are included as control variables. Other control variables are trade as percentage of GDP, R&D as percentage of GDP, and inflation rate (Arnold 2008, Lee and Gordon 2005, Mendoza et al. 1997). These variables can independently affect growth but are also possible channels through which taxation can influence growth. How taxes affect growth via their impact on other growth determinants is explained in Easterly and Rebelo (1993) and Engen and Skinner (1996), among others.

## 2.2. Data

A novel panel tax database is created and used for the analysis, covering 135 economies for the period 1990–2019. It includes information on the economies' tax revenues, GDP growth rates, and other variables that may be associated to the relationship between tax burden and growth. The tax database is constructed from the OECD Revenue Statistics Database, the International Monetary Fund (IMF) Government Finance Statistics (GFS)-Revenue Database, World Development Indicators, and Asian Development Bank (ADB) Key Indicators. The OECD Revenue Statistics Database serves as the base dataset. The data on the economies and years not covered by the OECD Revenues Statistics Database are obtained from the IMF GFS, World Development Indicators, and ADB Key Indicators.

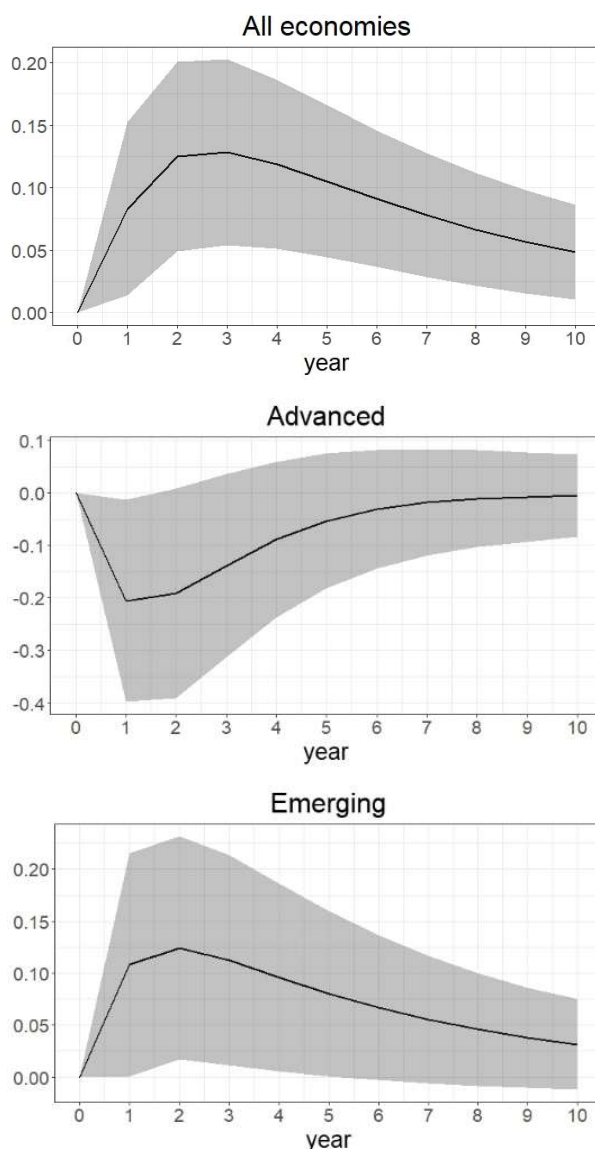
Additional indicators help us understand the relationship between tax burden and growth. The indicators describe macroeconomic policies, structural factors, and the macroeconomic environment. Macroeconomic policy variables include inflation targeting, exchange rate regime, and fiscal rules. The exchange rate regime classification comes from Ilzetzki et al. (2019, 2022), while the information on fiscal rules is obtained from the IMF Fiscal Rules Dataset. Structural factors include governance and financial sector development, which are represented, respectively, by the Worldwide Governance Indicators (WGIs) from the World Bank and the financial development index from the IMF Financial Development Index Database. Indicators for the macroeconomic environment include investments, savings, and inflation. The levels of investments and savings are expressed in terms of percentage of GDP, while inflation is in terms of percentage of consumer price index growth. A full description of the dataset is available in the Appendix.

### **3. Baseline Results**

In this section, we discuss the impact of tax revenues on per capita GDP growth using the PVAR approach. The sample is then divided into advanced and emerging economies to examine whether the impact varies for these different subgroups.

At an aggregate level, tax revenues have a positive effect on growth, as shown in Figure 1. The positive impact is significant and persistent, continuing for several years after the shock. Higher taxes are thought to be harmful because of the distortions created, but higher taxes also suggest greater resources for public expenditures that can be productive to growth (Arnold 2008). These results suggest that the latter effect dominates, at least for this sample of economies.

The impact of tax revenues on growth is quite different between advanced and emerging economies. For advanced economies, the tax revenues post an adverse effect on growth. The effect is transitory, appearing only a year after the shock. On the other hand, for emerging economies, the tax revenues have a positive and continuing effect on growth, lasting for about 5 years after the shock. The key takeaway from this empirical result is that the effect of taxes on growth has different dynamics for advanced economies and emerging markets.

**Figure 1: Baseline Results**

*Note:* Impulse response functions (IRFs) of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations. We also perform 1,000 Monte Carlo simulations to obtain the IRFs and estimate the confidence intervals of the baseline PVAR estimations. We find the same results as with the 200 Monte Carlo simulations.

Source: Authors' calculations.

The different results for advanced and emerging economies may be connected to government size. Bergh and Henrekson (2011) review the existing theoretical considerations, which imply an inverse U-shaped relationship between government size

and economic growth. For low-income or emerging economies with relatively small public sectors, the relationship between government size and growth is positive. On the other hand, for high-income or advanced economies with relatively large public sectors, the relationship is negative. When the government is small, the growth of the government may lead to the provision of basic services such as protecting property rights, establishing rule of law, and expanding spending on infrastructure, education, and health. These are productive expenditures that facilitate growth. On the other hand, when the government is large, the marginal negative growth effect of less productive government spending may outweigh the positive growth effect of productive expenditures. The negative effect of government size may arise as the government grows, given that the distortions from taxes become greater at higher levels of taxes. Furthermore, interest groups' actions associated with rent-seeking activities that divert resources from productive use are more likely in larger public sectors. We explore these factors in the next section.

#### **4. Factors Influencing the Relationship Between Taxes and Growth**

Having established the baseline result, we now introduce additional control variables on macroeconomic policies, structural factors, and the macroeconomic environment. These allow us to dig deeper into how these specific factors may affect the relationship between taxes and growth. We explore this by separating the sample across groups based on these factors and employing the PVAR estimation model. The groupings based on the additional control variables are explained in sections 4.1–4.3.

##### **4.1. Role of Macroeconomic Policies**

We look at three macroeconomic policies—inflation targeting, exchange rate regime, and fiscal rules—and examine whether the adoption and the choice of these policies would

have an influence on how taxes affect economic development. In employing such policies, the governments seek to achieve credibility, flexibility, or stability to improve macroeconomic performance and resilience to shocks (Berger et al. 2000, Kopits 2001, Ayres et al. 2014). Several studies have shown that inflation and growth performance vary across the types of inflation-targeting schemes, exchange rate regime, and fiscal rules (Ghosh et al. 1997, Levy-Yeyati and Sturzenegger 2003, Bleaney and Francisco 2007, Gonçalves and Salles 2008, Mollick et al. 2011, Afonso and Jalles 2013, Ayres et al. 2014, Grembi et al. 2016). We explore whether the choice of macroeconomic policies also matters to the relationship between taxes and growth.

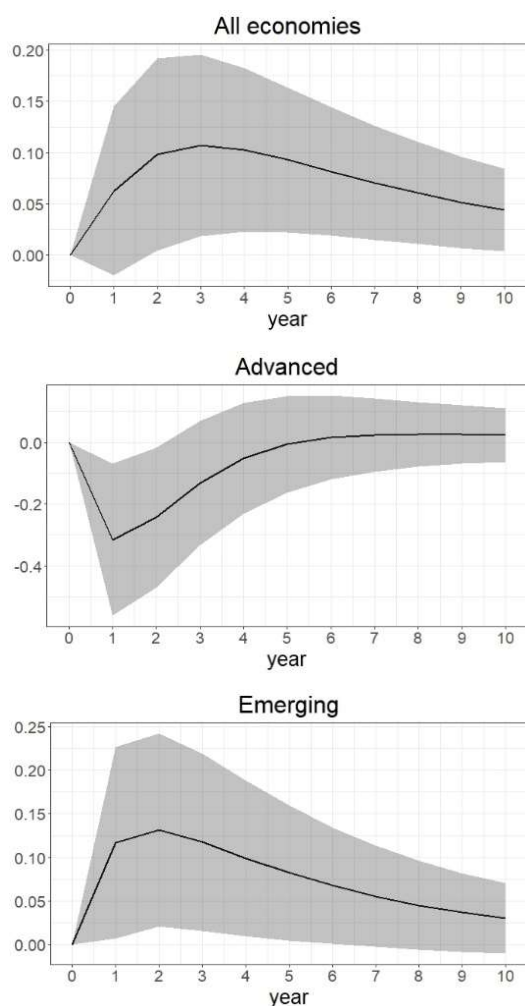
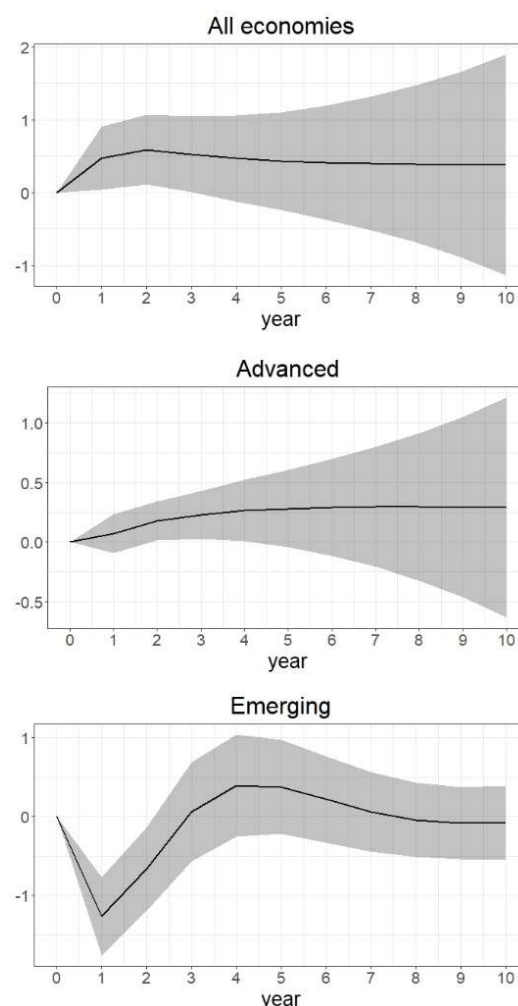
#### **4.1.1. Inflation Targeting**

Findings from several studies have shown that the adoption of an inflation-targeting scheme can lead to differentiation of macroeconomic performance across economies. The economies that adopted inflation targeting are observed to have lower inflation, reduced output variability, and higher income per capita as inflation targeting instills stability, which allows economies to better withstand crises (Gonçalves and Salles 2008, Mollick et al. 2011, Ayres et al., 2014). In addition, Ayres et al. (2014) find that effects of an inflation-targeting scheme on inflation and growth vary across regions. A group of Middle Eastern, North African, Southern European, and Eastern European economies experienced lower inflation rates and short-term economic growth after adopting inflation targeting. On the other hand, Asian, sub-Saharan African, and Oceanic economies that adopted inflation targeting experienced a rise in inflation and no substantial changes in economic growth. For advanced economies, Ball and Sheridan (2004) find no difference in the economic performance of targeting versus non-targeting economies. Meanwhile,



Gonçalves and Salles (2008) show that emerging economies that adopted inflation targeting enjoyed lower inflation rates and smaller output variability. Since the adoption of inflation targeting can affect aspects of economic performance, there is a possibility that it can also influence the relationship between taxes and growth.

The aggregate sample is grouped based on whether the implemented inflation-targeting scheme is strict or not. For all economies, the impact of tax revenues on growth is positive regardless of the inflation-targeting scheme (Figure 2). The difference between the two inflation-targeting schemes is observed in the duration of the effect, with a more persistent impact associated with a loose inflation-targeting scheme. For advanced economies, a negative effect of taxes on growth is associated with a loose inflation-targeting scheme, while a positive impact is noted with a strict inflation-targeting scheme. The opposite is observed for emerging economies—the positive impact of tax revenues on growth is seen with a loose inflation-targeting scheme, while a negative impact on growth is associated with a strict inflation-targeting scheme.

**Figure 2: Inflation-Targeting Scheme****(a) Loose Inflation-Targeting Scheme****(b) Strict Inflation-Targeting Scheme**

*Note:* Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, as well as across the types of inflation-targeting schemes (i.e., strict and loose). The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

These findings are consistent with existing literature. Lucotte (2012) finds that the adoption of inflation-targeting scheme improves tax collection in emerging economies. The study uses a propensity score matching approach and finds that total public revenues are significantly positive and large in magnitude in emerging economies that adopted

inflation targeting. A similar approach is used by Kazemi et al. (2020) in investigating the impact of inflation targeting on direct taxes and distinguishing the impact between oil-importing and oil-exporting economies. They observe that the adoption of inflation targeting increases direct taxes of oil importers, while there is no impact on the direct taxes among oil exporters. Meanwhile, Galvis Ciro and Ferreira de Mendonça (2016) relate the success in achieving the inflation target to the reputation of the central bank and examine the effect of the reputation on tax effort. Their results show that the reputation of the monetary authority causes a higher tax effort in Colombia.

Past studies relating monetary policy to fiscal policy discuss that the adoption of an inflation-targeting framework can lead to more disciplined fiscal policies (Lucotte 2012) and promote institutional quality (Minea et al. 2021), which would improve tax collections. The adoption of inflation targeting constrains the government in using seigniorage tax to source revenues. Thus, the government is forced to improve tax collection efforts from other sources of revenues to recoup the losses from seigniorage tax. Our results indicate that strict inflation targeting is associated with a positive effect of taxes on growth in advanced economies while loose inflation targeting is associated with a positive impact in emerging economies. This difference may be related to the credibility and thus effectiveness of inflation targeting, which, in turn, affects the impact of taxes on growth. Strict inflation targeting may be more credible in advanced economies, while loose inflation targeting may be more credible in emerging economies. Strict targeting is viewed as less credible in emerging economies, which depend more heavily on seigniorage as a source of government revenues (Cukierman et al. 1992). On the other hand, loose

targeting may be seen as a lack of commitment to inflation targeting in advanced economies.

#### **4.1.2. Exchange Rate Regime**

Past studies observed that macroeconomic performance of economies differs across different exchange rate regimes. In developing economies, Bleaney and Francisco (2007) find that lower inflation and slower growth are associated with hard pegs, and that float and soft pegs have similar growth rates.<sup>2</sup> However, float pegs have slightly higher inflation compared to soft pegs. For Ghosh et al. (1997), lower inflation and less variability are observed alongside fixed exchange rate regimes. Though fixed exchange rate regimes are also associated with higher investments, they are seen to have slower productivity growth. Hence, output growth is higher with flexible exchange rate regimes. On the other hand, the findings of Levy-Yeyati and Sturzenegger (2003) present that exchange rate regimes do not affect growth for industrial economies. But for developing economies, exchange rate regimes have a significant impact on growth, wherein slower growth and greater output volatility are associated with less flexible exchange rate regimes. As such, it is of interest to examine if exchange rate regimes have an influence on how taxes may impact economic growth.

The data of Ilzetzi et al. (2019, 2022) classify the different exchange rate regimes into six categories, as shown in Table 1.

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<sup>2</sup> Bleaney and Francisco (2007) group observations into three classification schemes: float pegs, soft pegs, and hard pegs. Float pegs describe those that are free, managed, or dirty floats. Soft pegs are the regimes that are categorized in the intermediate category, such as crawling pegs or bands.

**Table 1: Coarse Classification of Exchange Rate Regimes**

Category	Description
1	<ul style="list-style-type: none"> <li>• No separate legal tender</li> <li>• Pre-announced peg or currency board arrangement</li> <li>• Pre-announced horizontal band that is narrower than or equal to (+/-) 2.0%</li> <li>• De facto peg</li> </ul>
2	<ul style="list-style-type: none"> <li>• Pre-announced crawling peg</li> <li>• Pre-announced crawling band that is narrower than or equal to (+/-) 2.0%</li> <li>• De facto crawling peg</li> <li>• De facto crawling band that is narrower than or equal to (+/-) 2.0%</li> </ul>
3	<ul style="list-style-type: none"> <li>• Pre-announced crawling band that is wider than or equal to (+/-) 2.0%</li> <li>• De facto crawling band that is narrower than or equal to (+/-) 5.0%</li> <li>• Moving band that is narrower than or equal to (+/-) 2.0% (i.e., allows for both appreciation and depreciation over time)</li> <li>• Managed floating</li> </ul>
4	<ul style="list-style-type: none"> <li>• Freely floating</li> </ul>
5	<ul style="list-style-type: none"> <li>• Freely falling</li> </ul>
6	<ul style="list-style-type: none"> <li>• Dual market in which parallel market data is missing</li> </ul>

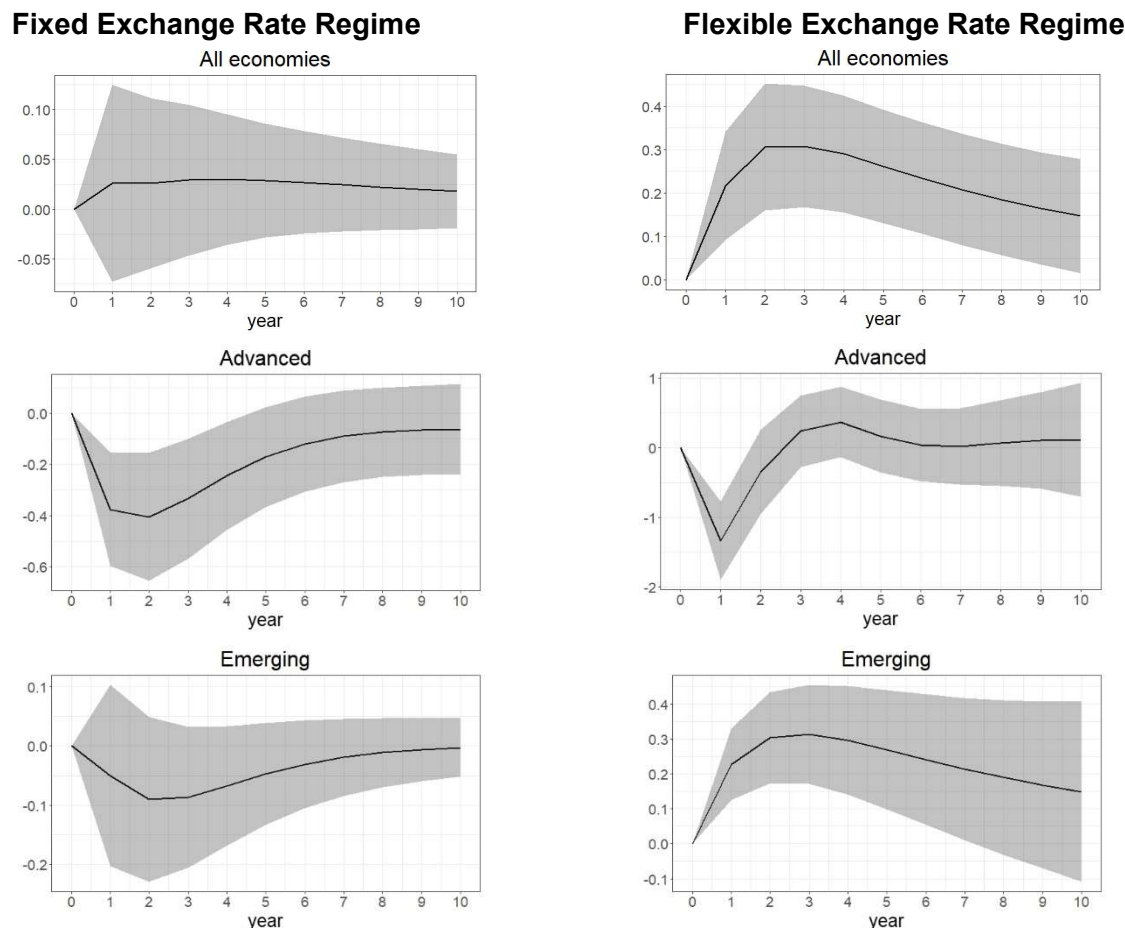
Sources: Ilzetzi, Ethan, Carmen M. Reinhart, and Kenneth S. Rogoff. 2019. "Exchange Arrangements Entering the Twenty-First Century: Which Anchor will Hold?" *The Quarterly Journal of Economics*, 134 (2): 599–646; Ilzetzi, Ethan, Carmen M. Reinhart, and Kenneth S. Rogoff. 2022. "Rethinking Exchange Rate Regimes." In *Handbook of International Economics 6*, edited by Gita Gopinath, Elhanan Helpman, and Kenneth Rogoff, 91–145. North Holland: Elsevier.

We separate the sample into two groups based on two types of exchange rate regime: fixed and flexible. The arrangements categorized as less than 3 based on the classification above is grouped into the fixed exchange rate regime.<sup>3</sup> On the other hand, the arrangements with greater than or equal to 3 are grouped under the flexible exchange rate regime.

For all economies, the positive impact of tax revenues on growth that we have seen in the baseline results is only present among those with a flexible exchange rate

<sup>3</sup> Ilzetzi et al. (2019) observe that arrangements that are less flexible than managed floating have a low degree of exchange rate variability.

regime (Figure 3). The effect of tax revenues on growth for advanced economies does not differ between the two types of exchange rate regime. A negative effect of tax revenues on growth is observed for both exchange rate regimes. The impact is transitory for the flexible exchange rate regime, with the effect persisting for only 1 year after the shock. The adverse effect of taxes on growth associated with a fixed exchange rate regime is more persistent, lasting for 4 years after the shock. For the emerging economies, the effect of tax revenues on growth varies between the two. A negative impact on growth is associated with a fixed exchange rate regime, but the impact is not significant. The effect of tax revenues on growth is positive for those with a flexible exchange rate regime.

**Figure 3: Exchange Rate Regime**

*Note:* Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, as well as across the types of exchange rate regimes (i.e., fixed and flexible). The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

A flexible exchange rate regime seems to facilitate taxes to positively affect growth for emerging economies; while for advanced economies, a flexible exchange rate regime lessens the permanence of the negative impact of taxes on growth. The result is aligned with previous studies, which found a positive link between flexible exchange rate regime and economic growth. Levy-Yeyati and Sturzenegger (2003) find that lower growth and greater output volatility are associated with fixed exchange rate regime, particularly for

developing economies. They explain that, in the event of shocks, the constrained adjustments in exchange rates and prices under a fixed exchange rate regime may result in price distortions and misallocation of resources, which can cause higher output volatility. The inflexibility of macroeconomic adjustments, especially in times of uncertainty, would have negative consequences on growth. Several studies relate the degree of macroeconomic adjustments brought by the different exchange rate regimes to the government's fiscal discipline. In the model of Tornell and Velasco (2000), a flexible exchange rate regime compels the government to be more disciplined, since consequences of unsound fiscal policies are immediately realized via exchange rate movements. Compared to a fixed rate regime, the consequences of imprudent fiscal policies are delayed and manifested when the situation is already unsustainable or when the eventual collapse of the peg is already irreversible, which can be politically costly to the government. Their empirical exercise using sub-Saharan African economies matches the implications of their model wherein the choice of the exchange rate regimes affects the degree of fiscal adjustments. Jalles et al. (2016) also find that (i) fixed exchange rate regime is associated with less fiscal discipline and (ii) flexible exchange rate regime intensifies the positive effects of strong politics on fiscal performance. They suggest that, in a way, the flexible exchange rate regime creates an environment that helps foster fiscal discipline.

The positive impact of taxes on growth for emerging economies and the less permanent negative adverse effect of taxes on growth for advanced economies observed in the flexible exchange rate regime may be a result of the fiscal discipline that the flexible exchange rate regime facilitates. Fiscal discipline is relatively greater in emerging



economies, which tend to face higher risks to fiscal sustainability. The association of flexible exchange rate regime with greater fiscal discipline suggests that sound fiscal policies are important transmission mechanisms through which the impact of taxes on growth is enhanced in economies with flexible exchange rates.

Another important mechanism may be the well-known role of flexible exchange rates as shock absorbers. That is, flexible exchange rates cushion economies against external shocks, enabling the governments to prioritize growth-promoting expenditures such as health, education, and infrastructure as the objective of fiscal policy. This tendency is likely to be more prevalent in emerging economies, where economic growth is a relatively more significant overall policy objective than in advanced economies.

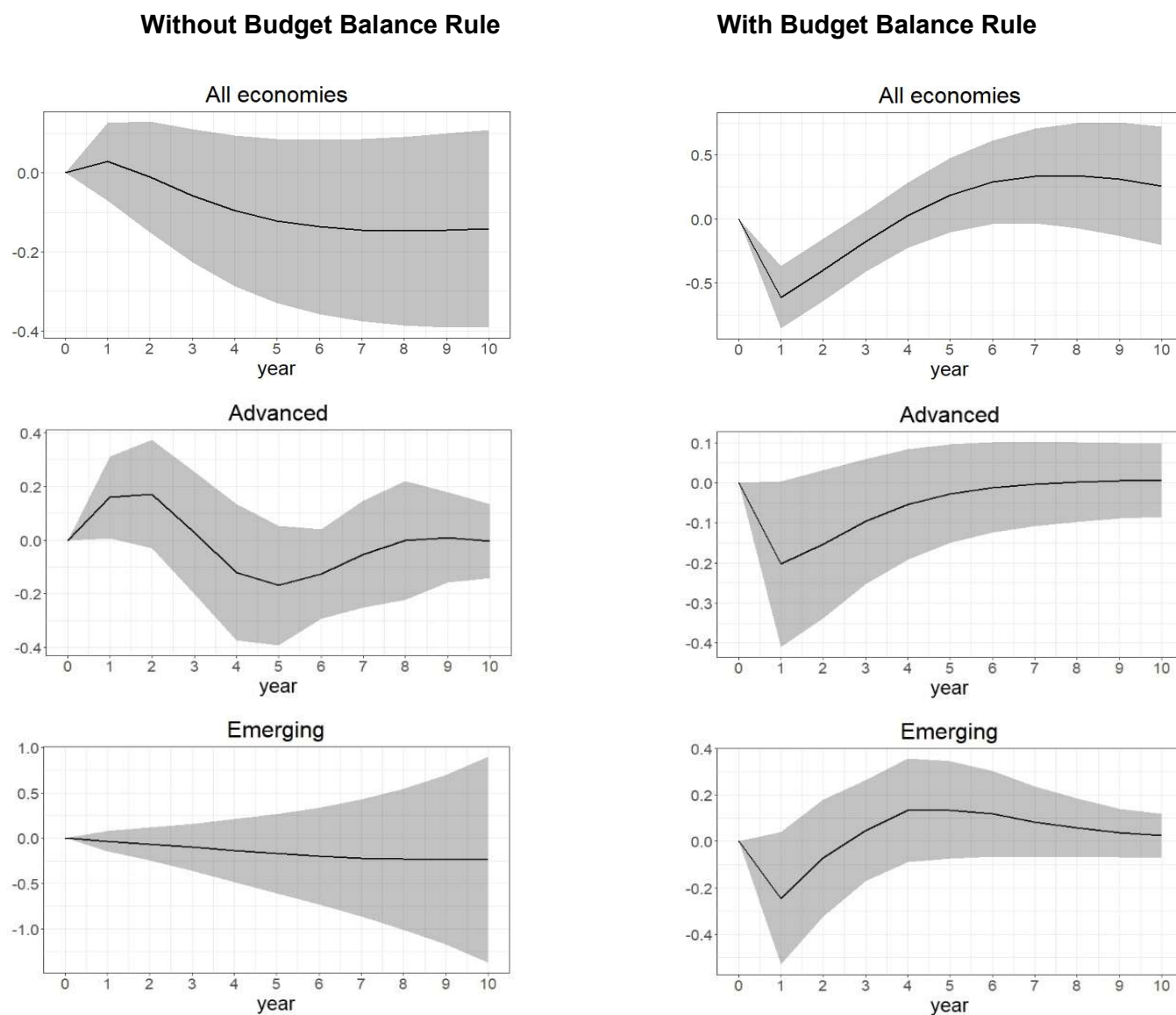
#### **4.1.3. Fiscal Rules**

Fiscal rules set a constraint on budgetary aggregates, of which taxes are a major component. Since taxes can be directly affected by the fiscal rules, these can in turn influence the impact of taxes on growth. Some studies have shown that fiscal rules are effective in improving fiscal balances. Grembi et al. (2016) conclude that fiscal rules are important in restraining public debt, and they find that relaxation of fiscal rules leads to lower tax rates and lower tax revenues in unconstrained cities in Italy. Caselli and Reynaud (2020) find that presence of fiscal rules is not necessarily associated with lower deficits, but fiscal rules should be well-designed in order to have a positive and significant impact on fiscal balance. Other studies have also presented that the effect of fiscal rules on fiscal balances have consequences for growth. The average growth of European economies is seen to be statistically higher for the period after the Maastricht Treaty, in which the 3% of GDP deficit rule was assessed (Castro 2011). Afonso and Jalles (2013)

find evidence that fiscal rules facilitate growth and that stricter rules can counter the adverse effect of big governments on growth.

The IMF Fiscal Rules Dataset contains information on the use and the types of fiscal rules employed in 106 economies from 1985 to 2021. The four types of fiscal rules contained in the dataset are budget balance rules, debt rules, expenditure rules, and revenue rules. We determine whether the presence of fiscal rules affects the relationship of taxes and growth by estimating the PVAR model separately for the sample with a fiscal rule implemented and for the sample with no fiscal rule. This is done for each type of fiscal rule and for an overall fiscal rule indicator that was created. The overall fiscal rule is a binary indicator that classifies observations between those with any of the fiscal rules implemented or those with none of the fiscal rules implemented.

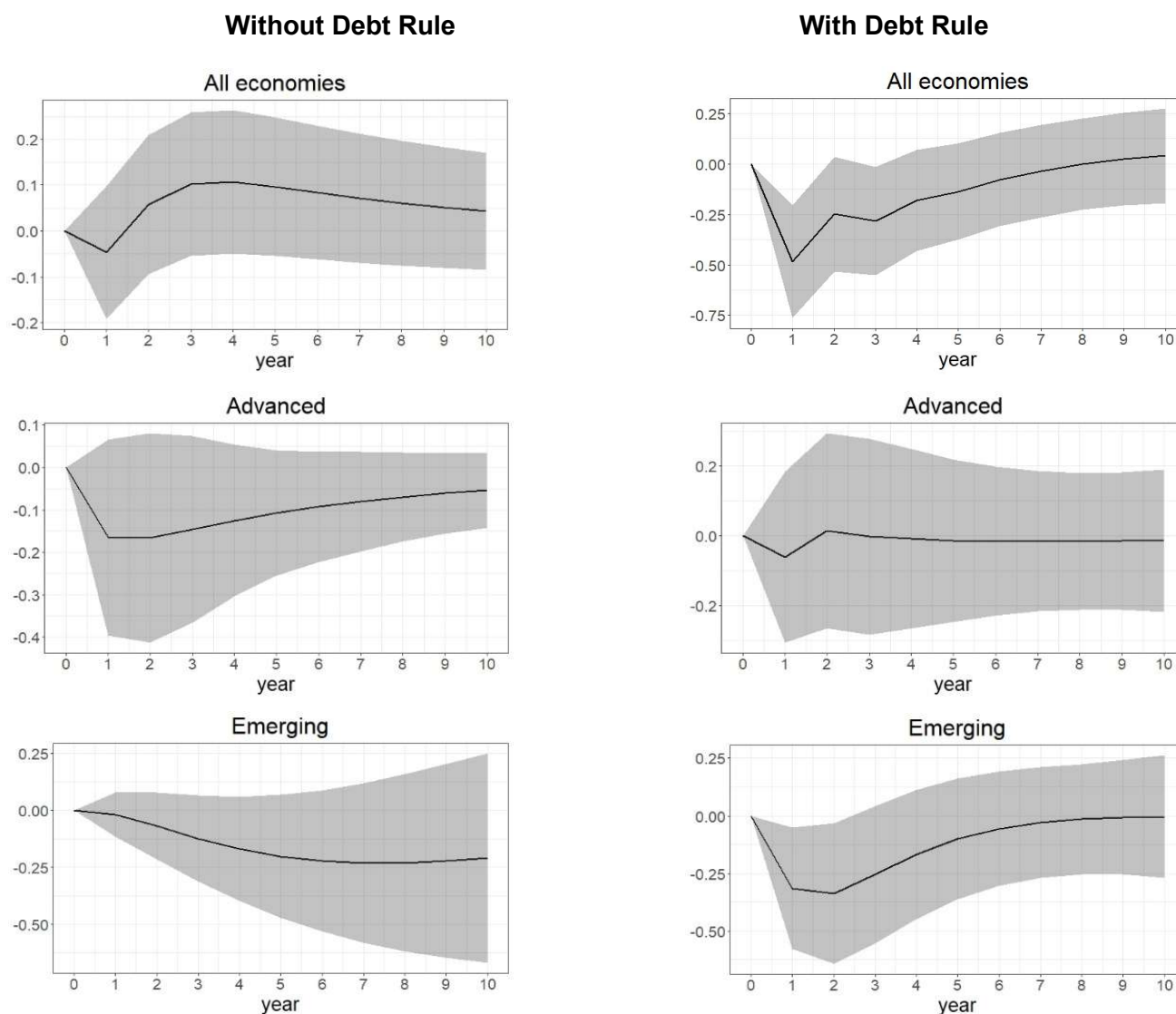
How fiscal rules impact the relationship of taxes and growth are different across the types of fiscal rule. Using all the economies, the presence of a revenue rule does not affect the positive impact taxes have on growth. In contrast, we find that growth is adversely affected by taxes when a budget balance rule (Figure 4) or a debt rule (Figure 5) is implemented.

**Figure 4: Fiscal Rules—Budget Balance Rule**

*Note:* Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, together with groupings on whether fiscal rule is implemented or not. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

Figure 5: Fiscal Rules—Debt Rule



*Note:* Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, together with groupings on whether fiscal rule is implemented or not. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

There are several reasons for the adoption of fiscal rules, among them are to ensure fiscal policy sustainability, to restrain use of inconsistent discretionary policy, and to strengthen fiscal discipline of the government. The importance of fiscal rules rests on

the observed relationship of discretionary policy to output and inflation volatilities. Badinger and Reuter (2017) present that aggressive discretionary policy leads to output volatility and, indirectly, to inflation volatility. The result implies the importance of fiscal rules to limit discretionary policy to reduce output and inflation volatilities. The study of Sachi and Salotti (2015) demonstrates this ability of the fiscal rules, finding a negative sign on the interaction term of the discretionary policy and the fiscal rule in its relation to output volatility. On the other hand, fiscal rules can be limiting to the effectiveness of fiscal policy. These rules can lead to smaller public sectors, reducing the ability of fiscal policies to impact the economy. This argument stems from the observations made by Galí (1994) and Fatás and Mihov (2001) in which greater government size results in more stable output levels.

From the results, the effect of taxes on growth depends on the type of fiscal rules implemented. A revenue rule is associated with a positive impact of taxes on growth. The revenue rule, which involves setting ceilings or floors on revenues or determining the use of unexpected earnings, improves certainty about the amount of revenues and promotes a more efficient use of revenues. On the other hand, taxes affect growth negatively when an expenditure rule or a debt rule is present. An expenditure rule sets a limit on spending either through the growth of expenditures or its ratio to GDP while the debt rule involves putting a clear limit on the stock of public debt. Both rules constrain the amount of government spending and thus constrain the amount of tax revenues, which, in turn, limits the impact of tax revenues on growth in the short term.

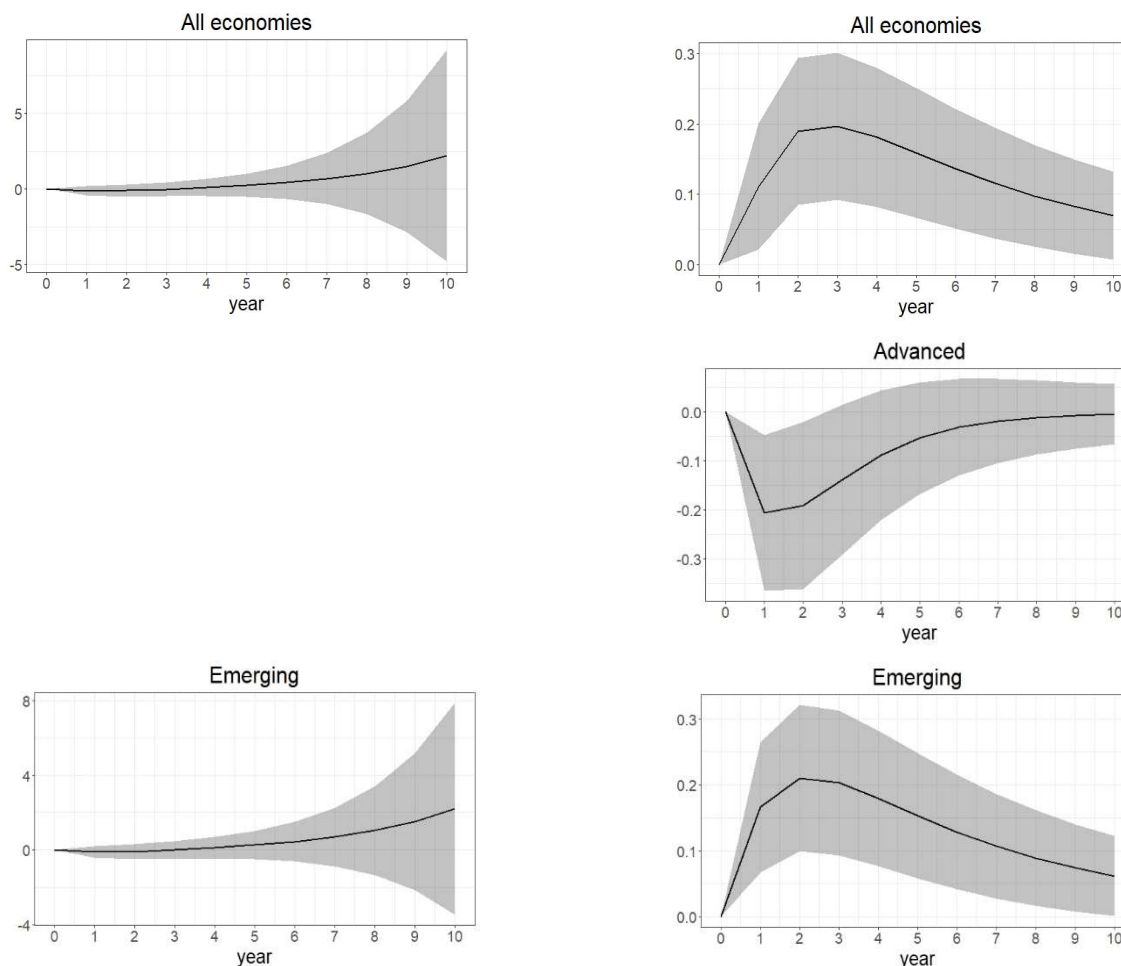
## **4.2. Structural Factors**

### **4.2.1. Governance**

The WGI describes six dimensions of governance: (i) voice and accountability, (ii) political stability and absence of violence, (iii) government effectiveness, (iv) regulatory quality, (v) rule of law, and (vi) control of corruption. The estimates are reported in standard normal units and range from  $-2.5$  to  $2.5$ , with higher values indicating better performance. The sample is separated between weak and strong performance based on the WGI. Relatively weak performance is defined as those with estimates lower than zero, while those with relatively strong performance have estimates greater than or equal to zero.

The results show that the impact of tax revenues on growth only appears when governance is relatively strong (Figure 6). For relatively weak governance, taxes do not affect growth. The result is consistent across the six WGIs. We see this for all economies and for emerging economies. For advanced economies, there are no observations or too few observations classified as having weak performance for the six WGIs, but we see the negative impact of taxes on growth for some WGIs of those with relatively strong performance. Overall, the results suggest that an environment of good governance can enable taxes to have a positive impact on growth.

**Figure 6: Worldwide Governance Indicators—Government Effectiveness**  
**Weak Performance**                      **Strong Performance**



**Notes:**

1. Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, as well as groupings on the quality of governance (i.e., weak and strong). The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.
2. The PVAR was not estimated for the advanced economies with weak governance since there are too few observations.

Source: Authors' calculations.

Well-developed institutions and good governance promote economic growth, while corruption and poor governance hinder economic development. Institutions affect economic growth by defining the incentive structure of the society and determining the

cost of the society's activities.<sup>4</sup> North (1990) states, "Third world countries are poor because the institutional constraints define a set of payoffs to political/economic activity that do not encourage productive activity." A smaller avenue of research related to institutions and economic performance focuses on the link of government, institutions, and economic growth. The government is among society's players, so its actions and their consequences are constrained by institutions. In the model of Chaudhry and Garner (2007), they present that rent-seeking activities of the government, which have an adverse effect on growth, are suppressed by a better institutional environment represented by a higher cost of adopting growth-reducing policies faced by the government. Afonso and Jalles (2016) argue that governments utilize a substantial share of the economy's resources so that actions of the government exert an impact on the growth of the economies and that the effect on growth depends on the quality of institutions. They found that large governments result in negative growth and that the negative impact on growth is larger among those with low levels of institutional quality. Meanwhile, Phuc Canh (2018) shows that the effectiveness of fiscal policy in facilitating economic growth is affected by the differences in institutions in emerging economies. The study finds that the interaction terms of government expenditure with the institutional indicators post a positive impact on growth, which implies that improvement in institutions enhances the effectiveness of fiscal policy in promoting growth.

The quality of governance and institutions is important for the pro-growth effect of taxes and other fiscal policies (Arvin et al. 2021, Ivanyna and Salerno 2021). In line with Phuc Canh (2018), who finds that governance and institutional quality influence the

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<sup>4</sup> North (2008) presents that formal rules, informal constraints, and characteristics related to the enforcement of the constraints constitute institutions.



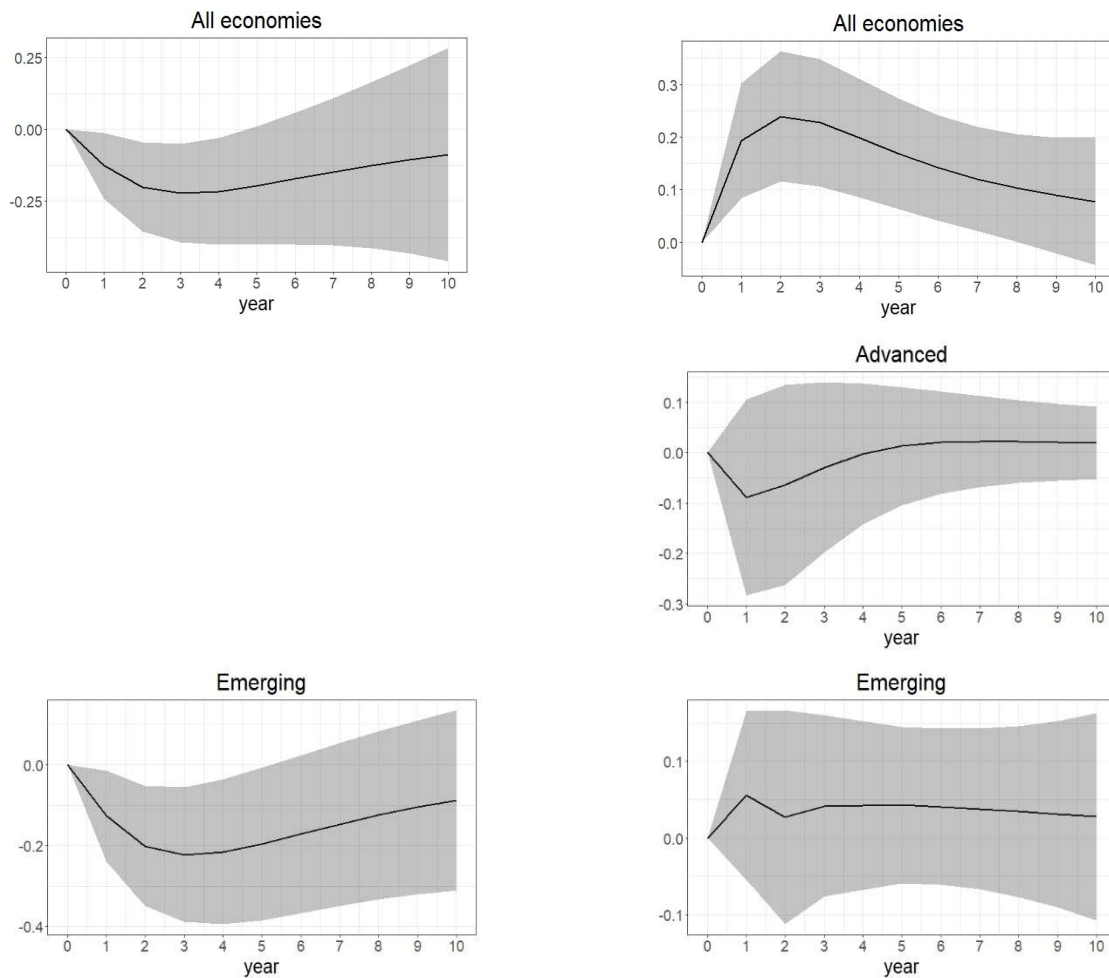
effectiveness of fiscal policy, our study observes that the baseline impact of taxes on growth is visible only when the level of governance is high. At a broader level, our results suggest that good governance and institutions are vital for the transformation of tax revenues into productive and efficient government spending, which, in turn, amplify their impact on growth. On the other hand, bad governance and institutions harm the quality of government spending.

#### **4.2.2. Financial Sector Development**

To characterize the financial sector development, we use the financial development index. The index is normalized so that values range from 0 to 1, where higher values indicate greater financial development. The sample is categorized into two groups, those with a less developed financial sector and those with a more advanced financial sector. We define the groups based on the median value of the financial development index. The observations with values less than the median are grouped into the less developed financial sector, while those with values greater than or equal to the median is classified under the more advanced financial sector group.

The effect of tax revenues on growth differs between the two groups based on the financial sector development (Figure 7). For all economies, a less developed financial sector is associated with tax revenues having a negative impact on growth. Meanwhile, the effect of tax revenues on growth is positive when the financial sector is more developed. The exercise cannot be done for advanced economies since all of them have advanced financial sectors. For emerging economies, those with less-developed financial sectors show a negative impact of taxes on growth.

**Figure 7: Financial Development Index**  
**Less Developed Financial Sector      More Advanced Financial Sector**



**Notes:**

1. Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, as well as groupings on the development of the financial sector using the financial development index. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.
2. The PVAR was not estimated for the advanced economies with less developed financial sector since there are too few observations.

Source: Authors' calculations.

A positive (negative) impact of taxes on growth when the financial development index is relatively high (low) may suggest that a well-developed financial sector mitigates the costs of taxes. While taxes create distortions in allocative decisions, the financial sector fosters growth by improving the allocation and mobilization of resources. The

functions of the financial sector such as allocating resources, mobilizing savings, and easing the trading of goods and services are significantly connected to growth. Levine (1997) points that the financial sector lowers information and transaction costs in savings and investment decisions. De Gregorio and Guidotti (1995) find that financial intermediation improves the efficiency of investment, which would impact growth.

Another way of interpreting the result is that a developed financial sector improves the efficiency of tax collection so that the benefits of tax outweigh its costs as costs are minimized. Ilievski (2015) shows that the higher stock market total value added is positively significant to tax revenues, while Gilbert and Ilievski (2016) show that expected taxes rise with banking activity. The studies find that the financial sector boosts tax revenues. They conjecture that a weak financial system imposes a constraint in the collection of taxes, resulting in inefficiency, a lower tax base, and a high occurrence of tax avoidance. Tsaurai (2021) finds that financial development enhances the effect of taxes on growth, wherein a complementarity between taxation and financial development leads to a positive impact on growth. A more advanced financial sector provides better means for fiscal policies; hence, the aim of tax collection, allocation, and distribution to foster growth is made effective only when the financial system is developed (Ott and Tatom 2006, Gnangnon 2019, Tsaurai 2021).

A well-developed financial sector augments the growth impact of taxes for yet another reason. Financial sector development lowers the government's cost of borrowing. For example, a large and smoothly functioning market for government bonds enables the government to borrow more at a lower cost. Financial development thus enables the government to more easily borrow and complement tax revenues with borrowed funds

when necessary—for example, when there is an unexpected shortfall in tax revenue collection. This prevents the disruption of public spending, including growth-promoting public spending such as infrastructure investment in emerging economies.

### **4.3. Macroeconomic Environment**

#### **4.3.1. Savings**

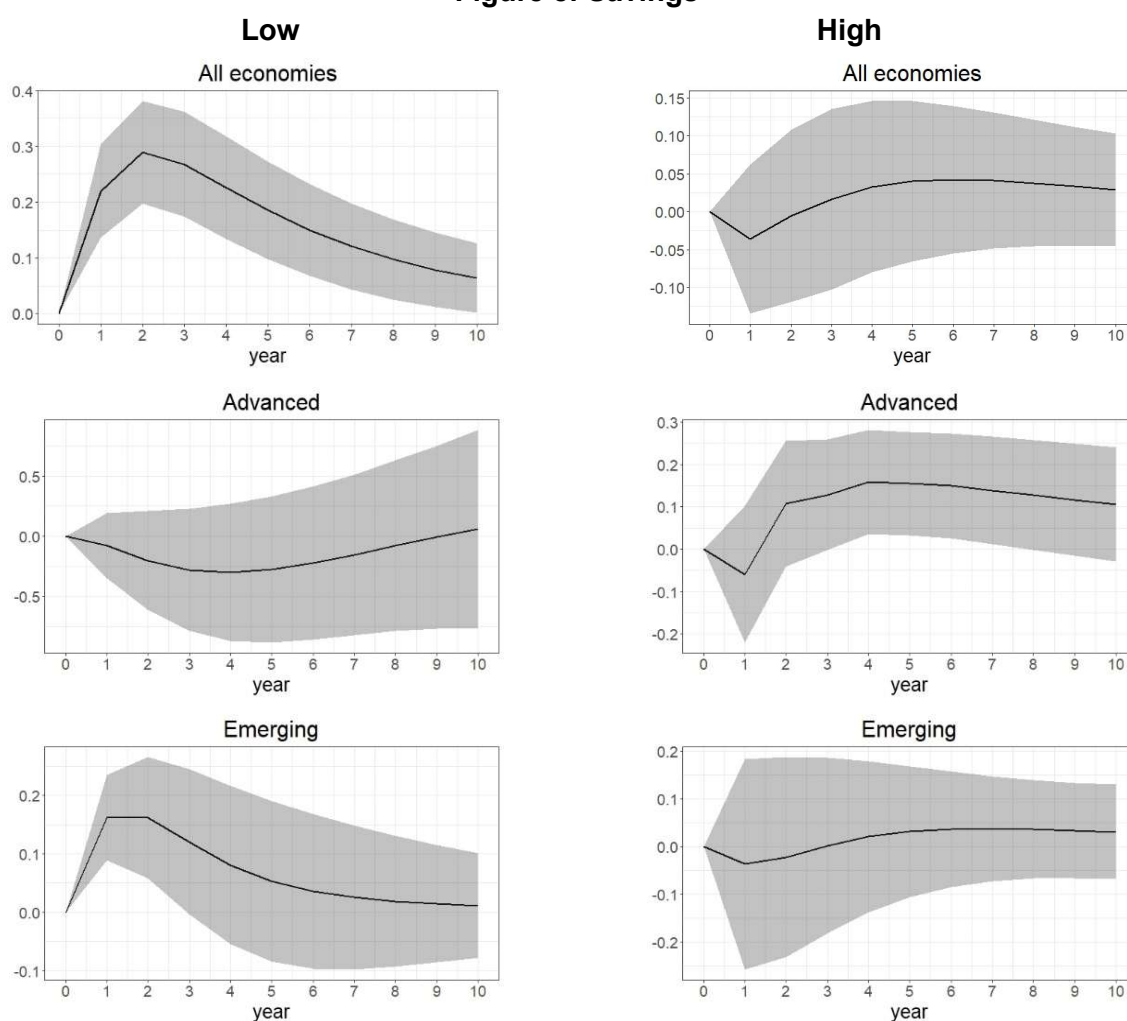
The sample is grouped in terms of levels of savings characterized by the variable national savings as percentage of GDP. The median of the variable is utilized to categorize low and high levels of savings. The values less than the median are classified as low levels of savings, while the values greater than or equal to the median are considered as high levels of savings.

The baseline effect of taxes on growth appears at low levels of savings, though only significant when using all economies and for emerging economies (Figure 8). At high levels of savings, taxes seem to have an immediate adverse effect on growth in all samples, but this negative effect is insignificant.

The positive effect of taxes on growth in emerging economies is observed at low levels of savings. This may be because, for low-income economies, the savings channel is not as powerful as the factor productivity channel for taxes to affect growth (Baldacci et al. 2004). Taxes directly affect the rate of return to savings, resulting to changes in capital accumulation of savers (Summers 1982). With high levels of savings, the impact of taxes on growth is no longer significant. It may be the case that, at high levels of savings, the adverse effect of taxes on accumulation of capital may be stronger. As the share of savings to national income is high, the effect can lead to negative consequences on growth, which can cancel out the growth-friendly effects of taxes.

More fundamentally, taxes are a relatively more important channel for mobilizing domestic resources for investment and other productive spending when the level of savings is low. That is, the scarcity of private domestic resources means that public domestic resources—i.e., tax revenues—must play a greater role in growth-promoting expenditures. As savings rise, the relative importance of tax revenues in domestic resource mobilization declines.

**Figure 8: Savings**



*Note:* Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, as well as groupings on the levels of savings. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

### 4.3.2. Investments

The levels of investments are described by the investments as a percentage of GDP variable. We use the median of the variable to separate observations—low levels of investments are characterized by values less than the median, while high levels of investments are values greater than or equal to the median.

Savings and investments are among the channels in which taxes can influence growth. Taxes affect private decisions, including the individual's decision to save and accumulate capital (Johansson et al. 2008), since taxes alter the income stream of the individual and the real rate of return of savings and investments (Boadway and Wildasin 1994). Other studies point out that it is not the level of savings and investments that is being affected by taxes, but rather the composition of savings and investments (Bovenberg 1989, Johansson et al. 2008).<sup>5</sup> Barro (1991) finds that taxes can be growth-enhancing through investments in public services having positive externalities in the private sector. However, taxes can also adversely affect growth by reducing savings and capital. Aside from impacting growth through changes in private savings and decisions, taxes can directly affect public savings. Krieckhaus (2002) finds that public savings are associated with higher growth for developing states when they are used for productive investments.

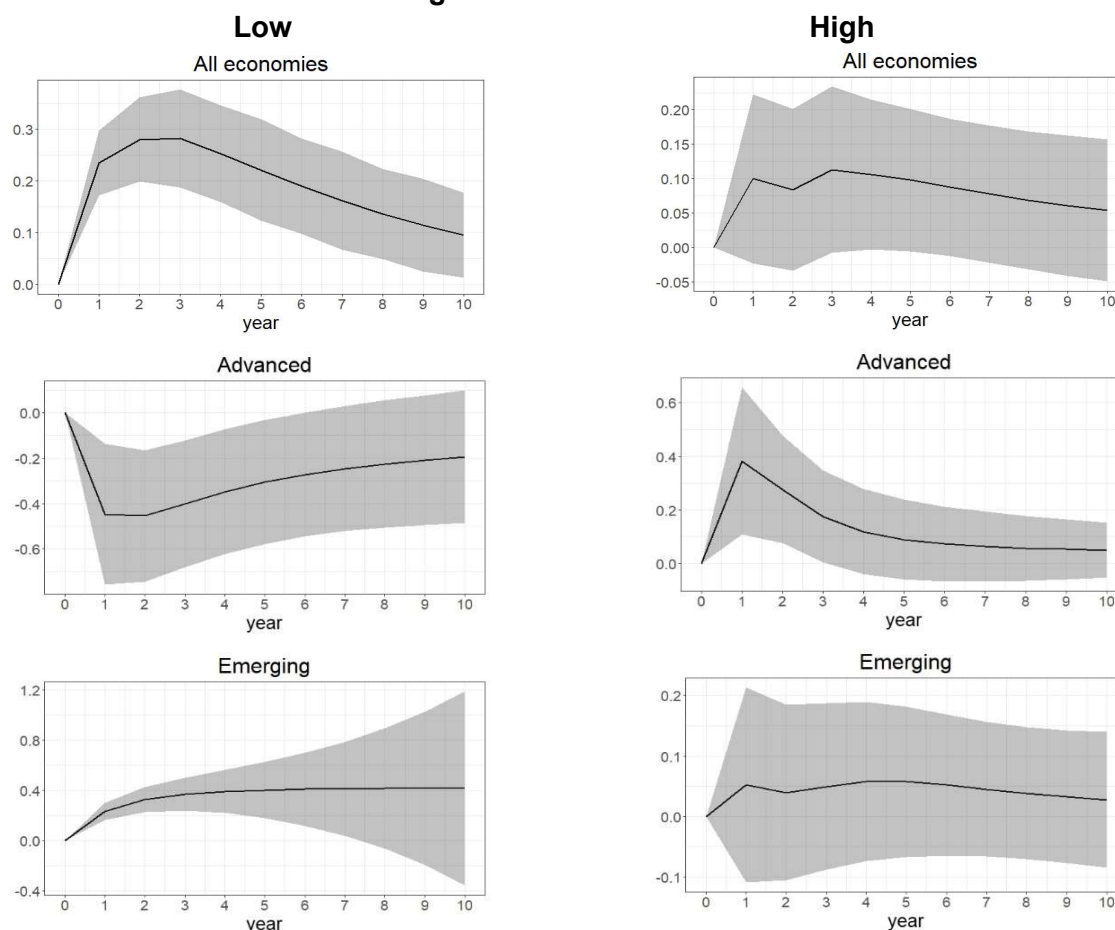
For the full sample of economies and emerging economies, the positive impact of taxes on growth is greater at low levels of investments than at high levels of investments (Figure 9). This is intuitively plausible since public spending financed by tax revenues

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<sup>5</sup> Bovenberg (1989) and Johansson et al. (2008) point out that the effect of taxes on the level of savings and investments is small and uncertain as findings determining the relationship of savings and the real rate of return remain inconclusive (e.g., Hall, 1988; Summers, 1982).

such as health, education, and infrastructure will have a relatively more significant impact on growth when other investments are low. For advanced economies, the positive impact of tax revenues on growth is observed at only high levels of investment, probably because of the synergy between public and private investments in productivity-enhancing investments such as R&D. This is in line with the study of Baldacci et al. (2004), which finds that, in high-income economies, investments are the primary channel through which fiscal policies affect growth.

**Figure 9: Investments**



*Note:* Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, as well as groupings on the levels of investments. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

### 4.3.3. Inflation

To characterize observations with relatively low and high inflation, we separate the samples by using the median. Low inflation is described by values less than the median, while high inflation is characterized by values greater than or equal to the median.

For all economies, the baseline result wherein taxes positively affect the growth is observed only when inflation is relatively low (Figure 10). Regardless of the level of inflation, taxes have an adverse effect on growth for the advanced economies, though the magnitude of the negative impact seems to be larger when inflation is relatively high. For emerging economies, the impact of taxes on growth varies between those with relatively low and high inflation. The positive effect of taxes on growth is associated with a relatively low inflation. When inflation is relatively high, for emerging economies, taxes have an adverse effect on growth.

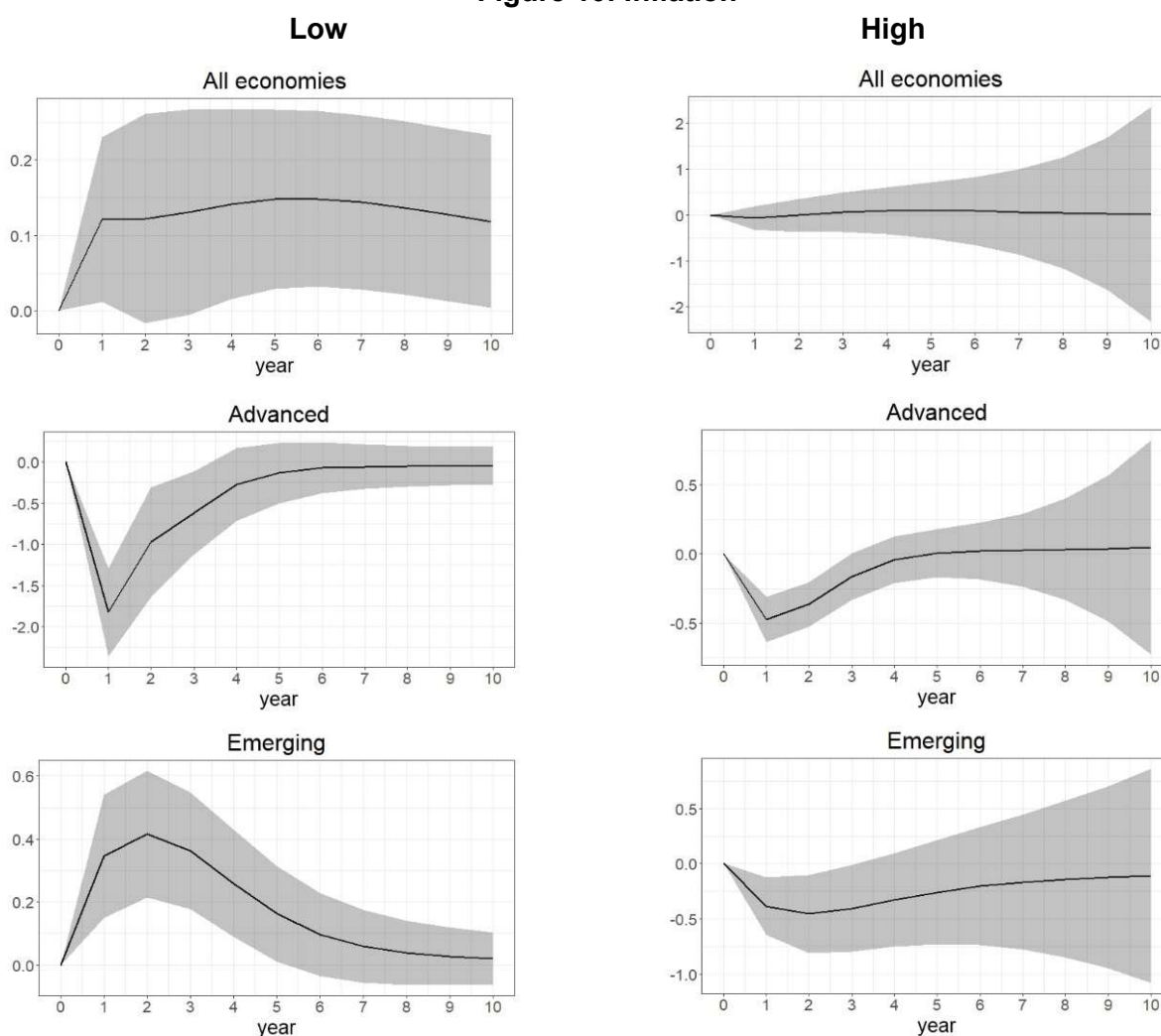
Persistent high inflation is a signal of inefficiencies in the tax system (De Gregorio 1993). This can be explained by the model of Cukierman et al. (1992) in which economies with greater political instability and a more polarized political system will exhibit inefficient tax systems and, therefore, will rely more heavily on seigniorage or inflationary tax. The link between inflation and the tax structure is also shown by Roubini and Sala-i-Martin (1992), wherein a government subjected to a high tax evasion in income chooses to increase revenue through seigniorage by repressing the financial sector and increasing inflation rates.

The positive impact of taxes on growth becoming non-existent at high levels of inflation using all economies and turning negative at high levels of inflation for emerging economies may be explained through the presence of inefficient tax systems. Inefficient



tax system is associated with substantial costs in the administration and enforcement of collecting tax revenues. With an inefficient tax system, the distortionary effects of taxes may be more substantial so that the costs of taxes outweigh the benefits of taxes through the financing of productive spending.

Overall, the results indicate that low inflation amplifies the positive impact of tax revenues on growth. Low inflation reflects macroeconomic stability, which, in turn, reflects sound monetary and fiscal policies. A central component of sound fiscal policy is the efficient use of tax revenues, which increases the positive effect of taxes on growth. The positive growth impact of taxes ultimately depends on the extent to which tax revenues are used productively, for instance via public investment in infrastructure.

**Figure 10: Inflation**

*Note:* Impulse response functions of per capita gross domestic product (GDP) growth to a shock in the tax as a percentage of GDP were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies, as well as groupings on the level of inflation. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

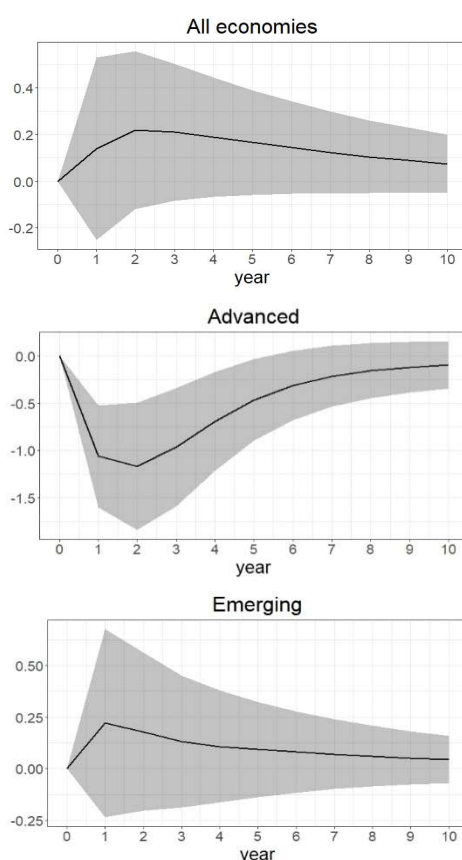
## 5. Effect of Taxes on Investments

We examine one of the channels through which taxes can affect growth, which is investments. We obtain the investment data of the sample with disaggregation between private and public investments from the Investment and Capital Stock Dataset of the IMF.

The relationship between taxes and investment growth is analyzed by estimating the PVAR equation (1) and replacing GDP growth with investment growth.<sup>6</sup>

Our findings show that taxes do not affect investment growth from the sample of all economies and emerging economies (Figure 11). But for advanced economies, taxes can affect investment growth. The impact of taxes is negative and is quite persistent, lasting for about 5 years after the shock.

**Figure 11: Impact of Taxes on Investments Growth**

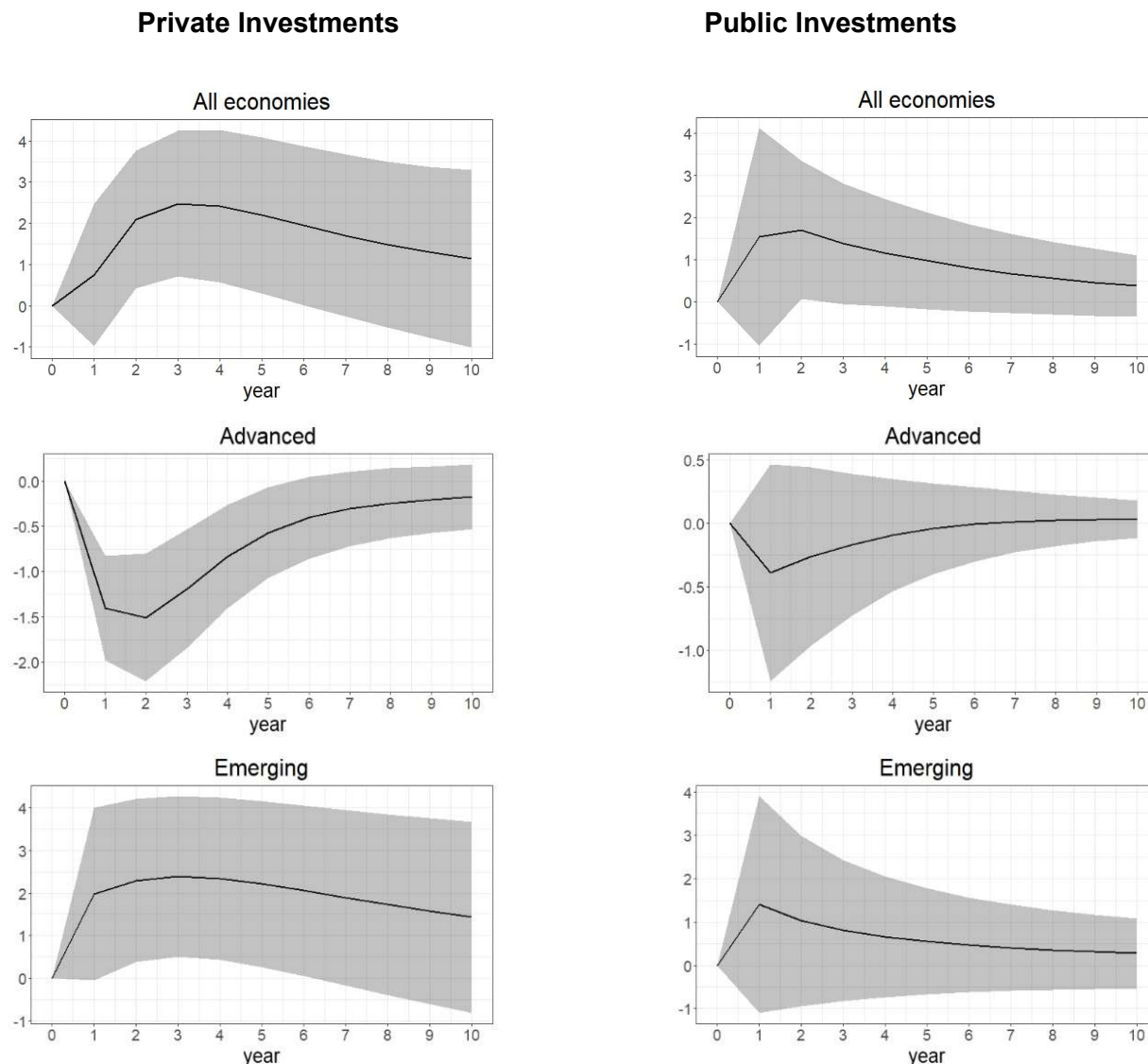


*Note:* Impulse response functions of growth in investments to a shock in the tax as a percentage of gross domestic product were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

<sup>6</sup> The investments growth is the year-on-year percentage change of total investments, calculated as the sum of both government and private gross fixed capital formation in the dataset. The growth of public investment is the year-on-year percentage change of government gross fixed capital formation, while the growth of private investment is the year-on-year change of private fixed capital formation.

Between the types of investments, taxes have a significant impact on the growth of private investments (Figure 12). Taxes seem to be irrelevant to the growth of public investments. The observed impact on private investment growth is similar to our baseline results of the impact of taxes on growth. For the sample of all economies and emerging economies, taxes have a positive impact on the growth of private investments. On the other hand, taxes post an adverse effect on private investment growth for advanced economies, with such effect appearing to be quite strong for both total investment growth and private investment growth. This may be because the investment channel is a primary channel in which fiscal policy affects growth for high-income economies, unlike for low-income economies wherein the investment channel is not as effective (Baldacci et al. 2004).

**Figure 12: Impact of Taxes on Growth of Private and Public Investments**

*Note:* Impulse response functions of growth in private and public investments, respectively, to a shock in the tax as a percentage of gross domestic product were obtained from the panel vector autoregression (PVAR) for all countries, advanced economies, and emerging economies. The shaded area represents the 90% confidence intervals based on 200 Monte Carlo simulations.

Source: Authors' calculations.

In most growth models, taxes on investments and income are anticipated to adversely affect growth given that private returns to accumulation of investments are reduced (Easterly and Rebelo 1993). The direct effect of taxes on investments is that they

distort private decisions, discouraging investments and possibly diverting resources from productive investments to less productive ones (Bovenberg 1989, Johansson et al. 2008). Using cross-sectional data on economies, Djankov et al. (2010) find that aggregate investments, foreign direct investments (FDIs), and entrepreneurial activity are negatively and substantially affected by effective corporate taxes. Similarly, the findings of Herger et al. (2016) show that corporate taxes broadly have an adverse impact on FDIs.

Advanced and emerging economies post different effects of taxes on investment growth. Developing economies, compared to developed economies, differ in structure, capacity of tax administration, and availability of basic data, which may pose dissimilarities in the effectiveness and efficiency of tax systems between the two groups of economies (Tanzi and Zee 2000). Baldacci et al. (2004) point to several characteristics of low-income economies that inhibit the investment channel, such as the underdeveloped financial markets, low responsiveness of interest rate of private investments, and restricted economic freedom. Their findings present that, for low-income economies, the factor productivity channel is a stronger channel relative to the investment channel for fiscal policy to facilitate growth. Also, tax structures vary between advanced and emerging economies. From the tax database, tax revenues of emerging economies are largely from taxes on goods and services, unlike in advanced economies wherein taxes from income, profits, and capital gains also have a substantial share of the revenues, with the taxes from goods and services (Table 2). The high reliance of advanced economies on taxes on income, profits, and capital gains suggests a larger investment tax base or large coverage of investments, which can make the distortions created by taxes more visible in advanced economies. The investment channel being the

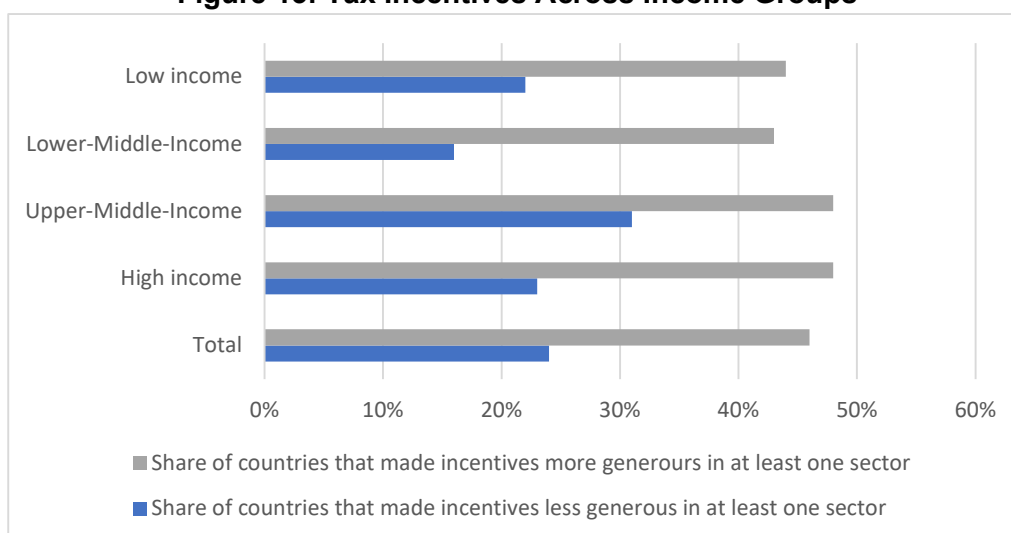
primary channel of fiscal policy to affect the growth and tax structure of the advanced economies may point to the more observable effect of taxes on investments in advanced economies relative to emerging economies, as seen in our results.

**Table 2: Percentage Share of Tax Revenues to Total Revenues**

<b>Type of Tax Revenues</b>	<b>Advanced Economies</b>	<b>Emerging Economies</b>
Taxes from income, profits, capital gains	44.5%	38.5%
Taxes from payroll (social security contributions)	1.4%	0.9%
Taxes from property	9.0%	3.1%
Taxes from goods and services	45.1%	57.5%

Source: Authors' calculations from the tax database.

Relatedly, the tax incentives implemented among groups of economies can affect the impact of taxes on investments. The incidence of tax incentives is somewhat the same across income groups (Figure 13). But Mosquera Valderrama and Balharová (2021) note that the role of tax incentives is different between developed and developing economies. Tax incentives are used to encourage exports, facilitate R&D activities, and improve the domestic market's position globally in the case of developed economies. As for developing economies, the aim of tax incentives is to attract FDIs. This may be a possible explanation for the positive effect seen in emerging economies. The tax system of emerging economies may be more geared toward encouraging and increasing investments rather than direct investments into specific instruments.

**Figure 13: Tax Incentives Across Income Groups**

Source: Presentation by Kronfol, Hania, and Sebastian James. 2021. "Taxing Times: The Role of Investment Incentives in Economic Recovery and Growth" [Webinar]. World Bank. 27 May. <https://www.worldbank.org/en/events/2021/05/05/taxing-times-the-role-of-incentives-in-economic-recovery-and-growth>

## 6. Comments on Threshold

Several theoretical models and empirical studies have presented the non-linear relationship of taxes and growth. Barro (1991) and Armey (1995) postulate an inverse U-shaped relationship between government size and growth. Using an endogenous growth model, Barro (1991) shows that, initially, growth rate rises with the tax rate as private productivity is enhanced by public services financed through taxes. But as the tax rate increases, private investments are discouraged, which can be detrimental to growth. Eventually, this latter effect dominates the effect on private productivity so that with a very large government, tax rate is negatively related to growth. Esen and Aydin (2019), employing a dynamic panel threshold model, find this inverse U-shaped relationship of tax revenues and growth for 11 central and southeastern European and Baltic economies. Their findings present that taxes, as a share of GDP below the threshold, have a beneficial impact on growth. In addition, above the threshold, the tax ratio to GDP adversely affects



growth. They also observe different thresholds for different economy groups: 18.0% for full transition economies, 18.5% for developing economies, and 23.0% for developed economies. Similarly, the results of other studies show the inverse U-shaped relationship of government size and growth, but use government expenditures to define government size (Chen and Lee 2005, Altunc and Aydin 2013, Asimakopoulos and Karavias 2016). For Gaspar et al. (2016), they also find a threshold in the effects of taxes on growth; however, instead of a threshold that maximizes growth, the threshold represents a minimum level that would accelerate growth. Using two large unbalanced panel datasets, the estimated tax-to-GDP thresholds are (i) 12.9% from a contemporary database of 139 economies from 1965 to 2011 and (ii) 12.7% from a historical database of 30 advanced economies from 1800 to 1980.

We also investigate whether the non-linearity of the effects of taxes on growth is present using our tax database.<sup>7</sup> The fixed-effect panel threshold model by Hansen (1999, 2000) is employed to estimate the threshold. We run the estimation model using our baseline specification with lag of GDP growth as an added control.<sup>8</sup>

Our exercise finds a tax-to-GDP threshold of 12.3%, which is close to the threshold estimated by Gaspar et al. (2016). We also observe that thresholds are different for advanced and emerging economies when estimated separately for the two groups. The results present the tax-to-GDP threshold levels of 16.7% for advanced economies and 13.2% for emerging economies.

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<sup>7</sup> The tax database used in calculating the threshold covers the period 1990–2020, which finds consistent estimates of the thresholds. The estimated thresholds using this period are not sensitive to the sample of countries that are covered in the estimation.

<sup>8</sup> Kneller et al. (1999), Lee and Gordon (2005), and Angelopoulos et al. (2007) include initial GDP as one of their controls in estimating the impact of taxes on growth using a fixed-effect panel regression model.

## 7. Conclusion

The central objective of our paper is to examine how macroeconomic and structural factors affect the impact of tax revenues on growth. Intuitively, such factors help determine whether and to what extent taxes contribute to growth. For instance, good governance improves the quality of public spending financed by taxes and amplifies the positive effect of taxes on growth. Similarly, low inflation—an indicator of sound monetary and fiscal policies—increases the growth effect of taxes. In our empirical analysis, we employ a PVAR model using panel data of 135 economies and covering the period 1990–2019. We first test the baseline effect of taxes on growth. We then investigate how macroeconomic policies, structural factors, and the macroeconomic environment influence the relationship between taxes and growth. We do so by examining how the baseline effect of taxes on growth changes with changes in macroeconomic policies, structural factors, and the macroeconomic environment.

The baseline results show that taxes have a positive effect on economic growth in the full sample of economies and emerging economies. Conversely, in the advanced economies, taxes adversely impact growth. Among macroeconomic policies, the inflation-targeting scheme and exchange rate regime appear to influence the effect of taxes on growth. We find that a flexible exchange rate regime is associated with taxes having a more benign effect on growth. On the other hand, the influence of inflation-targeting scheme on the growth effect of taxes varies between advanced and emerging economies.

For structural factors, both the quality of governance and the financial sector are important in determining the relationship between taxes and growth. We find that both magnify the beneficial impact of taxes on growth. In terms of the macroeconomic

environment, the relationship between taxes and growth is more apparent at low levels of savings and investments. The impact of savings and investments on the tax–growth nexus becomes more complex at higher levels of savings and investments. However, in advanced economies, taxes can facilitate growth at high investment levels. Finally, high inflation is associated with a more adverse impact of taxes on growth. Table 3 summarizes our empirical results.

**Table 3: Summary of Results**

<b>Factors Affecting the Tax–Growth Nexus</b>	<b>Category</b>	<b>All Economies</b>	<b>Advanced Economies</b>	<b>Emerging Economies</b>
<b>Baseline</b>		Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>
<b>Macroeconomic Policies</b>				
Inflation Targeting	Loose	Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>
	Strict	Positive <sup>a</sup>	Positive <sup>a</sup>	Negative <sup>a</sup>
Exchange Rate Regime	Fixed	None	Negative <sup>a</sup>	Negative
	Flexible	Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>
Fiscal Rule—Expenditure Rule	Without	Negative	Positive	Positive
	With	Negative	Negative	None
Fiscal Rule—Revenue Rule	Without	Positive	Negative	Positive <sup>a</sup>
	With	Positive <sup>a</sup>	Too few obs	None
Fiscal Rule—Budget Balance	Without	Positive, then Negative	Positive, then Negative	Negative
	With	Negative <sup>a</sup>	Negative	Negative
Fiscal Rule—Debt Rule	Without	Negative, then Positive	Negative	Negative
	With	Negative <sup>a</sup>	Negative	Negative <sup>a</sup>
Fiscal Rule—Any Rule	Without	Positive, then Negative	None	Negative
	With	Negative <sup>a</sup>	Negative	Negative
<b>Structural Factors</b>				
WGI—Government Effectiveness	Weak	None	No obs	None
	Strong	Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>

*Continued on the next page*

Factors Affecting the Tax–Growth Nexus	Category	All Economies	Advanced Economies	Emerging Economies
WGI—Control of Corruption	Weak	None	Too few obs	None
	Strong	Positive <sup>a</sup>	Negative	Positive <sup>a</sup>
WGI—Political Stability	Weak	None	Too few obs	None
	Strong	Positive <sup>a</sup>	Negative	Positive <sup>a</sup>
WGI—Regulatory Quality	Weak	None	No obs	None
	Strong	Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>
WGI—Rule of Law	Weak	None	No obs	None
	Strong	Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>
WGI—Voice and Accountability	Weak	None	Too few obs	None
	Strong	Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>
Financial Sector Development	Less Developed	Negative <sup>a</sup>	No obs	Negative <sup>a</sup>
	More Advanced	Positive <sup>a</sup>	Negative	Positive
<b>Macroeconomic Factors</b>				
Savings	Low	Positive <sup>a</sup>	Negative	Positive <sup>a</sup>
	High	Negative	Negative	Negative
Investments	Low	Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>
	High	Positive	Positive <sup>a</sup>	Positive
Inflation	Low	Positive <sup>a</sup>	Negative <sup>a</sup>	Positive <sup>a</sup>
	High	None	Negative <sup>a</sup>	Negative <sup>a</sup>

WGI = Worldwide Governance Indicators.

<sup>a</sup> Denotes significance at the 90% confidence interval.

Notes:

1. Calculated based on the estimation of the panel vector autoregression (PVAR) equation (1) and the corresponding impulse response functions of gross domestic product (GDP) growth to a shock in taxes as percentage of GDP.
2. “None” represents a flat impulse response function.
3. “No obs” and “Too few obs” mean that the subsample contains no observations or too few observations, respectively, to estimate the PVAR (Equation (1)).

Source: Authors' calculations.

Our findings suggest that taxes are not necessarily detrimental to economic development and can even be growth-enhancing. Although taxes are inherently distortionary and thus a source of economic inefficiency, they finance growth-promoting public expenditures on health, education, and infrastructure. The latter are especially important in emerging economies, which have relatively smaller governments and place

a higher priority on growth as compared with advanced economies, which place a higher priority on income redistribution. This difference between advanced economies and emerging economies helps to explain why the overall balance of our evidence points to a greater contribution of tax revenues to growth in emerging economies. At a broader level, our evidence confirms that the effect of tax revenues on economic growth should not be evaluated in isolation but in conjunction with macroeconomic and structural factors that can influence the tax–growth nexus. Our results are generally consistent with economic intuition. For instance, we find that low inflation, which reflects sound fiscal policies and, hence, efficient use of tax revenues, amplifies the positive effect of tax revenues on growth.

## APPENDIX

Dataset	Short Description	Source
OECD Revenue Statistics Database	The dataset provides detailed information on tax and government revenues, categorized into the types of tax revenue and levels of government.	OECD
IMF Government Finance Statistics	The dataset presents the fiscal data of all reporting countries in the framework of the Government Finance Statistics Manual 2014, which includes the data on revenues, expenditures, transactions in financial assets and liabilities, and its subsectors.	IMF
ADB Key Indicators Database	The database contains macroeconomic and socioeconomic statistics for ADB's member economies, including data on national accounts, prices, government finance, trade, balance of payments, money and interest rates, external debt, population, labor force, and social indicators.	ADB
World Development Indicators	The database compiles several comparable statistics about global development, covering themes such as poverty and inequality, people, environment, economy, states, markets, and global links.	World Bank
Exchange Rate Regime Classification	The dataset indicates the de facto exchange rate arrangement of the countries, classifying the exchange rate regimes into two types of classifications—one with 15 categories (fine classification), and the other with 6 categories (coarse classification).	Ilzetzki, Ethan, Carmen M. Reinhart, and Kenneth S. Rogoff. 2019. "Exchange Arrangements Entering the Twenty-First Century: Which Anchor will Hold?" <i>The Quarterly Journal of Economics</i> , 134 (2): 599–646.  Ilzetzki, Ethan, Carmen M. Reinhart, and Kenneth S.

*Continued on the next page*

Dataset	Short Description	Source
		<p>Rogoff. 2022. "Rethinking Exchange Rate Regimes." In <i>Handbook of International Economics 6</i> edited by Gita Gopinath, Elhanan Helpman, and Kenneth Rogoff, 91–145. North Holland: Elsevier.</p> <p>Reinhart, Carmen M., and Kenneth S. Rogoff. 2004. "The Modern History of Exchange Rate Arrangements: A Reinterpretation." <i>Quarterly Journal of Economics</i>, CXIX (1): 1–48.</p>
IMF Fiscal Rules Dataset	The dataset contains information on the use and design of fiscal rules, covering national and supranational fiscal rules. The four types of fiscal rules are budget balance rules, debt rules, expenditure rules, and revenue rules.	Davoodi, Hamid R., Paul Elger, Alexandra Fotiou, Daniel Garcia-Macia, Andresa Lagerborg, Raphael Lam, and Sharanya Pillai. 2022. <i>Fiscal Rules: 1985–2021 [Dataset]</i> . International Monetary Fund.
Worldwide Governance Indicators	The database reports governance indicators for six dimensions of governance: (i) voice and accountability, (ii) political stability and absence of violence or terrorism, (iii) government effectiveness, (iv) regulatory quality, (v) rule of law, and (vi) control of corruption.	Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi. 2010. <i>The Worldwide Governance Indicators: Methodology and Analytical Issues</i> . World Bank Policy Research Working Paper No. 5430. World Bank.
Financial Development Index	The index database contains nine indexes, which summarizes how developed financial institutions and financial markets are in terms of depth, access, and efficiency.	IMF

ADB = Asian Development Bank, IMF = International Monetary Fund, OECD = Organisation for Economic Co-operation and Development.

Source: Authors' compilation.

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## **Growth-Enhancing Taxes**

Tax revenues have a persistent positive impact on growth, and the association is especially pronounced in emerging economies. Macroeconomic and institutional factors such as low inflation and strong governance reinforce the growth-enhancing effect of taxes, but these results are conditional on the income level of the economy. The findings of this study imply that the effect of taxes on growth should be evaluated within macroeconomic and structural constraints.

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