International Journal of Enhanced Research in Management & Computer Applications,
ISSN: 2319-7471, Volume 15 Issue 4, April 2026

Emerging Markets: A Comparative Analysis of the Financial Landscapes in India and Brazil

Garv Kher

ABSTRACT

The rapid expansion of financial technology (FinTech) in emerging markets has created significant opportunities for economic growth, financial inclusion, and innovation. However, the increasing adoption of digital financial services also raises concerns regarding consumer protection, data privacy, cybersecurity, financial stability, and regulatory accountability. This paper examines how developing economies can balance financial innovation with consumer safety through the adoption and effective implementation of regulatory sandboxes, which provide a controlled regulatory environment for testing innovative financial products, services, and business models before their wider introduction to the public. The study undertakes a comparative analysis of the financial landscapes and regulatory frameworks of India and Brazil, focusing on their approaches to FinTech regulation, digital payments, financial inclusion, consumer protection, and innovation-driven economic development. Particular attention is given to the regulatory sandbox framework established by the Reserve Bank of India (RBI) and the innovative regulatory initiatives undertaken by Brazilian institutions, including the Central Bank of Brazil (BCB). The paper explores how Brazil's regulatory experiences, particularly its digital financial infrastructure, open finance initiatives, and regulatory approaches to financial innovation, can provide valuable lessons for strengthening India's FinTech regulatory ecosystem. It further evaluates the challenges associated with regulatory fragmentation, technological risks, institutional capacity, and balancing innovation with adequate consumer safeguards. Adopting a comparative and analytical research methodology based on secondary sources, the study identifies opportunities for regulatory cooperation and policy adaptation between the two emerging economies. It argues that a flexible, transparent, and consumer-centric regulatory sandbox framework can promote responsible financial innovation while maintaining market confidence, financial stability, and sustainable economic growth.

Keywords: Regulatory Sandbox, Financial Technology (FinTech), Consumer Protection, Emerging Markets, India-Brazil Comparative Analysis

INTRODUCTION

The rapid development of financial technology (FinTech) has significantly transformed the structure and functioning of financial markets, particularly in emerging economies such as India and Brazil. The integration of digital technologies into banking, payments, lending, insurance, investment, and other financial services has created new opportunities for economic growth, financial inclusion, operational efficiency, and innovation. FinTech has emerged as an important instrument for improving access to financial services, reducing transaction costs, and facilitating participation in the formal financial system. Digital payments, mobile banking, artificial intelligence, blockchain technology, peer-to-peer lending, and open banking have fundamentally changed the relationship between financial institutions and consumers. According to the World Bank (2022), digital financial services have played an important role in expanding financial account ownership and improving access to formal financial services, particularly in developing economies.

Emerging markets face a particularly complex challenge because they must encourage technological innovation while ensuring that financial services remain secure, accessible, transparent, and fair. Traditional regulatory frameworks are often designed around established financial institutions and conventional business models, making it difficult to accommodate rapidly evolving digital financial products. Excessively restrictive regulations may discourage innovation and prevent new entrants from competing with established financial institutions. Conversely, inadequate regulation may expose consumers to fraudulent transactions, unfair lending practices, misuse of personal information, algorithmic discrimination, and financial losses. Arner, Barberis, and Buckley (2016) explain that the development of FinTech requires a reconsideration of traditional financial regulation because technological innovation is changing the nature of financial intermediation, institutional structures, and regulatory responsibilities.



Image 1: Comparative Financial Landscapes of India and Brazil

The financial landscapes of India and Brazil provide particularly valuable examples of this transformation. Both countries have experienced considerable growth in digital financial services and have introduced institutional and regulatory reforms to strengthen their financial ecosystems. India has expanded its digital financial infrastructure through initiatives such as the Pradhan Mantri Jan-Dhan Yojana, Aadhaar-based identification, mobile banking, and the Unified Payments Interface (UPI). Similarly, Brazil has modernised its financial system through digital banking, instant payment infrastructure, open finance, and innovative regulatory initiatives. These developments demonstrate how technological advancements can promote financial inclusion, improve market competition, and support economic development.

However, the expansion of digital financial services also creates significant regulatory challenges concerning consumer protection, cybersecurity, data privacy, transparency, financial stability, and institutional accountability. The increasing dependence on digital platforms has made consumers vulnerable to phishing, identity theft, unauthorised transactions, misleading financial products, and inappropriate use of personal financial information. Therefore, emerging economies require regulatory mechanisms that can accommodate technological developments without compromising public confidence and financial stability.

Regulatory Sandboxes: Balancing Financial Innovation and Consumer Protection

One of the important regulatory mechanisms developed to address the challenges associated with financial innovation is the regulatory sandbox. A regulatory sandbox provides a controlled environment in which financial technology companies can test innovative products, services, and business models under regulatory supervision before introducing them into the wider market. It enables regulators to observe the practical implications of emerging technologies while allowing participating firms to experiment with innovative financial solutions under specified conditions. Such arrangements generally involve limited testing periods, eligibility requirements, consumer safeguards, reporting obligations, and restrictions on participating customers.

The Financial Conduct Authority (2015) introduced one of the prominent regulatory sandbox initiatives in the United Kingdom to facilitate innovation in financial services while ensuring appropriate consumer protection. Subsequently, several countries adopted similar approaches to address regulatory uncertainties associated with FinTech. Regulatory sandboxes have become particularly relevant in developing economies because they provide opportunities for start-ups and emerging financial technology companies to experiment without immediately facing the full regulatory requirements applicable to established financial institutions.

India provides an important example of this approach. The Reserve Bank of India (RBI) introduced its Enabling Framework for Regulatory Sandbox in August 2019 to facilitate the testing of innovative financial products and services within a controlled environment. The framework allows eligible entities to experiment with innovations under specified regulatory conditions, enabling the regulator to assess their potential benefits and associated risks (Reserve Bank of India [RBI], 2019). The RBI has introduced thematic cohorts covering areas such as retail payments, cross-border payments, and

MSME lending. These initiatives demonstrate India's commitment to promoting responsible financial innovation while maintaining regulatory oversight.

Brazil presents an equally significant example of regulatory transformation. The Central Bank of Brazil (BCB) introduced its Regulatory Sandbox framework through Resolution BCB No. 50 of December 2020, establishing a controlled testing environment for financial and payment innovations. The framework seeks to encourage innovative business models, promote financial inclusion, strengthen competition, and maintain the safety and soundness of the financial system (Banco Central do Brasil [BCB], 2020).

Brazil's introduction of PIX, its instant payment system, in November 2020 further illustrates how regulatory support and technological infrastructure can transform financial services. PIX has facilitated rapid, low-cost digital transactions and encouraged competition among financial service providers. Similarly, Brazil's Open Finance initiative has promoted greater consumer control over financial information and facilitated the development of personalised financial services.

Nevertheless, regulatory sandboxes should not be considered a substitute for comprehensive financial regulation. Their effectiveness depends on the quality of regulatory supervision, transparency of testing conditions, protection of participating consumers, cybersecurity standards, and the ability of regulators to respond to identified risks. Arner, Barberis, and Buckley (2017) emphasise that technological developments require financial regulators to reconsider traditional supervisory approaches and develop regulatory responses that address the changing nature of financial services.
Consumer protection must therefore remain central to the regulatory sandbox mechanism. Participating financial technology companies should be required to provide clear information about products, disclose potential risks, obtain appropriate consumer consent, maintain data security, and establish effective grievance-redressal mechanisms. A well-designed regulatory sandbox should promote innovation while ensuring that consumers do not become involuntary participants in experiments involving potentially harmful financial products.

Comparative Financial Landscapes of India and Brazil and Lessons for Regulatory Development
The comparative significance of India and Brazil becomes particularly evident when examining their financial landscapes, institutional arrangements, and regulatory approaches to technological innovation. Both countries represent major emerging economies with large consumer markets, expanding digital financial infrastructure, and considerable opportunities for FinTech development. However, their regulatory priorities, financial institutions, and approaches to digital transformation offer different experiences.

India has developed a strong digital financial ecosystem through the integration of banking services, digital identity, payment infrastructure, and financial inclusion programmes. The Unified Payments Interface has significantly improved the accessibility and convenience of digital transactions. Furthermore, the RBI's regulatory sandbox framework provides opportunities for financial technology companies to test innovative solutions under regulatory supervision. Despite these achievements, India continues to face challenges relating to digital financial literacy, consumer awareness, cybersecurity, fraudulent digital lending, data protection, and regulatory coordination.

Brazil has adopted an innovative approach to financial-sector modernisation through its digital payment infrastructure, Open Finance framework, and regulatory experimentation. Its PIX system has strengthened the accessibility and efficiency of digital payments, while Open Finance has encouraged competition and enabled consumers to share financial information securely with authorised financial institutions. These developments demonstrate the importance of integrating technological innovation with institutional reforms and consumer-oriented financial policies.

According to Klapper et al. (2022), financial account ownership and digital payment adoption have expanded considerably across developing economies, although differences remain in the actual utilisation of digital financial services. The Global Findex Database 2021 reported that approximately 78% of adults in India had an account, demonstrating considerable progress in financial inclusion (World Bank, 2022). Such developments suggest that financial inclusion should not be measured exclusively through access to bank accounts; rather, it should also consider affordability, accessibility, consumer awareness, trust, and the effective utilisation of financial services.

An important objective of this research is to identify lessons that India can learn from Brazil's regulatory environment. Brazil's experience demonstrates the importance of integrating regulatory experimentation with broader financial-sector reforms, digital payment infrastructure, and Open Finance initiatives. India can strengthen its existing sandbox framework by encouraging greater coordination among financial regulators, improving transparency in consumer disclosures, introducing stronger cybersecurity testing requirements, and establishing effective mechanisms for addressing consumer grievances.

Furthermore, regulatory authorities in both countries need to consider emerging challenges associated with artificial intelligence, automated credit assessment, algorithmic discrimination, digital lending, and cross-border financial transactions. The increasing use of automated decision-making in financial services makes it necessary to establish appropriate accountability standards and ensure that consumers have access to transparent information and effective remedies.

Against this background, the present study undertakes a comparative and analytical examination of the financial landscapes of India and Brazil, with particular emphasis on regulatory sandboxes, FinTech innovation, and consumer protection. It seeks to understand how regulatory experimentation can support innovation without exposing consumers to unacceptable financial and technological risks. The study also examines the institutional and regulatory differences between the two countries to identify opportunities for policy adaptation and regulatory cooperation.

The research argues that a balanced, transparent, flexible, and consumer-oriented regulatory framework is essential for developing sustainable FinTech ecosystems. By examining Brazil's regulatory experiences and India's existing institutional framework, the study aims to identify practical policy recommendations for strengthening financial governance, encouraging responsible innovation, protecting financial consumers, and promoting inclusive economic development in emerging markets.

REVIEW OF LITERATURE

FinTech Development and Transformation of Emerging Financial Markets

Arner, Barberis, and Buckley (2016), in their study The Evolution of FinTech: A New Post-Crisis Paradigm?, examined the transformation of financial services through technological innovation. The authors highlighted that technological developments have changed traditional banking structures, financial intermediation, and regulatory responsibilities. Their research provides a conceptual foundation for understanding the expansion of FinTech in emerging economies such as India and Brazil.

Buckley and Webster (2016), in FinTech in Developing Countries: Charting New Customer Journeys, discussed how technological innovations could improve access to financial services in developing economies. They emphasised that digital financial platforms could reduce transaction costs, improve service delivery, and promote financial inclusion. However, they also recognised the importance of developing appropriate regulatory arrangements to address emerging financial risks.

Arner, Barberis, and Buckley (2017), in FinTech, RegTech, and the Reconceptualization of Financial Regulation, examined the relationship between financial innovation and regulatory technology. They argued that regulators must adopt technologically informed supervisory approaches to respond effectively to changing financial business models. Their contribution is particularly relevant to understanding how regulatory institutions can balance innovation with financial stability.

Gomber, Koch, and Siering (2017), in Digital Finance and FinTech: Current Research and Future Research Directions, reviewed developments in digital finance and identified major research areas, including digital banking, payment systems, crowdfunding, and financial innovation. Their findings demonstrate the growing importance of technological integration in financial markets and the need for further research into regulatory and institutional challenges.

World Bank (2022), through The Global Findex Database 2021, examined financial account ownership, digital payments, and financial resilience across countries. The report highlighted the increasing role of digital financial services in expanding financial inclusion. It provides an important comparative statistical foundation for evaluating the financial development of India and Brazil.

Regulatory Sandboxes and Financial Innovation

Zetzsche, Buckley, Arner, and Barberis (2017), in Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation, examined the emergence of regulatory sandboxes as an instrument for facilitating financial innovation. The authors explained that controlled experimentation allows regulators to understand technological developments while identifying potential risks. Their research established the importance of moving towards flexible and innovation-oriented regulatory frameworks.

The Financial Conduct Authority (2015), through its Regulatory Sandbox initiative, introduced a practical model for testing innovative financial products under regulatory supervision. The initiative demonstrated how financial technology

companies could experiment with new business models while operating within specified consumer protection safeguards. This approach subsequently influenced regulatory experimentation in several jurisdictions.

Buckley, Arner, Veidt, and Zetzsche (2020), in Building FinTech Ecosystems: Regulatory Sandboxes, Innovation Hubs and Beyond, critically examined the role of sandboxes and innovation hubs in developing financial technology ecosystems. They argued that innovation hubs may provide significant regulatory benefits and that sandboxes should not automatically be considered the most effective instrument in every jurisdiction. Their findings suggest that institutional capacity and regulatory cooperation are essential for successful innovation policies.

The International Monetary Fund (2020), in its work on FinTech regulation and supervisory approaches, highlighted the importance of proportionate regulation, institutional coordination, and effective supervision in responding to financial innovation. Such approaches are particularly relevant for emerging economies where financial technology companies operate across traditional regulatory boundaries.

Wang (2026), in Effectiveness of Regulatory Sandboxes in Financial Services: A Systematic Review, evaluated empirical evidence concerning the effectiveness of regulatory sandboxes. The study identified potential benefits such as ecosystem development, information sharing, and improved regulatory learning, while emphasising that outcomes depend on supervisory capacity and complementary policy measures. This recent research highlights the need to evaluate sandboxes through measurable outcomes rather than assuming that their introduction automatically produces successful innovation.

Regulatory Framework and FinTech Development in India

Reserve Bank of India (2018), through its Report of the Working Group on FinTech and Digital Banking, examined the implications of technological developments for India's financial sector. The report recommended the introduction of a regulatory sandbox to facilitate controlled experimentation and encourage innovation while addressing potential regulatory and consumer-related risks. It provided the institutional foundation for India's subsequent sandbox framework.

Reserve Bank of India (2019), in its Enabling Framework for Regulatory Sandbox, established a formal mechanism for testing innovative financial products and services. The framework emphasised eligibility requirements, limited testing periods, consumer protection, and regulatory supervision. It represented an important development in India's efforts to create an innovation-friendly financial environment. The RBI subsequently revised and updated the framework, including its February 2024 publication, to incorporate regulatory experience and improve its implementation.

Reserve Bank of India (2022), through its Guidelines on Digital Lending, addressed concerns associated with digital lending platforms and lending service providers. The guidelines emphasised transparency, appropriate disclosure, data protection, and the continuing responsibility of regulated entities for outsourced lending activities. This regulatory development is important because digital lending innovation must operate within a framework that protects borrowers against unfair practices and unauthorised use of financial information.

Arner, Zetzsche, Buckley, and Barberis (2018), in From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance, examined the implications of data-driven financial services for traditional regulatory structures. Their work demonstrated that the increasing involvement of technology companies in financial activities creates new challenges relating to data ownership, privacy, competition, and institutional accountability. These findings are relevant to India's expanding digital financial ecosystem.

The Government of India and the Reserve Bank of India have also increasingly emphasised the importance of consumer protection in the FinTech sector. The regulatory framework for digital lending and the development of FinTech self-regulatory arrangements demonstrate the growing recognition that technological innovation requires corresponding institutional accountability. The Reserve Bank's 2024 framework for Self-Regulatory Organisations in the FinTech Sector further reflects this policy direction.

Brazil's Financial Landscape, Regulatory Sandbox and Digital Innovation

Central Bank of Brazil (2020), through Resolution BCB No. 50, established the regulatory framework for its financial regulatory sandbox. The framework provides a controlled environment for testing innovative financial and payment services. It aims to encourage competition, technological development, financial inclusion, and improvements in financial services while maintaining appropriate regulatory safeguards. This initiative provides an important comparative foundation for examining Brazil's approach to FinTech governance.

Ferreira (2022), in Arranjo Pix: Regulação e Concorrência em Pagamentos Digitais, examined the role of PIX in transforming Brazil's digital payment ecosystem. The study highlighted the importance of regulatory governance, market competition, and network effects in the widespread adoption of instant payment infrastructure. It demonstrated that regulatory intervention can facilitate innovation while encouraging competition among payment service providers.

The Organisation for Economic Co-operation and Development (OECD, 2024), in its report Competition, Fintechs and Open Banking, examined the relationship between financial technology, competition, and regulatory modernisation. Its discussion of Brazil highlighted the role of PIX, Open Finance, regulatory sandboxes, and reforms in the payments market in promoting financial competition. The report provides valuable evidence for understanding how Brazil has integrated technological innovation with broader financial-sector reforms.

The Central Bank of Brazil's Open Finance initiative also represents an important development in consumer-oriented financial innovation. It enables consumers to authorise the sharing of their financial information among participating institutions, subject to applicable requirements. This approach can improve competition, facilitate personalised financial services, and strengthen consumer choice. However, it also requires appropriate safeguards concerning informed consent, cybersecurity, and the protection of financial information.

Consumer Protection, Regulatory Challenges and Comparative Research Gap

Financial Stability Board (2017), in its report Financial Stability Implications from FinTech: Supervisory and Regulatory Issues that Merit Authorities' Attention, examined the potential implications of financial technology for financial stability. The report identified concerns involving operational resilience, interconnectedness, third-party dependencies, and regulatory oversight. It emphasised the need for financial authorities to adapt their supervisory practices to technological developments.

Zetzsche, Buckley, Arner, and Weber (2020), in The Future of Data-Driven Finance and RegTech: Lessons from EU Big Bang II, explored how data-driven financial services and regulatory technology could transform financial supervision. Their research highlighted the importance of data governance, regulatory cooperation, and technological capabilities in modern financial systems.

Arner, Buckley, Zetzsche, and Veidt (2020), in Sustainability, FinTech and Financial Inclusion, examined the relationship between technological innovation, inclusive finance, and sustainable development. The authors demonstrated that FinTech can contribute to broader development objectives when supported by appropriate institutional and regulatory frameworks.
World Bank (2022), through its Global Findex research, further highlighted the importance of digital payments and financial inclusion in improving economic participation. Its findings reinforce the argument that financial innovation must be accompanied by consumer awareness, accessibility, and institutional trust.

Wang (2026) provides a particularly relevant recent contribution by highlighting the limited availability of rigorous empirical evaluations of regulatory sandbox outcomes. The study indicates that the effectiveness of sandboxes varies according to regulatory capacity, institutional arrangements, and complementary financial policies.

Research Gap

The existing literature provides substantial insights into FinTech development, regulatory sandboxes, digital financial inclusion, and consumer protection. However, much of the research examines these dimensions independently or concentrates on individual national regulatory systems. There remains scope for a comparative examination of India and Brazil that specifically evaluates how regulatory sandbox mechanisms can balance financial innovation with consumer safety. In particular, the relationship between India's sandbox framework and Brazil's experience with PIX, Open Finance, regulatory experimentation, and financial-sector competition requires further examination. The present study seeks to address this gap by identifying transferable regulatory practices and developing recommendations for a more flexible, transparent, and consumer-centric FinTech regulatory environment in emerging markets.

Research objectives

1. To examine and compare the regulatory sandbox frameworks and FinTech financial landscapes of India and Brazil, with particular reference to financial innovation, digital payments, and financial inclusion.

2. To evaluate how India can adopt relevant regulatory practices from Brazil to strengthen consumer protection, data security, and responsible FinTech innovation in emerging markets.

RESEARCH METHODOLOGY

The study adopted a comparative and analytical research methodology to examine the financial landscapes and regulatory sandbox frameworks of India and Brazil. The research was primarily based on secondary data collected from authentic sources, including research journals, books, government publications, regulatory reports, central bank documents, and publications of international organisations such as the World Bank, IMF, and OECD. Particular emphasis was placed on the regulatory initiatives of the Reserve Bank of India (RBI) and the Central Bank of Brazil (BCB), including regulatory sandboxes, digital payment systems, and Open Finance. A comparative approach was employed to identify similarities and differences in financial innovation, consumer protection, financial inclusion, and regulatory supervision in both countries. The collected information was critically examined to assess the effectiveness of existing regulatory mechanisms and identify challenges relating to cybersecurity, data privacy, and financial stability. Finally, the study evaluated Brazilian regulatory practices and developed recommendations for strengthening India's consumer-centric FinTech regulatory framework.

Data Analysis

The present study analysed the financial landscapes and regulatory sandbox frameworks of India and Brazil using secondary data obtained from the Reserve Bank of India (RBI), Central Bank of Brazil (BCB), World Bank, National Payments Corporation of India (NPCI), and other recognised institutional sources. The analysis was organised around the two research objectives: (i) examining and comparing the regulatory sandbox frameworks and FinTech financial landscapes of India and Brazil, particularly in relation to financial innovation, digital payments, and financial inclusion; and (ii) evaluating the regulatory practices that India could adopt from Brazil to strengthen consumer protection, data security, and responsible FinTech innovation.

The analysis employed descriptive and comparative techniques to examine financial inclusion, digital payment growth, regulatory experimentation, consumer protection, and institutional effectiveness. Numerical information from official publications was presented in tabular form to identify the similarities, differences, achievements, and regulatory challenges of the two emerging economies.

1. Comparative Analysis of Financial Inclusion in India and Brazil

Financial inclusion represents an important indicator of the development of a country's financial landscape. It reflects the extent to which individuals have access to formal banking services and can participate in the financial system. The expansion of digital banking, mobile payments, and technology-driven financial services has strengthened financial inclusion in both India and Brazil.

According to the World Bank's Global Findex Database 2025, which reports survey data for 2024, financial account ownership reached approximately 89.02% in India and 86.38% in Brazil among adults aged 15 years and above. These figures demonstrate considerable progress in expanding access to formal financial services in both countries (World Bank, 2025).

Table 1: Comparative Financial Account Ownership in India and Brazil (2024)

Particulars	India (%)	Brazil (%)
Adult financial account ownership	89.02	86.38
Female account ownership	89.20	—
Male account ownership	88.80	—
Overall adult population without an account	10.98	13.62

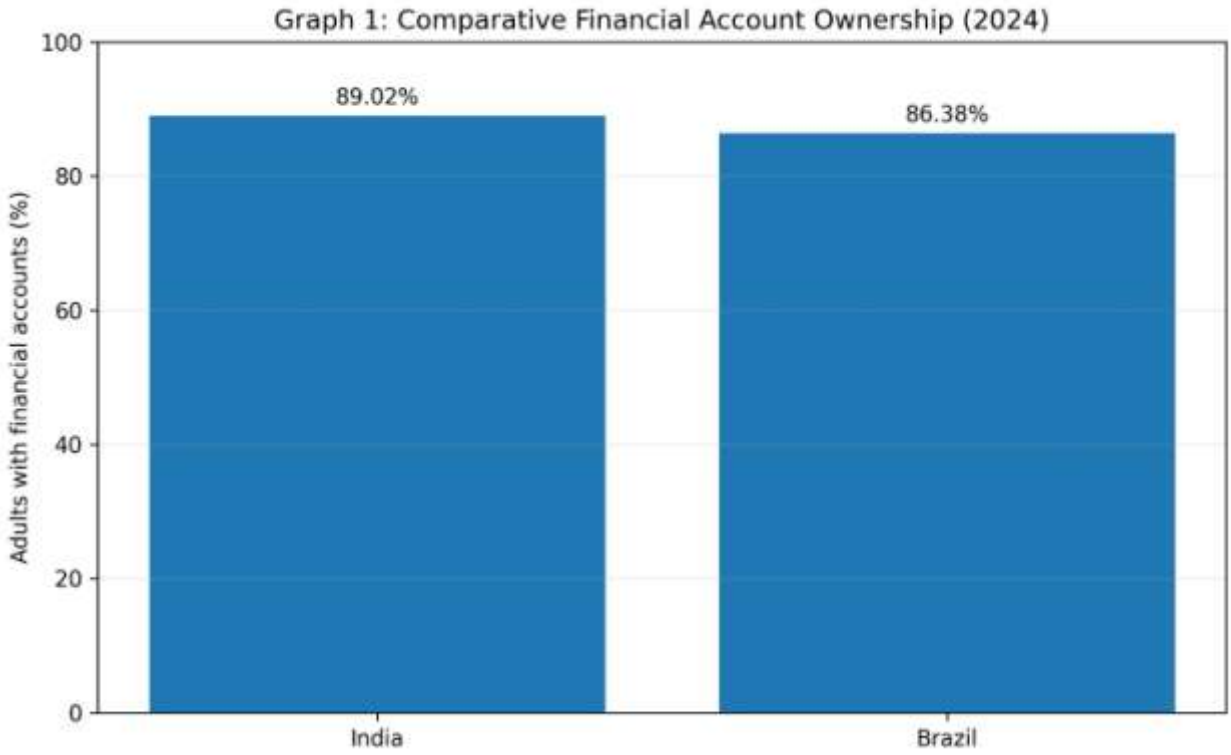
Source: World Bank, Global Findex Database 2025; country-level financial inclusion indicators for 2024.

The above table indicates that India recorded a slightly higher financial account ownership rate than Brazil, with a difference of 2.64 percentage points. India's achievement reflects the contribution of financial inclusion programmes, digital identity infrastructure, banking expansion, and digital payment initiatives. The female account ownership rate of 89.20% and male account ownership rate of 88.80% also indicate a relatively narrow gender gap in access to financial accounts.

Brazil, despite recording a marginally lower overall account ownership rate, has developed an advanced digital payment ecosystem through PIX and Open Finance. This suggests that financial inclusion should not be evaluated exclusively through account ownership. The actual utilisation of financial services, affordability, transaction convenience, and consumer confidence are equally important indicators.

The World Bank's earlier Global Findex 2021 findings also revealed that approximately 70% of Indian account holders had not made a digital payment during the preceding year. This highlighted the gap between financial account access and effective digital financial participation (World Bank, 2022).

The analysis therefore indicates that India has achieved substantial progress in expanding formal financial access, but further improvements in digital financial literacy, consumer awareness, and active account utilisation remain necessary.



2. Analysis of Digital Payment Infrastructure and Financial Innovation

Digital payment infrastructure represents one of the most important dimensions of FinTech development. India and Brazil have developed innovative payment systems that have significantly transformed their respective financial landscapes. India's Unified Payments Interface (UPI) and Brazil's PIX are important examples of technology-driven financial innovation supported by regulatory institutions.

Table 2: Growth of Retail Digital Payments in India (2021–2025)

Financial Year	Transaction Volume (Crore)	Transaction Value (₹ Lakh Crore)
2021–22	7,176.90	457.44
2022–23	11,369.56	587.39
2023–24	16,416.02	719.37
2024–25	22,167.90	849.12

Source: Ministry of Finance, Government of India, Press Information Bureau, data on retail digital payments.

The table demonstrates the substantial expansion of India's retail digital payment infrastructure. Transaction volume increased from 7,176.90 crore in 2021–22 to 22,167.90 crore in 2024–25. Similarly, transaction value increased from ₹457.44 lakh crore to ₹849.12 lakh crore during the same period. The figures indicate that digital payments have become an increasingly important component of India's financial ecosystem.

The Unified Payments Interface accounted for approximately 81% of retail digital payment transactions in 2024–25, demonstrating its dominant position in India's digital payment infrastructure (Ministry of Finance, 2026). This development has improved transaction convenience and provided opportunities for small businesses, retailers, start-ups, and individual consumers to participate in digital economic activities.



Brazil has achieved comparable transformation through its PIX instant payment system. According to the Central Bank of Brazil, PIX experienced a 52% increase in transaction volume during 2024 and accounted for approximately 47% of all non-cash payment transactions in the fourth quarter of that year (BCB, 2025).



Table 3: Comparative Performance of Major Digital Payment Systems

Particulars	India – UPI	Brazil – PIX
Introduction year	2016	2020
Transaction volume growth indicator	81% share of retail digital payments in FY 2024–25	52% growth in transaction volume during 2024
Market position	Dominant real-time retail payment	47% of non-cash transactions in Q4

	system	2024
Main institutional authority	RBI and NPCI	Central Bank of Brazil
Major objective	Fast, interoperable digital payments	Instant, accessible digital payments

Source: National Payments Corporation of India; Ministry of Finance (2026); Central Bank of Brazil (2025). The percentage indicators represent different measures and are not directly interchangeable.

The comparative analysis indicates that both countries have successfully developed large-scale digital payment infrastructures. India demonstrates considerable strength in interoperable payment technology and transaction expansion, whereas Brazil provides an important example of how central-bank-supported payment infrastructure can promote competition and financial participation.

Brazil's experience offers valuable lessons for India regarding the integration of digital payments with broader financial-sector reforms. In particular, the PIX model demonstrates the importance of institutional coordination, standardised payment infrastructure, and accessible digital services.

3. Comparative Analysis of Regulatory Sandbox Frameworks

Regulatory sandboxes are important instruments for promoting financial innovation while allowing regulatory authorities to monitor risks associated with emerging financial technologies. Both India and Brazil have established regulatory sandbox mechanisms to encourage innovation and improve the competitiveness of their financial sectors.

India introduced its regulatory sandbox framework in August 2019 through the Reserve Bank of India. The framework was subsequently updated to incorporate regulatory experience and accommodate different categories of financial innovation. The RBI adopted a thematic cohort approach, covering retail payments, cross-border payments, MSME lending, prevention and mitigation of financial frauds, and theme-neutral innovations (RBI, 2019, 2024).

Brazil introduced its regulatory sandbox through Resolution BCB No. 50 of December 2020. Its first regulatory sandbox cycle commenced in 2021. According to the Central Bank of Brazil, 52 projects were submitted during the first application period, while approximately 10–15 projects were expected to be selected for participation. The selection process covered innovations relating to payment systems, foreign exchange, credit, Open Banking, financial inclusion, and sustainable finance (BCB, 2021).

Table 4: Comparative Analysis of Regulatory Sandbox Frameworks in India and Brazil

Particulars	India	Brazil
Regulatory authority	Reserve Bank of India	Central Bank of Brazil
Framework introduced	August 2019	December 2020
Implementation approach	Thematic cohorts	Regulatory sandbox cycles
Major areas of innovation	Retail payments, cross-border payments, MSME lending, fraud prevention	PIX, Open Banking, foreign exchange, credit, financial inclusion
Application information	Fifth cohort received 22 applications	First cycle received 52 applications
Selection information	Five entities selected for fifth-cohort testing	Approximately 10–15 projects planned for first-cycle selection
Primary regulatory objective	Responsible financial innovation and consumer safeguards	Innovation, competition and financial inclusion

Source: Reserve Bank of India (2019, 2024); RBI Press Release dated July 26, 2024; Central Bank of Brazil (2021); Resolution BCB No. 50 of 2020.

The table demonstrates that India and Brazil have adopted different institutional approaches to regulatory experimentation. India's framework primarily follows thematic cohorts, allowing the RBI to examine specific categories of financial innovation. Brazil's framework, on the other hand, has incorporated broader financial-sector priorities, including payment infrastructure, foreign exchange, credit accessibility, and Open Finance.

An important observation concerns the number of applications received under the respective programmes. India's fifth regulatory sandbox cohort received 22 applications, of which five were selected for the testing phase. This represented a selection rate of approximately 22.73%. Brazil's first cycle received 52 applications, with approximately 10–15 projects

planned for selection, representing an intended selection range of approximately 19.23%–28.85%. These figures suggest that both regulatory authorities applied selective admission processes rather than permitting unrestricted experimentation.

However, the application figures relate to different cohorts and periods and should not be interpreted as a direct measure of the relative success of the two countries' sandbox frameworks. The number of applications alone cannot establish the quality of innovation, consumer protection, or commercial success of participating entities.

The analysis suggests that India could benefit from examining Brazil's broader approach to integrating regulatory experimentation with digital payment infrastructure, Open Finance, and financial-sector competition. Similarly, Brazil's experience demonstrates the importance of defining clear selection priorities and monitoring requirements for participating FinTech companies.

4. Analysis of Consumer Protection, Data Security and Regulatory Challenges

Consumer protection is a fundamental requirement for the sustainable development of digital financial services. Although FinTech has improved transaction efficiency and financial accessibility, it has also created new risks associated with digital fraud, unauthorised transactions, data misuse, cybersecurity threats, and unfair lending practices.

The World Bank's Global Findex Database 2021 identified a considerable difference between account ownership and actual utilisation of digital financial services in India. Approximately 78% of Indian adults had financial accounts, but only 35% of adults reported making or receiving digital payments. Furthermore, approximately 70% of Indian account holders did not make a digital payment during the reference year (World Bank, 2022).

This finding indicates that access to financial infrastructure does not automatically translate into consumer confidence or effective participation. Digital literacy, awareness of financial risks, accessibility of grievance-redressal mechanisms, and trust in digital platforms remain important considerations.

Table 5: Major Consumer Protection Challenges in India and Brazil

Regulatory Challenge	India	Brazil	Comparative Assessment
Digital financial fraud	Significant concern in UPI and online banking	Significant concern in instant payments	Stronger fraud prevention is required
Data privacy	DPDP Act, 2023	General Data Protection Law (LGPD), 2018	Both have statutory data protection frameworks
Digital lending risks	RBI Digital Lending Guidelines, 2022	BCB supervision and applicable consumer protection laws	Transparency and accountability are essential
Cybersecurity	RBI cybersecurity and digital payment controls	BCB security and operational requirements	Continuous technological monitoring is necessary
Consumer grievance redressal	RBI Integrated Ombudsman Scheme, 2021	Consumer protection institutions and applicable financial complaint mechanisms	Accessible and effective remedies are important
Algorithmic decision-making	Emerging regulatory concern	Emerging regulatory concern	Greater transparency and accountability are needed

Source: RBI (2021, 2022); Government of India (2023); Government of Brazil (2018); Central Bank of Brazil regulatory publications.

The above comparison indicates that both countries have developed legal and institutional mechanisms to protect financial consumers. India has introduced the Digital Personal Data Protection Act, 2023, and the RBI's digital lending guidelines to address concerns relating to personal information and lending practices. Brazil has established its General Data Protection Law (Lei Geral de Proteção de Dados Pessoais), Law No. 13,709/2018, to regulate the processing of personal data.

The analysis also reveals that regulatory sandboxes should incorporate consumer protection conditions at every stage of experimentation. Participating companies should be required to disclose the experimental nature of their products, obtain informed consent, maintain secure information systems, and provide appropriate compensation or redress where consumers suffer losses.

A particularly important issue is the increasing use of artificial intelligence in credit assessment and financial decision-making. Automated credit scoring may improve efficiency, but inadequate algorithmic transparency can produce discriminatory or unfair outcomes. Consequently, both India and Brazil need appropriate regulatory oversight to ensure that automated financial decisions remain explainable, accountable, and consistent with applicable consumer protection laws.

5. Policy Lessons for India from Brazil's Regulatory Environment

The comparative findings indicate that Brazil offers several important lessons for strengthening India's regulatory sandbox framework. These lessons concern the integration of digital payment infrastructure, regulatory experimentation, consumer protection, and financial-sector competition.

Table 6: Policy Lessons from Brazil for Strengthening India's FinTech Regulatory Framework

Policy Area	Existing Indian Position	Relevant Brazilian Experience	Suggested Improvement for India
Digital payments	UPI-based interoperable payments	PIX instant payment infrastructure	Strengthen fraud monitoring and payment security
Open Finance	Account Aggregator framework	Established Open Finance ecosystem	Improve secure financial data portability
Regulatory experimentation	RBI thematic cohorts	BCB regulatory sandbox cycles	Encourage cross-sector experimentation
Consumer protection	RBI guidelines and DPDP Act	LGPD and financial consumer safeguards	Strengthen informed consent and complaint mechanisms
Market competition	Growing FinTech participation	PIX and Open Finance-led competition	Encourage responsible participation by smaller FinTech firms
Regulatory cooperation	Multiple financial regulators	Coordinated central-bank-led initiatives	Improve inter-regulatory coordination

Source: RBI (2019, 2022, 2024); Central Bank of Brazil (2020, 2021); Government of India (2023); Government of Brazil (2018).

The first important lesson concerns the integration of regulatory sandboxes with digital financial infrastructure. Brazil's PIX system demonstrates how a common and interoperable payment platform can promote competition, reduce transaction barriers, and expand financial participation. India has already achieved considerable progress through UPI; therefore, the next priority should be to strengthen payment security, improve fraud detection, and enhance consumer confidence.

The second lesson relates to Open Finance. Brazil's approach allows consumers to authorise the sharing of financial information among participating institutions. India can further strengthen its Account Aggregator framework by improving consumer awareness, consent management, data portability, and interoperability among financial institutions.

The third lesson concerns regulatory coordination. FinTech companies frequently operate across banking, payments, insurance, lending, and technology sectors. Regulatory fragmentation can create uncertainty and compliance difficulties. India should therefore encourage greater coordination among the RBI, Securities and Exchange Board of India (SEBI), Insurance Regulatory and Development Authority of India (IRDAI), and other relevant authorities.

The fourth lesson concerns consumer protection within regulatory sandboxes. Testing innovative products should not reduce the protection available to participating consumers. Regulatory authorities should require clear disclosures, appropriate testing limits, cybersecurity assessments, data protection safeguards, and accessible grievance-redressal arrangements.

The analysis further suggests that sandbox evaluation should extend beyond the number of participating companies. Regulators should examine measurable outcomes such as the number of innovations successfully commercialised, consumer complaints, security incidents, financial inclusion improvements, and the effectiveness of corrective regulatory measures.

Overall Findings and Comparative Interpretation

The overall data analysis establishes that India and Brazil have made significant progress in developing technology-driven financial ecosystems. Both countries have recognised the importance of financial innovation, digital payments, and regulatory experimentation in promoting economic development. However, their experiences also demonstrate that technological expansion must be accompanied by effective regulatory supervision and consumer protection.

The major findings emerging from the comparative analysis are as follows:

1. **Financial inclusion:** India recorded approximately 89.02% financial account ownership in 2024, compared with 86.38% in Brazil. Both countries have achieved substantial progress in expanding access to formal financial services.

2. **Digital payment development:** India's UPI accounted for 81% of retail digital payment transactions in FY 2024–25, while Brazil's PIX accounted for approximately 47% of non-cash transactions in the fourth quarter of 2024.

3. **Regulatory experimentation:** India has developed a thematic regulatory sandbox framework, whereas Brazil has adopted a broader approach incorporating payment systems, Open Finance, credit, and financial inclusion.

4. **Consumer protection:** Both countries have established legal and institutional safeguards concerning data privacy, digital lending, and financial supervision. However, cybersecurity, digital fraud, and algorithmic accountability remain important regulatory concerns.

5. **Institutional learning:** Brazil's experience with PIX and Open Finance provides valuable lessons for India regarding interoperability, consumer consent, financial competition, and the integration of technological innovation with regulatory supervision.

6. **Future regulatory priorities:** Both countries need to strengthen risk-based supervision, consumer grievance mechanisms, cybersecurity testing, and transparent evaluation of regulatory sandbox outcomes.

The findings indicate that India does not necessarily need to replicate Brazil's regulatory framework. Instead, it should adapt those elements that are compatible with its existing institutional arrangements and financial infrastructure. A combination of technological innovation, regulatory flexibility, and consumer-oriented safeguards would provide a stronger foundation for sustainable FinTech development.

CONCLUSION

The study concludes that financial technology has emerged as a significant driver of economic growth, financial inclusion, and financial-sector transformation in emerging markets, particularly India and Brazil. The comparative analysis demonstrates that both countries have made considerable progress in developing digital payment infrastructure, expanding access to financial services, and introducing regulatory mechanisms to encourage innovation. India's Unified Payments Interface (UPI) and regulatory sandbox framework have strengthened its digital financial ecosystem, while Brazil's PIX system, Open Finance initiatives, and regulatory sandbox demonstrate the importance of integrating technological innovation with financial-sector reforms.

The study further establishes that regulatory sandboxes can provide an effective mechanism for testing innovative financial products while identifying potential risks before their wider introduction. However, their effectiveness depends on appropriate regulatory supervision, cybersecurity safeguards, data privacy, transparency, and consumer protection. Brazil's regulatory experience offers valuable lessons for India, particularly regarding digital payment interoperability, financial data portability, institutional coordination, and market competition. The study recommends strengthening India's regulatory sandbox through improved consumer grievance mechanisms, risk-based supervision, transparent testing procedures, and greater cooperation among financial regulators.

Ultimately, financial innovation and consumer safety should be treated as complementary rather than competing objectives. A flexible, accountable, and consumer-centric regulatory framework can enable emerging economies to encourage FinTech

development without compromising financial stability and public confidence. The comparative experiences of India and Brazil demonstrate that responsible technological innovation is essential for building inclusive, competitive, and sustainable financial markets.

SUGGESTIONS

The following suggestions are proposed to strengthen FinTech regulation, encourage responsible innovation, and improve consumer protection in India through comparative lessons from Brazil.

- **Strengthen Regulatory Sandboxes:** Expand RBI sandbox testing to emerging technologies and cross-sector financial innovations.
- **Enhance Consumer Protection:** Ensure transparent disclosures, effective grievance redressal, and protection against digital financial fraud.
- **Improve Data Security:** Strengthen cybersecurity standards, informed consent, and financial data privacy.
- **Adopt Brazilian Practices:** Learn from PIX and Open Finance to improve payment interoperability and financial competition.
- **Promote Regulatory Coordination:** Encourage cooperation among RBI, SEBI, IRDAI, and other regulatory institutions.
- **Monitor Outcomes:** Evaluate sandbox performance through consumer safety, financial inclusion, innovation, and market competitiveness.

FUTURE SCOPE

Future research may examine the long-term effectiveness of regulatory sandboxes in India and Brazil through empirical surveys of FinTech companies and consumers. Further studies could explore artificial intelligence, blockchain, cross-border digital payments, cybersecurity, Open Finance, and international regulatory cooperation to develop safer, more inclusive, and sustainable financial ecosystems.

REFERENCES

1. Arner, D. W., Barberis, J., & Buckley, R. P. (2016). The evolution of FinTech: A new post-crisis paradigm? Georgetown Journal of International Law, 47(4), 1271–1319.
2. Arner, D. W., Barberis, J. N., & Buckley, R. P. (2017). FinTech, RegTech, and the reconceptualization of financial regulation. Northwestern Journal of International Law & Business, 37(3), 371–413.
3. Arner, D. W., Buckley, R. P., Zetzsche, D. A., & Veidt, R. (2020). Sustainability, FinTech and financial inclusion. European Business Organization Law Review, 21, 7–35.
4. Arner, D. W., Zetzsche, D. A., Buckley, R. P., & Barberis, J. N. (2018). From FinTech to TechFin: The regulatory challenges of data-driven finance. New York University Journal of Law & Business, 14(2), 393–446.
5. Banco Central do Brasil. (2020). Resolução BCB No. 50, de 16 de dezembro de 2020. https://www.bcb.gov.br/estabilidadefinanceira/exibenormativo?numero=50&tipo=Resolu%C3%A7%C3%A3o+BCB
6. Banco Central do Brasil. (2021). Sandbox regulatório: Ciclo 1. https://www.bcb.gov.br/estabilidadefinanceira/sandbox
7. Banco Central do Brasil. (2025). Pix and cards were the most used payment instruments in Brazil in 2024. https://www.bcb.gov.br/en/pressdetail/2614/nota/https%3A/www3.bcb.gov.br/sgspub
8. Buckley, R. P., Arner, D. W., Veidt, R., & Zetzsche, D. A. (2020). Building FinTech ecosystems: Regulatory sandboxes, innovation hubs and beyond. Washington University Journal of Law & Policy, 61(1), 55–98. https://doi.org/10.2139/ssrn.3455872
9. Buckley, R. P., & Webster, S. (2016). FinTech in developing countries: Charting new customer journeys. The Journal of Financial Transformation, 44, 151–159.
10. Central Bank of Brazil. (2021). Open Finance. Banco Central do Brasil. https://www.bcb.gov.br/en/financialstability/open_finance
11. Ferreira, A. R. (2022). Arranjo Pix: Regulação e concorrência em pagamentos digitais. Revista da Procuradoria-Geral do Banco Central, 16(1), 100–113. https://doi.org/10.58766/rpgbcb.v16i1.1158

12. Financial Conduct Authority. (2015). Regulatory sandbox. https://www.fca.org.uk/firms/innovation/regulatory-sandbox
13. Financial Stability Board. (2017). Financial stability implications from FinTech: Supervisory and regulatory issues that merit authorities' attention. https://www.fsb.org/2017/06/financial-stability-implications-from-fintech/
14. Gomber, P., Koch, J.-A., & Siering, M. (2017). Digital finance and FinTech: Current research and future research directions. Electronic Markets, 27, 537–543. https://doi.org/10.1007/s12525-017-0270-0
15. Government of Brazil. (2018). Lei No. 13.709, de 14 de agosto de 2018 (Lei Geral de Proteção de Dados Pessoais). https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/lei/l13709.htm
16. Government of India. (2023). The Digital Personal Data Protection Act, 2023. https://www.meity.gov.in/
17. Klapper, L., Singer, D., & Ansar, S. (2022). The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19. World Bank. https://doi.org/10.1596/978-1-4648-1897-4
18. Ministry of Finance, Government of India. (2026). Coordinated efforts of Government, RBI and NPCI accelerate growth in digital payments. Press Information Bureau. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2240723
19. National Payments Corporation of India. (2026). Unified Payments Interface (UPI): Product statistics. https://www.npci.org.in/product/upi/product-statistics
20. Organisation for Economic Co-operation and Development. (2024). Competition, Fintechs and Open Banking. OECD Publishing. https://www.oecd.org/
21. Reserve Bank of India. (2018). Report of the Working Group on FinTech and Digital Banking. https://www.rbi.org.in/
22. Reserve Bank of India. (2019). Enabling framework for regulatory sandbox. https://fintech.rbi.org.in/FT_RegSandbox.aspx
23. Reserve Bank of India. (2021). Reserve Bank—Integrated Ombudsman Scheme, 2021. https://www.rbi.org.in/
24. Reserve Bank of India. (2022). Guidelines on digital lending. https://www.rbi.org.in/
25. Reserve Bank of India. (2024). Regulatory sandbox—Fifth cohort (Theme Neutral)—Test phase. https://www.rbi.org.in/
26. Reserve Bank of India. (2024). Enabling framework for regulatory sandbox. https://fintech.rbi.org.in/FT_RegSandbox.aspx
27. Wang. (2026). Effectiveness of regulatory sandboxes in financial services: A systematic review. Regulation & Governance. https://doi.org/10.1111/rego.70129
28. World Bank. (2022). The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19. https://doi.org/10.1596/978-1-4648-1897-4
29. World Bank. (2025). The Global Findex Database 2025. https://www.worldbank.org/en/publication/globalfindex
30. Zetzsche, D. A., Buckley, R. P., Arner, D. W., & Barberis, J. N. (2017). Regulating a revolution: From regulatory sandboxes to smart regulation. Fordham Journal of Corporate & Financial Law, 23, 31–103.