

Authors' contribution/
Wkład autorów:
A. Study design/
Zaplanowanie badań
B. Data collection/
Zebranie danych
C. Statistical analysis/
Analiza statystyczna
D. Data interpretation/
Interpretacja danych/
E. Manuscript preparation/
Przygotowanie tekstu
F. Literature search/
Opracowanie
piśmiennictwa
G. Funds collection/
Pozyskanie funduszy

ORIGINAL ARTICLE
JEL code: O44, N20, C50
Submitted:
Septembet, 2025
Accepted:
October, 2025

Tables: 7
Figures: 0
References: 92

ORYGINALNY ARTYKUŁ
NAUKOWY
Klasyfikacja JEL: O44,
N20, C50
Zgłoszony:
wrzesień, 2025
Zaakceptowany:
październik, 2025

Tabele: 7
Rysunki: 0
Literatura: 92

**THE ASYMMETRIC EFFECT OF FINANCIAL DEVELOPMENT ON
ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM LOWER
AND UPPER MIDDLE INCOME COUNTRIES**

**ASYMETRYCZNY WPŁYW ROZWOJU FINANSOWEGO NA
WZROST GOSPODARCZY: DOWODY EMPIRYCZNE Z KRAJÓW
O NIŻSZYCH I WYŻSZYCH ŚREDNICH DOCHODACH**

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Citation: Ilarslan, K., Yıldız, M., (2025). The Asymmetric Effect of Financial Development on Economic Growth: Empirical Evidence from Lower and Upper Middle Income Countries. *Asymetryczny wpływ rozwoju finansowego na wzrost gospodarczy: dowody empiryczne z krajów o niższych i wyższych średnich dochodach. Economic and Regional Studies / Studia Ekonomiczne i Regionalne*, 18(4), 491-509, <https://doi.org/10.2478/ers-2025-0034>

Abstract

Subject and purpose of work: This study focuses on the effects of financial development on economic growth across two groups of countries with different income levels and aims to control for the roles of the rule of law and human development levels in this relationship. The study sample covering the period 2002-2022 consists of 40 lower-middle-income and 42 upper-middle-income countries selected countries.

Materials and methods: Analysis was conducted using the method of moment quantile regression, and the validity of the findings tested using simultaneous quantile regression.

Results: Because of the analysis, the level of human development and the rule of law have a negative impact on economic growth in both country groups. According to the most interesting finding of the study, the effect of financial development on economic growth is asymmetric.

Conclusions: For both groups of countries, challenges in achieving human development and the rule of law are significant obstacles to achieving inclusive economic growth through financial markets and institutions.

Keywords: Financial Development, Economic Growth, Rule of Law, Moment Quantile Regression

Streszczenie

Przedmiot i cel pracy: Niniejsze badanie koncentruje się na wpływie rozwoju finansowego na wzrost gospodarczy w dwóch grupach krajów o różnym poziomie dochodów i ma na celu kontrolę roli praworządności i poziomu rozwoju społecznego w tej relacji. Próba badawcza obejmująca lata 2002-2022 obejmuje 40 wybranych krajów o niższych średnich dochodach i 42 kraje o wyższych średnich dochodach.

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Journal included in: AgEcon Search; AGRO; Arianta; Baidu Scholar; BazEkon; Cabell's Journalytics; CABI; CNKI Scholar; CNPIEC – cnpLINKer; Dimensions; DOAJ; EBSCO; ERIH PLUS; ExLibris; Google Scholar; Index Copernicus International; J-Gate; JournalTOCs; KESLI-NDL; MIAR; MyScienceWork; Naver Academic; Naviga (Softweco); Polish Ministry of Science and Higher Education; QOAM; ReadCube, Research Papers in Economics (RePEc); SCILIT; Scite; SCOPUS, Semantic Scholar; Sherpa/RoMEO; TDNet; Ulrich's PeriodicalsDirectory/ulrichsweb; WanFang Data; WorldCat (OCLC); X-MOL

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Materiały i metody: Analizę przeprowadzono metodą regresji kwantylowej, a trafność wyników sprawdzono za pomocą jednoczesnej regresji kwantylowej.

Wyniki: Z analizy wynika, że poziom rozwoju społecznego i praworządności negatywnie wpływają na wzrost gospodarczy w obu grupach krajów. Zgodnie z najciekawszym odkryciem badania, wpływ rozwoju finansowego na wzrost gospodarczy jest asymetryczny.

Wnioski: Dla obu grup krajów wyzwania w zakresie rozwoju społecznego i praworządności stanowią istotną przeszkodę w osiągnięciu inkluzywnego wzrostu gospodarczego za pośrednictwem rynków finansowych i instytucji finansowych.

Słowa kluczowe: rozwój finansowy, wzrost gospodarczy, praworządność, regresja kwantylowa momentu

Introduction

Financial development (*findev*) stands out as one of the potential drivers of economic growth (*egrow*) (Kumar & Paramanik, 2020). The general view on the subject is that a developed financial system facilitates the transformation of savings into investments, increases the efficiency of capital allocation, and thus contributes to sustainable growth (Levin, 2005). Another view is that *findev* causes inefficiency in resource allocation and harms growth by increasing the risk of credit bubbles and institutional fragility. While the financial system paves the way for innovative and productive investments, it can also lead to financial instability and hinder growth when combined with factors such as weak institutional frameworks and insufficient human capital (Wen et al., 2022; Filfilan, 2022). Clearly, it is impossible to quantify the impact of *findev* on *egrow* using a single dimension or a simple linear relationship. Research consistently highlights that the connection between financial growth and economic development is a complex and non-linear process, influenced by individual countries' unique dynamics and institutional standards. (Samargandi et al., 2015; Arcand et al., 2015; Aghion et al., 2009).

A country's income level is one of the key factors underlying the differential impact of *findev* on *egrow*. Depending on the country's income level, *findev* can positively or negatively impact *egrow* through different mechanisms (He & You, 2024). Lower-income countries (*lmcount*) have limitations compared to developed countries in capital accumulation, access to finance, and the resources available in the infrastructure of these institutions (Ahmad et al., 2021). Improvements in *findev* in these countries bring about multifaceted effects, such as strengthening banking systems, transforming savings into investment, providing access to credit at affordable costs, allowing new players to enter the markets, paving the way for technological development through the allocation of resources to new technologies and R&D, and increasing capacity in existing production facilities (Mlambo, 2024). However, the crucial point here is to ensure the sustainability of *findev*. To achieve this, establishing a sound institutional infrastructure, implementing practical and applicable regulatory and supervisory mechanisms, and implementing actions to facilitate financial access should be priorities (Azmeah & Al-Raei, 2025; Alawi et al., 2022).

On the other hand, improvements in *findev* in upper-middle-income countries (*umcount*) can yield different outcomes. These countries have more advanced *findev* levels than lower-income countries, and their economic structures have reached a certain level of maturity. However, compared to developed countries, lower-income countries also face shortcomings in areas such as financial depth, inclusiveness, and the development of financial technologies. In this respect, while improvements in *findev* may present opportunities for these countries, they can also lead to financial vulnerabilities. Increased financial depth in these countries, driven by *findev*, can pave the way for diversified investments, leading to sustained growth (Beck et al., 2007). However, this diversification requires prioritizing efficiency, technological innovation, and development (Aghion et al., 2005). Another issue in these countries is the need to increase financial inclusion. This will enable rural individuals, small businesses, and low-income people to access financial services and become part of the financial ecosystem (Demirgüç-Kunt et al., 2015). In *umcount*, *findev* can increase the risk of financial fragility by causing excessive credit growth, external capital dependence, and vulnerability to financial shocks, which can endanger economic stability

(Ranciere et al., 2008). It is essential to improve *findev* in a balanced manner for both lower-income and *umcount*. Excessive and rapid growth can pose a threat to the economies of both countries.

Considering only financial instruments and economic data in explaining the *findev*'s stimulating/inhibiting impact on *egrow* can make it challenging to observe accurate results. Therefore, it is imperative to consider the impact of the social and institutional infrastructure that ensures the effective and reliable use of financial instruments and protects all actors in the system (Samargandi et al., 2015; Acemoglu et al., 2005; Beck et al., 2003; La Porta et al., 1997). For example, in countries where human capital is substantial, individuals play an essential role in strengthening the impact of *findev* on *egrow* because they are much more effective in the monetary system, can use financial tools and technologies, and have high entrepreneurial capacity (Durusu-Ciftci et al., 2017; Demirgüç-Kunt et al., 2017; Acemoglu et al., 2014). A strong, transparent legal system that combats corruption and protects property rights and contracting parties on an equal footing can be considered another factor that strengthens the impact of *findev* on *egrow*. In countries with a strong rule of law (*rlaw*), investor confidence increases, risk perception decreases for lenders, and financial intermediation costs decrease. A strong *rlaw* fosters trust, particularly for financial institutions, shaping its impact on *egrow* through institutional capacity (Beck et al., 2003; La Porta et al., 1997).

The multifaceted impact of *findev* on *egrow* is evident in assessments of lower and *umcount*. This impact has been a subject of research in academic literature from the past to the present. Although there are studies in the literature examining the effect of *findev* on *egrow* in a single country (Jalil & Feridun, 2011; Giri & Mohapatra, 2012; Adu et al., 2013; Adusei & Nkrumah, 2013; Kargbo et al., 2016; Ofori-Abebrese et al., 2017; Kumar & Paramanik, 2020; Camba & Camba, 2020), the abundance of studies conducted especially for countries with different income levels is also remarkable (Loayza & Ranciere, 2005; Al-Zubi et al., 2006; Hassan et al., 2011; Samargandi et al., 2015; Durusu-Ciftci et al., 2017; Murari, 2017; Iskandar, 2017; Sharma & Kumar, 2018; Matei, 2020; Wen et al., 2022; Filfilan, 2022; Abbas et al., 2022). In addition to the new indices created in recent years, it has been observed that different variables included in the analysis of the relationship between the two have brought the relationship to other dimensions. In this respect, the topic remains relevant, and the relationship between *findev* and *egrow* maintains its appeal.

In this context, the research aims to reveal the effects of *findev* on *egrow* through two different models for 40 *lmcount* and 42 *umcount*. The study used data from 2002 to 2022, and the Method of Moments Quantile Regression (MM-QR) method was used for estimation. It also aimed to reveal the impact of the human development index (*hudev*) and *rlaw* variables on this relationship. It's important that the impact of financial development on economic growth is not limited to financial and economic indicators alone. Countries' levels of socio-economic development and institutional infrastructures play a significant role in shaping this relationship. For example, while *hudev* reflects the extent to which economic growth impacts human well-being, the *rlaw* is critical to the sustainability and effectiveness of financial development. Including these variables in the model allows for a more holistic and realistic approach to the relationship between financial development and economic growth.

The research is expected to contribute to the literature from a new and significant perspective by: i) examining the heterogeneity of the results within two different income levels; ii) using the MM-QR to assess the distributional impact of *findev* on *egrow* across different segments (lower, middle, upper quantiles); iii) repeating the analyses using the Simultaneous Quantile Regression (SQ-REG) method to increase the methodological reliability of the research; and iv) adding explanatory power to the impact of *findev* on *egrow* within an institutional and social framework by incorporating the *hudev* index and the *rlaw* into the models. Furthermore, it will offer differentiated recommendations for policymakers according to different income groups and institutional capacity, which is valuable for faster translation of research results into concrete outputs.

The following next section of the study summarizes and discusses the relevant literature. The subsequent second section provides information on the research methodology and findings. The final section shares the research results and offers recommendations.

Literature

The relationship between *findev* and *egrow* has received extensive research in the literature, theoretically and empirically. Pioneering studies emphasize the significant catalytic effect of *findev* on growth (Schumpeter, 1911; Gurley & Shaw, 1960; Goldsmith, 1969; McKinnon, 1973). While classical and neoclassical growth models often consider the financial system the backdrop for growth, recent growth theories argue that *findev* facilitates resource allocation, increases investment, and contributes to growth through technological innovation (Levine, 2005). Robinson (1952) argues that the financial system develops following the emergence of entrepreneurship and economic activity. It is generally argued that as economic activity increases, the financial system evolves to meet growing and diversified needs. Patrick (1966), who added a new dimension to these views, focused on the “supply-leading” and “demand-following” theories, arguing for a two-way causality between *findev* and *egrow*. In this context, supply-leading theory is based on the idea that “*findev* triggers growth”, while demand-following theory is based on the idea that “growth triggers *findev*”. In the early stages of growth, the financial system plays a leading role and accelerates *egrow*. In later stages, as *egrow* increases, the financial sector responds to growth by responding to needs. Because this study investigates the impact of *findev* on *egrow*, the relevant literature will be limited in scope. Furthermore, the effects of the control variables included in the study, the *hudev* index and the *rlaw*, on *egrow* will be discussed, and the research hypotheses will be presented.

Financial Development and Economic Growth

Studies investigating the impact of *findev* on *egrow* demonstrate that this impact is not negative/positive, linear/curvilinear, or unconditional; in other words, it can produce multifaceted results. Another noteworthy aspect is that when examining this impact, considering countries’ income levels or factors that are likely to influence this relationship (institutional structure, financial and technological infrastructure, etc.) can differentiate the results. On the other hand, the variable used as an indicator of financial development in the studies may also cause this difference (Adu et al., 2013). Among these, loans related to the banking sector have frequently been included in studies as an indicator of financial development (Batrancea et al., 2023; Ho & Saadaoui, 2022; Elfaki et al., 2021; Hacievliyagil & Eksi, 2019).

In parallel with *findev*, financial deepening leads to increased capital accumulation, supporting growth, particularly in the long run (Loayza & Ranciere, 2005; King & Levine, 1993). Levine and Zervos (1998) confirmed the short- and long-term growth effects on banks and markets. A stable and efficient financial system contributes positively to *egrow* by improving the investment environment and accelerating capital formation (Gizaw et al., 2024). Additionally, an effective financial system reduces the costs of financial transactions by reducing information asymmetry between lenders and borrowers (Levine, 2005). This facilitates access to finance for both households and businesses. Furthermore, easy and rapid financing, particularly for innovative ideas and initiatives, allows for the development of new products and processes, accelerating long-term growth (Shane & Venkataraman, 2000). Numerous studies in the literature reveal the positive effect of *findev* on *egrow* (Abbas et al., 2022; Kumar & Paramanik, 2020; Camba & Camba, 2020; Durusu-Ciftci et al., 2017; Ofori-Abebrese et al., 2017; Murari, 2017; Iskandar, 2017; Kargbo et al., 2016; Adusei & Nkrumah, 2013; Giri & Mohapatra, 2012; Jalil & Feridun, 2011; Hassan et al., 2011).

Contrary to the positive impact of *findev* on *egrow*, increasing studies, particularly after the 2008 global financial crisis, indicate that *findev* can have a negative effect on *egrow* under various conditions and when it deepens excessively, as articulated in the “too much finance” hypothesis (Arcand et al., 2015). Uncontrolled and excessively rapid deepening can lead to vulnerabilities in the financial system, and the accompanying poor governance and excessive debt problems can ultimately lead to financial crises (Mishkin, 2011). The fact that the financial sector is very profitable may cause the skilled workforce to choose the financial sector instead of manufacturing, R&D activities, or jobs that lead to technological development, which may lead to a decrease in innovation and productivity in the real sector and ultimately

a slowdown in growth (Philippon & Reshef, 2013). When broadly inclusive *findev* is not achieved, those with easier access to markets are more likely to benefit, which can increase income inequality and limit long-term growth (Demirgüç-Kunt & Levine, 2009; Beck et al., 2007). Some studies reveal the negative impact of *findev* on *egrow* (Wen et al., 2022; Samargandi et al., 2015). Some studies have focused on whether the relationship between *findev* and *egrow* is linear. Matei (2020), investigating the nonlinearity of the relationship between the two variables, found an inverted-U-shaped structure in his findings, demonstrating that *findev* positively affects growth up to a certain threshold, after which the effect turns negative.

One of the most important factors underlying the differential impact of *findev* on *egrow* is undoubtedly countries' income levels. Rioja and Valev (2004) argue that in lower- and middle-income countries, *findev* affects growth through new investments, while in high-income countries, this increase is driven by productivity. Focusing on 26 *lmcount* and 18 *umcount*, Abbas et al. (2022) demonstrate that *findev* contributes to growth for both income groups. Still, this effect is more pronounced in the upper-middle group of countries. Filfilan (2022), on the other hand, found no significant impact on *umcount* but a positive and significant effect in middle- and high-income countries. Samargandi et al. (2015), who conducted a similar study, examined 23 *umcount* and 29 *lmcount* and determined that the effect of *findev* on *egrow* was negative in *umcount* and had no significant impact in *lmcount*. These studies, conducted across income groups, demonstrate that the effects of *findev* on growth should be investigated by considering not only financial indicators but also structural and institutional characteristics. Furthermore, financial reforms and policies should be determined within this framework. Following the literature review, while *findev*'s negative/positive impact on *egrow* varies, a generally significant impact is expected. Based on this, the study's first hypothesis is expressed as follows.

H₁: Financial development has a significant impact on economic growth.

Economic Growth and Human Development Index

The supportive impact of *findev* on *egrow* depends not only on the availability of financial instruments or increased access to them, but also on the existence of the social and institutional infrastructure that facilitates the effective and reliable use of these instruments. Recent literature on the subject has been enriched by including these factors in research. The *hudev* index is considered a key indicator of human capital infrastructure. Human capital plays a critical role in creating quality human resources to enhance *egrow*, leading to higher productivity and *egrow* (Ramadhani, 2021). Iskandar (2017) also demonstrated the positive impact of the *hudev* index on *egrow* through an empirical study. A high level of *hudev* increases the depth of financial markets, facilitates the use of more complex and technology-based financial products and services, and helps the financial system provide more efficient funding to the real economy (Campbell, 2006). Furthermore, a high level of *hudev* may be associated with a more equitable income distribution (Ghifara et al., 2022). This index is included in studies investigating the impact of *findev* on growth because it provides essential information about areas such as education, health, and living standards. Many studies emphasize the index's positive impact on growth (Hoa et al., 2016; Elistia & Syahzuni, 2018; Taqi et al., 2021). Furthermore, one of the controversial points in the literature on this topic is which variable influences the other. Public expenditure for this purpose can negatively impact growth when they exceed a certain level (Barro, 1996). Especially in countries with high *hudev* levels, policies aimed at improving welfare can reduce individuals' motivation to work and produce, negatively impacting growth by lowering total factor productivity (Gylfason, 2001). In countries where welfare is prioritized, growth can be relegated to the background (UNDP, 2019). In this respect, the positive/negative impact of the *hudev* index on *egrow* remains unclear in the literature. Following this assessment, the second hypothesis of the study is as follows.

H₂: The human development index has a significant impact on economic growth.

Economic Growth and the Rule of Law

Safeguarding the rights of both the lending institution and the borrowing individual or firm within the financial system increases the system's effectiveness (Acemoglu et al., 2005). In this respect, in countries with a strong *rlaw*, trust in the functioning of the financial system increases and the conversion of savings into investment becomes easier, strengthening the impact on growth (La Porta et al., 1997). In lower- and middle-income countries, weak institutional structures limit the depth of the financial system, leading to inefficient use of resources (Acemoglu et al., 2005; Beck et al., 2003). Haggard and Tiede (2011) stated that in their studies examining the concept of the *rlaw* from different perspectives, they did not find high correlations between the relevant dimensions, especially in developing countries. It is emphasized that the impact of combating corruption on growth may be more significant than the property rights dimension. The study argues that examining the *rlaw* through the dimensions of "security, judicial independence, property rights, and corruption" yields more effective results. Ozpolat et al. (2016) demonstrate that institutional effectiveness positively affects growth in developed countries, but this effect is weak or negative in developing countries. One of the study's key findings is that the *rlaw*'s effectiveness on growth can be enhanced when implemented alongside the principles of equality, transparency, and accountability, rather than in isolation. In their study of 41 countries, Shevchuk et al. (2021) emphasized the contradictory results, stating that the *rlaw* has a positive impact on growth in some countries and a negative impact in others. Aydin and Karabulut (2024), in their study of 43 middle-income countries, concluded that the *rlaw* positively impacts growth only in some countries. While the effect of the *rlaw* on *egrow* appears generally positive, the effect can be reversed in some cases. Changing existing legal regulations is tricky in countries with a strong *rlaw*. This situation complicates structural reforms, adaptation to new technologies, and economic liberalization, limiting overall economic dynamism and potentially negatively impacting the economy (Aydin & Karabulut, 2024). This negative impact is particularly pronounced in transition economies and countries where democratization has not yet reached maturity (Butkiewicz & Yanikkaya, 2006; Shevchuk et al., 2021). Examining the results of studies examining the impact of the *rlaw* on *egrow* reveals that institutional reforms cannot be the same for every country. For institutions to positively impact *egrow* they must be shaped by the dynamics of countries, and other institutional elements must also be considered in this process. The impact of the *rlaw* on *egrow* is also uncertain. Therefore, the final hypothesis of the study is defined as follows.

H₃: The rule of law has a significant impact on economic growth.

Research Methodology

Data

The study concentrates on middle-income countries, as classified by the World Bank using the Atlas method for the fiscal year 2025. This classification is based on the GNI per capita income threshold. According to this method, countries with a GNI per capita income between \$1,146 and \$4,515 are categorized as *lmcount*, while those with incomes between \$4,516 and \$14,005 are classified as *umcount*. Although the dataset covers the period 2002-2022, the classification of countries into lower-middle-income and upper-middle-income is based on the World Bank's Atlas methodology for fiscal year 2025. This approach uses a fixed classification year (2025) to ensure consistency and comparability of country groups across the study period, as many countries may have transitioned between income categories during this time period. In this respect, the study sample consists of 40 *lmcount* and 42 *umcount* selected from among the countries whose data are as regular as possible. The countries listed in Table A1 in the appendix at the end of the study. The dependent variable for this study, which covers the period from 2002 to 2022, is *egrow*, and the data were obtained from the official World Bank website. Among the independent variables, the data for the *hudev* index was obtained from the United Nations website, the *findev* index came from the International Monetary Fund (IMF) website, and the *rlaw* variable was sourced from the World

Bank website. A summary of the abbreviations, sources, and scope information for the variables used in this study can be found in Table 1 below.

Table 1. Summary information about variables

Variable	Abbreviation	Period	Source
Economic growth	egrow	2002-2022	https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG
Human development index	hudev	2002-2022	https://hdr.undp.org/data-center/human-development-index#/indicies/HDI
Financial development index	findev	2002-2021	https://legacydata.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b
Rule of law	rlaw	2002-2022	https://www.worldbank.org/en/publication/worldwide-governance-indicators

Source: Prepared by the authors.

Method

In this study, the MM-QR method developed by Machado and Silva (2019) was utilized, and it has gained significant popularity in recent years. Unlike traditional linear regression techniques that depend on mean values, MM-QR emphasizes the conditional distribution of the dependent variable, offering a more comprehensive understanding of the relationship between dependent and independent factors. Relying solely on mean estimates can result in biased and unrepresentative outcomes. MM-QR effectively addresses datasets with outliers, non-normality, or non-parametric structures, ensuring unbiased and reliable results (Ostic et al., 2025). Additionally, as highlighted in the studies by Ridwan et al. (2024) and Almulhim et al. (2025), the MM-QR approach is more robust and widely accepted, particularly when addressing issues of heterogeneity and endogeneity, as well as in developing asymmetric nonlinear relationships. Indeed, it was observed that there was an endogeneity problem for both country groups, non-linear restrictions were valid, asymmetric effects were valid and heterogeneity was present, and the test results for these were given in Table A2 in the Appendix section. The functional and econometric model used in this study, which is inspired by the works of Wei et al. (2024) and Jahanger et al. (2023), can be presented as follows.

$$egrow = f(findev, hudev, rlaw) \tag{1}$$

$$egrow_u = \beta_0 + \beta_1 findev_u + \beta_2 hudev_u + \beta_3 rlaw_u + \mu_u \tag{2}$$

The conditional quantile estimates $Q_\tau(\tau|X)$ for quantile-based relationships between variables are shown in the equation (3) below.

$$Y_u = \alpha + X_u' \beta + (\zeta + Z_u' \psi) U_u \tag{3}$$

Here, Y_u and X_u are the explained variables, respectively, and are independent and identically distributed. Also α , β , ζ , ψ denote the coefficients to be estimated. $P\{\zeta + Z_u' \psi > 0\} = 1$ and Z is a k-vector of known components of X . U_u is orthogonal to X_u and consistently satisfies the moment conditions that do not involve strict heterogeneity. The model in equation 3 can be rewritten as follows.

$$Q_\tau(\tau|X_u) = (\alpha + \zeta, q_{(\tau)}) + X_u' \beta + Z_u' \psi q_{(\tau)} \tag{4}$$

Here, $Q_y(\tau|X_{it})$ is the quantile distribution of the dependent variable Y_{it} (*egrow*), X_{it} is a vector of explanatory variables represented by *findev*, *hudev*, and *rlaw*. i is the individual cross-section, and t is the time period.

Empirical Analysis and Findings

The econometric strategy used in this study is outlined as follows. First, descriptive statistical tests were conducted to gather general information about the variables. Next, we tested cross-sectional dependence and slope homogeneity, and we assessed the stationarity of the variables using unit root tests. Finally, we estimated the relationships between the variables using panel quantile regression analysis, which is a fundamental analytical method.

Descriptive Statistics

The results of descriptive statistical tests, which provided preliminary information about the general structure and characteristics of the variables used in the study, are shown in Table 2.

Table 2. Descriptive statistical test results

Variables	Lower-middle income countries				Upper-middle income countries			
	<i>egrow</i>	<i>hudev</i>	<i>findev</i>	<i>rlaw</i>	<i>egrow</i>	<i>hudev</i>	<i>findev</i>	<i>rlaw</i>
Panel A: Basic statistical tests								
Mean	4.321	0.588	0.180	-0.643	3.590	0.732	0.244	-0.301
Median	4.500	0.578	0.153	-0.725	3.850	0.738	0.212	-0.402
Max.	18.333	0.782	0.583	1.271	86.826	0.861	0.740	1.023
Min.	-20.805	0.377	0.026	-1.737	-50.338	0.536	0.000	-1.882
Std.Dev.	3.773	0.087	0.104	0.559	6.829	0.057	0.171	0.587
Skewness	-0.911	0.116	1.232	0.645	1.317	-0.532	0.663	0.332
Kurtosis	7.128	2.114	4.163	3.114	36.427	3.342	3.034	2.384
J-B	712.735	29.323	247.555	58.845	41319.64	46.024	61.745	30.183
propability	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
Panel B: Correlation analysis								
<i>egrow</i>	1				1			
<i>hudev</i>	-0.114	1			-0.091	1		
<i>findev</i>	-0.012	0.523	1		-0.103	0.081	1	
<i>rlaw</i>	-0.121	0.403	0.458	1	-0.076	0.110	0.418	1

Source: Prepared by the authors.

According to the data in Table 2, lower-middle income countries perform better than the other country groups regarding average *egrow* rate. In contrast, *umcount* perform better in terms of all other variables' mean and median values. The variable with the highest standard deviation is related to *egrow* in *umcount*. Studies by Kim et al. (2025), Cain et al. (2017), and Bai and Ng (2005) indicate that the skewness and kurtosis values of the variables deviate significantly from 0 and 3. This provides early evidence that the assumption of normality is not satisfied. The skewness and kurtosis values of the variables included in the study are far from 0 and 3, and according to the probability values of the Jarque-Bera test statistics, none of the variables exhibit a normal distribution. These findings suggest that nonparametric methods are more appropriate for analyzing the relationships between variables. According to the correlation analysis results, both country groups have a negative correlation between the dependent and independent variables.

Cross-Section Dependency

Wang et al. (2024) emphasize that one of the most important diagnostics for researchers to assess before conducting a panel data study is the presence of cross-sectional dependence and homogeneity. Traditional econometric techniques may yield inconsistent and unreliable results when these factors are present. Therefore, there is a general understanding that testing for cross-sectional dependence is a fundamental starting point for panel data analyses. In panel data analysis, cross-sectional dependence is highly likely due to the social, economic, and cultural relationships among the units in the dataset. This would lead to a commonality problem arising from any economic transition between units in the panel dataset. Therefore, the presence of cross-sectional dependence can lead to biased test statistics and a loss of efficiency in estimators, leading to misleading results (Ruiz et al., 2025; Rai & Raju, 2025; İlkay & Bilgili, 2025). According to the studies by Baghirov and Sarkhanov (2025) and Bölükbaş and Szymanska (2025), when the cross-sectional dimension (N) exceeds the time dimension (T) (i.e., $N > T$), researchers should employ Pesaran's CD test to assess cross-sectional dependence among the variables in the panel data set.

Table 3. Cross-sectional dependency test results

Variables	Lower-middle income countries		Upper-middle income countries	
	test statistics	p-value	test statistics	p-value
egrow	37.97	[0.000]***	60.13	[0.000]***
hudev	120.55	[0.000]***	115.18	[0.000]***
findev	46.51	[0.000]***	58.98	[0.000]***
rlaw	8.09	[0.000]***	0.05	[0.959]

Note: Significance level: ***1%

Source: Prepared by the authors.

The Pesaran CD test null hypothesis posits that there is cross-sectional independence among the observations. Table 3 shows that we reject the null hypothesis of no cross-sectional dependence for all variables in *lmcount* at the 1% significance level. In *umcount*, the null hypothesis was rejected for all variables except for the *law* variable. These results indicate that a shock to any variable within a country in the dataset will also affect the same variable in other countries within the panel. Based on these findings, it was determined that second-generation panel unit root tests, which account for cross-sectional dependence, should be used to test the stationarity of the *grate*, *findev*, and *human* variables. In contrast, first-generation panel unit root tests were chosen for the *law* variable.

Slope Homogeneity Test

Before conducting empirical analysis, it is important to check the homogeneity of the slope coefficients. When the slope coefficients are heterogeneous, the impact of an explanatory variable on the dependent variable can differ based on the values of another variable (van Hek et al., 2024). According to Zhang et al. (2025), testing for slope heterogeneity is crucial because panel data models with variable slopes can result in biased estimates if considered homogeneous.

Table 4. Homogeneity test results

	Lower-middle income countries				Upper-middle income countries			
	Pesaran, Yamagata (2008) test		Blomquist, Westerlund (2013) test		Pesaran, Yamagata (2008) test		Blomquist, Westerlund (2013) test	
$\tilde{\Delta}$	6.383	[0.000]***	5.387	[0.000]***	1.998	[0.046]**	2.855	[0.004]***
$\tilde{\Delta}_{adj}$	7.371	[0.000]***	6.221	[0.000]***	2.306	[0.021]**	3.296	[0.001]***

Note: Significance level: ***%1, **%5

Source: Prepared by the authors.

The results in Table 4 show that the null hypothesis, which accepts the assumption of homogeneity in both tests, is rejected at the 1% significance level. These results indicate that the model coefficients are heterogeneous, and the slope varies across sections.

Stationarity Analysis

The Cross-Sectionally Augmented Im, Pesaran, and Shin (CIPS) test was applied in the study to test the stationarity of the variables, a test which is one of the second-generation panel unit root tests, known for producing reliable results in the presence of cross-sectional dependence and data heterogeneity. Salim et al. (2025) and Shahnazi et al. (2025) state that the CIPS unit root test is a frequently employed technique for examining unit roots in panel data. This test produces more accurate outcomes by incorporating extra details from the cross-sectional aspects of the panel data set and considering potential correlations between the variables across sections. This test aids in identifying unit roots by examining the existence of cross-sectional dependence. The CIPS test examines the null hypothesis that all series possess unit roots and are non-stationary.

Table 5. Panel unit root test results

	Lower-middle income countries				Upper-middle income countries			
	egrow	hudev	findev	rlaw	egrow	hudev	findev	rlaw
CIPS	-3.432***	-2.436***	-2.121*	-2.565***	-3.264***	-2.176**	-2.756***	
LLC								-2.957***

Note: Significance level: ***%1, **%5, *%10

Source: Prepared by the authors.

According to the results presented in Table 5, the null hypothesis of the CIPS test, which stated that the variables have a unit root, was rejected for all variables in lower-middle income countries and for all variables except the law variable in upper-middle income countries. Similarly, the null hypothesis of the LLC unit root test for the law variable was also rejected. According to these results, all variables are stationary at their levels. In other words, all variables are stationary at degree I(0).

Baseline Analysis Results

Analyses were conducted using the MM-QR method, a non-parametric approach, to estimate the impact of *findev*, *hudev*, and the *rlaw* on *egrow* across various quantile levels. The results are displayed in Table 6 below.

Table 6. MM-QR results

Panel A: Lower-middle income countries									
	10	20	30	40	50	60	70	80	90
hudev	-7.527 [0.033]**	-6.539 [0.010]**	-5.922 [0.006]***	-5.525 [0.004]***	-5.115 [0.004]***	-4.661 [0.006]***	-4.222 [0.012]**	-3.795 [0.032]**	-3.223 [0.108]
findev	5.017 [0.059]*	4.527 [0.027]**	4.220 [0.015]**	4.023 [0.010]**	3.819 [0.008]***	3.5949 [0.008]***	3.376 [0.013]**	3.164 [0.026]**	2.879 [0.074]*
rlaw	-0.098 [0.834]	-0.412 [0.253]	-0.609 [0.045]**	-0.735 [0.008]***	-0.865 [0.001]***	-1.010 [0.000]***	-1.149 [0.000]***	-1.285 [0.000]***	-1.467 [0.000]***
c	3.653 [0.055]**	4.769 [0.001]***	5.467 [0.000]***	5.915 [0.000]***	6.379 [0.000]***	6.892 [0.000]***	7.388 [0.000]***	7.871 [0.000]***	8.518 [0.000]***
Panel B: Upper-middle income countries									
hudev	-7.231 [0.281]	-8.342 [0.104]	-8.895 [0.050]**	-9.364 [0.025]**	-9.756 [0.015]**	-10.157 [0.011]**	-10.624 [0.011]**	-11.161 [0.015]**	-11.980 [0.031]**
findev	-0.370 [0.864]	-1.733 [0.293]	-2.411 [0.097]*	-2.986 [0.026]**	-3.468 [0.007]***	-3.960 [0.002]***	-4.533 [0.001]***	-5.192 [0.000]***	-6.196 [0.001]***
rlaw	1.178 [0.077]*	0.459 [0.358]	0.101 [0.817]	-0.201 [0.618]	-0.455 [0.242]	-0.715 [0.066]*	-1.017 [0.012]**	-1.364 [0.002]***	-1.894 [0.001]***
c	3.605 [0.467]	7.155 [0.057]*	8.923 [0.007]***	10.422 [0.001]***	11.676 [0.000]***	12.958 [0.000]***	14.451 [0.000]***	16.167 [0.000]***	18.783 [0.000]***

Note: Significance level: ***%1, **%5, %10

Source: Prepared by the authors.

The results shown in Table 6 reveal that the human variable negatively impacts *egrow* in both groups of countries. This negative effect is statistically significant at *lmcount'* first eight quantile levels and *umcount'* middle and high quantile levels. Several arguments can be made regarding the diminishing impact of human variables on *egrow*. The *hudev* index indicates a long and healthy life, quality education, and a higher standard of living. Consequently, the government must invest significantly in these areas to improve education and healthcare services. Investments in infrastructure and technology demand substantial financial resources. Additionally, these investments often take time to produce results, and the return on investment may not be immediate. As a result, efforts to enhance *hudev* in middle-income countries could potentially have a short-term negative impact on *egrow*. Another possible explanation for the observed economic trends is the prevalence of illegal activities within certain country groups, such as corruption and the shadow economy. These factors could lead to inefficiencies in public investments and ultimately hinder *egrow*. An exciting finding from the study is the asymmetric effect of *findev* on *egrow*. *Findev* appears to boost *egrow* in *lmcount*, while it has a detrimental effect in *umcount*. The following arguments can be made to explain this situation. In *lmcount*, financial institutions and markets are still developing, which can positively impact *egrow* through benefits like job creation. Moreover, the financial system in these countries helps facilitate *egrow* by directing funds to both individual and institutional investors. In contrast, *umcount* face challenges such as poor institutional quality, biased credit allocation, and the diversion of funds to inefficient sectors. Additionally, the concentration of financial resources in the hands of a limited number of elite individuals or firms hinders broad-based and inclusive *egrow*. The study indicates a negative impact of the *rlaw* on *egrow* in both *lmcount* and *umcount*. This negative effect is statistically significant at the middle and high quantile levels for *lmcount*, and at the high quantile levels for *umcount*. This suggests that economic activity in these countries may often rely on illegal practices. Specifically, informal economic activities such as corruption, nepotism, and smuggling tend to decrease as the *rlaw* strengthens. Consequently, the fair application of laws and the accountability of public authorities and politicians limit illegal profits in these nations, which in turn can hinder *egrow*.

Robustness Analysis Results

We estimated coefficients using an alternative approach to ensure the accuracy and generalizability of the results from the study's initial analysis method. This involved conducting analyses with the SQ-REG method, and the findings are presented in Table 7 below. Unlike traditional quantile regression, SQ-REG preserves the exact standard error estimates when constructing a covariance matrix via bootstrap procedures, enabling the simultaneous estimation of auxiliary variables for multiple quantiles. This advanced approach enables direct statistical comparison of coefficients across various quantiles, permitting us to test for significant differences in parameter estimates across quantiles, construct robust confidence intervals, and systematically evaluate the strength and consistency of our MM-QR findings through the conditional distribution of *egrow* (Abbas et al., 2025; Isayev et al., 2024).

Table 7. Simultaneous panel quantile regression analysis results

Panel A: Lower-middle income countries									
	10	20	30	40	50	60	70	80	90
hudev _n	-9.493 [0.016]**	-6.195 [0.040]**	-2.498 [0.412]	-2.566 [0.221]	-2.664 [0.178]	-2.790 [0.092]*	-1.406 [0.414]	-3.321 [0.026]**	-4.240 [0.227]
findev	7.657 0.104]	6.867 0.001]***	4.663 [0.020]**	3.953 [0.024]**	4.509 [0.031]**	4.279 [0.036]**	3.444 [0.032]**	3.984 [0.001]***	3.140 [0.022]**
rlaw	0.076 [0.906]	-0.466 [0.267]	-1.050 [0.006]***	-0.783 [0.053]*	-0.685 [0.090]*	-1.090 [0.002]***	-1.050 [0.014]**	-1.055 [0.005]***	-1.079 [0.022]**
C	4.435 0.023]**	4.069 [0.008]***	3.089 [0.033]**	4.150 0.000]***	4.985 [0.000]***	5.504 [0.000]***	5.758 [0.000]***	7.587 [0.000]***	9.224 [0.000]***
Panel B: Upper-middle income countries									
hudev	-12.834 [0.066]*	-9.864 [0.034]**	-7.201 [0.007]***	-5.837 [0.042]**	-6.239 [0.009]***	-7.652 [0.000]***	-7.224 [0.017]**	-4.717 [0.390]	-14.506 [0.029]**
findev	-1.905 [0.591]	-0.146 [0.943]	-1.013 [0.527]	-2.138 [0.084]*	-2.328 [0.026]**	-2.446 [0.001]***	-2.594 [0.020]**	-4.263 [0.000]***	-3.175 [0.050]**
rlaw	0.623 [0.406]	-0.139 [0.747]	-0.152 [0.737]	0.404 [0.293]	0.177 [0.436]	-0.006 [0.981]	-0.527 [0.169]	-0.799 [0.053]*	-1.934 [0.000]***
c	8.020 [0.121]	7.710 [0.025]**	7.315 [0.001]***	7.799 [0.000]***	9.009 [0.000]***	10.909 [0.000]***	11.398 [0.000]***	11.333 [0.005]***	19.722 [0.000]***

Note: Significance level: ***%1, **%5, *%10

Source: Prepared by the authors.

The results obtained from the simultaneous quantile regression method indicate that the level of *hudev* adversely affects *egrow* in both groups of countries. Additionally, the analysis confirmed the asymmetric impact of *findev* on *egrow* in these two country groups. While the negative effect of the *rlaw* on *egrow* was evident for both groups, this effect was significant at all quantile levels except for the first two in *lmcount* and at the highest quantile levels in *umcount*. Consequently, the findings from the SQ-REG analysis align with those from the MM-QR technique, which is the primary analysis method used in this study. Overall, strong empirical evidence was gathered regarding the influences of *hudev*, *findev*, and the *rlaw* on *egrow* for the two different middle-income country groups.

Conclusion and recommendations

Determining what is practical or not practical for economic growth is essential for countries to determine and implement effective economic strategies and policies, allocate resources effectively, reduce poverty, and improve the quality of life.

This study focuses on the effects of financial development on economic growth and aims to obtain empirical evidence on the role of the rule of law and human development levels in this relationship. For this purpose, the research was modelled on two groups of countries with different income levels:

40 lower-middle income countries and 42 upper-middle income countries. In the study covering the period 2002-2022, firstly, the suitability of the data for econometric analysis was demonstrated by descriptive statistical tests, cross-section dependence, slope homogeneity, and unit root tests, respectively. In the next stage, coefficient estimates were obtained using the MM-QR panel quantile regression method, and the validity of the findings was assessed through the SQ-REG panel quantile regression analysis. Three key conclusions were drawn regarding the influence of financial development, human development, and the rule of law on economic growth based on various econometric analyses. Consequently:

1. The level of human development negatively impacts economic growth in both groups of countries. The state must invest significantly in these areas to improve education, healthcare, and living standards. Investments in infrastructure and technology require substantial financial resources. Investments in these areas can take time to yield results, and the return on investment may be delayed. Consequently, short-term investments to enhance human development can negatively impact economic growth. The prevalence of illegal economic activities, such as corruption and a thriving shadow economy, in these groups of countries can result in inefficiencies in public investments, ultimately hampering economic growth. However, the effect of human development on economic growth is more significant in upper-middle-income countries compared to lower-middle-income countries.
2. The study's most interesting finding is that financial development's impact on economic growth occurs in different directions in both countries. This asymmetric effect on economic growth is positive in lower-middle-income countries and negative in upper-middle-income countries. Accordingly, financial markets and institutions contribute to economic growth through their institutions and the allocation of resources to businesses. However, in upper-middle-income countries, weak institutional quality, bias in credit allocation and its channelling to inefficient areas, and the concentration of funds transferred from financial markets in a limited number of elite individuals and/or firms can be listed as obstacles to broad-based, inclusive economic growth. It has been concluded that financial development impacts economic growth differently at specific per capita income levels. Specifically, lower-middle-income countries are categorized as upper-middle-income countries once the per capita income exceeds \$4,515.
3. Another finding from the study is that the rule of law has a negative impact on economic growth in both country groups. The negative impact of an increase in the rule of law on economic growth signals that illegal activities fuel the economy in these country groups. In particular, informal economic activities such as corruption, nepotism, and smuggling have declined with the rise of the rule of law. Consequently, the equal application of laws to all and the accountability of public authorities and politicians in these countries prevent illicit profits, thus reducing economic growth. The negative impact of the rule of law on economic growth is usually more significant in lower-income countries. This suggests that economies in these nations rely more on illegal activities.

While the study provides significant and robust empirical evidence on the subject, it has some limitations. Because the study focuses on the effects of financial development, the rule of law, and human development index on economic growth, other factors with potential impacts (such as foreign trade, inflation, interest rates, political stability, foreign direct investment, etc.) are not considered. Furthermore, the study covers the period 2002-2022, and events such as the 2008 global financial crisis and the COVID-19 pandemic, which could have caused structural breaks in the relationship between the variables, are not considered.

Despite these limitations, the empirical findings provide useful information for policymakers. The evidence from the study suggests that financial development promotes economic growth in lower-middle-income countries, while the rule of law and human development hinder it. This suggests that while financial systems are a crucial driver of economic growth, weaknesses in legal enforcement and inefficiencies in human development policies reduce their effectiveness. Accordingly, by focusing on enhancing the sustainability and inclusiveness of economic growth in these countries, economic agents can increase access to finance. Resource allocation for infrastructure and technological development can be strengthened. Training should be provided to enable human resources to acquire technical skills, a more transparent legal system should be established, and regulatory and supervisory administrative

mechanisms should be used effectively. The results in upper-middle-income countries demonstrate weak institutional quality and structural inefficiencies. Accordingly, the financial system should be directed toward more productive areas, and effective structural and judicial reforms should be implemented to facilitate financial regulation and oversight. Financial access should be expanded at both the individual and institutional levels, and ways should be explored to broaden public access to public and private financial resources. Furthermore, educational processes should be updated with digital, technical, and innovation-based practices for better human development. Corruption should be combated by ensuring and strengthening the independence of the judiciary.

Here are some suggestions for future research on this topic. The financial development variable could be analysed separately within its two subsystems: financial institutions and financial markets. Additionally, the issue could be examined from different perspectives by incorporating variables such as corruption and political stability.

Appendix

Table A1. Countries list

Lower-middle income countries		Upper-middle income countries	
Angola	Lesotho	Albania	Guatemala
Bangladesh	Mauritania	Algeria	Indonesia
Benin	Morocco	Argentina	Iran, Islamic Rep.
Bolivia	Myanmar	Armenia	Jamaica
Cabo Verde	Nepal	Azerbaijan	Kazakhstan
Cambodia	Nicaragua	Belarus	Libya
Cameroon	Nigeria	Belize	Malaysia
Comoros	Pakistan	Botswana	Maldives
Congo Rep.	Papua New Guinea	Brazil	Mauritius
Cote d'Ivoire	Philippines	China	Mexico
Egypt	Samoa	Colombia	Mongolia
Ghana	Senegal	Costa Rica	Namibia
Guinea	Solomon Islands	Dominica	Paraguay
Haiti	Sri Lanka	Dominican Rep.	Peru
Honduras	Tajikistan	Ecuador	South Africa
India	Tanzania	El Salvador	St. Lucia
Jordan	Tunisia	Equatorial Guinea	St. Vincent and the Grenadines
Kenya	Uzbekistan	Fiji	Thailand
Kyrgyz Rep.	Viet Nam	Gabon	Tonga
Lao PDR	Zambia	Georgia	Turkiye
		Grenada	Ukraine

Source: Prepared by the authors.

Table A2. Diagnostic test results

Diagnostics	Test	Lower-middle income		Upper-middle income	
		Test Statistics	p-value	Test Statistics	p-value
Endogeneity	Hausman test	17.91	(0.000)	18.04	(0.000)
Nonlinearity	Wald test	2.57	(0.108)	0.56	(0.453)
Asymmetry	Wald test	7.56	(0.006)	3.48	(0.062)
Heterogeneity	Modified Wald test	150.32	(0.000)	4042.15	(0.000)

Source: Prepared by the authors.

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