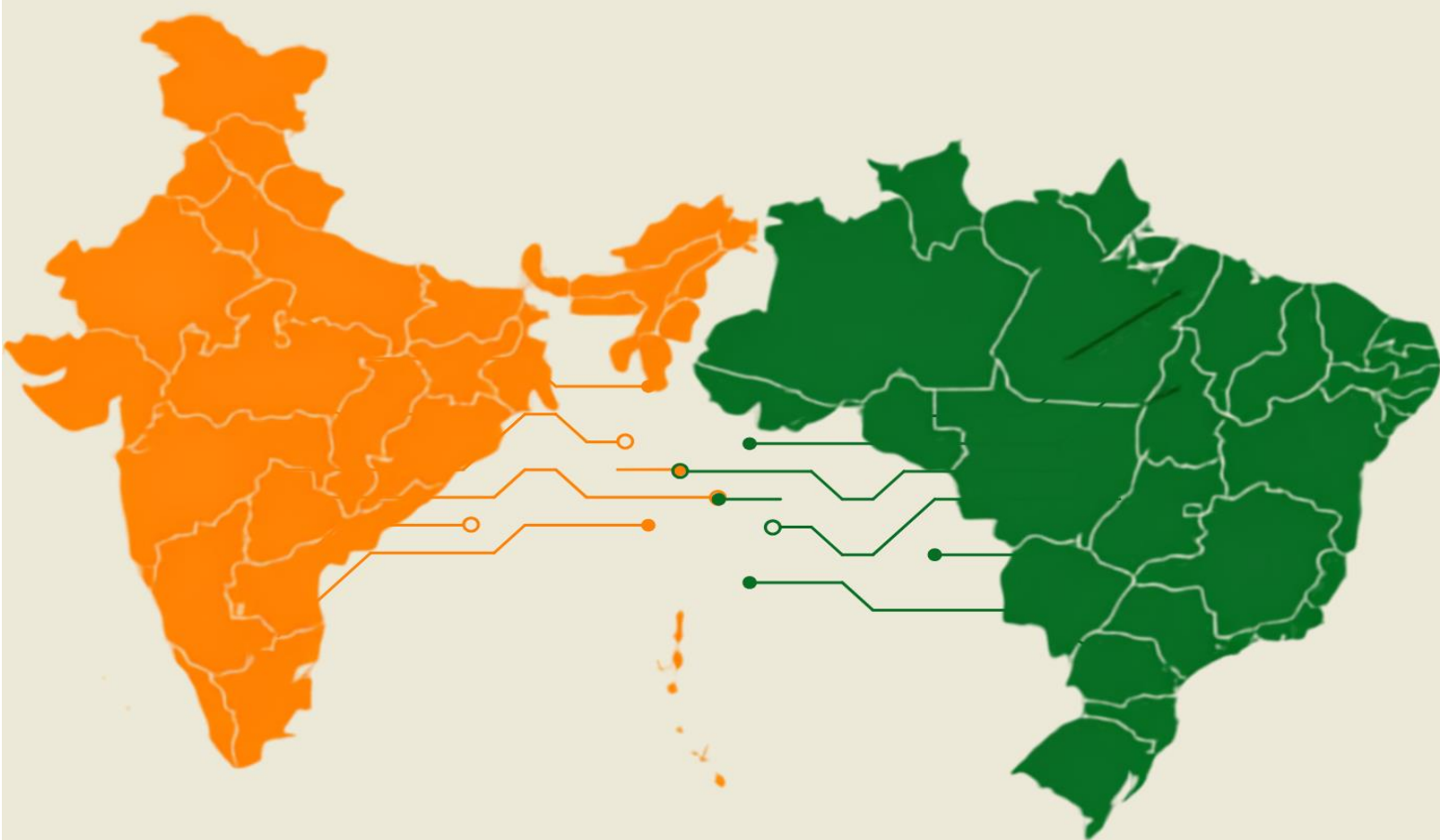


DIGITAL PUBLIC INFRASTRUCTURES FOR PAYMENTS (DPI4P) IN INDIA AND BRAZIL:

TOWARDS CONSUMER-CENTRIC
AND DIGITALLY SOVEREIGN
SOLUTIONS



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Authors: Luca Belli, Hannah Draper, Larissa Magalhães, Amrita Sengupta

ABSTRACT

Digital Public Infrastructures for Payments (DPI4P) have become important instruments of financial inclusion, promotion of innovation, market competition and digital sovereignty. This study contends that DPI4P success and public value depend on more than technological performance. Critically, it is also a function of the effectiveness of governance mechanisms and institutions, including their capacity to create incentives for stakeholders, guide market behavior, and distribute power and responsibility

This report analyses and compares India's Unified Payments Interface (UPI) and Digital Rupee with Brazil's Pix, Open Finance and Drex. Combining doctrinal legal analysis, regulatory assessment, policy research, structured country mapping, and stakeholder conducted by the CyberBRICS Programme of the Center for Technology and Society at FGV Law School, Rio de Janeiro.

The analytical framework treats public-good, state-centric and innovation-market logics as overlapping forms of governance. India and Brazil combine these logics differently to achieve similar goals. India employs a comparatively distributed model: the Reserve Bank of India (RBI) exercises regulatory oversight, the National Payments Corporation of India (NPCI) operates UPI and coordinates its standards, and private providers compete through consumer-facing applications. Brazil places the infrastructure, standards and oversight of Pix under the direct control of the Central Bank of Brazil (BCB), while private institutions build services above the public rails.

Our study illustrates a clear trade-off: while Brazil centralized governance within BCB, this strategy successfully diversified market participation. In contrast, India decentralized consumer-facing innovation, establishing genuine checks and balances, yet allowed market share to concentrate heavily among a small number of private applications. In this context, we emphasise the relevance of Open Finance, which introduces a more collaborative governance framework in both national ecosystems, by shifting part of its operational responsibilities to participating institutions. The comparison therefore reveals that there is no single institutional formula for successful DPI4P. Instead, success depends

on national idiosyncrasies and on the capacity of institutions to understand and shape them. Public authorities may allocate responsibilities differently while preserving the conditions on which effective systems depend.

UPI and Pix demonstrate what these arrangements can achieve. Both have reached national scale and made instant payments inexpensive, interoperable and resilient to geopolitical shocks, while decentralising the capacity to process and extract value from financial data. They have also expanded access to financial services and reduced domestic reliance on foreign card networks. Scale, however, has not completely removed the underlying inequalities of digital participation. Indeed we note that users may still be excluded by poor connectivity, insufficient devices, identification requirements or limited digital literacy. Moreover, fraud has exposed further weaknesses in liability and redress, while public control of core infrastructure coexists alongside reliance on dominant applications, cloud services and private technology providers.

Lastly, the study exposes a significant geographical limitation in the interoperability created by these initiatives. While DPI4P has established strong domestic interoperability, this success has not been achieved yet across borders. The principal obstacle is no longer the technical possibility of connecting payment systems, but the governance of that connection.

Critically, cross-border infrastructures must reconcile distinct national frameworks - ranging from data governance and consumer protection to anti-money-laundering and counter-terrorist-financing standards - while allocating supervisory responsibility and establishing final settlement mechanisms. In this context, the construction of digital sovereignty does not demand technological isolation or exclusive public ownership; rather, it rests on an institution's capacity to govern critical infrastructure, manage external dependencies, and set the terms of public and private participation. Extending this sovereignty beyond national borders therefore requires shifting from isolated domestic models to cooperative governance framework, leveraging international agreements and collaborative arrangements to align sovereign control with cross-border interoperability.

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CHAPTER 1: INTRODUCTION

Digital Public Infrastructure (DPI) has emerged as one of the defining paradigms of digital governance and economic development over the past decade. Hailed as the digital rails upon which economy and governance can be rebuilt, DPIs are increasingly promoted by international organizations, governments, and development institutions. They are typically understood as “a set of shared digital systems that are secure and interoperable, built on open technologies, to deliver equitable access to public and/or private services at a societal scale.”¹ While the concept encompasses several layers – including digital identity, data exchange, and digital payments – our study starts from the assumption that the payment layer plays a crucial role due to its capacity to facilitate financial inclusion, reduce transaction costs, enhance digital sovereignty reducing dependency on external providers, and promote innovation and competition, enabling new forms of public service delivery.

Consequently, what we define as “Digital Public Infrastructures for Payments” (DPI4P) are becoming increasingly important instruments for achieving broader economic, social, developmental and geopolitical objectives, and therefore are acquiring a central role within national digital transformation strategies. In this context, the rapid expansion of instant payment systems, interoperable payment platforms, open finance models, and

¹ This widely adopted formulation has been endorsed by both the United Nations and the Group of 20. United Nations Development Programme, *Digital Public Infrastructure* (UNDP) <https://www.undp.org/digital/digital-public-infrastructure>; G20, ‘G20 New Delhi Leaders’ Declaration’ (New Delhi, 9-10 September 2023). <https://www.consilium.europa.eu/media/66739/g20-new-delhi-leaders-declaration.pdf>.

experiments with Central Bank Digital Currencies² (CBDCs) has further accelerated policy interest in the governance of payment infrastructures.

Importantly, beyond questions of technical efficiency, our analysis aims at focusing on how legal, governance and institutional design choices influence the success of DPI4P, shaping market competition, consumer protection, data privacy, cybersecurity, financial inclusion, and digital sovereignty over and through their digital architectures.³ These issues have become particularly salient as digital payment ecosystems increasingly operate across borders and as governments seek to balance innovation with resilience and regulatory oversight.

Within this global context, the BRICS+ countries⁴ occupy a particularly significant position. Indeed, several of these jurisdictions have become pioneers in the design and implementation of large-scale digital public infrastructures, often developing governance models that differ substantially from those adopted in the most developed countries and are tailored to meet the needs and tackle challenges commonly shared by developing economies. India's DPI ecosystem – comprising, chiefly, the digital identity Aadhaar, the Unified Payments Interface (UPI), the Data Empowerment and Protection Architecture (DEPA) amongst an ample spectrum of DPIs⁵ – has become one of the most frequently cited examples of a comprehensive approach aimed at supporting both public administration and private-sector innovation through the articulation of DPIs with core

² Auer, R., Cornelli, G., & Frost, J. (2020). "Rise of the Central Bank Digital Currencies: Drivers, Approaches and Technologies." *BIS Working Papers*; Boar, C., Holden, H., & Wadsworth, A. (2020). "Impending Arrival – A Sequel to the Survey on Central Bank Digital Currency." *BIS Papers*.

³ The regulatory value of digital architectures in general and DPIs in particular has been the object of multiple studies organized by the CyberBRICS project over the past decade. See, in particular: Luca Belli, *Building Good Digital Sovereignty through Digital Public Infrastructures and Digital Commons in India and Brazil* (T20 India Policy Brief, 11 September 2023) <https://t20ind.org/research/building-good-digital-sovereignty-through-digital-public-infrastructures/>; Hannah Draper, Luca Belli, Larissa Galdino and others, 'A Consumer-centric Approach to Digital Public Infrastructure for Sustainable Financial Inclusion' (T20 Brasil Policy Brief, 2024) https://www.t20brasil.org/media/documentos/arquivos/TF05_ST_02_A_Consumer-centric66d5d363d0a6f.pdf;

Venkatesh Hariharan and Sarayu Natarajan, 'Digital Sovereignty and Payments: A Case Study of the National Payments Corporation of India' in Min Jiang and Luca Belli (eds), *Digital Sovereignty in the BRICS Countries: How the Global South and Emerging Power Alliances Are Reshaping Digital Governance* (Cambridge University Press 2025). <https://doi.org/10.1017/9781009531085.008>;

Nicolò Zingales, Smriti Parsheera, Larissa Galdino and others, *Standardized Payment Systems as Digital Public Infrastructure: Catalysing Remittances and Cross-border Trade in the Global South* (T20 Brasil Policy Brief, 2024).

⁴ Besides India and Brazil, which are the scope of this study, the full BRICS+ grouping, encompasses nine additional countries: China, Russia and South Africa complete the list of the traditional BRICS to which must be added the recent new members Egypt, Ethiopia, Indonesia, Iran, United Arab Emirates, and Saudi Arabia. See: "BRICS India 2026, 'About Us'" <https://www.brics2026.gov.in/about-us/>.

⁵ For a general overview, see Government of India, Press Information Bureau, *India's Digital Public Infrastructure: Setting a Global Benchmark for Population-Scale DPI* (PIB Backgrounder, 6 March 2026). <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2235812®=3&lang=2>.

digital building blocks.⁶ Brazil has similarly emerged as an international reference through the implementation of its remarkable Pix system (the national DPI4P that in less than four years established itself as the most used payment system in Brazil⁷), the development of more than five thousand digital public services, and the ongoing elaboration of the Drex project, an upcoming Central Bank Digital Currency.

Our analysis demonstrates that, beyond their technical sophistication and operational success, the experiences of India and Brazil illustrate how DPI4P can function as strategic instruments of digital sovereignty.⁸ By developing publicly governed, interoperable payment infrastructures such as the UPI and Pix systems, both countries have significantly reduced their structural dependence on foreign-controlled payment networks and intermediaries, such as Visa and Mastercard. In doing so, they have lowered – or eliminated – transaction costs for consumers and merchants, while simultaneously enabling domestic financial institutions, fintech providers and public authorities to retain greater control over payment infrastructures, data governance and innovation.⁹

Hence, rather than concentrating value creation and strategic decision-making in a limited number of foreign payment operators, DPI4P has redistributed opportunities for competition, technological development and data-driven innovation across a broader domestic ecosystem.¹⁰ In this sense, the Indian and Brazilian experiences demonstrate that DPI4P can simultaneously promote financial inclusion, economic efficiency, market competition and what has been described by one of the co-authors as “Good Digital Sovereignty”, namely, the capacity of a country to shape, govern and evolve its digital infrastructures in accordance with its own public policy priorities while preserving openness, interoperability and innovation.¹¹

⁶ Smriti Parsheera, 'India: An Analysis of the Digitalisation of Public Services' in Luca Belli and Larissa Galdino de Magalhães Santos (eds), *SmartBRICS: How the BRICS Countries are Regulating their Digital Transformation* (Springer 2026) 235 https://doi.org/10.1007/978-3-031-98204-0_10; Ravi, S. (2024). "Digital Public Infrastructure: India's New Development Paradigm." *Observer Research Foundation*.

⁷ Banco Central do Brasil, Department of Banking Operations and Payments System, *Instant Payment System (SPI): Annual Report 2024* (Banco Central do Brasil 2025) https://www.bcb.gov.br/content/financialstability/spi_annual_reports/SPI_2024.pdf.

Up-to-date information and statistics about the Pix system can be accessed at Banco Central do Brasil, 'Pix in Numbers (Pix Statistics)' (Banco Central do Brasil) <https://www.bcb.gov.br/en/financialstability/pixstatistics>.

⁸ *Supra* (n) 3.

⁹ See Luca Belli, *Building Good Digital Sovereignty through Digital Public Infrastructures and Digital Commons in India and Brazil* (T20 India Policy Brief, 11 September 2023).

¹⁰ *Ibid.*

¹¹ *Ibid.*

Tellingly, both countries have demonstrated that public institutions, particularly central banks and financial regulators, can play an active role in creating open, interoperable payment ecosystems while fostering innovation and expanding access to financial services. Crucially, our study demonstrates that institutional, governance, regulatory and industrial policy conditions¹² are frequently underestimated by observers – who typically focus on the initiative itself, rather than on the enabling environment that made it possible – but play an essential role in the success or failure of DPIs in general and DPI4P in particular.

In this respect, although India and Brazil have followed distinct historical, legal, and institutional trajectories, they offer particularly valuable comparative perspectives. Both jurisdictions have achieved remarkable progress in digital payments through governance arrangements that combine strong public leadership with participation by private actors. At the same time, each country has adopted different legal frameworks, regulatory instruments, institutional architectures, technological standards, and implementation strategies. These similarities and differences provide a unique opportunity to examine how alternative governance models shape the performance of digital payment infrastructures and affect outcomes for consumers, financial institutions, regulators, and the broader digital economy. Furthermore, being based on the analysis of developing countries, our study offers unique insight for other developing countries willing to experiment with DPIs and DPI4Ps.

Indeed, this study approaches DPI4P not merely as technological systems, but as socio-technical institutions whose effectiveness depends upon carefully designed legal, regulatory, technical, and governance arrangements.¹³ While DPIs can be conceived as a form of regulation through “structural power”¹⁴, embedding policy objectives such as

¹² Baldwin, R., Cave, M., & Lodge, M. (2021). *Understanding Regulation* (2nd ed.).

¹³ This crucial dimension has been the object of multiple doctrinal analyses. See particularly Ole Hanseth and Kalle Lyytinen, 'Design Theory for Dynamic Complexity in Information Infrastructures' (2010) *Journal of Information Technology*; Brett Frischmann, *Infrastructure: The Social Value of Shared Resources* (Oxford University Press 2012); OECD, *Digital Public Infrastructure for Digital Governments* (OECD Public Governance Policy Papers No 68, OECD Publishing 2024) <https://doi.org/10.1787/ff525dc8-en> ; David Eaves and Krisstina Rao, *Digital Public Infrastructure: A Framework for Conceptualisation and Measurement* (UCL Institute for Innovation and Public Purpose Working Paper 2025).

¹⁴ Susan Strange conceptualizes structural power as the capacity to shape the institutional and organizational frameworks within which economic and political actors operate, rather than merely influencing discrete decisions. See Susan Strange, *States and Markets* (Pinter Publishers 1988). This perspective has been famously integrated into

competition, innovation and consumer welfare into the architecture of digital systems, their effectiveness ultimately depends on supportive institutional arrangements, coherent regulatory frameworks and appropriate governance mechanisms that enable their deployment, adoption and continued evolution. Hence, rather than focusing exclusively on technological architecture or payment innovation, the research places governance at the center of analysis. As it will be illustrated in the Methodology, questions relating to institutional responsibilities, interoperability, data governance, regulatory coordination, accountability, competition policy, consumer rights, and public oversight are examined as essential determinants of the long-term sustainability and legitimacy of DPI4P ecosystems.

This governance-centered perspective reflects a broader premise underlying the study, namely that the success of DPI4P cannot be explained solely by the technological sophistication of the underlying platforms. While robust technical architecture is a necessary precondition for effective digital payment systems, it is not sufficient to ensure their adoption, scalability or long-term sustainability. Indeed, as it will emerge from the next chapters, to generate meaningful economic and social impact, DPI4P must operate within an enabling ecosystem composed of appropriate legal frameworks, coherent regulatory policies, effective institutional coordination, adequate governance mechanisms and incentives for stakeholder participation.

Importantly, an often underappreciated, yet critical, determinant of the DPI success is the role of the private sector in their development, adoption and continued evolution. Although DPI4P are frequently portrayed as public infrastructures because they are initiated, governed or overseen by public authorities, their ability to generate widespread economic and societal benefits depends upon sustained participation by a diverse ecosystem of private actors. Such participation may arise voluntarily, where firms perceive commercial opportunities in building innovative products and services on top of

legal thinking by Laurence Lessig. See Laurence Lessig, 'The Law of the Horse: What Cyberlaw Might Teach' (1999) 113(2) Harvard Law Review 501, arguing that cyberspace requires attention to the modalities through which behavior is regulated; and Laurence Lessig, Code: Version 2.0 (Basic Books 2006), explaining that software architecture ("code") functions as a modality of regulation alongside law, markets and social norms. Broadly applied to digital economy and governance, and to digital sovereignty this perspective suggests that the design and governance of digital infrastructures – including software architectures, technical standards, interoperability protocols and platform governance mechanisms – can influence market behavior, innovation, competition and user outcomes by structuring the environment in which these activities occur. Luca Belli *Structural Power as a Critical Element of Digital Platforms' Private Sovereignty* (published in *Constitutionalising Social Media*, Hart 2022; Jiang M, Belli L. Introduction: Contesting Digital Sovereignty: Untangling a Complex and Multifaceted Concept. In: Jiang M, Belli L, eds. *Digital Sovereignty in the BRICS Countries: How the Global South and Emerging Power Alliances Are Reshaping Digital Governance*. Communication, Society and Politics. Cambridge University Press; 2025:1-38.

open public infrastructure, or through regulatory mandates that require financial institutions and payment service providers to connect to, or interoperate with, national payment platforms.

In practice, successful DPI4P ecosystems are characterized by a layered governance model in which different categories of actors perform complementary functions: governance arrangements and technical standards that ensure trust, interoperability and accountability are typically overseen by central banks or ad hoc entities under the aegis of central banks as in the Indian case, with the National Payments Corporation of India. At the application layer, fintech companies backed by venture capital and private innovators compete to develop consumer-facing payment solutions and value-added services. Traditional financial institutions – and infrastructure providers such as Internet access providers – facilitate the integration of payment functionality into broader digital ecosystems.

The effectiveness of DPI4P, therefore, depends not only on technological design or public investment, but also on the ability of governance arrangements to align the incentives of public and private actors, encourage innovation while regulating the sector sustainably. Indeed, the capacity of these governance arrangements to anticipate and overcome barriers to implementation is essential, including market concentration, infrastructure gaps, deficiencies in both digital and financial literacy, and concerns relating to privacy, cybersecurity and consumer trust. Accordingly, this study aims to adopt a holistic approach that treats technology as one component of a broader socio-technical ecosystem, seeking to identify the institutional, legal and governance conditions that enable DPI4P not only to function effectively but also to scale sustainably, foster innovation and deliver inclusive, consumer-centric outcomes.

Our research is also situated within the growing discussion surrounding digital sovereignty, a concept that, based on our previous research, we define as “the capacity to understand, develop and regulate digital systems, thus retaining self-determination, agency, and control over such systems.”¹⁵ As we will discuss, it is important to consider

¹⁵ *Supra* (n) 9.; Luca Belli and Larissa Magalhães, ‘Toward a BRICS Stack? Leveraging Digital Transformation to Construct Digital Sovereignty in the BRICS Countries’ (2024) 55 *Computer Law & Security Review* 106064 <https://doi.org/10.1016/j.clsr.2024.106064>; Luca Belli, ‘To Get Its AI Foothold, Brazil Needs to Apply the Key AI Sovereignty Enablers (KASE)’ in Steven Feldstein (ed), *New Digital Dilemmas: Resisting Autocrats, Navigating Geopolitics, Confronting Platforms* (Carnegie 2023) <http://dx.doi.org/10.2139/ssrn.4465501>; Min Jiang and Luca Belli (eds), *Digital Sovereignty from the BRICS: How the Global South and Emerging Power Alliances Are Reshaping Digital Governance* (Cambridge University Press 2024) <https://doi.org/10.1017/9781009531085>; Luca

that, as countries increasingly depend upon digital infrastructures for critical economic activities, payment systems become strategic assets whose governance has implications for national autonomy, resilience, cybersecurity, and capacity to independently engage in economic relations. Simultaneously, to foster an individual-empowering conception of digital sovereignty¹⁶, digital payment infrastructures must remain consumer-centric, ensuring accessibility, affordability, transparency, effective dispute resolution, privacy protection, and trust. While digital sovereignty can – and should – be seen both from the individual perspective of consumer sovereignty and collective perspective of national sovereignty, we note that these objectives are not always perfectly aligned, creating important governance trade-offs that require careful legal and policy analysis.

1.1. RESEARCH QUESTION AND POTENTIAL DEVELOPMENTS

In the context presented above, the comparative focus on India and Brazil serves as the first milestone of a broader research agenda examining DPI4P across the BRICS+ countries, drawing on materials published by 15 June 2026.

. This grouping is particularly interesting as regards DPI4P discussion as recent initiatives aimed at strengthening cooperation among BRICS+ members – including sophisticated discussions and initiatives concerning interoperability among national payment systems¹⁷, commitments to promoting cross-border payment arrangements¹⁸, and

Belli, 'BRICS Countries and AI Sovereignty: Introduction to Thematic Section' (2024) 34 *African Journal of Information and Communication* 1 <https://doi.org/10.23962/ajic.i34.128842>; Luca Belli, Walter B Gaspar, and Shilpa Singh, 'Data Sovereignty and Data Transfers as Fundamental Elements of Digital Transformation: Lessons from the BRICS Countries' (2024) 54 *Computer Law & Security Review* 106017 <https://doi.org/10.1016/j.clsr.2024.106017>; Luca Belli and Walter B Gaspar (eds), *The Quest for AI Sovereignty, Transparency and Accountability* (Springer Nature 2025) <https://link.springer.com/book/10.1007/978-3-032-02762-7>.

¹⁶ For a discussion of the different conceptions of digital sovereignty focusing on individuals, companies, communities, states and supranational alliances, see Jiang M, Belli L. Introduction: Contesting Digital Sovereignty: Untangling a Complex and Multifaceted Concept. In: Jiang M, Belli L, eds. *Digital Sovereignty in the BRICS Countries: How the Global South and Emerging Power Alliances Are Reshaping Digital Governance*. Communication, Society and Politics. Cambridge University Press; 2025:1-38. <https://doi.org/10.1017/9781009531085.002>.

¹⁷ BRICS Foreign Ministers' Meeting, *Chair's Statement and Outcome Document* (15 May 2026) para 17. https://d2jiw2zrmmyqt8.cloudfront.net/wp-content/uploads/2026/05/15173225/BRICS_Chairs_Statement_May15_2026.pdf.

¹⁸ Already established in the 2024 Declaration, the commitment to 'facilitate fast, low-cost, more accessible, efficient, transparent, and safe cross-border payments among BRICS countries and other nations' was reiterated in the 2025 Declaration. BRICS, *XVI BRICS Summit Kazan Declaration: Strengthening Multilateralism for Just Global Development and Security* (23 October 2024) para 65 <https://d2jiw2zrmmyqt8.cloudfront.net/wp-content/uploads/2025/12/26170833/2024-XVI-BRICS-Summit-Kazan-Declaration-1-1.pdf>; BRICS, *Rio de Janeiro Declaration: Strengthening Global South Cooperation for a More Inclusive and Sustainable Governance* (6 July 2025) para 50 <https://d2jiw2zrmmyqt8.cloudfront.net/wp-content/uploads/2025/12/26170834/BRICS-Leaders-Declaration-2025-2.pdf>.

potential links between domestic DPIs and national CBDCs – underscore the need for a systematic understanding of the governance models that underpin these infrastructures.

In particular, as it will be emphasized in the conclusion of this study, proposals relating to payment “bridges” and interoperability mechanisms, such as the BRICS Bridge¹⁹, are gaining traction within the BRICS, but also raise new legal, institutional, and technical questions concerning standards, regulatory coordination, data governance, consumer protection, and cross-border supervision.

Understanding the domestic governance foundations of existing DPI4P systems therefore represents an essential prerequisite for evaluating their future international integration. Against this background, this study seeks to answer the following overarching research question:

How do varying governance models from BRICS+ countries shape end-user outcomes in national and international digital payment systems, and what can these models teach us about financial inclusion, consumer protection, and digital sovereignty? In particular, which payment protocols are supported by these governance frameworks?

This research question reflects the premise that governance choices are neither neutral nor merely administrative. The allocation of institutional responsibilities, the legal status of payment infrastructures, regulatory approaches to interoperability, technical standards, data governance arrangements, and market participation rules all influence the experience of end users and the broader functioning of payment ecosystems.

Accordingly, the study investigates not only whether digital payment infrastructures operate successfully, but also why certain governance arrangements produce more inclusive, resilient, and trustworthy outcomes than others.

1.2. STUDY PRESENTATION AND STRUCTURE

To address the abovementioned research question, the study is based on a structured mapping of the legal, regulatory, technical, and institutional frameworks governing

¹⁹ The BRICS Bridge refers to the emerging concept of an interoperable cross-border payment infrastructure that would connect the domestic digital payment systems and, potentially, the CBDCs of BRICS+ countries to facilitate faster, cheaper, and more secure international transactions. Although often discussed in policy and media discourse as a prospective BRICS initiative, the concept draws substantially on the technological and governance experience of Project mBridge, a multi-CBDC platform originally launched in 2021 by the Bank for International Settlements (BIS) Innovation Hub, together with the Hong Kong Monetary Authority, the People's Bank of China's Digital Currency Institute, the Bank of Thailand, and the Central Bank of the United Arab Emirates, later joined by the Saudi Central Bank. Bank for International Settlements Innovation Hub Hong Kong Centre, Hong Kong Monetary Authority, Bank of Thailand, Digital Currency Institute of the People's Bank of China and Central Bank of the United Arab Emirates, *Inthanon-LionRock to mBridge: Building a Multi-CBDC Platform for International Payments* (BIS 2021) <https://www.bis.org/publ/othp40.htm>.

DPI4P in Brazil and India. The analysis combines doctrinal legal research with qualitative policy analysis and empirical validation through engagement with relevant stakeholders, allowing both a rigorous examination of formal governance arrangements and an assessment of their practical implementation.

Rather than treating India and Brazil as isolated examples, this study seeks to identify broader patterns that may inform the design of consumer-centric, interoperable, and digitally sovereign payment infrastructures. Hence, beyond generating findings concerning the two case studies, our work also aims to develop a structured analytical framework that can be replicated in future studies of additional BRICS+ jurisdictions and applied to emerging initiatives such as the BRICS Bridge for cross-border payments.

The report is organized into five substantive parts. Following this Introduction, the second chapter establishes the analytical boundaries of the research, presenting the methodological framework adopted for the comparative analysis and explaining the structured mapping instrument used throughout the project and the criteria applied in the comparative assessment. A comprehensive annex accompanies this chapter, providing the complete mapping framework that serves as the basis for the subsequent country analyses.

The third chapter presents the case study of India. It examines the evolution of India's DPI4P, including its legal foundations, institutional governance arrangements, regulatory framework, technical architecture, interoperability mechanisms, and ongoing developments relating to digital payments and CBDCs. Particular attention is given to governance features that influence consumer outcomes, financial inclusion, innovation, competition, and digital sovereignty. A detailed mapping of the Indian framework is included as an annex to the chapter.

The fourth chapter follows the same analytical structure for Brazil. It examines the development of the Brazilian digital payment ecosystem, including Pix, the regulatory role of the Central Bank of Brazil, the governance of payment infrastructures, interoperability arrangements, consumer protection mechanisms, and the Drex CBDC initiative. As with the Indian case study, a detailed mapping is provided in an accompanying annex.

The third and fourth chapters focus on the Indian and Brazilian case studies, respectively. They examine the evolution of each country's DPI4P, including their legal foundations, institutional governance arrangements, regulatory framework, technical architecture, and

ongoing developments relating to digital payments and CBDCs. Particular attention is given to governance features that influence consumer protection, financial inclusion, cybersecurity, interoperability and digital sovereignty.

The concluding chapter synthesizes the findings emerging from both case studies to identify convergences, divergences, and transferable governance practices. It reflects on how different governance models shape consumer protection outcomes, financial inclusion, innovation, cybersecurity, interoperability and digital sovereignty, while also considering the implications for future BRICS+ cooperation in digital payments. In doing so, the conclusion also considers the principal technological and governance pathways currently being explored to achieve interoperability among national DPI4P. These include emerging initiatives for cross-border payment connectivity among BRICS+ countries, such as the proposed BRICS Bridge, which builds upon the experience and technical architecture developed through the BIS Project mBridge²⁰; protocol-based approaches such as the Interledger Protocol (ILP)²¹, designed to facilitate interoperability across heterogeneous payment ledgers without requiring a common settlement infrastructure; and the Project Aperta²² initiative spearheaded by the BIS Innovation Hub, which seeks to enhance interoperability among national Open Finance ecosystems through shared technical standards and governance arrangements.

While these initiatives illustrate different institutional and technological approaches to cross-border interoperability, they also reveal that interoperability is not merely a technical challenge but a multidimensional and multistakeholder governance question. Their future effectiveness will depend on a range of factors, besides their technical merits, including the willingness of jurisdictions to adopt common standards, the scalability of the proposed architectures, sustained political and institutional support, the likelihood of existing and new private sector players to support it, and the compatibility with existing legal and regulatory frameworks – particularly anti-money laundering and counter-terrorist financing requirements, data protection and privacy rules, and financial

²⁰ Bank for International Settlements Innovation Hub Hong Kong Centre, Hong Kong Monetary Authority, Bank of Thailand, Digital Currency Institute of the People's Bank of China and Central Bank of the United Arab Emirates, *Project mBridge: Connecting Economies through CBDC* (Bank for International Settlements 2022) <https://www.bis.org/publ/othp59.htm>;

²¹ Interledger Foundation, *Interledger Protocol V4: Specification* (Interledger Foundation) <https://interledger.org/developers/rfcs/interledger-protocol/>.

²² Bank for International Settlements Innovation Hub Hong Kong Centre, *Project Aperta: Enabling Cross-border Interconnectivity through Open Finance Interoperability* (Bank for International Settlements 2026) <https://www.bis.org/publ/othp111.htm>.

supervision – and the overall maturity of the underlying technologies and governance models.

Rather than advocating a particular solution, the study concludes by identifying the comparative strengths, limitations and open research questions associated with these emerging approaches, thereby laying the groundwork for future investigation into the international interoperability of DPI4P. In doing so, the study seeks to contribute not only to the comparative understanding of national DPI4P governance but also to the emerging debate on the architecture of a more interoperable, inclusive, and sovereign global digital payments ecosystem.

Finally, the conclusion identifies avenues for future research, particularly concerning international interoperability among DPI4P, the development of cross-border payment bridges and CBDC interoperability initiatives, and the extension of the comparative framework developed in this project to additional BRICS+ jurisdictions.