

Digital Shadow Banking: Regulatory Challenges to Bank Fintech Collaboration in Embedded Finance Schemes

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Abstract

The rise of embedded finance, namely the integration of financial services into non-financial digital platforms such as e-commerce, ride-hailing apps, and marketplaces, has intensified collaboration between banks and financial technology (fintech) firms. This model expands financial inclusion but also enables digital shadow banking, in which intermediation functions occur outside the traditional banking system. This study examines the regulatory challenges arising from bank-fintech collaboration in embedded finance schemes and their implications for financial system stability. This study employed the library research method, reviewing various literature sources such as scientific journals, books, industry reports, and regulations related to the digital finance sector. The results of the study indicate that, although collaboration between banks and fintech can improve service efficiency and expand financial access, there are still challenges within the regulatory framework, particularly with regard to the supervision of digital financial activities, consumer protection, and systemic risk mitigation. Therefore, an adaptive and comprehensive regulatory approach is needed to ensure that innovation in the digital financial ecosystem can flourish in a healthy manner while maintaining the stability of the financial system.

Keywords

Shadow Banking, Digital Banking, Fintech, Embedded Finance, Financial Regulation

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Introduction

Digital transformation has brought about significant changes in the financial services industry. Advances in information technology have enabled financial institutions to create new business models, improve operational efficiency, and expand access to financial services.¹ Technological innovations such as digital networks, electronic payment systems, and the use of mobile devices have transformed the way people access financial services.

This transformation has not only affected banking institutions but has also transformed the structure of the financial market as a whole through the emergence of various technological innovations that support faster and more efficient transaction processes, data management, and the distribution of financial services. Innovations such as ATMs, digital networks, mobile phones, and electronic payment systems have had a long-term impact on increasing financial inclusion and economic growth.²

Furthermore, advances in digital technology are also driving changes in consumer behavior and the way institutions provide services. Digitalization is enabling financial services to become more accessible, transparent, and reach segments of society previously underserved by traditional banking systems.

The development of digital technology has given rise to financial technology (fintech) innovation, which is a key factor in the transformation of the financial sector. Fintech offers various new business models, applications, and financial service processes that can improve user experience and financial efficiency.³ Fintech not only brings technological innovation but also creates digital financial services, previously dominated by banking institutions. Some emerging fintech services include:

¹ Peter Gomber et al., "On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services," *Journal of Management Information Systems* 35, no. 1 (2018): 220–65.

² Douglas W Arner, Ross P Buckley, and Dirk A Zetsche, "Fintech for Financial Inclusion: A Framework for Digital Financial Transformation," *UNSW Law Research Paper*, no. 18–87 (2018).

³ Peter Gomber, Jascha-Alexander Koch, and Michael Siering, "Digital Finance and FinTech: Current Research and Future Research Directions," *Journal of Business Economics* 87, no. 5 (2017): 537–80.

1. Digital payments (digital payments)
2. Online loans (fintech lending)
3. Peer-to-peer lending
4. Cryptocurrency and blockchain technology

This innovation enables faster, more affordable, and more accessible financial transactions for the wider community. Furthermore, fintech plays a role in increasing financial inclusion by providing access to financial services to groups previously excluded from formal financial institutions. The development of fintech has driven the emergence of a digital financial services ecosystem involving various actors, such as technology companies, financial institutions, digital platforms, and regulators.⁴

With the advancement of financial technology, finance is no longer solely provided by banking institutions. Financial services can now be integrated into various digital platforms through the concept of embedded finance.

Embedded finance refers to the integration of financial services into non-financial platforms, such as e-commerce platforms, digital transportation apps, or marketplaces. Through this integration, users can conduct various financial transactions directly within the platform without having to access separate banking services. The development of fintech also demonstrates the continued development of digital service innovation, encompassing various new forms of financial services, such as digital payments, online loans, crowdfunding, and digital investment services integrated within various digital ecosystems.⁵

The integration of financial services into digital platforms is creating a new, more flexible and innovative financial ecosystem. However, this development also poses challenges for

⁴ Maximilian Palmié et al., "The Evolution of the Financial Technology Ecosystem: An Introduction and Agenda for Future Research on Disruptive Innovations in Ecosystems," *Technological Forecasting and Social Change* 151 (2020).

⁵ Ceyla Pazarbasioglu et al., "Digital Financial Services" (Washington, DC: World Bank, 2020).

regulators in overseeing increasingly complex digital financial activities, particularly in the context of interactions between banks, fintech companies, and technology companies.⁶

Shadow banking is a financial intermediation system carried out by institutions or financial activities outside the traditional banking system. This activity encompasses various forms of non-bank financial institutions and instruments involved in the process of distributing credit and financing to those in need of funds. In practice, these activities often have lower credit standards than conventional banking institutions and operate with relatively limited transparency.

Furthermore, the operational mechanism of shadow banking involves various non-bank intermediary institutions in the credit intermediation chain. This process can include loan sales, asset securitization, and financing through broader financial markets. In this system, loan assets can be transferred from bank balance sheets to other institutions, such as special purpose vehicles (SPVs), and then converted into tradable financial instruments.

The development of new financial instruments and innovations in the financial system have accelerated the growth of shadow banking globally. In some developed financial markets, such as the United States and Europe, shadow banking has even become a significant competitor to traditional banking institutions in terms of transaction volume and proportion of financial assets.

However, the characteristics of shadow banking, such as high leverage, complex financial structures, and limited regulatory oversight, have the potential to pose systemic risks to the financial system. Therefore, the existence of shadow banking is often associated with the potential for increased market volatility and vulnerability to financial crises.

⁶ Dao Ha, Phuong Le, and Duc Khuong Nguyen, "Financial Inclusion and Fintech: A State-of-the-Art Systematic Literature Review," *Financial Innovation* 11, no. 1 (2025): 69, <https://doi.org/10.1186/s40854-024-00741-0>.

The development of shadow banking demonstrates that innovation in the financial system can both provide benefits and pose risks to economic stability. However, this activity also has the potential to trigger significant financial risks if not adequately monitored.

The experience of the 2008 global financial crisis demonstrated that weak oversight of shadow banking activities can exacerbate the accumulation of risks in the financial system. This situation prompted various countries to strengthen their financial regulatory frameworks, including through the implementation of the Dodd-Frank Act in the United States, which aims to improve oversight of financial institutions and mitigate systemic risk.

International organizations also emphasize the importance of strengthening regulations on shadow banking activities. Stricter oversight efforts are needed to increase transparency, reduce regulatory gaps, and prevent regulatory arbitrage between traditional and non-bank financial institutions. Therefore, effective regulation is a crucial instrument for maintaining financial system stability while ensuring the healthy development of financial innovation.⁷

However, the studies available thus far still tend to examine shadow banking, fintech, and embedded finance separately. Some research concludes that fintech can reduce shadow banking risks by enhancing transparency⁸, whereas other research finds that fintech may instead expand shadow banking activities through broader access to financing.⁹ Studies on embedded finance also remain relatively limited, particularly in relation to digital shadow banking and its regulatory framework.¹⁰ As a result, few studies have specifically integrated these three concepts into a single, comprehensive analytical framework from the perspective of regulation and financial system stability, especially in the context of a developing country

⁷ Longsheng Chen, "Shadow Banking: The Emergence, Development, and Regulation," in *International Conference on Finance, Trade and Business Management (FTBM 2023)* (Atlantis Press, 2023).

⁸ Yongqi Feng, Yue Cao, and Juan Ni, "Does Fintech Affect Shadow Banking of Non-Financial Firms? Evidence from the Entrusted Loans," *International Review of Financial Analysis* 94 (2024): 103268.

⁹ Qiuyue Zhang, Jiangjing Que, and Xiuting Qin, "Regional Financial Technology and Shadow Banking Activities of Non-Financial Firms: Evidence from China," *Journal of Asian Economics* 86 (2023): 101606.

¹⁰ Joscha Wullweber, "Embedded Finance: The Shadow Banking System, Sovereign Power, and a New State-Market Hybridity," *Journal of Cultural Economy* 13, no. 5 (2020): 592–609.

such as Indonesia. This gap constitutes the research gap that the present study seeks to address.

Based on this background and research gap, this study aims to examine the regulatory challenges arising from collaboration between banks and fintech companies within embedded finance schemes, as well as to analyze its implications for the supervision of digital financial activities, consumer protection, systemic risk mitigation, and the stability of the financial system as a whole. Accordingly, this study is expected to contribute to the formulation of an adaptive and comprehensive regulatory framework for the digital financial ecosystem in Indonesia.

Method

This research employed a library research method with a descriptive qualitative approach. This method was conducted by reviewing and analysing various literature sources relevant to the research topic of digital shadow banking, collaboration between banks and fintech companies, and regulations in the embedded finance ecosystem.

The data sources used in this study are secondary data obtained from various scientific references, such as journals, books, industry reports, and regulatory documents related to the development of financial technology and digital financial systems. Furthermore, this study also utilizes reports from financial institutions and relevant authorities discussing the development of fintech, shadow banking, and financial sector regulation.

Data collection techniques were conducted through documentation studies, namely by identifying, collecting, and reviewing various literature relevant to the research focus. Next, the obtained data were analysed using qualitative descriptive analysis techniques, by grouping, comparing, and interpreting various concepts, theories, and previous research findings to gain a comprehensive understanding of the regulatory challenges to bank and fintech collaboration in embedded finance schemes and their implications for financial system stability.

The analysis results are then systematically compiled to provide a clear picture of the digital shadow banking phenomenon, the regulatory challenges faced, and the importance of

strengthening the regulatory framework to maintain financial system stability amidst the development of digital financial innovation.

Result and Discussion

Shadow Banking in the Modern Financial System

Shadow Banking is an important phenomenon in the global financial system which refers to financial intermediation activities carried out outside the traditional banking system. This concept developed in response to the limitations of the formal banking system in meeting financing needs and financial innovation. In the literature, shadow banking is understood as a network of non-bank financial institutions and activities that perform credit intermediation functions using leverage and complex financial instruments.¹¹

The Financial Stability Board (FSB) emphasized that shadow banking encompasses activities that have the potential to create systemic risks, particularly through maturity transformation, liquidity manipulation, and regulatory arbitrage practices.¹² Meanwhile, Pozsar et al. explain that shadow banking functions as a financial intermediary that transforms credit and liquidity risks without being subject to strict banking regulatory frameworks.¹³

Shadow banking has grown significantly since the beginning of the 21st century, driven by financial innovations such as asset securitization. In many developed countries, this sector has even become a vital component of the global financial system. However, characteristics

¹¹ Ridoy Deb Nath and Mohammad Ashraful Ferdous Chowdhury, "Shadow Banking: A Bibliometric and Content Analysis," *Financial Innovation* 7, no. 1 (2021): 68.

¹² Edward F Greene and Elizabeth L Broomfield, "Promoting Risk Mitigation, Not Migration: A Comparative Analysis of Shadow Banking Reforms by the FSB, USA and EU," *Capital Markets Law Journal* 8, no. 1 (2013): 6–53.

¹³ Kehinde Damilola Ilesanmi, "Regulation of Shadow Banks and Its Implication for Financial Stability in Emerging Economies," in *Shadow Banking and Financial Risk in Emerging and Developing Markets: The Growth and Development of Non-Bank Financial Intermediation* (Springer, 2025), 233–52; Rudy Bouguelli, "Is Shadow Banking Really Akin to Banking? A Critical Analysis in Light of Monetary Theory," *Journal of Post Keynesian Economics* 43, no. 1 (2020): 1–27.

such as high leverage, structural complexity, and low transparency make shadow banking a potential source of systemic risk.¹⁴

According to the author, these definitions demonstrate that shadow banking is not simply an activity outside of banking, but rather a parallel system that functions similarly to banking but lacks adequate regulatory protection. This is the starting point for the emergence of systemic risks that are difficult for financial authorities to control.

Shadow Banking Risks and Financial System Stability

The literature shows that the expansion of shadow banking has significant implications for financial system stability. One major risk is a maturity mismatch between short-term funding and long-term investments, which could trigger a liquidity crisis.¹⁵ The experience of the 2007–2008 global financial crisis shows that shadow banking activities can increase the vulnerability of the financial system and accelerate the spread of risk to the formal banking sector.¹⁶ In addition, off-balance sheet practices carried out by conventional banks also create regulatory gaps that increase systemic risk.

Financial Technology (Fintech) and Digital Financial Transformation

Advances in information technology have given rise to financial technology (fintech), a key innovation in the modern financial sector. Fintech is the integration of financial services and technology, enabling faster, more efficient, and more accessible transactions.¹⁷ Fintech covers a wide range of services such as digital payments, peer-to-peer lending, and blockchain.

¹⁴ Min Huang, Hai Jiang, and Shaohua Zhang, “Nonlinear Effects of Shadow Banking on Banks’ Systemic Risk,” *Pacific-Basin Finance Journal* 93 (2025): 102869.

¹⁵ Hongguo Yan and Yang Ling, “The Impact of Maturity Mismatch between Investment and Financing on Corporate Financial Risk: Evidence from China,” *Applied Economics* 57, no. 60 (2025): 11173–86.

¹⁶ Olayinka Michael Olawoyin and Ayobami Gabriel Olanrewaju, “Reconstructing Global Credit Markets: Analyzing the Role of Shadow Banking in Systemic Financial Vulnerability,” n.d.; Francisco Louçã and Michael Ash, *Shadow Networks: Financial Disorder and the System That Caused Crisis* (Oxford University Press, USA, 2018).

¹⁷ Ha, Le, and Nguyen, “Financial Inclusion and Fintech: A State-of-the-Art Systematic Literature Review”; Adnan Jalal, Muneer Al Mubarak, and Farah Durani, “Financial Technology (Fintech),” in *Artificial Intelligence and Transforming Digital Marketing* (Springer, 2023), 525–36.

Its presence plays an important role in increasing financial inclusion and the efficiency of the financial system.¹⁸ In addition, fintech also drives the transformation of financial market structures through the digitalization of services and changes in consumer behaviour.¹⁹ However, the development of fintech also raises new challenges in terms of supervision and regulation, especially because technological innovation is developing faster than the existing regulatory framework.²⁰

According to Fadia Fitriyanti, the digitalization of financial services such as e-KYC requires strong personal data protection because technology-based identification processes have the potential to create risks of data leaks and misuse of consumer information.²¹

Embedded Finance as a Financial Services Innovation

Embedded finance is an innovation that enables the integration of financial services into non-financial platforms such as e-commerce and digital applications. This model allows users to access financial services directly without going through a separate bank.²²

This concept changes the paradigm of financial services to be more distributed in the digital ecosystem and increases efficiency and financial inclusion.²³ However, embedded finance

¹⁸ Thai-Ha Le, Anh Tu Chuc, and Farhad Taghizadeh-Hesary, "Financial Inclusion and Its Impact on Financial Efficiency and Sustainability: Empirical Evidence from Asia," *Borsa Istanbul Review* 19, no. 4 (2019): 310–22; Gang Kou and Yang Lu, "FinTech: A Literature Review of Emerging Financial Technologies and Applications," *Financial Innovation* 11, no. 1 (2025): 1.

¹⁹ Erik Feyen et al., "Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy," *BIS Papers*, 2021; Qianhua Liu, Ka-Ching Chan, and Ranga Chimhundu, "Fintech Research: Systematic Mapping, Classification, and Future Directions," *Financial Innovation* 10, no. 1 (2024): 24.

²⁰ Gomber et al., "On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services."

²¹ Fadia Fitriyanti et al., "Securing Personal Data in E-KYC: Vital for Digital Economy Growth," *Diponegoro Law Review* 9, no. 1 (2024): 104–20.

²² Sanjiv R Das, "The Future of Fintech," *Financial Management* 48, no. 4 (2019): 981–1007; Anne-Laure Mention, "The Future of Fintech," *Research-Technology Management* (Taylor & Francis, 2019).

²³ Feng, Cao, and Ni, "Does Fintech Affect Shadow Banking of Non-Financial Firms? Evidence from the Entrusted Loans."

also creates new complexities in the financial system, particularly regarding the division of responsibilities between actors in the digital ecosystem.²⁴

Collaboration between Banks and Fintech in the Digital Ecosystem

Collaboration between banks and fintech companies is a key strategy in navigating digital transformation. This collaboration model includes Banking-as-a-Service (BaaS), the use of APIs, and strategic partnerships.²⁵ This collaboration offers benefits in the form of operational efficiency and increased access to financial services. However, it also poses risks such as complex oversight and unclear responsibilities between parties.²⁶

In recent developments, this collaboration is also driven by the need for banks to adapt to changing consumer behaviour, which is increasingly digital. Fintech is emerging as a catalyst for innovation, enabling banks to accelerate digitalization without having to build technology from scratch.²⁷ According to the author, this condition shows that collaboration is no longer an option, but rather a strategic necessity in maintaining competitiveness in the digital economy era.

In addition, research shows that partnerships between banks and fintech can improve operational cost efficiency and expand the reach of financial services, especially in developing countries.²⁸ However, system integration between these two entities also increases operational risks, particularly related to third-party dependency. According to the authors,

²⁴ Chizoba Michael Okafor, Omoize Fatimetu Dako, and Vivian Chilee Osuji, "Architecting Embedded Finance Ecosystems That Converge Payments, Credit, and Data Services for Inclusive Economic Growth," *Shodhshauryam, International Scientific Refereed Research Journal* 6, no. 3 (2023): 289–312.

²⁵ Douglas W Arner et al., "FinTech and RegTech: Enabling Innovation While Preserving Financial Stability," *Georgetown Journal of International Affairs*, 2017, 47–58.

²⁶ Feng, Cao, and Ni, "Does Fintech Affect Shadow Banking of Non-Financial Firms? Evidence from the Entrusted Loans."

²⁷ Xavier Vives, "Digital Disruption in Banking," *Annual Review of Financial Economics* 11, no. 1 (2019): 243–72; Luigi Weweg, Jeo Lee, and Michael C Thomsett, "Disruptions and Digital Banking Trends," *Journal of Applied Finance and Banking* 10, no. 6 (2020): 15–56.

²⁸ Arnoud Boot et al., "Fintech: What's Old, What's New?," *Journal of Financial Stability* 53 (2021): 100836.

the higher the level of dependency, the greater the potential for system disruption if one of the parties fails.

Furthermore, this collaboration creates a network-based financial ecosystem model, where various actors are connected through digital platforms. In this system, value is no longer created by a single institution, but rather through interactions between actors within the ecosystem.²⁹ According to the authors, this model increases efficiency, but also increases the complexity of supervision because regulators must understand the dynamic and multidimensional relationships between entities.

On the other hand, compliance is a significant challenge in bank-fintech collaboration. The differing levels of regulation between highly stringent banks and relatively flexible fintechs can create gaps in the application of prudential principles.³⁰ According to the author, this imbalance has the potential to create regulatory loopholes that can be exploited for regulatory arbitrage practices.

Furthermore, this collaboration has also impacted the risk profile of the financial system. Risk is no longer concentrated in a single institution, but rather spread across an interconnected network. This complicates conventional risk identification and mitigation processes.³¹ According to the author, the entity-based supervision approach needs to be complemented by an activity-based supervision approach to address this complexity.

Thus, collaboration between banks and fintech is a dual-faceted phenomenon: it serves as both a driver of innovation and a source of potential new risks in the financial system. Therefore, an adaptive and integrated regulatory framework is needed to ensure that this collaboration delivers optimal benefits without compromising financial system stability.

²⁹ Dirk A Zetsche et al., "From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance," *Nyujl & Bus.* 14 (2017): 393.

³⁰ Stijn Claessens et al., "Fintech Credit Markets around the World: Size, Drivers and Policy Issues," *BIS Quarterly Review* September, 2018.

³¹ Thomas Philippon, "On Fintech and Financial Inclusion" (National Bureau of Economic Research, 2019).

Digital Shadow Banking and Its Development

The development of fintech and embedded finance has driven the emergence of the digital shadow banking phenomenon, namely digital-based financial intermediation activities that operate outside the traditional banking system.³²

Digital shadow banking shares similar characteristics with conventional shadow banking, but with greater complexity due to the use of digital technology. Furthermore, embedded finance has the potential to expand this activity through the integration of financial services across various digital platforms.³³

Regulatory Challenges in Digital Finance

The development of digital finance demands an adaptive regulatory framework. Traditional regulations often fail to accommodate the complexities of digital innovation, creating regulatory gaps and regulatory arbitrage.³⁴

This is also evident in Fadia Fitriyanti's study, which shows that regulations in the digital sector often lag behind the internal policies of digital platforms, thus creating a regulatory gap in protecting businesses and consumers.³⁵

In response, regulators have begun adopting approaches such as risk-based regulation and regulatory sandboxes to maintain a balance between innovation and financial system stability.

³² Wullweber, "Embedded Finance: The Shadow Banking System, Sovereign Power, and a New State–Market Hybridity"; Joscha Wullweber, "Embedded Finance: The Shadow Banking System, Monetary Politics and Sovereign Power," *Monetary Politics and Sovereign Power* (August 4, 2019), 2019.

³³ Junming Xie, "Banking Evolution in the Digital Age: How Digital Financial Inclusion Induces Systematic Financial Risk?," *Finance Research Letters* 80 (2025): 107351.

³⁴ Preethi Vijayagopal, Bhawana Jain, and Shyam Ayinippully Viswanathan, "Regulations and Fintech: A Comparative Study of the Developed and Developing Countries," *Journal of Risk and Financial Management* 17, no. 8 (2024): 324.

³⁵ Adi Bayu Nugraha and Fadia Fitriyanti, "Antara UU Dan Kebijakan Platform: Nasib UMKM Yang Hidup Dari Jualan Online," *Journal Evidence Of Law* 4, no. 3 (2025).

Consumer Protection in Embedded Finance

Consumer protection is a crucial aspect of the digital financial ecosystem. Risks such as data misuse, lack of transparency, and over-indebtedness are key challenges in embedded finance.

In line with this, Fadia Fitriyanti emphasized that personal data protection in digital financial systems is a crucial element in maintaining public trust in fintech services, particularly in the electronic verification process (e-KYC) which involves user biometric data.³⁶

Furthermore, the complex relationships between banks, fintech companies, and digital platforms raise questions about consumer protection responsibilities. Therefore, clear regulations are needed to protect consumer rights.

Systemic Risk and Financial System Stability

The integration of banks, fintech companies, and digital platforms has the potential to increase systemic risk in the financial system. The interconnectedness of actors in the digital ecosystem can accelerate the spread of risk during a crisis.

Therefore, regulators need to ensure that financial innovation remains in line with the principles of financial system stability by strengthening regulations and coordination between institutions.

Furthermore, the high level of interconnectedness within the digital financial ecosystem creates what is known as the contagion effect, which is the rapid spread of risk from one entity to another. In such an interconnected system, the failure of one platform or financial institution can trigger a domino effect that has a far-reaching impact on the entire financial system. This is exacerbated by the use of shared digital infrastructure, such as payment systems and data storage, which are critical to maintaining system stability.³⁷

³⁶ Fitriyanti et al., "Securing Personal Data in E-KYC: Vital for Digital Economy Growth."

³⁷ Ioannis Anagnostopoulos, "Fintech and Regtech: Impact on Regulators and Banks," *Journal of Economics and Business* 100 (2018): 7–25.

Furthermore, the emergence of the "too connected to fail" phenomenon presents a new challenge in the modern financial system. Unlike the "too big to fail" concept in traditional banking, in digital systems, highly connected entities can pose a source of systemic risk even if they don't possess significant assets.³⁸ According to the authors, this shows that the size of an institution is no longer the sole indicator of systemic risk, but rather the level of connectedness in digital financial networks must also be a primary concern for regulators.

Systemic risk is also exacerbated by the speed of information flow and transactions in digital systems. Negative information can spread rapidly through digital media and trigger excessive market reactions, such as massive withdrawals (digital bank runs). Under these conditions, financial system stability can be disrupted in a very short time. According to the authors, this characteristic requires a risk mitigation system that is not only robust but also responsive to real-time dynamics.

On the other hand, the use of technologies such as algorithms and artificial intelligence in financial decision-making can create new risks in the form of herding behavior. When many market participants use similar algorithmic models, the resulting decisions tend to be homogenous and can amplify market fluctuations.³⁹ According to the author, this has the potential to strengthen the boom and bust cycle in the digital financial system.

Furthermore, systemic risk in digital finance is also closely related to cybersecurity. Cyberattacks on digital financial infrastructure can disrupt widespread system operations and undermine public confidence in the financial system. In this context, system security is integral to financial stability. According to the authors, strengthening cyber resilience should be a priority in digital financial oversight policies.

Thus, financial system stability in the digital era depends not only on the strength of individual financial institutions but also on the resilience of the entire interconnected

³⁸ Jon Frost et al., "BigTech and the Changing Structure of Financial Intermediation," *Economic Policy* 34, no. 100 (2019): 761–99.

³⁹ Anjan V Thakor, "Fintech and Banking: What Do We Know?," *Journal of Financial Intermediation* 41 (2020).

ecosystem. Therefore, a more comprehensive and integrated supervisory approach is needed, including strengthening coordination between authorities, developing a digital macroprudential framework, and utilizing technology in supervision (SupTech). According to the authors, these steps are key to ensuring that financial innovation does not compromise the stability of the financial system as a whole.

Conclusion

Based on the discussion above, it can be concluded that the development of shadow banking, fintech, and embedded finance has brought about significant changes in the structure of the modern financial system. Shadow banking no longer merely functions as a complement to the banking system but has evolved into an integral part, playing a crucial role in global financial intermediation. However, its nature, which lies outside formal banking supervision, makes this sector potentially high in systemic risk, particularly related to leverage, lack of transparency, and regulatory arbitrage practices. On the other hand, advances in financial technology (fintech) have driven the transformation of financial services to become more efficient, inclusive, and digitally driven. Embedded finance, as part of fintech innovation, further strengthens the integration of financial services across various digital platforms, thereby changing the interaction patterns between consumers and financial institutions. While providing convenience and increasing financial inclusion, this phenomenon also creates new complexities in the financial system, particularly in terms of oversight, the allocation of legal responsibilities, and consumer protection.

Furthermore, the integration of banks, fintech, and digital platforms creates an increasingly connected and complex financial ecosystem. This increases system efficiency, but also increases the potential for systemic risks, particularly in crisis situations. These risks are not only financial but also encompass technological risks, data protection, and overall system stability. Thus, it can be emphasized that the development of digital finance, including digital shadow banking, requires an adaptive, integrated, and risk-based regulatory approach. Without an adequate regulatory framework, financial innovation has the potential to exacerbate instability in the financial system.

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