Role of institutional quality in debt-growth relationship in Pakistan: An econometric inquiry

Muhammad Ramzan [a], Yao HongXing [a,*], Qamar Abbas [a], Sumbal Fatima [b], Rana Yassir Hussain [c]

[a] *School of Finance and Economics, Jiangsu University, PR, China*
[b] *Institute of Higher Education, Nankai University, Tianjin China*
[c] *UE Business School, Division of Management and Administrative Science, University of Education Lahore, Pakistan*

ARTICLE INFO

ABSTRACT

This study attempts to investigate the mediating role of institutional quality on the relationship between public debt and economic growth in Pakistan spanning 1996–2020. Time series data on all six World Bank World Governance indicators of institutional quality is used in the empirical analysis. Findings of the autoregressive distributed lag (ARDL) bounds testing technique and error correction method (ECM) confirmed the existence of cointegration among variables of interest. The short-run results indicate that public debt has a favorable association with economic growth, while the relationship is found to be detrimental in the long run. Furthermore, the combined effect of public debt and institutional quality indicators revealed the significant positive association with economic growth, suggesting that better institutional quality can contribute to mitigate the negative impact of public debt on economic growth in Pakistan.

1. Introduction

The worldwide public debt level has skyrocketed because of the recent economic crisis. The drivers of economic development have been greatly impacted by the recent economic crisis of 2008, and public interest in fiscal policy concerns has increased as a result [1]. Budget deficits and public debt repercussions are a critical feature of fiscal policy, especially during periods of strong fiscal growth. The rising amounts of country's debt have spurred many academics and policymakers to look at the issue [2]. Most of the countries are experiencing fiscal imbalances and unpredictable development as a result of rising debt levels. The adoption of counter-cyclical fiscal policies is limited by high governmental borrowing, resulting in higher instability and weaker future growth. Public debt adversely affects country's output growth and these adverse effects can sometimes be so extreme that output growth becomes negative. The execution of counter-cyclical fiscal strategies is limited by higher indebtedness, resulting in higher volatility and a loss in future growth [3].

Budget deficits and public debt are integral parts of fiscal policy, particularly during significant fiscal expansions. One of the important conclusions is that, contrary to common opinion based on Keynesian policy suggestions, fiscal expansions can be contradictory. The structures of the fiscal adjustment, as well as the initial amount of public indebtedness, have all been specified, and the labor market structure all determine whether or not a fiscal expansion is contractionary. Classical economic research focuses on

---

* Corresponding author.
E-mail address: hxyao@ujs.edu.cn (Y. HongXing).

concerns such as economic development and debt; however, when role of non-economic factors in growth of economy are investigated, it becomes interesting. For example, the quality of an institution has a significant influence on debt burden [4]. Considering this perspective, Tarek and Ahmed [5] researched the relation between institutions and public debt and discovered that quality institutions are the source of economic growth and play an important part in mitigating the adverse effects of debts. Legal system and political institutions, as well as the quality of institutions, are interrelated [6]. To conclude, the quality of institutions and policies has a substantial influence on the debt-growth link. Several studies suggest that, effective policy framework and institutions are needed to promote investment, long-term growth, and debt relief [7].

Theoretically, quality institutions act as a catalyst to growth. Institutional quality may matter the debt-growth relationship via the efficient and sensible use of public debt. The adverse effect of debt can be reduced by quality institutions. However, there is no unanimity on how distinct kinds of institutions are interconnected and how they impact the debt-growth relationship. Different sets of institutions have been highlighted from the literature review as according to the theory of institutions, states that quality institutions determine the rules of governance, which in turn have a direct impact on economic growth. In the empirical literature, the debt-growth relationship has got little attention in the context of Pakistan.

To fill the gap, the aim of present study is to unveil how the theory of institutions moderates the debt-growth relationship in Pakistan. The novelty of this study is to investigate the impact of all six indicators of institutional quality (Voice and accountability, Political stability and violence, Government effectiveness, Regulatory quality, Rule of law, and Control of corruption) in debt-growth relationship separately as it is the least explored area in terms of role of institutional quality indicators in Pakistan. The study also adds to the existing literature of debt-growth relationship in the following ways. First, this study uses ARDL bounds testing technique to estimate the baseline model results. Second, this study uses the robustness tests by employing alternative estimation strategy, dynamic ordinary least square (DOLS) and fully modified ordinary least square (FMOLS) to confirm our main results.

It is important to note that in our findings the institutional quality indicators have an augmenting impact on the debt-growth relationship. Moreover, in short run, the impact of public debt on economic growth is positive, while in the long run, the impact of public debt on economic growth is found to be negative, while the combine effect of public debt and institutional quality indicators has a positive impact on economic growth in short run as well as in the long run in Pakistan. This finding is in line with the theory of institutions and the widely held belief that quality institutions are necessary for boosting growth.

Remaining of the paper is as follows, section 2 presents the literature survey, model, data and estimation strategy are presented in section 3. Section 4 provides results and discussion, while section 5 concludes the research with policy implications.

2. Literature survey

Public debt, often known as governmental debt, is the overall outstanding debt of a central government of a nation. It's usually stated as a proportion of GDP. Government's obligations to domestic creditors are referred to as internal debt, whilst country's obligations to foreign creditors are referred to as external debt. A government's public debt is a valuable potential resource for paying public spending and managing budget deficits.

The history of public debt shows that it began in ancient times when governments, like governments now, required money but did not borrow it from the public. In the sense of taking money from a large number of people and holding them accountable for repaying the debt (paying principle amount plus the interest), which is a kind of deferred taxes [8]. Eventually, public lending became a common practice, but Loans for war or unusual uses were included at first, rather than as a long-term source of financing [9]. The main difference between now and then is that previously no tangible assets were used a debt security. After Britain's Glorious Revolution in 16th century, the rule of law, the integrity of contract, and legislative constraints on monarchies gained root, and this type of sovereign obligations arose. Later with the start of feudal era, pledging of income and property as security started. After almost two centuries of trade and interest-bearing loans, Bentham [10] gave usury a strong, unequivocal defense, which the classical economists from Smith through Ricardo, Say and Mill, enthusiastically embraced. There would not have been such a large increase if there had been a more positive attitude about lending at interest. With the passage of time sovereign were treated in a better way, became more credible and more creditworthy.

The advent of constitutionally restricted, representative government, particularly in the aftermath of Britain's Glorious Revolution and America's Revolution in 17th century, facilitated the creation and growth of today's modern public funding system [11]. After the financial revolution in 17th and 18th centuries, due to which industrial revolution of 18th and 19th century became possible. Creditors and debtors were more reliant on rule-based systems and procedures, and debt securities and instruments were more standardized, as well as secondary markets where certain assets may be traded, making them more liquid as security for future borrowing Then, eventually, public securities were marketable and had a market value. Around 1650, the Italian republics of Genoa and Venice began serious public borrowing, followed by the United Provinces (Netherlands), and then England and France (particularly after 1688) [12, 13]. History shows that the post-medieval transition from absolute monarchy to today's practically unconstrained democracies took several centuries.

Number of theoretical models show the association between public debt and economic growth. The majority of studies recommend that public debt is negatively linked to economic growth. Although previous studies imply that the effect of public debt is typical crowding out, back-of-the-envelope calculation demonstrates that this adverse effect is extremely minimal. On the other side, uncertainty about policy legitimacy may aggravate the crowding out effect. While hysteresis may bring to a scenario where expansionary fiscal policies boost growth in the long run. The threshold effects in the link between public debt and economic growth are similarly difficult to forecast using comprehensive theoretical models.

The bivariate link between debt and growth observed in empirical literature shows that smooth threshold regression approaches

produce non-linearity that is far more complicated than that seen in models with exogenous thresholds. Although it is theoretically important for economic growth and producing funds for long-term development plans, as well as supporting financial systems in credit intermediation and during times of crisis, in practice, it is not. On the other hand, high public debt may have long-term negative implications. Governments are concerned about the public debt and deficit, which is still expanding in many nations following the previous crisis. At the same time, public spending is a critical determinant of financial development and public finances' long-term viability [14]. In the economy, the governments play the crucial role in allocating capital and resources. Private enterprises have better access to financial resources, which improves their financial stability and contributes to the financial sector's overall stability [15].

We begin by taking a quick look at what economic theory has to say about the relation between country's indebtedness and the output growth. We assume that governmental spending on goods and services are stable throughout this discussion, and we investigate what might happen if government decided to temporarily lower taxes and fund its spending with the issuance of debt. We also suppose that Ricardian Equivalence is not true and that public debt has an impact on real-world variables. Conferring to the "traditional view of public debt" [16], production is demand-driven in the near run, and fiscal deficits (or greater public indebtedness) boost disposable income, aggregate demand, and total output. When output falls much below capability, the positive short-run effect of budget deficits is likely to be significant.

Results would be different in the long run, when Ricardian Equivalence does not hold, the drop in public savings induced by a large level deficit in budget which will be partially offset by the increasing level of private savings [16]. As a result, country's saving will be lowered, results in a reduction of overall investment both locally and globally. Lower domestic investment lowers GDP via diminishing capital stock, higher interest rates, and lower employment and wages. Lesser foreign investment (or higher foreign inflows) would have a detrimental influence on foreign inflows, lowers the country's future GDP. If distortionary taxes are in place, the adverse effect of growing government borrowing on future GDP may be exacerbated. Furthermore, back-of-the-envelope calculations reveal that every extra dollar of government borrowing decreases steady-state GDP by around ten cents. They show that this shift in steady-state growth has a rather mild growth effect, assuming yearly real GDP growth of three percent and a convergence rate of two percent. Rising debt to 100%, according to these calculations, lowers yearly output growth by around 20% points during first twenty years. If government borrowing creates problems or forecasts of future expropriation, such as through inflationary and monetary repression, the detrimental effects of public debt may be substantially higher [17].

Higher debt might have a detrimental impact in this instance, even in the near term. The traditional distinction between debt's immediate and long-term consequences ignores the prospect that prolonged recessions will limit possible future production since they expand the amount of disgruntled personnel, resulting in skill loss, and have a detrimental effect on corporate investment and development of new projects. Therefore, in this situation, maintaining budget deficit and rising debt may boost output in both short and long run. In fact, in a low-interest-rate situation, expansionary fiscal policy is expected to be self-financing [18]. Evidences indicate that recessions have a long-term effect on future national output. A vast number of empirical articles underpinned that the association of public debt and economic growth is non-linear, with a debt-to-growth threshold at which debt begins to have a detrimental influence on economic growth. In case debt overhang, non-linearity and threshold effects might occur [19,20], It is debatable whether the debt overhang theory can be easily adapted to developed markets where the majority of loan holders are domestic and overseas transfers aren't really an issue.

Theoretical basis for which debts may only be granted to support public investment during the business cycle, and the optimal amount of public debt is decided by the optimal public to private capital proportion for the growth of economy [21]. With this scenario, they demonstrate that the optimal level of debt for economic growth is a function of the capital stock's output elasticity. They use the model to generate optimal debt levels for a variety of OECD countries, finding values ranging from 43 to 63% of GDP. However, debt is absolutely immaterial in this scenario, and the growth-maximizing tax rate determines the non-linear connection between debt and growth [22]. He further suggests that making for a broader debt structure leads to a monotone and adverse impact of public debt on steady-state growth. He therefore claims that impact of debt on the economic growth is constrained by economic constraints. In a model with no restrictions and an elastic supply of labor, he shows that the public debt has an adverse impact on labor supply, investment, and economic progress. Instead, in the context of wage stagnation and unemployment, public debt has very little impact on resource allocations and, in certain cases, can even be helpful if used to support productive investment. There is no well-defined paradigm, he says, that can establish an inverted U-shaped debt-growth relationship [22]. Non-linearity may occur if there is a turning point above which public debt becomes adversely related to growth [23].

Even without the turning point concept, large debt levels are also likely to impede a country's ability to undertake countercyclical policies, resulting in increased output instability and slowed economic growth [24]. The link between debt and the capacity to execute countercyclical policies is more likely to be influenced by the mix of public debt than its total quantity. This indicates that countries with various debt structures and monetary arrangements are more prone to experience challenges at various debt levels. To recap, basic back-of-the-envelope calculations imply that debt can influence growth negatively, although a slight one. The debt-growth connection is unclear in more sophisticated models, suggesting that the relation is impacted by a range of cyclical and structural variables. Given these considerations, calculating a unique debt coefficient that applies to all nations and eras appears to be unachievable.

North [25] and Olson [26] pioneered studies that prompted scholars and Policymakers should investigate the impact of institutions on economic growth. Institutions are vital for long-term investment and economic progress [27–29]. Moreover, Institutional inequalities throughout the world produce large variances in capital accumulation, education attainment, and productivity development, and so explain for income disparities [30]. Rule of law is beneficial for growth of an economy. Property rights and institutions are the primary determinants of long-term economic growth, investment, and financial development [31]. Quality institutions, according
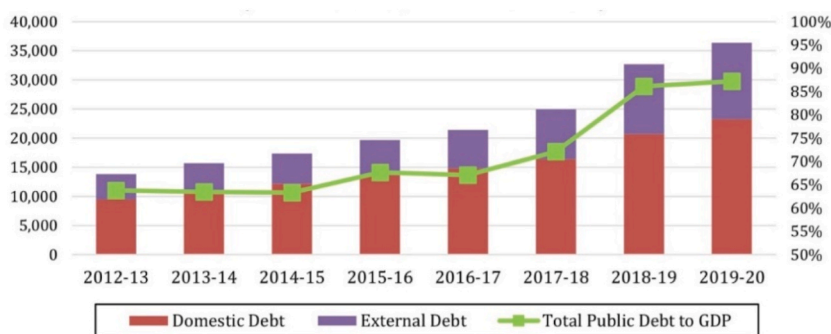
Fig. 1. Debt to GDP ratio of Pakistan (LHS: Rupees in billion, RHS: Percent of GDP)
Source: State bank of Pakistan.

to these studies, are the most significant determinants of long-term economic growth in different nations. The present study largely suggests that institutions and economic growth are linked. Institutions, on the other hand, have diverse effects on economic growth in various nations. The beneficial contribution of institutions is formed by a variety of elements, including the individual's perception of the institutions as well as the social norms and community rules of a certain group of people. Institutions with comparable traits have sometimes achieved wildly disparate outcomes among groups, regions, and countries. For example, comparable laws and solutions were used in Latin American countries to attain various degrees of growth and development of the economy [32]. Similarly, according to Alonso and Garcimartín [33], concluding that the degree of development influenced by quality institutions, which leads to higher growth. Few empirical research have examined the growth consequences of institutional quality at different phases of development [34,35].

Previous research has shown that there is a link between democracy and economic growth when political stability is taken into account. Furthermore, democracy is beneficial for the country's growth and it can be achieved in the context of a political stability. Stable political conditions and the elimination of violence, on the other hand, can diminish revenues, poverty, and education levels. Political instability, on the other hand, is linked to investor concern about the protection of intellectual property, which slows growth in the economy. Even under a democratic democracy, unstable administrations do not secure the pursuit of medium- and long-term economic policies that are growth bottlenecks. As a result, these findings suggest that economic growth, democracy, and political stability are mutually beneficial [36].

2.1. Public debt of Pakistan

Pakistan was a poor and impoverished country when it gained independence. Historically, Pakistan has relied on the International Monetary Fund (IMF) to keep its economy afloat. Pakistan needs enough taxes to enable economic success, yet the country has suffered financially since independence. A lack of income and savings, as well as excessive consumption, have resulted in a long-term budgetary imbalance. Pakistan's current account deficit exacerbates the country's balance-of-payments issue. Pakistan often attempts to finance its deficits by acquiring public debt, necessitating the expenditure of a significant part of its GDP on interest payments. The requirement to repay debts is stifling economic growth and compromising development goals. Economic progress is hampered because debt commitments and debt payment costs place additional strain on already restricted resources [37]. The IMF is unwilling to be flexible, and Pakistan must meet specific conditions. In addition to the IMF's criteria, there are other factors to consider. Rather of relying solely on the IMF or any other country, Pakistan's government must address the country's public debt. Pakistan's total national debt topped Rs.40 trillion this year, with external debt accounting for one-third of it (see Fig. 1). When the rupee falls in value, Pakistan pays more in local currency to international lenders. As a result, rather than seeking new foreign loans from the IMF and other sources, it may be preferable to take efforts to limit currency depreciation. We know something is seriously wrong with the economy when the cost of borrowing surpasses the cost of development.

Pakistan is now positioned at the bottom of international credit ratings, putting it in a group of highly speculative developing countries. Pakistan's ability to repay its commitments on time is under doubt. Pakistan's economic managers and other senior decision-makers are naive to the mounting threat in order to please the country's extreme lobbies, while the rest of the world sees Pakistan as a debt-defaulting country. It has already had problems getting off the FATF's grey list as a result of this restriction. There are a few things that need to be done right now. To begin, Pakistan's sovereign grade must be improved to properly reflect its institutional performance. Pakistan will be unable to do so unless and until Pakistan's economic structure and chances for development improve. External financing with fiscal and monetary flexibility, on the other hand, may be sufficient. Pakistan's per capita income has fallen in real terms since 2018, as has government revenue as a result of currency volatility [38].

Increased governmental debt is projected to exacerbate poverty, placing Pakistan's people under even greater duress. Pakistan is one of 50 countries on the verge of entering a debt catastrophe. This has no bearing on the country's human rights situation. Fundamental human rights, such as free expression and expression, are increasingly vital to international organizations. Given our abysmal human rights record, if Pakistan remains on the FATF grey list, its economic prospects would deteriorate much worse. If the
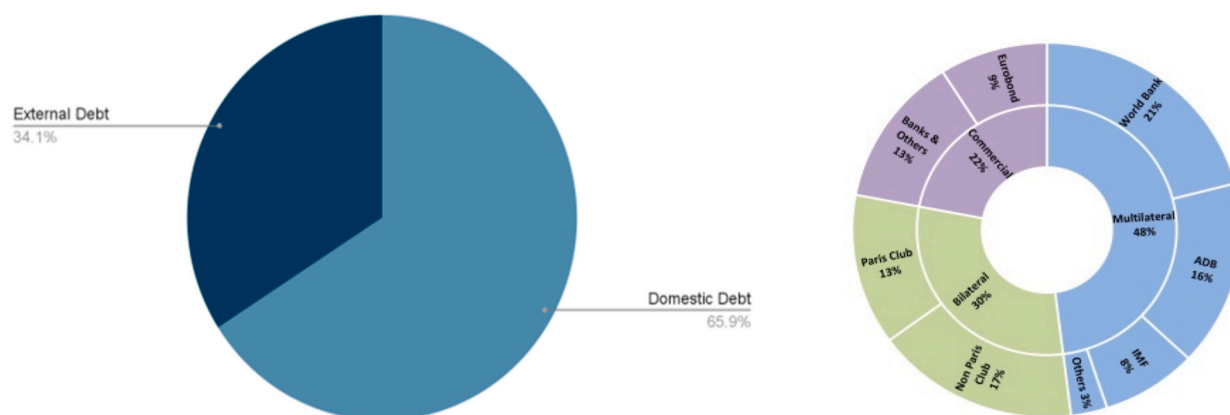
Fig. 2. Figure on the Left Side shows the Percentage of Domestic and External Debt of Pakistan as Total Gross Debt recorded in June 2021 is 38,859 billion Rupees. The figure on the Right Side shows the Compositions of Debt from Different Sources. (Source: State Bank of Pakistan).

government continues to borrow from the IMF and other sources, repaying and servicing external debt would become a difficult task. Any new borrowing creates further borrowing, leading in an oncoming external account crisis. Because a high level of debt has a detrimental influence on potential growth, the government should now prioritize reducing rather than increasing the debt load [39].

According to the Finance Ministry's Debt Policy Coordination Office, Pakistan's gross national debt was above PKR40 trillion in June 2021, with around one-third external and two-thirds domestic debt. The majority of the country's debt is made up of Pakistan Investment Bonds, Treasury Bills, and the National Savings Scheme. As seen in the pie chart below from the debt bulletin, multilateral lenders (the World Bank, the International Monetary Fund, and the Asian Development Bank), bilateral lenders (the Paris Club), and commercial lenders account for the vast bulk of foreign debt (See Fig. 2). Debt is a harsher burden since it must be paid in foreign currency and the creditors are powerful corporations and countries. The rupee to USD conversion rate used in the debt has now gone above PKR170 as of the end of December 2021, and the foreign debt has expanded significantly as a result of the currency rate. According to the Economic Survey 2020–21, Pakistan's debt has been increasing relative to GDP or size of the economy, lately exceeding 80%, highlighting the impact of the epidemic.

According to the State Bank of Pakistan's (SBP) bulletin, the ratio under the Fiscal Responsibility and Debt Limitation Act, 2005 was 100.3% using "total debt and liabilities" vs 74.9% using "total debt of the government." The fact that loan interest is the single largest item in the government budget for 2020–21, surpassing both "military affairs and services" and "development spending," is far more striking.

Furthermore, Pakistan requires sustainable debt, which indicates that the debt level should not rise with each passing year. Pakistan's debt might have assisted its economic growth if it had been used to boost the country's productive capacity, delivering larger returns than the interest rate and creating currency through increasing exports. However, Pakistan has created a situation in which it must accept fresh loans in order to repay previous debts, despite the fact that its imports exceed its exports [40]. Pakistan's larger level of debt has made it vulnerable not only to economic shocks, but also to political pressure from its powerful external creditors. It has also significantly impacted Pakistan's ability to carry out necessary tasks, such as investing in education and health.

To summarize, many people refer to fifth-generation warfare as a threat to Pakistan, but the level of debt dragging the country downward. There is no purpose in earning political points or blame someone for failing to provide a magical resolution to this problematic debt. Instead, it is time for Pakistan's institutions to be improved.

2.2. Institutional quality in Pakistan

The influence of institutions on growth rate varies by country, according to these researches. These studies suggest that industrialized nations' institutions perform better than developing countries' institutions. A study of transitional economies found that fighting corruption boosts growth when it's accompanied by robust democratic institutions, but not always. Institutional policies stimulate economic growth in nations with strong democracies but fail to do so in countries with weak democracies [41]. This research, on the other hand, lacked a theoretical framework to capture the links between institutional quality and growth of an economy except theory of institution as well as a potential endogeneity problem. It might be claimed that understanding the process by which institutions are connected to economic growth requires a theoretical foundation. Controlling endogeneity is also critical for obtaining trustworthy and robust empirical results. It is fair to agree that a major goal of every contemporary nation is to raise the living conditions of its citizens and to promote individual and general well-being inside its borders. The categories of wealth, material things, and fundamental requirements for life all play a role in determining one's living standard. It is made up of fundamental material variables such as people's income, gross domestic product, religious freedom, life expectancy, and economic opportunity. It is the quality of life, which includes political factors, environmental quality, and the safety of the people who live in the nation. In recent years, Pakistan's standard of living has been viewed as a leading indication of economic progress. Standard of living refers to the people's quality of life and economic situation. Each economy has a primary goal of achieving a high quality of life, and numerous
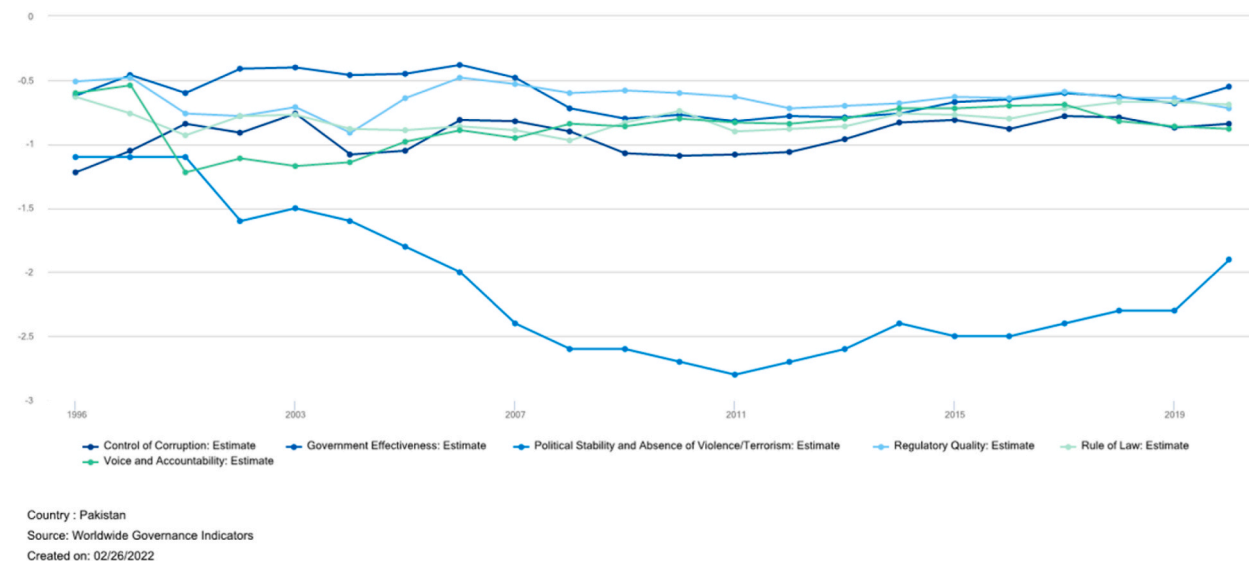
Country : Pakistan
Source: Worldwide Governance Indicators
Created on: 02/26/2022

Fig. 3. Institutional quality of Pakistan: All six indicators of institutional quality.

macroeconomic policies have been introduced to reach this goal. Pakistan's per capita standard of living growth rate has been positive since the 1990s; however, it is still low when compared to other Asian nations. People's living standards are influenced by a number of economic issues. Pakistan's standard of life is improving, although it is still inadequate in comparison to other economies.

Institutional quality significantly impacts economic growth. The institutional quality is a crucial predictor for measuring economy's speed of growth. Institutions are divided into two categories: official and informal institutions. Formal institutions comprise the legal and judicial system, whereas informal institutions comprise values and beliefs of a culture. Effective and well-managed institutions contribute to increased efficiency and competition in interactions between public and private economic players. This will result in a significant rise in the number of investments, national savings, and capital investment, as well as well-established management, resulting in an increase in people's living standards. It has been determined and shown that Pakistan is trying to upgrade the quality of institutions since 1990s which results in increasing the efficiency of the economic system. However, facing one of the main issues is corruption, which has harmed Pakistan's growth. Pakistan's quality of institution measures, such as government performance, rule of law, and political stability, rank in the middle among Asian countries (see Fig. 3).

According to these parameters for measuring institutional quality, Pakistan has been trying hard to improve the quality of its institutions. The quality of institutions appears to be getting better in recent years. Looking at the existing institutional environment, there are two options that should be prioritized in order to improve institutional quality. The first step toward progress is to evaluate the institution's change management approach. The second strategy is to design effective policies to increase the current institution's efficacy. On the other hand, mismanagement of institutions, corruption, and law and order would increase the budget deficit, which will have a range of consequences for Pakistan's standard of living. To improve the country's economic system and raise living standards, the government trying to place a high priority on law-and-order administration as well as institutional quality. Which means that the bigger the production, the better the quality of the institutions. It improves people's living conditions by increasing their per capita income.

A range of indications indicate that Pakistan's governance institutions are now getting better. The government effectiveness of Pakistan ranks at percentile ranking of 29. Similarly, regulatory quality of Pakistan ranks at percentile ranking of 27. Comparatively, these rankings are improving gradually. Moreover, rule of law ranks at percentile ranking of 20, and control of corruption ranks at 19, according to the World Bank's Worldwide Governance Indicators, based on data from 2019. On Transparency International's Corruption Perceptions Index (CPI) 2021, Pakistan was placed 140th out of 180 nations, down 16 places as compared to the previous year. In the World Bank's ease of doing business rankings of 2018, Pakistan dropped to 148th, but in resent year Pakistan has improved and currently stand at 108th position a lot. Pakistan is ranked 154th in the current United Nations Development Program Human Development Report, issued in 2021. In 2017, the country improved its ranking on the World Economic Forum's Global Competitiveness Index; however, it ranks 110th place out of 140 countries, up from 122nd in 2016.

Overall consequences of these conflicts are serious and disturbing: Inefficient institutions impede attempts to create and implement meaningful public policy. This suggests that wider development difficulties of Pakistan, ranging from basic needs such as food, water, and energy shortages to major public health and millions of kids out of school, would endure, if not worse. Additionally, Pakistan's economic problems, such as charitable organizations connected with terrorist organizations, to step in and fill service delivery tasks that civilian institutions are unwilling or unable to complete. In sum, Pakistan's institutional quality are important for the economic, growth, and politics of the nation.

3. Model, data and estimation strategy

3.1. Model

The neoclassical growth model is regarded as an essential framework for representing aggregate production function:

$$Y = f(AK, L) \tag{1}$$

In the preceding equation, Y specifies total output, K specifies capital stock, L denotes labor and A represents a residual used in the Solow residual model, named as total factor productivity (TFP). The calculation is given as.

3.1.1. Calculation of TFP

Here, the most important is the calculation of total factor productivity (TFP), as the TFP data of Pakistan is not available on any source. So, TFP is own calculated by using the Solow residuals. Solow [42] posited the presence of an exogenous residual capturing TFP, claiming that changes in this exogenous residual might result in considerable differences in production per capita between nations. Using Solow [43] growth accounting intuitions, we construct national aggregate TFP by assuming a Cobb-Douglas production function for aggregate country output. TFP is the fraction of output that remains unexplained after accounting for direct input contribution. As a result, TFP may be calculated using Equation (6) as follows:

$$Y = AL^{\alpha} K^{\beta} \tag{2}$$

Where Y is the country's total output, A is total factor productivity. When the components of production are correctly assessed, including the level of efficiency in the use of the elements of production, TFP indicates technical improvement. L and K represent input of labor and capital respectively. Shares of these two variables is presented by α and β. We set the labor share parameter to 2/3 and time periods since it is common practice to assume a constant labor share of 2/3 [44]. Another factor is that credible labor share data and years is not accessible. As a result, we must rely on the normal assumption of $\alpha = 0.6667$. The total number of people employed is used to indicate labor services. By multiplying both sides of the equation by the logarithm, we got the value of A by replacing the estimated value of capital (α) and labor (β) share in equation (3) and putting it in equation (2).

$$\ln Y = \ln A + \alpha \ln K + \beta \ln L \tag{3}$$

TFP recognized as a substantial source of revenue and social advantages. Productivity gaps are the fundamental driver of variances in income levels and growth rates among countries. TFP indicates more efficient input use, have been source of long-term growth and welfare [45,46].

The notion of convergence emerges as heterogeneity is present among nations while studying this production function. Because of the high return on capital, poor nations grow faster to reach steady-state than countries with greater values, according to this model [47,48]. There are several variables that also converges, such as the debt hang hypothesis, which states that if a country's debt burden is so enormous that it is difficult to repay, current investment is discouraged. As a result, economic growth is slowed, and from that point economies cannot recover. The debt-growth relation is characterized as an inverted U-shaped relationship [49]. However, as discussed by Cunningham [50], we add the public debt (D) into our model. Here, D is the public debt to GDP ratio. Equation (1) takes the form Y = f (AK, L, D). Confirmation from cross-country research reveals that some emerging nations are expanding faster than others due to the benefit of catching up.

One of the reasons countries' growth rates differ is due to institutional quality [51]. Researchers have previously searched the literature for a direct link between institutional quality and growth. According to the findings, quality institutions and economic growth are positively linked [52–54]. Various researchers have demonstrated the influence of institutions on growth of the economy, and their analytical methodology demonstrates the growth regression equation such as the authors [55–57]. In this analysis, we follow Woo and Kumar [58], we use institutional quality as a mediator variable to assess the debt-growth link. Furthermore, we employ all six indices of institutional quality as defined by them. The marginal effect is also measured using the expression of debt-institution quality interaction. Our model takes the following structure after the induction of the institutional quality variable as shown below in equation (4):

$$Y_t = \beta_o + \beta_1 \ln Y_{t-1} + \beta_2 debt_t + + \beta_3 IQ_t + \gamma X_t + \varepsilon_t \tag{4}$$

and the interaction term is presented by the below mentioned equation (5). The equations are the baseline equation in our analysis.

$$\ln Y_t = \beta_o + \beta_1 \ln Y_{t-1} + \beta_2 \ln debt_t + \beta_3 IQ_t + \beta_4 (\ln Debt_t \times IQ_t) + \gamma X_t + \varepsilon_t \tag{5}$$

Where t represents the timeframe which is (1996–2020), whereas, IQ_t is the set of institutional quality variables which consists of six indicators, namely, voice and accountability, political stability and violence, government effectiveness, rule of law, regulatory quality and control of corruption and ε_t denotes error term. In our analysis vector X_t is the sum of control variables used in this study. It comprises of total factor productivity (TFP); inflation (Inf); government size (GS) and exports (EXP). TFP is expected to have positive relation with economic growth, Inflation is considered to negatively affect the growth rate. The total amount spent by the government is defined as government size, and it has an adverse influence on economic growth and exports tend to have positive association with economic growth.

Table 1

Variables description.

Variable Description	Abbreviation	Data Source
GDP growth	Y_{it}	WDI
Public debt to GDP ratio	Debt	IMF
Voice and accountability	VAA	WGIs
Political stability and violence	PSV	WGIs
Government effectiveness	GEF	WGIs
Regulatory quality	REQ	WGIs
Rule of law	ROL	WGIs
Control of corruption	COC	WGIs
Total factor productivity	TFP	Authors own calculation
Inflation	Inf	WDI
General government spending as GDP' ratio	GS	PWT 9.1
Total exports as share of GDP	Exp	PWT 9.1

Table 2

Descriptive statistics.

Variable	Obs.	Mean	Median	Max	Min	Std. Dev.
Y	25	3.904	4.26	7.547	0.526	1.883
DEBT	25	0.666	0.655	0.876	0.52	0.089
TFP	25	1.593	1.443	2.351	0.978	0.435
INF	25	9.236	7.412	38.512	0.4	7.732
GS	25	0.124	0.117	0.199	0.095	0.025
EXP	25	0.053	0.055	0.069	0.037	0.009
VAA	25	3.296	3.313	4.403	2.559	0.422
PSV	25	1.196	0.62	3.876	0.034	1.138
GEF	25	3.815	3.805	4.376	3.364	0.299
REQ	25	3.734	3.724	4.49	3.189	0.251
ROL	25	3.428	3.391	4.375	3.063	0.265
COC	25	3.166	3.249	3.78	2.56	0.28

By modifying the baseline equation (2), according to the variables used in this analysis:

$$ln\,Y_t = \beta_0 + \beta_1 lnY_{t-1} + \beta_2 lnDebt_t + \beta_3 IQ_t + \beta_4\,lnTFP_t + \beta_5\,lnInf_t + \beta_6\,lnGS_t + \beta_7\,lnExp_t + \mu_t + \varepsilon_t \tag{6}$$

As the main purpose is to find the intermediating role of institutional quality in debt-growth relationship in Pakistan, by applying the combined effect of the debt and institutional quality, we have the below mentioned equation (7) as:

$$ln\,Y_t = \beta_0 + \beta_1 lnY_{t-1} + \beta_2 lnDebt_t + \beta_3 IQ_t + \beta_4(lnDebt_t \times IQ_t) + \beta_5\,lnTFP_t + \beta_6\,lnInf_t + \beta_7\,lnGS_t + \beta_8\,lnExp_t + \varepsilon_t \tag{7}$$

Theoretically, β_2 is expected to be negative and that will suggest that public debt has adverse relation with economic growth. Also, β_3 and β_4 are intended to provide positive coefficients indicating that institutional quality has a beneficial influence on economic growth, as well as the interaction between public debt and institutional quality. Whereas, β_5 and β_8 are the coefficients of total factor productivity and exports. These coefficients are expected to produce positive relation with economic growth. Moreover, β_6 and β_7 are the coefficients of inflation and government spending, these coefficients are expected to produce adverse relationship with economic growth.

In the above equation, $(lnDebt_t \times IQ_t)$ indicates the interacting term or the combined effect of public debt and institutional quality in Pakistan. If $\beta_4 < 0$, then the interaction term between public debt and institutional quality has negative relationship with economic growth (i.e., combined effect of public debt and institutional quality). If the coefficient between public debt and institutional quality is positive (i.e., $\beta_4 > 0$), it means that the combined effect of public debt and institutional quality has positive relationship with economic growth in Pakistan. Furthermore, for institutional quality, all the indexes will be analyzed separately to measure the direct and combined effect $(lnDebt_t \times IQ_t)$ of institutional variables on economic growth of Pakistan.

3.2. Data

Our model is based on the yearly time series data for the period ranges from 1996 to 2020. Much of the data is extracted from World Bank development indicator (WDI, 2020) of the World Bank. However, the data on world governance indicators (WGI) showing as institutional quality, was collected from the world bank, comprising six indicators: voice and accountability, political stability, violence government effectiveness, regulatory quality, rule of law, and control of corruption. The values of all six measure of institutional quality are range from −2.5 to +2.5. Using these values, we construct an index range from 0 to 10, indicating lower to higher quality of institutions.

As the standard computation of growth rate using log is to take the log difference between two years, which is a good proxy for growth. Therefore, we used GDP growth as our dependent variable and the data is extracted from WDI. Public debt is the independent

variable, comprising the total central government debt which is considered to be the 90% of total debt of a country measured as a ratio of GDP and the data on the public debt is extracted from IMF. The data on general government spending, and total exports is collected from Penn World Tables version 9.1 and measured as share of GDP. The data on inflation is extracted from WDI, measured as annual percentage change in GDP deflator. Following Solow residual formula, the data on total factor productivity is constructed by authors' own calculation. The data is analyzed using bounds testing ARDL estimation technique for the baseline model specifications, and the robustness of the main results are also tested in the robustness section of the result and discussion part of the paper. The variables, abbreviations and the data sources used in this study are given in Table 1 below.

In Table 2 below, we calculate the descriptive statistics of all the variables used in this study. Institutional quality variables are range from 0.034 to 4.49, we can see that these values are below 5, which means that all six variables of institutional quality are at the lower level or below the mid value which is considered to be the average level. So, Pakistan needs to improve its institutional quality as country is considered to be at high risk for the values lower than 50%. The public debt as a ratio of GDP has the mean value of 0.666, which is also considered to be relatively high.

3.3. Estimation approach

3.3.1. Unit root tests

The first step is to check the model' variables' integration order. We use two of the most basic unit root tests for this purpose: those of Dickey and Fuller [59], Dickey and Fuller [60] and Phillips and Perron [61] test. Dickey and Fuller developed an asymmetric distribution that was used in Monte-Carlo simulations to evaluate the unit root hypothesis. This distribution is used to test whether the unit root is present or not or to distinguish an AR (1) model from an integrated series. In the right half of the regression test, the Augmented Dickey Fuller test assumes that the series follows an autoregressive technique of order k such that AR (k) and adds time delays of dependent variables of the first order. Serial correlation and heteroscedasticity tests in regression analysis are modified by Phillips and Perron [61]. For the serial correlation of unit root, Phillips-Perron proposes an alternative (non-parametric) technique. The Phillips-Perron test may also be used to analyze time series when the differences are determined using an ARMA algorithm with unknown rank. They add a non-parametric diagnostic test for serial correlation and heteroscedasticity on regression test based on the results of the test.

3.3.2. ARDL Co-integration

In applied econometrics, co-integration methodologies are utilized to find the long run association between non-stationary time series. For short-run and long-run connections among variables, time series may also be used as an error correction model. The ARDL co-integration methodology to investigate long-run correlations among variables in a VAR model [62], and it has certain advantages over Johansen technique [63]. The following are some of the benefits of this test.

- For small samples, the Monte Carlo method produces reliable findings [64].
- In terms of the integration order of the variables, the ARDL method is more flexible. However, if a series has a second or higher integration order, it will be inefficient.
- The ARDL technique is only viable when there are a substantial number of temporal lags. The length of the lags is measured by Akaike (AIC), Schwarz (SBC), and Hannan-Quinn values (HQC).
- Furthermore, when compared to other co-integration strategies, the ARDL methodology can eliminate problems those emerged between dependent and independent variables, such as autocorrelation and endogeneity.

3.3.3. The steps of the ARDL Co-integration approach

3.3.3.1. Determine the existence of long run relationship. The first step investigates the existence of a long run association among variables by considering each model components as endogenous variables and the same variables as exogenous variables. The F-statistics, which is an asymptotic distribution, is used to assess whether or not there is a co-integrating link and is compared to critical bounds supplied by Ref. [62]. An empirical version of the ARDL approach to co-integration is as follows:

$$\Delta \ln Y_t = \alpha_0 + \sum_{i=1}^{n} a_{1i} \Delta \ln Y_{t-i} + \sum_{i=0}^{n} a_{2i} \Delta \ln Debt_{t-i} + \sum_{i=0}^{n} a_{3i} \Delta IQ_{t-i} + \sum_{i=0}^{n} a_{4i} \Delta \ln TFP_{t-i} + \sum_{i=0}^{n} a_{5i} \Delta \ln Inf_{t-i} + \sum_{i=0}^{n} a_{6i} \Delta \ln GS_{t-i}$$

$$+ \sum_{i=0}^{n} a_{7i} \Delta \ln Exp_{t-i} + \lambda_1 \ln Y_{t-1} + \lambda_2 \ln Debt_{t-1} + \lambda_3 IQ_{t-1} + \lambda_4 \ln TFP_{t-1} + \lambda_5 \ln Inf_{t-1} + \lambda_6 \ln GS_{t-1} + \lambda_7 \ln Exp_{t-1} + \varepsilon_t \quad (8)$$

Where α_0 is the intercept, ε_t represents the error term and λ_1 to λ_7 are the long run coefficients and a_1 to a_7 are short run coefficients. Employing the interaction term or the combined effect of public debt and institutional quality in Pakistan is represented by the below mentioned equation:

$$\Delta ln\,Y_t = \beta_0 + \sum_{i=1}^{n}\beta_{1i}\Delta ln\,Y_{t-i} + \sum_{i=0}^{n}\beta_{2i}\Delta lnDebt_{t-i} + \sum_{i=0}^{n}\beta_{3i}\Delta IQ_{t-i} + \sum_{i=0}^{n}\beta_{4i}\Delta(lnDebt \times IQ)_{t-i} + \sum_{i=0}^{n}\beta_{5i}\Delta lnTFP_{t-i}$$

$$+ \sum_{i=0}^{n}\beta_{6i}\Delta lnInf_{t-i} + \sum_{i=0}^{n}\beta_{7i}\Delta ln\,GS_{t-i} + \sum_{i=0}^{n}\beta_{8i}\Delta ln\,Exp_{t-i} + \vartheta_1 lnY_{t-1} + \vartheta_2 lnDebt_{t-1} + \vartheta_3 IQ_{t-1}$$

$$+ \vartheta_4\,(lnDebt \times IQ)_{t-1} + \vartheta_5\,lnTFP_{t-1} + \vartheta_6\,lnInf_{t-1} + \vartheta_7\,lnGS_{t-1} + \vartheta_8\,lnExp_{t-1} + \varepsilon_t \tag{9}$$

Where β_0 is the intercept. ε_t is the error term and ϑ_1 to ϑ_8 are the long run coefficients. Following the above equations (8) and (9) which are the baseline equations, we test all the six indicators of institutional quality to check their direct and combined effect on economic growth. For this purpose, above equations are modified according to the six indicators (VAA, PSV, GEF, REQ, ROL, and COC). Where Δ are the first differences, α_0 and β_0 are the drifts, and α and β are the coefficients of their respective variables.

The null hypothesis of no co-integration among the variables in equations (8) and (9) are given by:

$$H_0 : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = \lambda_7 = 0$$

$$H_0 : \vartheta_1 = \vartheta_2 = \vartheta_3 = \vartheta_4 = \vartheta_5 = \vartheta_6 = \vartheta_7 = \vartheta_8 = 0$$

Following the above-mentioned equations, it is obvious that there is no long run relationship.
Against the null hypothesis, the alternate hypothesis shows that:

$$H_a : \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq \lambda_7 \neq 0$$

$$H_a : \vartheta_1 \neq \vartheta_2 \neq \vartheta_3 \neq \vartheta_4 \neq \vartheta_5 \neq \vartheta_6 \neq \vartheta_7 \neq \vartheta_8 \neq 0$$

3.3.3.2. Selection of optimal length of lags for the ARDL estimation. When assessing bound test in ARDL estimation, the choice of lags length is critical. As a result, selecting the incorrect lag length may leads to biased results. So, getting correct information regarding series delays is critical for minimizing bias concerns. Furthermore, the lags' length for each variable is crucial in ARDL model to avoid non-normality, autocorrelation, and heteroscedasticity on error terms. To determine the optimal length lag in each variable for long run connections, the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), or Hannan-Quinn Criterion (HQC) are utilized. The ARDL model is estimated with variables at their current values. The long run equation for the chosen ARDL (k) model is:

$$ln\,Y_t = \alpha_0 + \sum_{i=1}^{k}a_{1i}\,ln\,Y_{t-i} + \sum_{i=1}^{k}a_{2i}lnDebt_{t-i} + \sum_{i=1}^{k}a_{3i}IQ_{t-i} + \sum_{i=1}^{k}a_{4i}lnTFP_{t-i} + \sum_{i=1}^{k}a_{5i}lnInf_{t-i} + \sum_{i=1}^{k}a_{6i}\Delta ln\,GS_{t-i} + \sum_{i=1}^{k}a_{7i}\Delta ln\,Exp_{t-i}$$

$$+ \varepsilon_t \tag{10}$$

And the equation to measure the combined effect of public debt and institutional quality (Debt $\times$ IQ) is transformed into below mentioned form:

$$ln\,Y_t = \beta_0 + \sum_{i=1}^{k}\beta_{1i}\,ln\,Y_{t-i} + \sum_{i=1}^{k}\beta_{2i}lnDebt_{t-i} + \sum_{i=1}^{k}\beta_{3i}IQ_{t-i} + \sum_{i=1}^{k}\beta_{4i}(Debt \times IQ)_{t-i} + \sum_{i=1}^{k}\beta_{5i}lnTFP_{t-i}$$

$$+ \sum_{i=1}^{k}\beta_{6i}lnInf_{t-i} + \sum_{i=1}^{k}\beta_{7i}\Delta ln\,GS_{t-i} + \sum_{i=1}^{k}\beta_{8i}\Delta ln\,Exp_{t-i} + \varepsilon_t \tag{11}$$

Where, k is lag orders that are optimal.

3.3.3.3. Error correction model (ECM). We change variables in our models from initial form to first difference so that the variables become stationary in order to avoid false regression. Although the erroneous regression may be solved, the first order equation only provides a short-term relationship between variables. Because researchers care more about the long run relationships, co-integration and the error correction model are used to connect the short and long run relationships of the models' variables. The following equations are examples of ECM form of our main equations (12) and (13):

$$ln\,Y_t = \alpha_0 + \sum_{i=0}^{n}a_{1i}\,ln\,Y_{t-i} + \sum_{i=0}^{n}a_{2i}lnDebt_{t-i} + \sum_{i=0}^{n}a_{3i}IQ_{t-i} + \sum_{i=0}^{n}a_{4i}lnTFP_{t-i} + \sum_{i=0}^{n}a_{5i}lnInf_{t-i} + \sum_{i=0}^{n}a_{6i}\Delta ln\,GS_{t-i} + \sum_{i=0}^{n}a_{7i}\Delta ln\,Exp_{t-i}$$

$$+ \varrho_1 ECM_{t-1} + \varepsilon_t \tag{12}$$

And,

Table 3
Results of unit root tests.

Variable	ADF		PP	
	At Level	At First Difference	At Level	At First Difference
Y	−2.262	−5.184***	−2.262	−5.183***
DEBT	−1.015	−3.362**	−0.721	−3.334**
VAA	−1.918	−4.13***	−1.918	−4.206***
PSV	−1.487	−5.84***	−1.459	−5.699***
GEFF	−2.179	−5.639***	−1.782	−5.639***
REQ	−2.532	−5.821***	−2.527	−5.704***
ROL	−2.072	−4.845***	−2.696*	−6.919***
COC	−5.324***	−9.914***	−5.25***	−13.5***
TFP	−0.318	−2.899*	−0.6	−2.899*
INF	−4.557***	−7.929***	−4.557***	−21.71***
GS	−3.457**	−4.126**	−4.922***	−6.494***
EXP	−0.515	−3.628**	−0.734	−3.638**

Notes: *, ** and *** indicate significance levels at 10%, 5% and 1% respectively.

Table 4
Results of Co-integration test.

Spec	Model	K	Optimal Lags	F-stat	t-stat
1	[lnY lndebt vaa lntfp lninf lngs lnexp]	6	(1 1 2 2 2 2)	5.760	−4.884
2	[lnY lndebt vaa lndebtvaa lntfp lninf lngs lnexp]	7	(2 2 2 2 2 2 2 0)	7.121	−2.351
3	[lnY lndebt psv lntfp lninf lngs lnexp]	6	(2 2 2 2 2 2 1)	17.570	2.478
4	[lnY lndebt psv lndebtpsv lntfp lninf lngs lnexp]	7	(2 2 2 1 2 2 2 1)	8.515	−2.295
5	[lnY lndebt geff lntfp lninf lngs lnexp]	6	(1 2 2 2 2 2 1)	8.829	−2.835
6	[lnY lndebt geff lndebtgeff lntfp lninf lngs lnexp]	7	(2 2 2 2 1 1 2 1)	6.968	−2.558
7	[lnY lndebt req lntfp lninf lngs lnexp]	6	(1 2 1 2 2 1 2)	7.103	−2.355
8	[lnY lndebt req lndebtreq lntfp lninf lngs lnexp]	7	(2 2 2 2 2 2 2 1)	7.404	−2.496
9	[lnY lndebt rol lntfp lninf lngs lnexp]	6	(2 1 2 2 2 2 1)	14.252	−2.279
10	[lnY lndebt rol lndebtrol lntfp lninf lngs lnexp]	7	(2 2 2 2 2 2 1 1)	8.701	−2.148
11	[lnY lndebt coc lntfp lninf lngs lnexp]	6	(2 2 2 2 2 2 2)	5.19	−2.263
12	[lnY lndebt coc lndebtcoc lntfp lninf lngs lnexp]	7	(2 2 2 1 2 2 2 1)	6.840	−2.984
Critical Values Bounds		1%	5%	10%	
K = 6 I (0) Bound		3.15	2.45	2.12	
I (1) Bound		4.43	3.61	3.23	
K = 7 I (0) Bound		2.96	2.32	2.03	
I (1) Bound		4.26	3.5	3.13	

Notes: AIC criterion is used to select the appropriate lag lengths.

$$
\begin{aligned}
ln\,Y_t = \beta_0 &+ \sum_{i=1}^{n}\beta_{1i}\,ln\,Y_{t-i} + \sum_{i=0}^{n}\beta_{2i}lnDebt_{t-i} + \sum_{i=0}^{n}\beta_{3i}IQ_{t-i} + \sum_{i=0}^{n}\beta_{4i}(Debt \times IQ)_{t-i} + \sum_{i=0}^{n}\beta_{5i}lnTFP_{t-i} \\
&+ \sum_{i=0}^{n}\beta_{6i}lnInf_{t-i} + \sum_{i=0}^{n}\beta_{7i}\Delta ln\,GS_{t-i} + \sum_{i=0}^{n}\beta_{8i}\Delta ln\,Exp_{t-i} + \varrho_2 ECM_{t-1} + \varepsilon_t
\end{aligned} \tag{13}
$$

Estimated error correction is referred to ECM term, which comes from co-integration models. The short run adjustment coefficient ϱ of ECM represents the adjustment velocity from equilibrium or in-equilibrium correction for each period. The coefficient's sign should be negative and statistically significant, ranging from 0 to 1. Last but not least, the ARDL and ECM models are calculated using least squares approach. Following the baseline equations (8) and (9), we used for all six indicators of institutional quality by abbreviating the term IQ as an indicator of institutional quality.

3.3.3.4. Stability and diagnostic tests. We employ different tests to see the reliability and stability of ARDL model. Both diagnostics testing and stability coefficients testing should be done to check the model under estimation is accurately stated and may be utilized to forecast. For this, we employ the ARCH approach to measure autocorrelation in residuals, the approach is utilized and presented by Engle [65] and the Breusch-Godfrey serial correlation LM test and the Breusch-Godfrey serial correlation LM test are used. The Ramsey RESET test [66] and the Jarque Bera test are used to assess the model' misspecification and investigate the normal distribution, respectively [67]. To determine, if the parameters of the ARDL model are stable, the cumulative sum of residuals (CUSUM) and cumulative sum of squares of residuals (CUSUMQ) are utilized. To ensure the regression coefficients are stable and correspond with the null hypothesis, the plots of the CUSUM and CUSUMSQ statistics must fall below 5% significance threshold [68].

Table 5
Short and Long Run Results using Voice and Accountability.

Variable	Spec 1 (IQ=VAA)		Spec 2 (IQ=VAA)	
	Coeff.	t-stat	Coeff.	t-stat
Short-run Coefficients				
ECM (−1)	−0.877***	−7.454	−0.896***	−7.616
ΔLNDEBT	0.137**	4.137	0.124**	2.994
ΔIQ	0.283***	4.512	0.216**	4.611
Δ(LNDEBT × IQ)			0.723***	5.663
ΔLNTFP	2.004	0.55	1.232	0.975
ΔLNINF	−0.526**	−5.037	−0.905**	−4.565
ΔLNGS	−0.327	−0.29	−1.507	−1.838
ΔLNEXP	2.377*	2.324	2.117*	2.389
C	6.394	1.265	7.793**	4.471
Long-run Coefficients				
LNDEBT	−0.648*	−2.348	−0.603***	−6.893
IQ	1.485***	4.832	1.573***	6.033
LNDEBT × IQ			0.813***	5.905
LNTFP	1.083**	3.933	1.829	2.215
LNINF	−1.028**	−3.78	−1.928***	−7.835
LNGS	0.871	0.315	0.796***	6.248
LNEXP	2.272	1.319	2.377*	2.324
C	7.578	1.293	−6.940***	−5.904

Notes: Spec. Is the short form of specification and coeff. represents the coefficient. Δ is the first difference, whereas C is the constant term. *, ** and *** represents the significance at 10%, 5% and 1% respectively.

Table 6
Short and Long Run Results using Political Stability and Violence.

Variable	Spec 3 (IQ=PSV)		Spec 4 (IQ=PSV)	
	Coeff.	t-Stat	Coeff.	t-Stat
Short-Run Coefficients				
ECM (−1)	−0.981***	−7.659	−0.889***	−7.557
ΔLNDEBT	0.426***	5.804	0.578***	5.886
ΔIQ	1.349***	6.999	1.333***	5.456
Δ(LNDEBT × IQ)			0.901***	6.888
ΔLNTFP	0.998***	5.884	1.002*	2.833
ΔLNINF	−0.844***	−5.804	−0.793*	−2.880
ΔLNGS	−0.871***	−5.093	−0.673***	−4.988
ΔLNEXP	0.456***	4.803	0.561**	3.451
C	6.265***	5.762	5.901***	5.883
Long-Run Coefficients				
LNDEBT	−0.467***	−5.436	−0.356**	−3.778
IQ	1.612***	6.395	1.190***	7.888
LNDEBT × IQ			0.909***	6.221
LNTFP	0.998***	4.894	0.893**	3.134
LNINF	−0.345***	−6.119	−0.451*	−2.789
LNGS	−0.533***	−6.003	−0.133	−1.673
LNEXP	0.223**	5.094	0.421**	4.987
C	5.921***	6.342	5.003**	3.883

Notes: Spec. Is the short form of specification and coeff. represents the coefficient. Δ is the first difference, whereas C is the constant term. *, ** and *** represents the significance at 10%, 5% and 1% respectively.

4. Results and discussion

4.1. Results of unit root tests

We investigate the stationary of variables before using ARDL Bounds testing to identify their integration order. This avoids inaccurate results on subsequent estimations by ensuring that series are not integrated at second order I (2). The invalidity of F-statistics stated by Pesaran, Shin [62] as caused by the presence of variables of integrated order two. According to Pesaran, Shin [62], for variable integration on the ARDL technique, variables must be stationary at I (0) or I (1). We utilize the Dickey and Fuller [59,60] and PP [61] tests for this purpose. Table 3 displays the results of these unit root testing.

Series I (0) and I (1) are integrated, as shown in Table 3. Because of the small sample size, the ARDL test must be used to assess if the variables are co-integrated.

Table 7
Short and Long Run Results using Government Effectiveness.

Variable	Spec 5(IQ = GEF)		Spec 6(IQ = GEF)	
	Coeff.	t-Stat	Coeff.	t-Stat
Short-Run Coefficients				
ECM (−1)	−0.929***	−7.897	−0.898***	−7.633
ΔLNDEBT	0.432**	3.919	0.346***	4.352
ΔIQ	1.012***	4.903	1.233***	5.122
Δ(LNDEBT × IQ)			0.764***	5.903
ΔLNTFP	−0.672**	−3.888	0.782***	5.422
ΔLNINF	−0.541***	−4.940	−0.453***	−4.993
ΔLNGS	−0.134**	−3.773	−0.098	−1.887
ΔLNEXP	0.442*	2.992	0.587*	3.412
C	6.342*	5.444	6.422**	4.630
Long-Run Coefficients				
LNDEBT	−0.322***	−2.599	−0.401***	−7.965
IQ	1.071**	4.012	1.340***	6.616
LNDEBT × IQ			0.921***	5.646
LNTFP	0.773	5.445	0.957**	4.783
LNINF	−0.192**	−3.244	−0.214***	−6.229
LNGS	−0.123*	−3.056	−0.097	−1.889
LNEXP	0.332**	3.624	0.5438**	4.567
C	4.883***	5.042	4.934**	4.904

Notes: Spec. Is the short form of specification and coeff. represents the coefficient. Δ is the first difference, whereas C is the constant term. *, ** and *** represents the significance at 10%, 5% and 1% respectively.

Table 8
Short and Long Run Results using Regulatory Quality.

Variable	Spec 7(IQ = REQ)		Spec 8(IQ = REQ)	
	Coeff.	t-Stat	Coeff.	t-Stat
Short-Run Coefficients				
ECM (−1)	−0.786***	−6.681	−0.762***	−6.477
ΔLNDEBT	0.330***	5.664	0.349**	4.756
ΔIQ	1.024*	3.001	1.332***	8.777
Δ(LNDEBT × IQ)			0.678***	4.556
ΔLNTFP	1.001***	4.962	0.782*	2.569
ΔLNINF	−0.198***	−5.456	−0.221	−2.762
ΔLNGS	0.386**	3.680	−0.246	−0.967
ΔLNEXP	0.092***	6.943		
C	4.882***	5.042	−5.833**	−4.332
Long-Run Coefficients				
LNDEBT	−0.341***	−6.687	−0.308**	−3.981
IQ	1.022***	5.453	1.223***	5.782
LNDEBT × IQ			0.827**	4.661
TFP	0.998**	4.072	0.991	0.784
LNINF	−0.302**	−4.602	−0.260	−2.691
GS	0.121**	−4.673	−0.096*	−2.609
LNEXP	0.340***	6.674	0.456***	5.321
C	5.990***	6.839	5.833*	3.229

Notes: Spec. Is the short form of specification and coeff. represents the coefficient. Δ is the first difference, whereas C is the constant term. *, ** and *** represents the significance at 10%, 5% and 1% respectively.

4.2. Results of bounds tests for Co-integration

It was previously stated, in the second stage, before estimating the equations models (10) and (11) with the ARDL approach, the amount of time lags of the variables' model must be determined using the relevant criteria. Because error term should avoid non-normality, autocorrelation, and heteroscedasticity, the lag for each variable on the ARDL model is critical. We utilized the Akaike criterion (AIC criteria) to determine the amount of time lags. Table 4 compares the estimated F-statistics from the ARDL co-integration test to find critical values [69].

The results show that the null hypothesis of no co-integration is rejected in all specifications. This demonstrates that there is a long-run causal relation between economic growth, total factor productivity, inflation, governing spending, exports, and institutional quality variables in Pakistan. The results of Table 4 show the optimal lag values for all the 12 model specifications. At the bottom of Table 4, we have the critical values at 1%, 5% and 10% for K = 6, 7. K equals to 6, when we use the variables without interaction term. In case, we apply the interaction term the value of K is 7.

Table 9
Short and Long Run Results using Rule of Law.

Variable	Spec 9 (IQ = ROL)		Spec 10 (IQ = ROL)	
	Coeff.	t-Stat	Coeff.	t-Stat
Short-Run Coefficients				
ECM (−1)	−0.771***	−6.553	−0.896***	−7.616
ΔLNDEBT	0.420***	5.944	0.346**	4.945
ΔIQ	1.230***	6.567	0.978***	6.788
Δ(LNDEBT × IQ)			0.664***	5.033
ΔLNTFP	0.544**	3.879	0.947***	5.974
ΔLNINF	−0.644*	3.339	−0.648***	−6.879
ΔLNGS	−0.333**	−4.944	−0.441***	5.440
ΔLNEXP	0.320***	5.093	0.499**	4.809
C	4.957***	5.380	5.930***	−6.743
Long-Run Coefficients				
LNDEBT	−0.620**	−4.890	−0.238***	−7.909
IQ	1.333	6.540	1.549***	7.784
LNDEBT × IQ			0.940***	6.849
TFP	0.908**	3.584	1.093***	8.039
LNINF	−0.104***	−5.090	−0.110**	−4.965
GS	−0.343***	−6.049	−0.742	−1.784
LNEXP	0.226*	2.875	0.532*	2.689
C	4.878***	5.042	−5.339**	−4.911

Notes: Spec. Is the short form of specification and coeff. represents the coefficient. Δ is the first difference, whereas C is the constant term. *, ** and *** represents the significance at 10%, 5% and 1% respectively.

Table 10
Short and Long Run Results using Control of Corruption.

Variable	Spec 11(IQ=COC)		Spec 12(IQ=COC)	
	Coeff.	t-Stat	Coeff.	t-Stat
Short-Run Coefficients				
ECM (−1)	−0.793***	−6.741	−0.868***	−7.378
ΔLNDEBT	0.433*	2.800	0.244***	6.036
ΔIQ	0.987*	2.885	1.225***	5.784
Δ(LNDEBT × IQ)			0.743***	7.888
ΔLNTFP	0.844**	7.002	1.112***	5.799
ΔLNINF	−0.671***	−6.014	−0.556***	−5.784
ΔLNGS	0.233*	2.883	−0.342	−1.771
ΔLNEXP	0.123***	7.322	0.094***	4.094
C	4.904**	5.920	5.219***	6.322
Long-Run Coefficients				
LNDEBT	−0.433***	−6.494	−0.397***	−6.039
IQ	0.978*	2.673	1.033***	6.055
LNDEBT × IQ			0.957***	5.758
TFP	0.744**	4.740	0.664**	4.093
LNINF	−0.234***	−7.449	−0.322***	−5.877
GS	−0.442***	−6.784	−0.019***	−6.607
LNEXP	0.224***	7.394	0.413***	6.543
C	5.332***	7.754	4.844***	8.784

Notes: Spec. Is the short form of specification and coeff. represents the coefficient. Δ is the first difference, whereas C is the constant term. *, ** and *** represents the significance at 10%, 5% and 1% respectively.

4.3. Short-run and long-run estimates

The results of our baseline model based on the yearly time series data for the period of 1996–2020, using all six indicators of institutional quality are reported from Tables 5–10. The outcomes of all model specifications show that all the six indicators of institutional quality have positive and statistically significant impacts on the economic growth of Pakistan. However, we find that the magnitude and significance of the impact of institutional quality depends on the measure of institutional quality used. While, almost in all model specifications, the ECM coefficients show negative signs and significant at the 1% level, indicating that short run disequilibrium will eventually converge to the long-run relationship.

In Table 5, from the Specification (1) and (2), in short run, the coefficients of public debt show positive signs, and statistically significant for all of the model specifications (Table 5 to Table 10), suggesting that public debt has a positive effect on economic growth. This finding is in line with the conventional view that for an economy, borrowing can be beneficial to grow if the payback period of funds is short. Furthermore, our result is similar to some previous studies, for example [70–73], who claimed that based on

the assumption of perfect capital mobility, debt has a positive association with economic growth at low levels. The justification for perfect capital mobility is based on the idea that shifting funds from one geographical place to another incurs no additional cost. This explanation also stated that debt expansion can have a positive influence on economic growth if the borrowed money is invested at a rate equal to or greater than the cost of borrowing.

While in the long run, the coefficients of public debt show negative signs, and statistically significant for all model specifications (Table 5 to Table 10), suggesting that public debt has a detrimental effect on economic growth in Pakistan. This finding is in line with the conventional view and the study of [74–80], concluded that public debt could become a destructive force when not invested wisely and productively in an economy and the risk of default is higher in the long run. These results established that in the debt-growth relationship in our study in the context of Pakistan as an emerging economy, the public debt has dual effect pattern on economic growth in short run and in the long run. These results concluded that public debt has dual impact on economic growth in Pakistan in short run and in the long run.

Moving to the coefficient values and significance levels of the public debt, this study evaluates how much public debt impacts economic growth in Pakistan. In short run, specification (1) and (2), the coefficient values of public debt are ranging between 0.124 and 0.137, concluded that other things remaining constant, a 1% increase in public debt would increase the economic growth by 0.124–0.137%, while the significant level of public debt is ranging between one to 10%. These results indicate that a moderate level of public debt contributes to enhance the economic growth in Pakistan. While, in the long run, the coefficient values of public debt are ranging between −0.603 to −0.648, concluded that other things remaining constant, a 1% increase in public debt would decrease the economic growth by −0.603 to −0.648%, while the significant level of public debt is $P < 0.01$%. These results indicate that public debt has a detrimental effect on the economic growth of Pakistan. This pattern of the public debt result remains the similar in all of our model specifications.

It is important to note that the coefficients of interaction terms between public debt and all six indicators of institutional quality have positive signs and are significant. However, the magnitudes of the coefficient of each interaction term in the long run is higher than that of in the short run. This result indicates that the there's some pattern of complementarity between public debt and the institutional quality to enhance economic growth in Pakistan by investing funds in the long-term projects, which may validate the theory of institutions.

In the same table, from specification (1) and (2), using voice and accountability (VAA) as an indicator of institutional quality, show the results without and with interaction terms respectively. In short run, and as well as in the long run, the coefficients of the first measure of institutional quality, namely, voice and accountability show positive signs, and statistically significant, suggesting that when institutional quality is measured by voice and accountability, it has a positive effect on economic growth. This finding is in line with the institutional theory and the widely held belief that better institutions are necessary for boosting economic growth. Furthermore, our result is similar to some previous studies, for example, [81–84]. While, from the specification (2), the coefficient values of the interaction term (lnDEBT × VAA) between public debt and the voice and accountability are 0.723 and 0.813, concluded that other things remaining constant, the combined effect of these two variables would increase the economic growth by 0.723 and 0.813% in short run and in the long run respectively, while the significant level of the interaction term is $P < 0.01$%. These results are consistent with [16,84,85], indicating that better quality of institutions when it is measured by voice and accountability contributes to enhance the economic growth in Pakistan.

In Table 6, turning now to the second indicator of the institutional quality, which is political stability and violence (PSV), from the specification (3) and (4), in short run and in the long run, the coefficient values of institutional quality when it is measured as political stability and violence (PSV) show positive signs and significant. This result indicates that the institutional quality when it is measured as political stability has increasing effect on economic growth of Pakistan. While, from the specification (4), the coefficient values of the interaction term (lnDEBT × PSV) between public debt and the political stability and violence (PSV) are 0.901 and 0.909, concluded that other things remaining constant, the combined effect of these two variables would increase the economic growth by 0.901 and 0.909% in short run and in the long run respectively, the significant level of the interaction term is $P < 0.01$%. These results are consistent with [84,86,87], concluded that the combine effect of public debt and the political stability and violence (PSV) contributes to enhance the economic growth. Moreover, the results indicate that for Pakistan it is important to focus on political stability because in this way the public debt can be used in a better way and for the welfare of the general public.

In Table 7, Moving towards the third indicator of the institutional quality, which is government effectiveness (GEF), from the specification (5) and (6), the coefficient values of institutional quality when it is measured as government effectiveness (GEF) are positive and significant, suggesting that the government effectiveness (GEF) has positive effect on the economic growth in Pakistan. These results indicate that better quality of institutions when it is measured as government effectiveness (GEF) contributes to enhance the economic growth in Pakistan. While, from the specification (6), the coefficient values of the interaction term (lnDEBT × GEF) between public debt and the government effectiveness (GEF) are 0.764 and 0.921, concluded that other things remaining constant, the combined effect of these two variables would increase the economic growth by 0.764 and 0.921% in short run and in the long run respectively, while the significant level of the interaction term is p< 0.01. These results are consistent with [16,84,85], concluded that better quality of institutions when it is measured as government effectiveness (GEF) contributes to enhance the economic growth.

In Table 8, turning now to the fourth indicator of the institutional quality, which is regulatory quality (REQ), from the specification (7) and (8), the coefficient values of institutional quality when it is measured as regulatory quality (REQ) show positive signs and statistically significant, indicating that the better regulatory quality (REQ) would increase the economic growth in Pakistan. While, from the specification (8), the coefficient values of the interaction term (lnDEBT × REQ) between public debt and the regulatory quality (REQ) are 0.678 and 0.827, concluded that other things remaining constant, the combined effect of these two variables would increase the economic growth by 0.678 and 0.827% in short run and in the long run respectively, while the significant level of the

Table 11

Robustness; estimation results of DOLS.

Variables	Specification models without interaction terms					
	(VAA)	(PSV)	(GEF)	(REQ)	(ROL)	(COC)
	(1)	(2)	(3)	(4)	(5)	(6)
LNDEBT	−0.771*** (−7.678)	−0.018*** (−5.936)	−0.329*** (−5.711)	−0.761*** (−5.906)	−0.684*** (−8.437)	−0.733** (−3.653)
IQ	0.723*** (5.741)	1.273*** (7.359)	1.204** (3.231)	0.987*** (5.793)	0.859*** (7.493)	0.663*** (5.683)
LNTFP	0.991*** (5.649)	1.285*** (8.943)	2.069** (3.108)	1.992*** (3.345)	2.794*** (5.920)	2.804** (3.169)
LNINF	−1.229*** (−5.967)	−0.112*** (−6.715)	−3.324*** (−4.759)	−2.668* (−2.998)	−2.901*** (−6.793)	−1.082*** (−7.893)
LNGS	−0.793** (−4.221)	−1.357*** (−9.681)	−1.193 (−1.001)	−0.992* (−2.590)	−0.903*** (−6.451)	−0.909*** (−5.993)
LNEXP	1.793*** (5.181)	1.385*** (6.259)	1.115* (2.928)	1.672*** (7.208)	1.092*** (5.998)	0.934*** (6.664)
C	6.223 (0.971)	−5.731*** (−7.757)	5.334*** (3.250)	8.890*** (6.839)	8.773*** (6.875)	9.339*** (7.228)
Specification models with interaction terms						
LNDEBT	−0.894*** (−7.203)	−0.439*** (−8.648)	−0.664*** (−7.342)	−0.663*** (−6.345)	−0.732*** (−5.632)	−0.786*** (−5.274)
IQ	0.946*** (8.344)	1.092*** (5.903)	1.228*** (5.444)	0.893** (4.452)	1.345*** (5.879)	0.868*** (6.403)
LNDEBT × IQ	1.374*** (8.456)	1.002*** (5.633)	1.883*** (9.884)	1.996*** (4.999)	1.453*** (5.673)	1.868*** (5.329)
TFP	1.957*** (5.838)	1.905*** (5.994)	1.832 (1.883)	0.991*** (5.577)	2.441*** (6.342)	1.168** (4.740)
LNINF	−0.484*** (−5.991)	−0.994*** (−6.442)	−1.221*** (−6.456)	−2.662*** (−4.002)	−0.662* (−2.229)	−1.862*** (−6.731)
GS	−0.486*** (−6.453)	−0.223*** (−7.334)	−0.112*** (−5.680)	−0.342** (−3.801)	−0.289*** (−6.221)	−0.868*** (−6.741)
LNEXP	0.684* (2.455)	1.039*** (5.449)	1.002*** (5.072)	1.331*** (5.553)	1.822*** (4.422)	1.868 (1.723)
C	5.793** (4.683)	4.967** (3.458)	5.783*** (6.443)	5.908** (6.742)	5.666*** (5.722)	4.878** (3.441)

Note: *, **, and *** indicate the significance level at 10%, 5%, and 1% respectively. Numbers in the parenthesis indicate the t-statistics.

Table 12

Robustness; estimation results of FMOLS.

Variables	Specification models without interaction terms					
	(VAA)	(PSV)	(GEF)	(REQ)	(ROL)	(COC)
	(1)	(2)	(3)	(4)	(5)	(6)
LNDEBT	−1.670*** (−7.888)	−2.992*** (−5.009)	−5.302*** (−5.900)	−2.665*** (−5.093)	−5.234*** (−7.567)	−5.653** (−3.545)
IQ	2.345*** (5.459)	2.234*** (6.290)	2.109*** (7.231)	3.834*** (5.001)	3.454*** (6.563)	1.112*** (5.456)
LNTFP	1.678*** (5.302)	3.345*** (5.593)	2.331** (3.782)	2.401*** (6.778)	2.449*** (5.450)	2.007** (3.230)
LNINF	−1.672*** (−6.860)	−1.692*** (−8.567)	−2.784*** (−4.991)	−2.998** (−3.562)	−2.783*** (−3.533)	−1.666*** (−5.382)
LNGS	−2.793*** (−6.761)	−3.664*** (−5.455)	−4.190 (−1.656)	−5.606*** (−5.770)	−4.720*** (−3.555)	−5.671*** (−5.694)
LNEXP	2.567*** (5.090)	3.893** (3.539)	3.453*** (6.678)	4.979*** (3.789)	3.578*** (5.773)	4.673*** (6.001)
C	5.879** (4.567)	6.944*** (5.677)	5.444** (4.076)	5.672*** (6.794)	4.893** (3.979)	5.984*** (5.964)
Specification models with interaction terms						
LNDEBT	−4.487*** (−6.033)	−5.674*** (−6.784)	−6.884*** (−7.594)	−5.973*** (−5.944)	−7.702*** (−5.784)	−6.743** (−4.078)
IQ	1.675*** (6.789)	1.879*** (6.785)	1.579*** (5.434)	1.873*** (5.833)	1.765* (2.783)	1.842*** (7.873)
LNDEBT × IQ	3.566*** (6.920)	1.903*** (6.563)	1.430*** (6.398)	1.453*** (6.339)	1.874*** (5.873)	1.099*** (6.089)
TFP	1.789 (1.339)	2.395* (2.333)	2.864** (3.443)	2.488*** (5.478)	2.784*** (5.994)	1.998*** (3.574)
LNINF	−2.673*** (−6.331)	−1.033 (−0.453)	−1.983* (−2.678)	−2.451*** (−4.563)	−2.882*** (−5.933)	−0.773* (−2.500)
GS	−2.687*** (−5.798)	−2.933* (−3.094)	−3.009*** (−5.390)	−2.332** (−3.330)	−3.003*** (−5.784)	−2.444*** (−6.778)
LNEXP	1.673*** (6.933)	1.893*** (2.933)	1.892*** (5.933)	1.831*** (5.733)	1.093*** (4.783)	1.093* (2.809)
C	5.784** (3.890)	6.980*** (5.054)	5.095*** (6.593)	5.558*** (5.984)	4.709*** (5.893)	4.993** (3.463)

Note: *, **, and *** indicate the significance level at 10%, 5%, and 1% respectively. Numbers in the parenthesis indicate the t-statistics.

interaction term is P < 0.01%. These results are consistent with [16,84,85], indicating that better quality of institutions when it is measured as regulatory quality (REQ) contributes to enhance the economic growth in Pakistan. In Pakistan, regulatory quality is comparatively better than other indictors of institutional quality. According to some previous studies, for instance Ref. [88], regulatory quality impacts the financial sector of a country, labor and product markets on resource allocations, investment and productivity, but most of the previous literature uses recent data and only measures the short run effect, while in our case; we measure the short and long run effect of regulatory quality.

In Table 9, turning now to the fifth indicator of the institutional quality, which is rule of law (ROL), from the specification (9) and (10), the coefficient values of institutional quality when it is measured as rule of law (ROL) are positive and statistically significant, indicating that the institutional quality when it is measured as rule of law (ROL) has a positive impact on economic growth in Pakistan. While, from the specification (10), the coefficient values of the interaction term (lnDEBT × ROL) between public debt and the rule of law (ROL) are 0.664 and 0.940, concluded that other things remaining constant, the combined effect of these two variables would increase the economic growth by 0.664 and 0.940% in short run and in the long run respectively and the significant level of the interaction term is P < 0.01%. These results are consistent with [16,84,85,89–92], indicating that better quality of institutions, namely, the rule of law contributes to enhance the economic growth in Pakistan.

In Table 10, turning now to the sixth indicator of the institutional quality, which is control of corruption (COC), from the specification (11) and (12), the coefficient values of institutional quality when it is measured as control of corruption (COC) are positive and

Table 13
Diagnostic tests.

Test	Specification 1		Specification 2		Specification 3		Specification 4		Specification 5		Specification 6	
	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.	Value	Prob.
Durbin-Watson stat	3.324		3.458		3.254		3.075		2.733		2.959	
Jarque-Bera	0.947	0.623	1.932	0.381	0.126	0.939	0.385	0.825	1.066	0.587	0.289	0.865
ARCH Test	1.666	0.217	0.016	0.901	2.482	0.131	1.158	0.337	0.123	0.730	0.071	0.793
B-G SC LM Test	5.157	0.108	2.676	0.146	6.430	0.239	2.499	0.255	2.673	0.163	0.629	0.573
Ramsey RESET Test	3.627	0.216	1.984	0.218	0.365	0.654	0.083	0.800	5.672	0.630	1.210	0.470
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
Test	**Specification 7**		**Specification 8**		**Specification 9**		**Specification 10**		**Specification 11**		**Specification 12**	
Durbin-Watson stat	3.023		3.390		2.866		2.915		3.487		3.456	
Jarque-Bera	1.534	0.464	0.096	0.953	2.494	0.287	1.441	0.487	1.608	0.448	0.177	0.915
ARCH Test	1.060	0.316	2.290	0.117	0.200	0.659	0.913	0.419	2.930	0.102	2.211	0.139
B-G SC LM Test	1.276	0.322	1.921	0.398	4.668	0.120	3.015	0.138	2.235	0.148	1.316	0.151
Ramsey RESET Test	1.433	0.443	4.088	0.153	0.934	0.419	1.050	0.345	0.056	0.835	0.881	0.482
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable

statistically significant, indicating that the institutional quality when it is measured as control of corruption (COC) has a positive impact on economic growth in Pakistan. While, from the specification (12), the coefficient values of the interaction term (lnDEBT × COC) between public debt and the control of corruption (COC) are 0.743 and 0.957, concluded that other things remaining constant, the combined effect of these two variables would increase the economic growth by 0.743 and 0.957%, in short run and in the long run respectively, while the significant level of the interaction term is $P < 0.01\%$. These results are consistent with [16,74,84,85,93], indicating that better quality of institutions when it is measured as control of corruption (COC) contributes to enhance the economic growth in Pakistan.

The results for most of the control variables are with expected signs for almost all the 12 model specifications. The coefficients of TFP show positive signs and statistically significant for most of the specification models. This finding is similar to the new growth theories and previous empirical studies. For instance, Solow [94], who pointed out that economic growth involves technological progress i.e. TFP. The role of TFP in economic growth has acquired significant importance as it has been helpful in improving the rate of economic growth [45,46,95]. Moreover, according to Dowrick and Nguyen [96], they claimed that in addition to the accumulation of inputs, TFP is also one of the primary drivers of economic growth.

The coefficients of inflation are found to be negative and statistically significant for most of the specification models. This finding is in line with the conventional view that inflation has a significant negative impact on economic growth in short run and as well as in long run. This result is in line with some previous studies. For example, Jouini [97], suggests that inflation tends to exert a negative impact on GDP growth because it is often a sign of macroeconomic instability and mismanagement. Unlike some theoretical studies in which moderate inflation is favorable to economic growth. For example, in the study of Darku and Yeboah [98]. He found a positive relationship between income growth and inflation rate in high-income countries.

The coefficients of general government spending are found to be negative almost for all models as expected. The coefficients of export indicate positive signs and statistically significant, suggesting the positive impact of export activity on economic growth. This result is in line with some empirical studies who have found that economic growth benefits from exports to the outside world [45,46, 99].

4.4. Robustness test

To evaluate the sensitivity of our baseline findings to data or econometric specifications further, we employed dynamic ordinary least square (DOLS), and fully modified ordinary least square (FMOLS) to measure the robustness of the outcome of long-term estimates of the ARDL approach. The results are reported in Table 11 and Table 12 respectively.

In robustness check, using the similar data confirm our main result that institutional quality has an interactive effect in debt–growth relationship. Using the alternative estimation strategy, we find that in the long run public debt has negative impact on economic growth, while the impact becomes positive once institutional quality variables are interacted with public debt. The robustness test confirms the results to the baseline ones, demonstrating the consistency and robustness of ARDL estimation technique findings.

4.5. Results of diagnostic and stability tests

Table 13 presents a series of diagnostic tests used in this analysis. The outcomes of ARCH and the Breusch-Godfrey serial correlation LM test show that there is no problem of autocorrelation exists regarding the residuals in the ARDL model. Values of Ramsey RESET tests which are employed for all the specifications, display that there exists no misspecification in the logarithmic form of the ARDL model. The Jarque-Bera test value in Table 13 indicates that the residuals are normally distributed.

After that, to examine whether the parameters are desirable or not, the CUSUM and CUSUMSQ tests are employed. For this purpose, we measure the CUSUM and CUSUMSQ of all the specifications, Fig. 4 show that the parameters are stable. Both the CUSUM and
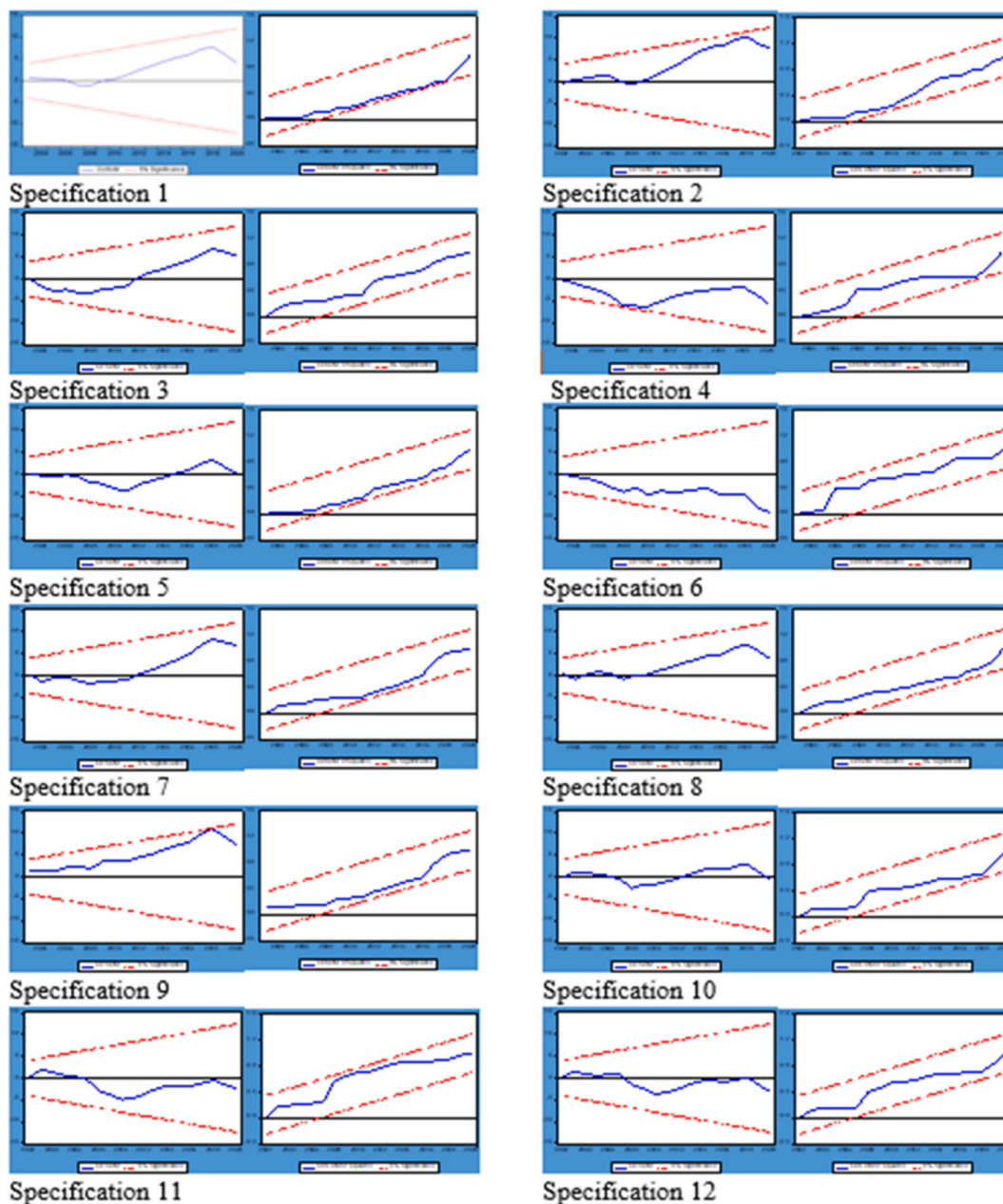
Fig. 4. CUSUM and CUSUMQ of all specifications.

CUSUMSQ tests are plotted within the 5% significance level for all 12 specifications. Thus, the results of the CUSUM and CUSUMSQ show that the ARDL model is stable and credible in its form. The data shown in the graphs below corroborate the long-term correlations between variables. The absence of coefficient instability is also evident, as evidenced by the plot of CUSUM and CUSUMSQ statistics, both of which lie inside the critical bounds of the 5% confidence range of parameter stability.

5. Conclusion

In this paper, we look at the importance of institutional quality in Pakistan's debt-growth relation. Pakistan, being a developing country, has had financial deficits since its independence, and in order to manage its budget, Pakistan must borrow both internally and outside. Because Pakistan was unable to handle its deficit on its own and had to borrow money every year, the overall debt to GDP ratio has reached around 90% as of today. As previously stated in the literature, institutional quality plays a key role to reduce the devastating effects of public debt and it helps countries to make better use of debt and ultimately achieve their economic goals. We

employ institutional quality measures to study their influence on Pakistan's debt-growth connection. We use the ARDL model for this purpose for the period 1996 to 2020. According to the findings, Pakistan's public debt is adversely related to country's economic growth in long run, while in short run, in most cases, it shows the crowding in relation with growth.

When we used the interaction term between public debt and institutional quality variables, it improved the long-run impact of public debt on all six institutional quality variables. On the other hand, in the short run, public debt has had a favorable connection with growth of the Pakistani economy. These findings are consistent with earlier research, which indicates that public debt has a favorable relationship with economic growth in the short run. Similarly, when the public debt is interacted with the institutional quality, it shows the crowding in relationship that the combined effect of debt and institutional quality variables, implying that Pakistan's institutional quality is positively associated to economic growth in the short run.

The positive coefficients of institutional quality variables in the long run indicate that Pakistan needs to continue long-term policies to improve the quality of its institutions, which should begin immediately because Pakistan currently has institutional quality that is comparable to that of most low-income countries. As a result, an immediate prescription is required to establish fiscal strategies to reduce the mounting debt, which inhibits private investment.

The study findings have policy implications: The immediate recommendation is for budgetary measures to be implemented to minimize the increasing debt, which is impeding private investment. There is an essential approach to reduce dependency on non-concessional loans and lessen fiscal risks in order to increase private investment in Pakistan. Government of Pakistan should dramatically reduce their reliance on public debt and also keep public debt level below the ideal level of public debt beyond which it stifles economic growth. As an alternative, the government of Pakistan should stimulate their internally generated revenue collecting mechanism to boost revenue generation and fill the gap between existing resources and spending with the least amount of public debt. Another policy conclusion of the findings is that government of Pakistan should develop export-led growth initiatives to enhance their balance of payments. Further key policy relevance to the findings of the institutions is that the lending institutions and governments should make compliance with the measures that improve the institutional quality, a prerequisite exhibiting interest in receiving loans. This policy would undoubtedly redirect their attention to enhancing the quality of institutions in Pakistan, while also limiting the Pakistan's public debt accumulation.

A good debt management system is also required to reduce fiscal vulnerabilities, as are clear strategies to improve institutional quality. Any current fiscal adjustment initiatives focusing on revenues and expenditures, as well as complementary monetary policies, should be welcomed. Anti-corruption measures that are already in place, as well as those that are being developed, should be strongly supported in order to create a favorable investment environment in which the private sector may thrive. Pakistan' government needs to strengthen the rule of law as it is seen as a crucial aspect in protecting property rights, such as the check and balance of governments and the independence of the judiciary.

To summarize, the role of institutional quality on the debt-growth relationship is very important to utilize the borrowing in productive projects in enhancing the economic growth in Pakistan. Higher debt levels must be managed, otherwise there is a risk of default. The negative impact of debt can be reduced by quality institutions. Pakistan must strengthen its institutional quality in order to attract both domestic and global investors. Efficient and effective use of government spending is necessary, as is effectiveness in regulations to foster competition and increase revenue collection and taxation. Pakistan's competitiveness may be enhanced and it can become a welfare state by implementing these institutional quality standards. Overall, public debt has positive relationship with economic growth in short run but in long run this relationship is negative. Most of the developing countries are facing this problem of negative effect of public debt in long run. Pakistan needs to improve its institutional quality further in order to have positive effect of public debt on economic growth, particularly in the long run.

Author contribution statement

Muhammad Ramzan: Conceived and designed the experiments.
Hong Xing Yao: Performed the experiments.
Qamar Abbas: Analyzed and interpreted the data.
Sumbal Fatima: Contributed reagents, materials, analysis tools or data.
Rana Yasir Hussain: Wrote the paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

References

[1] G.P. Kouretas, P. Vlamis, The Greek crisis: causes and implications, Panoeconomicus 57 (4) (2010) 391–404, https://doi.org/10.2298/PAN1004391K.
[2] C.M. Reinhart, K.S. Rogoff, This time is different: Eight centuries of financial folly, Princeton University Press, 2009, https://doi.org/10.1515/9781400831722.
[3] F. Ostrihon, M. Siranova, M.W. Tiruneh, Reassessing the public debt threshold in the EU: do macroeconomic conditions matter? Panoeconomicus (2022) 1–27, https://doi.org/10.2298/PAN181114007O.
[4] K. Masuch, E. Moshammer, B. Pierluigi, Institutions, public debt and growth in Europe, Public Sector Economics 41 (2) (2017) 159–205, https://doi.org/10.3326/pse.41.2.2.

[5] B.A. Tarek, Z. Ahmed, Governance and public debt accumulation: quantitative analysis in MENA countries, Econ. Anal. Pol. 56 (2017) 1–13, https://doi.org/10.1016/j.eap.2017.06.004.

[6] L. Zingales, More on finance and growth: more finance, more growth? Commentary, Fed. Reserv. Bank St. Louis Rev. 85 (4) (2003) 47–52.

[7] Q. Abbas, L. Junqing, M. Ramzan, S. Fatima, Role of governance in debt-growth relationship: evidence from panel data estimations, Sustainability 13 (11) (2021) 5954, https://doi.org/10.3390/su13115954.

[8] C. Sok-Gee, R. Zulkufly, Z.M. Mohd, Value-added tax and economic efficiency: role of country governance, Panoeconomicus 68 (3) (2018) 325–358, https://doi.org/10.2298/PAN180201020C.

[9] S. Homer, R. Sylla, kA History of Interest Rates, Rutgers, New Brunswick, 1991.

[10] J. Bentham, Defence of usury, in: W. Stark (Ed.), Jeremy Bentham's Economic Writings, vol. 1, Routledge, London and New York, 1952, pp. 121–207.

[11] E.L. Fisk, On prolonging human life, N. Am. Rev. 212 (776) (1920) 51–62.

[12] W. Fritschy, A'financial Revolution'reconsidered: Public Finance in Holland during the Dutch Revolt, 1568-1648, Economic History Review, 2003, pp. 57–89.

[13] A.M. Carlos, L. Neal, Amsterdam and London as financial centers in the eighteenth century1, Financ. Hist. Rev. 18 (1) (2011) 21–46, https://doi.org/10.1017/S0968565010000338.

[14] V. Izak, The Welfare state and economic growth, Prague Econ. Pap. 20 (4) (2011) 291–308.

[15] P. Jakubik, P. Teply, The JT index as an indicator of financial stability of corporate sector, Prague Econ. Pap. 20 (2) (2011) 157–176.

[16] D.W. Elmendorf, N.G. Mankiw, Government debt, Handb. Macroecon. 1 (1999) 1615–1669, https://doi.org/10.1016/S1574-0048(99)10038-7.

[17] J.H. Cochrane, Presidential address: discount rates, J. Finance 66 (4) (2011) 1047–1108, https://doi.org/10.1111/j.1540-6261.2011.01671.x.

[18] J.B. DeLong, et al., Fiscal policy in a depressed economy [with comments and discussion], Brookings Pap. Econ. Activ. (2012) 233–297.

[19] P. Krugman, Financing vs. forgiving a debt overhang, J. Dev. Econ. 29 (3) (1988) 253–268, https://doi.org/10.1016/0304-3878(88)90044-2.

[20] D. Cohen, How to Cope with a Debt Overhang: Cut Flows rather than Stocks, Dealing with the debt crisis, Washington, 1989, pp. 229–235.

[21] C. Checherita-Westphal, A. Hughes Hallett, P. Rother, Fiscal sustainability using growth-maximizing debt targets, Appl. Econ. 46 (6) (2014) 638–647, https://doi.org/10.1080/00036846.2013.861590.

[22] A. Greiner, Debt and Growth: Is There a Non-monotonic Relation? Working Papers in Economics and Management, Bielefeld University, 2012, p. 4.

[23] A.R. Ghosh, et al., Fiscal fatigue, fiscal space and debt sustainability in advanced economies, Econ. J. 123 (566) (2013) F4–F30.

[24] G. Ramey, V.A. Ramey, Cross-country Evidence on the Link between Volatility and Growth, National bureau of economic research Cambridge, Mass., USA, 1994.

[25] D.C. North, Structure and Change in Economic History, Norton, 1981.

[26] M. Olson, Rise and Decline of Nations, Economic Growth, 1982.

[27] S. Knack, P. Keefer, Institutions and economic performance: cross-country tests using alternative institutional measures, Econ. Polit. 7 (3) (1995) 207–227, https://doi.org/10.1111/j.1468-0343.1995.tb00111.x.

[28] P. Mauro, Corruption and growth, Q. J. Econ. 110 (3) (1995) 681–712, https://doi.org/10.2307/2946696.

[29] R.J. Barro, Determinants of Economic Growth, MIT Press, Cambridge, Ma, 1997.

[30] R.E. Hall, C.I. Jones, Why do some countries produce so much more output per worker than others? Q. J. Econ. 114 (1) (1999) 83–116, https://doi.org/10.1162/003355399555954, 16.

[31] C. Perugini, I. Tekin, Financial development, income inequality and governance institutions, Panoeconomicus (2020) 1–23, https://doi.org/10.2298/PAN191022004P.

[32] J.Y. Lin, J.B. Nugent, Institutions and economic development, Handb. Dev. Econ. 3 (1995) 2301–2370, https://doi.org/10.1016/S1573-4471(05)80010-5.

[33] J.A. Alonso, C. Garcimartin, The determinants of institutional quality. More on the debate, J. Int. Dev. 25 (2) (2013) 206–226, https://doi.org/10.1002/jid.1710.

[34] S. Nawaz, Growth effects of institutions: a disaggregated analysis, Econ. Modell. 45 (2015) 118–126, https://doi.org/10.1016/j.econmod.2014.11.017.

[35] E. Valeriani, S. Peluso, The impact of institutional quality on economic growth and development: an empirical study, Journal of Knowledge Management, Economics and Information Technology 1 (6) (2011) 1–25.

[36] N. Baklouti, Y. Boujelbene, An econometric study of the role of the political stability on the relationship between democracy and economic growth, Panoeconomicus 67 (2) (2018) 187–206, https://doi.org/10.2298/PAN170308015B.

[37] N. Akram, Impact of Public Debt on the Economic Growth of Pakistan, The Pakistan Development Review, 2011, pp. 599–615.

[38] M. Amin, M. Khan, R. Naseer, Pakistan in the FATF grey-list: challenges, remedies and international response, Margalla Papers 24 (1) (2020) 31–43.

[39] R. Atique, K. Malik, Impact of domestic and external debt on the economic growth of Pakistan, World Appl. Sci. J. 20 (1) (2012) 120–129.

[40] S. Abbas, A. Waheed, Fiscal deficit and trade deficit nexus in Pakistan: an econometric inquiry, Panoeconomicus 68 (5) (2021) 745–763.

[41] N. Iqbal, V. Daly, Rent seeking opportunities and economic growth in transitional economies, Econ. Modell. 37 (2014) 16–22, https://doi.org/10.1016/j.econmod.2013.10.025.

[42] R.M. Solow, Technical change and the aggregate production function, Rev. Econ. Stat. (1957) 312–320, https://doi.org/10.2307/1926047.

[43] R.M. Solow, A contribution to the theory of economic growth, Q. J. Econ. 70 (1) (1956) 65–94, https://doi.org/10.2307/1884513.

[44] D. Gollin, Getting income shares right, J. Polit. Econ. 110 (2) (2002) 458–474, https://doi.org/10.1086/338747.

[45] M. Ramzan, B. Sheng, M. Shahbaz, J. Song, Z. Jiao, Impact of trade openness on GDP growth: does TFP matter? J. Int. Trade Econ. Dev. 28 (8) (2019) 960–995, https://doi.org/10.1080/09638199.2019.1616805.

[46] S. Fatima, B. Chen, M. Ramzan, Q. Abbas, The nexus between trade openness and GDP growth: analyzing the role of human capital accumulation, Sage Open 10 (4) (2020), https://doi.org/10.1177/2158244020967377.

[47] X. Sala-i-Martin, G. Doppelhofer, R.I. Miller, Determinants of Long-Term Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach, American Economic Review, 2004, pp. 813–835.

[48] N.G. Mankiw, D. Romer, D.N. Weil, A contribution to the empirics of economic growth, Q. J. Econ. 107 (2) (1992) 407–437, https://doi.org/10.2307/2118477.

[49] C.A. Pattillo, H. Poirson, L.A. Ricci, External Debt and Growth, International Monetary Fund, 2002.

[50] R.T. Cunningham, The effects of debt burden on economic growth in heavily indebted developing nations, J. Econ. Dev. 18 (1) (1993) 115–126.

[51] M. Olson, N. Sarna, A.V. Swamy, Governance and growth: a simple hypothesis explaining cross-country differences in productivity growth, Publ. Choice 102 (3–4) (2000) 341–364, https://doi.org/10.1023/A:1005067115159.

[52] D. Kaufmann, A. Kraay, Governance and growth: causality which way? Evidence for the world, in: Brief, World Bank, February, 2003.

[53] H. Seldadyo, E.P. Nugroho, J. De Haan, Governance and growth revisited, Kyklos 60 (2) (2007) 279–290, https://doi.org/10.1111/j.1467-6435.2007.00372.x.

[54] K.P. Huynh, D.T. Jacho-Chavez, Growth and governance: a nonparametric analysis, J. Comp. Econ. 37 (1) (2009) 121–143, https://doi.org/10.1016/j.jce.2008.08.003.

[55] R.J. Barro, Xavier Sala-I-Martin, Economic Growth, 1995, p. 2.

[56] J. Temple, The new growth evidence, J. Econ. Lit. 37 (1) (1999) 112–156.

[57] A. Gani, Governance and growth in developing countries, J. Econ. Issues 45 (1) (2011) 19–40, https://doi.org/10.2753/JEI0021-3624450102.

[58] J. Woo, M.S. Kumar, Public debt and growth, Economica 82 (2015) 705–739.

[59] D.A. Dickey, W.A. Fuller, Likelihood ratio statistics for autoregressive time series with a unit root, Econometrica: J. Econom. Soc. (1981) 1057–1072, https://doi.org/10.2307/1912517.

[60] D.A. Dickey, W.A. Fuller, Distribution of the estimators for autoregressive time series with a unit root, J. Am. Stat. Assoc. 74 (366a) (1979) 427–431, https://doi.org/10.1080/01621459.1979.10482531.

[61] P.C. Phillips, P. Perron, Testing for a unit root in time series regression, Biometrika 75 (2) (1988) 335–346, https://doi.org/10.1093/biomet/75.2.335.

[62] M.H. Pesaran, Y. Shin, R.J. Smith, Bounds testing approaches to the analysis of level relationships, J. Appl. Econom. 16 (3) (2001) 289–326, https://doi.org/10.1002/jae.616.

[63] S. Johansen, Statistical analysis of cointegration vectors, J. Econ. Dynam. Control 12 (2–3) (1988) 231–254, https://doi.org/10.1016/0165-1889(88)90041-3.

[64] M.H. Pesaran, Y. Shin, An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis, Department of Applied Economics, University of Cambridge, Cambridge, UK, 1995.

[65] R.F. Engle, Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation, Econometrica: J. Econom. Soc. (1982) 987–1007, https://doi.org/10.2307/1912773.

[66] J.B. Ramsey, Tests for specification errors in classical linear least-squares regression analysis, J. Roy. Stat. Soc. B 31 (2) (1969) 350–371, https://doi.org/10.1111/j.2517-6161.1969.tb00796.x.

[67] C.M. Jarque, A.K. Bera, A Test for Normality of Observations and Regression Residuals, International Statistical Review/Revue Internationale de Statistique, 1987, pp. 163–172, https://doi.org/10.2307/1403192.

[68] R.L. Brown, J. Durbin, J.M. Evans, Techniques for testing the constancy of regression relationships over time, J. Roy. Stat. Soc. B 37 (2) (1975) 149–163, https://doi.org/10.1111/j.2517-6161.1975.tb01532.x.

[69] P.K. Narayan, The saving and investment nexus for China: evidence from cointegration tests, Appl. Econ. 37 (17) (2005) 1979–1990, https://doi.org/10.1080/00036840500278103.

[70] F.J. Farooq, How does institutional quality moderates the impact of public debt on economic growth? Startling evidence from OIC countries, Int. J. Manag. Res. Emerg. Sci. 12 (3) (2022), https://doi.org/10.56536/ijmres.v12i3.287.

[71] M. Caner, T.J. Grennes, S. Kohler-Geib, Finding the Tipping Point-When Sovereign Debt Turns Bad. Policy Research Working Paper No. 5391, The World Bank, 2010.

[72] T. Herndon, M. Ash, R.J.C.j.o.e Pollin, Does high public debt consistently stifle economic growth? A critique of Reinhart and Rogoff, Camb. J. Econ. 38 (2) (2014) 257–279, https://doi.org/10.1093/cje/bet075.

[73] C. Pattillo, H. Poirson, L. Ricci, External debt and growth, Review of Econ. Instit. 2 (3) (2011) 30.

[74] H. Mahmood, S. Hassan, M. Tanveer, Rule of law, control of corruption and CO2 emissions in Pakistan, Int. J. Energy Econ. Pol. 12 (4) (2022) 72–77.

[75] J.J.E.M.F. Klomp, Trade, Sovereign risk and natural disasters in emerging markets, Emerg. Mark. Finance Trade 51 (6) (2015) 1326–1341, https://doi.org/10.1080/1540496X.2015.1011530.

[76] S. Chatterjee, B.J.A.E.R. Eyigungor, Maturity, indebtedness, and default risk, Am. Econ. Rev. 102 (6) (2012) 2674–2699.

[77] J.N. Sandow, E.F. Oteng-Abayie, E.J.H. Duodu, External debt and economic growth in Sub-Saharan Africa: does heterogeneity in the quality of public sector management make a difference? Heliyon 8 (9) (2022), e10627 https://doi.org/10.1016/j.heliyon.2022.e10627.

[78] C.A. Pattillo, H. Poirson, External Debt and Growth. IMF Working Paper No. 02/69, International Monetary Fund), Washington, 2002.

[79] J. Frimpong, E.J.J.o.S. Oteng-Abayie, The impact of external debt on economic growth in Ghana: a cointegration analysis, J. Sci. Technol. 26 (3) (2006) 122–131.

[80] O. Onafowora, O.J.E.C. Owoye, Impact of external debt shocks on economic growth in Nigeria: a SVAR analysis, Econ. Change Restruct. 52 (2) (2019) 157–179, https://doi.org/10.1007/s10644-017-9222-5.

[81] D. Acemoglu, S. Johnson, J.A.J. Robinson, The colonial origins of comparative development: an empirical investigation, Am. Econ. Rev. 91 (5) (2001) 1369–1401.

[82] L. Slesman, A.Z. Baharumshah, W.J.E.M. Ra'ees, Institutional infrastructure and economic growth in member countries of the Organization of Islamic Cooperation (OIC), Econ. Modell. 51 (2015) 214–226, https://doi.org/10.1016/j.econmod.2015.08.008.

[83] D. Acemoglu, E.R. Robinson, Persistence of power, elites, and institutions, Am. Econ. Rev. 98 (1) (2008) 267–293.

[84] B. Fayissa, D.A. Nsiah, The Impact of Governance on Economic Growth in Africa, The Journal of Developing Areas, 2013, pp. 91–108.

[85] M. Gomez-Puig, S. Sosvilla-Rivero, Short-run and Long-Run Effects of Public Debt on Economic Performance: Evidence from EMU Countries, Research Institute of Applied Economics Working, 2015. Paper 2015/22 1/37.

[86] A. Zakari, C.E. Khan, B. Studies, Boosting economic growth through energy in Africa: the role of Chinese investment and institutional quality, J. Chin. Econ. Bus. Stud. 20 (1) (2022) 1–21, https://doi.org/10.1080/14765284.2021.1968709.

[87] A. Alesina, et al., Political instability and economic growth, J. Econ. Growth 1 (2) (1996) 189–211, https://doi.org/10.1007/BF00138862.

[88] S. Karim, et al., Sustainable banking regulations pre and during coronavirus outbreak: the moderating role of financial stability, Econ. Res.-Ekonomska Istraživanja 35 (1) (2022) 3360–3377, https://doi.org/10.1080/1331677X.2021.1993951.

[89] C. Ciftci, I.T. Durusu-Ciftci, Economic freedom, foreign direct investment, and economic growth: the role of sub-components of freedom, J. Int. Trade Econ. Dev. 31 (2) (2022) 233–254, https://doi.org/10.1080/09638199.2021.1962392.

[90] J. Sachs, The Rule of Law and Economic Reform in Russia, Routledge, 2019.

[91] S. Haggard, L.J.W.d. Tiede, The rule of law and economic growth: where are we? World Dev. 39 (5) (2011) 673–685, https://doi.org/10.1016/j.worlddev.2010.10.007.

[92] J.L. Butkiewicz, H.J.E.M. Yanikkaya, Institutional quality and economic growth: maintenance of the rule of law or democratic institutions, or both? Econ. Modell. 23 (4) (2006) 648–661, https://doi.org/10.1016/j.econmod.2006.03.004.

[93] A.A. Augustine, E.P.J.M.S. Enyi, Control of corruption, trust in government, and voluntary tax compliance in South-West, Nigeria, Manag. Stud. 8 (1) (2020) 84–97, https://doi.org/10.17265/2328-2185/2020.01.011.

[94] R.M.J.T.q.j.o.e. Solow, A contribution to the theory of economic growth, Q. J. Econ. 70 (1) (1956) 65–94.

[95] M.J.J. Jerzmanowski, Finance and sources of growth: evidence from the US states, J. Econ. Growth 22 (1) (2017) 97–122, https://doi.org/10.1007/s10887-016-9135-6.

[96] S. Dowrick, R. Nguyen, OECD Comparative Economic Growth 1950-85: Catch-Up and Convergence, The American Economic Review, 1989, pp. 1010–1030.

[97] J.J.T.j.o.i.t. Jouini, Linkage between international trade and economic growth in GCC countries: empirical evidence from PMG estimation approach, J. Int. Trade and Dev. 24 (3) (2015) 341–372, https://doi.org/10.1080/09638199.2014.904394.

[98] A.B. Darku, R.J.A.E. Yeboah, Economic openness and income growth in developing countries: a regional comparative analysis, Appl. Econ. 50 (8) (2018) 855–869, https://doi.org/10.1080/00036846.2017.1343449.

[99] Y. Wen, et al., Economic openness, innovation and economic growth: nonlinear relationships based on policy support, Heliyon (2023), e12825, https://doi.org/10.1016/j.heliyon.2023.e12825.