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ARTICLE

Central Banks as Regulators and (also) Operators of Instant Payments Schemes: Confronting the Criticisms of "Needless Intervention" and "Unfair Competition"

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Abstract

We argue it is efficient/desirable for central banks to operate retail Instant Payments (IP) schemes and infrastructure, considering that (i) payment service providers (PSPs) face a problem of collective action, which limits their capacity to deliver a cheap, fast, open-architecture and interoperable IP scheme; and (ii) this problem may be overcome by a central bank (economically neutral actor) with a dual role of regulator and operator of IP schemes, especially by mandating participation of large PSPs and ensuring that the low cost of infrastructure is passed on to consumers. We corroborate with data from Brazil's Pix and India's UPI, where the efficiencies of central bank-led IP schemes also led to social gains through financial inclusion.

Keywords: central banks; instant payments; regulation

I. Introduction

Instant payments are only now becoming possible with lower telecommunication costs, lower computer processing costs, exponentially higher internet/smartphone penetration, and higher pressure from consumers for services that are low-cost, 24 x 7 x 365, and fully digitalised[1]. This demand is heightened by inefficiencies of traditional payment methods that disproportionately burden individuals and small businesses[2]. Consequently, a range of very diverse countries have already implemented instant payment schemes, such as Brazil, India, United States (U.S.), and others[3], each with their peculiarities.

Beyond the self-explanatory advantages of instant payments, there is a large swathe of benefits for society at large: (i) financial inclusion for vulnerable households and small

[1] See *(i)* Tanai Khiaonarong and David Humphrey, "Instant Payments: Regulatory Innovation and Payment Substitution Across Countries" (2022) *International Monetary Fund Working Paper 22/228*, p 6; and *(ii)* Central Bank of Brazil, "Vote No. 271/2018-BCB," Exposition of motives for the Central Bank's Communiqué No. 32.927, 2018, which established the guidelines/foundations for the IP which would later become Pix.

[2] In Latin America, credit card fees surpass 1% of GDP, mostly due to considering the costs imposed by the complex chain of issuers, processors, and networks (i.e., the platform providers' fees), as opposed to 0,4% in Asian countries and 0,2% in European countries and a few African countries. In: Viviana Alfonso, Alexandre Tombini, Fabrizio Zampolli, "Retail payments in Latin America and the Caribbean: present and future" (December 2020) *BIS Quarterly Review*, p 73.

[3] The Economist, "A digital payments revolution in India," Report: Cashless Talk (*The Economist*, 15 May 2023) <https://www.economist.com/special-report/2023/05/15/a-digital-payments-revolution-in-india>, accessed 8 October 2023.

businesses (arguably the most relevant benefit of IP schemes in developing countries); (ii) lower prices for payers/payees in comparison to checks and bank transfers; (iii) immediate availability for payees, instead of waiting business days for a check or transfer to be settled, or for card receivables to be credited to a merchant's account (a benefit that also spurs financial inclusion, considering that IP schemes tend to be more cost-effective for small businesses); (iv) reduction (or even exclusion) of payment risk; (v) faster social assistance deposits by governments, such as conditioned cash transfer money and disaster relief money (i.e., pandemics, flash floods etc.); (vi) opportunities to develop *programmable settlement* schemes, namely delivery *vs.* payment (DvP), delivery *vs.* delivery (DvD), and payment *vs.* payment (PvP)[4].

That said, while the right technology is necessary, it is not enough for payers and payees to gain access to the most efficient IP scheme. That is why central banks have begun to collaborate in advancing IP in multiple roles (catalysts, regulators, or full-on operators). Their proactive efforts can direct technology in a direction that maximises higher quality and lower prices in payments, enabling entry for individuals and businesses that might otherwise be marginalised (or heavily tolled) by traditional payment schemes.

As a leading case, we have Pix – the IP scheme developed, supervised, and actually *operated* by the Central Bank of Brazil, which has been proven a great success with high penetration[5] and award-winning case of central bank innovation[6] (as of March 2024, more than 150 million Brazilians have used Pix at least once)[7]. We also have Unified Payments Interface (UPI), the Indian IP scheme developed by the National Payments Corporation of India, which is an umbrella organisation composed of more than 60 institutions and led by the Reserve Bank of India and the Indian Banks' Association – and also soared to success by the central bank's place at the leadership, with more than 300 million active users in India[8].

This critical role of central banks as promoters of IP takes us to the hypothesis of this paper – that *it is efficient and desirable for central banks to act as operators of retail Instant Payments schemes and infrastructure*, considering that (i) payment service providers (PSPs) face a severe problem of collective action which limits their capacity to deliver a cheap, fast, open-architecture and interoperable IP scheme (in other words: an efficient IP scheme); and (ii) this problem of collective action can be overcome by a central bank (economically neutral actor) with a dual role of regulator and operator of an IP scheme. Such scheme may become a rail on top of which the PSPs can build and compete for the end users.

To validate our hypothesis, this paper investigates the rising criticisms from private agents on whether central banks are overstepping when they decide to become operators of IP schemes, instead of limiting themselves to the classic role of regulators. These critics mostly argue the point of "needless government intervention" and "unfair competition against private agents."[9]

[4] See (i) Angelo Duarte, Jon Frost, Leonardo Gambacorta, Priscilla Koo Wilkens and Hyun Song Shin, "Central banks, the monetary system and public payment infrastructures: lessons from Brazil's Pix" (2022) *BIS Bulletin 52*, p 1–3; (ii) Central Bank of Brazil. "Pix Management Report: Conception and first years of operation" (2023); and (iii) Peter Conti-Brown and David Wishnick, "Private markets, public options, and the payment system" (2020) *Yale Journal on Regulation* 37 2.

[5] International Monetary Fund, Western Hemisphere Department. "*Pix: Brazil's Successful Instant Payment System*" (2023), <https://www.elibrary.imf.org/view/journals/002/2023/289/article-A004-en.xml>, accessed 10 December 2023.

[6] Central Bank of Brazil, "Pix Management Report: Conception and first years of operation" (2023) p 10.

[7] Central Bank of Brazil, <https://www.bcb.gov.br/estabilidadefinanceira/estatisticaspix>, accessed 26 March 2024.

[8] Sulivan Rocha, "How Pix compares to UPI and what FedNow can learn from both of them." *Payments CMI* (20 September 2023), <https://paymentscmi.com/insights/comparing-pix-upi-fednow/>, accessed 7 January 2024.

[9] Caio Mario Pereira Neto and Ricardo Ferreira Pastore, "Banco Central regulador e competidor" [free translation: Regulator and competitor central bank]. *Valor Econômico* (22 August 2023), <https://valor.globo.com/financas/coluna/banco-central-regulador-e-competidor.ghtml>, accessed 19 November 2023.

Introductory remarks aside, the structure of this paper is as follows. Chapter II will address the role of central banks in wholesale and retail payment systems, exploring (and justifying the reasoning behind) the role of IP operator central banks. Chapter III will present the criticisms levied by certain actors against central banks as operators of retail payment schemes. Chapter IV will present the practical advantages in having central banks as IP operators, all while rebuking the criticisms. Chapter V will present some concerns that additional concerns that might impact the operator central bank. And the Conclusion summarises this paper's contribution and validation of our hypothesis on whether central banks as operators are necessary (and desirable).

II. Central banks in payments: From wholesale (reserve accounts) to retail (instant payments)

Central banks are usually mandated by their country's laws to ensure that their payment systems are *solid* (sound, trustworthy, and transparent), and *efficient* (competitive, cheap, fast, easy, and inclusive). One of the ways in which they fulfil this mandate is by acting as regulators and operators of *reserve accounts held by banking/financial institutions* (wholesale payment systems).[10] A central bank uses this function to (i) intermediate interbank transactions by using its own balance sheet as the settlement vehicle[11]; and (ii) provide liquidity standing facilities to institutions to ensure smooth settlements through reserves (up to providing emergency liquidity as a lender of last resort).[12] In this institutional design, the central bank provides payment services to banks upstream, and the banks themselves provide payment services to households and businesses downstream. *Lo*, the so-called *two-tiered structure*.

Central banks use the instruments above to (indirectly) provide *soundness* to retail payments systems. However, even if that wholesale role is executed perfectly, retail payment systems might still be inefficient[13]: in other words, be expensive for payers/payees, slow, and non-interoperable between different PSPs[14]. As a critical example, we have households and businesses who see themselves obligated to participate in multiple PSPs. Inefficiencies in retail payment systems raise the transaction costs of goods and services, harming commerce, hindering financial inclusion of the unbanked, and ultimately burdening economic activity[15].

If a retail payment system is sound, but inefficient, then the mandate of its central bank is only *half accomplished*. With this gap in mind, central banks have expanded their

[10] The holders of reserve accounts are mostly banks, which transfer money between themselves to settle obligations assumed by themselves or their clients (i.e., a payment from client of bank A to client of bank B is ultimately settled by bank A transferring reserves to bank B in the central bank reserves system).

[11] Agustín Carstens, *The future of money and the payment system: what role for central banks?* Lecture by the General Manager of the BIS at Princeton University, 5 December 2019, <https://www.bis.org/speeches/sp191205.pdf>, accessed 15 November 2023.

[12] Committee on Payments and Market Infrastructures (CPMI), "Fast payments: enhancing the speed and availability of retail payments" (2016) *Bank for International Settlements (BIS)* p 72.

[13] For a full review on inefficiencies of cash, cards, checks etc, see: Central Bank of Brazil. "Pix Management Report: Conception and first years of operation" (2023).

[14] Interoperability means that the user of a certain PSP may make payments to individuals and businesses which use a different PSP, without the necessity of being onboarded on different systems. See: Codruta Boar, Stijn Claessens, Anneke Kosse, Ross Leckow, and Tara Rice, "Interoperability between payment systems across borders" (2021) *BIS Bulletin 49*, pp 1–2.

[15] Angelo Duarte and others, "Central banks, the monetary system and public payment infrastructures: lessons from Brazil's Pix" (2022) *BIS Bulletin 52*, p 3.

attention from wholesale reserve accounts to also the entire payments supply chain and end users.[16]

Among the options to build on top of the two-tiered structure (again, where the central bank provides payment services to banks upstream, and the banks themselves provide payment services to households and businesses downstream), the preferrable option to deliver efficiency today is instant payments.[17] They pave the way for cheaper transactions, immediate fund availability, streamlined/quality digital experience, and so on – central banks are interested in promoting them on behalf of efficiency in retail payment systems.

From a traditional viewpoint, these authorities' classic role has always been to address market failures in finance, such as information asymmetries, elevated barriers to entry, market power, and social cost of bank failure. In other words, they have traditionally worked to *regulate* away the negative externalities in financial markets.

Now, central banks may serve a greater cause. To cumulate the (classic) role of mitigating *negative* externalities with the (novel) role of promoting *positive* externalities and concrete social gains. As the BIS General Manager has described: "central banks are rolling up their sleeves to be at the front of the innovation process and help shape the digital transformation in the financial system – all while continuing to deliver on their mandates. In other words, they aren't afraid of the algorithms, but are seeking to master the art of designing them"[18]. Regarding *how* central banks may advance instant payments, according to the Committee on Payments and Market Infrastructure, there are three (non-exclusive) fronts.

First, the central bank may act as a *catalyst*. This is an institutional role at its core, where the authority leverages its expertise and relationship with public/private actors to advance IP agendas[19]. Examples include setting national strategies and payments roadmaps, facilitating cooperation between public authorities (i.e., ministries, competition/telecom agencies etc.), supporting interoperability between schemes, establishing sandboxes, and coordinating experimental linkages for cross-border payments, DLT, CBDC, etc.[20] Since this role is less crucial to our point than the other two, we will not refer to it again.

[16] Loretta Mester, "*U.S. Payment System Improvement and the Federal Reserve*," speech at The Clearing House Annual Conference in the Federal Reserve Bank of Cleveland, 18 November 2015, <https://www.clevelandfed.org/collections/speeches/2015/sp-20151118-us-payment-system-improvement-and-the-federal-reserve#cf-fn-3>, accessed 29 October 2023.

[17] Agustín Carstens, "*The future of money and the payment system: what role for central banks?*," lecture by the General Manager of the BIS at Princeton University, 5 December 2019, <https://www.bis.org/speeches/sp191205.pdf>, accessed 15 November 2023.

[18] Agustín Carstens, "*Central bank innovation - Swiss made*," speech by the General Manager of the BIS at the Kantonalbanken Event 2021 (SIX), 3 November 2021, <https://www.bis.org/speeches/sp211103.htm>, 1 October 2023.

[19] As the European Central Bank (ECB) describes its institutional role as a catalyst: "The role of the ECB as a catalyst is to facilitate private sector efforts to improve market efficiency. The integration of European market infrastructures, including payment services, is a market-driven process, but coordination problems can arise and the interests of different stakeholders need to be balanced. As a neutral party, the ECB tries to balance conflicting interests while promoting the following objectives: safety and security, efficiency, and market integration." For a full description, see <https://www.ecb.europa.eu/paym/integration/retail/ecb/html/index.en.html>, accessed 15 November 2023.

[20] See *(i)* CPMI, "Fast payments: enhancing the speed and availability of retail payments" (2016) *Bank for International Settlements (BIS)* p 72; and *(ii)* Tanai Khiaonarong and David Humphrey, "Instant Payments: Regulatory Innovation and Payment Substitution Across Countries" (2022), *International Monetary Fund Working Paper 22/228*, p 6–7.

Second, the central bank may act as a *regulator*. To fulfil their objectives of soundness and efficiency in payments, central banks already monitor existing/planned payment systems, assess them against these two objectives and, where necessary, induce change.[21] They might control entry/exit of PSPs with license requirements, supervise licensed PSPs, and determine/enforce minimum standards (i.e., obligating PSPs to settle payments in a time limit, capping card interchange fees etc.). This role is business as usual for central banks in payments, and naturally extends to IP.

Third, the central bank may act as the *operator*, which is our focus here. The role where central banks provide IP-related services directly to the private sector, instead of only regulating the IP initiatives originated by the private sector. They may operate the financial infrastructure of IP schemes, known as real-time gross settlement system (RTGS, which includes providing liquidity), and the database directory that links payers/payees' aliases with their account information, enabling the transactions to be cleared[22]. This infrastructure is where/how instant payments are settled between PSPs after being commanded by their client. Over the last few years, the adoption of IP in countries has closely followed the adoption of RTGS by their respective central banks, revealing how these institutions incentivise IP when they are providers of its infrastructure[23]. Additionally, central banks may operate not only the infrastructure, but the instant payment scheme itself.

We should take a step back to differentiate the IP infrastructure and the IP scheme, since conceptual overlaps may happen between them in a scenario where the central bank operates both. We may adopt Brazil's Pix as a practical guide since the Central Bank of Brazil operates both the financial infrastructure and the scheme. In short, Pix is the IP scheme launched in 2020 by the Central Bank to great success: over 70% of adoption by individuals in only 2 years, dramatically lower costs, relevant financial inclusion, and numerous international awards.[24] In fact, the significantly lower financial costs of Pix adoption when compared to debit/credit cards, especially for individuals and small businesses, led the Brazilian IP scheme to surpass Brazilian card schemes in number of transactions.[25]

Brazilian PSPs participate in Pix's infrastructure in the following way (to avoid any confusion, "Instant Payments System" in the following flowchart means the RTGS, and not the scheme) (Fig. 1).[26]

[21] Not only in payments, but deposits, lending and others. See: Bank for International Settlements (BIS), "Central banks and payments in the digital era," *BIS Annual Economic Report* (2020) p 70.

[22] Aliases would be phone numbers, emails, tax IDs or random number strings for each individual/business. See: Central Bank of Brazil. "Vote No. 176/2018-BCB," 27 August 2019, p 1–2, Exposition of motives for the Central Bank's Communiqué No. 34,085,2019, which updated the guidelines/foundations for the IP scheme which would later become Pix.

[23] Agustín Carstens, *The future of money and the payment system: what role for central banks?* Lecture by the General Manager of the BIS at Princeton University, 5 December 2019, <https://www.bis.org/speeches/sp191205.pdf>, accessed 15 November 2023.

[24] For studies/reports on the merits (and data) of Pix and its success, see: (i) Central Bank of Brazil. "Pix Management Report: Conception and first years of operation" (2023); (ii) Angelo Duarte and others, "Central banks, the monetary system and public payment infrastructures: lessons from Brazil's Pix" (2022) *BIS Bulletin 52*; and (iii) Aaron Klein, "Structural conflicts in central banking: regulator or operator of a payment system?" (2023) *Wharton (University of Pennsylvania) Initiative on Financial Policy and Regulation*.

[25] Central Bank of Brazil, <https://www.bcb.gov.br/estabilidadefinanceira/estatisticaspix>, accessed 26 March 2024.

[26] Available at <https://www.bcb.gov.br/en/financialstability/pixcentralbanksrole>, accessed 15 November 2023.

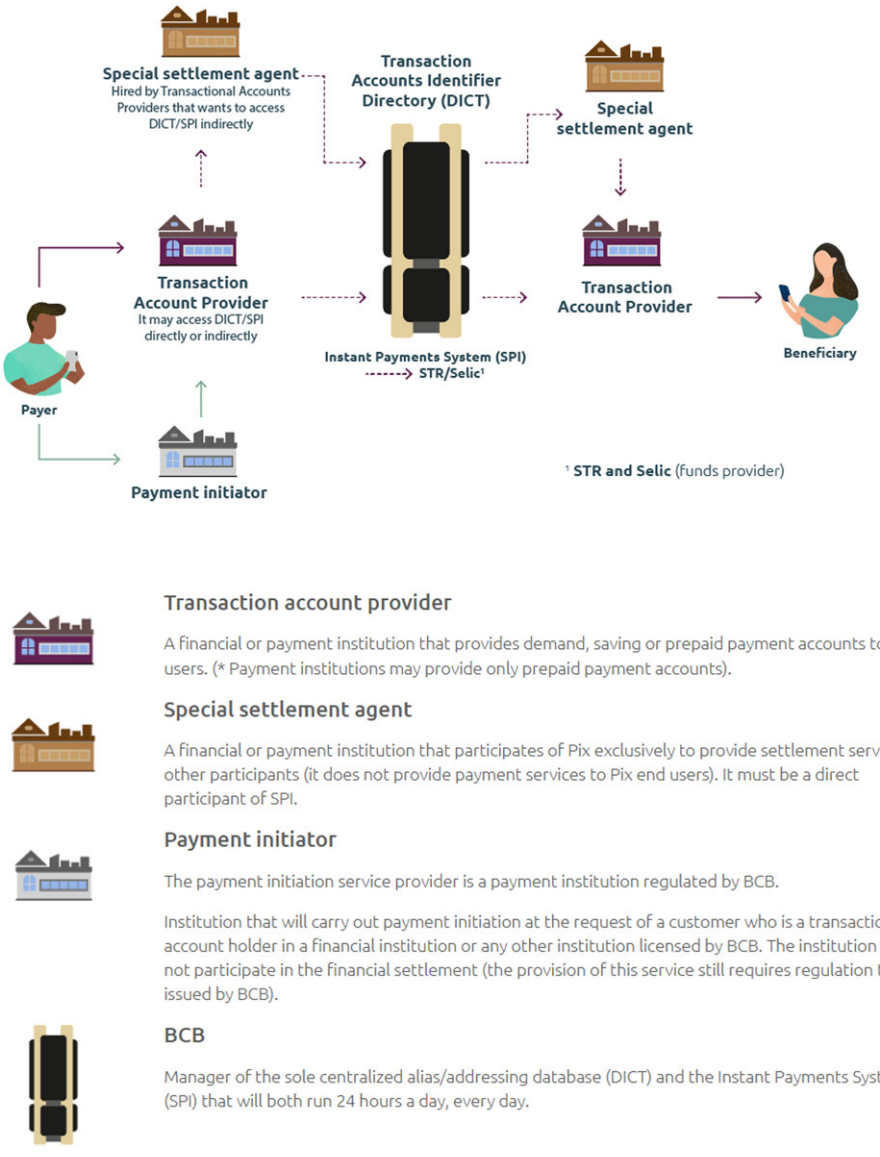

Figure 1. Brazil's Pix flowchart of participants (Source: Central Bank of Brazil, 2023).

Per the image above, Pix's infrastructure (RTGS and database) is operated by the Central Bank of Brazil and provided to the PSPs (for a low fee), which in turn provide IP services to Brazilian clients. These clients order payments, and the PSP settles these payments (instantly) between themselves inside Pix's infrastructure. For reference, this database infrastructure is already populated by more than 700 million aliases from Pix payers and payees.[27] These steps above only describe how the central bank operates the IP *infrastructure*, and not yet the IP *scheme*. Beyond them, the Central Bank of Brazil is

[27] Central Bank of Brazil, <https://www.bcb.gov.br/estabilidadefinanceira/estatisticaspix>, accessed 26 March 2024.

additionally responsible for Pix's entire rulebook, admission of PSPs into the scheme, branding/communication strategies etc. In practice, the authority owns the scheme.

As per the BIS publication on Pix, "the [Central Bank of Brazil] plays two roles in Pix: it operates the system, and it sets the overall rulebook. As a system operator, the [Central Bank of Brazil] fully developed the infrastructure and operates the platform as a public good. As rulebook owner, the [Central Bank of Brazil] sets the rules and technical specifications (i.e., APIs) in line with its legal mandate for retail payments"[28].

This model might seem familiar, considering that the role of operator central bank in IP schemes is analogous to the role of card networks in card schemes. Similarly to how Visa and Mastercard "own" their card schemes, the Central Bank of Brazil is the "owner" of Pix. The similarities are very clear: (i) they make and enforce the rules, each in their own way; (ii) they are not PSPs nor front-end for consumers, but control the participation of the actual PSPs in their schemes; (iii) they have a firm hand on all matters of branding/communication strategy of the scheme.

III. The existing criticisms against the operator central bank

Many authors and authorities have highlighted the benefits of central banks operating instant payment (IP) schemes. This paper innovates by putting this operator role through a stress test. The following paragraphs outline the most common criticisms and concerns raised by academia and the market. Later in the paper, we address each of these points in detail.

First, it is common for many state intervention to be called "unwarranted intervention" in the free market. This is not different in central bank-led IP schemes. In short, critics state that (i) there is no clear market failure that justifies the state intervention of a central bank that provides instant payments; and (ii) there is no concrete evidence that market forces cannot spontaneously address the demand for instant payments.[29] These critics state that central banks should passively wait for (and maybe assist) private actors to develop instant payments infrastructures and schemes, instead of developing it themselves. Bureaucracy, as these critics understand it, should wait for the free market to solve a problem – and if they do not solve it, then maybe there was never any problem in the first place. This rationale is not entirely dissimilar from the decades-old economic theory of regulation, which was sponsored by neoclassic economists (and business interests) to ultimately provide the rhetorical support for the deregulation policies across the twentieth century.[30] In a similar way, advocates today argue broadly that a public authority (central bank) should not intervene in a free market (payment sector).

Critics also say that, if an operator central bank provides an IP scheme to the public, the institution becomes a "competitor" of private PSPs that also wish to provide their IP

[28] Angelo Duarte and others, "Central banks, the monetary system and public payment infrastructures: lessons from Brazil's Pix" (2022) *BIS Bulletin 52*.

[29] According to Mastercard in its contrary response to FedNow's public consultation, "the United States economy is built upon the capitalist theory of free market competition and limited government intervention, which is not true of many other countries including several Western Europe countries that have adopted government-operated faster payments models. In our economic model, the Board should only intervene when careful consideration shows that there is a market failure and that private industry efforts will not correct the problem. This is simply not the case for faster payments, based on the numerous private industry efforts underway to develop services with which the Board's proposed services would directly compete". See: Mastercard International, "Response to the Federal Reserve System's request for comment regarding potential actions to support interbank settlement of faster payments," *Board of Governors of the Federal Reserve System*, 14 December 2018, p 8.

[30] Eric Posner, "Big Business Influence in the Decline of Antitrust Enforcement," *ProMarkets* (16 February 2024), <www.promarket.org/2024/02/16/big-business-influence-in-the-decline-of-antitrust-enforcement>, accessed 24 February 2024.

schemes. Since the central bank is also the supervisor of the PSPs, holding relevant regulatory sway over them, any competition between one and the other would be "unfair competition." In this theory, an operator central bank would have the power to favour its own scheme in detriment of private schemes. The result would be that the central bank would pressure PSPs into embarking in its own scheme, instead of developing their own schemes or embarking in other schemes (generating what some might call "artificial" network effects). In short, critics are concerned that an operator central bank would leverage its supervisor role to coerce PSPs.[31]

This "unfair competition" argument indirectly raises another argument – if a central bank operates IP schemes, while still carrying all its legacy responsibilities, would this situation result in conflict of interest *inside* that central bank? This criticism considers that the objectives/incentives of a regulator role are naturally different from those of an operator role, but both roles coexist inside a central bank that leads an IP scheme – and this coexistence is more conspicuous when the same department oversees the two roles.[32]

For example, we might consider a central bank that has the institutional power to enact rules/obligations that are objectively better in the payment system it supervises (i.e., minimum security requirements for payment schemes, maximum permitted time to settle, technical security standards, ISO formatting), and also operates an IP scheme in this system. However, that same central bank would not have the operational/technological capacity to comply with these intended rules/obligations, should they be enacted. Would the authority still enact these rules, only to become non-compliant itself? Or would the central bank's regulator role hesitate in favour of its operator role?[33]

IV. Efficiencies *vs.* criticisms of central bank-owned IP schemes

Now that we have presented the current criticisms from market and academia against the operator central bank, we will present the potential advantages of the model (already made implicit on Chapter II), and confront the criticisms from Chapter III. We find that it is desirable for central banks to bear the role of operators of IP infrastructure and IP schemes – especially because of the efficiencies arising from this role alone and from its synergies with the role of regulator. We identify four of these crucial efficiencies.

First, lower entry costs and production costs for PSPs. The operator central bank is not a profit-maximising institution. As per the BIS General Manager, "central banks are designed to 'make money' only in the literal sense", and their "bottom line" is exclusively the public good.[34] Since profit is unneeded, the (economically neutral) central banks charge PSPs participating in the IP schemes only the bare cost needed by the authority to keep the infrastructure functional – without any price mark-up, like what already happens in reserve accounts and other services provided by central banks (recoup human/technology

[31] See (i) Norbert Michel, "The Federal Reserve should drop FedNow and any plans to launch a CBDC," *CATO Institute* (15 December 2022), <https://www.cato.org/commentary/federal-reserve-should-drop-fednow-any-plans-launch-cbdc>, accessed 10 December 2023; (ii) Mastercard International, "Response to the Federal Reserve System's request for comment regarding potential actions to support interbank settlement of faster payments," *Board of Governors of the Federal Reserve System*, 14 December 2018, p 8; and (iii) Neil Haggerty, "GOP senators skeptical of Fed's faster payments network," *American Banker* (25 September 2019), <https://www.americanbanker.com/news/gop-senators-skeptical-of-feds-faster-payments-network>, accessed 10 December 2023.

[32] Caio Mario Pereira Neto and Ricardo Ferreira Pastore, "Banco Central regulador e competidor" [free translation: Regulator and competitor central bank], *Valor Econômico* (22 August 2023), <https://valor.globo.com/financas/coluna/banco-central-regulador-e-competidor.ghtml>, accessed 19 November 2023.

[33] Aaron Klein, "Structural conflicts in central banking: regulator or operator of a payment system?" (2023) *Wharton (University of Pennsylvania) Initiative on Financial Policy and Regulation*.

[34] Agustín Carstens. "Central banks are not here to make profits," *Financial Times* (7 February 2023), <https://www.ft.com/content/31fb4fa6-69ac-4b48-8315-73fda48f07ab>, accessed 29 October 2023.

expenditure). As a result, we have (i) *low entry costs* for (small and large alike) entrant PSPs to participate in central banks' IP schemes and compete with incumbent PSPs for consumers (business-stealing effects)[35]; and (ii) *low production costs* incurred by PSPs to offer IP to consumers, increasing the likelihood of lower prices for households and businesses (provided there is a competitive market).

Second, *efficient infrastructure*. The operator central bank's IP infrastructure (RTGS and database) results in a single-rail scheme that (i) maximises economies of scale and internalises many externalities particular to payment systems (i.e., payers and payees paying for redundant, non-interoperable systems)[36]; (ii) enables provision of liquidity to PSPs by the central bank; (iii) allows the central bank to create synergies with its other regulatory systems/databases, leveraging action against money laundering/fraud and other goals from its regulator role[37]; and (iv) allows the central bank to use decades of expertise/critical mass acquired from running reserve accounts systems, putting them to good use in the IP infrastructure.

Third, *PSPs may focus on products and not rails*. The operator central bank allows the PSPs to develop what the private sector excels at developing: *product.* While the authority manages the IP scheme's operation and IP infrastructure's rails, the PSPs can focus on developing better payment products (cheaper, better, and more innovative) to compete against other PSPs for clients[38]. When Mastercard openly criticised the Fed's intention to provide RTGS back in 2018, its letter encouraged the authority to drop this more interventive role and, instead, "let private industry do what it does best – innovate and compete to meet market demand."[39] That is an excellent reason for the operator central bank *to provide* an IP scheme – so that the PSPs can compete on top of a centralised system instead of competing with the development of redundant rails.

Fourth, *leveraging the operator role with powers from the regulator role*. The operator central bank can combine its powers from its supervisory function to increase its IP scheme's efficiency and adoption rate. The best examples are:

(i) *obligating* the largest PSPs in the respective financial system to participate in the central bank's IP scheme and IP infrastructure. By bringing all their clients to the IP scheme, the PSPs' presence generates instant/exponential network effects. This requirement was fundamental for the success of Brazil's Pix (where all PSPs with more than 500,000 accounts were obligated to join)[40]. The absence of any such requirement in the U.S.' FedNow (a possible result of pressure from American incumbents) might explain its lacklustre adoption by American PSPs.[41] We note

[35] This increased competition in instant payments allows society to further reap the benefits of consumer welfare. As price goes down and quality/innovation go up in payment products, businesses and households spend less and PSPs are pushed to up production, investment and employment. See: Thomas Philippon, *The Great Reversal: how America gave up on free markets*, Belknap Press of Harvard University Press, 2019, p 18.

[36] Central Bank of Brazil, "Vote No. 271/2018-BCB," 20 December 2018, p 45, Exposition of motives for the Central Bank's Communiqué No. 32.927, 2018, which established the guidelines/foundations for the IP scheme which would later become Pix.

[37] Ibid.

[38] Agustín Carstens, "*The future of money and the payment system: what role for central banks?*," lecture by the General Manager of the BIS at Princeton University, 5 December 2019, <https://www.bis.org/speeches/sp191205.pdf>, accessed 15 November 2023.

[39] Mastercard International, "Response to the Federal Reserve System's request for comment regarding potential actions to support interbank settlement of faster payments," *Board of Governors of the Federal Reserve System*, 14 December 2018, p 8.

[40] Angelo Duarte and others, "Central banks, the monetary system and public payment infrastructures: lessons from Brazil's Pix" (2022) *BIS Bulletin 52*.

[41] "If you saw a regulatory action that required faster funds availability, you would then see the type of changes that have occurred all around the rest of the world where there's huge demand for faster payments." See: Suman

that this strategy is not exclusive to IP schemes, and has already been implemented by central banks in wire schemes[42];

(ii) *capping fees* that PSPs may charge from clients to make payments in the IP scheme. While this might initially sound like exaggerated government intervention, it is important to remember that the PSPs are accessing the IP scheme and infrastructure while paying cost price to the central bank. The central bank's strategy when capping fees is to emulate *a state of perfect competition and complete transfer of the low-cost IP infrastructure to the end user*. The Central Bank of Brazil has achieved this by obligating PSPs to offer Pix transactions free of charge to natural persons and small businesses (i.e., those who might be financially included by cheap digital payments), but allowing the PSPs to freely charge non-small businesses. The Reserve Bank of India also adopted this approach by establishing a "zero MDR" rule for consumers and merchants in UPI[43];

(iii) *standardising* ISO messaging formats[44] and APIs to ensure an open-architecture/interoperable IP scheme. From a technology point of view, this is the gateway for the private sector to develop the most diverse/creative integrations (i.e., aggregation of financial and non-financial services like messaging and content), eventually reaching the point of smartphone "super-apps"[45];

(iv) establishing the *governance* of the IP scheme with joint participation/representativity from all segments of the payment sector, like incumbents and entrants, banks, and non-banks (i.e., Brazil's advisory committee "Forum Pix," and the umbrella of Indian institutions under National Payments Corporation of India forming UPI's governance). This leverages the central bank's relationship with the entire sector to ensure that the IP scheme will not be dominated by one private interest or another.[46]

In short, central banks can pair up their roles as operators and regulators to maximise the efficiency of their IP schemes.

Now that the practical advantages of central banks acting as operators have been clarified, especially when combined with their traditional regulatory role, it is possible to address the criticisms explored in Chapter III. Critics argue that there is no market failure justifying such intervention and that central banks create unfair competition against the private sector.

1. First counterargument. There is a market failure, since instant payments depend on coordinated action between PSPs to function properly, and herein lies a problem of collective action

IP schemes require a large number of PSPs to participate, considering that network effects are fundamental for the payment system to be useful for individuals and businesses (that they can

Bhattacharyya, "Brookings' Klein calls for regulators to speed up tepid FedNow adoption," *CFO Dive* (13 September 2023), <https://www.cfodive.com/news/brookings-klein-regulators-speed-tepid-fednow-adoption-instant-payments/693584/>, accessed 19 November 2023.

[42] Central Bank of Brazil. "Vote No. 32/2020-BCB," 12 February 2020, Exposition of motives for the Central Bank's official Letter No. 3,985, 2020, which established the models and criteria of participation in the IP scheme and settlement infrastructures.

[43] Sulivan Rocha, "How Pix compares to UPI and what FedNow can learn from both of them." *Payments CMI* (20 September 2023), <https://paymentscmi.com/insights/comparing-pix-upi-fednow/>, accessed 7 January 2024.

[44] International Standards Organization (ISO), <https://www.iso.org/home.html>, accessed 5 November 2023.

[45] Angelo Duarte and others, "Central banks, the monetary system and public payment infrastructures: lessons from Brazil's Pix" (2022) *BIS Bulletin 52*, p 3.

[46] Central Bank of Brazil. 'Vote No. 271/2018-BCB', p 43, Exposition of motives for the Central Bank's Communiqué No. 32.927, 2018, which established the guidelines/foundations for the IP scheme which would later become Pix.

pay and be paid by many other individuals and businesses). The scheme must reach critical mass. That said, PSPs that wish to participate in IP must bear the costs of (i) substantial investments in the necessary tech to enable the necessary availability and speed of IP, and (ii) cannibalisation of their other payment/lending products in face of IP products (i.e., merchants may stop paying high fees to receive payment by cards, and may stop borrowing emergency liquidity from payday lenders while their non-instant payments are still waiting to be settled). While the upfront cost for investing in IP is high, any actual future revenue is uncertain[47]. This parallel further reduces the incentives for private forces to pursue IP.

These concerns are exponentiated by the *problem of collective action*: a PSP must decide to enter the IP scheme without guarantee that the other PSPs will also enter. At the same time, the scheme will only be functional after reaching a critical mass of end users, which only comes from having a large pool of PSPs. If not enough PSPs enter, the few PSPs that do will have sunk relevant costs in an IP scheme without minimum network effects, thus failing to become functional. In this scenario, even if a PSP does decide to invest in IP, it would not be obligated to provide interoperability with other IP schemes developed by competitors. Dominant PSPs especially have more incentive to not interoperate, considering their larger pool of end users[48].

An IP scheme is only as efficient as how many individuals and businesses it connects. Because of the market failure of collective action, a regulatory guidance is needed to provide certainty to the PSPs that all will enter IP together. This certainty provides the necessary critical mass of end users and sufficient scale for the IP scheme to succeed – in other words, network effects.[49] As we have seen above, a practical advantage brought by the operator central bank is precisely how it may leverage its supervisor role to obligate PSPs into creating its scheme's critical mass.

2. *Second counterargument. Central banks waited for private actors to develop instant payments spontaneously, but that process did not occur fast enough*

This one is quite self-explanatory and presentable through concrete cases. In Brazil, before starting development of world-renowned Pix, the Central Bank went through three stages. First, noticing the advancing financial technology and innovation in the system, the Central Bank waited passively for the private sector to spontaneously develop a functional IP system. Second, when no such spontaneous movement came, the Central Bank actively urged the private sector to start developing an IP scheme. Third, when that did not work, the authority took matters into its hands – by its own words, "in 2018, the difficulty of coordination and the resulting lack of market mobilisation made it clear that private agents would not be able to implement an open solution for instant payments by themselves."[50] As such, the Central Bank of Brazil developed Pix in a dual role of operator and regulator, and, by obligating the largest PSPs to participate in the scheme, saw it to resounding success.

In the U.S., in a similar way, the private sector has been unable to deliver a fully functional IP scheme to date. There certainly were efforts, but not enough to convince the Fed to simply wait for IP to eventually flourish in America – not when Pix, UPI and

[47] CPMI, "Fast payments: enhancing the speed and availability of retail payments" (2016) *Bank for International Settlements (BIS)* p 27–28.

[48] Milo Bianchi, Matthieu Bouvard, Renato Gomes, Andrew Rhodes and Vatsala Shreeti, 'Mobile payments and interoperability: insights from the academic literature' (2023) *Bank for International Settlements Working Paper 1092*, p 37.

[49] CPMI. n 47 p 1.

[50] Central Bank of Brazil, 'Pix Management Report: Conception and first years of operation' (2023).

other practical successes were led by central banks instead of (spontaneous) market forces.[51] It was emblematic that, even after FedNow was launched, there were headlines in October 2023 about how JP Morgan, Mastercard, and ACH had launched a *non-instant* pay-by-bank tool for merchants to receive payments directly from customers' bank accounts.[52]

Once again referencing the theory of economic regulation, one might speculate whether the non-mandatory participation of large PSPs in FedNow was the result of regulatory capture by PSP incumbents in the U.S. (as the concept is described by Stigler and Posner).[53] While there is no concrete evidence to that possibility, there was an array of negative responses to the FedNow public consultation, which indicate that incumbents vehemently opposed the project (and this opposition is naturally extended to any effort to obligate American PSPs to participate in FedNow).[54] Moreover, it is a fact that FedNow still struggles to scale in the same level as Brazil's Pix and India's UPI – two schemes that flourished with the obligatory participation of the largest PSPs.

In short, we can see the very clear demand for IP from individuals and businesses (especially those most vulnerable), and this demand was not satisfied by American PSPs. This failure to provide IP disproves the "needless" part in the criticism of "needless intervention."

On yet another precedent in favour of Brazil and India's approach (and against the U.S.'), the European Union has recently enacted the Instant Payments Regulation (IPR). All PSPs in Europe shall be *obligated* to send and receive payments in Euro within seconds, 24h/7, across the EU – in other words, to offer IP products to their clients. The IPR came into force on 8 April 2024, and the adaption period for PSPs will range from nine to eighteen months.[55] As such, we still cannot draw any concrete data from the initiative – but we can count another regulatory approach of IP being mandated by the regulators, much like Brazil and India, which has had more success than FedNow's approach of voluntary participation by PSPs.

3. Third counterargument. Central banks do not compete with PSPs, thus they are not "unfair competitors"

By developing IP infrastructure and schemes, central banks provide the rails upon which the PSPs compete. Considering all the practical advantages we have seen above, it is not desirable for "competition" to happen at the rail level, else the negative externalities of payment systems be burdened by the end users, in the form of costs for redundant systems. On the contrary, it is preferrable that competition occurs between PSPs on the same rail.

We have concrete evidence of this competition phenomenon taking root in central bank-owned IP schemes. Brazil's Pix brought about considerable financial inclusion, onboarding more than 70 million individuals in the banking system.[56] These are new

[51] Juliana Bolzani, "Leading the Way in Payments: how central banks are using innovation to promote financial inclusion and reshape competition" (2022), *Journal of Law & Commerce 41 1*.

[52] Pymnts, 'JPMorgan and Mastercard pay-by-bank tool goes live', *PYMNTS* (20 October 2023), <https://www.pymnts.com/news/payment-methods/2023/jpmorgan-and-mastercard-pay-by-bank-tool-goes-live>, accessed 3 January 2024.

[53] Sam Peltzman, Stigler's theory of economic regulation after fifty years, *University of Chicago Coase-Sandor Institute for Law & Economics*, Research Paper 925 (2021) p 20–21.

[54] See notes 39 and 62.

[55] European Council. 'Council adopts regulation on instant payments', *Council of the European Union* (26 February 2024), available at < https://www.consilium.europa.eu/en/press/press-releases/2024/02/26/council-adopts-regulation-on-instant-payments/>, accessed 7 June 2024.

[56] Central Bank of Brazil, 'Pix Management Report: Conception and first years of operation' (2023) p 5–6.

clients for depository agents, namely banks and payment institutions, providing new sources of revenue for products and services built on top of Pix – the scheme that financially included these clients in the first place. In the same note, if the owners of different schemes do not offer payment instruments as efficient as Pix's, the process of competition may lead to their substitution in the long run.[57]

It is quite telling how *developing countries* were the ones to take the boldest steps (and reap the largest rewards) to central bank-led IP schemes. Since financial inclusion is arguably the greatest benefit behind IP, it stands to reason that Brazil and India's central banks would invest more time/resources in establishing it, as opposed to more advanced economies. In other words, while IP schemes provide efficiency to the payment system of any country, it also provides developing countries with the means to include a relevant part of their underbanked populace.

4. Fourth counterargument. Central banks are economically neutral actors

As the central bank does not seek profit for its balance sheet when operating an IP scheme (at least to date), there is no economic incentive to actively constitute a conflict of interest. For instance, in the case of Brazil's Pix, the Central Bank authorised WhatsApp to build an instant payment product (WhatsApp Pay) on top of Mastercard and Visa's card schemes. It currently runs parallel to Pix as a functional Brazilian IP product, albeit fully private.

Operator central banks do not compete against the private sector. They lead the way as coordinators of innovation, paving the way for the PSPs to develop IP products on top of a central rail. This rail is the IP scheme owned by the operator central bank.[58] As a neutral entity, a central bank is well-positioned to create an IP scheme that ensures both efficiency for the financial sector and social benefits for the broader society. This includes promoting the inclusion of underbanked households and small businesses.

Taking the opportunity to address a correlated criticism, some have stated that central bank entry into IP would inhibit private investments. We believe these investments will merely be redirected – they will go directly into IP products that will be built on top of the central bank's rail, instead of going into redundant payment rails. An economically and socially positive outcome for society.

V. Beyond the traditional criticisms: Additional concerns that might impact operator central banks

When central banks become operators, they gain access to a more versatile toolkit to fulfil their mandate. Specifically, the mandate of ensuring that retail payment systems are *not only sound*, but also *efficient*. A non-operator central bank does not have access to this toolkit. This toolkit is needed to address inefficiencies and market failures which are not addressed by pure competition in the market. To correct these market failures is no more than the goal of regulation. In fact, the only novelty here is that the operator central bank

[57] Barbara Pianese, "Brazil's PIX a threat to credit cards, but a boon for banks," *The Banker* (27 November 2023), <https://www.thebanker.com/Brazil-s-Pix-a-threat-to-credit-cards-but-a-boon-for-banks-1701073814>, accessed 7 January 2024.

[58] Carlos Portugal Gouvêa and Ricardo Paixão, "Banco central não compete, mas deve liderar mercado" [free translation: The central bank does not compete, but must lead the market], *Valor Econômico* (27 October 2023), <https://valor.globo.com/financas/coluna/bc-nao-compete-mas-deve-liderar-mercado.ghtml>, accessed 9 December 2023.

is not correcting market failures from an *exogenous role (regulator)*, but from an *endogenous role (agent)*.[59]

While we have addressed the most common (and somewhat partial) criticisms against the operator central bank and its IP infrastructure and schemes, there are more legitimate concerns to keep in mind. First, there are opportunities to improve the operator central bank IP model.

We suggest simple *governance solutions* to address some of the criticisms above. There is no apparent reason for the operator role and the supervisor role to be carried out by the same personnel and same department inside a central bank. As such, to prevent any undue use of data from one role by the other, a central bank may distribute the roles to different departments, and establish a functional Chinese wall between them. As benchmark, the Reserve Bank of Australia has a clear division between the commercial department and the other departments.[60]

Besides governance, a minimum *legal mandate* accommodating the operator central bank may deter the allegations of acting outside of Congress' intent. As argued in Chapter II, the central bank's mandate to ensure efficiency and financial inclusion in the payment sector justifies its dual role as both regulator and operator.[61] Still, if a concrete law is put in place, that would further prevent disputes over the boundaries of operator central banks.

Those issues, however, pose no major difficulties to the discussion on the central bank´s operator role. There are far more complicated issues that should be under discussion but are still overlooked due to the attention dispensed to the criticisms addressed earlier.

First, there is data privacy. The volume of personal information generated by daily use of retail IP by individuals and businesses is colossal and being steadily stored by the public authority. A Chinese wall inside the State is needed to address the valid concern of privacy and surveillance powers, considering the plethora of data that may be collected and hoarded by an owner of a payment scheme, and eventually used for nefarious purposes by a public authority without the proper governance.[62] If a central bank owns an IP scheme that generates/stores half a country's payment data, we cannot rely on traditional governance models for this new reality.

Second, and somewhat related, is cybersecurity resilience. Banks worldwide are still grappling with understanding cyber risk and how to quantify and mitigate it. This challenge is heightened by the interconnectedness of today's financial system, the heavy reliance on third-party tech providers, and other consequences of the digital age.[63]

If a central bank operates IP infrastructure and schemes, the cyber risk is further magnified, becoming even more of a concern for society at large. How technically secure are the central bank's data storages (full of individuals and businesses' info) against hacker attacks? How much of the authority's budget is being dedicated to a functional cybersecurity scheme? How effective are their firewalls? What criteria are they adopting

[59] Juliana Bolzani, "Leading the Way in Payments: how central banks are using innovation to promote financial inclusion and reshape competition" (2022) *Journal of Law & Commerce 41 1*, p 172.

[60] Reserve Bank of Australia, "Managing Potential Conflicts of Interest Arising from the Bank's Commercial Activities" (2023), <https://www.rba.gov.au/payments-and-infrastructure/payments-system-regulation/conflict-of-interest.html>, accessed 10 December 2023.

[61] Juliana Bolzani, "Leading the Way in Payments: how central banks are using innovation to promote financial inclusion and reshape competition" (2022) *Journal of Law & Commerce 41 1*, p 117.

[62] Bank Policy Institute, "Response to the Federal Reserve System's request for comment regarding potential actions to support interbank settlement of faster payments," *Board of Governors of the Federal Reserve System*, December 2018.

[63] Michael Barr, "*Measuring cyber risk in the financial services sector*," speech by Michael Barr, the Vice Chair for Supervision of the Fed's Board of Governors, at the Conference on Measuring Cyber Risk in the Financial Services Sector, January 2024. Available at, <https://www.bis.org/review/r240123a.htm>, accessed 24 February 2024.

when selecting contractors for improving all that protection? *Are the operator central banks aware of these discussions?*

Taking a concrete case, Brazil's Pix has faced some data leaks over the last few years due to cyber vulnerabilities in the participating PSPs.[64] The weak link has never been the Brazilian Central Bank itself; the PSPs were penalised, and the leaked data was relatively minor and non-transactional. Still, the leaks ratify the essentiality of increasing the sophistication of cybersecurity in the financial system.

On the same security note, IP schemes greatly facilitate digital fraud, made easier by the fast and irreversible nature of the system.[65] There are already efforts to address the problem by regulators (i.e., KYC, "mule" accounts) and by technology (i.e., behavioural analytics, biometrics, geographical "safe zones" for transactions, etc). Even now, as the Basel Committee enforces the necessity to act on financial fraud prevention,[66] that should be a larger concern for operator central banks that enable millions of retail payments daily through IP infrastructure and schemes.

VI. Conclusion

The brave/digital new world has enabled very advanced technology and high consumer expectation for digital services. In the financial sector, this is best represented by instant payments – to allow individuals and businesses to transfer money with speed, low cost, and availability around the clock. A welcome evolution against classic payment instruments, such as cash (costly to handle and easy to launder), cheques and wire transfers (slow and inconvenient), and cards (costly, especially for small businesses).

Yet, while the efficiencies of instant payments are evident, the private sector was remarkably slow to develop them. As such, central banks have decided to lead the way, building IP infrastructure and schemes with a dual role of regulator and operator. They leverage their institutional positions as economically neutral actors to take the reins and develop IP infrastructure and schemes with low entry cost, rulebook enforcement, and (preferably) mandatory participation by relevant PSPs. In a way, *the central banks play in IP a structurally similar role to Mastercard and Visa's roles in cards – owners of a payment scheme.*

These IP schemes owned/operated by central banks have had resounding success, especially in Brazil (inclusion of 70 million persons) and India (over 300 million active users). Both schemes are led by their countries' central banks, involved obligatory participation by the largest PSPs, and mandatory low/zero cost for individuals and small businesses (thus emulating a "perfect competition" scenario where the low cost of the PSP is passed on to the consumer).

By now, many reports have praised the practical advantages of IP infrastructure/schemes owned by central banks. This paper innovates by putting these practical advantages through the stress test, responding to market-oriented rhetoric levied by interested parties against operator central banks (with the corroborating data).

First, to address the claim of "needless government intervention without a clear market failure to justify it." While there may be potential gains from IP (i.e., larger customer bases,

[64] Larissa Garcia and Alvaro Campos. New leak threatens Pix's credibility. *Valor International* (3 February 2022). Available at <https://valorinternational.globo.com/business/news/2022/02/03/new-leak-threatens-pixs-credibility.ghtml>, accessed 24 February 2024.

[65] Lucas Caminha, "Pagamentos digitais, fraude e a eterna tensão entre usabilidade e segurança: Resolução Conjunta nº 6 de 20232023" [free translation: Digital payments, fraud and the eternal tension between usability and security: Joint Resolution No. 6 of 2023], *Boletim Revista dos Tribunais Online 41* (July 2023).

[66] Basel Committee on Banking Supervision (BCBS), "Digital fraud and banking: supervisory and financial stability implications" (2023), discussion paper issued for comment, *BIS*, November 2023, p 1–2.

improved loyalty, rails for innovative products), these gains depend on a large enough number of PSPs developing/participating in IP, and they may choose to favour the guaranteed revenue of less efficient payment instruments. This is a market failure of collective action, thus justifying regulatory guidance. As clear evidence to the problem, no fully private IP scheme has been as successful as Brazil's Pix and India's UPI, and even these were only developed when it became clear that PSPs were not gaining meaningful ground on providing instant payments.

Second, we need to address the claim that central banks owning IP schemes are a "source of unfair competition and conflict of interest against private agents." We argue that central banks do not compete as innovators, but rather lead the way as coordinators for innovation. At most, central banks use the operator role to develop IP schemes that maximise efficiency and network effects – with fundamental assistance from the regulator role – and enables full competition between the PSPs on top of the central bank's rails (with more innovative IP products for the end users).

While major scheme owners are challenged by the Brazilian Central Bank's IP scheme (i.e., card networks and closed-loop schemes), depository institutions and payment initiators rejoice as they welcome new clients aboard. More individuals and businesses embark into the system, enjoying an easier and cheaper mechanism to transfer money, and consumer welfare flourishes.

For future research, it is essential to understand how the creation of new functions for instant payments aids in social inclusion and competition with other payment methods. Additionally, examining the potential impact on international business growth between countries from implementing cross-border instant payment systems is necessary.

Competing interests. The authors have no conflicts of interest to declare.

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