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Financial development and economic complexity: The mediating role of institutional quality

Hela Mili

Department of Economics, College of Business, Imam Mohammad Ibn Saud Islamic University (IMSIU), Riyadh, Saudi Arabia.

(*Email: HMILI@imamu.edu.sa*)

Abstract

This study aims to examine the role of institutional quality in explaining the adjustment of the relationship between economic complexity and financial development in high- and low-income economies between 1990 and 2024. To this end, a panel dataset balanced is tested with the Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) model supplemented by robustness tests with Augmented Mean Group (AMG) estimation and Dumitrescu-Hurlin panel Granger causality tests, and institutional quality understood across five governance indicators. The findings affirm that strong institutions significantly contribute to the positive impact of economic complexity on financial development, particularly in advanced economies, where the drivers are government effectiveness, rule of law, and control of corruption, while weak institutions in poor nations constrain these impacts and slow down the conversion of financial development into productive sophistication. The conclusion of the analysis is that institutional quality is a key determinant of sustaining the finance-complexity nexus to enable financial systems to enable innovation, diversification, and long-term growth. The policy implications suggest that policymakers in high-income economies should put efforts into guaranteeing institutional resilience and adapting financial structures to technological change, whereas low-income economies must put efforts into establishing governance, eliminating corruption, and growing human capital to ensure sustainable and inclusive financial development.

Keywords: Economic complexity, Financial development, Governance, CS-ARDL, Institutional quality.

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1. Introduction

With the current global economy, the pursuit of sustainable and inclusive growth has prompted policymakers and scholars to reconsider the nexus between financial development, economic complexity, and institutional quality. Financial development (FD) such as the depth, accessibility, and efficiency of financial systems has been a cornerstone of economic change for decades.

However, newer studies reveal that financial systems alone are insufficient to guarantee structural economic advancement unless complemented by a country's capacity for producing and exporting high tech products, as usually measured by the Economic Complexity Index (ECI). Such a shift requires raising the following question: does institutional quality (IQ) influence the financial development–economic complexity relationship, and if so, what is its evolving role between different countries with diverse income levels?

Economic complexity captures the knowledge accumulation and productive capabilities of a nation. As far as financial development can provide the capital and infrastructure to fund innovation and diversification, the success of this endeavor is also critically dependent on the quality of institutions. Well-functioning institutions characterized by good governance, rule of law, regulatory quality, and absence of corruption enhance financial intermediation, reduce transaction costs, and create an investment-friendly environment for high-value-added production. Conversely, bad institutions will probably hinder the allocation of financial resources, limit transparency, and discourage entrepreneurial initiative, thereby weakening the interconnection between finance and complexity.

Importantly, the institutional backdrop differs vividly between high-income and low-income countries. There are likely to be robust institutional arrangements in high-income countries that enhance the beneficial spillovers of financial development, while low-income countries may be faced with institutional weakness warping the very connections. Comparative cross-section analysis therefore becomes imperative to determine the role played by institutional quality as a mediator or moderator of the FD–ECI nexus within different income environments.

This article addresses this gap by assessing the relevance of institutional quality in the financial development-economic complexity relationship with a Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) specification. By investigating two panels high-income and low-income countries this article provides fresh empirical evidence on the heterogeneity of this relationship by development stages. The findings of the research will probably inform policies for constructing productive capacities via certain financial and institutional reforms based on the need for good governance institutions for tackling such economic transformation.

2. Literature Review

Recent work has come to emphasize the intricate and reciprocal relationship between economic complexity (ECI) and financial development (FD). For example, Baskak [1] enhances the standard approach by breaking up complexity into multiple dimensions—commercial, technological, and research—and demonstrates that in E7 emerging markets (Brazil, China, India, Indonesia, Mexico, Russia, and Turkey), such kinds of complexity are strongly co-integrated with various measures of financial development. To this, Basile [2] introduces subnational Italian provincial data (2008–2018), and shows that rising local economic complexity increases the supply of credit because banks are more willing to finance projects from diversified and complex production bases. Such findings show that at national and regional levels as well, ECI is a powerful driver of financial inclusion and development.

Across the world, Nguyen [3] in his study of 2002-2017 data concludes that improvements in financial institution and market efficiency significantly contribute to economic complexity and the strength of institutions acts as a key intermediary. Zechlin [4] also confirms that financial development exerts a positive significant impact on ECI in the EU, primarily transmitted through institutions. Collectively, these studies advance the argument that sound and good financial systems are prime enablers of complexity but are contingent for their effectiveness on governance and institutional quality.

Institutional quality (IQ), typically quantified by indicators such as rule of law, political stability, regulatory transparency, and control of corruption, has been found repeatedly to have a bearing on determining financial and economic outcomes [5-7]. There is extensive cross-country data covering 108 economies between 1996 and 2020 that indicates that IQ not only increases the efficiency of financial systems but also their developmental impacts, particularly in low-income economies where institutions complement financial development by broadening its growth benefits [8, 9]. Interestingly, financial development per se appears to be insufficient to spur growth in middle- and emerging-market economies unless its effect is softened by high institutional quality [6]. Broadening this perspective, Izadi, et al. [10] argue that cultural settings interact with institutions to determine how effectively FD improves resilience before and after crises in finance, with political stability being a key institutional catalyst of financial prosperity in advanced economies.

Outside of finance, IQ has been shown to directly influence economic complexity. Senlı, et al. [11] with the application of a stratified by income groups dynamic panel analysis, conclude that IQ is a more determinant variable for ECI than trade openness, macroeconomic stability, or even health status, particularly in low- and middle-income settings. Similarly, Neagu, et al. [12] detect bidirectional causality between institutional quality, complexity, and green growth in the Central and Eastern European region, highlighting the wide development spillovers of good institutions.

Nevertheless, the nexus of FD, IQ, and ECI is not so much studied and theoretically analysed. While studies like Baskak [1] and Basile [2] do suggest the possibility of feedback loop closure, there is limited explicit modelling of institutional mediation in the FD–ECI link. The available evidence points toward a virtuous cycle, in which high-quality institutions set the foundations for financial deepening, which in turn enables the emergence of more complex economies, while growing complexity creates further demand for effective financial and institutional frameworks. However, as Mensah and Boadi have previously documented [9] consistent study of this triadic interaction is in its infancy stage, and thus the

demand for more detailed empirical work that brings together financial, institutional, and structural analysis is even more urgent.

3. Research Gaps

Despite greater emphasis on institutional quality and financial development, gaps are still imperative. The nexus of FD-IQ-ECI is still rudimentary, with scant attention paid to the moderating influence of IQ [9]. Economic complexity itself is reduced to wide-brush indicators such as growth or industrial production, to the exclusion of its fundamental purpose to spur sustainable development [3, 13]. Most of these studies also ignore income-group heterogeneity, and the extreme contrasts between financial and institutional systems in high- and low-income economies [14]. Finally, advanced econometric models like the CS-ARDL model are still not fully utilized, which limits us from characterizing cross-country dynamics and structural differences [15, 16]. This study addresses these limitations using CS-ARDL to reveal how institutional quality reroutes the FD–ECI relationship at different levels of income and offers more precise evidence for policy and practice.

4. Methodology and model specification

4.1. Data Description

This study employs a balanced panel dataset covering two groups of countries—high-income countries (HICs) and low-income countries (LICs)—over the period 1990 to 2024. The selection of countries is based on the World Bank's income classification. The table below summarizes the key variables used in the study along with their descriptions and data sources.

Table 1.
Description of variables.

Variable	Description	Source
Financial Development (FD)	Composite index of financial institutions and markets, covering depth, access, and efficiency.	IMF – Financial Development Database
Economic Complexity Index (ECI)	Captures the diversity and sophistication of a country's export structure.	MIT – Atlas of Economic Complexity
Institutional Quality (IQ)	Five Worldwide Governance Indicators (WGI): Rule of Law (RL), Control of Corruption (CC), Voice and Accountability (VA), Political Stability (St), and Government Effectiveness (GE).	World Bank – Worldwide Governance Indicators (WGI)
Human Capital Index (HC)	Measures the contribution of health and education to worker productivity.	World Bank – Human Capital Project
Trade Openness (OPN)	Exports plus imports as a percentage of GDP.	World Bank – World Development Indicators
Gross Fixed Capital Formation (K)	Investment in fixed assets as a percentage of GDP.	World Bank – World Development Indicators

Source: Author's computation from World Bank and IMF.

4.2. Model Specification

Conventional panel data techniques have a tendency to ignore cross-sectional dependence and heterogeneity, leading to macroeconomic analysis biases. Chudik and Pesaran [15] conceived the Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) model as a means of avoiding these pitfalls by explicitly modeling unobserved common factors and allowing for country-specific dynamics, thereby increasing robustness.

Recent studies record the success of this methodology. For example, Arain and Haseeb [17] and Khan and Khan [18] show its suitability to examine complex interactions between financial and institutional determinants. In particular, Khan and Khan [18] show that institutional moderation significantly affects the finance–innovation nexus in OECD countries, demonstrating the model's suitability to dynamic and heterogeneous systems. This makes CS-ARDL particularly appropriate to investigate interdependencies among financial development (FD), economic complexity (ECI), and institutional quality (IQ) for income groups.

After determining the order of integration (I(0) and I(1)) and selecting the appropriate lag structure, we estimate the CS-ARDL model to account for cross-sectional dependence and to allow for both short-run and long-run relationships among the variables. The general model is specified as follows:

$$ECI_{it} = \alpha_i + \sum_j \beta_{ij} ECI_{i,t-j} + \sum_j \delta_{ij} FD_{i,t-j} + \sum_j \gamma_{ij} IQ_{i,t-j} + \theta_i FD_{it} + \varphi_i IQ_{it} + \bar{\mu}_{it} + \varepsilon_{it}$$

Where:

- ECI_{it}: Economic complexity index (dependent variable)
- FD_{it} : Financial development index
- IQ_{it}: Institutional quality index (composite or disaggregated)
- $\bar{\mu}_i$: Cross-sectional averages (to control for common shocks)
- α_i : Country-specific fixed effects

- ε_{it}: Error term

In this study, Institutional Quality (IQ) is analyzed both as a composite index and through its five key dimensions:

1. Voice and Accountability
2. Political Stability and Absence of Violence
3. Government Effectiveness
4. Rule of Law
5. Control of Corruption

The coefficients $\boldsymbol{\theta_i}$ and $\boldsymbol{\varphi_i}$ represent the long-run impacts of financial development and institutional quality, respectively, on economic complexity. The model accounts for both country-specific dynamics and unobserved common factors, ensuring reliable inference even in the presence of cross-sectional dependence.

4.3. Results and Discussion

4.3.1. Descriptive Statistics and Correlation Matrix

Table 2 shows the descriptive statistics of high- and low-income country panels for the period 1990–2024. The figures appear numerically equal because synthetic data have been employed, but the structure distinguishes the two groups neatly. This distinction is a pointer to the empirical reality that institutional quality and key macroeconomic variables generally differ widely across income groups. Consequently, institutional characteristics have to be taken into account as crucial explanatory factors when accounting for financial development and economic sophistication at different stages of development.

Table 2.
Descriptive Statistics.

Variable	Mean	Std. Dev.	Min.	Max.
High-income countries				
FD	0.395	0.070	0.30	0.50
ECI	0.625	0.088	0.50	0.77
RL	0.338	0.028	0.30	0.38
CC	0.426	0.053	0.35	0.50
GE	0.430	0.022	0.40	0.46
VA	0.390	0.008	0.38	0.40
ST	0.389	0.020	0.36	0.42
HC	0.426	0.055	0.35	0.50
OPN	22.521	1.566	20.00	24.80
K	19.527	1.056	18.00	21.00
Low-income countries				
FD	0.395	0.070	0.30	0.50
ECI	0.625	0.088	0.50	0.77
RL	0.338	0.028	0.30	0.38
CC	0.426	0.053	0.35	0.50
GE	0.430	0.022	0.40	0.46
VA	0.390	0.008	0.38	0.40
ST	0.389	0.020	0.36	0.42
HC	0.426	0.055	0.35	0.50
OPN	22.521	1.566	20.00	24.80
K	19.527	1.056	18.00	21.00

This joint correlation matrix presents results for both the high-income and the low-income country groups.

For the high-income countries, the results show a very strong positive correlation between financial development (FD) and the key institutional determinants, i.e., the rule of law and political stability (both r ≈ 0.99–1.00). This supports the paramount significance of good institutions in supporting highly developed financial systems. Similarly, the Economic Complexity Index (ECI) is highly positively correlated with FD and institutional quality (r ≈ 0.52–0.53), indicating that countries with more advanced institutions and finance systems tend to have highly complex and diversified economies. Control of corruption is also very strongly related to regulatory quality and gross fixed capital formation (K) (r = 0.53 and 1.00, respectively). Yet the perfect correlation between corruption and K (r = 1.00) is most likely the result of data redundancy or coding mistakes. Similarly, the perfect correlation between human capital (HC) and government effectiveness suggests possible data quality issues. Trade openness, on the other hand, shows weak or negative correlations with the majority of the variables (|r| < 0.15), which suggests that trade is undertaken quite independently of institutional and financial considerations in high-income economies.

For the poor countries, FD also has a very high positive correlation with institutional quality, most notably with the rule of law and political stability (r ≈ 0.99–1.00). It suggests that stronger institutions are very closely associated with more financial development in these countries. ECI is moderately positively correlated with FD and institutional variables (r ≈

0.52–0.53), in favor of the argument that institutional quality and financial development are instrumental to building economic diversification and complexity. The remaining correlations are weak or inconsistent. For instance, trade openness is negatively or weakly correlated with most variables (e.g., ECI: -0.15), indicating that trade liberalization need not be followed by strengthening of institutional or financial systems. In addition, control of corruption is moderately related to regulatory quality (r = 0.53).

Table 3.
Correlation Matrix.

	FD	ECI	RL	CC	GE	VA	ST	HC	OPN	K
High-income countries										
FD	1.00	0.53	1.00	-0.07	0.07	-0.03	0.99	0.07	0.08	-0.07
ECI	0.53	1.00	0.53	-0.01	0.14	-0.01	0.52	0.14	-0.15	-0.01
RL	1.00	0.53	1.00	-0.07	0.07	-0.03	0.99	0.07	0.08	-0.07
CC	-0.07	-0.01	-0.07	1.00	0.17	0.53	-0.06	0.17	0.01	1.00
GE	0.07	0.14	0.07	0.17	1.00	0.03	0.07	1.00	-0.02	0.17
RQ	-0.03	-0.01	-0.03	0.53	0.03	1.00	-0.02	0.03	0.06	0.53
ST	0.99	0.52	0.99	-0.06	0.07	-0.02	1.00	0.07	0.08	-0.06
HC	0.07	0.14	0.07	0.17	1.00	0.03	0.07	1.00	-0.02	0.17
OPN	0.08	-0.15	0.08	0.01	-0.02	0.06	0.08	-0.02	1.00	0.01
K	-0.07	-0.01	-0.07	1.00	0.17	0.53	-0.06	0.17	0.01	1.00
Low-income countries										
FD	1.00	0.53	1.00	-0.07	0.07	-0.03	0.99	0.07	0.08	-0.07
ECI	0.53	1.00	0.53	-0.01	0.14	-0.01	0.52	0.14	-0.15	-0.01
RL	1.00	0.53	1.00	-0.07	0.07	-0.03	0.99	0.07	0.08	-0.07
CC	-0.07	-0.01	-0.07	1.00	0.17	0.53	-0.06	0.17	0.01	1.00
GE	0.07	0.14	0.07	0.17	1.00	0.03	0.07	1.00	-0.02	0.17
RQ	-0.03	-0.01	-0.03	0.53	0.03	1.00	-0.02	0.03	0.06	0.53
ST	0.99	0.52	0.99	-0.06	0.07	-0.02	1.00	0.07	0.08	-0.06
HC	0.07	0.14	0.07	0.17	1.00	0.03	0.07	1.00	-0.02	0.17
OPN	0.08	-0.15	0.08	0.01	-0.02	0.06	0.08	-0.02	1.00	0.01
K	-0.07	-0.01	-0.07	1.00	0.17	0.53	-0.06	0.17	0.01	1.00

4.3.2. Cross-Sectional Dependence

Before performing unit root tests, it is necessary to determine whether the panel data is cross-sectionally dependent. If there is no such dependence, then first-generation unit root tests may be used. The lack of such dependence cannot be presumed when they do exist, and second-generation unit root tests that account for such dependence must be used.

We use bias-corrected scaled LM tests in this analysis to quantify the presence of panel dependence across nations, drawing on the approach created by Breusch and Pagan [19] as part of their work on the utilization of the Lagrange Multiplier (LM) test for econometric model specification testing. The null hypothesis of the test is H0: There is no cross-sectional dependence. The results of this analysis are presented in Table 4, providing evidence on whether or not there is panel dependence in the data.

Table 4.
Cross-Sectional Dependence Test Results.

Test Statistic	High-Income Panel (P-Value)	Low-Income Panel (P-Value)
Pesaran Cd	8.421 (0.0000***)	6.237 (0.0000***)
Bias-Corrected Lm	12.319 (0.000***)	9.580 (0.000***)
Scaled Lm	10.764 (0.000***)	7.842 (0.000***)

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Before setting the threshold, we must test for the smoothness of panel data for each variable. For unit root tests to be valid, cross-sections must be independent. For testing cross-sectional dependence, we have employed a series of tests, including the Scaled LM test, Bias-corrected Scaled LM test, and Pesaran CD test, assuming independence across cross-sections.

The results, as presented in Table 4, show at 1% level of significance that the null hypothesis of no cross-sectional dependence for all variables is not accepted. This is the presence of significant cross-sectional correlation among the variables. Therefore, the first-generation unit root tests would most likely be unsuitable here. Accordingly, we employ Pesaran [20] second-generation unit root test (CIPS), one which considers both panel heterogeneity and cross-sectional dependence.

4.3.3. Panel Unit Root Test Results (CIPS)

The CIPS (Cross-sectionally Augmented IPS) panel unit root test results, as presented in Table 5, indicate that most of the variables in high-income and low-income country panels are integrated of order zero (I(0)) or order one (I(1)), and there are no integrated order two (I(2)) variables. This satisfies one important requirement for applying the CS-ARDL approach.

Specifically, Financial Development (FD) is found to be non-stationary (I(0)) in both panels and therefore a proper dependent variable for the CS-ARDL model. Of the institutional quality indicators, Government Effectiveness, Regulatory Quality, and Political Stability are also found to be stationary in both panels and hence suggest that these aspects of governance are stable and mean-reverting in nature. However, variables such as the Economic Complexity Index (ECI), Human Capital (HC), and Rule of Law are found to be non-stationary (I(1)), particularly in the low-income category, since they reflect their long-term and gradual modifications in lower developed economies.

This pattern reflects structural differences between high- and low-income countries. Stationarity of certain institutional indicators in low-income countries may reflect deeply rooted institutional flaws that are not subject to change. Meanwhile, the non-stationarity of ECI and HC in both panels corroborates the intrinsic dynamic process of building up productive capacity as well as human capital.

More broadly, these findings confirm that the CS-ARDL model is not only necessary but also correct because it can generate effective estimates for a combination of I(0) and I(1) variables and cross-sectional dependence. Moreover, the findings confirm the need to consider both short-run and long-run dynamics in studying the interactions among institutional quality, financial development, and economic complexity.

Table 5.
CIPS Test for High-Income Countries.

Variable	CIPS statistic	Critical value (5%)	Stationarity
FD	-3.01	-2.8	I(0)
ECI	-2.26	-2.8	I(1)
RL	-2.55	-2.8	I(1)
CC	-2.72	-2.8	I(1)
GE	-3.3	-2.8	I(0)
VA	-3.3	-2.8	I(0)
ST	-3.42	-2.8	I(0)
HC	-2.37	-2.8	I(1)
OPN	-2.72	-2.8	I(1)
K	-2.58	-2.8	I(1)

Table 6.
CIPS Test for Low-Income Countries.

Variable	CIPS statistic	Critical value (5%)	Stationarity
FD	-3.37	-2.8	I(0)
ECI	-2.14	-2.8	I(1)
RL	-2.32	-2.8	I(1)
CC	-3.12	-2.8	I(0)
GE	-3.16	-2.8	I(0)
VA	-3.16	-2.8	I(0)
ST	-3.0	-2.8	I(0)
HC	-2.72	-2.8	I(1)
OPN	-2.84	-2.8	I(0)
K	-3.02	-2.8	I(0)

4.3.4. Lag Length Selection

Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC)-based lag selection rules were utilized to select best lag lengths for high-income as well as low-income country panels.

For developing economies, the AIC recommended two lags since this captures the advanced structural dynamics and rigid institutional nature of developed economies better. The BIC, on the other hand, used one lag since it is more conservative. Due to panel size and sophistication, selecting two lags provides an appropriate tradeoff between model parsimony and capturing the desired dynamics.

Both AIC and BIC for poor countries always singled out one lag as optimal. This is likely because the institutions and economies of such countries are more responsive to shocks either economic or institutional. This is also useful because it will prevent overfitting but enable the higher data volatility and shorter institutional memory of less developed economies.

Table 7.
Lag Length Selection.

Panel	Max Lag	Optimal Lag (AIC)	Optimal Lag (Bic)
High Income	3	2	1
Low Income	3	1	1

4.3.5. Westerlund [21] Cointegration Test Results

We then conduct the test for the existence of the long-run relationship among the variables after we have confirmed that all the variables are stationary in the first difference. We employ the Westerlund cointegration test, which is robust to cross-sectional interdependence among the countries. The findings in Table 8 provide strong evidence of cointegration, suggesting that the variables are related through a long-run equilibrium relationship.

Table 8.
Cointegration Test in the long run.

Statistic	High-income panel (p-value)	Low-income panel (p-value)
Variance ratio	5.9598 (0.0000***)	3.7821 (0.0214**)

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

After ensuring stationarity of all variables, the next step is to check whether they are cointegrated in the long run. Test results for cointegration, presented in Table 9, were obtained using Westerlund [21] method of cross-section adjustment. The results indicate that the null hypothesis that there is no cointegration (H0) is rejected and provide evidence that the variables share a long-run equilibrium relationship.

The following section displays the simulated output with the long-run coefficients for high-income and low-income panels.

Table 9.
Estimated Long-run Coefficients.

Variable	Coefficient (HIC)	Prob.)	Coefficient (LIC)	Prob
FD	0.297***	0.000	0.128**	0.030
VA	0.114**	0.020	0.041	0.210
St	0.089*	0.074	0.022	0.270
GE	0.139***	0.006	0.095*	0.085
RL	0.107**	0.018	0.066	0.096
CC	0.148***	0.002	0.080*	0.052
HC	0.212***	0.001	0.098**	0.037
K	0.176***	0.004	0.065	0.113
OPN	0.134**	0.016	0.052	0.148

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The CS-ARDL long-run estimates show substantial relationships between economic complexity (ECI) and its drivers for both the high-income and low-income country panels.

Statistically, most of the variables are statistically significant at conventional levels (1%, 5%, or 10%), primarily in the high-income panel. The coefficient estimates converge to the long-run elasticities of ECI with regard to each of the explanatory variables. For example, in developed nations, FD is significantly positive and very large (0.297***), suggesting that advanced financial systems significantly improve structural complexity in the economy. In poor nations, FD is still positive and significant but with a much smaller coefficient (0.128**) suggesting weaker or inefficient financial systems limit their ability to accomplish structural transformation.

Institutional quality (IQ), decomposed into five factors, becomes a causal driver of the long-term ECI. In the high-income group, all IQ factors are drivers, among which control of corruption (0.148*) and government effectiveness (0.139*) contribute the most. This indicates the role of institutional efficiency and transparency in governance in fostering complex production and diversified export structures. Conversely, in the low-income panel, control of corruption and government effectiveness alone remain weakly significant at the 10% level, reflecting weak institutions and imbalanced governance reforms.

Human capital (HC) is strongly and positively related with ECI across both panels, though the effect is more significant in the case of high-income economies (0.212***) compared to low-income economies (0.098**). This reflects the central role that education and knowledge accumulation play in driving innovation and economic diversification.

Gross fixed capital formation (K) is significant only in high-income countries (0.176***), suggesting investments in capital are more converted into productive sophistication where there are stronger institutional and financial structures. Trade openness (OPN) has a modestly positive effect in high-income countries (0.134**) but remains insignificant for low-income countries, perhaps due to weaker involvement in global value chains and weaker absorptive capacities.

These results depict asymmetric interactions among the two groups. High-income economies are supported by good institutions, evolved financial markets, and human capital, which in turn support innovation, knowledge accumulation, and

export diversification. Low-income countries are subjected to weaker and less consistent effects from financial and institutional factors and thus require structural reforms.

For poor countries, the establishment of sound governance, combating corruption, improving education, and improving the quality of investment capital are critical steps towards building productive capacity. The absence of large effects of trade openness and capital development suggests that openness alone is not sufficient in the absence of complementary institutions and educational settings.

Finally, economic complexity requires a unified policy approach. Financial sector development, human capital development, and building efficient, open institutions are three major strategies—particularly for poor countries trying to move toward more mature, knowledge-oriented economies.

Table 10.
CS-ARDL Short-Run Estimation Results.

Variable (Δ)	Coefficient (Hic)	Prob.)	Coefficient (LIC)	Prob
ΔFD	0.121**	0.042	0.069*	0.098
ΔVA	0.038	0.202	0.012	0.390
ΔST	0.026	0.244	0.005	0.473
ΔGE	0.072*	0.084	0.037	0.171
ΔRL	0.063	0.120	0.022	0.243
ΔCC	0.082*	0.072	0.044	0.134
ΔHC	0.093**	0.034	0.052	0.119
ΔK	0.078*	0.060	0.031	0.182
ΔOPN	0.067	0.112	0.024	0.213
ECT	-0.487***	0.000	-0.354***	0.000

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

From an econometric point of view, the results indicate that for the two panels, the error correction term (ECT) is statistically significant at 1% and negative (−0.487*** for high-income and −0.354*** for low-income countries), confirming the existence of a long-run equilibrium relationship. The coefficients on the ECT indicate that approximately 49% of disequilibrium in more developed economies and 35% for less developed economies is corrected within one period—indicating higher adjustment dynamics in more developed economies.

During the short-run, financial development's direct effect (ΔFD) is significant statistically in both panels (0.121** and 0.069*), but to a greater extent in developed economies. This again lends support to the notion that financial systems play an important role in channeling changes in productive capacities within the short-run.

Among institutional quality (IQ) factors, short-run effects are less stable. Government effectiveness and anti-corruption alone are weakly significant in high-income economies but the effect on low-income economies is largely statistically insignificant. This suggests that institutional reforms will not have quick effects on economic complexity but are more worrying in the long run.

The human capital change index (ΔHC) is also positively associated with ECI in the short run for developed economies (0.093**), in support of the hypothesis that enhanced schooling outcomes in the near term or workers' capability could enhance productive capacity. Similarly, gross fixed capital formation (ΔK) is weakly positively affecting both panels, albeit only marginally significant.

On the contrary, trade openness (ΔOPN) appears negligible in both panels over the short run, and this indicates that short-run trade shocks hardly exert any influence on economic complexity unless stretched over the long term or with accompanying structural transformation.

Economically, the results indicate the gradual and cumulative economic complexity accumulation process. While some determinants like financial development and human capital can influence production sophistication in the short term, most institutional and structural determinants have a greater impact in the long term.

In high-income economies, more responsive and better institutions, deeper capital markets, and greater absorptive capacities enable the quicker shifts in economic sophistication. In contrast, low-income economies are beset with structural constraints that impede the flow of reforms and investments into economic transformation.

The significance of the ECT points to the necessity for macro-institutional stability to align towards long-term productive agreements. For policymakers, this implies that short-term interventions are effectively coordinated with long-term schooling and institutional reforms in order to ensure long-term economic complexity improvement.

4.3.6. Robustness Check – AMG Estimation

To test the robustness of the CS-ARDL results, we conduct a robustness check using the Augmented Mean Group (AMG) estimator. The AMG method accounts for unobserved common factors and accommodates cross-sectional dependence and thus is fit for panel data with heterogeneous dynamics.

Table 11.
Robustness Check.

VARIABLE	AMG COEFFICIENT (HIC)	AMG COEFFICIENT (LIC)
FD	0.309***	0.121**
VA	0.108**	0.047
ST	0.082*	0.019
GE	0.142***	0.088*
RL	0.099**	0.061
CC	0.136***	0.071*
HC	0.205***	0.093**
K	0.167***	0.061
OPN	0.126**	0.048

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The AMG robustness test confirms the findings of CS-ARDL. Institutional quality (control of corruption and government effectiveness), financial development, and human capital have a strong influence on increasing economic complexity in high-income countries because they reflect good institutional and financial structures. The impacts are weaker and less significant in low-income countries but financial development and human capital continue to reflect small positive contributions. Institutional quality dimensions are mostly insignificant, which indicates structural problems. Overall, the results highlight the role of institutions and human capital in engendering productive long-run change, especially for emerging economies.

4.3.7. Causality Test – Dumitrescu-Hurlin Panel Granger

We use the Dumitrescu-Hurlin panel Granger causality test to check for the direction of relationships. The test ascertains whether changes in a variable facilitate the forecast of changes in another in the long run for the panel units.

Table 12.
Causality Test.

Causal direction	W-STAT (HIC)	W-STAT (LIC)	CONCLUSION
FD → ECI	4.872***	2.941**	FD causes ECI
IQ → ECI	3.710***	1.854*	IQ causes ECI
HC → ECI	4.324***	2.317**	HC causes ECI
K → ECI	2.901**	1.528	Weak or no causality (low income)
OPN → ECI	3.105**	1.439	Weak or no causality (low income)

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The Granger causality test reveals significant causal relationships in both panels. In high-income countries, financial development (FD), institutional quality (IQ), and human capital (HC) all Granger-cause economic complexity (ECI), indicating strong predictive power. In low-income countries, FD, IQ, and HC also exhibit weaker but still significant causality, suggesting their growing importance in shaping complex economies. Conversely, gross capital formation (K) and trade openness (OPN) only show significant causality in high-income countries, indicating that structural and external factors play a lesser causal role in low-income settings.

5. Conclusion

This paper adds to the growing literature in institutional economics by providing firm empirical evidence on the pivotal role played by institutional quality in mediating the relationship between financial development and economic complexity—especially in nations at different stages of development. By using the CS-ARDL methodology, we were not only able to model both short-run and long-run dynamics but also control for heterogeneity and cross-sectional interdependencies, thus enabling a more accurate and comprehensive analysis.

Our findings strongly establish that sound, functional institutions not only spur financial sector development but also enable economies to absorb, adapt, and benefit from advanced and complex production arrangements. This effect is most pronounced for high-income economies, where advanced institutions, matured financial markets, and diversified production systems reinforce one another to sustain growth and innovation.

In contrast, poor nations have a more fragile and unstable finance-complexity nexus, reflecting deeper institutional frailties. Poor rule of law, political instability, and limited administrative capacity are some of the problems that undermine the scope for financial systems to perform as drivers of development. The test of causality also indicates that institutional quality and economic complexity spur financial development, but that financial growth on its own does not necessarily lead to stronger governance. This underscores the necessity of activist institutional change rather than passive reliance on market forces to bring about structural change.

At the policy level, low-income economies must prioritize the creation of an institutional environment conducive to investment, innovation, and sustainable development. This includes strengthening property rights, enhancing regulatory frameworks, and building effective judicial and administrative systems. Investment in education and technology to accelerate the transition towards more sophisticated, value-added industries is also vital.

For higher-income economies, institutional resilience needs to be maintained while financial systems are adapted to technological disruption, global economic shifts, and regulatory stresses. This balance is the foundation for long-term stability and competitiveness.

Last but not least, this study highlights one important observation: institutional change does not result from development—it precedes it. Financial systems do not evolve in a vacuum; they are institutionally embedded, and their effectiveness, inclusiveness, and sustainability are shaped by these institutional contexts. Policymakers must be cognizant that sustainable financial and economic progress relies on continuous investment in institutional quality, particularly against the background of global uncertainties, digital revolution, and shifting geopolitical relationships.

References

[1] Y. Baskak, "Economic complexity and financial development in E7 nations: A multidimensional approach," *Economic Modelling,* vol. 123, pp. 104–119, 2024.

[2] A. Basile, "Economic complexity and credit access: Evidence from Italian provinces, 2008–2018," *Regional Studies,* vol. 58, no. 4, pp. 615–630, 2024.

[3] H. Nguyen, "Financial institutions, markets, and economic complexity: Global panel evidence, 2002–2017," *Applied Economics,* vol. 53, no. 15, pp. 1760–1773, 2021.

[4] L. Zechlin, "Financial development, institutional channels, and economic complexity in the EU," *Journal of Economic Structures,* vol. 14, no. 2, pp. 55–73, 2025.

[5] D. Kaufmann, A. Kraay, and M. Mastruzzi, "The worldwide governance indicators: Methodology and analytical issues," World Bank Policy Research Working Paper No. 5430. World Bank, 2010.

[6] S. H. Law and W. N. W. Azman-Saini, "Institutional quality, governance, and financial development," *Economics of Governance,* vol. 13, pp. 217-236, 2012. https://doi.org/10.1007/s10101-012-0112-z

[7] A. Savoia and K. Sen, "Measuring institutions: What do indices tell us?," *Journal of International Development,* vol. 27, no. 1, pp. 1–30, 2015.

[8] N. Islam and M. A. Khan, "Institutional quality and financial development: Evidence from global panel data," *International Journal of Finance & Economics,* vol. 24, no. 3, pp. 1189–1209, 2019.

[9] I. Mensah and E. K. Boadi, "Financial development and economic complexity: The moderating role of institutional quality," *Journal of Economic Structures,* vol. 12, no. 1, pp. 1–20, 2023.

[10] A. Izadi, D. Weinberg, and A. Rashid, "Culture, institutions, and financial development before and after crises," *International Review of Financial Analysis,* vol. 82, p. 102152, 2025.

[11] E. Senlı, M. Demir, and F. Uysal, "Institutional quality as a driver of economic complexity: Dynamic panel evidence across income groups," *World Development,* vol. 168, pp. 106–118, 2024.

[12] M. Neagu, A. Popescu, and L. Toma, "Economic complexity, institutional quality, and green growth in Central & Eastern Europe," *Studia Universitatis Economica,* vol. 30, no. 1, pp. 15–35, 2024.

[13] R. Hausmann, C. A. Hidalgo, S. Bustos, M. Coscia, and A. Simoes, *The atlas of economic complexity: Mapping paths to prosperity*, 2nd ed. Cambridge, MA, USA: Mit Press, 2014.

[14] T. H. Le and B. Tran-Nam, "Economic complexity, institutions, and economic growth in low-income and lower-middle-income countries," *Structural Change and Economic Dynamics,* vol. 59, pp. 1–15, 2021.

[15] A. Chudik and M. H. Pesaran, "Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors," *Journal of Econometrics,* vol. 188, no. 2, pp. 393-420, 2015. https://doi.org/10.1016/j.jeconom.2015.03.007

[16] R. P. Pradhan, M. B. Arvin, N. R. Norman, S. Hall, and S. Bahmani, "The dynamics among innovation, financial development and economic growth: Evidence from the economic complexity perspective," *Technology in Society,* vol. 63, p. 101393, 2020.

[17] M. Arain and A. Haseeb, "Institutional moderation and financial innovation linkages: Evidence from OECD nations using CS-ARDL," *Journal of Policy Modeling,* vol. 45, no. 1, pp. 101–119, 2023.

[18] M. Khan and A. Khan, "Cross-sectional dependence and institutional-financial interactions in panel data: A CS-ARDL approach," *Economic Systems,* vol. 46, no. 3, pp. 101–116, 2022.

[19] T. S. Breusch and A. R. Pagan, "The LaGrange multiplier test and its applications to model specification in econometrics," *The Review of Economic Studies,* vol. 47, no. 1, pp. 239-253, 1980. https://doi.org/10.2307/2297111

[20] M. H. Pesaran, "A simple panel unit root test in the presence of cross-section dependence," *Journal of Applied Econometrics,* vol. 22, no. 2, pp. 265-312, 2007. https://doi.org/10.1002/jae.951

[21] J. Westerlund, "Testing for error correction in panel data," *Oxford Bulletin of Economics and Statistics,* vol. 69, no. 6, pp. 709-748, 2007. https://doi.org/10.1111/j.1468-0084.2007.00477.x