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Corporate Bonds, Financial Development, and Big Data: A Triangular Approach to Strengthening Banking Stability in OECD Countries

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A B S T R A C T

Banking stability is a critical component of financial systems, particularly in the context of increasing global integration and technological advancements. Drawing on Financial Intermediation and Information Asymmetry Theory, this study investigates the impact of corporate bond issuance and financial development on banking stability in OECD countries from 2010 to 2022, with a focus on the mediating roles of Fintech and Big Data. Utilizing a combination of panel data regression and two-step System GMM techniques, the study finds that corporate bond issuance and financial development significantly enhance banking stability, particularly in developed economies. However, the impact varies across different economic and technological contexts, with Big Data emerging as a significant mediator, while Fintech shows a more limited role. These findings suggest that policymakers should tailor financial and technological policies to the specific conditions of their economies, promoting corporate bond markets and financial development while leveraging technological innovations to enhance banking stability.

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Introduction

Banking stability is a cornerstone of economic health, underpinning the resilience of financial markets and the broader economy . It ensures the smooth functioning of financial intermediation, maintains depositor and investor confidence, and prevents the escalation of financial crises into more severe economic downturns . The importance of banking stability has been underscored by recent global financial crises, which have exposed the vulnerabilities of financial systems and prompted a reevaluation of the factors that contribute to the robustness of banks . Traditional measures of banking stability, such as the Z-score, which quantifies a bank's risk of insolvency by integrating profitability, capital adequacy, and risk volatility, remain central to these discussions . However, the financial landscape has evolved significantly, driven by technological innovations, changes in market structures, and new financial instruments, necessitating a deeper exploration of the determinants of banking stability in advanced economies.

The literature has extensively recognized banking stability as a cornerstone of economic stability, with the Z-score emerging as a key metric for evaluating a bank's financial health. The Z-score, which combines return on assets (ROA), capital-asset ratio (CAR), and the standard deviation of ROA, effectively indicates a bank's risk of insolvency, making it essential for regulators and analysts . Corporate bond issuance has also been highlighted as a crucial factor in enhancing banking stability by providing firms with a diversified funding source. This reduces their dependence on bank loans, mitigating risks during economic uncertainties. The recent pandemic underscored the role of corporate bonds in maintaining liquidity and resilience, particularly in sectors heavily impacted by the crisis, thereby supporting overall banking stability . Additionally, a balanced capital structure, integrating both bonds and bank financing, further bolsters a firm's ability to navigate economic shocks, contributing to a more stable banking system .

Financial development, defined by the expansion and deepening of financial markets is another critical determinant of banking stability. However, its relationship with stability is complex, with potential for both positive and negative effects. On one hand, financial development can enhance stability by improving resource allocation and access to credit, fostering economic growth . On the other hand, it may introduce systemic risks, such as an increase in non-performing loans (NPLs) or encourage risky behavior among banks . The effects of financial development are further influenced by competition within the banking sector, where increased competition can either stabilize or destabilize the system depending on the context . Moreover, the rapid rise of Fintech and Big Data has transformed the financial landscape, offering both opportunities and challenges. While these technologies have improved operational efficiency and risk management, they also pose new risks related to competition and data security . This study seeks to address gaps in the literature by examining how Fintech and Big Data mediate the relationships between corporate bond issuance, financial development, and banking stability in OECD countries, where these dynamics are shaped by advanced technological and regulatory environments.

To ground these relationships conceptually, this study draws on Financial Intermediation Theory and Information Asymmetry Theory. Financial Intermediation Theory (Levine, 2005) underscores the role of financial institutions and markets in channeling savings into productive investments, thereby enhancing efficiency and stability within the financial system. In contrast, Information Asymmetry Theory (Stiglitz & Weiss, 1981) highlights the challenges arising from unequal access to information between borrowers and lenders, which can lead to adverse selection, moral hazard, and instability. Within this theoretical context, corporate bond issuance and financial development are seen as mechanisms that strengthen intermediation efficiency and diversify funding sources, while Fintech and Big Data serve as technological solutions that mitigate information asymmetry. Integrating these perspectives provides a robust foundation for examining how traditional financial structures and technological innovations jointly influence banking stability across OECD countries.

Despite the growing body of literature on banking stability, several critical research gaps remain, particularly concerning the roles of corporate bond issuance and financial development in shaping banking stability within OECD countries. While existing studies have explored the impacts of corporate bond markets and financial development on various financial outcomes, they often overlook the nuanced effects of these factors on banking stability, especially in the context of mature economies with complex regulatory environments. Furthermore, the rapid advancements in Fintech and Big Data have significantly transformed financial systems , yet their mediating roles in the relationship between traditional financial mechanisms and banking sta-

bility remain underexplored. This gap is particularly evident in the lack of empirical studies that examine how these technological innovations influence the resilience of banks in the face of economic shocks. Additionally, there is limited understanding of how these dynamics vary across different country groups and technological contexts, particularly in terms of Fintech and Big Data adoption. Addressing these gaps is crucial for developing a comprehensive understanding of the interplay between financial mechanisms and technological innovations in maintaining banking stability, which has significant implications for policymakers, regulators, and financial institutions in OECD countries.

This study makes several important contributions to the literature on financial stability, corporate finance, and technological innovation. First, it offers a nuanced analysis of how corporate bond issuance and financial development influence banking stability in OECD countries, emphasizing the role of market-based financing in enhancing the resilience of advanced financial systems. Second, by integrating Fintech and Big Data into the analytical framework, the study advances understanding of how technological innovation interacts with traditional financial mechanisms to shape banking stability. Finally, through a heterogeneity analysis across country groups and technological contexts, the study highlights how the effects of corporate bond issuance and financial development vary with different levels of Fintech and Big Data adoption. Together, these contributions provide new insights into the evolving dynamics of financial systems in advanced economies and enrich the discourse on stability in the digital era.

Theoretical background and hypothesis

Theoretical Framework

This study draws upon Financial Intermediation Theory and Information Asymmetry Theory to explain the pathways through which corporate bond issuance and financial development influence banking stability, both directly and through technological mediators—Fintech and Big Data. Financial Intermediation Theory (Levine, 2005) posits that the financial system enhances economic efficiency by mobilizing savings, reducing transaction costs, and facilitating risk sharing between lenders and borrowers. Financial development deepens these intermediation functions, expanding credit access and improving liquidity management. Similarly, the expansion of corporate bond markets provides firms with diversified funding sources, reducing their dependence on bank credit and mitigating systemic vulnerability (Thakor, 2014). Thus, corporate bond issuance and financial development strengthen banking stability by enhancing the efficiency, depth, and diversity of financial intermediation mechanisms.

However, traditional financial intermediation is constrained by information asymmetry, where lenders lack sufficient information to assess borrower risk, leading to adverse selection and moral hazard. Information Asymmetry Theory (Akerlof, 1970; Stiglitz & Weiss, 1981) explains that these inefficiencies can undermine stability within the banking sector. In this context, Fintech and Big Data innovations function as technological solutions that reduce information asymmetry. Fintech enhances transaction transparency and credit accessibility, while Big Data analytics improves risk modeling and early-warning systems (Koranteng & You, 2024). By strengthening information flows, these technologies mediate the effects of financial development and corporate bond issuance on banking stability, enabling banks to allocate resources more efficiently and manage risks more effectively. Thus, by integrating these two theoretical perspectives, the conceptual framework views banking stability as the combined outcome of financial mechanisms and technological innovation.

Financial development and corporate bond issuance directly influence stability, while Fintech and Big Data act as mediating forces that enhance this relationship by improving information efficiency and strengthening risk control.

Figure 1 shows the conceptual framework of the study.

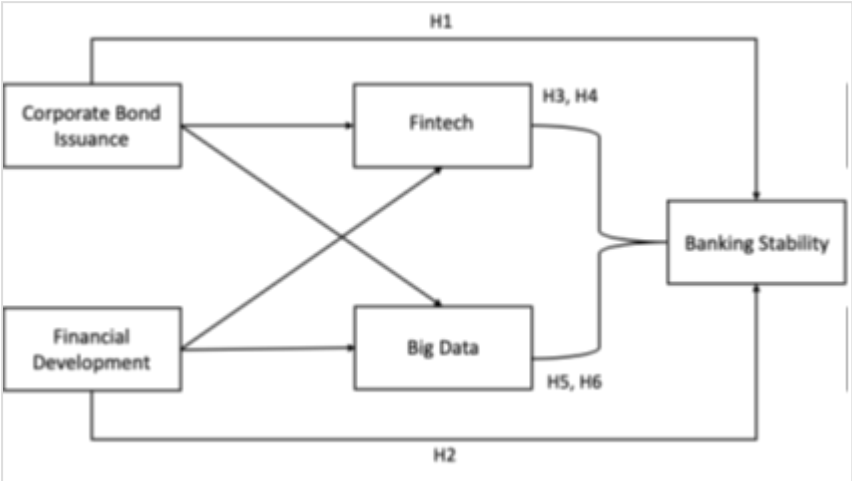

Figure 1. *Conceptual model of study.*

Banking Stability

Banking stability, defined as a system's capacity to withstand shocks while maintaining core functions, is influenced by a complex array of interconnected factors. A substantial body of literature emphasizes the pivotal role of monetary policy, which affects stability through interest rates, inflation, and broader economic conditions (Cao & Chollete, 2017; Campbell et al., 2016). This relationship is moderated by the regulatory framework, where capital requirements and accounting standards directly impact banks' capital adequacy (Ryan, 2017). The challenge for central banks and regulators is compounded by dynamic market conditions, institutional mandates, and factors like market concentration and competition (IJtsma et al., 2017; Martinez & Tsomocos, 2018). Consequently, achieving banking stability requires a comprehensive understanding of the interplay between monetary policy, regulatory frameworks, and systemic risk measures.

Given this complex landscape, accurately measuring bank-level stability is paramount for both research and regulation. The Z-score has emerged as a prominent and reliable metric for this purpose, serving as a direct indicator of a bank's distance to default. It comprehensively integrates profitability (ROA), leverage (CAR), and the volatility of returns to quantify the number of standard deviations a bank's profits must fall to deplete its equity capital . Its utility is well-established in identifying banks at risk of financial distress, making it an indispensable tool for regulators and investors alike .. The Z-score's versatility is demonstrated by its application across diverse banking contexts, including both conventional and Islamic banking systems . Moreover, it has been effectively used to examine the impact of critical factors such as banking market concentration, which has been shown to negatively impact the Z-score, and to assess the efficacy of various regulatory frameworks on bank soundness .

Corporate bond issuance and banking stability

The issuance of corporate bonds plays a pivotal role in enhancing banking stability by offering firms an alternative funding source that reduces reliance on traditional bank loans. This diversification is particularly cru-

cial during economic uncertainties, as it mitigates risks associated with overdependence on bank financing. The presence of credit rating agencies further supports this process by reducing information asymmetries between issuers and investors, leading to lower borrowing costs and increased market efficiency . During the recent pandemic, the surge in corporate bond issuance allowed firms to bolster liquidity and resilience, particularly in heavily impacted sectors, thereby reducing the risk of defaults that could destabilize the banking sector .

Moreover, the structure of corporate debt significantly influences banking stability. Firms with a balanced capital structure, combining both bond and bank financing, exhibit greater financial flexibility and are better equipped to withstand economic shocks . In contrast, firms relying heavily on bank loans are more vulnerable to liquidity constraints during downturns Macroeconomic factors such as interest rate fluctuations and government policies also affect the relationship between corporate bonds and banking stability, with a well-functioning bond market contributing to economic recovery and systemic risk reduction . Thus, corporate bonds are integral to the resilience of the financial system. In line with the preceding discussion, this study hypothesizes that:

***Hypothesis 01*:** Corporate bond issuance has a positive and significant effect on banking stability.

Financial development and banking stability

The relationship between financial development and banking stability is intricate, influenced by various factors such as market structure, regulatory environment, and the nature of financial instruments. Financial development, which enhances the efficiency and depth of financial markets, can have both stabilizing and destabilizing effects on banking systems. suggest that bank concentration can stabilize industrial volatility by smoothing the variance of real value-added growth per firm, indicating that larger banks may absorb shocks more effectively. However, the relationship between concentration and stability remains debated, as point out conflicting evidence, suggesting that excessive concentration could introduce systemic risks.

The development of financial markets also impacts the quality of bank assets, particularly concerning NPLs. Saliba et al. (2023) finds that in more developed financial markets, there is a positive correlation between financial development and NPLs, implying that while financial development enhances lending capabilities, it may also increase risk exposure if not managed properly. Effective regulation is crucial in mitigating these risks, ensuring that banks operate within safe limits to maintain stability. Competition within the banking sector further complicates the relationship between financial development and stability. argue that financial openness fosters competition, leading to better resource allocation and improved stability. However, excessive competition may push banks toward riskier lending practices, increasing the likelihood of instability. Akins et al. (2016) support this by showing that competition can reduce corruption in bank lending, thereby enhancing stability. Additionally, emphasize the importance of liquidity management in maintaining financial stability, as adequate liquidity buffers allow banks to navigate economic shocks effectively. As a result, financial development impacts banking stability in nuanced ways, shaped by market structure, regulatory frameworks, competition, and liquidity management. While it can enhance stability through better resource allocation and risk management, it also presents challenges that require careful oversight to prevent systemic risks. Thus, this study hypothesizes that:

Hypothesis 02: Financial development positively influences banking stability.

Technological advancements and banking stability

Technological innovations in fintech and big data have significantly transformed the banking sector, presenting both opportunities and challenges for banking stability. Fintech has enhanced the efficiency and accessibility of financial services, promoting financial inclusion by reaching underserved populations, thereby broadening the customer base and reducing systemic risks). Recent studies have further explored the complex relationship between fintech and financial stability. For instance, conducted a spatial analysis across 25 countries, revealing that fintech financing positively impacts financial stability, with significant cross-border effects. Their findings suggest that smaller fintech markets benefit more from these positive impacts, emphasizing the need for spatial considerations when assessing financial stability. Similarly, highlighted fintech's role in sustainable finance, where it has been shown to improve credit access for environmentally focused firms, helping banks identify greenwashing practices and ensuring efficient redistribution of financial resources within the sector.

Conversely, the rapid adoption of fintech can introduce risks. noted that fintech could lead to increased risk-taking behavior among banks, particularly when technological investments are not fully understood, potentially destabilizing operations. supported this by finding that competitive pressures from fintech firms might drive traditional banks toward riskier lending practices, thereby exacerbating financial instability. Their study underscores the importance of legal frameworks and institutional quality in moderating the effects of fintech on banking stability, advocating for stricter prudential regulations to address these risks. Effective regulation can mitigate the risks associated with fintech activities, ensuring a stable environment for both traditional banks and fintech firms (Preziuso et al., 2023).

Big data analytics further enhances banking stability by improving credit risk assessment and customer behavior analysis. Advanced data analytics tools can enhance risk management frameworks by providing deeper insights into customer behavior, thereby allowing banks to better predict and mitigate risks. found that digital transformation, coupled with financial inclusion can reduce bank credit risk, suggesting a symbiotic relationship between fintech and traditional banking institutions. This integration can lead to better risk assessments and more informed lending decisions, ultimately supporting banking stability. However, the heavy reliance on data raises concerns about privacy and security, where breaches could have severe repercussions (Muganyi et al., 2022). Thus, the regulatory frameworks must evolve to address these issues, ensuring that the benefits of big data and fintech are harnessed without compromising security or stability. Together, these studies underscore the diverse impacts of fintech and big data on the banking sector, from enhancing financial inclusion and stability to posing challenges to traditional banking models. The findings collectively highlight the need for adaptive regulatory frameworks that balance innovation with robust cybersecurity and financial stability. Such regulation would facilitate the sustainable growth of both traditional banks and fintech firms, allowing them to thrive in a rapidly evolving financial ecosystem. Therefore, based on the above discussion, the following hypotheses are proposed:

Hypothesis 03: Fintech mediates the relationship between corporate bond issuance and banking stability.

Hypothesis 04: Fintech mediates the relationship between financial development and banking stability.

Hypothesis 05: Big Data mediates the relationship between corporate bond issuance and banking stability.

Hypothesis 06: Fintech mediates the relationship between financial development and banking stability. The conceptual model of the study is given below in Figure 1.

Research Method

Data and variables

This study utilizes a comprehensive dataset covering OECD countries from 2010 to 2022 to investigate the impact of corporate bond issuance and financial development on banking stability, with a particular focus on the mediating roles of Fintech and Big Data. The following provides detailed descriptions of the key variables used in the analysis along with their data sources as shown in Table 1:

Explained variable:

Banking Stability (BS): The banking stability is measured using the Bank Z-score, which reflects the probability of default within a country's commercial banking system (Abdelbadie & Salama, 2019; Fosu et al., 2017; Thai Nguyen & Boateng, 2015). The Z-score is an aggregate measure that accounts for a bank's capitalization, returns, and the volatility of those returns, providing an indicator of the overall stability and resilience of the banking sector and sourced from Bankscope and Orbis.

Explanatory variables:

Corporate Bond Issuance (CB): CB issuance is captured as the volume of corporate bonds issued as a percentage of GDP. This variable indicates the extent to which firms rely on bond markets for financing, serving as a critical indicator of market-based financing relative to traditional bank lending and adapted from the World Bank Global Syndicated Loans and Bonds Database (FinDebt).

Financial Development (FD): The financial development is measured through a composite index that reflects the relative development of financial institutions and markets, considering factors such as financial depth, access, and efficiency. This index provides a comprehensive measure of the sophistication and maturity of a country's financial system is obtained from the International Monetary Fund (IMF).

Control variables:

Bank Non-performing Loans (BNPL): The ratio of non-performing loans to gross loans in the banking sector is used as a control variable. These variable capture credit risk within the banking sector, which is a direct indicator of potential vulnerabilities affecting banking stability and sourced from the IMF.

Trade (TRDE): Trade is measured as the total trade (exports plus imports) as a percentage of GDP. This variable controls for the effects of economic openness and international trade on banking stability, reflecting the broader economic environment and sourced from World Development Indicators (WDI). Economic growth (EG): EG is measured using GDP per capita to represent economic growth, serving as a control variable to account for the overall economic development of a country. Higher GDP per capita generally indicates a more robust economy, which can influence banking stability and obtained from WDI.

Industrialization (IND): IND is captured through the value added by industry (including construction) as a percentage of GDP. This variable reflects the level of industrial activity within a country, which may impact banking stability by influencing economic cycles and sectoral risks is sourced from WDI.

Research and Development (R&D): R&D expenditure is measured as a percentage of GDP. This variable reflects a country's innovation capacity, which could influence long-term economic growth and subsequently banking stability, adapted from WDI.

Table 1. Variable descriptions

Variable Type	Variable Name	Symbol	Description	Source
Explained Variable	Banking Stability (Bank Z-score)	BS	Represents the probability of default within a country's commercial banking system. The Z-score measures the buffer (capitalization and returns) against the volatility of those returns.	Bankscope and Orbis
Explanatory Variable	Corporate Bond Issuance	CB	Volume of corporate bonds issued as a percentage of GDP.	FinDebt
	Financial Development	FD	A composite index measuring the development of financial institutions and markets, considering factors such as depth, access, and efficiency.	IMF
Control Variables	Bank Non-performing Loans	BNPL	Ratio of non-performing loans to gross loans in the banking sector (%).	IMF
	Trade	TD	Total trade as a percentage of GDP.	WDI
	Economic Growth	EG	GDP per capita, representing economic growth.	WDI
	Industrialization	IND	Value added by industry (including construction) as a percentage of GDP.	WDI
	Research and Development	RD	Expenditure on research and development as a percentage of GDP.	WDI
	Regulatory Quality	RQ	Percentile rank measuring the quality of regulation.	WDI
	Political Stability	PS	Percentile rank indicating political stability and the absence of violence/terrorism.	WDI
	Foreign Direct Investment	FDI	Net inflows of foreign direct investment as a percentage of GDP.	WDI
Mediating variables	Fintech	FINT	Total funding received by Fintech startups.	Crunchbase
	Big Data	BD	Total funding received by Big Data startups.	Crunchbase

Political Stability (PS): PS is assessed using a percentile rank that indicates the level of political stability and absence of violence. This control variable accounts for the influence of political risk on banking stability, recognizing that a stable political environment is crucial for financial stability, and sourced from WDI.

Regulatory Quality (RQ): RQ is measured to reflect the government's ability to formulate and implement sound policies and regulations that support private sector development. This variable controls for the impact of the regulatory environment on banking stability is sourced from WDI.

Mediating variables:

Fintech (FINT): Fintech activity is measured by the total funding received by Fintech startups in each country. This variable serves as an indicator of the level of innovation and technological advancement in the financial sector, which may mediate the relationship between financial development and banking stability and sourced from Crunch base. Fintech funding in OECD countries shows significant variation, reflecting the diverse levels of innovation and investment across different economies as can be seen in Figure 2. The United States leads with a staggering $148,903.61 million, followed by the United Kingdom at $25,745.86 million and Canada at $9,744.92 million. Other notable figures include Germany with $9,513.73 million and South Korea with $5,308.43 million. In contrast, smaller markets like Hungary, Slovakia, and Iceland received significantly lower funding, with amounts as low as $15.27 million, $10.06 million, and $36.62 million, respectively. These differences highlight the varying degrees of Fintech adoption and development across OECD countries. Big Data (BD): Big Data adoption is captured through the total funding received by Big Data startups. This variable reflects the influence of data-driven technologies in the financial sector, potentially serving as a mediating factor in the relationship between financial development and banking stability and sourced from Crunchbase.

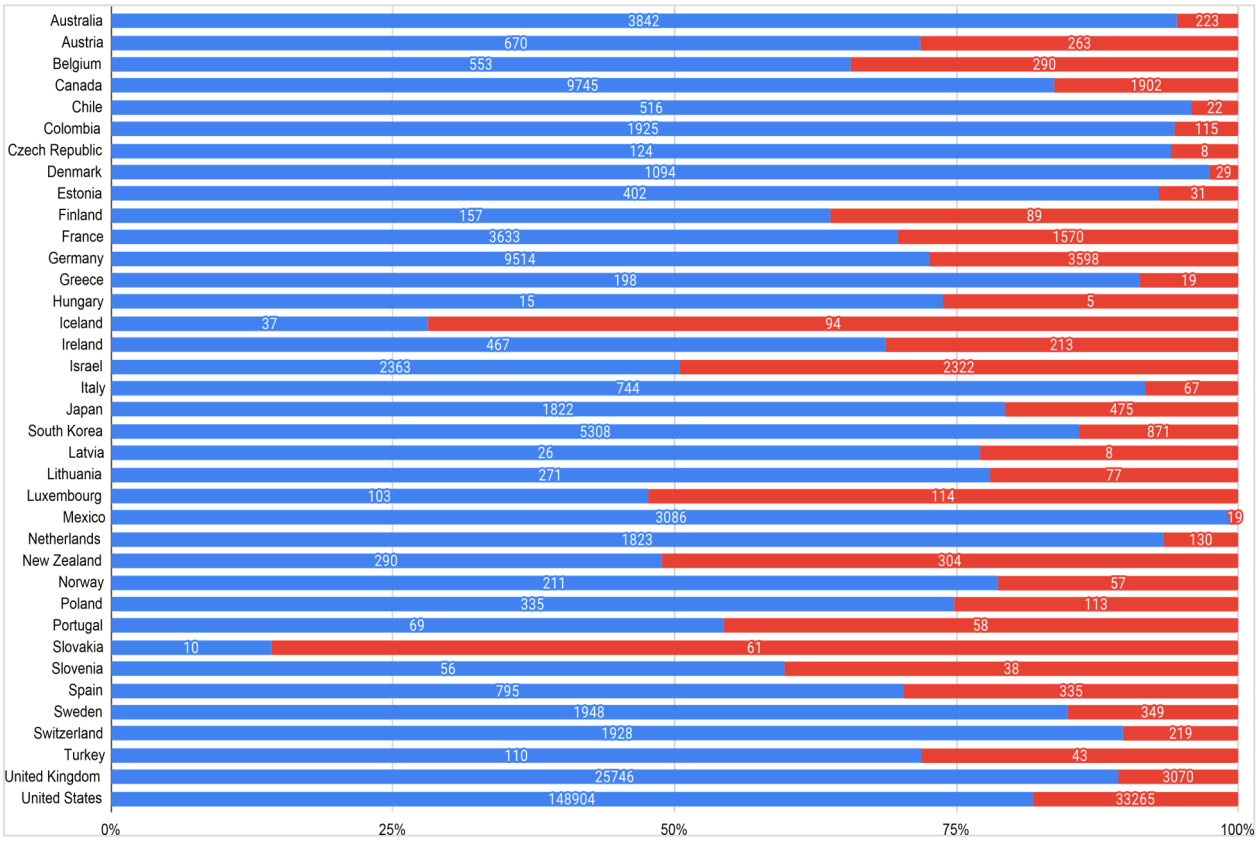

Figure 2. *Fintech (blue color) and Big Data (red color) spending.*

Big Data funding in OECD countries exhibits considerable disparities, reflecting the diverse levels of technological investment and adoption across these economies, as shown in Figure 2. The United States dominates with a significant $33,264.77 million in funding, followed by the United Kingdom at $3,070.28 million and

Germany at $3,598.20 million. Other notable contributors include Israel with $2,322.00 million and Canada with $1,901.64 million. In contrast, countries like Hungary, Slovakia, and the Czech Republic received much lower levels of funding, with figures of $5.43 million, $60.78 million, and $7.86 million, respectively. These variations underscore the differing priorities and capacities for Big Data adoption and innovation among OECD countries, highlighting the importance of context-specific strategies to enhance data-driven capabilities in various economic environments.

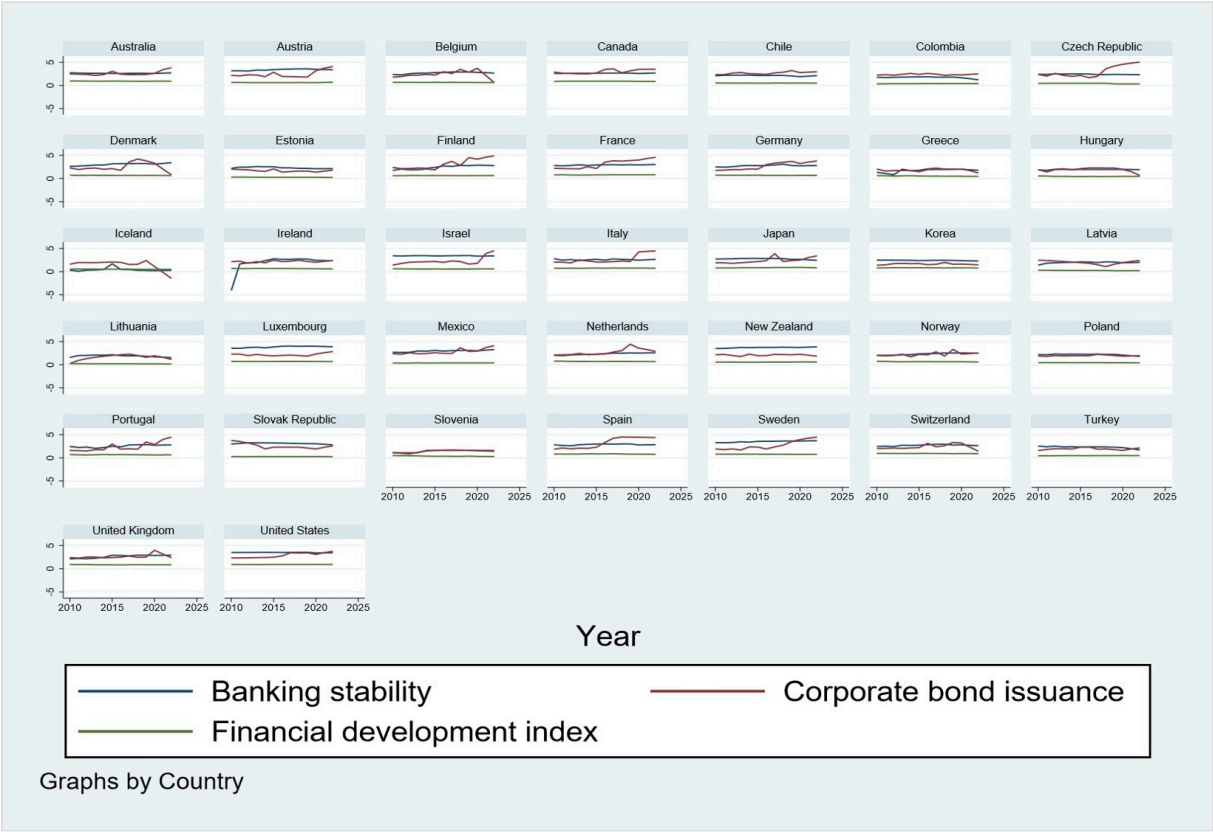

Figure 3. *Trends in Banking Stability and Financial Development Index by Country*

Moreover, the use of startup funding as a proxy for Fintech and Big Data development is grounded in its established application as a market-based indicator of a technological ecosystem's vitality, scale, and innovative capacity (Siddik et al., 2024). While an input measure, the volume of investment serves as a strong leading indicator of the potential for sector-wide disruption and adoption. Significant funding reflects market confidence, fuels innovation, and creates the competitive pressure that compels incumbent financial institutions to adapt, thereby capturing the essential mediating force these technologies exert on banking stability.

Furthermore, this study is crucial in the context of OECD countries for several reasons. First, OECD economies are characterized by highly developed financial markets and regulatory environments, making them ideal for examining the nuanced impacts of corporate bond issuance and financial development on banking stability. Second, as leaders in technological innovation, OECD countries offer a unique opportunity to explore how emerging technologies like Fintech and Big Data mediate the relationship between financial activities and banking stability. Given that these countries are often at the forefront of financial and technological trends, understanding these dynamics within the OECD context provides valuable insights that can inform global financial stability practices.

Finally, the findings from OECD countries can serve as a benchmark for other economies, particularly those looking to replicate the financial and technological advancements seen in these nations. By identifying the factors that contribute to banking stability in highly developed economies, this study provides actionable recommendations for policymakers, regulators, and industry leaders who aim to enhance financial resilience in their respective countries. Consequently, the OECD context is vital for this research as it offers a mature and innovative environment in which to study the interplay between corporate bonds, financial development, and emerging technologies, thereby contributing significantly to the literature on banking stability and financial innovation. Figure 3 shows the trends in banking stability and financial development index by country.

Econometric models

To investigate the impact of CB and FD on BS, Panel-Corrected Standard Errors (PCSEs) were employed to estimate the following benchmark regression models . PCSEs are utilized to account for potential cross-sectional dependence and heteroskedasticity across the panel data using the equations 1 to 10.

Impact of CB on BS through Fintech and Big data:

$$\ln(BS_{it}) = \alpha + \beta_1 \ln(CB_{it}) + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.1)}$$

$$\ln(BD_{it}) = \alpha + \beta_1 \ln(CB_{it}) + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.2)}$$

$$\ln(BS_{it}) = \alpha + \beta_1 \ln(CB_{it}) + \beta_2 \ln(BD_{it}) + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.3)}$$

$$\ln(FINT_{it}) = \alpha + \beta_1 \ln(CB_{it}) + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.4)}$$

$$\ln(BS_{it}) = \alpha + \beta_1 \ln(CB_{it}) + \beta_2 \ln(FINT_{it}) + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.5)}$$

Impact of FD on BS through Fintech and Big data:

$$\ln(BS_{it}) = \alpha + \beta_1 FD_{it} + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.6)}$$

$$\ln(BD_{it}) = \alpha + \beta_1 FD_{it} + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.7)}$$

$$\ln(BS_{it}) = \alpha + \beta_1 FD_{it} + \beta_2 \ln(BD_{it}) + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.8)}$$

$$\ln(FINT_{it}) = \alpha + \beta_1 FD_{it} + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.9)}$$

$$\ln(BS_{it}) = \alpha + \beta_1 FD_{it} + \beta_2 \ln(FINT_{it}) + \sum \beta_k \ln(X_{kit}) + \gamma_i + \delta_t + \varepsilon_{it} \text{ (Eq.10)}$$

Where:

$\ln(BS_{it})$: Natural logarithm of banking stability for country i at time t.

$\ln(CB_{it})$: Natural logarithm corporate bond issuance as a percentage of GDP for country i at time t.

FD_{it}: Financial development index for country for country i at time t.

$\ln(BD_{it})$: Natural logarithm of total funding received by BD startups for country i at time t.

$\ln(FINT_{it})$: Natural logarithm of total funding received by FINT startups for country i at time t.

$\ln(X_{it})$: Vector of control variables, including BNPL, TRDE, GDP, IND, RD, PS, and RQ

μ_i: Country-specific fixed effects

λ_t: Time-specific fixed effects

ε_{it}: Error term

Furthermore, to address potential endogeneity and ensure the robustness of the findings, a two-step System Generalized Method of Moments (GMM) estimator was employed. The System GMM approach is particularly suitable for dealing with endogeneity issues arising from the potential correlation between the explanatory variables and the error term, as well as from the inclusion of lagged dependent variables . The GMM estimator uses internal instruments derived from lagged levels and differences of the variables, ensuring consistent and efficient parameter estimates even in the presence of endogeneity . The System GMM approach also accounts for dynamic panel bias by including lagged values of the dependent variable (L.BS*it*) to capture the persistence of banking stability over time. This method provides robust estimates by controlling for unobserved country-specific effects and potential simultaneity bias in the relationships among the variables.

Table 2. Descriptive statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
BS	481	2.551	0.754	-4.055	4.051
CB	481	2.375	0.813	-1.443	5.037
FD	481	0.622	0.206	0.186	0.987
FINT	481	3.027	2.877	-12.908	9.904
BD	481	1.617	2.767	-15.223	8.597
BNPL	481	0.541	0.589	-0.999	2.189
TRDE	481	4.479	0.544	3.140	5.974
GDP	481	10.307	0.669	8.558	11.612
IND	481	3.154	0.253	2.341	3.895
RD	481	0.480	0.679	-1.642	1.741
PS	481	4.121	0.547	1.561	4.600
RQ	481	4.433	0.151	3.770	4.605

Results

Descriptive statistics

The descriptive statistics presented in Table 2 provide an overview of the central tendencies and variability for each variable across 481 observations. The mean values offer insight into the average level of each variable, while the standard deviations reveal the degree of variation or dispersion around these means. For instance, the mean value of Banking Stability (BS) is 2.551, with a standard deviation of 0.754, indicating moderate variability. The minimum and maximum values highlight the range of the data, showing the extremes of the observed values. For example, Fintech has a wide range, from -12.908 to 9.904, suggesting significant variation across the sample period.

The pairwise correlations in Table 3 reveal the relationships between the variables. The positive correlation between BS and CB (0.339) and FD (0.348) suggests that higher levels of these factors are associated with greater banking stability. Conversely, the negative correlation between BS and BNPL (-0.255) indicates that an increase in non-performing loans is associated with decreased banking stability. The correlations also highlight the interconnectedness of the explanatory and control variables, such as the strong positive correlation

between FD and GDP (0.703), suggesting that countries with higher financial development tend to have higher GDP per capita. These relationships provide initial insights into the dynamics among the variables in the study.

Table 3. Pairwise correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(
(1) BS	1								
(2) CB	0.339***	1							
(3) FD	0.348***	0.267***	1						
(4) FINT	0.187***	0.162***	0.452***	1					
(5) BD	0.225***	-0.023	0.425***	0.529***	1				
(6) BNPL	-0.255***	-0.207***	-0.494***	-0.038	-0.061	1			
(7) TRDE	-0.078*	-0.169***	-0.366***	-0.337***	-0.312***	-0.185***	1		
(8) GDP	0.337***	0.142***	0.703***	0.196***	0.298***	-0.593***	0.103**	1	
(9) IND	-0.221***	-0.059	-0.254***	-0.032	-0.121**	0.293***	-0.066	-0.347***	1
(10) RD	0.236***	0.042	0.561***	0.231***	0.295***	-0.509***	-0.003	0.690***	-
(11) PS	0.024	-0.011	0.251***	-0.120**	-0.005	-0.483***	0.363**	0.536***	-
(12) RQ	0.275***	0.111**	0.439***	0.108**	0.238***	-0.490***	0.142**	0.745***	-

Note: This table reports the pairwise correlation coefficients among the study variables. Positive coefficients i relationships, whereas negative coefficients suggest potential trade-offs. Significance levels are denoted as * p

Benchmark regression

The benchmark regression results in Table 4 demonstrate a consistently positive and statistically significant impact of CB on BS across all models. Across all model specifications (M1–M8), the coefficient of corporate bond issuance ranges from 0.242 to 0.314 and remains statistically significant at the 1% level. This implies that, holding other factors constant, a one-unit increase in corporate bond issuance is associated with approximately a 24.2% to 31.4% increase in banking stability, depending on the model specification. The relatively stable magnitude of the coefficients across models suggests that the positive impact of corporate bond issuance on banking stability is robust and not sensitive to alternative controls or estimation strategies.

Among the control variables, BNPL generally exhibit a negative and significant relationship with banking stability, particularly in models M2 and M3, indicating that higher levels of non-performing loans undermine banking stability. Similarly, the negative impact of IND on banking stability suggests that as economies become more industrialized, there might be increased risk factors that affect the stability of banks. Conversely, GDP shows a robust positive effect on banking stability, indicating that wealthier economies tend to have more stable banking systems. PS and RQ also play significant roles, where better regulatory quality and lower political instability are associated with enhanced banking stability.

Furthermore, the regression results in Table 5 illustrate a strong and statistically significant positive impact of FD on BS across all models. Across all model specifications (M1–M8), the coefficient of financial development (FD) is positive and statistically significant at the 1% level, with estimated magnitudes ranging from

0.563 to 1.273. This indicates that, ceteris paribus, a one-unit increase in financial development is associated with approximately a 56.3% to 127.3% increase in banking stability. The consistently positive and sizeable coefficients, together with strong t-statistics, underscore the pivotal role of financial development in enhancing the resilience and soundness of the banking sector.

Table 4. Impact of corporate bond issuance on banking stability

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)	(M7)	(M8)
	BS	BS	BS	BS	BS	BS	BS	BS
CB	0.314***	0.277***	0.264***	0.259***	0.259***	0.263***	0.251***	0.242***
	(4.659)	(4.554)	(4.581)	(4.175)	(4.114)	(4.020)	(3.957)	(4.000)
BNPL		-0.247***	-0.267***	-0.057	-0.037	-0.026	-0.084*	-0.095**
		(-6.705)	(-7.472)	(-1.299)	(-0.840)	(-0.608)	(-1.859)	(-2.182)
TRDE			-0.095	-0.094	-0.096	-0.089	-0.022	-0.008
			(-1.449)	(-1.522)	(-1.514)	(-1.558)	(-0.357)	(-0.134)
GDP				0.314***	0.279***	0.249***	0.346***	0.222**
				(6.873)	(5.304)	(2.827)	(3.607)	(2.195)
IND					-0.344***	-0.357***	-0.277**	-0.282**
					(-3.078)	(-2.868)	(-2.140)	(-2.235)
RD						0.046	0.034	0.017
						(0.772)	(0.547)	(0.270)
PS							-0.252***	-0.377***
							(-6.274)	(-8.430)
RQ								1.094***
								(5.578)
Constant	1.804***	2.026***	2.495***	-0.847	0.595	0.872	0.433	-2.634*
	(11.061)	(13.005)	(7.516)	(-1.204)	(0.601)	(0.656)	(0.324)	(-1.953)
R^2	0.115	0.150	0.155	0.205	0.216	0.217	0.236	0.253

Note: statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The control variables further elucidate the dynamics of banking stability. BNPL consistently show a negative and significant relationship with banking stability in most models, particularly in M2, M3, M6, and M8, indicating that an increase in non-performing loans weakens banking stability. IND also exhibits a negative and significant impact, implying that higher industrial activity may introduce risks that challenge the stability of banks. Conversely, GDP demonstrates a positive effect on banking stability in several models, signifying that wealthier economies tend to support more stable banking environments. PS and RQ also play crucial roles; better political stability and regulatory frameworks significantly bolster banking stability, underscoring the importance of institutional quality in maintaining a stable banking system.

Table 5. Impact of financial development on banking stability

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)	(M7)	(M8)
Variables	BS	BS	BS	BS	BS	BS	BS	BS
FD	1.273***	1.076***	1.106***	0.603***	0.595***	0.600***	0.563***	0.782***
	(17.946)	(11.652)	(8.235)	(3.028)	(3.074)	(3.137)	(3.216)	(3.935)
BNPL		-0.140***	-0.132***	-0.095**	-0.077	-0.081*	-0.145***	-0.140***
		(-2.815)	(-2.735)	(-2.002)	(-1.621)	(-1.691)	(-2.790)	(-2.965)
TRDE			0.019	-0.069	-0.073	-0.075	0.001	0.060
			(0.266)	(-1.107)	(-1.144)	(-1.227)	(0.016)	(0.840)
GDP				0.205***	0.173**	0.187**	0.301***	0.095
				(3.399)	(2.548)	(2.118)	(3.165)	(0.902)
IND					-0.337***	-0.330***	-0.241*	-0.246**
					(-3.020)	(-2.718)	(-1.897)	(-2.002)
RD						-0.023	-0.034	-0.056
						(-0.468)	(-0.669)	(-1.115)
PS							-0.289***	-0.449***
							(-7.240)	(-9.581)
RQ								1.428***
								(6.658)
Constant	1.759***	1.958***	1.850***	0.421	1.828*	1.687	1.137	-2.789**
	(32.513)	(19.896)	(5.012)	(0.660)	(1.767)	(1.305)	(0.867)	(-2.131)
N	481	481	481	481	481	481	481	481
R^2	0.121	0.130	0.130	0.142	0.153	0.153	0.178	0.205

Note: statistics in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

Robustness analysis

The robustness analysis presented in Table 6 employs a two-step System GMM approach, incorporating lagged banking stability (L.BS) to address potential endogeneity and capture dynamic relationships . The results consistently demonstrate that CB has a positive and statistically significant effect on BS across Models M1 to M3, with coefficients of 0.243, 0.162, and 0.135 respectively. This indicates that increased issuance of corporate bonds contributes to enhanced stability within the banking sector, likely by providing alternative financing channels and reducing banks' reliance on traditional lending, thereby mitigating credit risk and improving overall resilience.

Similarly, FD exhibits a robust and significant positive impact on banking stability across Models M4 to M6, with coefficients of 0.982, 0.707, and 0.773 respectively. These findings suggest that more developed financial institutions and markets facilitate better resource allocation, greater efficiency, and improved risk management, all of which contribute to a more stable banking environment. The inclusion of lagged BS further reinforces the reliability of these results by accounting for past stability levels, thereby ensuring that the

observed effects of CB and FD on BS are not confounded by unobserved heterogeneity or reverse causality. Overall, the analysis confirms that both corporate bond issuance and financial development are pivotal determinants of banking stability in OECD countries.

Furthermore, the robustness analysis using the two-step System GMM includes AR (2) and Hansen test diagnostics to validate the model. The AR (2) test p-values (ranging from 0.051 to 0.754) indicate no significant second-order autocorrelation, confirming the appropriateness of the model . The Hansen test p-values (ranging from 0.052 to 0.123) suggest that the instruments are valid and not overidentified, supporting the reliability of the findings . These diagnostics affirm that corporate bond issuance and financial development have a significant positive impact on banking stability, with robust and well-specified models.

Table 6. Robustness analysis (2 step System GMM)

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
Variables	BS	BS	BS	BS	BS	BS
CB	0.243***	0.162***	0.135***			
	(10.689)	(8.173)	(9.565)			
L.BS			0.170***			
			(11.324)			
FD				0.982***	0.707**	0.773***
				(4.746)	(2.620)	(3.268)
L.BS						0.217***
						(11.250)
BNPL		-0.061	-0.050		-0.063	-0.004
		(-1.462)	(-0.949)		(-1.293)	(-0.117)
TRDE		-0.014	0.019		0.028	0.132**
		(-0.247)	(0.300)		(0.490)	(2.495)
GDP		0.293**	0.247**		0.172	0.125
		(2.183)	(2.097)		(1.228)	(1.397)
IND		-0.537***	-0.432***		-0.496**	-0.402***
		(-4.074)	(-3.489)		(-2.698)	(-3.126)
RD		-0.062	-0.047		-0.032	-0.089
		(-0.733)	(-0.662)		(-0.413)	(-1.429)
PS		-0.412***	-0.332***		-0.436***	-0.333***
		(-4.906)	(-5.023)		(-5.298)	(-5.683)
RQ		1.138**	1.103**		1.667***	1.267***
		(2.129)	(2.613)		(3.783)	(4.841)
Constant	1.992***	-2.324	-2.894**	1.946***	-3.765***	-3.218***
	(22.710)	(-1.598)	(-2.505)	(15.670)	(-3.193)	(-4.188)

ar2p	0.504	0.257	0.665	0.754	0.542	0.051
hansenp	0.123	0.119	0.076	0.116	0.052	0.086

Note: statistics in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

Heterogeneity analysis

Impact of CB on BS

In the analysis, the overall focus was on how CB influences BS across different country groups and technological contexts, specifically comparing developing and developed countries, as well as environments with varying levels of Fintech and Big Data adoption. For developed countries (M2), the findings show a significant positive impact of CB on BS, with a coefficient of 0.208. This indicates that in more advanced economies, increased corporate bond issuance contributes meaningfully to enhancing banking stability, likely due to well-established financial markets and regulatory frameworks. In contrast, while developing countries (M1) show a positive effect of CB on BS, the relationship is not statistically significant, with a coefficient of 0.213. This suggests that the impact of corporate bond issuance on banking stability in developing countries is less pronounced and may be influenced by other factors not captured in this model.

Table 7. Heterogeneity analysis (impact of CB on BS)

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
	Developing countries	Developed countries	High Fintech	Low Fintech	High Big data	Low Big data
CB	0.213	0.208***	0.143***	0.254***	0.080**	0.241***
	(1.256)	(4.128)	(2.704)	(4.376)	(2.564)	(4.129)
BNPL	0.383***	-0.163***	0.181***	-0.372***	0.052	-0.310***
	(4.275)	(-4.256)	(5.509)	(-5.525)	(0.830)	(-4.979)
TRDE	2.518***	-0.069	-0.107	-0.054	-0.389***	0.036
	(5.356)	(-1.183)	(-1.244)	(-0.665)	(-2.698)	(0.510)
GDP	-1.270***	0.077	0.636***	-0.039	0.700***	0.011
	(-2.794)	(0.620)	(5.492)	(-0.316)	(5.722)	(0.094)
IND	-0.866**	-0.348**	-0.195**	-0.386**	0.237	-0.323*
	(-2.148)	(-1.980)	(-2.393)	(-2.008)	(1.130)	(-1.760)
RD	0.285	-0.026	-0.011	-0.246**	-0.023	-0.060
	(1.191)	(-0.263)	(-0.194)	(-2.547)	(-0.372)	(-0.637)
PS	-0.176	-0.437***	-0.257***	0.049	-0.525***	-0.311***
	(-1.068)	(-4.718)	(-7.734)	(0.605)	(-7.154)	(-5.426)
RQ	0.870**	2.062***	-0.453**	2.343***	-0.790***	1.961***
	(1.964)	(6.620)	(-2.339)	(7.144)	(-6.442)	(5.613)
Constant	2.805	-4.580***	-0.221	-6.598***	1.732	-4.551***
	(1.116)	(-3.416)	(-0.214)	(-3.957)	(1.237)	(-2.758)

R^2	0.726	0.271	0.651	0.290	0.762	0.268

Note: statistics in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01.

When examining technological adoption, it is observed that in high Fintech (M3) and high Big Data (M5) environments, CB gl positively impacts BS, with coefficients of 0.143 and 0.080 respectively. However, the effect is even more substantial in low Fintech (M4) and low Big Data (M6) contexts, with coefficients of 0.254 and 0.241 respectively. This suggests that in countries with lower levels of technological adoption, corporate bond issuance plays a more crucial role in stabilizing banks, possibly because these economies rely more heavily on traditional financial instruments, making the availability of bond financing more impactful.

Impact of FD on BS

In the heterogeneity analysis presented in Table 8, it is examined that how the impact of FD on BS differs across various country classifications and technological contexts. The results show a clear divergence in the effect of FD depending on whether a country is developing or developed, as well as its level of Fintech and Big Data adoption.

For developing countries (M1), the impact of FD on BS is negative and highly significant, with a coefficient of -7.386. This suggests that in these countries, higher financial development may destabilize the banking sector, potentially due to factors such as weak regulatory frameworks, market inefficiencies, or overextension of credit in the financial system. Conversely, in developed countries (M2), FD has a positive and significant effect on BS, with a coefficient of 0.803, indicating that in more advanced economies, financial development strengthens banking stability, likely due to more mature financial institutions and better regulatory oversight.

When examining the role of technological adoption, a similar pattern emerges. In high Fintech (M3) and high Big Data (M5) environments, FD negatively affects BS, with coefficients of -2.165 and -1.521, respectively. This indicates that rapid financial development in these technologically advanced contexts may introduce new risks, such as increased competition or technological disruptions, that can destabilize the banking sector. In contrast, in low Fintech (M4) and low Big Data (M6) environments, FD positively influences BS, with coefficients of 1.457 and 1.205, respectively. This suggests that in less technologically advanced settings, financial development plays a stabilizing role, possibly by enhancing access to financial services and improving market efficiency, without the destabilizing effects seen in more technologically advanced contexts.

Table 8. Heterogeneity analysis (impact of FD on BS)

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
	Developing countries	Developed countries	High Fintech	Low Fintech	High Big data	Low Big data
FD	-7.386***	0.803***	-2.165***	1.457***	-1.521***	1.205***
	(-5.891)	(4.300)	(-7.968)	(5.705)	(-5.827)	(5.348)
BD	-0.020	0.015	0.022***	0.008	0.018*	0.007
	(-1.170)	(1.025)	(3.103)	(0.434)	(1.897)	(0.433)
BNPL	0.483***	-0.204***	0.118***	-0.335***	0.095*	-0.304***
	(7.197)	(-4.330)	(4.041)	(-4.541)	(1.709)	(-4.838)

TRDE	1.984***	0.031	-0.297***	0.158	-0.315***	0.197**
	(5.474)	(0.433)	(-3.560)	(1.616)	(-2.667)	(2.143)
GDP	0.350	-0.103	1.193***	-0.383**	1.038***	-0.260**
	(0.858)	(-0.742)	(7.419)	(-2.505)	(9.672)	(-2.018)
IND	-1.634***	-0.324*	-0.125	-0.255	0.027	-0.205
	(-4.212)	(-1.816)	(-1.179)	(-1.318)	(0.143)	(-1.105)
RD	0.260**	-0.092	-0.083	-0.287***	-0.025	-0.109
	(2.161)	(-0.984)	(-1.355)	(-3.285)	(-0.372)	(-1.267)
PS	-0.178	-0.507***	-0.060	0.033	-0.260***	-0.350***
	(-1.485)	(-5.064)	(-1.254)	(0.377)	(-2.773)	(-6.831)
RQ	0.922***	2.508***	-0.901***	2.939***	-1.264***	2.574***
	(2.884)	(7.168)	(-3.119)	(8.020)	(-7.538)	(7.244)
Constant	-3.919	-4.908***	-2.228**	-7.294***	0.894	-5.576***
	(-1.589)	(-3.685)	(-2.102)	(-4.381)	(0.712)	(-3.466)
R^2	0.824	0.245	0.716	0.264	0.786	0.243

Note: statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Mechanism analysis

Mediating effect of Fintech

In the mechanism analysis focusing on Fintech, presented in Table 9, I explore how Fintech influences the relationship between CB, FD, and BS. The analysis provides insights into whether Fintech acts as a channel through which these variables impact banking stability. In Models M1 and M3, it is observed that CB has a direct and significant positive impact on BS, with coefficients of 0.242 and 0.238, respectively. However, when Fintech is introduced into the model (M2), the impact of CB on FINT is positive but not statistically significant, suggesting that while CB may boost Fintech activity, this channel does not strongly mediate the effect of CB on banking stability.

For financial development, the results in Models M4 and M6 show a strong direct positive impact on BS, with coefficients of 0.782 and 0.710, respectively. In Model M5, FD has a highly significant and positive impact on Fintech, with a coefficient of 8.289, indicating that financial development significantly boosts Fintech activity. However, the effect of Fintech on BS remains small and statistically insignificant in both models (M3 and M6), with coefficients of 0.013 and 0.009, respectively. This suggests that while Fintech is positively influenced by financial development, it does not substantially mediate the relationship between financial development and banking stability.

As a result, the mechanism analysis reveals that although both corporate bond issuance and financial development positively affect banking stability, Fintech does not play a significant mediating role in these relationships. Instead, its influence on banking stability appears limited, suggesting that other factors may be more critical in translating the effects of CB and FD into banking stability.

Table 9. Mechanism analysis (Fintech)

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
Variables	BS	FINT	BS	BS	FINT	BS
CB	0.242***	0.300	0.238***			
	(4.000)	(1.572)	(3.948)			
FD				0.782***	8.289***	0.710***
				(3.935)	(8.273)	(2.696)
FINT			0.013			0.009
			(1.242)			(0.674)
BNPL	-0.095**	0.287	-0.099**	-0.140***	0.744***	-0.146***
	(-2.182)	(1.276)	(-2.178)	(-2.965)	(3.590)	(-2.801)
TRDE	-0.008	-1.407***	0.010	0.060	-0.026	0.060
	(-0.134)	(-6.323)	(0.160)	(0.840)	(-0.077)	(0.854)
GDP	0.222**	0.905***	0.210**	0.095	-0.830**	0.103
	(2.195)	(4.344)	(2.039)	(0.902)	(-2.369)	(0.953)
IND	-0.282**	0.348	-0.286**	-0.246**	0.431*	-0.250**
	(-2.235)	(1.476)	(-2.273)	(-2.002)	(1.854)	(-2.042)
RD	0.017	0.644***	0.008	-0.056	0.435***	-0.060
	(0.270)	(3.273)	(0.136)	(-1.115)	(2.896)	(-1.185)
PS	-0.377***	-1.074***	-0.364***	-0.449***	-1.294***	-0.437***
	(-8.430)	(-4.044)	(-8.408)	(-9.581)	(-4.459)	(-8.791)
RQ	1.094***	1.300	1.077***	1.428***	3.465***	1.398***
	(5.578)	(1.095)	(5.797)	(6.658)	(2.947)	(6.811)
Constant	-2.634*	-3.610	-2.588*	-2.789**	-5.457	-2.742**
	(-1.953)	(-0.919)	(-1.913)	(-2.131)	(-1.345)	(-2.103)
N	481	481	481	481	481	481
R^2	0.253	0.208	0.254	0.205	0.299	0.206

Note: statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Mediating effect of Big Data

In this mechanism analysis centered on Big Data, presented in Table 10, it is examined how BD intermediates the relationship between CB, FD, and BS. This analysis sheds light on whether Big Data functions as a channel through which these variables exert influence on banking stability.

In Models M1 and M3, CB consistently exhibits a significant and positive effect on BS, with coefficients of 0.242 and 0.257, respectively. However, when BD is considered as a mediating factor in Model M2, CB displays a significant negative impact on BD, with a coefficient of -0.411. This finding suggests that while CB positively

affects banking stability, it may have an adverse effect on Big Data development, potentially due to resource reallocation or shifts in strategic focus within the financial sector.

For financial development, Models M4 and M6 indicate a robust positive effect on BS, with coefficients of 0.782 and 0.703, respectively. In Model M5, FD also significantly promotes Big Data activity, with a coefficient of 4.150, highlighting that enhanced financial development strongly supports the expansion of Big Data initiatives. Furthermore, in Model M3, BD positively influences BS with a coefficient of 0.035, suggesting that Big Data serves as a critical conduit through which financial development bolsters banking stability. However, in Model M6, the impact of BD on BS is smaller and not statistically significant, implying that while Big Data can strengthen banking stability, its mediating role may vary depending on specific conditions. Therefore, the analysis underscores that Big Data can act as a significant intermediary in the relationship between financial development and banking stability, but its impact is nuanced and context-specific, particularly when interacting with corporate bond issuance.

Table 10. Mechanism analysis (Big data)

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
	BS	BD	BS	BS	BD	BS
CB	0.242***	-0.411**	0.257***			
	(4.000)	(-2.282)	(4.257)			
FD				0.782***	4.150***	0.703***
				(3.935)	(4.043)	(3.608)
BD			0.035***			0.019
			(2.593)			(1.332)
BNPL	-0.095**	0.460**	-0.111**	-0.140***	0.918***	-0.157***
	(-2.182)	(2.030)	(-2.433)	(-2.965)	(3.975)	(-3.006)
TRDE	-0.008	-1.601***	0.049	0.060	-0.747***	0.074
	(-0.134)	(-9.681)	(0.710)	(0.840)	(-3.463)	(1.016)
GDP	0.222**	1.014***	0.186*	0.095	0.047	0.095
	(2.195)	(4.333)	(1.738)	(0.902)	(0.128)	(0.876)
IND	-0.282**	-0.526	-0.263**	-0.246**	-0.557	-0.236*
	(-2.235)	(-1.061)	(-1.964)	(-2.002)	(-1.149)	(-1.859)
RD	0.017	0.514*	-0.002	-0.056	0.548**	-0.067
	(0.270)	(1.884)	(-0.029)	(-1.115)	(2.157)	(-1.322)
PS	-0.377***	-0.745***	-0.351***	-0.449***	-0.722***	-0.435***
	(-8.430)	(-2.808)	(-7.941)	(-9.581)	(-2.899)	(-9.819)
RQ	1.094***	3.321***	0.976***	1.428***	4.064***	1.351***
	(5.578)	(3.792)	(4.991)	(6.658)	(4.350)	(6.780)
Constant	-2.634*	-11.174***	-2.238	-2.789**	-12.148***	-2.559*

	(-1.953)	(-3.365)	(-1.622)	(-2.131)	(-3.600)	(-1.937)
N	481	481	481	481	481	481
R^2	0.253	0.255	0.265	0.205	0.269	0.208

Note: statistics in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Discussion

This study aimed to examine the impact of corporate bond issuance and financial development on banking stability within OECD countries from 2010 to 2022, while exploring the mediating roles of Fintech and Big Data. The findings from the empirical analysis offer several key insights that contribute to the existing literature on financial development, technological innovation, and banking stability.

First, the results consistently demonstrate that corporate bond issuance positively influences banking stability across various models. This relationship holds even when accounting for different economic and technological contexts. Specifically, the findings showed that in developed countries, corporate bond issuance significantly enhances banking stability, likely due to the more mature financial markets and robust regulatory environments that characterize these economies. The availability of corporate bonds provides firms with alternative financing options, reducing their reliance on bank loans and thereby mitigating credit risk within the banking sector. This diversification of funding sources strengthens the resilience of the banking system against potential shocks, which is particularly crucial in maintaining overall financial stability. The availability of corporate bonds as an alternative financing option significantly reduces firms' reliance on bank loans, thereby mitigating credit risk within the banking sector. During periods of tight monetary policy, firms often shift from bank loans to corporate bonds, providing greater flexibility in managing capital structures and reducing over-reliance on banks . This shift not only stabilizes the banking environment by lowering loan demand but also fosters competition, compelling banks to improve lending practices and offer more favorable terms .

In contrast, the effect of corporate bond issuance on banking stability in developing countries is less pronounced and in some cases statistically insignificant. This suggests that the benefits of corporate bond issuance may be contingent upon the level of financial market development and the regulatory infrastructure in place. In developing countries, where financial markets may be less developed and regulatory frameworks weaker, the positive effects of corporate bond issuance on banking stability are not as robust. This finding highlights the need for developing countries to strengthen their financial markets and regulatory institutions to fully capitalize on the benefits of corporate bond issuance.

Furthermore, the analysis also reveals significant heterogeneity in the impact of financial development on banking stability. In developed countries, financial development is positively associated with banking stability, supporting the notion that well-developed financial systems contribute to the stability of the banking sector. This relationship is likely driven by the increased efficiency, depth, and access provided by developed financial markets, which facilitate better resource allocation and risk management, ultimately enhancing the stability of banks. The relationship between financial development and banking stability varies across economic contexts. In developed countries, financial development generally enhances banking stability due to improved market efficiency, resource allocation, and risk management, with well-capitalized banks better po-

sitioned to absorb shocks . Conversely, in developing countries, financial development can introduce vulnerabilities if not supported by robust regulation, as increased financial access may expose banks to systemic risks . Additionally, monetary policy plays a crucial role in balancing financial and price stability, particularly in rapidly developing financial systems .

The counterintuitive negative relationship between financial development and banking stability in developing countries can be explained through the lens of premature financial liberalization. When financial systems develop faster than corresponding regulatory capacity and institutional maturity, it can lead to regulatory arbitrage and excessive risk-taking rather than stability enhancement. This aligns with the 'financial development paradox' where rapid expansion without proper safeguards actually increases systemic vulnerability. In developing OECD economies, financial development may manifest as credit booms and speculative investments that outpace supervisory capabilities, ultimately undermining banking stability despite superficial market growth.

However, in developing countries, a significantly negative relationship between financial development and banking stability is observed. This counterintuitive finding suggests that rapid financial development in these contexts may introduce vulnerabilities that undermine banking stability. Possible explanations include the overextension of credit, inadequate regulatory oversight, and market inefficiencies that often accompany rapid financial sector growth in less developed economies. These results underscore the importance of carefully managing financial development in developing countries to avoid potential destabilizing effects.

When examining the role of technological innovation, the findings indicate that Fintech and Big Data play complex and context-dependent roles in mediating the relationships between corporate bond issuance, financial development, and banking stability. Specifically, while Fintech shows potential as a channel through which financial development can enhance banking stability, its mediating effect is not consistently significant across all models. This suggests that while Fintech activity is influenced by both corporate bond issuance and financial development, its impact on banking stability is not as direct or pronounced as one might expect. The relatively nascent nature of Fintech in many OECD countries, combined with varying levels of regulatory adaptation, may explain the limited role of Fintech in enhancing banking stability.

The limited mediating roles of Fintech and Big Data, despite their theoretical potential, reflect what might be termed the 'technology adoption gap' in financial intermediation. While these technologies develop rapidly in startup ecosystems (as measured by funding), their integration into core banking stability mechanisms faces significant implementation lags. Banking systems, particularly in developing economies, may lack the absorptive capacity, including technical expertise, data infrastructure, and regulatory frameworks, to effectively translate technological investment into stability benefits. This suggests that technological solutions require complementary investments in human capital and institutional adaptation before they can fully mediate financial stability relationships.

Conversely, Big Data emerges as a more significant mediator in the relationship between financial development and banking stability. The results show that financial development strongly promotes Big Data activity which in turn positively influences banking stability. This finding highlights the importance of data-driven decision-making and advanced analytics in strengthening the banking sector. Big Data technologies enable banks to better assess and manage risks, optimize operations, and enhance customer service, all of which contribute to greater stability. However, the impact of Big Data is not uniform; it varies depending on the level of

technological adoption and the economic context. In high-tech environments, the benefits of Big Data on banking stability are more pronounced, whereas in lower-tech settings, the impact is more subdued.

Policy recommendations

Grounded in the lenses of Financial Intermediation Theory and Information Asymmetry Theory, the findings of this study yield several nuanced implications. First, the positive impact of corporate bond issuance on banking stability, particularly in developed countries, suggests that policymakers should focus on strengthening corporate bond markets. This aligns with Financial Intermediation Theory which emphasizes the stability benefits of diversified funding sources beyond traditional bank loans. In developing countries, where this relationship is less pronounced, efforts must prioritize bolstering financial market infrastructure, including robust credit rating agencies and transparent disclosure standards to reduce information asymmetries and build investor confidence. By doing so, these economies can more effectively utilize corporate bond issuance as a tool for improving banking stability. Furthermore, promoting a diversified financial market that includes a well-functioning corporate bond segment can reduce banks' over-reliance on traditional lending, thereby mitigating systemic risks.

Second, the dual nature of financial development's impact reveals a critical theoretical insight: the benefits of enhanced intermediation can be negated by unchecked information problems. In developed economies, financial development enhances stability through improved market efficiency, depth, and access. Conversely, in developing countries, rapid financial development can introduce vulnerabilities, a phenomenon explicable through Information Asymmetry Theory, where premature liberalization outpaces regulatory capacity and information transparency, leading to adverse selection and moral hazard. Therefore, financial regulators must adopt a nuanced approach, encourage financial development while maintain stringent oversight to prevent destabilizing effects. This approach should involve gradual financial sector reforms, enhanced supervision, and capacity-building initiatives aimed at strengthening the resilience of financial institutions.

Third, the significant role of Big Data as a mediator between financial development and banking stability implies that industry leaders and financial institutions should prioritize investments in advanced data analytics and risk management technologies. These technologies enable more precise risk assessment, better decision-making, and greater operational efficiency, all of which contribute to a more stable banking environment. Moreover, integrating Big Data within the financial system can provide regulators with new tools for monitoring systemic risks and enforcing compliance, ultimately enhancing overall financial stability.

Finally, the limited and mixed mediating role of Fintech suggests that its current evolution may not yet be fully resolving the fundamental information frictions in ways that consistently bolster banking stability. While Fintech can drive innovation and improve access to financial services, it must be integrated into the broader financial ecosystem in a way that strengthens rather than destabilizes banking stability. Regulatory frameworks should be designed to foster Fintech innovation while ensuring that it complements traditional banking practices and contributes to the overall robustness of the financial sector. As a result, a coordinated and context-specific approach that considers the unique economic and technological conditions of each country will be essential for ensuring sustained banking stability. The goal is to guide Fintech's integration so that it ultimately reduces, rather than exacerbates, information asymmetries within the financial ecosystem.

Limitations and future research directions

This study has several limitations that warrant consideration. First, the analysis is confined to OECD countries which may limit the generalizability of the findings to non-OECD economies with different financial and regulatory environments. Second, the study period from 2010 to 2022 may not capture the long-term effects of corporate bond issuance, financial development, and technological innovation on banking stability. Third, the focus on Fintech and Big Data as mediating variables, while theoretically grounded, overlooks other technological dimensions that may influence banking stability. Future research could incorporate artificial intelligence, blockchain, Reg Kabir & Worthington, 2017Tech, and digital currencies to capture a broader picture of technological transformation in finance.

Fourth, developing more granular and multidimensional measures of Fintech and Big Data adoption would enhance analytical precision. Current indicators may not fully reflect the depth or integration of these technologies in banking operations. Composite indices that account for technological scope, adoption intensity, and data utilization could yield more robust insights into their mediating effects. Moreover, future research should explore these relationships in a broader set of countries, including emerging and developing economies, to enhance the generalizability of the findings. Furthermore, extending the study period or using alternative time frames could provide insights into the long-term effects.

Finally, future research could explore how emerging technologies such as blockchain and artificial intelligence interact with sustainable finance initiatives, including green bonds and ESG-oriented Fintech, to enhance banking stability and support the broader transition toward a more resilient financial system.

Conclusion

The stability of the banking sector is crucial for the overall health of financial systems, particularly in the context of global economic integration and technological advancements. This study explored the impact of corporate bond issuance and financial development on banking stability in OECD countries from 2010 to 2022, with attention to the mediating roles of Fintech and Big Data. The results show that corporate bond issuance strengthens banking stability, especially in developed countries, by providing alternative financing sources that lower credit risk. Financial development also promotes stability in advanced economies but can create vulnerabilities in developing countries, when not supported by effective regulation. Big Data emerged as a key mediator, improving banking stability through better risk management and operational efficiency. These findings highlight the need for tailored financial and technological policies to ensure robust banking stability across diverse economic environments.

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Author contributions

Amin Ul: Methodology, Conceptualization, Writing – review & editing, Writing – original draft, Formal analysis, Project administration, Validation.

Declaration of competing interest

Not applicable.

Ethics statement

Not applicable.

Data availability

Data available on request from the corresponding author.

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