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Financial development impact on domestic investment: does income level matter?

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ABSTRACT

Financial development significantly bolsters a country's economic growth and resilience. Despite increasing focus on the relationship between financial development and economic growth, few studies examine the impact of financial development on domestic investment across countries' income levels. Therefore, this study employs the system Generalized Method of Moments estimator and the Pooled Mean Group estimator to investigate this relationship, utilizing a panel of 152 countries from 1980 to 2021. The empirical findings affirm that financial development positively influences investment performance until a specific threshold over time. However, while increasing financial development benefits investment, further deepening the financial sector may eventually diminish its impact on domestic investment. Specifically, the benefit of investment growth remains valid only up to a threshold of 0.5147, beyond which it becomes a hindrance. In the short run, financial development changes do not substantially impact investment. Additionally, the marginal effect of financial development on investment is more pronounced in low- and middle-income countries. These empirical findings provide valuable reference for enhancing financial development to foster investment growth.

PUBLIC INTEREST STATEMENT

Investment is pivotal for sustaining long-term economic growth, fostering development, expanding market access, promoting innovation, and reducing transaction costs. This research aims to examine the impact of financial development on domestic investment across countries with varying income levels. Utilizing the system generalized method of moments (GMM) and the pooled mean group (PMG) estimator, the study analyzes a panel of 152 countries from 1980 to 2021. The findings reveal a positive influence of financial development on investment performance, particularly up to a certain threshold in the long run. Importantly, as countries' income levels rise, the significance of financial development on investment performance becomes more pronounced in low- and middle-income countries. However, with the deepening of the financial sector, its effect on domestic investment may eventually diminish. These results underscore the importance of considering the optimal level of financial development to foster investment growth.

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1. Introduction

Financial development is recognized as one of the critical drivers for economic growth (Levine, 2005; Love & Zicchino, 2006). The relationship between financial development and economic growth has been extensively analyzed since the 1980s. The perspective that financial development affects economic growth suggests a role of financial development in mobilizing domestic savings and investment through a liberalized financial system (Bassanini et al., 2001; Svirydzhenka, 2016). However, providing evidence of the relationship is complex because various proxy variables for financial development, such as liquid

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liabilities, market capitalization ratio, and private sector credit, capture only limited aspects of the financial sector. Sinha and Shastri (2023) state that financial development is mainly defined as the efficiency of the financial sector and financial intermediaries. The financial system generates information regarding possible investments, allocates capital, and monitors investments (Dutta & Meierrieks, 2021; Scholtens, 2006). As the development of the financial system reduces the cost of information acquisition and optimizes the allocation of resources (Aglietta & Breton, 2001; Hermes & Lensink, 2003), a stable financial system could provide reliable and accessible information that reduces risk and transaction costs, contributing to the rational allocation of capital.¹

Since the late 1980s, many developing countries experienced financial market reforms to integrate them into the global capital market and financial system (Bekaert & Harvey, 2003; Obstfeld, 2009). These reforms aimed to facilitate trade and investment flows and included market liberalization, privatization, technical modernization, institutional and regulatory changes, and improvements in monitoring systems (Ahmed, 2016). However, owing to their underdeveloped financial systems, some developing countries face challenges in raising funds, managing risks, and supporting economic activities (Naidoo, 2020; Park, 2011). The small and ineffective banking systems in many developing countries struggle to allocate deposits efficiently, further hindering international capital and trade flows for years (Settle, 2022). Thus, a favorable financial environment and system play vital roles in capital allocation efficiency and marginal productivity improvement.

However, most previous studies on financial development have focused on the relationship between financial development and economic growth for selected countries.² Unlike the previous literature, this study aims to deepen the understanding of the dynamics by exploring the relationship between investment and financial development with a large sample of 152 countries from 1980 to 2021. To overcome the measurement difficulties, we follow Sahay et al. (2015), who provided a comprehensive index of financial development, considering the depth, access, and efficiency of financial institutions and markets.

From the empirical analysis, this study reveals an inverted U-shaped relationship between financial development and investment growth using the system Generalized Method of Moments (GMM) estimator.³ Moreover, this finding illustrates the complex relationship between financial development and investment growth and provides a unique perspective on comprehending the variations in this process among countries with different income levels. This study contributes to the existing literature on the nexus between financial development, investment performance, and economic growth for countries with different income levels. We also adopt the Pooled Mean Group (PMG) estimation method to examine the short- and long-run effects of financial development on investment, offering insights on how these linkages grow over time. Overall, this study extends the literature in the understanding of countries with different income levels.

The remainder of this article is organized as follows. Section 2 reviews the relevant literature on financial development. Section 3 describes the data and methodology of the study, and Section 4 presents the empirical results and robustness tests. Finally, Section 5 summarizes the key findings from the empirical analysis.

2. Literature review

The significance of financial development in promoting economic growth has attracted considerable attention in the existing literature. The Keynesian theory of investment determinants asserts that policy measures are imperative for promoting economic growth. It suggests that a stable and developed financial system is essential for instilling investor confidence (Keynes, 1936). A stable financial system can mitigate investment risks, thereby promoting investment activities. From the perspective of developing economies with underdeveloped capital markets, Shaw (1973) emphasized that interventions, such as imposing interest rate ceilings, controlling credit expansion, targeted credit allocation, and elevated reserve requirements, in domestic financial markets have negative effects on economic growth. According to the financial intermediation theory, the stability of financial intermediaries contributes to economic growth (Diamond, 1984). Effective financial intermediaries can boost the effectiveness of fund distribution, encouraging growth in investment and production.

Several studies have explored the relationships among financial development, economic growth, and investment to foster financial development (Ibrahim & Alagidede, 2018; Ouedraogo & Sawadogo, 2022; Xu, 2000). Xu (2000) examined the effects of financial development on domestic investment, focusing on 41 countries from 1960 to 1993, using the vector autoregression (VAR) method. The study found substantial evidence that financial development is important for economic growth and domestic investment, revealing that domestic investment is a critical channel through which financial development affects economic growth. Using a sample of 29 Sub-Saharan African countries, Ibrahim and Alagidede (2018) investigated the impact of financial development on economic growth under the initial levels of a country's income. They found that a high level of financial development is a primary condition for economic growth. Specifically, financial development has a significant positive impact on economic growth below a certain threshold. However, the sensitivity of financial development is limited above this threshold, indicating nonlinearities in financial development and economic growth. Ouedraogo and Sawadogo (2022) examined the relationship between financial development and financial structure with economic growth using financial development indicators, such as account accessibility, depth, and financial efficiency for Sub-Saharan African countries. The empirical results find the existence of thresholds of non-linear relationships. In addition, they suggest that a financial system relies on financial markets in low-income countries and the banking industry in middle-income countries.

Ndikumana (2005) investigated whether a financial structure independently affects domestic investment and found no independent effect on investment; however, it was further found that financial development makes domestic investment more responsive to economic growth. Love and Zicchino (2006) examined the dynamic relationship between financial conditions and investment at the firm level to identify the impact of financial factors on investment. They observe that financial development is critical for improving capital allocation and economic growth. Additionally, the availability of internal funds is more crucial when explaining investment in countries with less developed financial systems. Sinha and Shastri (2023) investigated the impact of financial development on domestic investment and suggested positive short and long-run impacts on investment in the Indian economy.

Osei and Kim (2020) use a dynamic panel threshold model focusing on middle- and high-income countries from 1987 to 2016 and find substantial evidence that financial development encourages foreign direct investment (FDI) and, thus, economic growth. Additionally, Shuaibu et al. (2022) investigate the link between financial development, FDI inflows, and economic growth, focusing on the Economic Community of West African States (ECOWAS) economies from 1999 to 2017. The results demonstrated that financial development could be a significant predictor of FDI inflows. Moreover, the financial system is crucial for increasing foreign capital; thus, the financial development structure should be strengthened to achieve economic growth.

However, existing studies often analyze a limited number of countries and short periods, presenting certain limitations. To address the aforementioned gaps, this study utilizes a larger dataset comprising 152 countries from 1980 to 2021 to provide a more comprehensive understanding of the persistent correlation between financial development and investment. The study analyzes the influence of financial development on investment performance and explores the potential existence of threshold effects. Furthermore, it investigates whether the relationship between financial development and investment differs across various levels of financial development. Moreover, concerns arise in investment performance regression regarding the potential correlation of the financial development variable with unobserved factors influencing investment. While financial development may impact investment, it is crucial to recognize that investment may also contribute to financial development. However, most of the literature considers the impact of financial development on investment performance without addressing the possible simultaneity between the two variables. To eliminate potential endogeneity, we employ a system GMM estimator, utilizing the lagged dependent variable as a regressor, to control the potential bidirectional causality between financial development and investment effectively. Further, the study examines the varying influences of financial development on investment in the short and long run using the PMG estimation method.

3. Data and Methodology

3.1. Data

To analyze the impact of financial development on investment, we collected country-level data for 152 countries, including both developed and developing countries, from 1980 to 2021, that is, 42 years.⁴ The sample comprised 53 high-income countries, 81 middle-income countries, and 18 low-income countries.⁵ All data were obtained from the International Monetary Fund (IMF) database and the World Development Indicators. The definitions of the variables used in this study are described in Table 1.

As shown in Table 1, INV_{it} , the gross fixed capital formation as a percentage of GDP represents the domestic investment. According to the World Bank, gross fixed capital formation, also called formerly gross domestic fixed investment, covers land improvements, purchase of machinery and equipment, infrastructure projects, and construction of educational, health, residential, and commercial buildings, and net acquisitions of valuables. As a result, INV_{it} is considered as a dependent variable in this study. This study uses the aggregate indicator FD_{it} to measure financial development. As mentioned, previous studies prefer to use proxies to measure financial development from a specific perspective, such as liquid liabilities, the ratios of private credit to GDP, and stock market capitalization to GDP. However, according to Čihák et al. (2012) and Sahay et al. (2015), these specific indicators only measure financial development from one perspective. To overcome this shortcoming, we employ the composite indicator (FD_{it}) that can comprehensively measure financial development. GDP_{it} denoting GDP per capita growth rate is used to control the effects of economic growth. The annual growth rate of actual GDP per capita reflects the overall state of the economy, which directly affects the expectations and decisions of investors (Gylfason & Zoega, 2006).⁶ $OPEN_{it}$ is the sum of imports and exports of GDP, which reflects the level of economic openness. In principle, trade provides access to investment and intermediate goods that are critical to a country's processes of growth (Yanikkaya, 2003). Trade openness can boost international competitiveness, mitigate unfair competition, and inspire domestic businesses to support and improve the financial sector (Ashraf, 2018; Menyah et al., 2014). According to David et al. (2014), trade openness is crucial for financial development in countries with high-quality institutions. Therefore, the trade variable is also included to control for a country's level of economic openness. GOV_{it} is the general government's final consumption expenditure as a percentage of GDP. Government final consumption expenditure is an imperative explanatory variable for development and is considered a source of economic growth (Collier & Dollar, 2002; Ferreira & Simões, 2013). In general, government spending has a significant impact on the development of physical and human capital throughout time (Easterly & Rebelo, 1994; Turnovsky, 2004). According to Keynesian theory, increased government spending will stimulate aggregate demand, thereby affecting the investment environment and the level of investment (Meltzer, 1981; Shen et al., 2018). Thus, GOV_{it} is also considered to measure the role of the government in investment. FDI_{it} denotes the FDI, which is generally considered to promote economic growth in various ways. The theory on foreign capital flows suggests that FDI is a significant form of international capital flow, and it plays a strong contribution in fostering economic growth and advancing technological development (Alfaro et al., 2004; Haskel et al., 2007; Rogmans & Ebberts, 2013). FDI can also measure how economic openness affects investment performance, so FDI_{it} is invited in the model. All the variables, except for financial development, are presented as percentages of GDP.

Table 1. Description of variables.

Variable	Description
INV_{it}	Gross fixed capital formation as a percentage of GDP in country i at time t .
FD_{it}	A comprehensive index of financial development in country i at time t .
F_{it}	An index of financial institutions, including the indicators of financial depth, access, and efficiency (sub-index of financial development), in country i at time t .
GDP_{it}	The annual growth rate of real GDP per capita in country i at time t .
$OPEN_{it}$	Total imports plus exports as a percentage of GDP in country i at time t .
GOV_{it}	General government final consumption expenditure as a percentage of GDP in country i at time t .
FDI_{it}	Foreign direct investment net inflows as a percentage of GDP in country i at time t .

Data source: International Monetary Fund Database and the World Development Indicators.

3.2. Model specification

To analyze the impact of financial development on domestic investment growth, this study estimates the relationship between financial development and investment performance using three different estimation methods, namely, pooled ordinary least squares (pooled OLS), fixed effects panel analysis, and system GMM. The empirical model includes an indicator of financial development along with several control variables. Following Arcand et al. (2015) and Sahay et al. (2015), we construct an empirical model with a squared term of financial development to examine a non-monotonic relationship between financial development and investment growth.

The basic estimation equation is

$$INV_{it} = \alpha_0 + \alpha_1 FD_{it} + \alpha_2 FD_{it}^2 + \alpha_3 X_{it} + \mu_{it} \quad (1)$$

From Equation (1), i and t represent country and year, respectively. The dependent variable, $INV_{i,t}$, is gross fixed capital formation denoting domestic investment. FD_{it} represents the financial development index discussed previously. The basic model is a quadratic functional form chosen based on the empirical results of previous studies (Arcand et al., 2015; Eugster, 2014). Since the change in the investment-to-GDP ratio only traces the changes in investment growth relative to output growth, this study focuses on investment growth to capture the overall output growth. Finally, $X_{i,t}$ represents a set of explanatory variables that typically affect the investment performance, and $\mu_{i,t}$ is the random error term. All variables, except financial development, are taken in natural logarithms transformation to acquire a stationary variance. On the one hand, this avoids the problem of heteroscedasticity; on the other hand, in the case of a non-linear relationship, previous empirical studies suggest that the log transformation provides the best fit.

Given the basic model in Equation (1), we examine the presence of an inverted U-shaped relationship in advance using the pooled OLS model. Next, a fixed effects model is applied to account for unobserved heterogeneity, which is ignored in the pooled OLS model. Finally, since the financial development variable may be correlated with unobserved factors also affecting investment regression, the fixed effects model is likely to be biased and inconsistent when estimating the causal effect of financial development on investment performance in the dynamic panel data. To avoid the endogeneity problem, we adopt the instrumental variable (IV) method proposed by Arellano and Bover (1995) and Blundell and Bond (1998). In this approach, a lagged dependent variable is used as a regressor; thus, its value is employed as an instrument to control for the endogenous relationship. The system GMM method is applied to provide consistent estimates using the following model:

$$INV_{i,t} = \beta_1 INV_{i,t-1} + \beta_2 FD_{i,t} + \beta_3 FD_{i,t}^2 + \beta_4 GDP_{i,t} + \beta_5 OPEN_{i,t} + \beta_6 GOV_{i,t} + \beta_7 FDI_{i,t} + \epsilon_{i,t} \quad (2)$$

$INV_{i,t-1}$ indicates one lag of the dependent variable. By internally transforming the data, it is possible to control for endogeneity, thus providing improved analytic results compared to the OLS method. Moreover, given that different outcomes may exist in countries with different income levels, we regress the equation following the income group separately.

To explore the temporal effects of financial development on investment, we utilize the PMG estimation method to trace the differences between the short- and long-run relationship more effectively.⁷ Using the PMG estimation enables us to capture the relationship between financial development and investment more accurately, drawing more robust conclusions. The following represents the equilibrium error correction of the error correction equation:

$$\begin{aligned} \Delta INV_{i,t} = & \gamma_i + \theta \left(INV_{i,t-1} - \alpha_i - \beta_2 FD_{i,t-1} - \beta_3 FD_{i,t-1}^2 - \beta_4 GDP_{i,t-1} - \beta_5 OPEN_{i,t-1} - \beta_6 GOV_{i,t-1} - \beta_7 FDI_{i,t-1} \right) \\ & + \delta_1 \Delta FD_{i,t} + \delta_2 \Delta FD_{i,t}^2 + \delta_3 \Delta GDP_{i,t} + \delta_4 \Delta OPEN_{i,t} + \delta_5 \Delta GOV_{i,t} + \delta_6 \Delta FDI_{i,t} + \sigma_{i,t} \end{aligned} \quad (3)$$

4. Empirical analysis

4.1. Panel unit root tests

To mitigate spurious regression, we conduct the panel unit root tests, such as the IPS (Im-Pesaran-Shin) test, the Fisher-Augmented Dickey-Fuller (Fisher-ADF) test, and the PP (Phillips-Perron) test, to

Table 2. Panel unit root tests results.

Variables	IPS Test		Fisher-ADF		PP test		Status
	Statistic	<i>p</i> -Value	Statistic	<i>p</i> -Value	Statistic	<i>p</i> -Value	
INV_{it}	-10.2335	0.0000	1052.6348	0.0000	576.6962	0.0000	I(0)
FD_{it}	-0.3323	0.3698	872.6036	0.0000	352.4694	0.0289	I(1)
ΔFD_{it}	-58.9005	0.0000	2006.3321	0.0000	5570.4746	0.0000	
GDP_{it}	-46.3275	0.0000	1735.5745	0.0000	3549.4136	0.0000	I(0)
$OPEN_{it}$	-3.1969	0.0007	871.8831	0.0000	464.5654	0.0000	I(0)
GOV_{it}	-8.3311	0.0000	1077.4249	0.0000	590.3522	0.0000	I(0)
FDI_{it}	-17.3410	0.0000	1094.1564	0.0000	1411.9188	0.0000	I(0)

Table 3. Kao residual panel cointegration results.

Test	<i>t</i> -Statistic	<i>p</i> -Value
Modified Dickey-Fuller	-9.7897	0.0000
Dickey-Fuller	-9.2813	0.0000
Augmented Dickey-Fuller	-7.9705	0.0000

ensure the variables in the regression analysis are stationary.⁸ The results of the tests are given in Table 2.

All three tests aim to determine the presence of unit roots, with the null hypotheses suggesting that all panels contain unit roots. The last column in Table 2 provides the final assessment for each variable. We can reject the null hypothesis of a unit root for all series except FD_{it} . While FD_{it} exhibits a unit root at the level in the IPS and PP tests, its first difference is stationary I(1) in all tests.

4.2. Panel cointegration tests

The study conducts a panel cointegration test to investigate the presence of a long-run equilibrium relationship among the variables, utilizing the Kao panel cointegration tests (Kao, 1999).

According to Table 3, the null hypothesis of no cointegration is rejected at the 1% significance level. Thus, we conclude that a long-run cointegration relationship exists among the variables in the panel data, and the PMG model can be applied for analytic purposes.

4.3. Regression results

To analyze the relationship between the explanatory variables and domestic investment, this study examines the basic model using three approaches: pooled OLS, fixed effects, and system GMM. Table 4 reports the empirical results for Equations (1) and (2).

In Table 4, Model (1) presents the relationship between financial development and domestic investment. The coefficients of $FD_{i,t}$ and $FD_{i,t}^2$ are significant at the 1% level of significance, revealing an inverted U-shaped relationship between financial development and investment. Meanwhile, the relationship between financial development and investment is dynamic because past domestic investment may affect the current year's performance. Therefore, the Durbin-Wu-Hausman test is implemented to detect the endogeneity of regressors in the pooled OLS regression. The result of the Hausman test, that is, $\chi^2(6) = 53.58$ and $\text{Prob} > \chi^2 = 0.0000$, reveals that the fixed effects model is appropriate, which is employed in Model (2), controlling for unobservable heterogeneity. The results still demonstrate an inverted U-shaped relationship between financial development and domestic investment.

This study also conducts the system GMM estimation to address endogeneity by including the lagged value of the dependent variable. In Model (3), the lagged dependent variable is used as the instrument to control for endogeneity from reverse causality using the system GMM approach. Moreover, the results of the Sargan and Arellano-Bond tests verify that the investment function is correctly specified and the instruments are valid.

Based on the empirical results using the OLS, fixed effects, and system GMM approaches the relationships of $FD_{i,t}$, $FD_{i,t}^2$, $GDP_{i,t}$, and $OPEN_{i,t}$ are consistent. Specifically, $FD_{i,t}$ is positive and significant while the squared term $FD_{i,t}^2$ is significantly negative at the 1% significance level. $GDP_{i,t}$ is a significant positive,

Table 4. Empirical results for the basic model.

Variable	(1) OLS	(2) Fixed effects model	(3) System GMM
INV_{it-1}			0.6047*** (0.0641)
FD_{it}	0.7865*** (0.0812)	0.4489*** (0.1206)	1.3651*** (0.4151)
FD_{it}^2	-0.6648*** (0.0917)	-0.7643*** (0.1163)	-1.3261*** (0.4218)
GDP_{it}	0.0426*** (0.0050)	0.0123*** (0.0042)	0.0098* (0.0052)
$OPEN_{it}$	0.0767*** (0.0101)	0.2016*** (0.0186)	0.1980** (0.0821)
GOV_{it}	0.0119 (0.0126)	-0.0756*** (0.0208)	-0.0206 (0.1641)
FDI_{it}	0.0056 (0.0040)	0.0261*** (0.0035)	0.0113 (0.0070)
Cons	2.6603*** (0.0635)	2.383*** (0.0889)	0.1957 (0.6541)
Number of observations	3804	3804	3740
Number of countries	152	152	152
R-squared	0.121	0.079	
Sargan test ^a			148.33 (0.717)
AR(2) ^b			0.700

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Standard errors are reported in parentheses. (a) The null hypothesis of the Sargan test is that overidentifying restrictions are valid. (b) The null hypothesis of the Arellano-Bond test is that there is no autocorrelation. OLS: ordinary least squares; GMM: generalized method of moments.

suggesting that economic growth can enhance domestic investment. $OPEN_{it}$ is positive and significant, indicating that trade openness can promote investment performance. However, one difference is that the impact of $GOV_{i,t}$ is found to be negative and significant at the 1% significance level in Model (2), whereas it is estimated to be positive but not significant when using the OLS and negative but not significant in the system GMM model. Further, $FDI_{i,t}$ is positive but only significant when using the fixed effects model.

From the above analysis, we conclude that financial markets and institutions promote the availability of financial services, resulting in sustainable domestic investment growth.⁹ Considering that the $FD_{i,t}^2$ captures the non-linear relationship between financial development and investment performance, there is an unfavorable effect on investment performance when financial development reaches a certain stage. This is consistent with the results of previous studies, such as those of Ibrahim and Alagidede (2018) and Tori and Onaran (2020), which suggest that a higher degree of financial development is associated with a stronger negative effect on investment.

Our findings present a more comprehensive approach than previous studies, such as Ibrahim and Alagidede (2018), who focused on sub-Saharan African countries, and Tori and Onaran (2020), focused on European countries. Our study covers an extensive range of countries, specifically, a total of 152. Unlike previous studies considering a specific geographical area, including several countries significantly enhance the applicability and usefulness of our findings, consistent with the theory of financial intermediation and investment under uncertainty. Financial intermediation theory suggests that the presence of financial institutions and markets is crucial for mobilizing savings, distributing capital efficiently, and facilitating risk diversification, supporting investment activities (Ahmed & Mmolainyane, 2014; Levine, 2002). By improving access to capital and reducing transaction and information costs, financial intermediaries significantly contribute to increased investment during the initial stages of financial growth (Levine et al., 2000). However, according to the investing under uncertainty hypothesis, as financial development matures, the risks of over-financialization become evident. The risks include market volatility, the formation of financial bubbles, and the diversion of resources from productive investment to speculative activities (Ibrahim & Alagidede, 2018). Consequently, investors become more anxious, potentially resulting in a decline in long-term sustainable investment in the actual economy. This theoretical perspective explains the observed inverted U-shaped relationship, wherein the initially positive effects of

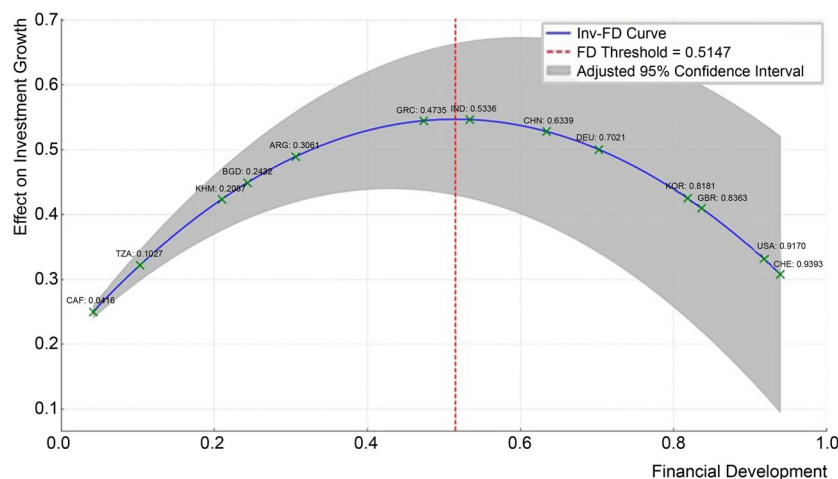


Figure 1. Effect of financial development on investment growth. *Data source:* International Bank.

financial development on investment gradually become negative when the financial system becomes excessively complex and speculative.

To summarize, investment first increases with improvements in the level of financial development at a decreasing rate to reach a maximum and then decreases at an increasing rate; that is, over-expansion of financial markets may result in resource misallocation, leading to financial excesses or bubbles, which can depress investment. Specifically, it is shown that the impact on investment reaches the highest level when the level of financial development reaches 0.5147 when all samples are considered.¹⁰

Figure 1 describes the inverted U-shaped relationship between financial development and domestic investment for the 152 countries, and the fitted curve presents a 95% confidence interval. If a country passes the turning point, it implies that the effect of a high level of financial development on investment growth will decrease. Hence, financial development must be at the optimal level to facilitate investment growth. According to Xu (2000) and Arcand et al. (2015), financial development increases growth to a certain threshold, after which the effect of high levels of financial development could weaken growth. This is due to over-financialization, occurring when financial development reaches a certain level that results in lower investment returns or higher financial market volatility. As shown in Figure 1, further financial development may help promote investment in countries with a financial development index of less than 0.5147. However, those with an index above 0.5147 should be cautious of the risks that rapid financial development may bring and take action to ensure the stability of their financial markets.

From Figure 1, the Central African Republic, Tanzania, Cambodia, Bangladesh, and Argentina show that their investment growth rises following their levels of financial development. Greece and India may be at a stage where financial development generates the largest investment growth. From the right-hand of the figure, most high-income countries, including Germany, Korea, the UK, the USA, and Switzerland, investment growth is decreasing rapidly with the current financial development levels.¹¹

Figure 2 presents the scatter plot of GNI per capita and financial development for the two groups. The top presents the relationship in low- and middle-income countries, while the bottom shows the situation in high-income countries. The dashed line in the middle of the scatter plot represents a financial development threshold value of 0.5147. Most low- and middle-income countries have a financial development level below 0.5147, whereas high-income countries with GNI per capita of US\$ 40,000 or more have a financial development level above the benchmark.

4.4. PMG estimation results

Considering that this study uses data spanning from 1980 to 2021, we further investigate the different time horizon effects of financial development on investment. Thus, the PMG method is used to estimate the dynamic relationship between financial development and investment in both the short and long run. Given that PMG estimation emphasizes the dynamic adjustment between the short and long run

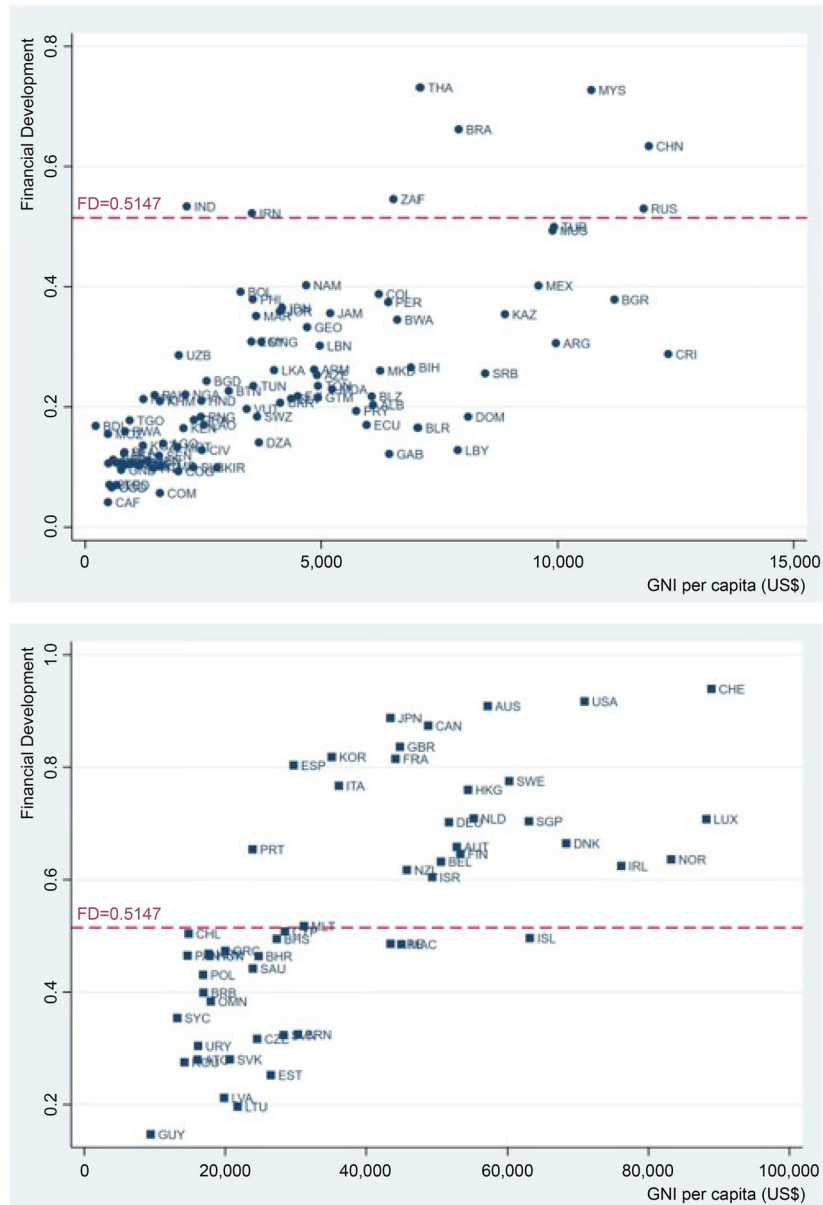


Figure 2. Scatter plot of GNI per capita and financial development by income group. *Data source:* International Monetary Fund, World Bank.

(Pesaran et al., 1999), this approach enables us to examine a stable long-run equilibrium relationship among variables, while short-run dynamics may vary by country.

As shown in Model (4) in Table 5, all variables are significant with investment except $\Delta FD_{i,t}$ implying that changes in financial development are not likely to have a significant impact on investment in the short run. Some financial impacts may take time to become fully apparent. Specifically, changes in financial development may not have an immediate influence on investment, but this effect may arise gradually over a longer time. The error correction term (*ECT*) is negative and significant at the 1% significance level, indicating that the system will gradually adjust back to its long-run equilibrium when it deviates. $\Delta INV_{i,t-1}$ is positive and significant at the 1% significance level in the short run, suggesting that past increases in investment have a positive influence on current levels. $\Delta GDP_{i,t}$ is negative and significant at the 1% significance level. This can be interpreted to indicate that a short-run increase in GDP could be driven by higher spending rather than increased investment. In certain instances, economies could experience growth driven by consumer spending that does not immediately transfer into more fixed-asset investment. $\Delta OPEN_{i,t}$ is positive and significant at the 1% significance level, suggesting that a

Table 5. Empirical results for short and long run effects.

Variable	(4) Short run effect	(5) Long run effect
FD_{it}		11.6467*** (3.0532)
FD_{it}^2		-8.0640** (2.6561)
GDP_{it}		1.3124*** (0.0637)
$OPEN_{it}$		-0.0015 (0.0065)
GOV_{it}		-0.0321 (0.0546)
FDI_{it}		-0.0093 (0.0086)
ECT	-0.1816*** (0.0101)	
$\Delta INV_{i,t-1}$	0.1250*** (0.0185)	
ΔFD_{it}	-0.6611 (6.0351)	
ΔGDP_{it}	-0.0808*** (0.0135)	
$\Delta OPEN_{it}$	0.0601*** (0.0096)	
ΔGOV_{it}	0.1646*** (0.0466)	
ΔFDI_{it}	0.0898** (0.0322)	
Con	3.3965*** (0.2591)	

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Standard errors are reported in parentheses.

more open economy can send out positive market information to attract both domestic and international investments. $\Delta GOV_{i,t}$ is positive and significant at the 1% significance level in the short run, indicating that when the government increases its spending, it may directly promote investment. $\Delta FDI_{i,t}$ is positive and significant at the 5% significance level. This is because FDI often comes with technology transfer, and new technologies may stimulate investment.

In the long run, as shown in Model (5), $FD_{i,t}$ is positive and significant at the 1% significance level and $FD_{i,t}^2$ is negative and significant at the 5% significance level. These long-run effects may reflect the dual impact of financial development on investment: initial financial development may encourage investment; however, excessive development may have adverse effects. $GDP_{i,t}$ is positive and significant at the 1% significance level, suggesting that in a growing economy, banks, and other financial institutions may be more willing to offer loans and firms spend more on fixed assets.

4.5. Regression results by income groups

To address the relationship between financial development and investment performance across different income groups, we separate the sample into low- and middle-income and high-income groups, conducting separate regression analyses. Table 6 presents the regression results of the empirical model with different income groups.

Table 6 reveals the empirical results to identify whether the effect of financial development depends on a country's income level by using the fixed effects model and the System GMM model. Both the variables $FD_{i,t}$ and $FD_{i,t}^2$ indicate a robust and statistically significant relationship with investment in both low- and middle-income group and the high-income group. Both subgroups have an inverted U-shaped relationship between financial development and investment, as the squared term of financial development, $FD_{i,t}^2$, is negative and significant in both models. However, the influence of financial development on investment is greater in low- and middle-income countries (0.5532 and 2.3739) than that of high-income countries (0.4163 and 1.5002), as indicated by the fixed effects model and the system GMM model.

Table 6. Empirical results by income group.

Variable	Low- and middle-income countries		High-income countries	
	(6) Fixed effects model	(7) System GMM	(8) Fixed effects model	(9) System GMM
INV_{it-1}		0.4962*** (0.1237)		0.7481*** (0.1111)
FD_{it}	0.5532** (0.2155)	2.3739** (1.0035)	0.4163*** (0.1481)	1.5002*** (0.5303)
FD_{it}^2	-1.1510*** (0.3078)	-3.0032** (1.3088)	-0.4482*** (0.1303)	-1.1911*** (0.4324)
GDP_{it}	0.0151*** (0.0056)	0.0045 (0.0123)	0.0007 (0.0055)	0.0034 (0.0107)
$OPEN_{it}$	0.2797*** (0.0243)	0.1571 (0.1095)	-0.0374 (0.0266)	0.0991 (0.0709)
GOV_{it}	-0.0326 (0.0249)	-0.1429 (0.2880)	-0.4438*** (0.0422)	0.4813* (0.4813)
FDI_{it}	0.0304*** (0.0046)	0.0399* (0.0206)	0.0101** (0.0048)	0.0336*** (0.0113)
Cons	1.9224*** (0.1091)	0.9442 (0.5706)	4.4889*** (0.1704)	-1.4518 (1.2884)
Number of observations	2385	2349	1419	1391
Number of countries	99	99	53	53
R-squared	0.115		0.102	
Sargan test ^a		41.07 (1.000)		76.32 (0.341)
AR(2) ^b		0.517		0.367

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Standard errors are reported in parentheses. (a) The null hypothesis of the Sargan test is that overidentifying restrictions are valid. (b) The null hypothesis of the Arellano–Bond test is that there is no autocorrelation. GMM: generalized method of moments.

The variable $FDI_{i,t}$ is significantly positive in both subgroups. The variable $FDI_{i,t}$ is significantly positive in both subgroups. In high-income countries characterized by well-developed industrial and service sectors, a secure environment for investors attracts long-run investments. Conversely, in low- and middle-income countries with abundant natural resources and substantial market potential, foreign investors may be drawn to invest in resources and market access.

4.6. Robustness test

Financial institutions such as banks or capital markets are essential to a healthy financial development environment (Čihák et al., 2012). Consequently, we replace the financial development variable with a sub-component as a proxy to verify the main results regarding the influence of financial development on investment growth. Table 7 presents the results of using lagged financial development (FD_{it-1}) and financial institutions (FI_{it}) variable – constructed by depth, access, and efficiency of banks, insurance companies, mutual funds, pension funds, and other types of nonbank financial institutions – as a proxy tool.

In both Model (10) and (11), whether the lagged financial development ($FD_{i,t-1}$) or the financial institutions (FI_{it}) are used, the inverted-U-shaped relationship between financial development and institutions and domestic investment still exists. Thus, the statistically significant coefficients of financial development and financial institutions, including squared terms, verify the strong relationship between financial development and investment. Additionally, $GDP_{i,t}$ and $OPEN_{i,t}$ are positively correlated with investment, in line with previous results. $GOV_{i,t}$ is not significant in both Model (10) and (11), $FDI_{i,t}$ is positive and significant at the 10% significance level in Model (11).

Table 8 presents the robustness check for different time horizons. Both the short-run effect in Model (12) and the long-run effect in Model (13) are consistent with the empirical findings. To summarize, the impact of financial development on investment is not significant in the short run. However, in the long run, financial development can promote investment, but this relationship weakens after reaching a certain threshold.

Table 9 presents the robustness test results by income group. In low- and middle-income countries, both $FD_{i,t-1}$ and $FI_{i,t}$ provide robust results, supporting our previous findings. When $FD_{i,t-1}$ is invited in the regression in high-income countries (Model 15), the results are not as apparent; however, when employing $FI_{i,t}$ in Model (17), the results are robust and consistent with previous empirical findings.

Table 7. Robustness test using proxy variables.

(10) System GMM based on lagged FD ($FD_{i,t-1}$)		(11) System GMM based on FI ($FI_{i,t}$)	
$INV_{i,t-1}$	0.6239*** (0.0640)	$INV_{i,t-1}$	0.6303*** (0.0663)
$FD_{i,t-1}$	1.1981*** (0.4214)	FI_{it}	1.3210** (0.5840)
$FD_{i,t-1}^2$	-1.1749*** (0.4326)	FI_{it}^2	-1.2100** (0.5503)
GDP_{it}	0.00926* (0.0051)	GDP_{it}	0.0111** (0.0049)
$OPEN_{it}$	0.1992** (0.0830)	$OPEN_{it}$	0.2387*** (0.0832)
GOV_{it}	0.0008 (0.1611)	GOV_{it}	0.0606 (0.1523)
FDI_{it}	0.0108 (0.0069)	FDI_{it}	0.0130* (0.0069)
<i>Cons</i>	0.1072 (0.6454)	<i>Cons</i>	-0.3168 (0.6117)
Number of observations	3740	Number of observations	3740
Number of countries	152	Number of countries	152
Sargan test ^a	152.78 (0.624)	Sargan test	165.00 (0.356)
AR(2) ^b	0.744	AR(2)	0.683

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Standard errors are reported in parentheses. (a) The null hypothesis of the Sargan test is that overidentifying restrictions are valid. (b) The null hypothesis of the Arellano-Bond test is that there is no autocorrelation. GMM: generalized method of moments.

Table 8. Robustness test for short and long run effects.

Variable	(12) Short run effect	(13) Long run effect
FD_{it}		15.4406*** (3.1192)
FD_{it}^2		-12.0986** (2.7760)
GDP_{it}		1.2472*** (0.0591)
$OPEN_{it}$		-0.0043 (0.0059)
GOV_{it}		-0.0457 (0.0518)
FDI_{it}		-0.0106 (0.0080)
ECT	-0.1875*** (0.0108)	
$\Delta INV_{i,t-1}$	0.1298*** (0.0181)	
ΔFD_{it}	0.4741 (3.3772)	
ΔGDP_{it}	-0.0794*** (0.0136)	
$\Delta OPEN_{it}$	0.0618*** (0.0097)	
ΔGOV_{it}	0.1608*** (0.0454)	
ΔFDI_{it}	0.0892** (0.0340)	
<i>Con</i>	3.3751*** (0.2677)	

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Standard errors are reported in parentheses.

As a result, we can state that there is an inverted U-shaped association between financial development and investment in the robustness checks. The underlying reason for the strong link between financial institutions and investment growth is that investors are easily motivated to benefit from more improved financial institutions. Moreover, developing financial institutions can enhance domestic financial stability and resilience by managing financial risks in emerging markets (Cantú & Chui, 2020).

Table 9. Robustness test by income group.

Variable	System GMM based on lagged FD ($FD_{i,t-1}$)		System GMM based on FI ($FI_{i,t}$)	
	(14) Low- and Middle-Income Countries	(15) High-Income Countries	(16) Low- and Middle-Income Countries	(17) High-Income Countries
$INV_{i,t-1}$	0.6109*** (0.1011)	0.7140*** (0.1075)	0.4446*** (0.1354)	0.7367*** (0.1082)
$FD_{i,t-1}$	1.1630*** (0.4151)	0.0273 (0.1403)		
$FD_{i,t-1}^2$	-1.4063** (0.5502)	0.2377 (0.1457)		
FI_{it}			3.4707** (1.4948)	2.0373* (1.0556)
FI_{it}^2			-3.8057** (1.7640)	-1.5090* (0.8154)
GDP_{it}	0.0169 (0.0119)	0.0083 (0.0089)	0.0069 (0.0118)	0.0043 (0.0112)
$OPEN_{it}$	0.0800 (0.1231)	0.0206 (0.0573)	0.1328 (0.1146)	0.0518 (0.0694)
GOV_{it}	-0.0223 (0.3463)	0.0926 (0.2336)	-0.1499 (0.2638)	0.4231 (0.2702)
FDI_{it}	0.0366* (0.0220)	0.0119* (0.0068)	0.0383* (0.0211)	0.0370*** (0.0116)
$Cons$	0.7410 (0.8957)	0.4474 (1.1453)	0.9193 (0.8160)	-1.2652 (1.2834)
Number of observations	2349	1391	2349	1391
Number of countries	99	53	99	53
Sargan test ^a	40.69 (1.000)	80.22 (0.212)	37.32 (1.000)	78.77 (0.273)
AR(2) ^b	0.612	0.208	0.490	0.620

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Standard errors are reported in parentheses. (a) The null hypothesis of the Sargan test is that overidentifying restrictions are valid. (b) The null hypothesis of the Arellano-Bond test is that there is no autocorrelation. GMM: generalized method of moments.

5. Conclusion

Investment is crucial for sustaining long-term economic growth because well-performing investments can stimulate economic development by expanding market access, fostering innovation, and reducing transaction costs. This study aims to investigate the impact of financial development on domestic investment to comprehensively understand how to establish effective financial structures and policies to maximize investment performance. Our study utilizes panel data from 1980 to 2021, encompassing 152 countries for empirical analyses. To address the endogeneity issue between financial development and domestic investment, we adopt the system GMM estimation procedure, incorporating the lagged dependent variable as a regressor. Additionally, we employ the PMG estimation method to analyze both short- and long-run effects. To assess the impact of financial development on investment by income level, the study categorizes the sample into low- and middle-income countries and high-income countries. The empirical findings can be summarized as follows. First, there is evidence that financial development enhances investment growth. The development and improvement of financial institutions and markets provide more financing channels for investors and enterprises, encouraging investment. Second, the relationship between investment growth and financial development is non-linear. The inclusion of the squared term of financial development reveals an inverted U-shaped relationship with investment. Financial development benefits investment growth up to a threshold of 0.5147, beyond which it becomes a drag on investment. Over-financialization tends to slow down investment or decrease investment efficiency, as the financial sector's size and operations surpass the needs of the real economy. Third, the effect of financial development on investment growth increases with a country's income level, with a greater marginal effect observed in low- and middle-income countries. Consequently, these countries should implement better regulations to enhance financial development and promote investment growth. Fourth, investment did not significantly impact in the short run by changes in financial development. However, investment conditions seem more affected by changes in financial development in the long run. Despite these valuable insights, this study has some limitations. For instance, the focus on investigating the impact of financial development on investment performance by income level may overlook country-specific characteristics. Therefore, future research should consider how other factors,

such as a country's industrial and geopolitical characteristics, may influence the efficiency of capital allocation.

Notes

1. Furthermore, Levine (2005) states that the financial system promotes economic growth because it can provide information related to future investment in advance.
2. For instance, Mlachila et al. (2016) states that financial development has supported growth and reduced its volatility in many Sub-Saharan African countries whose financial development is below its benchmark. Also, Xu (2000) and Sinha and Shastri (2023) examine the effects of financial development on domestic investment for 41 countries and Indian economy, respectively.
3. Many previous studies suggest that the impact of financial development on economic growth becomes negative upon reaching a certain threshold, indicating an inverted U-shaped relationship. For further details, see Arcand et al. (2015), Sahay et al. (2015), Xu (2000), and Zhang and Zhou (2021).
4. Data on the Financial Development Index are available for the period (1980–2021) from the Financial Development Index Database by the International Monetary Fund. For more details on the construction of the index, see Svirydzhenka (2016).
5. Appendix A lists all countries included in this study.
6. For instance, investment decision theory focuses on how organizations and individuals make investment decisions in various economic environments. For further details, see Aharoni (2015).
7. According to Pesaran et al. (1999), the PMG estimation method permits short-term parameters to differ within groups while requiring long-term coefficient equivalence.
8. The IPS test is beneficial for handling datasets that show different dynamics over time by controlling heterogeneity across different panel units (Im et al., 2003). According to Choi (2001), the Fisher-ADF test combines the p-values of individual ADF unit root tests to evaluate the null hypothesis that all series in the panel contain a unit root against the alternative that at least one series in the panel is stationary. Further, the non-parametric aspect of the PP test is one of its main advantages over the ADF test (Phillips & Perron, 1988). Instead of requiring the addition of lag difference terms, as is the case with the ADF test, it corrects for any serial correlation and heteroskedasticity in the test equation's error terms.
9. This result is consistent with those of previous studies that have confirmed that an effectively operating financial system can greatly raise savings and investment rates, which will eventually result in economic growth (Afonso & Blanco-Arana, 2018; Asteriou & Spanos, 2019; Becsi & Wang, 1997; Guru & Yadav, 2019; Hassan et al., 2011; Law & Singh, 2014; Valickova et al., 2015). Moreover, Xu (2000), Arcand et al. (2015), Sahay et al. (2015), and Zhang and Zhou (2021) show that investment is an imperative channel through which financial development affects growth.
10. The threshold value for FD is determined by calculating the derivative of Column (3) in Table 4 with respect to FD and setting the derivative equal to zero (i.e. $1.3651-2*1.3261FD = 0$). Solving this equation yields the threshold value for FD as 0.5147.
11. This result is consistent with prior findings that fast-growing financial sectors may be costly for the economy. For details, see Arcand et al. (2015) and Sahay et al. (2015).

Authors' contributions

Yizhou He: Conceptualization; Formal analysis; Roles/Writing – original draft; Validation; Methodology; Tae Hwan Yoo: Supervision; Conceptualization, Visualization; Modelling; Writing - review and editing.

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Data availability statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Appendix A:

List of countries used in the estimation in 2021

Country (income group)	FD	FI	FM	Country (income group)	FD	FI	FM
AGO (MI)	0.1392	0.2490	0.0241	JPN (HI)	0.8876	0.8848	0.8557
ALB (MI)	0.2034	0.3905	0.0082	KAZ (MI)	0.3542	0.4572	0.2373
ARE (HI)	0.4860	0.3676	0.5852	KEN (MI)	0.1646	0.2850	0.0378
ARG (MI)	0.3061	0.3788	0.2213	KGZ (MI)	0.1359	0.2590	0.0076
ARM (MI)	0.2621	0.4908	0.0230	KHM (MI)	0.2097	0.4096	0.0016
ATG (HI)	0.2800	0.5490	0.0000	KIR (MI)	0.0994	0.1949	0.0000
AUS (HI)	0.9086	0.9129	0.8688	KOR (HI)	0.8181	0.8518	0.7523
AUT (HI)	0.6584	0.7398	0.5511	LAO (MI)	0.1700	0.2459	0.0873
AZE (MI)	0.2530	0.2885	0.2076	LBN (MI)	0.3020	0.4496	0.1424
BDI (LI)	0.1686	0.2369	0.0936	LBY (MI)	0.1282	0.2513	0.0000
BEL (HI)	0.6320	0.7527	0.4865	LKA (MI)	0.2612	0.3423	0.1699
BEN (MI)	0.1104	0.2067	0.0098	LTU (HI)	0.1965	0.3584	0.0270
BFA (LI)	0.1245	0.2435	0.0007	LUX (HI)	0.7076	0.8232	0.5644
BGD (MI)	0.2432	0.2869	0.1899	LVA (HI)	0.2121	0.3819	0.0340
BGR (MI)	0.3787	0.6733	0.0692	MAC (HI)	0.4852	0.8573	0.0941
BHR (HI)	0.4639	0.3465	0.5632	MAR (MI)	0.3513	0.4330	0.2559
BHS (HI)	0.4947	0.6481	0.3219	MDA (MI)	0.2295	0.4467	0.0033
BIH (MI)	0.2657	0.5187	0.0022	MDG (LI)	0.1062	0.2048	0.0033
BLR (MI)	0.1654	0.3076	0.0168	MEX (MI)	0.4017	0.4654	0.3223
BLZ (MI)	0.2175	0.4195	0.0070	MKD (MI)	0.2603	0.5062	0.0042
BOL (MI)	0.3915	0.7584	0.0093	MLI (LI)	0.1231	0.2382	0.0032
BRA (MI)	0.6618	0.6429	0.6547	MLT (HI)	0.5176	0.6419	0.3730
BRB (HI)	0.3990	0.5727	0.2097	MNG (MI)	0.3084	0.4937	0.1109
BRN (HI)	0.3249	0.4628	0.1743	MOZ (LI)	0.1550	0.2082	0.0956
BTN (MI)	0.2266	0.4281	0.0162	MRT (MI)	0.1333	0.2558	0.0057
BWA (MI)	0.3451	0.4494	0.2272	MUS (MI)	0.4934	0.5122	0.4552
CAF (LI)	0.0416	0.0815	0.0000	MYS (MI)	0.7271	0.6982	0.7275
CAN (HI)	0.8738	0.9595	0.7539	NAM (MI)	0.4024	0.7231	0.0660
CHE (HI)	0.9393	0.9204	0.9213	NER (LI)	0.1122	0.2104	0.0097
CHL (HI)	0.5041	0.5936	0.3947	NGA (MI)	0.2206	0.2359	0.1967
CHN (MI)	0.6339	0.6075	0.6354	NLD (HI)	0.7089	0.6310	0.7590
CIV (MI)	0.1283	0.2042	0.0474	NOR (HI)	0.6360	0.5506	0.6966
CMR (MI)	0.1014	0.1960	0.0028	NPL (MI)	0.2131	0.4172	0.0006
COD (LI)	0.0661	0.1297	0.0000	NZL (HI)	0.6174	0.7390	0.4716
COG (MI)	0.0931	0.1649	0.0176	OMN (HI)	0.3836	0.4095	0.3427
COL (MI)	0.3878	0.4581	0.3023	PAK (MI)	0.2196	0.2908	0.1398
COM (MI)	0.0568	0.1114	0.0000	PAN (HI)	0.4650	0.5147	0.3971
CRI (MI)	0.2880	0.5357	0.0289	PER (MI)	0.3744	0.5136	0.2205

(continued)

Continued.

Country (income group)	FD	FI	FM	Country (income group)	FD	FI	FM
CYP (HI)	0.5080	0.5584	0.4376	PHL (MI)	0.3791	0.3799	0.3635
CZE (HI)	0.3169	0.5186	0.1027	PNG (MI)	0.1837	0.2614	0.0987
DEU (HI)	0.7021	0.6206	0.7560	POL (HI)	0.4309	0.4825	0.3623
DNK (HI)	0.6646	0.7367	0.5665	PRT (HI)	0.6539	0.7291	0.5531
DOM (MI)	0.1837	0.3443	0.0158	PRY (MI)	0.1933	0.3217	0.0573
DZA (MI)	0.1409	0.2746	0.0017	ROU (HI)	0.2753	0.4685	0.0713
ECU (MI)	0.1700	0.3085	0.0249	RUS (MI)	0.5299	0.6000	0.4389
EGY (MI)	0.3088	0.3185	0.2870	RWA (LI)	0.1595	0.2795	0.0331
ERI (LI)	0.0887	0.1739	0.0000	SAU (HI)	0.4420	0.3487	0.5180
ESP (HI)	0.8035	0.7759	0.7996	SDN (LI)	0.1075	0.2107	0.0002
EST (HI)	0.2524	0.4439	0.0510	SEN (MI)	0.1190	0.2217	0.0116
FIN (HI)	0.6457	0.6126	0.6534	SGP (HI)	0.7039	0.7606	0.6196
FJI (MI)	0.2179	0.4255	0.0017	SLB (MI)	0.0996	0.1954	0.0000
FRA (HI)	0.8149	0.8468	0.7510	SLE (LI)	0.0704	0.1332	0.0049
GAB (MI)	0.1219	0.2280	0.0109	SLV (MI)	0.2138	0.3902	0.0290
GBR (HI)	0.8363	0.7856	0.8541	SRB (MI)	0.2558	0.4470	0.0546
GEO (MI)	0.3327	0.6194	0.0330	SVK (HI)	0.2804	0.5250	0.0248
GHA (MI)	0.1784	0.2457	0.1041	SVN (HI)	0.3237	0.5441	0.0907
GIN (MI)	0.1070	0.1968	0.0129	SWE (HI)	0.7753	0.7387	0.7815
GMB (LI)	0.1073	0.2104	0.0000	SWZ (MI)	0.1839	0.3484	0.0122
GNB (LI)	0.0953	0.1868	0.0000	SYC (HI)	0.3540	0.6224	0.0717
GRC (HI)	0.4735	0.4300	0.4985	SYR (LI)	0.1220	0.2392	0.0000
GTM (MI)	0.2158	0.4092	0.0139	TCD (LI)	0.0702	0.1083	0.0293
GUY (HI)	0.1473	0.2834	0.0054	TGO (LI)	0.1776	0.2491	0.0992
HKG (HI)	0.7597	0.7932	0.6964	THA (MI)	0.7314	0.7103	0.7237
HND (MI)	0.2103	0.3423	0.0700	TJK (MI)	0.1065	0.2061	0.0027
HRV (HI)	0.4682	0.6810	0.2370	TLS (MI)	0.1025	0.2009	0.0000
HTI (MI)	0.0980	0.1923	0.0000	TON (MI)	0.2350	0.4608	0.0000
HUN (HI)	0.4644	0.5266	0.3840	TUN (MI)	0.2349	0.4051	0.0555
IDN (MI)	0.3644	0.4104	0.3041	TUR (MI)	0.4996	0.4166	0.5630
IND (MI)	0.5336	0.4640	0.5822	TZA (MI)	0.1027	0.1886	0.0128
IRL (HI)	0.6245	0.5866	0.6380	UGA (LI)	0.1041	0.2014	0.0028
IRN (MI)	0.5222	0.5998	0.4242	UKR (MI)	0.2070	0.3704	0.0355
ISL (HI)	0.4961	0.7011	0.2717	URY (HI)	0.3044	0.5637	0.0332
ISR (HI)	0.6045	0.7645	0.4209	USA (HI)	0.9170	0.8982	0.8999
ITA (HI)	0.7670	0.7218	0.7821	UZB (MI)	0.2860	0.5107	0.0501
JAM (MI)	0.3559	0.5542	0.1436	VUT (MI)	0.1966	0.3855	0.0000
JOR (MI)	0.3591	0.4641	0.2400	ZAF (MI)	0.5456	0.5778	0.4920

Notes: Region and income groups are designated according to the World Bank classification of countries. Low-income (LI) economies are defined as those with a gross national income (GNI) per capita of \$1085 or less in 2022, calculated using the World Bank Atlas method; Middle-income (MI) economies are defined as lower-middle-income economies, those with a GNI per capita between \$1086 and \$4255, and upper-middle-income economies, those with a GNI per capita between \$4256 and \$13,205; High-income (HI) economies are those with a GNI per capita of \$13,206 or more.