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Economic growth volatility: Is financialization a culprit?

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Abstract

Financial development plays a crucial role in shaping economic growth, yet it can introduce volatility. This study examines the relationship between financial development and economic growth volatility. Using panel data from 60 countries (30 developed and 30 developing) for 1981–2022, we employ panel-corrected standard errors and generalized method of moments to ensure robustness. Financial development is analyzed through financial institutions and financial markets across three dimensions: depth, access, and efficiency. Conceptually, the paper finds that the supply-leading hypothesis does not account for the economic growth volatility associated with excessive financialization. The results indicate that, at higher levels, financial development has a volatility-enhancing impact in developed countries, while in developing countries it has a volatility-reducing effect. Policymakers in developed countries should ensure that credit expansion is aligned with real-sector development. Regulators should monitor adverse effects of financial depth and ensure funds are directed toward real-sector growth, while improving access and efficiency. In a too-much-finance scenario, economies need moderators — such as strong regulatory quality and well-defined rights for creditors and borrowers — to mitigate volatility-enhancing effects.

Keywords: financialization, financial development, economic growth volatility, financial depth, economic growth.
JEL classification: C23, E3, E32, E44, G2, G15, O16.

1. Introduction

Financial development (FD) encompasses the factors, policies, and institutions that contribute to effective financial intermediation and well-functioning markets, ensuring broad and inclusive access to capital and financial services

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(World Economic Forum, 2011). Conceptually, FD is a process aimed at reducing the costs of acquiring information, enforcing contracts, and conducting transactions (World Bank, 2019). The supply-leading hypothesis emerges from this context, positing that FD drives economic growth by ensuring the efficient allocation of financial resources.

As financial systems expand and persist over time, expectations and dependencies on intermediation increase, adding layers of complexity and accumulating systemic vulnerabilities. These fragilities may trigger a chain reaction of unexpected economic disruptions, potentially culminating in financial crises. Rajan (2005) was among the earliest researchers to systematically discuss the detrimental effects of excessive finance. A growing body of literature suggests a trade-off between economic growth and growth volatility. While many scholars argue that FD promotes long-term expansion, it may simultaneously contribute to financial instability and macroeconomic volatility. Key drivers include high inflation that affects consumption patterns, reduced investment, declining borrower net worth, systemic risks leading to banking crises, and financial liberalization that diverts human capital from productive sectors.

Economic growth volatility is commonly classified into two categories: realized volatility — measured as the standard deviation of per-capita GDP growth — and innovation volatility — defined as the standard deviation of unexpected growth shocks. According to Andersen and Banzoni (2008), realized volatility is a nonparametric ex-post estimate of the return variation. The most obvious realized volatility measure is the sum of finely-sampled squared return realizations over a fixed time interval. In contrast, innovation volatility may be referred to as the variation (over time) in aggregate economic output or other macroeconomic variables that arises due to structural, financial, or institutional innovations (e.g., financial-market development, financial liberalization, structural reforms, technological–financial innovation; Jermann and Quadrini, 2006). In this study, economic growth volatility (hereafter, EV) refers to realized volatility, assessed using the standard deviation of per-capita GDP growth.

A widely held view suggests that FD reduces macroeconomic volatility, particularly in developed countries. Some studies propose that well-developed banking systems mitigate EV, as industrial output fluctuations tend to be negatively correlated with banking-sector credit portfolios. However, these conclusions have not been consistently robust across different measures of FD. Given the crucial role that FD plays in shaping economic growth, policymakers must assess its implications for both stability and volatility. A precise understanding of this relationship is essential for designing macroeconomic policies that maximize the benefits of FD while mitigating its potential risks.

This relationship requires systematic evaluation from several perspectives. First, a simultaneous study of developed and developing countries using the same period, variable measures, and estimation techniques can clarify potentially different dynamics. Second, in contrast to earlier unidimensional approaches, this study examines depth, access, and efficiency for both bank-based and market-based components of FD.

We address three questions. First, does excessive FD prove detrimental by inducing EV? Second, if so, which dimensions of FD (depth, access, or efficiency) are the primary contributors? Third, is this effect consistent across developed and

developing countries? The answers are intended to inform macroeconomic and macroprudential policymakers.

The post-2008 global financial crisis literature increasingly suggests that the relationship between FD and economic growth is nonmonotonic: FD initially fosters growth but, beyond a threshold, has a negative impact. This "vanishing effect" or "too-much-finance effect" underscores the need for further investigation. Examining interactions with institutional and regulatory environments within this assumed non-linear relationship may offer valuable insights for both policymakers and researchers.

Another source of inconclusiveness is the imperfection of indicators used to measure the financial system's contribution to development. Levine (2022) notes that the literature remains inconclusive on whether finance causes growth and, if so, through what mechanisms — attributing this to limitations of FD indicators in empirical research. Many studies use the size of financial institutions or financial markets as proxies for FD. However, a more comprehensive measure is needed — one that incorporates financial institutions (FI), financial markets (FM), and their respective dimensions: access, depth, and efficiency.

Among these, financial depth is the most common proxy. Credit to the private sector is standard in cross-country regressions, but it is not comprehensive, as it fails to capture the diverse mechanisms through which the financial system supports growth (Beck, 2009). Given these limitations, the research landscape reveals a significant gap. A more nuanced measure of FD is required to assess whether a country's financial system aligns with its macroeconomic conditions and institutional framework.

Much of the literature on FD and growth has focused on depth, neglecting access and efficiency. As a result, policymakers and regulators are often left with a one-dimensional perspective. This study addresses that gap by using a detailed FD index that includes both FI and FM, further decomposed into depth, access, and efficiency for each component. This comprehensive framework, developed by Sahay et al. (2015), provides a robust foundation for evaluating FD.

A further challenge is estimation uncertainty, which contributes to inconclusive empirical findings. Botev et al. (2019) emphasize that variation in estimation techniques and model specifications has led to divergent conclusions. To ensure robustness, this study employs the panel-corrected standard errors (PCSE) method to estimate the effects of FD in both developed and developing economies. Additionally, the generalized method of moments (GMM) technique is applied to address endogeneity concerns, thereby enhancing the credibility of the empirical results.

2. Literature review

In line with Adam Smith's proposition, two primary streams of thought underpin the relationship between financial development and economic outcomes. The first stream considers FD as a supply-leading productive input that fosters economic growth. Commonly referred to as the supply-leading hypothesis, this remains the dominant perspective. Because financial markets comprise various intermediaries, it is elaborated through multiple sub-theories, including finance theory, market-based theory, bank-based theory, law-and-finance theory, and financial-services-based theory.

Renewed interest in the finance—growth nexus was sparked by the development of endogenous growth models grounded in the supply-leading hypothesis. The seminal work of Diamond and Dybvig (1983) laid the foundation for models demonstrating how financial systems influence growth by managing liquidity risk. Among the pioneers were Lucas (1988), Romer (1988), and Rebelo (1991).

Numerous studies provide empirical support for the supply-leading hypothesis, emphasizing the role of FD in promoting economic growth. A foundational contribution is King and Levine (1993), who found strong empirical evidence linking FD to economic expansion. Several subsequent studies reinforce these findings, including Ullah et al. (2024b) for developing countries, Afonso and Blanco-Arana (2022), Tran et al. (2021), Tang and Abosedra (2020), and Ustarz and Fanta (2021).

A significant body of research, however, identifies excessive credit expansion as a driver of economic volatility (Jorda et al., 2011; Kaminsky and Reinhart, 1999; Schularick and Taylor, 2012). Demetriades et al. (2023) observe that private credit negatively affects growth, supporting the argument that excessive financial depth can be destabilizing. Rousseau and Wachtel (2011) attribute the "vanishing effect" of FD to high financial depth, which fuels inflation and undermines banking-sector stability. Other researchers examine household credit and find it more influential for volatility than private-sector credit (Beck et al., 2014; Sassi and Gasmi, 2014; Angeles, 2015).

Recent studies also highlight that financialization affects EV through various channels. Yilmaz (2024) show that enhanced FD, particularly through improved banking and capital markets, can reduce volatility by improving risk management and capital allocation, although in some cases it may also increase exposure to systemic shocks.

Concerns about excessive financial deepening date back to Minsky (1974) and Kindleberger (1978), who suggested that unchecked financial expansion contributes to macroeconomic volatility. Deidda and Fattouh (2002, 2008) find that the positive relationship between financial depth and growth reverses during financial-system transitions, particularly when economies shift from bank-based to market-based systems.

Another mechanism through which financial deepening contributes to volatility is monetary policy. A contractionary stance can raise interest rates, limit credit access for small businesses, and increase systemic vulnerability (Beck et al., 2000). Some studies also observe that FD increases systemic risk, amplifying the potential for domestic financial crises (Rousseau and Wachtel, 2011).

The size of the financial system is also correlated with economic volatility. Beck et al. (2014) find that in high-income countries, a well-developed financial system is positively associated with volatility. Some researchers argue that firms with high collateral crowd out lower-productivity projects, ultimately slowing growth (Van Wijnbergen, 1983; Buffie, 1984). Rodrik (1998) and Stiglitz (2002) further contend that volatility in capital flows at high levels of FD undermines both economic and financial stability.

Some studies focus on financial markets as a source of volatility. Bernanke and Gertler (1990) and Bernanke and Blinder (1992) find that low-net-worth borrowers rely heavily on external finance, which increases agency costs and financial fragility. This reliance amplifies real-sector shocks through financial-accelerator effects during distress (Beck et al., 2000; Ibrahim and Alagidede, 2017). Acemoglu and

Zilibotti (1997) suggest that investment indivisibility leads to concentrated financial risk, increasing volatility. Kiyotaki and Moore (1997) argue that capital-market imperfections exacerbate temporary productivity shocks by reducing borrowers' net wealth, particularly among credit-constrained firms. Rajan (2005) finds that financial-innovation-led expansion contributes to tail risks, which individual investors often fail to anticipate. Abbas and Iftikhar (2016) observe that financial-sector instability increases volatility in industrial growth.

The securitization of lending portfolios has also been linked to greater instability. Dell'Ariccia et al. (2012), Keys et al. (2010), and Mian and Sufi (2009) find that securitization weakens lending standards, resulting in higher delinquency rates. Similarly, Ashcraft and Santos (2009) and Gennaioli et al. (2012) note that financial engineering techniques, designed to match securities with risk-averse investors, can obscure critical risks and increase overall fragility. Aizenman and Pinto (2005) and Le et al. (2023) find that financial-sector expansion initially increases EV, although it may enhance growth in the short term due to a favorable risk — return trade-off. Over time, however, this volatility can reduce long-term growth by lowering investment and consumption.

Despite these concerns, some researchers argue that financial-sector development can reduce EV. This perspective is based on the premise that innovative financial structures allow greater risk-sharing, reduce financial constraints, and enhance firms' ability to absorb shocks. These mechanisms also promote consumption smoothing, stabilizing household spending patterns. Denizer et al. (2000) find that in economies with highly developed financial systems, investment-growth volatility is significantly lower. Larrain (2006), Raddatz (2006), and Park (2015) also report that the development of financial institutions reduces output volatility in the industrial sector.

Beck et al. (2014) conclude that financial intermediation supports long-term growth while reducing volatility. Similarly, Alagidede and Ibrahim (2016) observe that financial-sector advancements dampen real-sector shocks. Liu and Yang (2016) find that financial deepening reduces macroeconomic volatility up to a threshold. Kapingura et al. (2022) also report that a well-developed financial system — where both financial institutions and markets operate effectively — contributes to lower macroeconomic volatility.

Several studies further suggest that financial deepening reduces the impact of external shocks, helping stabilize macroeconomic conditions (Iwasaki et al., 2020; Levine and Warusawitharana, 2021). Manganelli and Popov (2015) find that FD helps reduce aggregate volatility, while Xue (2020) observes that financial deepening decreases volatility in advanced economies.

Some researchers propose a U-shaped relationship between financial-sector development and EV. Alatrash et al. (2014) argue that in well-developed financial systems, FD initially reduces growth volatility, but beyond a threshold it begins to increase it. These findings are consistent with Easterly et al. (2000), Kunieda (2008), Dabla-Norris and Srivisal (2013), and Sahay et al. (2015).

Aghion et al. (2005) find that economies at an intermediate stage of development experience higher instability, while Acemoglu and Zilibotti (1997) argue that underdeveloped economies are most vulnerable due to limited investment diversification. However, another strand of research finds no significant relationship between FD and growth volatility. Beck et al. (2006) find no evidence that

financial-sector development influences volatility, while Xu (2007) reports that FD does not significantly affect volatility in emerging economies. Despite these findings, the literature on this topic remains limited.

Levine (2021) emphasizes that shortcomings in FD measurement hinder definitive conclusions regarding whether and how finance drives growth. The lack of a universally accepted indicator has contributed to inconsistencies in empirical findings, making it difficult for policymakers to formulate effective strategies based on FD metrics.

A review of thirty significant studies on FD and growth reveals considerable variation in measurement approaches. As shown in Table 1, the estimates used to quantify FD differ widely. Common indicators include private credit-to-GDP, credit extended to private enterprises relative to total domestic credit, and monetary aggregates such as M1, M2, and M3 as percentages of GDP. Other studies employ measures such as bond-market development, private credit provided by domestic commercial banks-to-GDP, bank credit-to-GDP, and private-credit-to-deposit-money ratios. This spectrum of FD metrics underscores the lack of a standardized approach, complicating cross-country comparisons and limiting the generalizability of findings.

Table 1
Estimates and dimensions of financial development.

No.	Authors	Theory	Estimate of FD	Dimension of FD
1	Gregorio and Guidotti (1995); Andersen and Tarp (2003); King and Levine (1993); Rioja and Valev (2004); Beck and Levine (2004); Rousseau and Wachtel (2011); Arcand et al. (2011); Beck et al. (2012); Cecchetti and Kharroubi (2012); Law and Singh (2014)	Supply-leading hypothesis	Private credit provided by domestic commercial banks and other financial institutions-to-GDP	Financial depth
2	Shen and Lee (2006); Chakraborty (2010)	Supply-leading hypothesis	Stock-market activity	Financial depth
3	Rousseau and Wachtel (2002); Yilmazkuday (2011)	Supply-leading hypothesis	M1-to-GDP ratio	Financial depth
4	Demetriades and Hussein (1996); Giedeman and Compton (2009); Anwar and Cooray (2012)	Supply-leading hypothesis	M2-to-GDP ratio	Financial depth
5	Dawson (2008); Hassan et al. (2011)	Supply-leading hypothesis	M3-to-GDP ratio	Financial depth
6	Fink et al. (2003)	Supply-leading hypothesis	Bond-market development	Financial depth
7	Bahri et al. (2018)	Supply-leading hypothesis	Private credit-to-deposit-money ratio	Financial depth
8	Levine and Zervos (1998)	Supply-leading hypothesis	Stock-market liquidity (financial-market development)	Financial depth
9	Levine et al. (2000); Beck et al. (2000)	Supply-leading hypothesis	Country's legal origin	Financial depth

Source: Compiled by the author.

Beyond measurement inconsistencies, another shortcoming is the overemphasis on financial depth as the sole indicator of FD. While depth — defined as the size of financial institutions and markets relative to GDP — is important, it does not fully capture the complexity of FD. The literature increasingly recognizes three core dimensions: financial depth, financial access, and financial efficiency. Financial access refers to the availability and affordability of financial services, ensuring that individuals and businesses can participate in financial systems. Financial efficiency measures how effectively institutions allocate capital, manage risk, and support economic activity.

The failure to incorporate financial access and efficiency into FD measurement represents a major gap. This omission limits policymakers' ability to design holistic financial policies that promote inclusive and sustainable development. Most existing research focuses predominantly on depth, overlooking the essential contributions of access and efficiency in shaping overall effectiveness. Addressing this gap — by integrating all three dimensions (depth, access, and efficiency) into analysis — enables a more comprehensive understanding of the finance — growth relationship and supports the formulation of policies aimed at enhancing financial stability and long-term growth.

Traditional measures — such as credit-to-GDP and stock-market capitalization ratios — offer narrow proxies that do not capture the full scope of financial development. A more robust approach evaluates these aspects using composite indices with well-defined sub-indices, yielding a more accurate estimate of FD. Moreover, FD should not be confined to a single dimension (depth). A holistic measure must incorporate financial efficiency and financial access, which are equally critical for understanding how financial systems affect economic performance.

Recognizing these gaps, this study adopts a comprehensive index that evaluates both financial institutions and financial markets, incorporating depth, efficiency, and access as key dimensions through structured sub-indices.

The divergence in empirical findings further highlights the complexity of the relationship between FD and economic volatility, underscoring the need for systematic investigation. Table 2 illustrates the inconclusive nature of existing research, showing how different studies reach conflicting conclusions regarding the impact of FD on volatility. This variation suggests that the effect of FD may be context-dependent — shaped by institutional quality, regulatory frameworks, and broader macroeconomic conditions. Therefore, a more nuanced understanding of threshold effects is essential to determine whether excessive financialization is universally detrimental or whether its consequences differ across economic environments.

The literature shows that the relationship between financial development and economic volatility is both inconclusive and underexplored. Few studies investigate which specific dimensions — depth, access, or efficiency — drive heightened volatility, leaving a significant research gap. This study addresses that shortcoming. Moreover, recent research on FD and economic growth, particularly in the post-Global Financial Crisis (2008) era, has largely focused on developing countries or single-country cases (e.g., Karagol et al., 2022; Sahay et al., 2015; Bahri et al., 2018; Oro and Alagidede, 2018). This narrow scope is notable given that the crisis originated in developed countries with advanced financial markets and institutions. The lack of a comprehensive analysis of these economies may

Table 2
Inconclusive evidence: Relationship between financial development and economic volatility.

Evidence type	Authors
Positive relationship between financial development and economic volatility	Demirgüç-Kunt and Detragiache (1998, 2002); Jorda et al. (2011); Kaminsky and Reinhart (1999); Domaç and Peria (2003); Schularick and Taylor (2012); Reinhart and Rogoff (2009); Ibrahim and Alagidede (2017); Kiyotaki and Moore (1997); Beck et al. (2014); Enoch and Ötker-Robe (2007); Gourinchas et al. (2001); Rodrik (1998); Stiglitz (2002); Bernanke and Gertler (1990); Bernanke and Blinder (1992); Acemoglu and Zilibotti (1997); Ashcraft and Santos (2009); Gennaioli et al. (2012); Le et al. (2023)
Negative relationship between financial development and economic volatility	Iwasaki et al. (2020); Levine and Warusawitharana (2021); Denizer et al. (2002); Larrain (2006); Raddatz (2006); Park (2015); Beck et al. (2013); Alagidede and Ibrahim (2016); Kapingura et al. (2022); Manganelli and Popov (2015); Xue (2020); Xu (2007)
U-shaped relationship between financial development and economic volatility	Bijlsma et al. (2018); Alatrash et al. (2014); Easterly et al. (2000); Kunieda (2008); Dabla-Norris and Srivisal (2013); Sahay et al. (2015)
Insignificant impact of financial development on economic volatility	Beck et al. (2003)

Source: Compiled by the author.

hinder effective policy design — an observation that also applies to the relationship between FD and economic-growth volatility.

Overall, the existing literature highlights a paradoxical and inconsistent relationship between financial development, economic growth, and its volatility. Empirical studies report positive, negative, U-shaped, and insignificant relationships. These inconsistencies present a dilemma for policymakers, who must decide whether to promote FD as a tool for growth or to curtail it to prevent imbalances that could destabilize the economy.

3. Hypotheses

The empirical literature provides mixed evidence — both negative and positive — regarding the relationship between FD and EV. Building on this ambiguity, we hypothesize a nonlinear relationship between FD and EV: FD initially promotes stability by reducing EV, but beyond a threshold it may increase volatility.

H1: There is a nonlinear relationship between FD and EV in developed countries.
H2: There is a nonlinear relationship between FD and EV in developing countries. (see Fig. 1).

4. Materials and methods

This study examines a *nonlinear* relationship between financial development (*FD*) and economic growth volatility (*EV*) across two country groups — developed and developing — using panel data and two estimation strategies: PCSE and GMM. The main independent variable, *FD*, is measured with a composite index

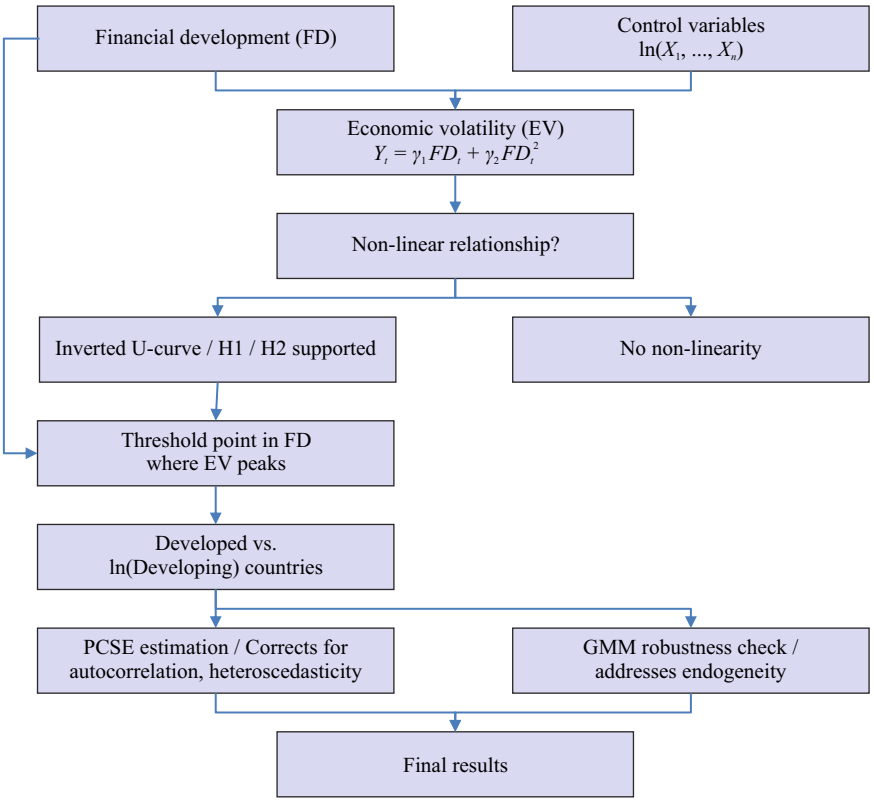

Fig. 1. Research flow diagram.

Source: Compiled by the author.

comprising three sub-dimensions — depth, access, and efficiency — each defined separately for FI and FM.

The empirical model is represented by Equation (1), which links the dependent variable, *EV*, to *FD* and controls for country *j* at time *t*:

$$EV_{j,t} = \gamma_0 + \gamma_1 FD_{j,t} + \gamma_2 FD_{j,t}^2 + \sum_{m=1}^{n} \delta_m X_{m,j,t} + \epsilon_{j,t}. \quad (1)$$

Equation (1) tests Hypotheses 1 and 2 regarding nonlinearity between *FD* and *EV*. A *positive* coefficient on the quadratic term (γ_2) indicates a *U-shaped* relationship (stability at lower FD and higher EV beyond a threshold), whereas a *negative* γ_2 indicates an *inverted-U*. The turning point is given by $-\gamma_1/(2\gamma_2)$ when $\gamma_2 \neq 0$.

Diagnostic tests indicate autocorrelation, heteroskedasticity, and cross-sectional dependence; therefore, we employ PCSE to estimate Equation (1). As a robustness check and to address potential endogeneity, we also estimate the model using GMM.

4.1. Variables of the study

The dependent variable, *EV*, captures fluctuations in economic performance and is measured as the standard deviation of per-capita GDP growth, providing

Table 3
Estimates of financial development.

	Financial institutions	Financial markets
Depth	(1) Private-sector credit (% of GDP) (2) Pension-fund assets (% of GDP) (3) Mutual-fund assets (% of GDP) (4) Insurance premiums, life and nonlife (% of GDP)	(1) Stock-market capitalization-to-GDP (2) Stocks-traded-to-GDP (3) International debt securities, government (% of GDP) (4) Total debt securities of nonfinancial corporations (% of GDP) (5) Total debt securities of financial corporations (% of GDP)
Access	(1) Bank branches (commercial) per 100,000 adults (2) ATMs per 100,000 adults	(1) Percent of market capitalization outside the top ten companies (2) Total number of debt issuers (domestic and external; nonfinancial and financial corporations)
Efficiency	(1) Net interest margin (2) Lending—deposit spread (3) Non-interest income to total income (4) Overhead costs to total assets (5) Return on assets (6) Return on equity	(1) Stock-market turnover ratio (stocks traded/ capitalization)

Source: Compiled by the author using data from Sahay et al. (2015).

an indicator of macroeconomic stability and the extent of output fluctuations over time.

The construction of the financial development index follows a structured, multi-step approach. First, we develop six sub-indices: Financial Institutions' Access (FIA), Financial Institutions' Depth (FID), Financial Institutions' Efficiency (FIE), Financial Markets' Access (FMA), Financial Markets' Depth (FMD), and Financial Markets' Efficiency (FME). Each sub-index aggregates the corresponding variables in Table 3 to capture distinct aspects of FD. For example, FID combines pension-fund assets, private-sector credit, insurance premiums (life and nonlife), and mutual-fund assets. We use principal component analysis (PCA) to determine variable weights when constructing each composite sub-index.

Second, we obtain the Financial Institutions (FI) and Financial Markets (FM) indices by aggregating their respective sub-indices via PCA. Finally, we combine FI and FM to construct the overall FD index, a comprehensive multidimensional measure of financial development.

4.2. Control variables

Following Beck and Levine (2004) and Sahay et al. (2015), we use a standard set of country-level controls to account for panel heterogeneity: foreign direct investment (FDI), inflation, education, public consumption, trade openness, and gross capital inflows. Including these controls enhances the robustness of the estimates while keeping the focus on the primary explanatory variable *FD*.

4.3. Data sources, descriptive testing, diagnostic testing, and estimation methods

We test the hypotheses using a sample of 30 developed and 30 developing economies, employing country-level annual data for the independent, dependent, and control variables over 1981–2022. This extended timeframe captures the evolution of financial systems from rudimentary banking structures to modern, technology-driven systems. Unlike many recent studies that focus on the post-Global Financial Crisis period or begin in the mid-1990s, our coverage spans more than four decades. Countries are selected using the International Monetary Fund (IMF) classification, with additional filtering based on data availability.

Data are drawn from widely used sources, including the World Development Indicators and TheGlobalEconomy.com. Countries with substantial missing data are excluded to preserve data integrity, although this exclusion may introduce selection bias.

A panel-data structure is adopted because it improves identification relative to pure cross-sectional or time-series approaches. Cross-country models often suffer from unobserved country-specific effects being absorbed into the error term; if these effects correlate with regressors, coefficients are biased. Panel data help control for individual heterogeneity and reduce omitted-variable bias, and they facilitate the use of instrumental-variable strategies where appropriate (Hsiao, 1986). All data management, estimation, and robustness checks are conducted in Stata/SE 15.

To verify consistency and reliability, we compute summary statistics (mean, minimum, maximum, and standard deviation) and assess multicollinearity using the variance inflation factor (VIF). We also examine normality and test for heteroskedasticity, cross-sectional dependence, and autocorrelation.

The dataset is an unbalanced panel because data availability varies across countries and time. Missing observations can introduce bias — particularly if nonrandom — but this concern is less acute for developed countries with more complete historical data. For developing countries, nonrandom exclusion is applied where missingness is substantial. Unbalanced panels can bias standard errors, aggravate heteroskedasticity and serial correlation, and reduce efficiency. To mitigate these risks, we estimate models using panel-corrected standard errors (PCSE) and, as a robustness check, the generalized method of moments (GMM).

PCSE adjusts standard errors for heteroskedasticity, serial correlation, and cross-sectional dependence, yielding more reliable inference in panel settings, including unbalanced panels. It is generally preferred to ordinary least squares and often performs better than feasible generalized least squares in empirical applications.

To strengthen econometric validity further, we also estimate via GMM — well suited for addressing endogeneity and omitted-variable bias. The GMM framework introduced by Arellano and Bover (1995) is widely used in the finance — growth literature and is effective for handling simultaneity, reverse causality, and unobserved heterogeneity by leveraging instrumental variables.

While PCSE focuses on improving inference under heteroskedasticity and cross-sectional correlation given a correctly specified model, GMM offers a complementary approach that allows consistent parameter estimation under weaker assumptions, particularly in the presence of endogenous regressors.

5. Results

The descriptive statistics are reported in Table 4. The key independent variable, financial development (*FD*), has a mean of 0.456 (std. deviation 0.202; range 0–1.097). The panel spans 60 countries (30 developed and 30 developing) over 1981–2022, covering multiple cycles (booms, recessions, and crises). The dispersion in *FD* reflects the heterogeneous economic conditions in the sample.

For the linear terms of the financial-development components — financial institutions' depth (*FID*), access (*FIA*), and efficiency (*FIE*), and financial markets' depth (*FMD*), access (*FMA*), and efficiency (*FME*) — dispersion is moderate. Notably, FIA and FIE have standard deviations below their means, indicating relatively tight distributions across countries.

By contrast, for the squared terms of the market subindices — FMD^2, FMA^2, and FME^2 — the standard deviations exceed the means, suggesting that higher levels of market development are associated with greater variability. This pattern is consistent with threshold-type, volatility-enhancing effects at elevated levels of market development.

An inspection of skewness and kurtosis shows no extreme departures from symmetry or thin/thick tails: most variables have skewness within ±2 (Hair et al., 2022), and kurtosis values are moderate. As expected, squared terms (e.g., FD^2 components) are more leptokurtic, a common feature of transformed financial indices. These features do not undermine inference given our use of PCSE and GMM. Summary statistics for the dependent variable, *EV* (realized volatility of per-capita GDP growth), indicate meaningful dispersion across countries and years (Table 4). Variance inflation factors (VIFs) for linear regressors are all < 2, indicating that multicollinearity is not a concern and that predictors contribute distinct explanatory power.

Table 4
Summary statistics: Financial development variables.

Variable	Observations	Mean	Std. dev.	Min.	Max.	Skewness	Kurtosis	*VIF*
FID	2160	0.42654	0.28524	0	1.11258	0.44456	1.9025	1.62
FID^2	2160	0.26798	0.27687	0	1.20689	1.2258	3.7872	–
FIA	2160	0.47659	0.27614	0	1.16111	0.24213	1.8174	1.46
FIA^2	2160	0.27256	0.29035	0	1.14878	0.9540	2.6687	–
FIE	2160	0.61365	0.15220	0	0.93994	−1.5309	3.6790	1.34
FIE^2	2160	0.37689	0.14545	0	0.90228	−0.2223	2.5629	–
FMD	2160	0.35311	0.30222	0	1.24777	0.6430	2.6017	1.51
FMD^2	2160	0.21832	0.27569	0	1.53361	1.3061	3.4060	–
FMA	2160	0.39473	0.23749	0	1.19444	0.4857	2.3668	1.20
FMA^2	2160	0.19881	0.23441	0	1.35942	1.6898	5.2147	–
FME	2160	0.48087	0.34781	0	1.27604	0.3421	1.5158	1.17
FME^2	2160	0.36437	0.36534	0	1.69719	0.7825	2.3647	–
FI	2160	0.50208	0.27990	0	1.16639	0.1183	1.6897	1.89
FI2	2160	0.31340	0.26311	0	1.12491	0.6144	3.2588	–
FM	2160	0.38945	0.27666	0	1.09129	0.4141	2.2571	1.41
FM^2	2160	0.23333	0.24888	0	1.18968	1.1874	3.3435	–
FD	2160	0.45667	0.20201	0	1.09732	0.2459	1.3267	1.42
FD^2	2160	0.25554	0.19818	0	1.14903	2.0789	3.9980	–
EV	2160	2.872	1.301	−0.19368	0.30191	−0.1912	7.3601	–

Source: Author's calculations.

Table 5
Diagnostic testing results for relationship FD, $FD^2 \rightarrow EV$.

Issue	Test statistic
Heteroskedasticity (Breusch–Pagan)	213.70***
Cross-sectional dependence (Pesaran CD)	49.127***
Autocorrelation (Breusch–Godfrey)	40.279***

Note: *** $p < 0.01$. Test statistics are reported as returned by the respective procedures (LM/χ^2 for Breusch–Pagan and Breusch–Godfrey; CD statistic for Pesaran).
Source: Author's calculations.

5.1. Diagnostic testing

We apply the Breusch–Pagan test for heteroskedasticity to assess whether error variances are constant across observations. Table 5 indicates heteroskedasticity, implying that the variance of residuals varies across observations.

To examine correlation across countries, we use Pesaran's (2004) cross-sectional dependence (CD) test. The results confirm significant cross-sectional dependence across specifications linking *FD* (and FD^2) to *EV*, suggesting that shocks affecting one country may influence others in the panel.

Lastly, the Breusch–Godfrey test is used to detect serial correlation in residuals across panel units. The results show statistically significant autocorrelation.

These diagnostics motivate the use of PCSE and support our GMM robustness checks.

5.2. Financial development and economic volatility

The findings in Table 6 document the relationship between *FD* and *EV* across developed and developing economies. For the 30 *developed* countries, we find a *U-shaped FD–EV* relationship: the linear FD term is negative and the quadratic term is positive, implying that *FD* initially stabilizes *EV* but, beyond a threshold, raises volatility.

FI in developed economies also exhibit a U-shaped pattern with *EV*. At the subindex level, *FID* is U-shaped, while *FIA* and *FIE* are inverted U-shaped (IUS)—volatility increases at early stages of financial development, but declines once financial development reaches higher levels. These results align with evidence for advanced economies showing that volatility tends to rise at higher *FD* levels. U-shaped patterns for *FD*, *FI*, *FID*, and *FMD* are consistent with Alatrash et al. (2014), Angeles (2015), Beck et al. (2014), Dabla-Norris and Srivisal (2013), Gennaioli et al. (2012), Haiss et al. (2016), and Reinhart and Rogoff (2009). Notably, financial access (*FIA* and *FMA*) appears destabilizing at high development levels, echoing Naceur et al. (2019).

Several mechanisms may explain why elevated *FD* lifts volatility in developed economies. Cecchetti and Kharroubi (2015), Bolton et al. (2016), and Philippon (2010) argue that an expanding financial sector can draw skilled labor away from the real sector. Kindleberger (1978) posits that an oversized financial system encourages instruments that fuel speculation rather than investment; Chu (2020) likewise links rapid stock-market growth to speculative dynamics that undermine stability. In the Minsky (1974) view, deepening shifts capital toward speculative

uses, increasing systemic risk; Tobin (1984) therefore proposed a transactions tax to curb destabilizing speculation.

Excessive credit growth is another channel. Demirgüç-Kunt and Detragiache (1998, 2002), Jorda et al. (2011), Kaminsky and Reinhart (1999), Domaç and Peria (2003), and Schularick and Taylor (2012) show that large credit booms often precede downturns. Beck (2012) and Angeles (2015) find that household credit, in particular, amplifies volatility when funds flow to non-productive uses. Rousseau and Wachtel (2011) link the "vanishing effect" of FD to inflationary pressures and weakened banking stability at high depth. Complex financial engineering can also raise fragility: Ashcraft and Santos (2009) and Gennaioli et al. (2012) note that many instruments *obscure* rather than reduce risks. Securitization, while improving liquidity, has been tied to weaker screening and higher defaults (Dell'Ariccia et al., 2012a; Keys et al., 2010; Mian and Sufi, 2009). Banking concentration can further amplify volatility by restricting credit to collateral-rich firms, constraining entrepreneurship (Levine and Rubinstein, 2020; see also Adelino et al., 2015; Corradin and Popov, 2015; Fairlie and Krashinsky, 2012; Kerr and Nanda, 2009; Schmalz et al., 2017).

For the 30 *developing* countries, we find an *inverted U-shaped FD–EV* relationship: volatility rises at early *FD* stages and falls at higher levels. Similar IUS patterns hold for *FI*, *FID*, and *FIA*, while *FIE* is U-shaped. On the market side, *FMD* and *FME* are inverted U-shaped — consistent with Kapingura et al. (2022), who report initially higher volatility that subsides as markets mature. Naceur et al. (2019) also find that improved financial access enhances stability in low-income settings, highlighting the role of inclusion. These findings accord with earlier work emphasizing transitional dynamics and diversification gains at higher development stages (Aghion et al., 2005; Acemoglu and Zilibotti, 1997; Cheng et al., 2021; Mbome, 2016; Sahay et al., 2015).

Several factors may underpin these patterns. Deidda and Fattouh (2008) argue that the positive association between depth and growth can invert during shifts from bank-based to market-based systems. Levine (2022) emphasizes liquidity-risk channels affecting saving and investment, with implications for *EV* at different *FD* levels. Credit-to-GDP surges can raise volatility at high *FD* (Enoch and Ötker-Robe, 2007; Gourinchas et al., 2001), and household-credit growth has been linked to instability (Sassi and Gasmi, 2014).

For the full sample of 60 countries, *FD* does not show a statistically significant linear association with *EV*, whereas the squared term is positive and significant (Table 6). This pattern implies that volatility tends to rise at higher levels of *FD*, even if modest changes around lower levels are not strongly related to *EV*. In other words, the evidence points to a nonlinear, level-dependent effect in which excessive financial deepening is associated with greater macroeconomic instability.

FI also display nonlinear effects. The squared terms for *FI* and its sub-indices — *FID*, *FIA*, and *FIE* — are jointly significant, indicating that banking-sector development affects *EV* through threshold-type mechanisms. Depth and access tend to become volatility-enhancing as they expand beyond moderate levels, consistent with the idea that rapid credit growth and broadening outreach can, after some point, fuel risk-taking and misallocation. The behavior of efficiency is more nuanced, suggesting that improvements in intermediation quality can

Table 6
Estimation results: Financial development and economic volatility.

Variable	Sample (method)			
	60 countries (PCSE)	Developed (PCSE)	Developing (PCSE)	60 countries (two-step GMM)
FD	0.5239	−0.0459*	0.0499**	0.0598
FD^2	0.3256	0.0444**	−0.0598**	0.0831***
FI^2	0.0247**	0.0378**	−0.0709*	0.3591***
FM^2	0.0210**	−0.0101***	−0.0456**	0.3896**
FID^2	0.0233***	0.0196***	−0.0388**	0.1718**
FIA^2	0.0199***	−0.0289**	−0.0513**	0.1470***
FIE^2	−0.0436**	−0.0593*	0.0382**	0.1503**
FMD^2	0.0274***	0.0194***	0.0422**	0.3120**
FMA^2	0.0851*	0.0236**	−0.0259***	0.1750***
FME^2	−0.0311**	−0.0241**	0.0413**	0.1116***

Note: Coefficients shown; *p*-values in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. PCSE — panel-corrected standard errors; GMM — generalized method of moments.
Source: Author's calculations.

dampen volatility up to a point, but may introduce new vulnerabilities when efficiency gains are driven by aggressive risk transfer or loosening lending standards. These findings are in line with previous work linking "too much finance" to heightened volatility (Aizenman et al., 2015; Arcand et al., 2011; Chu, 2020; Demetriades et al., 2023; Haiss et al., 2016; Pagano and Pica, 2012; Rousseau and Wachtel, 2011).

By contrast, *FM* exhibit a stabilizing effect at lower levels of development and a destabilizing effect at higher levels. In the baseline regressions, the linear *FM* term is negative and the squared term is positive, implying that initial deepening of financial markets helps absorb shocks and smooth fluctuations, but very high levels of market development are associated with increased volatility. At the component level, *FMD* follows a U-shaped pattern with *EV*: early stages of market deepening reduce volatility, whereas further expansion eventually becomes destabilizing. *FME* displays an IUS relationship, whereby initial efficiency gains lower volatility, but very high efficiency — often accompanied by complex trading strategies and higher leverage — can again raise exposure to systemic risk.

To assess robustness, the study reestimates the models using GMM. The GMM results, also reported in Table 6, confirm the significance and positive sign of the *FD* squared term and support the nonlinear roles of *FI* and *FM*. In particular, the quadratic *FD* coefficient remains positive and significant, and the nonlinear terms for institutional and market development retain their expected signs, reinforcing the interpretation that it is the higher levels of financial deepening — rather than financial development per se — that are associated with higher volatility.

Taken together, the evidence suggests that financial development has a dual effect on macroeconomic stability. Moderate development of financial institutions and markets tends to be stabilizing, strengthening risk sharing and smoothing fluctuations, whereas excessive deepening introduces systemic risks that raise volatility. For regulators and policymakers, this underscores the importance of managing the pace and composition of financial-sector growth — especially the expansion

of credit and the sophistication of market instruments — so that financial development supports, rather than undermines, long-term economic stability.

6. Discussion and conclusion

The results indicate that in developed economies economic volatility rises at higher levels of financial development. A decomposition shows that *financial depth* in both banking and market segments is the main driver of this effect, consistent with the "too-much-finance" view: beyond a threshold, additional deepening ceases to raise productivity and instead heightens fragility.

On the banking side, abundant credit can misallocate resources toward saturated sectors, with surplus liquidity spilling into speculative, non-productive uses and inflating asset-price cycles. Concentrated banking structures may also exclude collateral-constrained entrepreneurs, dampening innovation and entrenching inequality. On the market side, excessive depth encourages complex instruments that *obscure* underlying risk, raising exposure to tail events.

Policy for developed economies. Financial deepening should be balanced with real-sector needs and accompanied by guardrails. Useful tools include (i) targeted credit-allocation mechanisms that tilt a *portion* of private credit toward innovative, high-potential firms; (ii) state-backed credit-guarantee schemes to relax collateral constraints for start-ups; and (iii) borrower-based macroprudential limits and countercyclical buffers to restrain leverage cycles. Equity-market exuberance should not dominate sectoral growth; a balanced architecture that supports both bank-based and market-based intermediation fosters resilience.

Access and efficiency at high development levels. In line with our estimates, financial-institution access (*FIA*) and efficiency (*FIE*) in developed economies display *inverted U-shapes*: broadening inclusion and lowering intermediation frictions are stabilizing at low-to-moderate *FD*, but can become destabilizing *when very extensive* (for example, if standards loosen or risk migrates to weaker borrower segments). Policy should therefore expand access *with safeguards* (e.g., proportional affordability tests, stress-tested digital onboarding) and pursue efficiency gains that do not erode underwriting quality. On the market side, widening participation (a larger free float beyond the top-ten firms) can diversify risk without encouraging excessive churn.

In *developing* economies, *EV* declines at higher *FD*. Development in both financial institutions and markets contributes to this stabilizing effect, plausibly because credit is more often directed to productive investment and markets are less saturated with complex, high-risk instruments. Sequencing matters: deepen access and market infrastructure while building supervisory capacity, so that later-stage risks are contained. As shown by recent evidence, improving *regulatory quality* can moderate volatility in bank-centric environments (Ullah et al., 2024a). Central banks, supervisors, and market authorities should adopt macroprudential frameworks suited to local structures (countercyclical capital buffers, sectoral risk weights, foreign-currency borrowing limits).

Interpretation. The supply-leading hypothesis on its own does not capture the *nonmonotonic* pattern we observe. In developed economies, higher *FD* is associated with greater *EV* at advanced stages — reflecting risk-taking, complex instruments, and expansive credit cycles. In developing economies, sustained

deepening tends to stabilize *EV*, consistent with finance supporting productive investment and diversification.

Limitations and future research. We focus on *FD* as a determinant of *EV*. Other forces — especially *financial innovation* (e.g., securitization, derivatives, digital credit) — may materially shape volatility. Future work should integrate direct measures of innovation intensity, interact them with institutional quality and macroprudential regimes, and quantify threshold (turning-point) levels at which benefits give way to risks.

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