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The Impact of Public Debt and Quality of Governance on Economic Growth in High-Income Countries

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Abstract

Government intervention is imperative in the mixed economic system due to market failures, imperfection, pure public goods, and economic externalities to stabilize the economy. We examine the impact of public debt on economic growth. As the role of *quality of governance* (QoG) is disputed in prior studies, we examine the direct and moderating role of QoG in the context of high-income countries. Whereas analyses are often based on static models along with conventional quantile regression methods not considering the scale and location, we use the method of moment quantile regression (MMQR) by considering the quantile in both scale and location based on heterogeneous panel data from 1990 to 2020. Our empirical investigation shows that public debt promotes economic growth in lower to upper-medium quantiles but is ineffective in top quantiles. The moderating role of QoG on the debt-growth nexus is counterproductive in lower quantiles and insignificant in upper quantiles, which could be the rationale for the tight QoG rules and regulations. The findings also indicate that the effectiveness of the QoG on public debt is crucial for economic growth in high-income countries, while large public debt and too strict rules and regulations of QoG often slow down the growth process in high-income countries. As policy recommendations, governments should adopt prudent public debt management strategies to balance growth stimulation with the avoidance of excessive debt accumulation. Besides, a moderate QoG framework can be prioritized to effectively moderate the relationship between public debt and economic growth to foster sustainable growth trajectories.

Extended author information available on the last page of the article

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Highlights

• We examined the impact of public debt on economic growth by using the data from high-income countries.
• We applied methods of moment quantile regression (MMQR) for heterogeneous panels.
• We found that public debt promotes growth in lower quantiles but remains insignificant in upper quantiles.
• The findings show that the moderating role of QoG on the debt-growth nexus is counterproductive in lower quantiles and insignificant in upper quantiles.

Keywords Public debt · Governance · Quality of governance · Economic growth · MMQR · High-income countries

Introduction

The citizens of highly industrialized countries have access to a diverse range of public goods, services, and welfare benefits. Countries may find it difficult to cover these significant expenses with domestic revenue collections and opt to implement an expansionary fiscal policy to balance the budget (Fessler & Schürz, 2018; Monte & Pennacchio, 2020; Bartak et al., 2022). Although cyclical public debt diminishes household and national savings rates, debt funds can facilitate long-term economic growth (MacGee et al., 2022; Haughton & Keane, 2021). Onofrei et al. (2020) asserted that expansionary fiscal policy through public debt is frequently used as a policy tool to accelerate economic growth through new investment, full employment, infrastructure development, and information technology development, among other factors. The study also contends that debt ratios higher than the 90% threshold of gross domestic product (GDP) create high inflation and production expenses, which impair growth function in advance. Petrović et al. (2021) found that during economic downturns, public investment financed by borrowing stimulates output, wages, and consumption, which supports economic growth. In high-income countries, economic growth is frequently augmented by a debt ratio that is below or equal to the threshold level and by strong debt governance (Bartak et al., 2022).

A number of issues motivate us to conduct this study. First, previous studies have revealed that public debt promotes macroeconomic features, such as output, employment, wage range, and aggregate consumption during the financial crisis, and strengthens the economy (Petrović et al., 2021; Baum et al., 2013). However, in most cases, public debt supports economic growth conditionally with a moderate debt ratio threshold of 90% of GDP, as claimed by Reinhart et al. (2015). Some empirical studies found similar results: tolerant public debt can stimulate capital formation, new investments, and aggregate demand in emerging market economies and advance economics (Gómez-Puig & Sosvilla-Rivero, 2017; Burhanudin et al., 2017).

On the other hand, another group of studies argues that the government frequently imposes high taxes on its citizens to pay debt service charges to return debt installments (Meyll & Walter, 2019; Turan & Yanıkkaya, 2021; Blecker, 2022). This extra

expense creates high disposable income, low purchasing capacity, and low saving rates, which hurt new investment and growth processes. Additionally, public debt also causes crowding-out in the domestic capital market, discourages new investment, leads to unemployment, raises the price of raw materials in productive sectors, and finally distresses the whole economy. According to a group of neoclassical economists, public debt is an immoral economic tool that burdens future generations while spending for the present (Phelps, 2022; Arsić et al., 2021). Studies also extend that the economy gains barely any growth-enhancing effects from public debt and even invites economic disaster during debt payback. Some other groups of studies found that public debt might have some positive impacts in the short term or during a crisis, but in the long run, the effects are detrimental to the economy (Grosu et al., 2022; Ampofo et al., 2021). So, mostly, we find that the role of public debt on economic growth is debated in the literature, which primarily motivate us to conduct this study.

Second, studies argue that strong QoG eliminates distortions in the growth function and promotes economic growth (Coccia, 2021; Nguyen et al., 2021; Zhuo et al., 2021). Several studies acknowledge that the effectiveness of public debt is highly conditional on the level of QoG of a country (Acemoglu & Robinson, 2019; Bisogno & Cuadrado-Ballesteros, 2022), while most high-income countries tend to have strong and stable QoG that boost consumer confidence, support new investments, motivate economic activities, and finally facilitate stable economic growth (Pérez-Morote et al., 2020). Alexandre et al. (2022) and Raza et al. (2021) similarly explored that the components of good governance, i.e., corruption control, stable democracy, political stability, voice and accountability, and government effectiveness, are the main fundaments of steady economic growth in high-income countries. A number of other studies also explore similar reasons behind the growth factor in high-income countries (Abreu & Gomes, 2022; Potrafke, 2020; Gründler & Potrafke, 2019; Faruk & Eleonora, 2020).

Contrarily, a group of studies claims that rather than experiencing the anticipated growth, many countries suffer from poor debt management and run into debt problems as a result of poor governance (Kemoe & Lartey, 2022; Pour & Lasfer, 2019). In addition, some other anecdotal evidence also comes up with contradictory findings on the effectiveness of governance on economic growth (Anginer et al., 2022; Dorobantu & Müllner, 2019). According to studies, excessively strict QoG laws and regulations can occasionally demotivate production function and growth trajectory. The disproportionate role of QoG on economic growth in the literature is the second motivation for this study.

Third, countries implement public debt as a means of expansionary fiscal policy tools to stabilize the macroeconomic environment during the economic downturn. Similarly, the governments of high-income countries, i.e., the Organisation for Economic Co-operation and Development (OECD), European Union (EU), and other high-income countries, often intervene in the economy and inject funds by borrowing from internal and external sources to boost the economy (Bentour, 2021; MacGee et al., 2022; Haughton & Keane, 2021). Some of these countries undertake an expansionary fiscal policy through public debt during the recession and repay that debt during the economic boom to maintain economic stability (Amato et al., 2021; Uxó

et al., 2018). Therefore, the countries gain more fiscal space to apply the debt tool to support the expansionary fiscal policy and motivate the macroeconomic condition.

On the other hand, a few nations, including Greece, Italy, Portugal, and Spain, adhere to risky procyclical debt policies with large expenditures in unproductive sectors, which escalates the debt burden (Nordström & Laiho, 2023; Brady & Magazzino, 2019; Anton & Afloarei Nucu, 2020). This causes income and savings instability for households and businesses, as well as a decrease in consumer spending and company investment, all of which have a negative impact on the economy. At the same time, some high-income countries collect public debt from national and international private lenders with high interest rates and short-term payback. However, too strict or loose QoG, poor debt management, and high welfare expenditures often fail this debt to economic activity. The unstable relationship between debt and growth caused by the presence of QoG in high-income countries also motivates us to examine the issue.

Finally, considering the facts above, this study aims to examine the direct impact of public debt and QoG on economic growth in the context of high-income countries. Besides, the study also examines the moderating role of QoG on the relationship between public debt and economic growth. To do so, we employ the method of moment quantile regression (MMQR) approach, which allows for examining the effect of predictor variables on the experimental variable by considering different economic conditions or quantiles and can provide robust results. The MMQR technique is scarcely used in the existing studies on the relationship between public debt and economic growth in high-income countries, thus being unable to provide scale and location effects as well. Given the differences between the findings of earlier studies and the methodological shortcomings, we decided to use a newly designed MMQR approach in the current study to add new knowledge to the inquiry into the subject. Furthermore, the method is also able to provide information on how public debt and QoG work in different economic circumstances by the results of different quantiles. However, Fig. 1 provides information about the long-term trends between our considered variables.

Therefore, the current study sheds light on the issue and contributes to the body of knowledge in a number of ways. First, the current study contributes to the debate on the debt-growth relationship theoretically and empirically. Second, the study also examines the moderating role of QoG on the debt-growth nexus. Third, since the high-income countries have the highest amounts of debt, this study looks at how public debt affects economic growth in this group of countries. Finally, the existing literature mostly applies static methods as well as the conventional quantile regression method, which is unable to provide scale and location effects, while this study employs the newly developed MMQR method. Besides, this method can help policymakers by providing progressives quantile-based role of debt and QoG on economic growth.

The remainder of our paper is structured as follows. The "Literature Review" section provides a critical literature review of previous studies. The "Research Methodology" section demonstrates data and empirical and econometric models. The "Result and Discussion" section delivers descriptive statistics, main findings, and discussion, and the "Conclusion and Policy Implication" section concludes the study.

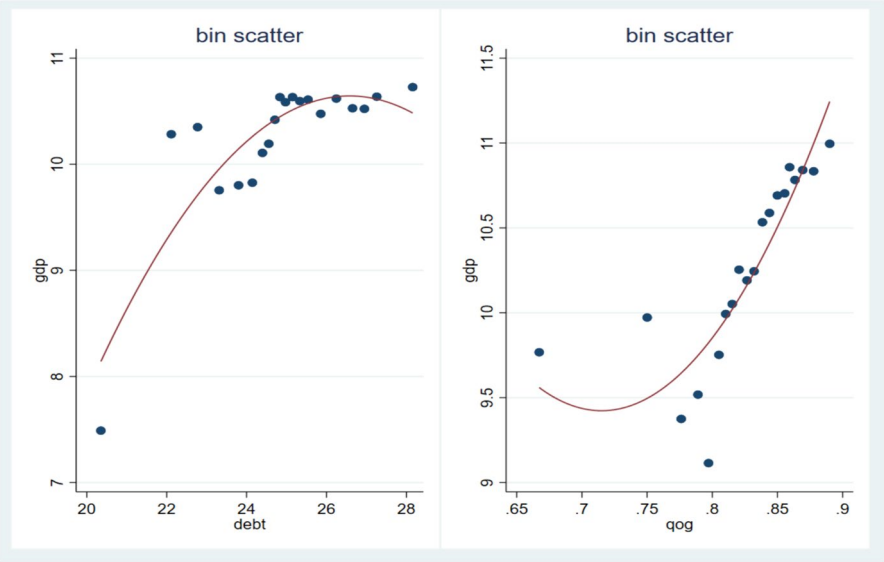

Fig. 1 Long-term relationship between GDP and debt and GDP and QoG. Figure source: author compilation

Literature Review

The impact of governmental or public debt on economic growth is a debated issue in academic literature. The Keynesian and post-Keynesian economic theories regard public debt as a significant policy tool for enhancing economic growth as a means of government expenditure (McCombie & Thirlwall, 2002; Klein, 2016). Similarly, Wagner's law and the principle of Peacock and Wiseman's displacement effect also consider government expenditure as a catalyst for economic growth through various developmental activities such as infrastructure development, investment in education, advancements in the medical sector, and boosted social expenditure (Routledge.Magazzino et al., 2015; Arestis et al., 2021). On the other hand, classical economic theories considered government expenditure through public debt to be harmful to the economy (Friedman & Bordo, 2017; Vergnhanini & De Conti, 2017). Another group considered that it could help macroeconomics for short-run development activities but could trigger inflation and slow down the economy when it repays (Jacobs et al., 2020). Moreover, the theory of debt overhang states that huge debt may distort the economy rather than support it (Krugman, 1988; Vanlaer et al., 2021). So the impact of public debt on economic growth is highly debated in the theoretical discussion, which motivates us to scrutinize the issue.

Public debt is an issue of intertemporal income distribution since it must be repaid in the future but is taken on to address immediate economic challenges and to spur economic growth (Haughton & Keane, 2021; Petrović et al., 2021; Brady & Magazzino, 2018). Public debt is a generational fiscal policy tool. According to one stream of studies, public debt drives economic activity in the present, but when

it is paid off, future generations often suffer the tax burden (Phelps, 2022; Meyll & Walter, 2019; Ampofo et al., 2021). Another stream argues that public debt stimulates the demand side in an economy and encourages new investment for massive production in supporting economic growth (Fessler & Schürz, 2018; Del Monte & Pennacchio, 2020). A final stream of studies argues that QoG plays a critical role in the debt-growth relationship (Zhuo et al., 2021; Ochi et al., 2023). Table 1 provides a summary of the recent literature on the issue because the application of MMQR (Machado & Silva, 2019) is relatively new in the literature on the debt-growth relationship, along with the methodological gaps below. However, we select the literature on the debt-growth relationship from 2019 onward from the *Scopus* source to track the use of econometric models, including MMQR.

Table 1 shows recent studies on the relationship between public debt and economic growth along with governance, mostly in high-income countries. According to these studies, large levels of public debt hinder economic growth and frequently result in greater taxes, high inflation, higher unemployment, a scarcity of capital, and depreciating currency (Grosu et al., 2022; Mohsin et al., 2021). The studies mainly focus on the correlation between public debt and economic development, low debt and negative growth, and debt uncertainty and low growth issues (Hauptmeier & Kamps, 2022; Petrakos et al., 2021; Arabzadeh, 2022).

These studies found that public debt supports economic growth, whereas debt uncertainty creates vulnerability to growth. Aldama and Creel (2022) and Cronin and McInerney (2023) argued that public debt and economic growth are highly connected, and sometimes, debt has mixed effects on the economy. Nguyen (2022) and Gootjes and de Haan (2022) argued that economic growth, debt, and QoG are all interrelated issues, and QoG is crucial to understanding the debt-growth nexus. The findings of the recent studies on the debt and economic growth relationship in the context of high-income countries are mostly conflicting, which motivates us to conduct the current study to contribute to the effectiveness of the debt-growth relationship debate.

Table 1 shows that the studies apply a variety of methods, including the nominal cyclical adjustment method, autoregressive distributed lag (ARDL), generalized method of moment (GMM), ordinary least square (OLS), penalized spline regression, GARCH models, panel estimation, and generalized least squares (GLS) with panel fixed effects approach to examine the relationship. These methods hardly provide information about the scale, location, and estimations in different conditions with quantiles (frequency distribution into different groups by the model as quantile). Moreover, some methods are static, which are unable to deal with heterogeneity and abnormality in data and produce comparatively less reliable results (Machado & Silva, 2019). Nguyen (2022) and Mohsin et al. (2021) employed the conventional quantile regression method, which has computing and mathematical biasedness (Chernozhukov & Hansen, 2006, 2008). The methodological drawbacks in the existing studies drive our research to select a robust method that can overcome the stated criticisms. Therefore, we propose the method of moment quantile regression (MMQR) approach developed by Machado and Silva (2019) to address the drawbacks of the scale and location issues and computing and mathematical weakness issues.

Table 1 Summary of the relationship between public debt and economic growth

Authors	Sample countries	Sample period	Methods	Findings
Hauptmeier and Kamps (2022)	European Union	1999 to 2019	Nominal cyclical adjustment method	The current design has a procyclical bias that makes it difficult to apply during an economic downturn.
Arabzadeh (2022)	OECD countries	1980 to 2014	Autoregressive distributed lag (ARDL)	Lower budget deficits (debt) create wage stagnation and low growth
Aldama and Creel (2022)	OECD	from 1997 to 2018	Generalized method of moments (GMM)	Asymmetric public debt is sensitive to growth
Cronin and McInerney (2023)	EU member states	2013 and 2019	Ordinary least squares (OLS)	The study found that public debt has mixed effects on economic growth.
Grosu et al. (2022)	Central and Eastern EU countries	2000 to 2019	Penalized spline regression	Few countries have pursued sustainable public debt policies, while most other countries face weak debt sustainability policies.
Petrović et al. (2021)	10 emerging European economies	2000–2015	GARCH models, panel estimation	Public debt uncertainty has had a detrimental impact on GDP.
Petrakos et al. (2021)	European Union	1981–2009	Generalized least squares (GLS) with panel fixed effects	Growth benefits from public debt used for infrastructure and public goods.
Mohsin et al. (2021)	South Asia	2000–2018	Quantile regression	External debt has a negative impact, and external debt stock has a positive impact on economic growth.
Nguyen (2022)	34 developed countries	2002 to 2019	Quantile regression	Inflation is lowered by public debt and good governance individually, but the relationship is triggered by the moderating role of governance.
Gootjes and de Haan (2022)	73 countries	2003–2013	GMM	Low debt transparency affects budget balance

Table source: author compilation

Table 1 is constructed, followed by Law et al. (2021), Grosu et al. (2022), and Adeleye et al. (2022).

In addition, the study is paramount due to some growth-related policy gaps in high-income countries. First, a group of high-income countries struggle to maintain stable economic growth, while another group is struggling to achieve their projected economic growth rate. Similarly, almost all high-income countries adopt public debt to motivate economic growth, but the growth rates of different countries are disproportionate. Some countries, like Greece, Spain, and Portugal, experience huge troubles dealing with public debt. At the same time, the level of GoG is highly strong in most high-income countries, and they often experience hardship in leveraging public debt to spur economic growth. Considering the stated economic challenges in high-income countries, high-income countries urgently need some policy suggestions to overcome some of the macroeconomic challenges. Additionally, most of the prior studies fail to address how public debt and QoG respond to economic growth during an economic boom or recession. Therefore, this is still challenging for policymakers to set up the most suitable macroeconomic policies considering economic conditions. The quantile via moment method is able to provide such information to policymakers. Therefore, the current study aims to provide some important policy recommendations for high-income countries on public debt, QoG, and economic growth by deploying the method of moment quantile regression (MMQR).

Research Methodology

Data and Measurement

The study covers panel data from 1990 to 2020, considering 34 high-income countries (GDP per capita higher than $30,000). The data of the focused variables were obtained from secondary sources such as the World Bank (The World Development Indicators), the International Country Risk Guide (ICRG), Government Finance Statistics (GFS), and the International Monetary Fund (IMF). However, this study uses the Stata software package version 17 to analyze the method. Measurement and proxy of the variables are provided in Table 2.

Empirical Model

We formulated our empirical models based on the Solow growth model; hence, we incorporate labor force (LF) and capital (FCF) with the model. Since our sample countries are free-to-trade economies, we consider trade openness (TO) in the model. Finally, our main variables are economic growth with the proxy of LGDPC = logarithmic form of GDP, DEBT = public debt, and QoG = governance. However, the formulation of the models also follows the existing literature on the areas of public debt and economic growth (Chen et al., 2024; Musa et al., 2023).

Table 2 Variable description and sources

Variable	Definition	Source	Measurement
Economic growth (GDP)	GDP per capita is the proxy of economic growth, obtained by dividing the gross domestic product by the total population.	World Development Indicators (WDI) The World Bank	GDP per capita (constant US $ 2010)
Public debt (DEBT)	External debt per cent of GDP	Government Finance Statistics of IMF	Debt to GDP ratio
Quality of governance (QoG)	Good governance is the degree to which it delivers on the promise of human rights: civil, cultural, economic, political, and social rights.	Developed by the author using the ICRG data set	The index of QoG was compiled using the moving average method from the 12 components (investment profile, socio-economic conditions, democratic accountability, government effectiveness, bureaucratic quality, rule of law, corruption perception index, religious tensions, military in politics, religion in politics, internal conflict and external conflict)
Trade openness (TO)	Trade is the sum of imports and exports of services and goods as a % of GDP	WDI The World Bank	Trade (as % of GDP)
Labor force (LF)	LF includes people ages 15 and older who supply labor to produce goods and services during a specified period.	WDI The World Bank	Population aged (15 and above). Percent of the total population
Fixed capital formation (FCF)	Gross FCF (% of GDP) is used to measure capital constant 2010 US $.	WDI The World Bank	Gross FCF as % of GDP)

Table source: author compilation

$$\mathrm{LGDPC}_{it} = B_0 + \beta_1 \mathrm{DEBT}_{it} + \beta_2 \mathrm{TO}_{it} + \beta_3 \mathrm{LF}_{it} + \beta_4 \mathrm{FCF}_{it} + \epsilon_{it} \quad (1)$$

$$\mathrm{LGDPC}_{it} = B_0 + \beta_1 \mathrm{DEBT}_{it} + \beta_2 \mathrm{TO}_{it} + \beta_3 \mathrm{LF}_{it} + \beta_4 \mathrm{FCF}_{it} + \beta_5 \mathrm{QoG}_{it} + \epsilon_{it} \quad (2)$$

The moderating role of QoG

$$\mathrm{LGDPC}_{it} = B_0 + \beta_1 \mathrm{DEBT}_{it} * \mathrm{QoG} + \beta_2 \mathrm{TO}_{it} + \beta_3 \mathrm{LF}_{it} + \beta_4 \mathrm{FCF}_{it} + \beta_5 \mathrm{QoG}_{it} + \epsilon_{it} \quad (3)$$

where LGDPC = logarithmic form of GDP, DEBT = public debt, TO = trade openness, LF = labor force, FCF = fixed capital formation, QOG = quality of governance, and ϵ_{it} = error.

Technique of Analysis

We employ the MMQR approach that Machado and Silva (2019) developed to estimate our empirical models for the number of crucial traits. First, the behaviors of the variables are highly heterogeneous for the countries and over time. Studies report that a number of existing panel data–based approaches cannot address the cross-sectional heterogeneity and variance over time (Canay, 2011; Koenker, 2004), while the MMQR technique can observe the conditional heterogeneous covariance impact (Awan et al., 2022). Moreover, the approach can address the possible existence of endogenous factors in the independent variables, which is suitable in cases where impacts submerge the panel data model. It yields robust results for non-linear models and allows location-based asymmetries (Machado & Silva, 2019; Awan et al., 2022). The method can generate heterogeneous estimations across the entire distribution. The FMOLS and the DOLS models are existing panel regression models that can handle correlation and endogeneity, but the methods are lacking with the data of conditional mean. With the dependent variable's nonlinearity and asymmetric association, the MMQR can handle endogeneity and heterogeneity concerns.

$$Q_y\left(\tau | X_{it}\right) = \left(a_i(\tau) + \delta_i q(\tau)\right) + X'_{it}\beta(\tau) + Z'_{it}\gamma(\tau) \quad (4)$$

where $a_i(\tau)$ is the quantile-τ fixed effect for countries i, or the distributional effects (location effect), $\delta_i(\tau)$ is the scale effect, τ is the quantile, $Q_y\left(\tau | X_{it}\right)$ is the quantile of the dependent variable, $X'_{it}\beta$ is the vector of the independent variables, and Z is a vector of known differentiable (with probability 1) transformation of the components of X.

Our approach to structural quantile function estimation can contribute to the expanding literature addressing the computing issues (calculation faults) associated with the Chernozhukov and Hansen (2008) estimator. Even though a number of intriguing solutions to this issue have been developed, as far as we are aware, they all have undesirable characteristics, including the need for optimization algorithm tuning (Chernozhukov & Hong, 2003), tolerance parameter selection (Xu & Burer, 2017), smoothing parameter selection (Kaplan & Sun, 2017), specification in parameter spacing (Chen & Lee, 2018), or some techniques are bias in binary treatments issues (Wüthrich, 2015). While our model has several endogenous factors

with the non-linear issue, the MMQR approach is best to deploy to produce robust estimations.

Furthermore, the specific benefits of the panel MMQR technique are that it can estimate conditional means, address cross-sectional effects from the model, and offer extensive statistical evidence of how the explanatory variables impact the entire conditional distribution of a model. The information on different quantiles provided by the MMQR is one of the most useful features of this technique (Bassett & Koenker, 2017). Thus, this model provides information on the critical empirical models and offers estimations of different quantiles considering the practical economic fluctuations, which are often unaddressed by the plenty of existing setups (Chernozhukov et al., 2010). Furthermore, the robustness of the estimation of MMQR was confirmed in recent studies, and the method can produce strong results despite the abnormality in the data (Adebayo et al., 2022).

Result and Discussion

Table 3 displays the descriptive statistics of the total number of observations, mean value, standard deviation, and minimum and maximum value of the variables of concentrated high-income countries. The standard deviation shows that it is profound under the "between" option for most of the variables, implying the presence of disparity in different high-income countries. Besides, the total *N* is 34, and the value of observations varies from variable to variable due to missing data in some years, where the highest mean of Table 3 shows 22.87 for fixed capital formation (FCF) and the lowest mean for QoG is 0.77. Besides, the data also skewed negatively a little, and the higher Kurtosis values indicated more extreme tails in the distribution.

Table 4 depicts the unit root tests of the variables considered in this study. We perform several unit root tests, i.e., the Levin et al. (2002) (LLC) unit root test, the Im et al. (2003) W-stat panel unit root test, and the augmented Dickey-Fuller unit root test. Most of the variables are stationary in the level, and some of them are stationary in the first difference.

Table 3 Descriptive statistics of high-income countries before interpolation

Variable	Observation	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
GDP	1,013	10.23	0.89	6.13	11.62	−1.85	7.59
DEBT	858	3.80	0.79	0.026	5.51	−0.636	3.83
TO	1020	4.35	0.53	2.77	6.01	−1.85	8.47
LF	1054	15.48	1.48	11.86	18.93	2.33	11.51
FCF	1020	22.87	4.14	10.13	45.59	−0.094	3.02
QoG	958	0.77	0.16	0.11	0.97	0.798	5.09

Descriptive statistics: 34 high-income countries, table source: author compilation

Table 4 Unit root tests

	LLC unit root test		IMS unit root test		ADF-Fisher unit root test	
	Level	1st Diff	Level	1st Diff	Level	1st Diff
LGDPC	−10.45***	–	−2.82***	–	5.91	−10.27***
DEBT	−3.73***	–	−3.36	−12.77***	0.85	−10.18***
QoG	−6.29***	–	−7.08***	–	−5.18***	–
TO	−2.36***	–	1.20	−20.35***	−3.55**	–
LF	−3.28***	–	2.34	−20.77***	0.032	−6.63***
FCF	−4.60***	–	−5.58***	–	−5.64***	–

Table source: author compilation

Main Findings

The results of the empirical model of Eq. (1) are discussed in this section. Table 4 depicts the coefficients of public debt on economic growth estimations that take the form $Q_{LGDPC}(\tau|DEBT, TO, LF, FCF) = \alpha + X'(DEBT, TO, LF, FCF)\beta + \sigma(\delta + Z'\gamma)q(\tau)$. Table 5 displays the coefficients of DEBT, which are positive and significant at the 1% significance level from lower quantiles to medium quantiles. In addition, the coefficients for quantiles 60 and 70 are positive and significant at 5% and 10% significance levels; however, the coefficients for the top two quantiles are insignificant.

The finding implies that public debt spurs economic growth under different economic circumstances in the lower to upper-middle quantiles, but the impacts are minimal in the highest quantiles. Despite the majority of the benefits associated with public debt being positive, the results reveal that debt under a low debt ratio regime facilitates economic growth and has no impact during the high debt ratio regime represented by the top two quantiles. Dudzevičiūtė et al. (2018), Jorgenson and Fraumeni (1992), and Chu et al. (2020) found similarly that public debt mostly augments economic growth in European Union countries and the American economy as well as in high-income countries. At the same time, Heimberger (2023) found that debt has a counterproductive impact in high-income countries, while Kraemer and Lehtimäki (2023) came up with mixed results.

Table 5 also provides the coefficients of control variables. TO showed mixed trends during analysis. It has a positive and significant relationship with economic growth as scale and q10; then, it became negative from q20 till q40. After that, it became positive but insignificant. LF has an inverse and significant relationship with economic growth at scale and from q10 to q20. After that, it provided an insignificant relationship with economic growth. FCF showed an inverse and insignificant relationship with economic growth throughout location, scale, and all quintiles with economic growth.

According to Fig. 2, public debt has an overall positive impact on economic growth. At the same time, the effects start to fade after the second quantile and become insignificant at the top quantiles. Figure 2 also exhibits graphically how the considered control variables, i.e., trade openness, labor force, and fixed capital formation, impact economic growth in different quantiles.

Table 5 Impact of the public debt on economic growth

Variables	Location	Scale	q10	q20	q30	q40	q50	q60	q70	q80	q90
DEBT	0.420***	−0.314***	1.016***	0.714***	0.573***	0.459***	0.370***	0.264**	0.201*	0.097	−0.065
	(−0.097)	(−0.077)	(−0.141)	(−0.102)	(−0.088)	(−0.090)	(−0.097)	(−0.11)	(−0.118)	(−0.137)	(−0.169)
TO	0.009	0.156*	−0.287*	−0.137	−0.067	−0.010	0.033	0.086	0.118	0.169	0.251
	(−0.11)	(−0.087)	(−0.162)	(−0.111)	(−0.102)	(−0.106)	(−0.116)	(−0.132)	(−0.144)	(−0.165)	(−0.203)
LF	0.002	−0.077**	0.150**	0.075*	0.040	0.012	−0.009	−0.035	−0.051	−0.076	−0.117
	(−0.041)	(−0.033)	(−0.061)	(−0.042)	(−0.038)	(−0.040)	(−0.043)	(−0.049)	(−0.053)	(−0.061)	(−0.076)
FCF	−0.016	−0.011	0.005	−0.005	−0.011	−0.015	−0.018	−0.022	−0.024	−0.028	−0.034
	(−0.012)	(−0.010)	(−0.018)	(−0.012)	(−0.011)	(−0.012)	(−0.013)	(−0.015)	(−0.016)	(−0.019)	(−0.023)
Constant	8.929***	2.553***	4.074***	6.530***	7.682***	8.606***	9.332***	10.19***	10.71***	11.55***	12.88***
	(−1.069)	(−0.851)	(−1.561)	(−1.094)	(−0.983)	(−1.015)	(−1.101)	(−1.248)	(−1.355)	(−1.56)	(−1.924)
Observations	1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	1020

Observation: 34 high-income countries, table source: author compilation

***, **, and * indicate 1%, 5%, and 10% significance level. Standard errors are in parenthesis

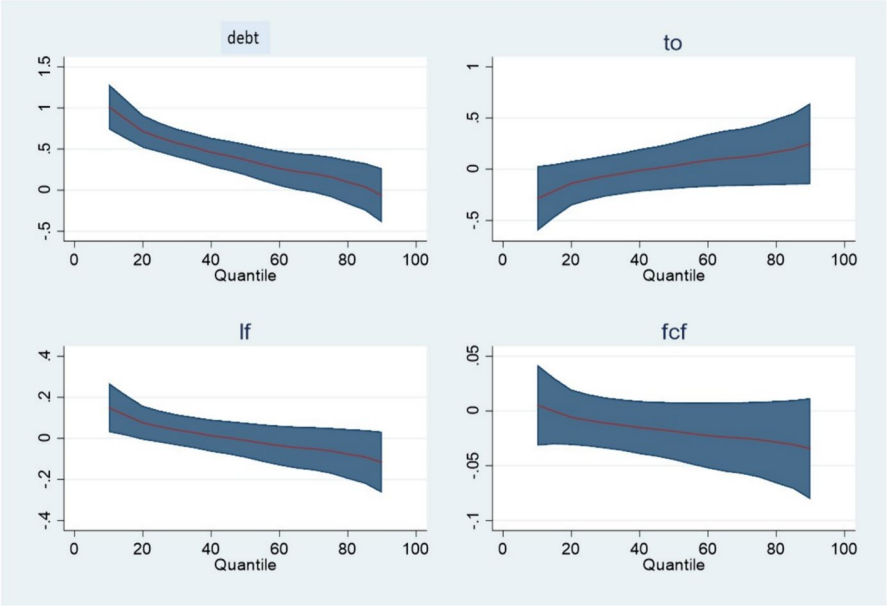

Fig. 2 The impact of public debt on economic growth in high-income countries under quantiles. Note: The vertical axis indicates the magnitude of coefficients, and the horizontal axis indicates the quantile. Figure source: author compilation.

Table 6 provides the results of the impact of QoG on economic growth, followed by the empirical model of Eq. (2). The estimations take the form $Q_{LGDPC}(\tau|DEBT, TO, LF, FCF, QoG) = \alpha + X'(DEBT, TO, LF, FCF, QoG)\beta + \sigma(\delta + Z'\gamma)q(\tau)$. The table shows that, except for the quantile 90, which is insignificant, the coefficients of QoG are positive and significant at a 1% significance level in all quantiles from quantile 10 to quantile 80. According to the findings, QoG highly promotes economic growth in almost all quantiles. Additionally, the consequences are comparatively greater at lower quantiles, and effects gradually diminish as quantiles rise. It suggests that economic growth will be weaker the higher the level of QoG in high-income countries.

This finding of the study is parallel with the findings of Alsaleh and Abdul-Rahim (2021), Cigu et al. (2019), and Khan et al. (2019). Studies acknowledge that good governance expediates economic growth, but at the same time, strong QoG highly prioritizes inequality reduction, environmental sustainability, and inclusive social welfare issues, which might decrease the growth rate through high social and environmental responsibilities in developed countries. Moreover, the strict rules and regulations of QoG might distress foreign direct investment (FDI) inflows, export and import sectors, and cause slow growth in high-income countries (Ouyang et al., 2019). Despite the slow growth, strong QoG, on the other hand, contributes to societal sustainability by reducing inequality and upholding social justice.

Table 7 demonstrates the coefficients of the moderating role of QoG on the debt-growth relationship considering different economic conditions, followed by Eq. (3). The estimation of MMQR takes the form

Table 6 Impact of QoG on economic growth in different economic conditions

Variance	Location	Scale	q10	q20	q30	q40	q50	q60	q70	q80	q90
DEBT	0.26***	−0.21**	0.64***	0.47***	0.40***	0.32***	0.26***	0.21**	0.14	0.04	−0.07
	(−0.1)	(−0.08)	(−0.20)	(−0.14)	(−0.12)	(−0.10)	(−0.09)	(−0.09)	(−0.09)	(−0.11)	(−0.13)
TO	0.06	0.117	−0.148	−0.0539	−0.013	0.029	0.061	0.089	0.127	0.185	0.246
	(−0.121)	(−0.106)	(−0.252)	(−0.181)	(−0.154)	(−0.132)	(−0.12)	(−0.115)	(−0.118)	(−0.138)	(−0.174)
LF	0.035	−0.065*	0.152*	0.099*	0.076	0.053	0.034	0.019	−0.001	−0.033	−0.067
	(−0.039)	(−0.034)	(−0.080)	(−0.057)	(−0.049)	(−0.042)	(−0.038)	(−0.036)	(−0.037)	(−0.044)	(−0.055)
FCF	−0.010	0.002	-0.015	−0.013	−0.012	−0.011	−0.010	−0.009	−0.008	−0.007	−0.005
	(−0.013)	(−0.01)	(−0.027)	(−0.02)	(−0.017)	(−0.014)	(−0.013)	(−0.012)	(−0.013)	(−0.015)	(−0.01)
QoG	1.89***	−0.84***	3.39***	2.71***	2.42***	2.11***	1.88***	1.68***	1.41***	1.00***	0.559
	(−0.35)	(−0.30)	(−0.70)	(−0.50)	(−0.43)	(−0.37)	(−0.336)	(−0.322)	(−0.333)	(−0.387)	(−0.49)
Constant	7.17***	2.39**	2.89	4.83***	5.66***	6.53***	7.21***	7.78***	8.54***	9.73***	10.99***
	(−1.212)	(−1.055)	(−2.471)	(−1.775)	(−1.509)	(−1.294)	(−1.177)	(−1.13)	(−1.161)	(−1.353)	(−1.711)
Obs	939	939	939	939	939	939	939	939	939	939	939

Observation: 34 High-income Countries, Table source: author compilation

***, **, and * indicate 1%, 5% &10% significance level. Standard errors are in parethesis

of $Q_{LGDPC}(\tau|DEBT, TO, LF, FCF, QoG, DEBT * QoG) = \alpha + X'(DEBT, TO, LF, FCF, QoG, DEBT * QoG)\beta + \sigma(\delta + Z'\gamma)q(\tau)$. Table 7 displays the coefficients of the moderating role of QoG, which are negative and significant from the lower quantiles to medium quantiles up to a 10% significance level. Besides, the magnitudes of the coefficients are negative and significant from the medium quantiles to the top quantiles. Results imply that good governance is somewhat ineffective and even counterproductive in the relationship between debt and economic growth in the context of high-income countries.

The rigorous controls and regulations of QoG in high-income countries might distract the use of public debt in some growing sectors of some economies and affect growth trajectory. On the other hand, strong QoG ensures the fund allocation in the healthcare, pension, subsidy, and other social welfare sectors from the public debt fund and affects the growth rate in lower quantiles. During the high debt regime, the social expenditure might surpass the threshold and make low space to invest in the productive sectors in upper quantiles, which show relatively close support growth from the lower quantiles. So investment in social welfare as a trade-off in the productive sectors might be the reason for the counterproductive scenarios in different quantiles of the debt-growth nexus. However, the findings are consistent with the prior studies (Mauro et al., 2018; Asimakopoulos & Karavias, 2016; Özmen & Mutascu, 2023). The studies also argue that high social expenditure and subsidy transfers consume a considerable amount of the public budget, including debt funds, and reduce investment in productive sectors. However, the findings imply that the QoG does not always support the debt-growth nexus, but sometimes, it also asymmetrically impacts the relationship of high-income countries. TO has an insignificant relationship with economic growth. LF has a positive relationship with economic growth for q10 and q20, but for all other quantiles, its relationship with economic growth is insignificant. FCF has an inverse but insignificant relationship with economic growth. Additionally, Figs. 3 and 4 illustrate the moderating role of QoG on the relationship between public debt and economic growth graphically.

We also check the robustness of our estimated models with the alternative method, the ordinary least square (OLS), with fixed and random effects. The results of Table 8 are mostly consistent with the results from the MMQR method, which acknowledges the reliability of the previous findings.

Discussion

The study examines the impact of public debt and quality of governance (QoG) on economic growth in the context of high-income countries. The analysis was conducted by first examining the impact of public debt on economic growth, followed by the impact of QoG on economic growth, and the moderating role of QoG on the nexus between public debt and economic growth. We deploy a robust MMQR approach to achieve the objectives of the study. Any conventional panel data–based methodologies frequently fall short of capturing variation over time and cross-sectional heterogeneity, while our variables are highly heterogeneous. Moreover, the MMQR approach offers some statistical advantages, i.e., it avoids several mathematical biasedness that exist in a number of other approaches, can

Table 7 The moderating role of QoG on the nexus between public debt and economic growth

Variance	Location	Scale	q10	q20	q30	q40	q50	q60	q70	q80	q90
DEBT	1.449	−0.386	2.085***	1.860***	1.695***	1.545**	1.435	1.313	1.171	1.024	0.833
	(−0.931)	(−0.893)	(−0.789)	(−0.468)	(−0.508)	(−0.732)	(−0.944)	(−1.194)	(−1.499)	(−1.821)	(−2.246)
TO	−0.032	0.122	−0.233	−0.162	−0.11	−0.062	−0.028	0.010	0.055	0.101	0.162
	(−0.236)	(−0.227)	(−0.202)	(−0.12)	(−0.13)	(−0.188)	(−0.242)	(−0.307)	(−0.385)	(−0.468)	(−0.577)
LF	0.044	−0.052	0.131*	0.100**	0.077*	0.057	0.042	0.025	0.006	−0.013	−0.039
	(−0.079)	(−0.076)	(−0.067)	(−0.04)	(−0.043)	(−0.062)	(−0.080)	(−0.102)	(−0.128)	(−0.156)	(−0.192)
FCF	−0.006	0.005	−0.015	−0.012	−0.010	−0.008	−0.006	−0.005	−0.003	−0.001	0.001
	(−0.028)	(−0.027)	(−0.024)	(−0.014)	(−0.015)	(−0.022)	(−0.029)	(−0.037)	(−0.046)	(−0.056)	(−0.069)
QoG	7.730*	−1.918	10.89***	9.774***	8.952***	8.209**	7.658*	7.056	6.349	5.618	4.666
	(−4.491)	(−4.31)	(−3.806)	(−2.259)	(−2.45)	(−3.533)	(−4.555)	(−5.764)	(−7.235)	(−8.79)	(−10.84)
DEBT*QoG	−1.62	0.255	−2.040**	−1.891***	−1.782***	−1.683*	−1.61	−1.53	−1.436	−1.339	−1.212
	(−1.143)	(−1.097)	(−0.975)	(−0.577)	(−0.627)	(−0.907)	(−1.171)	(−1.481)	(−1.86)	(−2.26)	(−2.787)
Constant	3.162	2.872	−1.573	0.101	1.332	2.445	3.27	4.172	5.231	6.326	7.751
	(−4.438)	(−4.26)	(−3.733)	(−2.222)	(−2.406)	(−3.457)	(−4.454)	(−5.634)	(−7.071)	(−8.589)	(−10.59)
Observations	939	939	939	939	939	939	939	939	939	939	939

Observation: 34 high-income countries, table source: author compilation

***, **, and * indicate 1%, 5%, and 10% significance level. Standard errors are in parenthesis

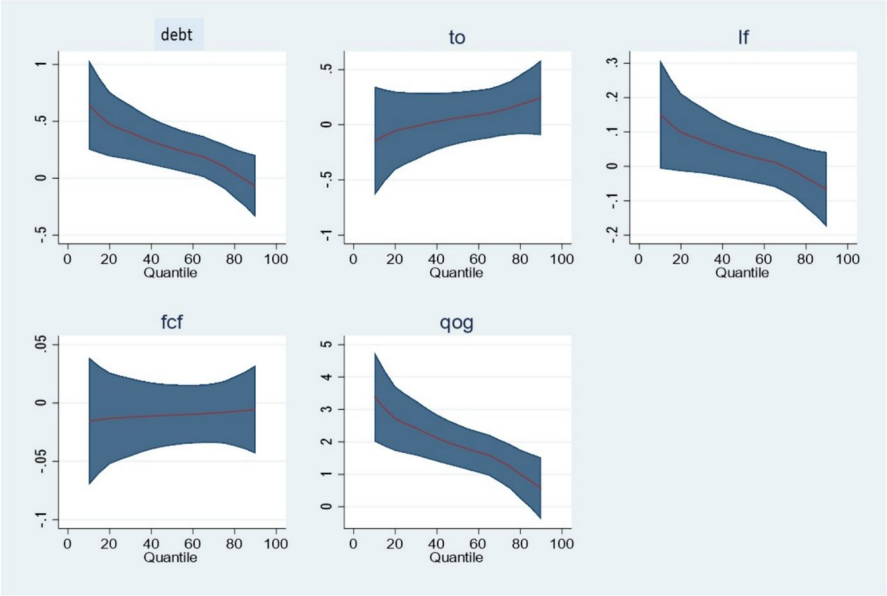

Fig. 3 provides the graphical presentation of the results in different quantiles. Note: The vertical axis indicates the magnitude of coefficients, and the horizontal axis indicates the quantile. Figure source: author compilation.

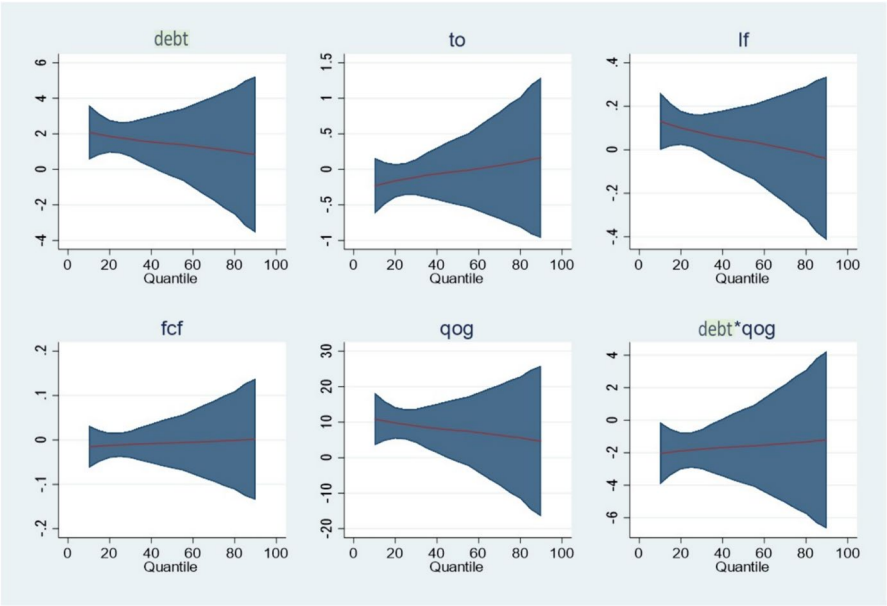

Fig. 4 The moderating role of QoG on the nexus between public debt and economic growth under quantiles. Note: The vertical axis indicates the magnitude of coefficients, and the horizontal axis indicates the quantile. Figure source: author compilation

Table 8 Robustness check

Variable	OLS Coefficient	FE Coefficient	RE Coefficient
C	−0.516 *** (0.1927)	−0.481 (0.7673)	−3.366*** (0.3138)
DEBT	0.942*** (0.0105)	0.835523*** (0.0368)	1.025*** (0.0230)
QOG	0.841*** (0.1711)	1.527509*** (0.1441)	1.308*** (0.1255)
TO	0.0009*** (0.0001)	0.001708*** (0.0001)	0.002*** (0.0001)
LF	−0.891*** (0.01345)	−0.745544*** (0.0534)	−0.856*** (0.0347)
FFC	0.0171*** (0.0019)	0.005497*** (0.0010)	0.005*** (0.0009)

Observation: 34 high-income countries, table source: author compilation

***, **, and * indicate 1%, 5%, and 10% significance level. Standard errors are in parenthesis

estimate conditional means, and provides comprehensive information of lower to upper quantiles according to the practical economic fluctuations.

The finding of Eq. (1) implies that the public debt spurs economic growth under different economic circumstances in the lower quartile to upper-medium quantiles, but the top two quantiles show ineffective growth impacts. As the effects of debt are diminishing trends from the lower quantile to upper quantiles, the coefficients align with the debt overhang theory. According to the theory, debt promotes economic growth, but excessive debt or debt above a certain threshold has a detrimental impact on economic growth (Vanlaer et al., 2021). Although in most quantiles, the public debt still has a favorable impact on economic growth since most of the EU and OECD countries run countercyclical public debt to overcome the crisis along with strong fiscal space (MacGee et al., 2022; Haughton & Keane, 2021). Moreover, some countries ensure the proper use of debt funds in developing infrastructure, job creation, and new investment to benefit the economy (Canelli et al., 2021; Petrović et al., 2021).

At the same time, a group of studies also found that a number of high-income countries similarly, i.e., Greece, Spain, Italy, and Portugal, have huge public debt. The countries have been struggling to motivate new investment and productive sectors due to huge welfare expenditure as well as high debt payments since the last decade (Nordström & Laiho, 2023; Anton & Afloarei Nucu, 2020; Brady & Magazzino, 2019). Therefore, the results of the first equation are consistent with the previous studies (Haughton & Keane, 2021; Anton & Afloarei Nucu, 2020). Also, it appears that the usefulness of debt is heavily influenced by its proper use.

Equation (2) estimates the impacts of QoG on economic growth, while the results are highly positive and significant in almost all quantiles except the top-most quantile. The results also indicate that economic growth slows down in every

upper quantile compared to the immediate lower quantile. The findings suggest that strong QoG enhances economic growth by tackling corruption and growth-distorting obstacles in advanced economies despite the slow growth in upper quantiles (Rodríguez-Pose & Tselios, 2019). Similarly, Kuziemski and Misuraca (2020) and Saurwein and Spencer-Smith (2020) state that high-income countries typically benefit from steady economic growth due to their solid institutional foundation, good governance, and strict rule of law. On the other hand, the tighter the rules and regulations of QoG, the lower the output growth displayed in the upper quantiles. It might happen due to the constant process of initiating strict rules and regulations of QoG that might somewhat hamper a bigger scale of growth (Anginer et al., 2022; Dorobantu & Müllner, 2019). Besides, the strong QoG also prioritizes closing the income disparity, lowering carbon emissions, and enhancing social welfare, all of which could slow down the growth rate in this group of countries.

According to the estimation following Eq. (3), the result shows that the first four quintiles are negative and significant up to a 10% significance level, and the rest of the upper quantiles are insignificant. Results imply that the nexus between public debt and economic growth has mixed effects when QoG moderates the relationship. However, the debt-growth relationship is still negative in all quantiles, which might be the consequence of stringent laws and regulations of governance, which might hamper the supply chain, FDI inflows, and financial flows, which make it challenging for productive industries to engage in international trade and stalling economic growth (Ketels & Porter, 2021; Peng et al., 2023). On the other hand, the QoG in high-income countries is already too strong for a long time, while implementing new QoG rules and regulations might be counterproductive for debt-growth relationships.

The prior results in Eqs. (1) and (2) show that public debt and QoG individually support economic growth, but by the presence of QoG, the debt-growth relationship is counterproductive and insignificant overall in Eq. (3). Interestingly, the strongest the level of QoG, the strongest the debt-growth relationship shown by the lower to upper quantiles in Eq. (3) as well. This implies that the debt-growth nexus will gradually benefit from QoG's effects. In summary, QoG does not always augment economic growth, but sometimes it also asymmetrically impacts the debt-growth relationship in some high-income countries.

The results of control variables showed mixed results, and TO showed mixed trends during analysis. It has a positive and significant relationship with economic growth as scale and q10; then, it became negative from q20 till q40. After that, it became positive but insignificant for all equations. LF has an inverse and significant relationship with economic growth at scale and from q10 to q20. After that, it provided an insignificant relationship with economic growth. FCF showed an inverse and insignificant relationship with economic growth throughout the analysis.

Conclusion and Policy Implications

This study aims to examine the impact of public debt on economic growth in high-income countries. Since the role of quality of governance (QoG) is disputed in the existing literature, the relationship between public debt and economic growth is also

given priority in this study. Additionally, we also attempt to examine the moderating role of QoG on the nexus between public debt and economic growth. Highly heterogeneous panel data sets spanning the years 1990 to 2020 were employed in the study to examine the relationships. Hence, this study deploys a recently developed econometric model termed method of moment quantile regression (MMQR), which takes into account the moment conditions in both scale and location. Additionally, this method can provide reliable estimations from data with nonlinearity and various abnormality issues.

The estimations demonstrate that public debt spurs economic growth under different economic circumstances, especially in the economic downturn, but shows no effect during an economic boom by the result of top quantiles. In a gross sense, public debt has a favorable impact on economic growth in the context of high-income countries despite the slow growth during an economic boom. Besides, the estimations also find that QoG plays a major role in sustainable economic growth in different economic conditions but distracts the growth in the upper quantile. However, the moderating role of QoG on the debt-growth nexus also demonstrates negative results in lower to medium quantiles, but the overall picture is that the stronger the QoG, the stronger the debt-growth relationship by the lower to upper quantiles.

The findings of the study provide a number of important policy implications for specific macroeconomic areas, and policymakers can take into account the recommendations in policymaking. Findings indicate that public debt is effective for economic growth in almost all quantiles. Therefore, public debt continues to be an instrument for expansionary fiscal policy that budgetary institutions and policymakers in high-income countries may employ to promote the economy. It is also recommended to maintain enough fiscal space as well as avoid procyclical public debt to evade experiencing debt overhang issues. As the level of QoG is already strong in high-income countries, policymakers must be cautious in formulating further new strict rules and regulations of QoG to avoid growth distortion. For example, certain high-income nations have been experiencing stagnant growth over the past decade, and their large sums of public debt frequently do barely anything to stimulate the economy, which may be the reason for the stringent QoG regulations. Last but not least, budgetary bodies and policymakers may explicitly examine financial rules and regulations as an aspect of QoG to drive the relationship between QoG, public debt, and economic growth in order to benefit from the debt-growth relationship.

The current study has some limitations. First, the COVID-19 pandemic and the Russia-Ukraine conflict contributed to the recent financial crisis, and as a result, countries are now adopting massive public debt to tackle the financial catastrophe. The current study was unable to incorporate debt issues triggered by the events due to data unavailability. Second, this study focuses on high-income countries, which might limit the generalizability of the findings to a broader range of economic contexts. Third, economic conditions and the impact of public debt on growth may vary significantly in low- or middle-income countries with different structural characteristics. Therefore, the study's findings may not be directly applicable to regions with diverse economic profiles, and caution should be exercised in extrapolating the results to a global context. Finally, the current study

evaluates the effects of the overall quality of governance and ignores exploring the impacts of its specific components on growth.

Consequently, future studies might be done taking into account the debt issue of the stated events in a diverse set of countries, encompassing different income levels and economic structures. This would allow for a more comprehensive understanding of how the relationship between public debt and economic growth varies across various economic conditions. Also, to determine the precise impact, future research may look at public debt and economic growth, including the particular components of QoG.

This would allow for a more comprehensive understanding of how the relationship between public debt and economic growth varies across various economic conditions. Additionally, exploring the impact of public debt on growth in specific sectors or industries within high-income countries could provide nuanced insights. Moreover, investigating the role of other potential moderators beyond quality of government (QoG) could contribute to a more holistic understanding of the complex dynamics between public debt and economic growth.

Appendix. Abbreviations/Nomenclature

Abbreviations/nomenclature	Full form
ARDL	Autoregressive distributed lag
DOLS	Dynamic ordinary least square
EU	European Union
FCF	Fixed capital formation
FDI	Foreign direct investment
FMOLS	Fully modified ordinary least square
GDP	Gross domestic product
GFS	Government finance statistics
GLS	Generalized least squares
GMM	Generalized method of moment
ICRG	International country risk guide
IMF	International Monetary Fund
LF	Labour force
MMQR	Methods of moment quantile regression
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary least square
QoG	Quality of governance
TO	Trade openness
WB	World Bank
WDI	World Development Indicators

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Declarations

Conflict of Interest The authors declare no competing interests.

References

Abreu, W. M., & Gomes, R. C. (2022). Shackling the Leviathan: Balancing state and society power against corruption. *Public Management Review*, *24*(8), 1182–1207.

Acemoglu, D., & Robinson, J. A. (2019). Rents and economic development: The perspective of why nations fail. *Public Choice*, *181*, 13–28.

Adebayo, T. S., Rjoub, H., Akinsola, G. D., & Oladipupo, S. D. (2022). The asymmetric effects of renewable energy consumption and trade openness on carbon emissions in Sweden: New evidence from quantile-on-quantile regression approach. *Environmental Science and Pollution Research*, *29*(2), 1875–1886.

Adeleye, B. N., Jamal, A., Adam, L. S., & Oyedepo, T. (2022). ICT leapfrogging and economic growth among SAARC economies: Evidence from method of moments quantile regression. *Journal of Global Information Technology Management*, *25*(3), 230–253.

Aldama, P., & Creel, J. (2022). Real-time fiscal policy responses in the OECD from 1997 to 2018: Procyclical but sustainable? *European Journal of Political Economy*, *73*, 102135.

Alexandre, F., Bação, P., & Veiga, F. J. (2022). The political economy of productivity growth. *European Journal of Political Economy*, *75*, 102185.

Alsaleh, M., & Abdul-Rahim, A. S. (2021). The Nexus between Worldwide Governance indicators and Hydropower Sustainable Growth in EU 28 Region. *International Journal of Environmental Research*, *15*(6), 1001–1015.

Amato, M., Belloni, E., Falbo, P., & Gobbi, L. (2021). Europe, public debts, and safe assets: The scope for a European Debt Agency. *Economia Politica*, *38*, 823–861.

Ampofo, G. M. K., Jinhua, C., Bosah, P. C., Ayimadu, E. T., & Senadzo, P. (2021). Nexus between total natural resource rents and public debt in resource-rich countries: A panel data analysis. *Resources Policy*, *74*, 102276.

Anginer, D., Demirguc-Kunt, A., Simsir, S. A., & Tepe, M. (2022). Is short-term debt a substitute for or complementary to good governance? *Borsa Istanbul Review*, *22*(2), 197–208.

Anton, S. G., & Afloarei Nucu, A. E. (2020). Sovereign credit default swap and stock markets in Central and Eastern European Countries: Are Feedback effects at Work? *Entropy*, *22*(3), 338.

Arabzadeh, H. (2022). Wage centralization and the political economy of budget deficits. *European Journal of Political Economy*, *74*, 102168.

Arestis, P., Şen, H., & Kaya, A. (2021). On the linkage between government expenditure and output: Empirics of the keynesian view versus Wagner's law. *Economic Change and Restructuring*, *54*(2), 265–303.

Arsić, M., Mladenović, Z., & Nojković, A. (2021). Debt uncertainty and economic growth in emerging European economies: Some empirical evidence. *Emerging Markets Finance and Trade*, *57*(12), 3565–3585.

Asimakopoulos, S., & Karavias, Y. (2016). The impact of government size on economic growth: A threshold analysis. *Economics Letters*, *139*, 65–68.

Awan, A., Abbasi, K. R., Rej, S., Bandyopadhyay, A., & Lv, K. (2022). The impact of renewable energy, internet use and foreign direct investment on carbon dioxide emissions: A method of moments quantile analysis. *Renewable Energy*, *189*, 454–466.

Bartak, J., Jabłoński, Ł., & Tomkiewicz, J. (2022). Does income inequality explain public debt change in OECD countries? *International Review of Economics & Finance*, *80*, 211–224.

Bassett, G. W., & Koenker, R. (2017). A quantile regression memoir. *Handbook of Quantile Regression* (pp. 3–5). Chapman and Hall/CRC. https://www.taylorfrancis.com/chapters/edit/10.1201/9781315120256-1/quantile-regression-memoir-gilbert-bassett-roger-koenker

Baum, A., Checherita-Westphal, C., & Rother, P. (2013). Debt and growth: New evidence for the euro area. *Journal of International Money and Finance, 32*, 809–821.

Bentour, E. M. (2021). On the public debt and growth threshold: One size does not necessarily fit all. *Applied Economics*, *53*(11), 1280–1299.

Bisogno, M., & Cuadrado-Ballesteros, B. (2022). Budget transparency and governance quality: A cross-country analysis. *Public Management Review*, *24*(10), 1610–1631.

Blecker, R. A. (2022). New advances and controversies in the framework of balance-of-payments-constrained growth. *Journal of Economic Surveys*, *36*(2), 429–467.

Brady, G. L., & Magazzino, C. (2018). Government debt in EMU countries. *The Journal of Economic Asymmetries*, *18*, e00096.

Brady, L., G., & Magazzino, C. (2019). The sustainability of Italian fiscal policy: Myth or reality? *Economic research-Ekonomska istraživanja*, *32*(1), 772–796.

Burhanudin, M. D. A., Muda, R., Nathan, S. B. S., & Arshad, R. (2017). Real effects of government debt on sustainable economic growth in Malaysia. *Journal of International Studies*, 10(3). https://jois.eu/files/10_390_440_Burhanudin.pdf

Canay, I. A. (2011). A simple approach to quantile regression for panel data. *The Econometrics Journal*, *14*(3), 368–386.

Canelli, R., Fontana, G., Realfonzo, R., & Passarella, M. V. (2021). Are EU policies effective to tackle the Covid-19 crisis? The case of Italy. *Review of Political Economy*, *33*(3), 432–461.

Chen, L. Y., & Lee, S. (2018). Exact computation of GMM estimators for instrumental variable quantile regression models. *Journal of Applied Econometrics*, *33*(4), 553–567.

Chen, J., Ma, W., Kchouri, B., & Ribeiro-Navarrete, S. (2024). Resource rich yet debt ridden: The role of natural resources and debt servicing in sustainable economic growth. *Resources Policy*, *89*, 104565.

Chernozhukov, V., & Hansen, C. (2006). Instrumental quantile regression inference for structural and treatment effect models. *Journal of Econometrics*, *132*(2), 491–525.

Chernozhukov, V., & Hansen, C. (2008). Instrumental variable quantile regression: A robust inference approach. *Journal of Econometrics*, *142*(1), 379–398.

Chernozhukov, V., & Hong, H. (2003). An MCMC approach to classical estimation. *Journal of Econometrics*, *115*(2), 293–346.

Chernozhukov, V., Rigobon, R., & Stoker, T. M. (2010). Set identification and sensitivity analysis with Tobin regressors. *Quantitative Economics*, *1*(2), 255–277.

Chu, T. T., Hölscher, J., & McCarthy, D. (2020). The impact of productive and non-productive government expenditure on economic growth: An empirical analysis in high-income versus low-to middle-income economies. *Empirical Economics*, *58*(5), 2403–2430.

Cigu, E., Agheorghiesei, D. T., & Toader, E. (2019). Transport infrastructure development, public performance and long-run economic growth: A case study for the Eu-28 countries. *Sustainability*, *11*(1), 67.

Coccia, M. (2021). How a Good Governance of Institutions Can Reduce Poverty and Inequality in Society? In N. Faghih & A. H. Samadi (Eds.), *Legal-Economic Institutions, Entrepreneurship, and Management . Contributions to Management Science.* Springer. https://doi.org/10.1007/978-3-030-60978-8_4

Cronin, D., & McInerney, N. (2023). Official fiscal forecasts in EU member states under the European Semester and Fiscal Compact–An empirical assessment. *European Journal of Political Economy*, *76*, 102227.

Del Monte, A., & Pennacchio, L. (2020). Corruption, government expenditure and public debt in OECD countries. *Comparative Economic Studies*, *62*(4), 739–771.

Dorobantu, S., & Müllner, J. (2019). Debt-side governance and the geography of project finance syndicates. *Journal of Corporate Finance*, *57*, 161–179.

Dudzevičiūtė, G., Šimelytė, A., & Liučvaitienė, A. (2018). Government expenditure and economic growth in the European Union countries. *International Journal of Social Economics, 45*(2), 372–386. https://doi.org/10.1108/IJSE-12-2016-0365

Faruk, B., & Eleonora, P. (2020). Risk sharing and institutional quality: Evidence from OECD and Emerging economies. *Scottish Journal of Political Economy*, *67*(1), 53–71.

Fessler, P., & Schürz, M. (2018). Private wealth across European countries: The role of income, inheritance and the welfare state. *Journal of Human Development and Capabilities*, *19*(4), 521–549.

Gómez-Puig, M., & Sosvilla-Rivero, S. (2017). Heterogeneity in the debt-growth nexus: Evidence from EMU countries. *International Review of Economics & Finance*, *51*, 470–486.
Gootjes, B., & de Haan, J. (2022). Do fiscal rules need budget transparency to be effective? *European Journal of Political Economy*, *75*, 102210.
Grosu, A. C., Pintilescu, C., & Zugravu, B. (2022). Trends in public debt sustainability in Central and Eastern EU countries. *Post-Communist Economies*, *34*(2), 173–195.
Gründler, K., & Potrafke, N. (2019). Corruption and economic growth: New empirical evidence. *European Journal of Political Economy*, *60*, 101810.
Haughton, H., & Keane, J. (2021). Alleviating debt distress and advancing the sustainable development goals. *Sustainable Development*, *29*(3), 528–536.
Hauptmeier, S., & Kamps, C. (2022). Debt policies in the aftermath of COVID-19—The SGP's debt benchmark revisited. *European Journal of Political Economy*, *75*, 102187.
Heimberger, P. (2023). Do higher public debt levels reduce economic growth? *Journal of Economic Surveys*, *37*(4), 1061–1089.
Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, *115*(1), 53–74.
Jacobs, J., Ogawa, K., Sterken, E., & Tokutsu, I. (2020). Public debt, economic growth and the real interest rate: A panel VAR approach to EU and OECD countries. *Applied Economics*, *52*(12), 1377–1394.
Jorgenson, D. W., & Fraumeni, B. M. (1992). Investment in education and US economic growth. *The Scandinavian Journal of Economics*, S51–S70.
Kaplan, D. M., & Sun, Y. (2017). Smoothed estimating equations for instrumental variables quantile regression. *Econometric Theory*, *33*(1), 105–157.
Kemoe, L., & Lartey, E. K. (2022). Public debt, institutional quality and growth in sub-saharan Africa: A threshold analysis. *International Review of Applied Economics*, *36*(2), 222–244.
Ketels, C., & Porter, M. E. (2021). Rethinking the role of the EU in enhancing European competitiveness. *Competitiveness Review: An International Business Journal*, *31*(2), 189–207.
Khan, M. A., Khan, M. A., Abdulahi, M. E., Liaqat, I., & Shah, S. S. H. (2019). Institutional quality and financial development: The United States perspective. *Journal of Multinational Financial Management*, *49*, 67–80.
Klein, L. R. (2016). The Keynesian revolution. Springer. https://books.google.com.my/books?hl=en&lr=&id=fz2vCwAAQBAJ&oi=fnd&pg=PR7&dq=Klein,+L.+R.+(2016).+The+Keynesian+revolution.+Springer&ots=kzJSiQzBIV&sig=xBIj2L10arGl4ZiMHVy7jg2oiD4&redir_esc=y#v=onepage&q=Klein%2C%20L.%20R.%20(2016).%20The%20Key
Friedman, M., & Bordo, M. (2017). The optimum quantity of money. Routledge. https://www.taylorfrancis.com/books/mono/10.4324/9781315133607/optimum-quantity-moneymilton-friedman-michael-bordo
Koenker, R. (2004). Quantile regression for longitudinal data. *Journal of Multivariate Analysis*, *91*(1), 74–89.
Kraemer, R., & Lehtimäki, J. (2023). Government debt, European Institutions and fiscal rules: A synthetic control approach. *International Tax and Public Finance*, 1–46. https://link.springer.com/article/10.1007/s10797-023-09791-z
Krugman, P. (1988). Financing vs. forgiving a debt overhang. *Journal of Development Economics*, *29*(3), 253–268.
Kuziemski, M., & Misuraca, G. (2020). AI governance in the public sector: Three tales from the frontiers of automated decision-making in democratic settings. *Telecommunications Policy*, *44*(6), 101976.
Law, S. H., Ng, C. H., Kutan, A. M., & Law, Z. K. (2021). Public debt and economic growth in developing countries: Nonlinearity and threshold analysis. *Economic Modelling*, *98*, 26–40.
Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, *108*(1), 1–24.
MacGee, J., Pugh, T. M., & See, K. (2022). The heterogeneous effects of COVID-19 on Canadian household consumption, debt and savings. *Canadian Journal of Economics/Revue Canadienne d'économique*, *55*, 54–87.
Machado, J. A., & Silva, J. S. (2019). Quantiles via moments. *Journal of Econometrics*, *213*(1), 145–173.
Mauro, L., Pigliaru, F., & Carmeci, G. (2018). Decentralisation and growth: Do informal institutions and rule of law matter? *Journal of Policy Modeling*, *40*(5), 873–902.

McCombie, J. S., & Thirlwall, A. P. (2002). Growth in an international context: A post keynesian view. *Foundations of International Economics* (pp. 45–100). Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9780203017760-9/growth-international-context-john-mccombie-thirlwall

Meyll, T., & Walter, A. (2019). Tapping and waving to debt: Mobile payments and credit card behavior. *Finance Research Letters*, *28*, 381–387.

Mohsin, M., Ullah, H., Iqbal, N., Iqbal, W., & Taghizadeh-Hesary, F. (2021). How external debt led to economic growth in South Asia: A policy perspective analysis from quantile regression. *Economic Analysis and Policy*, *72*, 423–437.

Musa, K., Ali, N., Said, J., Ghapar, F., Mariev, O., Mohamed, N., & Tahir, H. M. (2023). Does the effectiveness of Budget Deficit Vary between Welfare and Non-welfare countries? *Sustainability*, *15*(5), 3901.

Nguyen, V. B. (2022). Does governance matter for the public debt–inflation relationship in developed countries? Panel quantile regression approach. *Annals of Public and Cooperative Economics*, *93*(4), 1153–1173.

Nguyen, C. V., Giang, L. T., Tran, A. N., & Do, H. T. (2021). Do good governance and public administration improve economic growth and poverty reduction? The case of Vietnam. *International Public Management Journal*, *24*(1), 131–161.

Nordström, L., & Laiho, N. (2023). Explaining IMF design of 2010 Greece loan: Bricoleurs relying on fiscal space and nonlinear multiple equilibria processes. *Comparative European Politics*, *21*(3), 285–307.

Ochi, A., Saidi, Y., & Labidi, M. A. (2023). Non-linear threshold effect of governance quality on economic growth in African countries: Evidence from panel smooth transition regression approach. *Journal of the Knowledge Economy*, *14*(4), 4707–4729.

Onofrei, M., Bostan, I., Oprea, F., Paraschiv, G., & Lazăr, C. M. (2020). The implication of fiscal principles and rules on promoting sustainable public finances in the EU countries. *Sustainability*, *12*(7), 2772.

Ouyang, X., Shao, Q., Zhu, X., He, Q., Xiang, C., & Wei, G. (2019). Environmental regulation, economic growth and air pollution: Panel threshold analysis for OECD countries. *Science of the Total Environment*, *657*, 234–241.

Özmen, İ., & Mutascu, M. (2023). Public Debt and Growth: New Insights. *Journal of the Knowledge Economy*, 1–31. https://link.springer.com/article/10.1007/s13132-023-01441-3

Peng, Z., Madni, G. R., Anwar, M. A., & Yasin, I. (2023). Imperative of institutions for effective relationship between economic performance and ethnic diversity. *Journal of the Knowledge Economy*, 1–14. https://link.springer.com/article/10.1007/s13132-023-01195-y

Pérez-Morote, R., Pontones-Rosa, C., & Núñez-Chicharro, M. (2020). The effects of e-government evaluation, trust and the digital divide in the levels of e-government use in European countries. *Technological Forecasting and Social Change*, *154*, 119973.

Petrakos, G., Artelaris, P., & Kallioras, D. (2021). Convergence and public debt in the European Union: An overlooked trade-off? *Regional & Federal Studies*, *31*(5), 671–688.

Petrović, P., Arsić, M., & Nojković, A. (2021). Increasing public investment can be an effective policy in bad times: Evidence from emerging EU economies. *Economic Modelling*, *94*, 580–597.

Phelps, E. (2022). Public debt: My dissent from keynesian theories. *Journal of Government and Economics*, *5*, 100029.

Potrafke, N. (2020). General or central government? Empirical evidence on political cycles in budget composition using new data for OECD countries. *European Journal of Political Economy*, *63*, 101860.

Pour, E. K., & Lasfer, M. (2019). Taxes, governance, and debt maturity structure: International evidence. *Journal of International Financial Markets Institutions and Money*, *58*, 136–161.

Raza, S. A., Shah, N., & Arif, I. (2021). Relationship between FDI and economic growth in the presence of good governance system: Evidence from OECD Countries. *Global Business Review*, *22*(6), 1471–1489.

Reinhart, C. M., Reinhart, V., & Rogoff, K. (2015). Dealing with debt. *Journal of International Economics*, *96*, S43–S55.

Rodríguez-Pose, A., & Tselios, V. (2019). Well-being, political decentralisation and governance quality in Europe. *Journal of Human Development and Capabilities*, *20*(1), 69–93.

Routledge. Magazzino, C., Giolli, L., & Marco, M. E. L. E. (2015). Wagner's law and peacock and Wiseman's displacement effect in European Union countries: A panel data study. *International Journal of Economics and Financial Issues*, *5*(3), 812–819.

Saurwein, F., & Spencer-Smith, C. (2020). Combating disinformation on social media: Multilevel governance and distributed accountability in Europe. *Digital Journalism*, *8*(6), 820–841.
Turan, T., & Yanıkkaya, H. (2021). External debt, growth and investment for developing countries: Some evidence for the debt overhang hypothesis. *Portuguese Economic Journal*, *20*(3), 319–341.
Uxó, J., Álvarez, I., & Febrero, E. (2018). Fiscal space on the eurozone periphery and the use of the (partially) balanced-budget multiplier: The case of Spain. *Journal of Post Keynesian Economics*, *41*(1), 99–125.
Vanlaer, W., Picarelli, M., & Marneffe, W. (2021). Debt and private investment: Does the EU suffer from a debt overhang? *Open Economies Review*, *32*, 789–820.
Vergnhanini, R., & De Conti, B. (2017). Modern Monetary Theory: A criticism from the periphery. *Brazilian Keynesian Review*, *3*(2), 16–31.
Wüthrich, K. (2015). Semiparametric estimation of quantile treatment effects with endogeneity (No. 15–09). Discussion Papers. https://www.econstor.eu/handle/10419/126627
Xu, G., & Burer, S. (2017). A branch-and-bound algorithm for instrumental variable quantile regression. *Mathematical Programming Computation*, *9*(4), 471–497.
Zhuo, Z., O, A. S. M., Muhammad, B., & Khan, S. (2021). Underlying the relationship between governance and economic growth in developed countries. *Journal of the Knowledge Economy*, *12*, 1314–1330.

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