

## INSTITUTIONAL QUALITY, INCOME LEVEL, AND DEBT SUSTAINABILITY: NEW EVIDENCE USING DYNAMIC PANEL THRESHOLD REGRESSION

Chee Loong LEE<sup>1</sup>, Riayati AHMAD<sup>2\*</sup>,  
Zulkefly Abdul KARIM<sup>2#</sup>, Norlin KHALID<sup>2</sup>

<sup>1</sup>*Centre for Accounting Banking and Finance, Faculty of Business and Finance,  
Universiti Tunku Abdul Rahman (UTAR), Kampar Perak, Malaysia*

<sup>2</sup>*Center for Sustainable and Inclusive Development Studies, Faculty of Economics and Management,  
Universiti Kebangsaan Malaysia (UKM), 43600 Bangi Selangor, Malaysia*

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**Abstract.** Most countries have suffered from prolonged budget deficits over the past two decades. This situation has made researchers and policymakers aware of the challenges to debt sustainability. This study investigates the threshold effect of institutional quality on debt sustainability in a panel of 82 countries, focussing on various threshold effects at different income levels. All the countries selected for this study fell under the categories of high income (HI), upper middle income (UMI), and lower-middle and low income (LMLI) based on the World Bank classifications. The dynamic threshold panel regression results indicate the presence of a threshold effect of institutional quality on the fiscal reaction function (including debt sustainability and cyclical fiscal policy) in all the countries with different income levels. In HI countries, fiscal adjustment weakens if institutional quality surpasses the threshold value of institutional quality. The fiscal adjustment in UMI countries is similar to that in HI countries but statistically insignificant. By contrast, governments in LMLI countries can promote sustainable debt if their institutional quality exceeds the threshold value. Thus, policymakers in LMLI countries need to prioritise their efforts to raise the level of institutional quality to promote debt sustainability.

**Keywords:** fiscal reaction function, institutional quality, debt sustainability, Income level, dynamic panel threshold regression.

**JEL Classification:** C54, E62, H60, H63.

### Introduction

Budget deficits and government debt are vital policy instruments for promoting a stable economy. According to the Keynesian theory, governments may implement a budget deficit during a recession by expanding expenditure (finance by government debt) to stimulate

\*Corresponding author. E-mail: [riayati@ukm.edu.my](mailto:riayati@ukm.edu.my)

#Corresponding author. E-mail: [zak1972@ukm.edu.my](mailto:zak1972@ukm.edu.my)

economic growth (Barro, 1990; Pelagidis & Desli, 2004). By contrast, the neoclassical model advocates budget deficits leading to increased lifetime consumption, decreased saving rates, increased interest rates, and crowding out private investment (Bernheim, 1989). Prolonged budget deficit is an endogenous risk factor for debt sustainability. According to Baharumshah et al. (2017), unlimited debt accumulation can adversely affect economic progress through multiple channels including greater economic risk, vulnerability to crises, higher long-term interest rates, and higher future taxation. A sustainable public debt level acts as a stabilising tool during recessions by enabling fiscal policies. In short, addressing the unsustainable debt problem can benefit sustainable economic growth, in addition to the well-being of firms and households.

In the past two decades, budget deficits have prolonged, especially in middle- and low-income countries. Figure 1 illustrates the budget deficits of high-income (HI), upper-middle-income (UMI), lower-middle-income (LMI), and low-income (LI) countries between 1996 and 2017. As countries may change income categories over a long period of time, this study converts ordinal categories into nominal numbers. The HI, UMI, LMI, and LI countries are converted to numbers 4,3,2,1, respectively. We then obtain the average (from 1996 to 2017) number and round it to determine its income group. This study combines LMI and LI countries in one group (LMLI) due to the limited number of LI countries. However, HI countries have the lowest budget deficits (achieved budget surplus from 2005 to 2008), followed by UMI and LMLI countries. Prolonged budget deficits, which can negatively affect economic growth and debt sustainability, are a major concern for many governments.

Figure 1 shows that countries' incomes at different levels have varying budgetary balances (positive means budget surplus, while negative means budget deficits). A few previous studies have pointed out this phenomenon; for example, Mercan (2014) demonstrates that many HI countries within the Organisation for Economic Co-operation and Development

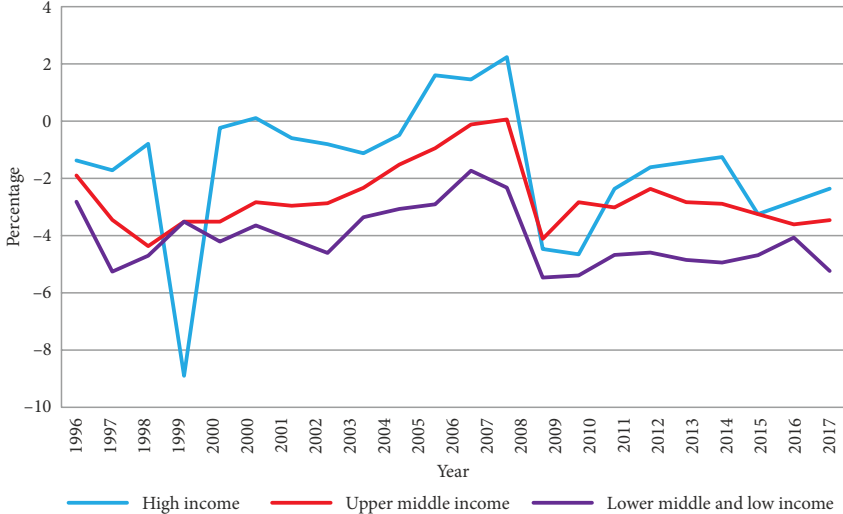


Figure 1. Trends of the average budget balance-to-GDP ratio (source: created by authors from World Bank and International Monetary Fund data)

(OECD) are burdened by significant and persistent fiscal deficits. However, the rapidly increasing countries with prolonged deficits and government debt are concentrated in LMLI countries. This is because revenues are lower and more volatile in LMLI countries, limiting access to state-contingent claims (Mendoza & Ostry, 2008). Hence, countries' income levels affect fiscal performance, and it is imperative to understand the link between income levels and budget deficits.

Besides income level, the persistence of fiscal deficits may also be due to internal political problems. According to the political budget cycle hypothesis, political conflicts of interest may motivate governments to run debts, such as gaining political support and winning elections or reelections (Mawejje & Odhiambo, 2020). Nevertheless, the mitigation of budget deficits cannot rely on the self-discipline of the government staff. Therefore, institutional quality, resembling rules and regulations, can monitor governments' budget decisions externally. As the quality of higher institutions reflects a more transparent and stricter external monitoring of fiscal budgeting operations, governments may not be able to abuse political power by manipulating budgetary (e.g., resource allocation and public programs) or restricting budget deficits and rent-seeking activities.

However, maintaining a high level of institutional quality incurs a high cost (Chang, 2011). For instance, governments should spend capital on anti-corruption measures, enforce strong laws and orders, and maintain bureaucratic quality. Consequently, higher budget deficits are needed to support better institutional quality. Governments should maintain an appropriate level of institutional quality. The cost of institutional quality will outweigh its benefits if the level is too high; however, its benefit may be insignificant if it is too low. Therefore, finding a tipping point or threshold of institutional quality that promotes debt sustainability has gained significant attention. This issue has attracted the attention of economists and policymakers because the threshold level is a crucial parameter in designing fiscal policies with appropriate institutional levels to promote prudent government budgeting.

Most studies examining debt sustainability employ linear regression without considering the impact of institutional quality. However, institutional quality at different levels may have varying effects on debt sustainability. Accordingly, international creditors such as the IMF and World Bank required that borrowing countries adopt better institutions that will enhance governance to fulfil their 'governance-related-conditionality' (Kapur & Webb, 2000). Therefore, good development prospects for institutional quality can limit political interference and manipulation of government budgets, which can significantly promote fiscal discipline and improve debt sustainability. It is still unknown whether institutional quality has a threshold effect on debt sustainability. Hence, this study seeks to bridge this gap by using dynamic panel threshold regression to study the interaction between institutional quality and debt sustainability.

Previous studies confirm that a higher level of national income leads to higher institutional quality, which also promotes economic growth, implying that the two variables interact (Alonso et al., 2020). To the best of our knowledge, no study has examined the interaction between institutional quality and debt sustainability by incorporating countries' income levels. However, the threshold effect of institutional quality on debt sustainability may be partially influenced by income levels. It is well known that the higher the income of a nation,

the stronger the credibility of countries that support their financing with lower interest rates. This fact is supported by Mendoza and Ostry (2008), who argued that advanced countries have more mature capital markets and stronger credibility for government debt. Therefore, this study split the data into three groups (HI, UMI, and LMLI) to provide new insights into the interaction between institutional quality and debt sustainability. The findings of this study are expected to provide a more comprehensive guide for utilising institutional quality to promote debt sustainability.

Given this background, this study's objective is to assess the institutional threshold level of debt sustainability in countries with different income levels. This study makes two significant contributions to the literature: First, this study utilises an advanced modelling estimator (dynamic and nonlinear model) to conduct data analysis that helps researchers avoid the misleading estimation of debt sustainability associated with the traditional linear model and thus assists in preparing prudent fiscal policy through a more accurate measure. Second, this study is expected to shed light on the necessity for institutions to improve the effectiveness of fiscal policy by considering their income level. Additionally, fiscal authorities should be aware that institutional quality is not a panacea for debt sustainability. They should aim for adequate quality of institutions based on their income level.

The remainder of this paper is organised as follows. Section 1 reviews literature on debt sustainability and institutional quality. Section 2 introduces the theoretical and extended models. Section 3 discusses the data used in the empirical analysis and their sources. The estimated effects of institutional quality on debt sustainability worldwide are discussed in Section 4. Finally, the last Section concludes the study with a summary and policy implications.

## **1. Literature review**

### **1.1. Debt sustainability and its measurement**

Debt sustainability (also called fiscal sustainability) is the status in which a country can afford its debt service obligations (current and future) without adopting rescheduling, debt relief, or issuing new debt to finance old debt (Gunter, 2011). A well-known theory of debt sustainability is the government's intertemporal budget constraint (see Bohn, 1995, Baharumshah et al., 2017). A country considers a solvent if it is in the no-Ponzi scheme. Under this condition, debt is sustainable because the present value of future revenue can cover the present value of future debt services. Hence, the no-Ponzi scheme shows that debt sustainability is a long-run achievement; a country able to pay its debt service in the short run does not indicate its achievement of debt sustainability. Based on this concept, Bohn (1995) proposed that debt sustainability requires a government to run a primary surplus in some periods to control debt mounting. In this sense, evidence that the primary balance increases when debt grows indicates that governments undertake the necessary fiscal adjustments to maintain debt sustainability. In summary, the existing body of research on debt sustainability suggests that the primary balance is a critical policy instrument for achieving debt sustainability.

The fiscal reaction function (FRF) is the most broadly applied empirical test for fiscal sustainability. This approach examines whether a country's fiscal authorities made sufficient efforts to stabilise the public debt level and business cycle fluctuations via primary balance

adjustment. This series of articles by Bohn (1998, 2007) proved that FRF is a more promising measurement than other approaches. Meanwhile, Mendoza and Ostry (2008) stated that fiscal FRF is applicable irrespective of the type of data, knowledge of fiscal policy, and type of debt holders. Furthermore, recent empirical evidence revealed that the FRF is likely to be nonlinear (Ghosh et al., 2013). Using time-series studies, Bohn (1998) tested US data and found that debt sustainability was maintained. However, the results are insignificant at low debt-GDP ratios but significantly positive at higher levels. Based on previous panel studies, debt sustainability was determined to have only been held in low-debt countries, which is not the case in high-debt countries (Everaert & Jansen, 2018; Theofilakou & Stournaras, 2012).

It is well known that a high and persistent budget deficit is harmful to the economy. For example, a budget deficit increases the debt level, and the debt-to-GDP ratio negatively affects debt sustainability; therefore, it affects the debt burden and living standards of future generations (Alesina & Rodrik, 1994; Alesina & Perotti, 1996). Furthermore, unsustainable debt has eroded the performance of investment, growth, and poverty reduction significantly (Gunter, 2011). According to Eslava (2011), there is no high and persistent budget deficit because deficits will arise in economic contractions but will reduce in economic expansions. The government also wants to maintain a constant flow of expenditures and constant tax rates (to help consumers smooth their consumption). However, the traditional economic model fails to explain the rise and persistence of budget deficits in most countries that face similar economic shocks, although their fiscal deficits vary (Javid et al., 2011). Therefore, Alesina and Perotti (1995, 1996) argue that economic theory alone cannot explain this persistent budget deficit; incorporating political and institutional perspectives is essential to solving this question.

Conflicts of interest and heterogeneity among politicians drive persistent budget deficits. These two theories explain the impact of political and institutional factors on budget balance and debt sustainability. First, early theories of fiscal deficits arising from political considerations highlight policymakers' manipulation of government expenditures to be re-elected (Nordhaus, 1975; Buchanan & Wagner, 1977). This school argues that deficits may arise, either in the election period or during the incumbent's stay in power, as a result attempts by the incumbent to manipulate electoral results using fiscal outcomes. It also generates asymmetric stabilisation policies, as policymakers are willing to run deficits to fight a recession but are not willing to run surpluses in good times (Eslava, 2011). Second, more recent models of overspending and persistent deficits arise from common-pool problems. This theory shows that the benefits of a given government project are concentrated while all groups share their costs. Therefore, the additional government revenue available during booms generates a more intense fight among different groups for a common pool of resources. Consequently, governments do not follow the tax-smoothing model and raise their deficits in good times. Gavin and Perotti (1997) documented that common-pool problems could explain the procyclicality of fiscal policies, especially in less developed economies.

## **1.2. Prolonged budget deficit and institutional quality**

To mitigate the effects of political distortion and budget deficits, Alesina and Perotti (1999) and Stein et al. (1999) proposed budget institutions that capture transparency by considering

limits to the ability of the government to overspend. These studies found that lower deficits are related to better budgetary institutions. Dabla-Norris et al. (2010) conducted comprehensive research and extended the coverage to many low-income countries. The authors established an index of budget institutions that included more dimensions than previous measures. They found that rules ensuring transparency and comprehensiveness of the budget are the two most conducive elements for promoting fiscal discipline. However, fiscal outcomes depend on other institutions and voter preferences (Eslava, 2011). Many studies have analysed factors beyond budget institutions that focus only on the budgeting procedure. Person (2002) found that political and institutional variables also affected fiscal responsiveness. Furthermore, Henisz (2004) suggested that institutional checks and balances might improve economic outcomes. Therefore, a comprehensive index, such as institutional quality, is better than a narrow index (i.e., budget institution).

Institutions are defined as formal legal rules and informal social norms that govern individual behaviour and interactions (Hodgson, 2000). However, measuring institutions is challenging in different territorial contexts. Hence, institutions can be categorised into two types. In the first, informal institutions involve trust, individual habits, values, and group routines. The second type represents social norms that are more challenging to assess and evaluate than formal laws, rules, and organisations (Amin, 1999). Therefore, Álvarez et al. (2018) suggested that a study should not rely on a single definition or dimension of institutions. Instead, a holistic and multi-angle index should be considered to identify institutional quality. Several studies have investigated institutional quality in terms of developmental problems and economic growth. Higher-quality institutions can help mitigate rent-seeking behaviour (Spinesi, 2009), reduce corruption (Bologna, 2017), and reduce the finance curse phenomenon, in which the financial sector grows beyond a useful size and begins to harm the host economy (Law et al., 2018). Economists generally agree that the performance of growth policies depends mainly on institutional quality (Aron, 2000; Gagliardi, 2008).

Several authors have considered the impact of institutional quality on the reputation of governments. Sen (2013) states that governments can create more credible commitments through higher institutional quality. Melecky (2012) supports this view by adding that superior institutional quality reduces borrowing costs and financial risk. Therefore, better institutions can help develop domestic markets, boost investors' confidence, and minimise the lending spread. Similarly, Papageorgiou et al. (2016) report that institutional quality is positively related to government revenue and social benefits. In short, these studies demonstrate that institutional quality matters for governments' financial performance.

However, institutional quality can affect the financial status of governments through government integrity. Corruption can inflate and change government expenditure (Sevüktekin et al., 2010). Consequently, corruption could contribute to a sizeable fiscal deficit as public revenue erodes and public spending simultaneously increases (Dzhumashev, 2014). Extant theoretical findings and empirical evidence indicate that corruption growth depends on the institutional environment (Aidt, 2009; Méon & Weill, 2010). Based on the studies mentioned above, superior institutional quality can increase revenue and reduce the unessential expenditures of a government. However, the effects of institutional quality on budget balance and debt sustainability (through the threshold effect) remain unclear.

### 1.3. Income levels as the interplay between institutional quality and debt sustainability

The threshold effect of institutional quality is becoming an increasingly important topic in fiscal performance. Although institutional quality and its threshold effect have been gaining popularity in recent years, especially in enhancing economic and financial performance, limited econometric evidence traces the threshold effect of institutions on debt sustainability, mainly using international data. Albu and Albu (2021) adopted a wavelet approach to analyse the euro area's nexus of public debt and economic growth rate. They found a strong relationship between public debt and economic growth, especially for high frequencies and periods above two years. Furthermore, Law et al. (2021) confirmed that institutions tend to minimise the negative impact of public debt on economic growth when a country's institutional quality is above a certain threshold level. However, the resource curse could impede economic growth below a certain threshold.

Based on the above discussion, this study addresses the literature gap regarding debt sustainability in several ways. First, it utilises a dynamic threshold model to analyse the threshold effect of institutional quality on debt sustainability. Previous studies have mainly focused on debt sustainability using linear and nonlinear models, particularly in advanced countries. However, past studies have not examined the impact of institutional quality and its threshold effect through governments' reactions to the accumulation of debt with significant consequences for public debt sustainability. Understanding the role of institutional quality in debt sustainability is important for prudent fiscal policy planning. Thus, this study proposes the following hypotheses:

*H1: Institutional quality had a threshold effect on debt sustainability.*

Previous studies suggest that a country's level of income per capita and institutional quality are usually positively correlated. This relationship between country income and institutional quality is consistent with the theoretical models of Gradstein (2003) and Besley and Persson (2011). The former model states that national income growth and institutional quality have bidirectional relationships, while the latter model points out that there are two-way forces between state capacity and state income. Numerous empirical studies have confirmed this relationship between income level and institutional quality, and per capita income is an important control variable that influences the significance of estimations (e.g., Islam & Montenegro, 2002; Alesina et al., 2003; Alonso & Garcimartin, 2013; Alonso et al., 2020). Thus, this study classifies and compares the heterogeneity of the threshold effect on countries with different income levels. A higher-income country has higher credibility; however, little is currently known about the threshold effect of institutional quality on debt sustainability with the classification of income levels. This study proposes the second hypothesis to fill the literature gap:

*H2: The threshold effect on countries' debt sustainability depends on their income level.*

## 2. Theoretical framework of Fiscal Reaction Function

Bohn’s sustainability test estimates a fiscal reaction function (FRF) to determine debt sustainability by the reaction of primary balance to the change in public debt-to-GDP, controlling for other cyclical determinants (the business cycle and the government expenditure cycle). This reaction ensures that the government will not use the new debt to cover the old debt; therefore, it is considered to achieve debt sustainability. Hence, the government should reduce its budget deficit or increase its budget surplus to balance its fiscal conditions. The regression equation proposed by Bohn is shown in Eq. (1):

$$b_t = \alpha_0 + \rho d_{t-1} + \alpha_G GVAR_t + \alpha_Y YVAR_t + \varepsilon_t. \tag{1}$$

In Eq. (1),  $b$  and  $d$  represent the overall budget balance and government debt, respectively. Although the primary balance is a better variable, it is not possible to obtain disaggregated data for the budget balance for such a large country sample, especially in low- and middle-low-income countries; therefore, this study adopted the overall budget balance as the proxy fiscal adjustment.  $GVAR$  is the government expenditure gap (the fluctuation of government spending) and  $YVAR$  is the output gap (business cycle). This study incorporated  $GVAR$  and  $YVAR$  as proxies for temporal shocks (e.g., war, natural disasters, crises, and recessions), as did Bohn (1998), to overcome the outlier problem. The expected result yields a positive  $YVAR$  and negative  $GVAR$ . This model also suggests that temporary shocks which finance budget deficits can recover from economic expansion. Therefore, the coefficient between the budget balance and the business cycle needs to be positive, whereas the response budget balance to the government expenditure gap is negative.

To maintain debt sustainability, governments must adjust their budget balance according to their debt levels (this reaction is represented by  $\rho$ ). When the debt level increases, they must improve their budget balance (reducing budget deficits or increasing surplus). In other words, a significant and positive  $\rho$  indicates debt sustainability. However, governments violate debt sustainability when  $\rho$  is negative and significant, and there is no evidence to judge debt sustainability when  $\rho$  is insignificant. According to Mendoza and Ostry (2008),  $GVAR$  and  $YVAR$  are based on the GDP and government expenditure trends. This study estimates GDP and government expenditure trends using the Hodrick-Prescott filter. These measures are defined as  $GVAR$  and  $YVAR$  for government expenditure gap and output gap, respectively. Thus, the corresponding equation is:

$$GVAR = \frac{g_t - g_t^T g_t^T}{g_t^T y_t}, YVAR = \frac{y_t^T - y_t g_t^T}{y_t^T y_t}, \tag{2}$$

where superscript  $T$  denotes the trend value of the corresponding variable.

Furthermore, Mendoza and Ostry (2008) applied the FRF model to analyse cyclical fiscal policy, including counter-cyclical ( $\alpha_y$  is positive and significant), pro-cyclical ( $\alpha_y$  is negative and significant), or a-cyclical ( $\alpha_y$  is insignificant) policies. The fiscal authority which implements a counter-cyclical fiscal policy will deteriorate (improve) the primary balance during recessions (booms) to stabilise national output performance.



### 3. Methodology

#### 3.1. Econometric model

By incorporating institutional quality in Eq. (2), the following panel linear equation shows the impact of institutional quality on the fiscal reaction:

$$b_{it} = \alpha_0 + \rho d_{it-1} + \alpha_G GVAR_{it} + \alpha_Y YVAR_{it} + \alpha_I IQ_{it} + D, \quad (3)$$

where  $IQ$  is institutional quality,  $\varepsilon$  is the error term, subscript  $i$  indicates countries,  $t$  represents time, and  $t - 1$  indicates lag of one year, and the  $D$  is the dummy variable capturing the impact of the global financial crisis. The value is 0 for the pre-crisis period (years before 2008) and 1 for the post-crisis period (years after 2008) on FRE. The other variables were similar to those of the FRF explained in the previous section.

This study argues that debt sustainability is dynamic and depends on institutional quality. Therefore, this study adopts the novel GMM method developed by Seo and Shin (2016). This model can determine the threshold value for panel data to better address potential endogeneity (Wu et al., 2019; Zhu et al., 2020). Referring to Yu et al. (2022), the econometric model to investigate the threshold effect on debt sustainability is shown in Eq. (4):

$$b_{it} = (\beta_1 b_{it-1} + \beta_2 d_{it-1} + \beta_3 GVAR_{it} + \beta_4 YVAR_{it} + \beta_5 D_{it}) \mathbf{1}(IQ_{it} \leq \gamma) + (\lambda_1 b_{it-1} + \lambda_2 d_{it-1} + \lambda_3 GVAR_{it} + \lambda_4 YVAR_{it} + \lambda_5 D_{it}) \mathbf{1}(IQ_{it} > \gamma) + \varepsilon_{it}. \quad (4)$$

The  $IQ$  is treated as a regime-dependent variable.  $\mathbf{1}(\cdot)$  is an indicator function that takes the value of 1 if the argument is valid and zero otherwise.  $\varepsilon_{it}$  ( $\varepsilon_{it} = u_i + v_{it}$ ), the error term, is composed of individual fixed effects ( $u_i$ ) and idiosyncratic random disturbances ( $v_{it}$ ).  $\beta$  and  $\lambda$  are the coefficients of the covariates in the lower and upper regions, respectively. For Eq. (3), this study follows Seo et al. (2019), using the bootstrap algorithm to test the threshold effect:  $\sup W = \sup W_n(\gamma)$  statistics for the null of  $\beta = \lambda = 0$ , where  $W_n(\gamma)$  is the standard Wald statistic for each fixed  $\gamma$ . To examine the threshold effect on debt sustainability in countries with different income groups, we estimate Eq. (4) with three datasets: HI, UMI, and LMLI.

#### 3.2. Data

The data collected in this study consisted of annual panel observations for 82 countries for the period 1996–2017. The sample countries were selected based on the available data for the three group variables adopted in this study: fiscal, economic, and institutional variables. Fiscal variables consisted of government debt, overall budget balance, and government expenses, and data for all fiscal variables were extracted from the Country Data Online (CDO). The real and nominal GDP of the economic variables were extracted from the World Development Indicators (WDI). Data for institutional quality were retrieved from the International Country Risk Guide (ICRG) to measure the institutional quality index, which consists of 12 components with a total of 100.

The components of the ICRG are (1) government stability (with a maximum of 12 points), (2) socioeconomic conditions (12 points), (3) investment profile (12 points), (4) internal

conflict (12 points), (5) external conflict (12 points), (6) corruption (6 points), (7) military in politics (6 points), (8) religious tensions (6 points), (9) law and order (6 points), (10) ethnic tensions (6 points), (11) democratic accountability (6 points), and (12) bureaucracy quality (4 points). ICRG data qualify a country’s political risk. It ranges from 0 (lowest level of institutional quality) to 100 (highest level). The better the institutional quality, the lower the political risk; therefore, previous studies have widely adopted the ICRG as a proxy for institutional quality (see Álvarez et al., 2018; Law et al., 2021).

For the robustness test, we adopt an alternative institutional quality index. The alternative index utilised in this study was built through the equal-weight aggregation of five variables (corruption, law and order, bureaucratic quality, government stability, and democratic accountability) proposed by Law et al. (2021). Each value is converted to a ten scale before an equally weighted combination of the five variables. Table 1 lists the summary variables, Table 2 lists the selected countries, and Table 3 presents descriptive statistics.

The descriptive statistics indicate a contradictory trend between the fiscal variables (debt and budget balance) and institutional quality. The results also illustrate that the higher the income level, the higher the institutional quality. Moreover, the largest debt level comes from

Table 1. Summary of variables

Data	Unit of measurement	Definition
Budget balance ( <i>b</i> ) <sup>#</sup>	% of GDP	The overall difference between government revenues and spending divide by GDP.
Central government debt ( <i>d</i> ) <sup>##</sup>	% of GDP	Debt is the entire stock of direct government fixed-term contractual obligations to other outstanding on a particular date.
Output gap ( <i>YVAR</i> ) <sup>###</sup>	% of GDP	Output gap is the difference between actual GDP and potential GDP, to identify the current economic position over the business cycle.
Government expenditure gap ( <i>GVAR</i> ) <sup>###</sup>	% of GDP	Government expenditure gap is the difference between government expenditure and potential government expenditure, to identify the current government expenditure over the business cycle.
Institutional quality ( <i>IQ</i> ) <sup>#</sup>	Index (1 to 100)	The institutional quality index is the sum of 12 components that show a compressive view of institutional quality. Each variable consists of a different scale. The total is 100.
Alternative Institutional quality ( <i>IQ<sub>2</sub></i> ) <sup>#</sup>	Index (1 to 50)	Institutional quality index included Five components that directly related to the fiscal decision. Those are corruption, law and order, bureaucratic quality, government stability, and democratic accountability. Each component is converted to a scale of ten and sum up to get the total.
Global financial crisis ( <i>D</i> )	Dummy that 1 for years after 2008, 0 otherwise.	After the onset of the crisis, governments deployed massive bailouts of financial institutions and other palliatives monetary and fiscal policies to prevent a collapse of the global financial system.

Notes: # – PRS group data; ## – IMF data; ### – the World Bank data, #### – author’s calculation.

HI countries, followed by LMLI and UMI countries. However, the higher the institutional quality, the lower the budget deficit. Based on the results, HI countries obtained the highest institutional quality level with the lowest budget deficit, but the highest debt level. The UMI countries had a middle budget deficit, but the lowest debt level. Finally, the largest deficit has the second-largest debt level in the LMLI countries. These summary statistics provide the basis for subsequent analysis.

Table 2. Selected country list

High Income			
Australia	Germany	Netherlands	Sweden
Austria	Greece	New Zealand	Switzerland
Belgium	Ireland	Norway	Trinidad & Tobago
Canada	Israel	Portugal	UAE
Czech Republic	Italy	Saudi Arabia	United Kingdom
Denmark	Japan	Singapore	United States
Finland	Korea, South	Slovakia	
France	Kuwait	Spain	
Upper Middle Income			
Argentina	Costa Rica	Mexico	South Africa
Botswana	Gabon	Panama	Suriname
Brazil	Hungary	Poland	Turkey
Bulgaria	Jamaica	Romania	Uruguay
Chile	Malaysia	Russia	
Lower Middle Income			
Algeria	Ecuador	Indonesia	Sri Lanka
Angola	Egypt	Iran	Sudan
Bolivia	El Salvador	Morocco	Thailand
Cameroon	Guatemala	Papua New Guinea	Tunisia
China	Guyana	Paraguay	
Colombia	India	Philippines	
Low Income			
Bangladesh	Ghana	Kenya	Zambia
Congo, DR	Guinea	Nigeria	Zimbabwe
Côte d'Ivoire	Haiti	Pakistan	

Table 3. Descriptive statistics

Variables	Unit of measurement	Mean	SD	Max	Min	Observation
HI						
<i>b</i>	% of GDP	-0.99	5.82	47.30	-40.00	660
<i>d</i> <sub><i>t</i>-1</sub>	% of GDP	55.51	39.66	236.07	1.56	660
YVAR	% of GDP	-0.13	2.84	8.99	-15.00	660
GVAR	% of GDP	-2.88	14.40	32.22	-119.52	660
<i>IQ</i>	1 to 100	80.78	7.51	97.50	58.00	660
<i>IQ</i> <sub>2</sub>	1 to 50	39.90	5.91	49.17	24.17	660
UMI						
<i>b</i>	% of GDP	-2.56	4.08	11.50	-32.10	418
<i>d</i> <sub><i>t</i>-1</sub>	% of GDP	44.05	28.20	152.25	4.09	418
YVAR	% of GDP	-0.22	3.60	10.97	-19.63	418
GVAR	% of GDP	-4.48	20.50	48.56	-119.30	418
<i>IQ</i>	1 to 100	69.81	6.93	86.00	44.00	418
<i>IQ</i> <sub>2</sub>	1 to 50	30.27	4.50	47.50	19.17	418
LMLI						
<i>b</i>	% of GDP	-3.68	3.98	13.00	-31.00	726
<i>d</i> <sub><i>t</i>-1</sub>	% of GDP	53.97	39.78	283.49	3.67	726
YVAR	% of GDP	-0.21	3.47	13.45	-35.78	726
GVAR	% of GDP	-3.94	22.23	94.39	-182.31	726
<i>IQ</i>	1 to 100	56.75	9.52	77.00	22.00	726
<i>IQ</i> <sub>2</sub>	1 to 50	25.34	4.91	40.00	11.25	726

## 4. Empirical results

### 4.1. Main findings

A dynamic threshold panel regression analysis was used to investigate the impact of institutional quality on debt sustainability. According to Table 4, the estimation results are measured based on Eq. (4). The first column lists the overall sample’s results, while columns two to four present the HI, UMI and LMLI countries. Based on these results, the threshold values for overall, HI, UMI, and LMLI countries were 81, 78.6, 76, and 61.6, respectively. The threshold effect was significant in all the cases. Hence, the first hypothesis is confirmed: institutional quality affects debt sustainability; however, the impact might be positive or negative and depends on the country’s income level.

Tables 4 compared the threshold effect of institutional quality on debt sustainability for the sample of overall, HI, UMI and LMLI countries. The overall sample’s results show that the debt sustainability status is stronger in high institutional quality regimes; however, the estimation results are either weakly robust or vanish once split into sub-sample according to income levels. First, in HI countries, the finding shows that the coefficient between *b* and *d*<sub>*t*-1</sub> is positive and significant in the lower and upper regimes (0.17 + (-0.1) = 0.07). The higher regime shows a weaker fiscal (0.07 < 0.17) response to maintain debt sustainability.

This finding is consistent with a study by Mendoza and Ostry (2008), who advocate that high-credibility countries can use weaker fiscal responses to sustain debt.

Second, the response of  $b$  to  $d_{t-1}$  in UMI countries is statistically insignificant in both regimes which indicates that there is no evidence to judge debt sustainability. Finally, an interesting result was found in LMLI countries, which are those countries unable to achieve debt sustainability in the lower regime ( $\beta_2 = -0.02$ ) but maintain sustainable debt in the higher regime ( $-0.02 + 0.18 = 0.16$ ). This finding is consistent with Sen (2013), who advocated that the benefit of institutional quality on macroeconomics was only valid for poor and underdeveloped countries. In summary, the second hypothesis is confirmed: the institutional quality threshold effect on countries' debt sustainability varies according to their income levels.

Table 4. Results of dynamic panel threshold estimations with IQ

	Overall	HI	UMI	LMLI
Threshold (IQ)	81.00*** [69.73]	78.57*** [6.48]	76.00*** [34.99]	61.57*** [22.87]
Lower regime ( $\beta$ )				
$b$	0.52*** [29.23]	0.27** [2.23]	0.07 [0.13]	0.15** [2.56]
$d_{t-1}$	0.13*** [6.44]	0.17*** [2.98]	0.08 [0.87]	-0.02 [-1.46]
YVAR	0.34*** [15.65]	-0.15 [-0.20]	0.17 [0.39]	0.15 [1.43]
GVAR	-0.06*** [-24.23]	-0.04 [-0.26]	0.08 [0.68]	-0.03 [-1.09]
$D$	0.59*** [5.50]	-12.72 [-1.58]	1.21 [0.59]	0.74 [0.65]
Difference ( $\lambda - \beta$ )				
$b$	-0.34** [-2.41]	-0.19 [0.55]	-2.22 [-0.91]	0.48 [1.26]
$d_{t-1}$	0.09*** [2.69]	-0.10** [-2.19]	-0.32 [-0.60]	0.18** [2.59]
YVAR	0.46*** [4.02]	1.43** [1.99]	2.64 [1.16]	0.69 [1.58]
GVAR	0.12*** [6.08]	0.07 [0.28]	-1.04*** [-2.81]	0.09 [0.54]
$D$	-2.59*** [-4.37]	20.11** [2.24]	-5.48 [-0.47]	3.37 [0.69]
Constant	-10.65*** [-4.83]	29.10*** [3.57]	2.39 [0.10]	-10.95*** [-3.08]
Linearity (P-Value)	(0.00)	(0.00)	(0.00)	(0.00)
Observation	1804	660	418	726
Year	22	22	22	22
Country	82	30	19	33

Notes: T-values in [ ] and ( ) represent p-values. \*\*\*, \*\*, \* indicate significance at 1%, 5%, and 10%, respectively.

According to the results on *YVAR*, HI countries' results show that cyclical fiscal policy improved from pro-cyclical to counter-cyclical in the upper regime ( $-0.15 + 1.43 = 1.28$ ). By contrast, an a-cyclical fiscal policy (the coefficient between *b* and *YVAR* is statically insignificant) is implemented in the UMI and LMLI countries, regardless of the lower or upper regime. This study contradicts the results of Mendoza and Ostry (2008), who demonstrated a cyclical or counter-cyclical fiscal policy being implemented in advanced countries and a pro-cyclical fiscal policy in developing countries. Frankel et al. (2013) also added that the fiscal policies of developing countries could escape the procyclicality trap.

On the contrary, the control variable (*GVAR*) results were diverse for the different income groups. The UMI countries show that the government only increased its budget balance during temporary government expenditure shocks in the upper regime. In contrast, the budget balance of the HI and LMLI countries is statistically insignificant in response to government expenditure shocks in both regimes. The global financial crisis also affects macroeconomic stability and fiscal policy reactions. However, its impact on the budget balance also depends on the threshold effects of institutional quality and income levels. In the UMI and LMLI countries, whether in the lower or upper regimes, the financial crisis had an insignificant impact on budget balance. Nevertheless, it is positive and insignificant in HI countries with upper-regime institutional qualities. These findings reveal that HI countries with high institutional quality have a better budget balance against crises.

#### 4.2. Robustness checks

The robustness test involved the use of an alternative index, namely  $IQ_2$ . There are two differences between Tables 4 and 5: First, there is a large difference in the magnitude of the coefficients because of the measurement of institutional quality. The original institutional quality was measured using *IQ*, which combines 12 components with values of 1 to 100. In comparison, the robustness check model adopted  $IQ_2$  which consist of 5 components with values of 1 to 50. Therefore, the difference in magnitude was normal, and the robustness check focused on the signs of the parameters. Second, the overall sample results are inconsistent; this finding corroborates the findings of previous studies (see Alonso et al., 2020) which stated that the estimation results are inconsistent without controlling per capita income.

Table 5 presents the empirical results based on the  $IQ_2$  index also indicating similar findings to that of the *IQ* index reported in Table 4. First, the results for the threshold effect on debt sustainability are significant in Table 5. Second, the threshold effect of institutional quality on debt sustainability varies according to a country's income level. Finally, a high-quality institutional regime that can promote debt sustainability is found only in LMLI countries. Overall, these results indicate that the findings in Table 4 are robust even with an alternative institutional quality index.

Table 5. Results of dynamic panel threshold estimations with  $IQ_2$ 

	Overall	HI	UMI	LMLI
Threshold ( $IQ_2$ )	27.23*** [23.04]	43.35*** [18.73]	28.80*** [5.72]	22.95*** [10.56]
Lower regime ( $\beta$ )				
$b$	0.79*** [19.60]	0.67*** [2.80]	0.29 [0.45]	0.06 [1.03]
$d_{t-1}$	-0.002 [-0.73]	0.02 [0.736]	0.05 [0.41]	-0.49* [-1.69]
YVAR	-0.10*** [-2.98]	-0.28 [-0.97]	0.29 [0.40]	-0.01 [-0.06]
GVAR	-0.01*** [-3.15]	0.05** [2.02]	-0.23 [-1.57]	-0.42*** [-4.45]
$D$	1.30*** [6.30]	7.00*** [3.86]	6.37 [0.95]	-0.96 [-0.77]
Difference ( $\lambda - \beta$ )				
$b$	-0.55*** [-18.91]	-2.00** [-2.51]	0.77 [1.17]	0.17 [1.12]
$d_{t-1}$	0.03*** [8.47]	-0.66*** [-2.51]	-0.21 [-0.87]	0.07** [2.51]
YVAR	0.46*** [11.49]	2.98*** [3.42]	0.14 [0.19]	0.72*** [3.13]
GVAR	-0.04*** [-11.19]	-0.18* [-1.90]	0.27** [2.21]	0.01 [0.42]
$D$	-0.02 [-0.06]	-17.15** [-2.33]	-9.66 [0.25]	2.30 [1.22]
Constant	1.57*** [5.28]	24.80* [1.75]	16.36* [1.80]	-7.82*** [-2.94]
Linearity (P-value)	(0.00)	(0.00)	(0.00)	(0.00)
Observation	1804	660	418	726
Year	22	22	22	22
Country	82	30	19	33

Notes: T-values in [ ] and ( ) represent p-values. \*\*\*, \*\*, \* indicate significance at 1%, 5%, and 10%, respectively.

## Conclusions

Over the past two decades, most countries have experienced prolonged budgetary deficits. The political economy showed that governments have the intention to overspend and that institutions play an important role in mitigating this intention. However, maintaining a high level of institutions is costly. Therefore, the net effect of institutional quality depends on its marginal benefit and cost. The two main objectives of this study are to examine the threshold effect of institutional quality on debt sustainability and identify whether the threshold effect

varies with income levels. This study then adopted a large panel of the dataset (82 countries over 22 years) using the dynamic panel threshold model which objectively determined the threshold value and better dealt with potential endogeneity problems. Furthermore, the study compared the estimated results by three income groups: HI, UMI, and LMLI.

The main findings confirm that institutional quality has a threshold effect on debt sustainability. However, the threshold effect on debt sustainability varies according to income level. The highest threshold was found in HI countries at 78.57, followed by 76.6 and 61.6 for UMI and LMLI countries, respectively. The second significant finding is that the threshold effect of institutional quality varies in debt sustainability in countries with different income levels. In HI countries, debt sustainability weakens when the regime transfers from under threshold to over threshold. However, there is no significant difference between the lower and upper regimes in UMI countries. By contrast, LMLI countries can improve their debt sustainability status from unsustainable to sustainable if their institutional quality surpasses 61.6.

This study shows that institutional quality is not a silver bullet for maintaining debt sustainability. This effect depends on a country's income level. In LMLI countries, fiscal authorities seeking to enhance debt sustainability should strive to improve institutional quality and surpass the 61.6 threshold level. Upper-regime institutional quality, with stronger checks and balances, promotes debt sustainability. Second, there was no difference in debt sustainability status in UMI countries between the lower and upper regimes. Therefore, UMI countries' fiscal authorities cannot pursue debt sustainability through institutional quality enhancement. Finally, fiscal authorities in HI countries should realise that the upper regime's institutional quality (more than 78.6) did not promote debt sustainability. Hence, the further development of institutional quality in HI and UMI countries will not contribute to debt sustainability; they should find another solution by exploring more factors.

Institutional quality is not the only factor mitigating conflicts of interest and heterogeneity among politicians. Thus, institutions and rules should be combined with an independent fiscal advisory council to restrict overspending and debt mounting. Independent fiscal councils help internalise conflict claims among interest groups to mitigate political distortion. Moreover, debt sustainability may be determined by the composition of public spending funded by the debt. Debt sustainability can be sustained if governments use debt to finance productive spending, such as health, education, and infrastructure, which can boost economic growth and tax revenue. However, debt financing might undermine debt sustainability if governments use additional debt to increase unproductive expenditures, such as the salaries of public servants, cultural events, and social protection. These two issues will be valuable for future research.

### **Author contributions**

Chee Loong, Lee: Contributed to all parts. Riayati, Ahmad: Contributed to introduction, literature review, methodology and result. Zulkefly Abdul, Karim: Contributed to methodology and result. Norlin, Khalid: Contributed to introduction and conclusion.



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