

# **Institutional quality, financial development and sustainable economic growth among lower income countries**

Rudra P. Pradhan <sup>1,\*</sup>, Mahendhiran S. Nair <sup>2</sup>, Mak B. Arvin <sup>3</sup>, John H. Hall <sup>4</sup>

<sup>1</sup> Vinod Gupta School of Management, Indian Institute of Technology Kharagpur, Kharagpur, India

<sup>2</sup> Sunway Institute for Global Strategy & Competitiveness, Sunway University Business School, Sunway University, Bandar Sunway, Malaysia<sup>3</sup> Department of Economics, Trent University, Peterborough, Ontario, Canada<sup>4</sup> Department of Financial Management, University of Pretoria, Pretoria, Republic of South Africa

\*Correspondence: Rudra P. Pradhan, Vinod Gupta School of Management, Indian Institute of Technology Kharagpur, WB 721302, India. Email: rudrap@vgsom.iitkgp.ernet.in

## **ABSTRACT**

This article postulates strong endogenous relationships in lower income countries between institutional quality, financial development and sustained economic growth. These associations were investigated using the vector-error correction model (VECM) and Granger causality method for a sample of 79 countries from 2005 to 2022. The findings show that (1) these variables reinforce each other in the short run. (2) In the long run, both institutional quality and financial development can fuel economic growth. (3) The positive effect of institutional quality on economic growth is greater than that of financial development. Policy implications of these findings are that careful attention should be paid to co-development policies to enhance the institutional quality and the financial system in these economies. Policies should also consider economic growth strategies to enable sustainable economic growth rates.

**KEYWORDS:** economic growth, financial development, institutional quality, lower income countries

## **1 INTRODUCTION**

The global economy is undergoing unprecedented transformation. Both rapid technological advances (especially the diffusion of disruptive technologies) and the emergence of new business models play a role, but both have had some adverse effects on traditional industries and business systems. The world is also grappling with the effects of environmental degradation, climate change, a health pandemic (COVID-19) and the Ukraine–Russia war. The situation has had a severe impact on the global economic supply chain and economic growth trajectories of countries across the globe (IMF Blog, 2023). These global challenges pose severe challenges to policymakers and financial markets that have to manage economic uncertainty and volatility (Pop et al., 2022). The effect is magnified in the economies of countries with a lower income—mostly developing countries—where many institutions of governance and financial systems are relatively weaker than those in the economies of higher income, more developed countries. To address extreme volatility in the global markets and economic systems, policymakers in developing countries are undertaking major institutional reforms, putting in place measures to strengthen their financial systems to meet the challenges posed by the global forces that are creating extreme market uncertainties and adversely affecting global supply chains and economic growth rates.

The World Bank (2023) forecast global economic growth for 2023 at a modest rate of 1.7% and at 2.7% in 2024. The effects of COVID-19 on the markets and the disruption in the global supply chain were most severe in less developed and smaller economies. The decline in economic growth in the smaller economies (in terms of GDP) was seven times worse than that in other emerging and developing countries, as they lost almost 5% of their GDP because of these disasters (World Bank, 2023). These trends suggest that for less developed countries to improve their long-term economic growth trajectories, they need to put in place strong institutional governance systems to ensure that their economies become resilient to the global forces mentioned above, to improve corporate and public sector governance and to ensure that adequate financial resources are available for economic diversification strategies.

A substantial number of studies have been done to identify the factors that determine economic growth. Some researchers have used various kinds of panel data to identify differences between countries' economic growth rates over the long term (for example, Chang & Huang, 2010; Wennekers & Thurik, 1999). Two notable findings are a strong association between financial development and economic growth, and a robust nexus between institutional quality and economic growth. Useful surveys of relationships between the pair of variables financial development and economic growth have been done by Cetin et al. (2023), Pradhan et al. (2015), and Qamruzzaman and Jianguo (2017). The pair of variables economic growth and the quality of institutional development has been surveyed by Acemoglu et al. (2001), Bruinshoof (2016), Nair et al. (2021) and Vieira et al. (2013). In most of the prior research, one of these two pairs is considered, but few studies offer convincing explanations of why financial development, when it is associated with institutional quality, can be a key catalyst for economic growth—a few that have considered the problem are those by Ahmed et al. (2022) and Ehigiamusoe and Mohamad (2021) and Recuero and González (2019). The absence of strong evidence in this regard raises the following research questions: (1) How does institutional quality affect the development of the financial sector? (2) Is economic growth a determinant of both financial development and institutional quality? (3) What kinds of policy could promote both the financial sector and institutional quality?

In this article, we consider the possibility that there may be joint interdependence between institutional quality, financial development and economic growth. Another innovation in our article is that the research focuses on the dynamics between the three variables of interest for lower income developing countries, whereas much prior research was conducted for panel data with a mix of economies in diverse stages of development. Relationships between the three covariates for lower income countries, especially using advanced econometrics, are understudied in the literature.

We formally test the hypothesis of a nexus between financial development, institutional quality and economic growth for 79 lower income economies. We define lower income countries (as a broad category) to include low-income countries (LICs) and lower middle-income countries (LMICs). LICs and LMICs are two of the income categories that the World Bank uses to divide the world's economies into income groups. We examine two important issues relevant to capturing the dynamics between financial development, institutional quality and economic growth as a nexus. The primary issue is whether financial development and institutional quality should be considered together, as advocated by Law et al. (2013). The second issue is understanding any long-run symmetry in the association between financial development and institutional quality and economic growth, as posited by Demetriades and Law (2006).

The limited literature on this topic mostly consists of studies done across countries and time-series studies. Thus far, such cross-country approaches have attempted to answer why there may be different growth rates across a set of countries; time-series studies have looked at any long-run associations between the growth rate and other variables. By contrast, our study uses panel data to search for evidence of temporal causal associations between financial development, institutional quality and sustainable growth in a group of economies hitherto largely understudied, namely LICs.<sup>1</sup> We contribute to the literature in four ways by investigating different avenues. Firstly, we use a trivariate framework to probe the tie between economic growth and financial development, adding to the literature by including a third variable, namely institutional quality. In other words, our study forms a bridge between the literature inspecting a possible causal interconnection between financial development and economic growth and the literature examining a promising relation between financial development and institutional quality. Secondly, the study regards institutional quality as imperative, and therefore tests the general assumption that institutional quality should be linked to financial development and economic growth. Thirdly, this study expands the literature because of the large size of the cluster of countries (79 countries, including both LMICs and LICs), drawing on the latest available data, from 2005 to 2022. This review period includes the economic crises of 2008 and 2009, as well as the start of the COVID-19 pandemic. Fourthly, we use cutting-edge panel cointegration and causality tests to examine the linkage between financial development, institutional quality and economic growth, and we develop the results in this article. To date, such tests have not been used to observe the causal dynamics between these variables for LMICs and LICs in the short and long term.

From a policy angle, this article also makes an important contribution by demonstrating strong endogenous relationships between these variables. These relationships imply that policymakers need to give careful consideration to the co-curation of policies and strategies pertaining to institutional reforms on the one hand, and to financial sector development on the other, if they wish to enhance sustainable economic growth in LICs and LMICs. Institutional transformation and financial development should reinforce one another to enable these countries to transition from uncertain low economic growth trajectories to more sustainable and higher growth rates. Moreover, this research is different from prior studies in that it uses a wide range of indicators for institutional quality and for financial development. These include instruments for banking and stock market development factors. Using a wider range of indicators can capture more complex dynamics between the three variables.

The remainder of this article is arranged into four more sections. We provide an overview of the background literature and undertake hypothesis development. Next, we sketch the method that we used to investigate the interconnections between institutional quality, financial development and growth. The results are then discussed in detail. This is followed by a conclusion, which comments on policy implications, and a discussion of the limitations to the study.

### **1.1 Theoretical framework, review of the literature and hypothesis development**

The finance literature suggests that financial development can affect economic growth in two possible ways through its effect on the functioning of financial markets and other related variables, especially institutional quality, as described above (Ali, Nazir, et al., 2022; Khan et al., 2019; Úbeda et al., 2022). Hence, development of the financial sector has been the subject of a number of empirical studies, and it has received attention from economists, theorists, and policymakers (see, for instance, Cetin et al., 2023; Law et al., 2018). From a theoretical point

of view, the services provided by the financial sector should contribute to economic growth through many channels, for example, by providing funds to all sectors of the economy, mobilizing domestic savings and encouraging capital accumulation, improving the efficiency of risk management (risk sharing and risk diversity) and capital allocation, and fostering the development of trade and commerce—Levine (2005) provides a comprehensive survey of these services. Logically then, one would expect that financial development would make a positive contribution to economic growth. However, despite the traditional view that predicts that financial development will have a favourable effect on economic growth, there is some evidence that contradicts this view. The presence of high levels of inequality and financial market imperfections might in fact have a negative effect on economic growth, notably “too much finance” (see Arcand et al., 2015 and Song et al., 2021, for a comprehensive survey).

A sizeable literature thus provides theoretical support for and presents empirical analyses of the financial development–economic growth nexus. Similarly, there have been several studies on the institutional quality–economic growth nexus. However, only a very limited number of studies have probed the dynamic associations between all three of these variables simultaneously, especially over both the long and the short run, by means of robust empirical analysis. So far, where this trivariate nexus has been probed at all, the results are mixed. The multifaceted dynamics between institutional quality and financial development, their separate or joint influence on economic growth may vary if these dynamics are considered over different lengths of time, and if different proxies are chosen for the variables. The results hold important implications from a policy perspective if sustainable economic growth in the sample economies is to be guaranteed.

This section covers three schools of thought regarding possible causal associations between institutional quality, financial development and economic growth. One school of thought focuses on links between financial development and economic growth, another on links between institutional quality and economic growth, and the third on the possible nexus between institutional quality and financial development. The causal linkages between the variables are discussed below, including the economic rationale for the relevant inter-relationships. Based on these relationships, hypotheses are then formulated for the current study. The results of empirical studies that confirm causal relationships between pairs of these chosen variables are also discussed. The theoretical framework and the postulated hypothesis are shown in Figure 1.

## **1.2 Links between financial development and economic growth**

Several researchers have considered associations between economic growth and financial development (Cetin et al., 2023; Kliestik et al., 2020; Liu et al., 2021; Pradhan et al., 2016; Sun & Tang, 2022). The findings on promising Granger causality between these two variables suggest four pathways.

The first argument is that financial development leads to economic growth. This supply-led proposition is supported by the results of research by Chaiechi (2012), Christopoulos and Tsionas (2004), Hamdi et al. (2017), Ibrahim and Alagidede (2018), Kar et al. (2011), Kyophilavong et al. (2016), Kliestik et al. (2020), Liu et al. (2021), Mhadhbi et al. (2020), Nguyen et al. (2022), Opoku et al. (2019), Pradhan et al. (2020), Sun and Tang (2022), and Wang et al. (Wang, Wu, & Chu, 2023b; Wang, Wu, & Chu, 2023c). The rationale for this argument is that financial sector development enables economic agents to use their capital optimally to enhance economic productivity. Furthermore, good financial institutions enable economic agents to mitigate a wide range of economic and market risks. These factors reduce

the cost of undertaking business, improve returns on investment and facilitate inward foreign direct investment. These benefits then have a positive knock-on effect on economic growth trajectories.

The second argument is that there is causality in the reverse direction. Evidence for this demand-led proposition has been reported in studies by Hye (2011), Kar et al. (2011), Laeven et al. (2015), Levine (1997), Mlachila and Ouedraogo (2020), Nguyen et al. (2022), Pradhan et al. (2021) and Pradhan, Arvin, Nair, and Hall (2022a). The rationale for proposition is that a rise in economic activity also heightens demand for more refined financial services to meet the needs of firms and consumers. As economic wealth increases, it provides countries with the resources they need to undertake reforms to raise the level of sophistication and competitiveness of the financial services sector. These reforms include using more and newer technology, intensifying capability development programmes, ensuring the implementation of effective governance systems and adherence to global best practices.

A third argument is that there is a mutual causal link between financial development and economic growth, as reflected, for example, in studies by Dritsakis and Adamopoulos (2004), Nazir et al. (2021), Nguyen et al. (2022), Pradhan et al. (2013), Pradhan et al. (2016), Pradhan et al. (2018), and Wolde-Rufael (2009).

A fourth position is the neutrality proposition, which is supported by more mixed results. Studies by Lucas (1988), Pradhan et al. (2013), and Pradhan, Arvin, Hall, and Bahmani (2014), Pradhan, Arvin, Norman, and Hall (2014), and Pradhan, Arvin, Norman, and Nishigaki (2014) report no causal relationship between these two variables. Cecchetti and Kharroubi (2012), Samargandi et al. (2015), Ergungor (2008), Hung (2009), Pradhan, Arvin, Nair, and Hall (2022b), Pradhan, Arvin, Nair, Hall, and Bennett (2022), and Shen and Lee (2006) show that the relationship between financial development and economic growth can follow an “inverse U-shaped” association. In that scenario, countries have a threshold beyond which it seems that more sophisticated financial development in fact impedes economic growth.

Adu et al. (2013) warn that findings on the overarching influence of financial development on economic growth and vice versa depend strongly on which financial development indicators are used.

Based on the findings discussed above, we tested below two hypotheses:

*H<sub>1</sub><sup>A</sup>: Financial development Granger-causes economic growth.*

*H<sub>1</sub><sup>B</sup>: Economic growth Granger-causes financial development.*

### **1.3 Links between institutional quality and economic growth**

Several studies investigate links between institutional quality and economic growth. As in the preceding section, the possible nexus between the two can be divided into four arguments, as outlined below.

Firstly, some researchers adopt the supply-led proposition that institutional quality contributes to economic growth, for example, Afonso and Jalles (2016), Aluko and Ibrahim (2020), Arvin et al. (2021), Barro (1991, 2000), Corradini (2020), Pradhan, Arvin, Nair, and Hall (2022b), Pradhan, Arvin, Nair, Hall, and Bennett (2022), Salman et al. (2019), and Wang, Yang, and

Yang (2023), Wang, Wang, and Li (2023), Wang, Yang, and Li (2023), Wang, Zang, and Li (2023).

This proposition holds that higher quality institutions and governance systems have a positive influence on economic growth. One justification for this line of argument is that high-quality institutions allocate resources more efficiently to enhance economic value for all economic agents. Sound institutions also tend to implement continuous review and improvement programmes by adopting the latest technology, systems and talent. These allow for more efficient and more business-friendly policies, and should reduce market inefficiencies such as rent-seeking behaviour, and improve return on value (ROV) and return on investment (ROI) for investors. In other words, economic institutions play a crucial role in improving the overall economic growth potential of an economy by allocating resources optimally for productive endeavours.

The second argument is that economic growth has a positive effect on institutions of governance. Proponents of this demand-following proposition are Alexiou et al. (2004), Haini (2020), Nair et al. (2020) and Pradhan et al. (2023). The economic rationale for this hypothesis is that strong economic growth provides countries with adequate resources to improve their institutions of governance. Institutional reforms and development promote efficiency, productivity and competitiveness among firms and in the workforce. Sound institutions of governance can also mitigate risks associated with market volatilities, rent-seeking, moral hazard behaviour and other negative externalities that reduce investor confidence. Sound institutions of governance contribute to greater political stability. All of these benefits reinforce economic growth.

Third, Chong and Calderón (2000) and Hayat (2019) report a mutual causal association between institutional quality and economic growth. This suggests that there is a feedback association between the two.

However, a fourth argument has been represented by Pradhan et al. (2017), who have found no association between institutional quality and economic growth, and therefore argue that a neutrality proposition is probably valid.

Based on these four propositions, we test the below two hypotheses:

*H<sub>2</sub><sup>A</sup>: Institutional quality Granger-causes economic growth.*

*H<sub>2</sub><sup>B</sup>: Economic growth Granger-causes higher institutional quality.*

#### **1.4 Links between institutional quality and financial development**

A third strand of research has focused on links between institutional quality and financial development (see, for instance, Ali, Nazir, et al., 2022; Khan et al., 2019; Nkoa & Song, 2020; Úbeda et al., 2022). Again, possible Granger causality has been reported in four ways.

One group of researchers postulate that institutional quality affects financial development (a supply-leading proposition). For example, a study by Nkoa and Song (2020) shows that improvements in institutions of governance increased financial services and financial education in Africa. A more recent study by Ali, Ramakrishnan, and Faisal (2022) shows that institutional quality moderated financial inclusion for 45 Organization of Islamic Cooperation (OIC)

countries. This had a positive impact on financial development in these countries. Similar results were obtained by Khan et al. (2022) for a panel of 189 developing and emerging countries—sound governance systems institutions in these countries were key drivers for financial sector development. The rationale for this line of thought is that institutional reforms to make better use of higher technology, adherence to global best practices, a strong regulatory architecture and effective implementation of policies, regulations and strategies have a positive spill-over on financial institutions. Hence, they contribute to greater development of the financial sector, providing greater access and more sophisticated services to a wider segment of the market.

The second argument focuses on the demand-following proposition that financial sector development has an impact on institutional quality. The rationale for this hypothesis is that over the last two decades, the financial sector has undergone rapid transformation because of the rapid digitalization of financial services. This shift in financial services delivery has had a spill-over impact on all sectors of the economy. The emergence of FinTech, blockchain and other technologies in the financial sector has transformed the workforce in this sector and many other economic sectors. A new regulatory architecture to govern a more digitalized financial ecosystem has also had a major impact on the broader institutions of governance in the economy. This implies that the regulatory architecture and institutional governance had to be transformed to cater for digitalized financial and economic ecosystems. Chorzempa and Huang (2022) explain that financial developments such as the introduction of FinTech have prompted policymakers in China to improve regulations and oversight to enhance this new innovation in the economic arena. Stronger regulations were important to mitigate any market risks and protect the interests of the users of these new financial services; in this regard, Kharisma (2020) argues that financial sector development in Indonesia must ensure strong governance institutions to ensure consumer protection and to accelerate growth of the digital economy.

A third argument holds that the causal dynamics between institutional quality and financial development are reciprocal (Dritsakis & Adamopoulos, 2004; Wolde-Rufael, 2009), in other words, they reinforce one another.

A fourth group of studies reported the absence of a causal association between these variables. An older study by Lucas (1988), and a more recent one by Pradhan, Arvin, Hall, and Bahmani (2014) found no causal dynamics, suggesting that the neutrality hypothesis should apply.

Based on the findings of the studies discussed above, we examined the below two hypotheses:

*H<sub>3</sub><sup>A</sup>: Institutional quality Granger-causes financial development.*

*H<sub>3</sub><sup>B</sup>: Financial development Granger-causes institutional quality.*

A summary of this literature review relating to these three sets of hypotheses is set out in Appendix A, Table A1.

Figure 1 illustrates these three hypotheses and Figure 2 on page 34 posits the potential pathways between the three variables.

## 2 METHODOLOGY

In this segment, we discuss the selection of the sample countries and sample period, as well as the indicators considered in this study. The section also sets out the methodology employed to observe the short- and long-run associations between the covariates.

### 2.1 The sample

We considered data from a large set of 79 LMICs and LICs, covering the period from 2005 to 2022. Annual data from the WDI of the World Bank were used for this study. The same data source also provided the list of LMICs and LICs. The sample consisted of an unbalanced panel, because data were not always accessible for all years for each of the chosen countries.

### 2.2 Choice of indicators and building the composite indices

We looked at the per capita economic growth (denoted by PEG), plus three diverse composite financial development indicators, namely a banking sector development indicator (CBD<sup>2</sup>), a stock market development indicator (CSD<sup>3</sup>) and a combined financial development indicator that captures development in both the banking sector and the stock market (CFD<sup>4</sup>).

The study also used 11 different indicators to represent institutional quality (INQ), employing a set of country and policy institutional assessment (CPIA) indicators also used by the World Bank in the selected countries' economies. The indicators were

- the CPIA building human resources (HR) rating (CBH);
- the CPIA business regulatory environment (BRE) rating (CBE);
- the CPIA debt policy rating (CDP);
- the CPIA economic management cluster average rating (CEM);
- the CPIA efficiency of revenue mobilization rating (CER);
- the CPIA financial sector rating (CFS);
- the CPIA macroeconomic management (MM) rating (CMM);
- the CPIA quality of budgetary and financial management (BFM) rating (CQF);
- the CPIA quality of public administration (PA) rating (CQP);
- the CPIA accountability, transparency, and corruption in the public sector rating (CTP); and
- an index of institutional quality (CIQ), which we derived.

A full definition of the individual indicators can be found in the World Bank's CPIA database.

Appendix B shows how principal component analysis (PCA) was deployed to obtain two of our composite indices, namely CIQ and CFD.<sup>5</sup> Table B1 supplies statistical information on our PCA relating to the derivation of CIQ. The table presents the eigen analysis of correlation matrix in Part A, and the eigen vectors (component loadings) in Part B, as well as the cross-correlations among these variables in Part C. Figure B1 presents the loading plots of variables of the PCA used to extract the CIQ.

Table B1, Part A, displays a maximum eigen value of 6.078 for the CIQ index for the first prime factor, and 1.024 for the second factor, 0.638 for the third factor, 0.614 for the fourth factor, 0.488 for the fifth factor, of 0.347 and 0.302 for the sixth and seventh factors respectively, 0.268 and 0.223 for the eighth and ninth factors respectively, and a mere 0.018

for the tenth factor. Table B1, Part B, shows the eigen vectors indicating the eight principal component (PC) factors' loadings, namely PC1–PC10. The PC loadings for PC2 to PC10 displayed negative values. These values were noticeably lower than those for PC1. Hence, PC1's factor loading was used to build the CIQ index. This result is supported by the scree plots, loading plots and eigenvalue plots, as well as the eigenvalue proportion (see Figure B1).

Table B2 sets out the statistical information on the PCA to derive CFD, which relates to the eigen analysis of the correlation matrix (Table A.2., Part A), and the eigen vectors (component loadings) (Table B2., Part B), and cross-correlations among these variables (Table B2., Part C). Figure B2 presents the loading plots for the PCA to derive the CFD.

Table A2, Part A, shows that the maximum eigen values for the CFD index were 7.778 for the first factor, 0.914 for the second, 0.216 for the third, 0.079 and 0.012 for the fourth and fifth respectively, 0.001 and 0.001 for the sixth and seventh respectively, and finally, 0.0001 and 0.0001 for the eighth and ninth factors respectively. In Table A2, Part B, the eigen vectors specifying the eight PC factors' loadings are shown, namely for PC1–PC9. The PC factor loadings for PC2 to PC9 again included some negative values, which were noticeably lower than those for PC1. For this reason, PC1 was used as the factor loading to build the CFD index. This procedure was in line with the loading plots (Figure B2).

We then considered three cases, namely LICs separately, LMICs separately, and LICs and LMICs together. In each case, we considered three specifications, which depend on the use of three composite financial development indicators (CBD, CSD and CFD), and 11 cases under each specification. These 11 cases were based on the 11 selected institutional quality variables (CBH, CBE, CDP, CEM, CER, CFS, CMM, CQP, CQF, CTP and CIQ). Of these, CIQ is a composite indicator. These cases and specifications added to the robustness of our causality analysis between financial development, institutional quality and economic growth.

All monetary variables were converted to constant US dollars. These were then transformed into their logarithms for the purposes of our model outcome, so that we could normalize the data. Table C1 in Appendix C summarizes the statistics, as well as the variables' correlations. Cross-correlations were performed to determine whether there was a statistical association among financial development, institutional quality and economic growth.<sup>6</sup> The procedure revealed significant cross-correlations between the indicators. The existence of these correlations and their possible pathways warranted further investigation to determine any Granger causal associations between institutional quality, financial development and economic growth. One set of possible causal pathways is depicted in Figure 2.

### 2.3 Empirical model and the choice of methodology

In light of the literature, the model below is used as an example of the type of relationship that may exist between the variables.

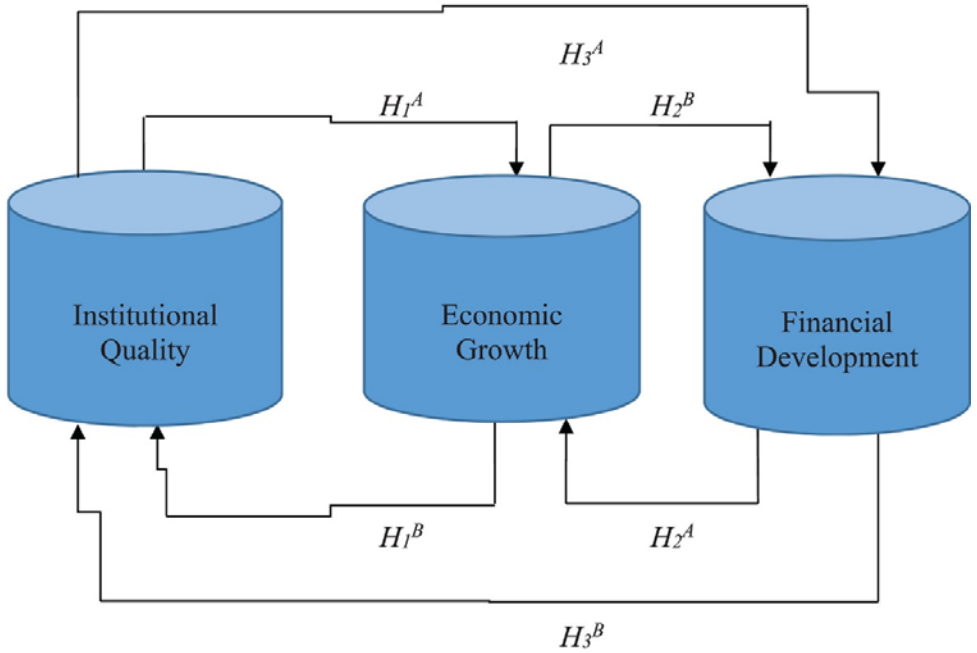
$$PEG_{it} = \alpha_{PEG_{it}} + \beta_{1PEG_i} FIN_{it} + \beta_{2PEG_i} INQ_{it} + \varepsilon_{PEG_{it}} \quad (1)$$

where  $i = 1, 2, \dots, N$  represents each country in the panel; and  $t = 1, 2, \dots, T$  refers to the time period in the panel. Given the logarithmic form for two variables, the parameter  $\beta_j$  (for  $j = 1, 2$ ) represents the long-run elasticity estimate of PEG in respect of FIN and INQ, respectively. In Equation (1), PEG is the dependent variable, but similar equations were written with the two other variables taking turns to act as the dependent variable. That way, we allowed for the

possibility that causality may follow any direction, as the primary objective of this study was to estimate the parameters in Equation (1) and conduct panel tests and cointegration tests on the causal nexus between these three variables.

The model we propose allowed us to test the following hypotheses: FIN Granger-causes economic growth, and/or vice versa; INQ Granger-causes economic growth, and/or vice versa; and FIN Granger-causes INQ, and/or vice versa. Figure 1 summarizes these three hypotheses, which describe the direction of possible causality between these three variables.

*Synopsis of the Hypotheses*



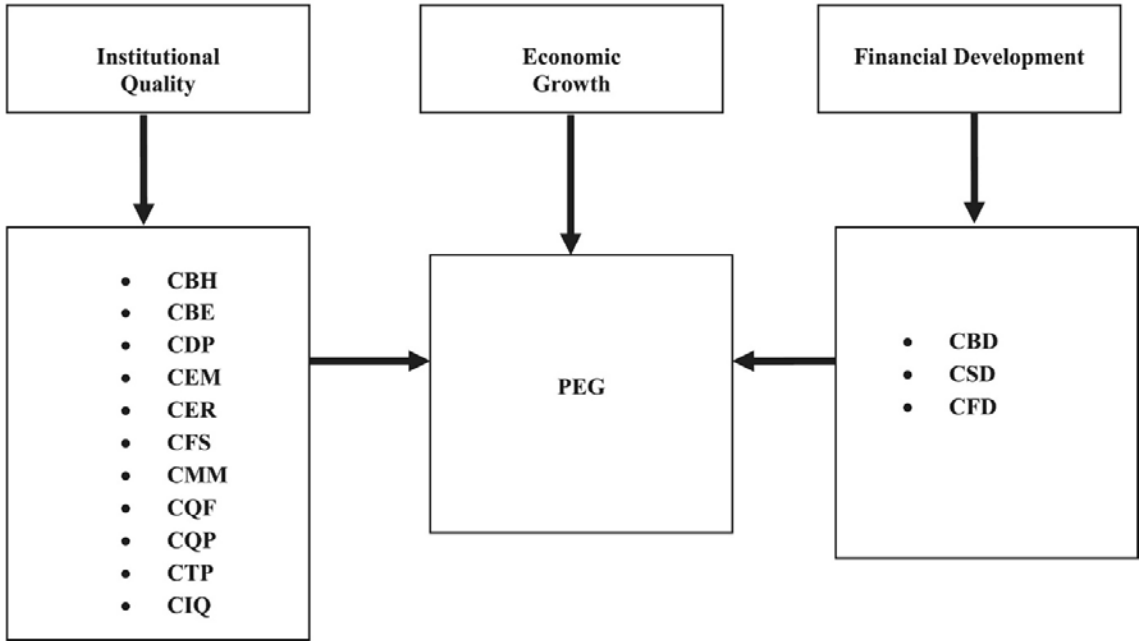
**Note 1:**

- $H_1^A$ : Institutional quality Granger-causes economic growth.
- $H_2^A$ : Financial development Granger-causes economic growth.
- $H_3^A$ : Institutional quality Granger-causes financial development.
- Superscript A indicates possible causality.
- Superscript B indicates possible reverse causality.

**Source:** Modified from the schematic diagram of the Granger causality test by Li et al. (2021).

**FIGURE 1.** Synopsis of the hypotheses.  $H_1^A$ : Institutional quality Granger-causes economic growth.  $H_2^A$ : Financial development Granger-causes economic growth.  $H_3^A$ : Institutional quality Granger-causes financial development. Superscript A indicates possible causality. Superscript B indicates possible reverse causality. *Source:* Modified from the schematic diagram of the Granger causality test by Li et al. (2021).

*Framework of the Possible Causal Pathway Among Financial Development, Institutional Quality, and Economic Growth*

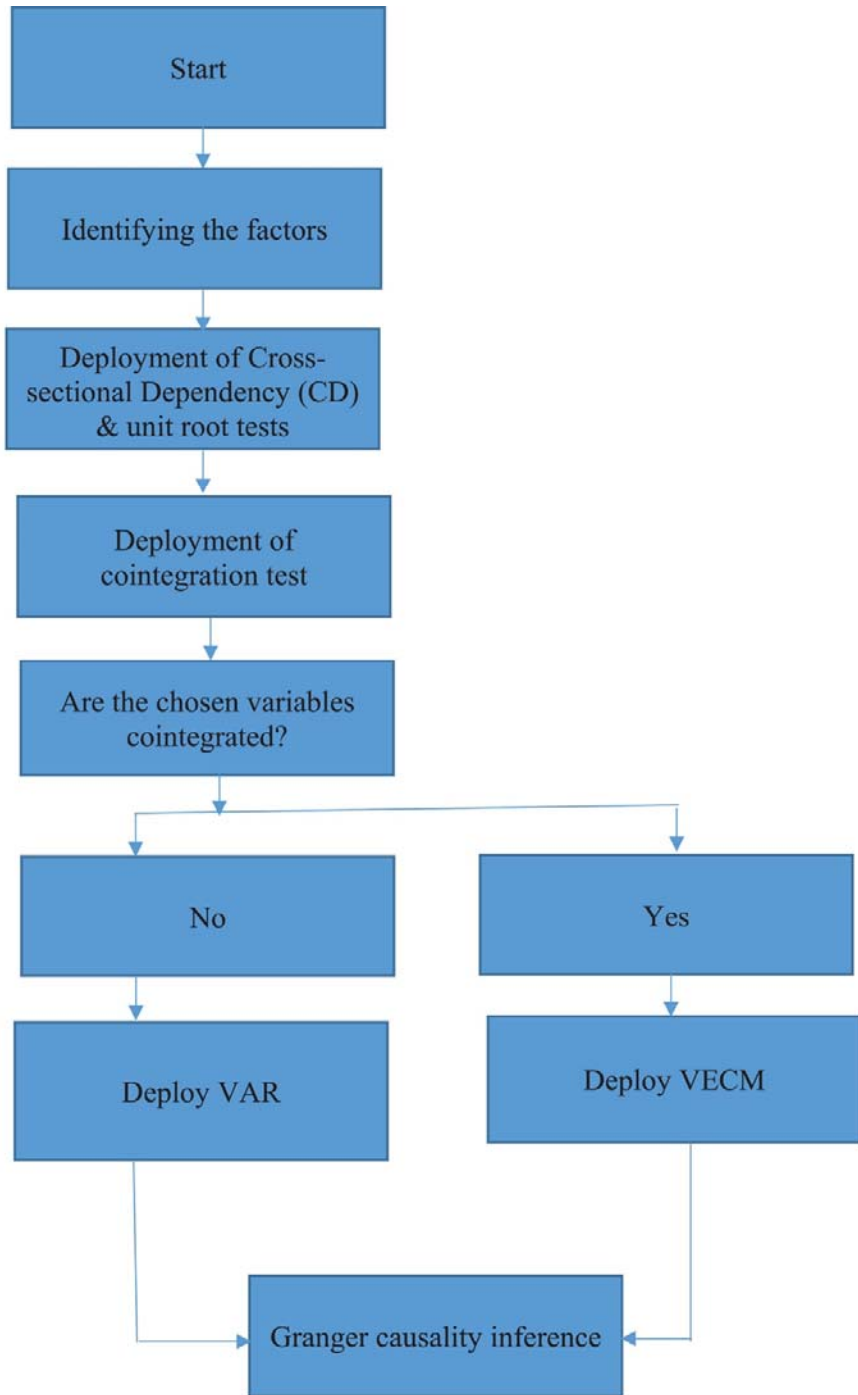


*Note:* All notations as described earlier.

**FIGURE 2.** Framework of the possible causal pathway among financial development, institutional quality and economic growth. All notations are as described earlier.

We used the below typical panel vector error-correction model (PVECM) to ascertain the causal associations between economic growth, financial development and institutional quality. Thus, we estimated a set of regressions, represented by the below set of equations (presented in a matrix structure):

$$\begin{bmatrix} \Delta PEG_{it} \\ \Delta FIN_{it} \\ \Delta INQ_{it} \end{bmatrix} = \begin{bmatrix} \theta_{1j} \\ \theta_{2j} \\ \theta_{3j} \end{bmatrix} + \sum_{k=1}^q \begin{bmatrix} \delta_{11ik}(L) & \delta_{12ik}(L) & \delta_{13ik}(L) \\ \delta_{21ik}(L) & \delta_{22ik}(L) & \delta_{23ik}(L) \\ \delta_{31ik}(L) & \delta_{32ik}(L) & \delta_{33ik}(L) \end{bmatrix} \begin{bmatrix} \Delta PEG_{it-k} \\ \Delta FIN_{it-k} \\ \Delta INQ_{it-k} \end{bmatrix} + \begin{bmatrix} \lambda_{1i} ECT_{it-1} \\ \lambda_{2i} ECT_{it-1} \\ \lambda_{3i} ECT_{it-1} \end{bmatrix} + \begin{bmatrix} \psi_{1it} \\ \psi_{2it} \\ \psi_{3it} \end{bmatrix} \tag{2}$$



**Source:** Modified from the flow diagram for the econometric method for Li et al.'s (2021) estimation procedure.

**FIGURE 3.** The path analysis of the study. To assist the reader, we present the below path analysis to establish the causality between variables, as discussed in the empirical model and the choice of methodology on page 34 of the present paper. *Source:* Modified from the flow diagram for the econometric method for Li et al.'s (2021) estimation procedure.

where  $\psi$  is the random error term, which represents mutually independent and identically distributed data (IID) with a zero mean and unique variance (see Yao & Lin, 2017). Note that the three variables PEG, FIN and INQ in the structure of equations were preserved as

potentially endogenous. For the purposes of the study reported in this article, financial development (FIN) was composed of CBD, CSD or CFD; institutional quality (INQ) was composed of CBH, CBE, CDP, CEM, CER, CFS, CMM, CQF, CQP, CTP and CIQ. Additionally,  $q$  refers to the lag volumes for the differenced variables of the relevant equations and is represented by the Engle–Granger framework. The error-correction terms (ECTs) were procured from the long-run properties built into Equation (1). The lagged ECTs displayed long-run dynamics, whereas differenced variables signified short-run dynamics among the chosen variables. These specific tests were performed using a Wald test. The following statistical hypotheses were supported:

$$\delta_{12ik} \neq 0; \delta_{13ik} \neq 0; \delta_{14ik} \neq 0; \text{ and } \lambda_{1i} \neq 0.$$

$$\delta_{21ik} \neq 0; \delta_{23ik} \neq 0; \delta_{24ik} \neq 0; \text{ and } \lambda_{2i} \neq 0.$$

$$\delta_{31ik} \neq 0; \delta_{32ik} \neq 0; \delta_{33ik} \neq 0; \text{ and } \lambda_{3i} \neq 0.$$

It may be argued, for instance, that FIN and INQ can Granger-cause economic growth if  $\delta_{12ik}$  and  $\delta_{13ik}$  differ significantly from zero.

## 2.4 Selection of lag lengths

The empirical results derived from the panel VECM depend on the lag volume selected. Long lag volumes are likely to increase the standard error for the estimation process, which would result in inaccurate parameter estimates. Conversely, short lag lengths could mean that the model does not capture the key dynamics. However, there is no consensus on the best strategy to determine stable lags in the panel VECM model (Arvin et al., 2021). We therefore opted to employ the widely used Schwarz–Bayesian criterion (SBC) to decide the optimal lag volume (particulars on the selection of the lags can be requested from the authors.)

## 3 ESTIMATION RESULTS

In this section, we report the empirical results. We first describe the properties of the data generation process for each of the variables used in the study. Then, we examine whether the data series were cointegrated; if they were, we then assess the short-run and long-run dynamics for these three variables. The details of the methodological approach to assess the causal relationship between the variables are shown in Figure 3.

### 3.1 Results from stationarity tests

To identify the Granger causality linkages between institutional quality, financial development and economic growth, we began by looking for the unit root<sup>7</sup> and the nature of the stationarity of the time series. For this purpose, the Im et al. (2003) and the Breitung (BRE) (Breitung, 2000) tests<sup>8</sup> were employed to ascertain the order of integration of the variables in the panel. Based on the results of the IPS and the BRE tests, the null hypotheses ( $H_0$ ) of a unit root and the stationarity of variables were rejected at a 5% level of significance for the first difference (see Appendix B, right-hand columns). Hence, all series investigated—INQ, FIN

and PEG—were integrated in a single order: I (1). Hence, we could employ an integrated dataset of the same order, as suggested, for instance, by Wang, Yang, & Yang (2023); Wang, Wang, & Li (2023); Wang, Yang, & Li (2023); Wang, Zang, & Li (2023).

### 3.2 Results from the cointegration tests

The panel cointegration (Pedroni test) was then executed to clarify the nature of the cointegration that applied to the three sets of chosen variables. Based on the Pedroni panel cointegration test results, the null hypothesis ( $H_0$ ) of no cointegration was rejected, along with the null hypotheses that there were no long-run dynamics between institutional quality, financial development, and (per capita) economic growth (see Appendix D1, Tables D2 and D3). This implied that it was likely that there was cointegration and a long-run relationship among institutional quality, financial development, and (per capita) economic growth in the sample LICs and LMICs, both independently and collectively. This was generally true in our three samples and three specifications, and for the 11 cases under each sample and specification.

### 3.3 Panel Granger causality results

Since there was cointegration between variables, a change in one variable could have an impact on other variables through possible feedback. Accordingly, the PVECM was used to provide estimates to illuminate the nature of possible feedback relationships between institutional quality, financial development and economic growth. Using this estimation procedure offers the advantage of revealing both long-run causality results (through the lagged ECT coefficients)—and short-run causality results (through inspection of the joint  $\chi^2$  statistics between the PEG, FIN and INQ pairs). The findings using the PVECM for three samples and three specifications, and for 11 cases in each sample and each specification, are presented in Tables 1–3.

The first result relates to long-run panel Granger causality outcomes, which we determined by looking at the statistical implications of the ECTs. For  $\Delta$ PEG, the coefficients for the ECTs were econometrically significant at  $p \leq 0.05$ , which implies that economic growth congregated to its long-run equilibrium trajectory in reaction to changes in the quality of governance institutions, as well as financial development. This was true for all three samples and all three specifications and the 11 cases in each sample, and for each specification that we considered (see Tables 1–3). Consequently, we deduce that growth in LICs and LMICs is affected to a significant extent by institutional quality and financial development. This robust finding suggests that stimulating long-run economic growth requires facilitating both improvements in institutional quality and financial development in lower income countries. This outcome for 79 countries for the sample period 2005–2022 is in line with the findings of Ahmed et al. (2022) for a sample of five South Asian countries over the period from 2000 to 2018, of Aluko and Ibrahim (2020) for a sample of 28 Sub-Saharan African countries from 1996 to 2015, of Hamdi et al. (2017) for a mixed sample of 143 countries from 2006 to 2013, and of Kutan et al. (2017) for a sample of 21 Middle Eastern and North African countries from 1980 to 2012.

By contrast, the findings for the short term were not as uniform as those for the long term. The short-run Granger causality outcomes for associations between economic growth, institutional quality and financial development are summarized in Tables 4–6, which show variation in the short-run fine-tuning peaks across the three samples and three specifications, and the 11 cases in each sample and each specification under review.

**TABLE 1** Empirical results for Granger causality test between INQ, CBD and PEG.

Dependent variable	Independent variables and ECT <sub>-1</sub>											
	Sample 1: LICs—Low-income countries											
	Case 1 (CBH)				Case 2 (CBE)				Case 3 (CDP)			
	ΔPEG	ΔCBD	ΔCBH	ECT <sub>-1</sub>	ΔPEG	ΔCBD	ΔCBE	ECT <sub>-1</sub>	ΔPEG	ΔCBD	ΔCDP	ECT <sub>-1</sub>
ΔPEG	–	3.13	16.6*	–0.916*	–	1.34	3.57	–0.91*	–	2.95	5.96***	–0.089*
ΔCBD	9.83*	–	1.12	–0.026	6.86*	–	0.74	–0.176	7.90**	–	17.8*	–0.095
ΔINQ	3.25	12.1*	–	–0.016	2.20	21.9*	–	–0.089	12.2*	25.1*	–	–0.073
	Case 4 (CEM)				Case 5 (CER)				Case 6 (CFS)			
	ΔPEG	ΔCBD	ΔCEM	ECT <sub>-1</sub>	ΔPEG	ΔCBD	ΔCER	ECT <sub>-1</sub>	ΔPEG	ΔCBD	ΔCFS	ECT <sub>-1</sub>
ΔPEG	–	2.98	6.08**	–0.962*	–	1.78	4.42***	–0.962*	–	2.99	4.96***	–0.964*
ΔCBD	10.5*	–	14.5*	–0.173	9.43*	–	2.00	–0.224	8.4.1*	–	70.3*	–0.132
ΔINQ	8.36*	5.12***	–	–0.001	4.66***	2.83	–	–0.09*	0.99	0.86	–	–0.065
	Case 7 (CMM)				Case 8 (CQF)				Case 9 (CQP)			
	ΔPEG	ΔCBD	ΔCMM	ECT <sub>-1</sub>	ΔPEG	ΔCBD	ΔCQF	ECT <sub>-1</sub>	ΔPEG	ΔCBD	ΔCQP	ECT <sub>-1</sub>
ΔPEG	–	4.99***	2.16	–0.976*	–	0.373	4.90***	–0.892*	–	2.249	6.29**	–0.889*
ΔCBD	9.38*	–	1.93	–0.259	3.15	–	18.0*	–0.191	9.35*	–	2.13	–0.083
ΔINQ	2.10	1.18	–	–0.019	19.9*	0.41	–	–0.132	30.0*	3.17	–	–0.113
	Case 10 (CTP)				Case 11 (CIQ)							
	ΔPEG	ΔCBD	ΔCTP	ECT <sub>-1</sub>	ΔPEG	ΔCBD	ΔCIQ	ECT <sub>-1</sub>				
ΔPEG	–	3.50	9.43*	–0.981*	–	2.37	13.8*	–0.896*				
ΔCBD	8.92*	–	0.46	–0.257	5.20***	–	6.11**	–0.271				
ΔINQ	0.42	5.09***	–	–0.064	9.23*	14.5*	–	–0.023				

**TABLE 1** (Continued)

Sample 2: LMICs—Lower middle-income countries												
	Case 1 (CBH)				Case 2 (CBE)				Case 3 (CDP)			
	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CBH	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CBE	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CDP	ECT <sub>-1</sub>
$\Delta$ PEG	—	5.73***	2.02	-0.364*	—	5.38***	10.37*	-0.369*	—	8.17*	11.5*	-0.387*
$\Delta$ CBD	2.20	—	1.54	-0.135	2.02	—	4.55***	-0.144	3.38	—	5.02***	-0.129
$\Delta$ INQ	15.9*	6.79*	—	-0.321	3.63	1.78	—	-0.281	13.0*	2.66	—	-0.343
	Case 4 (CEM)				Case 5 (CER)				Case 6 (CFS)			
	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CEM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CER	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CFS	ECT <sub>-1</sub>
$\Delta$ PEG	—	10.67*	14.49*	-0.377*	—	8.04*	3.89	-0.410*	—	7.60*	6.41*	-0.317*
$\Delta$ CBD	2.92	—	4.62***	-0.197	2.26	—	16.5*	-0.214	7.77*	—	18.0*	-0.123
$\Delta$ INQ	8.85*	1.73	—	-0.174	2.14	3.08	—	-0.046	9.66*	6.75*	—	-0.229
	Case 7 (CMM)				Case 8 (CQF)				Case 9 (CQP)			
	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CMM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CQF	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CQP	ECT <sub>-1</sub>
$\Delta$ PEG	—	10.5*	9.63*	-0.438*	—	6.11**	5.01***	-0.344*	—	5.68*	2.17	-0.414*
$\Delta$ CBD	1.64	—	2.21	-0.302	1.85	—	3.35	-0.273	1.34	—	1.69	-0.295
$\Delta$ INQ	6.51**	4.30***	—	-0.079	19.3*	0.89	—	-0.342	5.33***	5.81***	—	-0.119
	Case 10 (CTP)				Case 11 (CIQ)							
	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CTP	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CIQ	ECT <sub>-1</sub>				
$\Delta$ PEG	—	7.37*	1.30	-0.383*	—	7.05***	15.7*	-0.420*				
$\Delta$ CBD	1.42	—	1.59	-0.343	4.29***	—	6.49**	-0.134				
$\Delta$ INQ	6.17***	10.7*	—	-0.071	11.3*	3.34	—	-0.109				

(Continues)

**TABLE 1** (Continued)

Sample 3: All countries [LICs and LMICs]												
	Case 1 (CBH)				Case 2 (CBE)				Case 3 (CDP)			
	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CBH	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CBE	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CDP	ECT <sub>-1</sub>
$\Delta$ PEG	–	1.64	10.5*	–0.822*	–	3.32	8.35*	–0.811*	–	5.59*	7.37*	–0.794*
$\Delta$ CBD	11.6*	–	0.93	–0.187	10.2*	–	1.07	–0.806	9.54*	–	16.8*	–0.057
$\Delta$ INQ	9.18*	7.72*	–	–0.129	4.37***	22.7*	–	–0.158	11.9*	34.1*	–	–0.150
	Case 4 (CEM)				Case 5 (CER)				Case 6 (CFS)			
	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CEM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CER	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CFS	ECT <sub>-1</sub>
$\Delta$ PEG	–	6.06***	7.07**	–0.819*	–	3.53	7.78*	–0.777*	–	5.75***	3.41	–0.777*
$\Delta$ CBD	11.1*	–	9.00*	–0.084	11.7*	–	1.47	–0.196	10.9*	–	81.6*	–0.047
$\Delta$ INQ	10.7*	4.98***	–	–0.018	4.47***	4.30***	–	–0.096	4.42***	2.16	–	–0.107
	Case 7 (CMM)				Case 8 (CQF)				Case 9 (CQP)			
	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CMM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CQF	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CQP	ECT <sub>-1</sub>
$\Delta$ PEG	–	7.45**	5.81***	–0.823*	–	3.62	22.5*	–0.808*	–	5.58***	0.91	–0.824*
$\Delta$ CBD	10.8*	–	1.12	–0.148	7.21*	–	6.46**	–0.057	12.2*	–	1.68	–0.215
$\Delta$ INQ	3.36	4.25***	–	–0.009	24.5*	4.23***	–	–0.271	37.3*	7.27*	–	–0.104
	Case 10 (CTP)				Case 11 (CIQ)							
	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CTP	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CBD	$\Delta$ CIQ	ECT <sub>-1</sub>				
$\Delta$ PEG	–	5.58***	1.54	–0.795*	–	3.23	16.9*	–0.821*				
$\Delta$ CBD	11.8*	–	0.49	–0.199	7.47*	–	8.54*	–0.019				
$\Delta$ INQ	0.82	5.12***	–	–0.052	4.83***	21.2*	–	–0.032				

Note: INQ is used for CBH, CBE, CDP, CEM, CER, CFS, CMM, CQF, CQP, CTP and CIQ. ECT<sub>-1</sub> is the error-correction term. \*\*\*, \*\* and \* are statically significant at the 10%, 5% and 1% levels, respectively. All notations are as described in the text.

**TABLE 2** Results for the Granger causality test between INQ, CSD and PEG.

Dependent variable Sample 2: LMICs	Independent variables and ECT <sub>-1</sub>											
	Case 1 (CBH)				Case 2 (CBE)				Case 3 (CDP)			
	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CBH	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CBE	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CDP	ECT <sub>-1</sub>
$\Delta$ PEG	–	5.54***	0.32	–0.447**	–	4.79***	2.33	–0.309**	–	5.22***	3.02	–0.14**
$\Delta$ CSD	5.15***	–	0.94	–0.152	9.06*	–	1.85	–0.107	6.48**	–	2.94	–0.099
$\Delta$ INQ	1.70	2.19	–	–0.038	2.67	1.14	–	–0.089	1.77	4.01	–	–0.252
	Case 4 (CEM)				Case 5 (CER)				Case 6 (CFS)			
	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CEM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CER	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CFS	ECT <sub>-1</sub>
$\Delta$ PEG	–	6.29***	7.97**	–0.267**	–	2.29	3.20	–0.317**	–	5.49***	4.76***	–0.12**
$\Delta$ CSD	5.60***	–	2.12	–0.118	8.57*	–	15.2*	–0.831	7.51**	–	4.82***	–0.519
$\Delta$ INQ	6.65**	2.40	–	–0.213	1.01	16.5*	–	–0.059	0.96	1.93	–	–0.146*
	Case 7 (CMM)				Case 8 (CQF)				Case 9 (CQP)			
	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CMM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CQF	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CQP	ECT <sub>-1</sub>
$\Delta$ PEG	–	8.63*	10.3*	–0.133**	–	6.36***	3.56	–0.14**	–	16.9*	12.7*	–0.23**
$\Delta$ CSD	5.92***	–	2.21	–0.395	8.50*	–	18.3*	–0.138	3.14	–	2.25	–0.657
$\Delta$ INQ	9.44*	5.95***	–	–0.320	11.5*	12.6*	–	–0.024	4.03	5.04***	–	–0.079
	Case 10 (CTP)				Case 11 (CIQ)							
	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CTP	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CIQ	ECT <sub>-1</sub>				
$\Delta$ PEG	–	6.29**	0.33	–0.30**	–	5.89**	5.29***	–0.303**				
$\Delta$ CSD	15.7*	–	10.6*	–0.123	4.61***	–	0.90	–0.987				
$\Delta$ INQ	3.85	2.07	–	–0.020	9.07*	2.83	–	–0.021				

(Continues)

**TABLE 2** (Continued)

Sample 3: LICs and LMICs												
	Case 1 (CBH)				Case 2 (CBE)				Case 3 (CDP)			
	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CBH	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CBE	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CDP	ECT <sub>-1</sub>
$\Delta$ PEG	–	5.54***	0.32	–0.448**	–	5.79***	2.33	–0.309**	–	5.22***	3.02	–0.14**
$\Delta$ CSD	5.15***	–	0.94	–0.152	9.05*	–	1.85	–0.107	6.48***	–	2.94	–0.099
$\Delta$ INQ	1.70	2.19	–	–0.038	2.67	1.14	–	–0.089	1.77	4.01	–	–0.252
	Case 4 (CEM)				Case 5 (CER)				Case 6 (CFS)			
	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CEM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CER	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CFS	ECT <sub>-1</sub>
$\Delta$ PEG	–	6.30***	7.97*	–0.267**	–	5.28***	3.20	–0.32**	–	6.57**	9.24*	–0.14**
$\Delta$ CSD	5.60***	–	2.12	–0.118	8.57*	–	15.2*	–0.831	1.93	–	2.01	–0.520
$\Delta$ INQ	6.65**	2.40	–	–0.213	1.01	16.5*	–	–0.060	0.82	1.24	–	–0.146
	Case 7 (CMM)				Case 8 (CQF)				Case 9 (CQP)			
	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CMM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CQF	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CQP	ECT <sub>-1</sub>
$\Delta$ PEG	–	8.64*	10.3*	–0.13**	–	6.36***	3.57	–0.17**	–	16.9*	12.7*	–0.23**
$\Delta$ CSD	5.92*	–	2.21	–0.395	8.50*	–	18.3*	–0.024	3.14	–	2.25	–0.657
$\Delta$ INQ	9.44*	5.95***	–	–0.320	11.5*	12.6*	–	–0.027	4.03	5.04***	–	–0.079
	Case 10 (CTP)				Case 11 (CIQ)							
	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CTP	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CSD	$\Delta$ CIQ	ECT <sub>-1</sub>				
$\Delta$ PEG	–	5.29***	0.33	–0.299**	–	5.87***	5.29***	–0.303**				
$\Delta$ CSD	15.7*	–	10.6*	–0.126	4.61***	–	0.90	–0.987				
$\Delta$ INQ	3.85	2.07	–	–0.019	9.07*	2.83	–	–0.021				

Note: Results for Sample 1 are not available because of the small sample size. All notations as described in the text.

**TABLE 3** Results for the Granger causality test between INQ, CFD and PEG.

Dependent variable Sample 1: LICs	Independent variables and ECT <sub>-1</sub>											
	Case 1 (CBH)				Case 2 (CBE)				Case 3 (CDP)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CBH	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CBE	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CDP	ECT <sub>-1</sub>
$\Delta$ PEG	–	4.92***	15.2*	–0.911*	–	6.20**	3.27	–0.915*	–	6.65**	5.91***	–0.932*
$\Delta$ CFD	7.96*	–	0.58	–0.114	4.96***	–	0.03	–0.075	5.28***	–	22.3*	–0.190
$\Delta$ INQ	4.36***	11.1*	–	–0.024	3.60	33.1*	–	–0.102	15.6*	19.7*	–	–0.062
	Case 4 (CEM)				Case 5 (CER)				Case 6 (CFS)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CEM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CER	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CFS	ECT <sub>-1</sub>
$\Delta$ PEG	–	5.85***	6.13***	–0.941*	–	7.33*	4.72***	–0.921*	–	5.96*	5.68*	–0.924*
$\Delta$ CFD	8.25*	–	18.9*	–0.237	7.32*	–	0.98	–0.537	4.65***	–	83.0*	–0.183
$\Delta$ INQ	10.9*	5.83***	–	–0.004	5.11***	0.68	–	–0.107	1.43	0.29	–	–0.076
	Case 7 (CMM)				Case 8 (CQF)				Case 9 (CQP)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CMM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CQF	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CQP	ECT <sub>-1</sub>
$\Delta$ PEG	–	5.60***	1.80	–0.964*	–	5.16***	22.9*	–0.887*	–	5.51***	0.24	–0.888*
$\Delta$ CFD	5.49***	–	3.21	–0.277	1.45	–	11.4*	–0.162	6.90**	–	0.40	–0.091
$\Delta$ INQ	2.63	2.95	–	–0.004	15.3*	2.31	–	–0.139	22.8*	1.29	–	–0.122
	Case 10 (CTP)				Case 11 (CIQ)							
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CTP	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CIQ	ECT <sub>-1</sub>				
$\Delta$ PEG	–	6.25**	0.821	–0.944*	–	5.43***	13.2*	–0.994*				
$\Delta$ CFD	5.79***	–	0.90	–0.361	3.30	–	6.63**	–0.038				
$\Delta$ INQ	1.28	5.61***	–	–0.086	16.6*	26.2*	–	–0.009				

(Continues)

**TABLE 3** (Continued)

Sample 2: LMICs												
	Case 1 (CBH)				Case 2 (CBE)				Case 3 (CDP)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CBH	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CBE	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CDP	ECT <sub>-1</sub>
$\Delta$ PEG	–	9.54*	1.90	–0.393*	–	9.09*	11.5*	–0.385*	–	12.8*	14.7*	–0.411*
$\Delta$ CFD	2.71	–	0.88	–0.237	2.34	–	1.43	–0.327	4.08	–	4.86***	–0.236
$\Delta$ INQ	12.4*	3.18	–	–0.304	3.76	1.87	–	–0.296	12.4*	7.40*	–	–0.367
	Case 4 (CEM)				Case 5 (CER)				Case 6 (CFS)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CEM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CER	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CFS	ECT <sub>-1</sub>
$\Delta$ PEG	–	11.9*	14.9*	–0.389*	–	10.7*	5.10***	–0.436*	–	11.5*	7.15**	–0.377*
$\Delta$ CFD	4.23	–	6.78*	–0.368	2.94	–	23.1*	–0.258	5.66***	–	9.82*	–0.055
$\Delta$ INQ	8.98*	3.16	–	–0.199	2.06	6.36**	–	–0.039	9.61*	4.73***	–	–0.216
	Case 7 (CMM)				Case 8 (CQF)				Case 9 (CQP)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CMM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CQF	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CQP	ECT <sub>-1</sub>
$\Delta$ PEG	–	10.1*	8.13*	–0.466*	–	8.96*	5.07***	–0.349*	–	9.79*	3.01	–0.435*
$\Delta$ CFD	3.03	–	3.28	–0.483	3.08	–	3.48	–0.266	2.20	–	0.13	–0.468
$\Delta$ INQ	5.70**	3.48	–	–0.090	24.8*	1.18	–	–0.397	7.63*	2.34	–	–0.159
	Case 10 (CTP)				Case 11 (CIQ)							
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CTP	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CIQ	ECT <sub>-1</sub>				
$\Delta$ PEG	–	10.9*	1.57	–0.418*	–	9.05*	16.7*	–0.443*				
$\Delta$ CFD	2.38	–	0.69	–0.474	4.11	–	4.57***	–0.420				
$\Delta$ INQ	6.43**	9.49*	–	–0.056	12.3*	3.96	–	–0.118				

**TABLE 3** (Continued)

Sample 3: LICs and LMICs												
	Case 1 (CBH)				Case 2 (CBE)				Case 3 (CDP)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CBH	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CBE	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CDP	ECT <sub>-1</sub>
$\Delta$ PEG	–	7.50*	10.7*	–0.812*	–	20.4*	8.16*	–0.809*	–	25.4*	7.02*	–0.789*
$\Delta$ CFD	8.74*	–	0.89	–0.382	7.38*	–	0.42	–0.256	6.17**	–	17.7*	–0.116
$\Delta$ INQ	10.7*	14.7*	–	–0.135	5.79*	41.9*	–	–0.158	17.7*	33.6*	–	–0.161
	Case 4 (CEM)				Case 5 (CER)				Case 6 (CFS)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CEM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CER	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CFS	ECT <sub>-1</sub>
$\Delta$ PEG	–	25.7*	6.67**	–0.817*	–	17.2*	7.65*	–0.769*	–	15.3*	4.85***	–0.761*
$\Delta$ CFD	8.27*	–	10.4*	–0.150	7.79*	–	3.59	–0.386	6.54**	–	80.6*	–0.044
$\Delta$ INQ	13.5*	6.26**	–	–0.040	4.86	2.23	–	–0.079	6.33**	5.00***	–	–0.121
	Case 7 (CMM)				Case 8 (CQF)				Case 9 (CQP)			
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CMM	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CQF	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CQP	ECT <sub>-1</sub>
$\Delta$ PEG	–	26.7*	5.06***	–0.824*	–	13.4*	21.1*	–0.800*	–	11.1*	0.64	–0.819*
$\Delta$ CFD	7.05**	–	1.32	–0.205	3.61	–	12.1*	–0.097	9.02*	–	0.24	–0.410
$\Delta$ INQ	3.62	1.09	–	–0.002	27.3*	6.47**	–	–0.289	29.6*	3.96	–	–0.124
	Case 10 (CTP)				Case 11 (CIQ)							
	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CTP	ECT <sub>-1</sub>	$\Delta$ PEG	$\Delta$ CFD	$\Delta$ CIQ	ECT <sub>-1</sub>				
$\Delta$ PEG	–	18.9*	1.51	–0.785*	–	13.6*	15.8*	–0.829*				
$\Delta$ CFD	7.83*	–	0.03	–0.300	5.17**	–	7.15*	–0.047				
$\Delta$ INQ	0.87	4.52***	–	–0.059	9.63*	30.3*	–	–0.039				

Note: Results for Sample 1 are not available because of the small sample size. All notations are as described in the text.

From Tables 4–6, it is clear that in respect of the association between financial development and economic growth, 44 out of 88 cases<sup>9</sup> supported the feedback hypothesis, while 23 supported the supply-led hypothesis that financial development Granger-causes economic growth, 20 supported the demand-led hypothesis that economic growth Granger-causes financial development, and one case supported the neutrality hypothesis. These findings are congruent with those of Nguyen et al. (2022) for a cluster of 22 emerging countries from 1980 to 2020, of Pradhan et al. (2020) for a sample of 34 European countries from 1996 to 2016, of Opoku et al. (2019) for a sample of 47 African economies from 1980 to 2016, of Pradhan et al. (2018) for a sample of G-20 countries from 1980 to 2015, and of Mukhopadhyay et al. (2011) for a sample of seven Asian countries from 1979 to 2009.

Concerning the link between institutional quality and economic growth, for 43 out of 88 cases, the results supported the feedback hypothesis, 16 supported the supply-led hypothesis that institutional quality Granger-causes per capita economic growth, 15 supported the demand-led hypotheses that economic growth Granger-causes better institutional quality, and 14 cases supported the neutrality hypothesis. These findings are consistent with those of Rahman and Sultana (2022) for 19 emerging countries from 2002 to 2019, of Pradhan, Arvin, Nair, and Hall (2022b), and Pradhan, Arvin, Nair, Hall, and Bennett (2022) for a cluster of developing countries from 2005 to 2019, of Arvin et al. (2021) for 79 middle-income countries from 2005 to 2019, and by Nair et al. (2021) for 67 developing countries from 2005 to 2018.

Finally, regarding the association between institutional quality and financial development, we found that 24 out of 88 cases supported the feedback hypothesis, 15 supported the supply-led hypothesis that better institutional quality Granger-causes financial development, 26 supported the demand-led hypothesis that financial development Granger-causes better institutional quality, and 23 cases supported the neutrality hypothesis. These outcomes correspond with the results reported by Ahmed et al. (2022) for South Asian economies from 2000 to 2018, and by Kutan et al. (2017) for Middle Eastern and North African economies over the period from 1980 to 2012.

In the short run, Granger causality outcomes were clearly non-uniform and depended on which institutional quality and financial development indicators were applied, but some important Granger causal links were still discernible between the variables even in the short run. This applies in particular to the short-run nexus between institutional quality and financial development, where, on balance, the evidence suggests a strong short-run relationship between these two chosen variables. Hence, our general inference is that there are many short-run dynamics between these variables and economic growth. Again, there is strong evidence that over the longer term, all the dynamics point in the same direction: institutional quality and financial development are indeed key drivers of economic growth.

### 3.4 Robustness test results

To ascertain the robustness of our empirical results, we used impulse response functions and variance decomposition analysis to examine the impact of a one-off disturbance by one of the variables (for example, PEG) to the other covariates (for example, FIN and INQ). Both impulse response functions and variance decomposition analysis provide a supplementary test to advance insight into the causal relationships between PEG, INQ and FIN. The results offer additional support for the notion that there are causal links between economic growth, financial development and institutional quality. The impulse response functions and variance decomposition analysis (displayed in graphs) are available from the authors upon request.

**TABLE 4** Summary of results for short-run causality between INQ, CBD and PEG.

Sample	Case	Linkages between variables		
		INQ and PEG	CBD and PEG	INQ and CBD
1	1	CBH → PEG	CBD → PEG	CBH → CBD
	2	CBE → PEG	CBD → PEG	CBE → CBD
	3	CDP ↔ PEG	CBD → PEG	CDP ↔ CBD
	4	CEM ↔ PEG	CBD → PEG	CEM ↔ CBD
	5	CER ↔ PEG	CBD → PEG	CER † CBD
	6	CFS → PEG	CBD → PEG	CFS → CBD
	7	CMM → PEG	CBD ↔ PEG	CMM † CBD
	8	CQF ↔ PEG	CBD † PEG	CQF → CBD
	9	CQP ↔ PEG	CBD → PEG	CQP † CBD
	10	CTP → PEG	CBD → PEG	CTP → CBD
	11	CIQ ↔ PEG	CBD ↔ PEG	CIQ ↔ CBD
2	1	CBH → PEG	CBD → PEG	CBH → CBD
	2	CBE → PEG	CBD → PEG	CBE → CBD
	3	CDP ↔ PEG	CBD → PEG	CDP → CBD
	4	CEM ↔ PEG	CBD → PEG	CEM → CBD
	5	CER → PEG	CBD → PEG	CER → CBD
	6	CFS ↔ PEG	CBD ↔ PEG	CFS ↔ CBD
	7	CMM → PEG	CBD → PEG	CMM → CBD
	8	CQF ↔ PEG	CBD → PEG	CQF → CBD
	9	CQP → PEG	CBD → PEG	CQP ↔ CBD
	10	CTP → PEG	CBD → PEG	CTP → CBD
	11	CIQ → PEG	CBD → PEG	CIQ → CBD
3	1	CBH ↔ PEG	CBD → PEG	CBH → CBD
	2	CBE ↔ PEG	CBD → PEG	CBE → CBD
	3	CDP ↔ PEG	CBD ↔ PEG	CDP ↔ CBD
	4	CEM ↔ PEG	CBD ↔ PEG	CEM ↔ CBD
	5	CER ↔ PEG	CBD → PEG	CER → CBD
	6	CFS → PEG	CBD ↔ PEG	CFS → CBD
	7	CMM → PEG	CBD ↔ PEG	CMM → CBD
	8	CQF ↔ PEG	CBD → PEG	CQF ↔ CBD
	9	CQP → PEG	CBD ↔ PEG	CQP → CBD
	10	CTP → PEG	CBD ↔ PEG	CTP → CBD
	11	CIQ ↔ PEG	CBD → PEG	CIQ ↔ CBD

Note: →/ →/↔ indicate the nature of the Granger causality; and † is non-Granger causality. Samples 1–3 are as defined in the text. All notations are as described earlier.

**TABLE 5** Summary of results for short-run causality between INQ, CSD and PEG.

Sample	Case	Linkages between variables		
		INQ and PEG	CSD and PEG	INQ and CSD
2	1	CBH ↓ PEG	CSD ↔ PEG	CBH ↓ CSD
	2	CBE ↓ PEG	CSD ↔ PEG	CBE ↓ CSD
	3	CDP ↓ PEG	CSD ↔ PEG	CDP ↓ CSD
	4	CEM ↔ PEG	CSD ↔ PEG	CEM ↓ CSD
	5	CER ↓ PEG	CSD → PEG	CER ↔ CSD
	6	CFS → PEG	CSD ↔ PEG	CFS → CSD
	7	CMM ↔ PEG	CSD ↔ PEG	CMM → CSD
	8	CQF → PEG	CSD ↔ PEG	CQF ↔ CSD
	9	CQP → PEG	CSD → PEG	CQP → CSD
	10	CTP ↓ PEG	CSD ↔ PEG	CTP → CSD
	11	CIQ ↔ PEG	CSD ↔ PEG	CIQ ↓ CSD
3	1	CBH ↓ PEG	CSD ↔ PEG	CBH ↓ CSD
	2	CBE ↓ PEG	CSD ↔ PEG	CBE ↓ CSD
	3	CDP ↓ PEG	CSD ↔ PEG	CDP ↓ CSD
	4	CEM ↔ PEG	CSD ↔ PEG	CEM ↓ CSD
	5	CER ↓ PEG	CSD ↔ PEG	CER ↔ CSD
	6	CFS → PEG	CSD → PEG	CFS ↓ CSD
	7	CMM ↔ PEG	CSD ↔ PEG	CMM → CSD
	8	CQF → PEG	CSD ↔ PEG	CQF ↔ CSD
	9	CQP → PEG	CSD → PEG	CQP → CSD
	10	CTP ↓ PEG	CSD ↔ PEG	CTP → CSD
	11	CIQ ↔ PEG	CSD ↔ PEG	CIQ ↓ CSD

Note: All notations are as described earlier.

**TABLE 6** Summary of results for short-run causality between INQ, CFD and PEG.

Sample	Case	Linkages between variables		
		INQ and PEG	CFD and PEG	INQ and CFD
1	1	CBH ↔ PEG	CFD ↔ PEG	CBH → CFD
	2	CBE ↓ PEG	CFD ↔ PEG	CBE → CFD
	3	CDP ↔ PEG	CFD ↔ PEG	CDP ↔ CFD
	4	CEM ↔ PEG	CFD ↔ PEG	CEM ↔ CFD
	5	CER ↔ PEG	CFD ↔ PEG	CER ↓ CFD
	6	CFS → PEG	CFD ↔ PEG	CFS → CFD
	7	CMM ↓ PEG	CFD ↔ PEG	CMM ↓ CFD
	8	CQF ↔ PEG	CFD → PEG	CQF → CFD
	9	CQP → PEG	CFD ↔ PEG	CQP ↓ CFD
	10	CTP ↓ PEG	CFD ↔ PEG	CTP → CFD
	11	CIQ ↔ PEG	CFD → PEG	CIQ ↔ CFD
2	1	CBH → PEG	CFD → PEG	CBH ↓ CFD
	2	CBE → PEG	CFD → PEG	CBE ↓ CFD
	3	CDP ↔ PEG	CFD → PEG	CDP ↔ CFD
	4	CEM ↔ PEG	CFD → PEG	CEM → CFD
	5	CER → PEG	CFD → PEG	CER ↔ CFD
	6	CFS ↔ PEG	CFD ↔ PEG	CFS ↔ CFD
	7	CMM ↔ PEG	CFD → PEG	CMM ↓ CFD
	8	CQF ↔ PEG	CFD → PEG	CQF ↓ CFD
	9	CQP → PEG	CFD → PEG	CQP ↓ CFD
	10	CTP → PEG	CFD → PEG	CTP → CFD
	11	CIQ ↔ PEG	CFD → PEG	CIQ → CFD
3	1	CBH ↔ PEG	CFD ↔ PEG	CBH → CFD
	2	CBE ↔ PEG	CFD ↔ PEG	CBE → CFD
	3	CDP ↔ PEG	CFD ↔ PEG	CDP ↔ CFD
	4	CEM ↔ PEG	CFD ↔ PEG	CEM ↔ CFD
	5	CER ↔ PEG	CFD ↔ PEG	CER ↓ CFD
	6	CFS ↔ PEG	CFD ↔ PEG	CFS ↔ CFD
	7	CMM → PEG	CFD ↔ PEG	CMM ↓ CFD
	8	CQF → PEG	CFD → PEG	CQF ↔ CFD
	9	CQP → PEG	CFD ↔ PEG	CQP ↓ CFD
	10	CTP ↓ PEG	CFD ↔ PEG	CTP → CFD
	11	CIQ ↔ PEG	CFD ↔ PEG	CIQ ↔ CFD

Note: All notations are as described earlier.

We also conducted supplementary assessments to determine the validity of our estimated results.

First, we engaged fully modified ordinary least squares and dynamic ordinary least squares estimates, which confirmed that both institutional quality and financial development have a significant impact on economic growth. Moreover, the positive effect of institutional quality on economic growth is greater than that of financial development. The findings from these estimations are presented in Appendix E (see Tables E1 and E2, respectively).

Secondly, our work also performed generalized methods of moments (GMM) estimations to enhance understanding of the causality between institutional quality, economic growth and financial development in the long term. In other words, we wanted to identify whether any causal relationships among the variables were negative or positive, and were significant. The GMM estimates are reported in Appendix E, Table E3. These results also confirm that financial development and institutional quality have a positive significant influence on economic growth in all 11 cases for both banking and stock market development. This relationship held for both LICs and LMICs. These findings are congruent with those reported by Acemoglu and Robinson (2006, 2010), Ahmed et al. (2022), Ali et al. (2019), and Kutan et al. (2017).

Third, we performed quantile-on-quantile regression estimations to verify the causality between institutional quality, financial development and economic growth. In particular, we wanted to verify whether the causal impact of institutional quality and financial development on economic growth was positive or negative, and whether it was statistically significant. The quantile-on-quantile regression estimates are presented in Appendix E, Table E4. As with the fully modified ordinary least squares, dynamic ordinary least squares and GMM results, the quantile-on-quantile regression results confirmed that both financial development and institutional quality had a positive and significant impact on economic growth in our respective cases for financial development (Table E4).

Next, we altered the lag order of the PVECM. We found no significant variations to the results already conveyed in Tables 1–3. For the sake of brevity, these empirical outcomes are not displayed, but can be requested from the authors.

Finally, we conducted another estimation procedure, namely the generalized forecast error variance decomposition mechanism, to test the strength of any causal affiliation between financial development, institutional quality and per capita economic growth. Our findings from this procedure support the claim that in lower income countries, financial development and institutional quality affect (per capita) economic growth over the long term. Again, these empirical outcomes are not displayed, but are available upon request.

#### **4 CONCLUSIONS AND POLICY IMPLICATIONS**

The various shocks to the global economy over the last decade and a half, and, more recently, the COVID-19 pandemic and the Ukraine–Russian war have had an extremely negative impact on economic growth across the globe, but especially on economic growth in the economies in our sample, namely lower income countries. In this context, these countries urgently need to undertake structural reforms to nurture a stronger institutional governance architecture and financial systems that can withstand similar global shocks in future, and enable these economies to attain sustainable long-term economic growth.

This study has investigated the short- and long-run effects of financial development and institutional quality and sustainable economic growth on one another in 79 LMICs and LICs from 2006 to 2022. These relationships have been extensively studied by other researchers, but usually looking only at combinations of pairs of these three variables. The primary distinguishing factor of the current article is the simultaneous inclusion of all three variables in a single model, and the treatment of the variables as endogenous. A second distinguishing feature of this study is its focus on LMICs and LICs, a set of countries that have not received much attention in this literature. The empirical evidence is also based on several tests, including dynamic ordinary least squares, fully modified ordinary least squares, GMM and Granger causality from the perspective of the VECM. The possibility of joint temporal causality across the variables is investigated.

The results from our study indicate that there is strong endogenous association between institutional quality, financial development and economic growth in the short term. The institutional quality, financial development and economic growth nexus appear to reinforce one another in the short term. In the long term, improvement in institutional quality and financial sector development together will have the greatest positive impact on economic growth.

The empirical causal relationships between these variables suggest that policymakers should pay close attention to more holistic improvement policies designed to improve both institutional quality and financial sector development, and should put in place strategies to stimulate economic growth, such as diversifying the economy, especially in the higher value-added sectors, and in environmentally friendly industries. Below, we propose key institutional reforms and financial sector development policies that should promote the sustainable economic growth of LICs and LMICs.

The short-term and long-term analysis for LIC and LMIC countries shows that these countries must put in place strategies to enhance the development of the financial sector and institutions of governance that will add value to sustainable economic growth of these countries. To improve the institutional quality and financial systems, a concerted effort must be made in these countries to adopt electronic governance systems and capability development programmes, both in the public sector and in the financial sector. Such a strategy will drive long-term sustainable economic growth in LICs and LMICs. Increasing the use of electronic governance systems and nurturing appropriate talent to manage these governance systems will result in the following outcomes (OECD, 2019a, 2019b):

- the streamlining of various government processes and financial transactions, which will ensure easy access to government and financial services by all economic agents;
- a reduction of red tape, and an increase in the effective implementation of sound macroeconomic and industrial policies, budgetary prudence, a stronger regulatory architecture and taxation systems, thus improving productivity and efficiency in the public sector, the financial system and the corporate sector;
- focused and well-curated national policies and channel-appropriate investments to enhance the absorptive, adaptive and innovative capabilities of local industries and economic sectors (this includes reducing the cost of duplicating resources and ensuring that policies are outcomes-driven to improve productivity and efficiency, and enhancing the competitiveness of domestic industries and economic sectors);

- greater transparency and accountability among public servants and in the corporate sector, thus reducing rent-seeking and unethical behaviour (see for instance, Lazaroiu et al., 2020); and
- investment in research and development activities to generate more value-added environmentally friendly industries that create high income and new employment opportunities for people in these countries.

There is some historical evidence that shows that several less developed countries that improved their institutional governance and financial sector were able to enhance their economic growth and quality of life for citizens. For example, Singapore was an under-developed country in the 1960s with very few natural resources and a small population. Significant investment in building a good public sector and strong institutions (legal, regulatory bodies, education institutions and other public services providers) changed that (Wardle & Mainelli, 2021). Singapore also invested significantly in its financial sector, adopting modern technology, and strengthening the financial, banking and stock market regulations. These reforms enabled Singapore today to be ranked the most effective government in the world—coming first in the World Bank Government Effectiveness Index in 2021 (World Bank, 2022a). The financial reforms undertaken coupled with the institutional quality development initiative by the Singaporean government have positioned Singapore's financial sector as the top, most sophisticated, advanced and competitive financial system in the world in 2021 (Wardle & Mainelli, 2021). The institutional and financial sector reforms undertaken by Singapore since its independence in 1965 increased its wealth from a per capita GDP of US\$517 in 1965 to US\$72,794 in 2021 (World Bank, 2022b).

In conclusion, based on our empirical outcomes, we recommend that to promote long-term growth in LMICs and LICs, urgent thought be given to co-development policies, such as strengthening institutional quality and promoting financial development simultaneously. Our findings suggest that governments and industry should work in tandem to ensure that institutions of governance reinforce the development of the financial and key economic sectors, and vice versa, to ensure that these economies attain sustainable economic growth trajectories. Without a strong co-development policy initiative to bolster the institutional quality and the financial sector outcomes, LMIC and LICs will continue to struggle to bring about economic prosperity for their citizens.

## **5 LIMITATIONS TO THE STUDY AND FUTURE RESEARCH**

The study has provided valuable insights into the dynamic relationships between institutional quality, financial development and economic growth in lower income countries. Notwithstanding the usefulness of its findings, this study has two noticeable limitations. First, although we provide insight into the nexus between institutional quality and financial development that affect short- and long-term economic growth in lower income countries, inevitably, other important variables could not be included in the model. These include infrastructure, trade openness and the intensity of government investment in institutional quality and financial development, and many more. Not considering these variables in the VECM may cause omitted variable bias, which affects the robustness of the findings. Secondly, the VECM adopted in this study captured linear associations between the three variables of interest, which may not fully reflect the underlying data generation process of the data series that was the focus of this study. Hence, the VECM might not have captured more complex relationships between economic growth, institutional quality and financial development. If the nexus between these variables is non-linear, then the non-linear panel autoregressive

distributive lag (NPARDL) or quantile autoregressive distributive lag (QARDL) models would be more appropriate models. Additionally, financial development can be used as the threshold variable to explore the non-linear relationship between economic growth and institutional quality. In that case, a more appropriate model would be the threshold VECM (TVECM). These should be explored in future research. Overall, it appears that the application of advanced dynamic methods is certainly fruitful for future research in this domain.

Limitations in the current study notwithstanding our empirical analysis provides valuable insights into the complex temporal causal relationships between financial development, institutional quality and economic growth. Our results provide evidence that co-developing appropriate policies pertaining to financial development as well as institutional quality are more likely to generate a multiplier effect, fuelling economic prosperity among LICs and LMICs in an increasingly network-based global economy. Future studies should address the above-mentioned limitations to identify more robust short-run and long-run patterns between growth and other economic factors. Such studies will deliver additional valuable intuitions on the key levers of sustainable economic growth in less developed countries, using our study as a baseline.

## Endnotes

<sup>1</sup> Temporal causal links are better known as Granger causal links. Thus, in the remainder of the article, we use the terms Granger causality and temporal causality synonymously. It should be noted that temporal causality is not the same as causality in a philosophical sense.

<sup>2</sup> CBD is derived from five banking indicators: broad money supply (BRM), claims on the private sector (CPS), domestic credit (DC) circulated by the financial sector (DCF), DC to the private sector (DCP), and DC made available to the private sector by banks (DCB).

<sup>3</sup> CSD is derived using four stock market indicators: the market capitalization of listed domestic companies (MAC), listed domestic companies (LDC), the turnover ratio of domestic shares – stocks traded (STU), and traded stocks – total value (STR).

<sup>4</sup> CFD is an average of nine financial development indicators listed in the previous two footnotes. They comprise the five banking indicators and the four stock market indicators covered under CBD and CSD. A formal definition of all nine financial development indicators is available in the WDI database (<http://www.worldbank.org/wdi>).

<sup>5</sup> For the sake of brevity, we provide a structured explanation of the derivation of only two of our composite indices, namely CIQ and CFD. The remaining composite indices, CBD and CSD, were derived in the same way. Details can be provided on request.

<sup>6</sup> This provides a guarantee for having consistent and unbiased estimation outcomes in subsequent econometric process (see, for instance, Wang, Yang, & Yang, 2023; Wang, Wang, & Li, 2023; Wang, Yang, & Li, 2023; Wang, Zang, & Li, 2023).

<sup>7</sup> This was done to check the stability of the data (see, for instance, Wang et al., 2022).

<sup>8</sup> These tests were chosen after cross-sectional dependency tests confirmed the absence of cross-sectional dependency between these variables.

<sup>9</sup> Although we had three samples, three specifications and 11 cases under each sample, results are reported for only 88 individual viable cases (instead of 99), because of the small sample size for LICs when stock market development (CSD) was used as a proxy (see Table 2).

## DATA AVAILABILITY STATEMENT

Will be available upon request.

## REFERENCES

- Abid, M. (2017). Does economic, financial and institutional developments matter for environmental quality? A comparative analysis of EU and MEA countries. *Journal of Environmental Management*, 188, 183–194.
- Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review*, 91(5), 1369–1401.
- Acemoglu, D., & Robinson, J. A. (2006). *Economic origins of dictatorship and democracy*. Cambridge University Press.
- Acemoglu, D., & Robinson, J. A. (2010). The role of institutions in growth and development. *Review of Economics and Institutions*, 1(1), 1–33.
- Adu, G., Marbuah, G., & Mensah, J. T. (2013). Financial development and economic growth in Ghana: Does the measure of financial development matter? *Review of Development Finance*, 3(4), 192–203.
- Afonso, A., & Jalles, J. T. (2016). Economic performance, government size, and institutional quality. *Empirica*, 43, 83–109.
- Ahmed, F., Kousar, S., Pervaiz, A., & Shabbir, A. (2022). Do institutional quality and financial development affect sustainable economic growth? Evidence from south Asian countries. *Borsa Istanbul Review*, 22(1), 189–196.
- Alexiou, C., Tsaliki, P., & Osman, H. R. (2004). Institutional quality and economic growth: Empirical evidence from the Sudanese economy. *Economic Annals*, 59(203), 1–20.
- Ali, A., Ramakrishnan, S., & Faisal, S. (2022). Financial development and natural resources. Is there a stock market resource curse? *Resources Policy*, 75, 1–16.
- Ali, H. S., Law, S. H., Lin, W. L., Yusop, Z., Chin, L., & Bare, U. A. A. (2019). Financial development and carbon dioxide emissions in Nigeria: Evidence from the ARDL bounds approach. *GeoJournal*, 84, 641–655.
- Ali, M., Nazir, M. I., Hashmi, S. H., & Ullah, W. (2022). Financial inclusion, institutional quality and financial development: Empirical evidence from OIC countries. *The Singapore Economic Review*, 67(1), 161–188.
- Aluko, O. A., & Ibrahim, M. (2020). Institutions and the financial development-economic growth nexus in sub-Saharan Africa. *Economic Notes*, 49(3), 1–16.

- Arcand, J. L., Berkes, E., & Panizza, U. (2015). Too much finance? *Journal of Economic Growth*, 20, 105–148.
- Arvin, M. B., Pradhan, R. P., & Nair, M. (2021). Uncovering interlinks among ICT connectivity and penetration, trade openness, foreign direct investment, and economic growth: The case of the G-20 countries. *Telematics and Informatics*, 60, 1–25.
- Barro, R. J. (1991). Economic growth in cross-section of countries. *Quarterly Journal of Economics*, 106(2), 407–443.
- Barro, R. J. (2000). Rules of law, democracy, and economic performance. In G. P. O'Driscoll, K. R. Holmes, & M. Kirkpatrick (Eds.), 2000 index of economic freedom (pp. 31–49). Heritage Foundation & Wall Street Journal.
- Breitung, J. (2000). The local power of some unit root tests for panel data. *Advances in Econometrics*, 15, 161–177.
- Bruinshoof, A. (2016). Institutional quality and economic performance. Rabobank RaboResearch – Economic Research. January 19, 2021 <https://economics.rabobank.com/publications/2016/january/institutional-quality-and-economic-performance>
- Cecchetti, G., & Kharroubi, E. (2012). Reassessing the impact of finance on growth (BIS working papers No. 381). Bank for International Settlements.
- Cetin, M., Sarigiil, S. S., Isik, C., Avc, P., & Ahmad, M. (2023). The impact of natural resources, economic growth, savings, and current account balance on financial sector development: Theory and empirical evidence. *Resources Policy*, 81, 1–13.
- Chaiechi, T. (2012). Financial development shocks and contemporaneous feedback effect on key macroeconomic indicators: A post-Keynesian time series analysis. *Economic Modelling*, 29, 487–501.
- Chang, S., & Huang, L. (2010). The nexus of finance and GDP growth in Japan: Do real interest rates matter? *Japan and the World Economy*, 22(4), 235–242.
- Chong, A., & Calderón, C. (2000). Causality and feedback between institutional measures and economic growth. *Economics and Politics*, 12(1), 69–81.
- Chorzempa, M., & Huang, Y. (2022). Chinese Fintech innovation and regulations. *Asian Economic Policy Review*, 17(2), 274–292.
- Christopoulos, D. K., & Tsionas, E. G. (2004). Financial development and economic growth: Evidence from panel unit root and cointegration tests. *Journal of Development Economics*, 73, 55–74.
- Corradini, C. (2020). Local institutional quality and economic growth: A panel-VAR analysis of Italian NUTS-3 regions. *Economics Letters*, 198, 1–4.

- Demetriades, P., & Law, S. H. (2006). Finance, institutions and economic development. *International Journal of Finance and Economics*, 11(3), 245–260.
- Dritsakis, N., & Adamopoulos, A. (2004). Financial development and economic growth in Greece: An empirical investigation with granger causality analysis. *International Economic Journal*, 18(4), 547–559.
- Ehigiamusoe, K. U., & Mohamad, S. S. (2021). What matters for the finance-growth nexus? A critical survey of macroeconomic stability, institutions, financial and economic development. *International Journal of Finance & Economics*, 26, 5302–5320.
- Ergungor, O. E. (2008). Financial system structure and economic growth: Structure matters. *International Review of Economics and Finance*, 17(2), 292–305.
- Haini, H. (2020). Examining the relationship between finance, institutions and economic growth: Evidence from the ASEAN economies. *Economic Change and Restructuring*, 53, 519–542.
- Hamdi, H., Hakimi, A., & Sbia, R. (2017). Finance and growth nexus: What role for institutions in developed and developing countries? *Journal of Economic Development*, 42(4), 1–22.
- Hayat, A. (2019). Foreign direct investments, institutional quality, and economic growth. *Journal of International Trade & Economic Development*, 28(5), 561–579.
- Hung, F. S. (2009). Explaining the nonlinear effects of financial development on economic growth. *Journal of Economics*, 97(1), 41–65.
- Hye, Q. (2011). Financial development index and economic growth: Empirical evidence from India. *The Journal of Risk Finance*, 12(2), 98–111.
- Ibrahim, M., & Alagidede, P. (2018). Effect of financial development on economic growth in sub-Saharan Africa. *Journal of Policy Modeling*, 40(6), 1104–1125.
- Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53–74.
- IMF Blog. (2023). Global Economy to Slow Further Amid Signs of Resilience and China Re-opening. <https://www.imf.org/en/Blogs/Articles/2023/01/30/global-economy-to-slow-further-amid-signs-of-resilience-and-china-re-opening>
- Kar, M., Nazlioglu, S., & Agir, H. (2011). Financial development and economic growth nexus in the MENA countries: Bootstrap panel granger causality analysis. *Economic Modelling*, 28, 685–693.
- Khan, H., Khan, S., & Zuojun, F. (2022). Institutional quality and financial sector development: Evidence from developing and emerging economies. *Global Business Review*, 23(4), 971–983.
- Khan, M. A., Khan, M. A., Abdulahi, M. E., Liaqat, I., & Shah, S. S. H. (2019). Institutional quality and financial development: The United States perspective. *Journal of Multinomial Financial Management*, 49, 67–80.

- Kharisma, D. B. (2020). Urgency of financial technology (Fintech) laws in Indonesia. *International Journal of Law and Management*, 3, 320–331.
- Kliestik, T., Valaskova, K., Lăzăroiu, G., Kovacova, M., & Vrbka, J. (2020). Remaining financially healthy and competitive: The role of financial predictors. *Journal of Competitiveness*, 12(1), 74–92.
- Kutan, A. M., Samargandi, N., & Sohag, K. (2017). Does institutional quality matter for financial development and growth? Further evidence from MENA countries. *Australian Economic Papers*, 56(3), 228–248.
- Kyophilavong, P., Uddin, G., & Shahbaz, M. (2016). The nexus between financial development and economic growth in Lao PDR. *Global Business Review*, 17(2), 303–317.
- Laeven, L., Levine, R., & Michalopoulos, S. (2015). Financial innovation and endogenous growth. *Journal of Financial Intermediation*, 24(1), 1–24.
- Law, S. H., Azman-Saini, W. N. W., & Ibrahim, M. H. (2013). Institutional quality thresholds and the finance-growth nexus. *Journal of Banking & Finance*, 37, 5373–5381.
- Law, S. H., Kurtan, A. M., & Naseem, N. A. M. (2018). The role of institutions in finance course: Evidence from international data. *Journal of Comparative Economics*, 46, 174–191.
- Lazaroiu, G., Ionescu, L., Ut, C., Hurloiu, I., Andronie, M., & Dijmarescu, I. (2020). Environmentally responsible behavior and sustainability policy adoption in green public procurement. *Sustainability*, 12(5), 1–12.
- Levine, L. (2005). Finance and Growth: Theory and Evidence. Working Paper, No. 10766. <https://www.nber.org/papers/w10766>
- Levine, R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature*, 35(2), 688–726.
- Li, R., Wang, Q., Liu, Y., & Jiang, R. (2021). Per-capita carbon emissions in 147 countries: The effect of economic, energy, social, and trade structural changes. *Sustainable Production and Consumption*, 27, 1149–1164.
- Liu, Y., Luan, L., Wu, W., Zhang, Z., & Hsu, Y. (2021). Can digital financial inclusion promote China's economic growth? *International Review of Financial Analysis*, 78, 1–13.
- Lucas, R. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22(1), 3–42.
- Mhadhbi, K., Terzi, C., & Bouchrika, A. (2020). Banking sector development and economic growth in developing countries: A bootstrap panel granger causality analysis. *Empirical Economics*, 58, 2817–2836.
- Mlachila, M., & Ouedraogo, R. (2020). Financial development curse in resource-rich countries: The role of commodity price shocks. *The Quarterly Review of Economics and Finance*, 76(C), 84–96.

- Mukhopadhyay, B., Pradhan, R. P., & Feridun, M. (2011). Finance-growth nexus revisited for some Asian countries. *Applied Economics Letters*, 18(16), 1527–1530.
- Nair, M., Pradhan, R. P., & Arvin, M. B. (2020). Endogenous dynamics between R&D, ICT and economic growth: Empirical evidence from the OECD countries. *Technology in Society*, 62, 1–12.
- Nair, M. N., Arvin, M. B., Pradhan, R. P., & Bahmani, S. (2021). Is higher economic growth possible through better institutional quality and a lower carbon footprint? Evidence from developing countries. *Renewable Energy*, 167, 132–145.
- Nawaz, S., Iqbal, N., & Khan, M. A. (2014). The impact of institutional quality on economic growth: Panel evidence. *Pakistan Development Review*, 53(1), 15–31.
- Nazir, M. R., Tan, Y., & Nazir, M. I. (2021). Financial innovation and economic growth: Empirical evidence from China, India and Pakistan. *International Journal of Finance & Economics*, 26(4), 6036–6059.
- Nguyen, H. M., Le, Q. T. T., Ho, C. M., Nguyen, T. C., & Vo, D. H. (2022). Does financial development matter for economic growth in the emerging countries? *Borsa Istanbul. Review*, 22(4), 688–698.
- Nirola, N., & Sahu, S. (2019). The interactive impact of government size and quality of institutions on economic growth – Evidence from the states of India. *Heliyon*, 5, 1–28.
- Nkoa, B. E. O., & Song, J. A. (2020). Does institutional quality affect financial inclusion in Africa? A panel data analysis. *Economic Systems*, 44, 1–11.
- OECD. (2019a). Digital government review of Panama: Enhancing the digital transformation of the public sector. OECD Library.
- OECD. (2019b). Strengthening digital government. OECD Library.
- Opoku, E. E. O., Ibrahim, M., & Sare, Y. A. (2019). The causal relationship between financial development and economic growth in Africa. *International Review of Applied Economics*, 33(6), 789–812.
- Osman, R., Alexiou, C., & Tsaliki, P. (2012). The role of institutions in economic development: Evidence from 27 sub-Saharan countries. *International Journal of Social Economics*, 39(2), 142–160.
- Pop, R.-A., Dabija, D.-C., Pelau, C., & Dinu, V. (2022). Usage intentions, attitudes, and behaviors towards energy-efficient applications during the COVID-19 pandemic. *Journal of Business Economics and Management*, 23(3), 668–689.
- Pradhan, R. P., Arvin, M. B., & Bahmani, S. (2018). Are innovation and financial development causative factors in economic growth? Evidence from a panel granger causality test. *Technological Forecasting and Social Change*, 132, 130–142.

- Pradhan, R. P., Arvin, M. B., Bahmani, S., Hall, J. H., & Norman, N. R. (2017). Finance and growth: Evidence from the ARF countries. *Quarterly Review of Economics and Finance*, 66(4), 136–148.
- Pradhan, R. P., Arvin, M. B., Hall, J. H., & Bahmani, S. (2014). Causal nexus between economic growth, banking sector development, stock market development, and other macroeconomic variables: The case of ASEAN countries. *Review of Financial Economics*, 23(4), 155–173.
- Pradhan, R. P., Arvin, M. B., Hall, J. H., & Nair, M. (2016). Innovation, financial development and economic growth in Eurozone countries. *Applied Economics Letters*, 23(16), 1141–1144.
- Pradhan, R. P., Arvin, M. B., Nair, M., & Bennett, S. E. (2020). Unveiling the causal relationships among banking competition, stock and insurance market development, and economic growth in Europe. *Structural Change and Economic Dynamics*, 55, 74–87.
- Pradhan, R. P., Arvin, M. B., Nair, M., Hall, J., & Bennett, S. E. (2022). Institutional development in an information-driven economy: Can ICTs enhance economic growth for low- and lower middle-income countries? *Information Technology for Development*, 28(3), 468–487.
- Pradhan, R. P., Arvin, M. B., Nair, M., & Hall, J. H. (2022a). Public debt, economic openness, and sustainable economic growth in Europe: A dynamic panel causal analysis. *Journal of Economics Development*, 47(1), 167–183.
- Pradhan, R. P., Arvin, M. B., Nair, M., & Hall, J. H. (2022b). The dynamics between financial market development, taxation propensity, and economic growth: A study of OECD and non-OECD countries. *Quality & Quantity*, 56, 1503–1534.
- Pradhan, R. P., Arvin, M. B., Nair, M., Hall, J. H., & Bennett, S. E. (2021). Sustainable economic development in India: The dynamics between financial inclusion, ICT development and economic growth. *Technological Forecasting and Social Change*, 169, 1–19.
- Pradhan, R. P., Arvin, M. B., Norman, N. R., & Hall, J. H. (2014). The dynamics of banking sector and stock market maturity and the performance of Asian economies. *Journal of Economic and Administrative Sciences*, 30(1), 16–44.
- Pradhan, R. P., Arvin, M. B., Norman, N. R., & Hall, J. H. (2015). The dynamics of economic growth, oil prices, stock market depth, and other macroeconomic variables. *International Review of Financial Analysis*, 39(1), 89–95.
- Pradhan, R. P., Arvin, M. B., Norman, N. R., & Nishigaki, Y. (2014). Does banking sector development affect economic growth and inflation? A panel cointegration and causality approach. *Applied Financial Economics*, 24(7), 465–480.
- Pradhan, R. P., Bahmani, S., & Abraham, R. (2023). Institutional quality, insurance markets, and economic growth: Evidence from pooled mean group estimation. *Applied Economics Letters*, 30(4), 445–449.

- Pradhan, R. P., Dasgupta, P., Bele, S., & Samadhan, B. (2013). Finance development and economic growth in BRICS: A panel data analysis. *Journal of Quantitative Economics*, 11(2), 308–322.
- Qamruzzaman, M., & Jianguo, W. (2017). Financial innovation and economic growth in Bangladesh. *Financial Innovation*, 3(19), 1–24.
- Rahman, M. M., & Sultana, N. (2022). Impacts of institutional quality, economic growth, and exports on renewable energy: Emerging countries perspective. *Renewable Energy*, 189, 938–951.
- Recuero, L., & González, R. (2019). Economic Growth, Institutional Quality and Financial Development in Middle-Income Countries. Banco de Espana Working Paper, No. 1937. <file:///C:/Users/Prakash/Downloads/SSRN-id3489866.pdf>
- Salman, M., Long, X., Dauda, L., & Mensah, C. N. (2019). The impact of institutional quality on economic growth and carbon emissions: Evidence from Indonesia, South Korea and Thailand. *Journal of Cleaner Production*, 241(1), 1–15.
- Samargandi, N., Fidrmuc, J., & Ghosh, S. (2015). Is the relationship between financial development and economic growth monotonic? Evidence from a sample of middle-income countries. *World Development*, 68, 66–81.
- Shen, C. H., & Lee, C. C. (2006). Same financial development yet different economic growth – Why? *Journal of Money, Credit and Banking*, 38(7), 1907–1994.
- Song, C., Chang, C., & Gong, Q. (2021). Economic growth, corruption, and financial development: Global evidence. *Economic Modelling*, 94, 822–830.
- Sun, Y., & Tang, X. (2022). The impact of digital inclusive finance on sustainable economic growth in China. *Finance Research Letters*, 50, 1–9.
- Úbeda, F., Forcadell, F. J., & Suárez, N. (2022). Do formal and informal institutions shape the influence of sustainable banking on financial development? *Finance Research Letters*, 46, 1–9.
- Vieira, F., Holland, M., Da Silva, C., & Bottecchia, L. (2013). Growth and exchange rate volatility: A panel data analysis. *Applied Economics*, 45, 3733–3741.
- Wang, J., Yang, J., & Yang, L. (2023). Do natural resources play a role in economic development? Role of institutional quality, trade openness, and FDI. *Resources Policy*, 81, 1–8 Is this one used? There are only 3 references to Wang et al, and there are 4 here. At most, 3 of them can be used in the article.
- Wang, L., Wu, X., & Chu, N. (2023b). Financial development, technological innovation and urban-rural income gap: Time series evidence from China.
- Wang, L.-M., Wu, X.-L., & Chu, N.-C. (2023c). Financial development, technological innovation and urban-rural income gap: Time series evidence from China. *PLoS One*, 18(2), e0279246. <https://doi.org/10.1371/journal.pone.0279246>

Wang, Q., Wang, L., & Li, R. (2023). Trade protectionism jeopardizes carbon neutrality–decoupling and breakpoints roles of trade openness. *Sustainable Production and Consumption*, 35, 201–215.

Wang, Q., Wang, X., & Li, R. (2022). Does urbanization redefine the environmental Kuznets curve? An empirical analysis of 134 countries. *Sustainable Cities and Society*, 76, 1–14.

Wang, Q., Yang, T., & Li, R. (2023). Does income inequality reshape the environmental Kuznets curve (EKC) hypothesis? A nonlinear panel data analysis. *Environmental Research*, 216, 1–15.

Wang, Q., Zang, F., & Li, R. (2023). Revisiting the environmental Kuznets curve hypothesis in 208 counties: The roles of trade openness, human capital, renewable energy and natural resource rent. *Environmental Research*, 216, 1–19.

Wardle, M., & Mainelli, M. (2021). The global financial centres index 29, Long finance and financial centre futures. October 11, 2021 [https://www.longfinance.net/media/documents/GFCI\\_29\\_Full\\_Report\\_2021.03.17\\_v1.2.pdf](https://www.longfinance.net/media/documents/GFCI_29_Full_Report_2021.03.17_v1.2.pdf)

Wennekers, S., & Thurik, R. (1999). Linking entrepreneurship and economic growth. *Small Business Economics*, 13, 27–55.

Wolde-Rufael, Y. (2009). Re-examining the financial development and economic growth nexus in Kenya. *Economic Modelling*, 26, 1140–1146.

World Bank. (2022a). Government effectiveness – Country ranking. [https://www.theglobaleconomy.com/rankings/wb\\_government\\_effectiveness/](https://www.theglobaleconomy.com/rankings/wb_government_effectiveness/)

World Bank. (2022b). Database of indicators. <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=SG>

World Bank. (2023). Sharp, long-lasting slowdown to hit developing countries hard. World Bank Press Release, January 10, 2023. <https://www.worldbank.org/en/news/press-release/2023/01/10/global-economic-prospects>

Yao, C., & Lin, Q. (2017). The mutual causality analysis between the stock and futures markets. *Physica A*, 478, 188–204.