

Digital topologies of finance: Pix fast payments and Central Bank regulatory policy in Brazil

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ABSTRACT

This paper aims at shedding light on the central role played by the Pix instant payments scheme as an instrument used by the Central Bank of Brazil to steer the regulatory governance of an increasingly digital payments system. So as to achieve this objective, the paper first assesses the history of recent regulatory reforms that paved the way for new digital entrants in the payments industry. Second, this research highlights there is a new transformation in course, fostered by the growing convergence of the digital economy, technology platforms and new payments-centered business models. Third, instant payments are put into perspective as part of the regulatory policy inventory aimed at dealing with digital economy challenges, especially in regard to network effects. The paper further analyzes core attributes of the Pix scheme and demonstrates how regulatory governance led by the Central Bank has been central for its wide adoption and resulting network effects. In lieu of conclusion, the Pix scheme is presented as a key policy instrument to calibrate regulation and competition in the digital payments industry, while also renewing the central bank's gatekeeping role in the digital arena of an emerging economy.

Keywords: Pix; fast payments; payments system regulation; competition; digital economy.

1. Introduction

The delay in processing and compensating payments could have negative consequences for end users, especially for low-income communities and small businesses, which rely more heavily on immediate cash transfers to sustain household budget and cash flow (Conti-Brown & Wishnick, 2020, pp. 397-400). Operational bottlenecks, additional costs and fees that burden end users in traditional credit or debit cards and account-to-account transfer schemes could be radically mitigated when it comes to instant transfers. Fast payments are also significant for industry-level organization, notably due to their strong network effects in the payments market, and also considering its entanglement with the payments infrastructure architecture itself (CPMI, 2016). In this sense, it is a solution that should be considered by policymakers.

The Central Bank of Brazil (BC) has been pushing the fast payments agenda through Pix, a public retail fast payments scheme (CPMI, 2016) created in august 2020 and controlled by the BC. Recent data demonstrates that transactions made through Pix have been growing at astonishing rates. By the time it had completed one year of operation (october of 2021), Pix had already been used for over 7 billion transactions made by 118 million end users, including 8,5 million companies and businesses and 104,4 individuals - which is equivalent to 62,4% of the Brazilian adult population.

Pix has consequently become a popular means of payment for personal finance¹. Nearly 45% of individual Pix users had not used any other electronic deposit transfer method in a 12-month period prior to using Pix, signaling that the new BC-run structure has been enhancing digital payments and financial inclusion at some level. Its considerable growth and popularity are not accidental, but rather demonstrate the potential of promoting fast payments systems and its significant impact on everyday lives (Conti-Brown & Wishnick, 2020, p. 381), making it an attractive substitute for the use of cash. Pix's reach was further boosted by the

¹ From march through october of 2021, the adoption of Pix by individuals grew at a rate 52% considering all ranges of income. However, considering only the low-income population, this rate jumps to 131%. Additionally, 60% of P2P Pix transactions were under BRL 100,00.

simplicity of the scheme and its wide adoption, which is mandatory for large commercial banks and optional to other payment service providers (PSPs), including new fintech entrants and digital challengers.

BC has defined a progressive agenda for Pix including new features and technology expected to be rolled out in the coming years, following the scheme's immediate success. The regulator aims at amplifying Pix as a tool for public-private coordination and also to induce competition policy among incumbent banks, payment institutions, fintechs and big tech companies. Therefore, analyzing competition and innovation policy in the Brazilian payments and financial industries requires considering the state-owned Pix infrastructure as a key element.

Pix is not an isolated initiative, but rather part of "Agenda BC#", a set of regulatory and operational reforms in the Brazilian financial system led by the Central Bank and backed by the National Monetary Council (CMN), the highest financial system regulatory body in the country. This agenda further includes measures such as the creation of Real Digital, a retail Central Bank Digital Currency (CBDC), and the implementation of an open banking ecosystem. These initiatives are being bundled into a policy toolkit used by the Brazilian regulator to cope with two distinguished elements. First, BC has set itself the strategic goal of enhancing competition and reducing asset concentration in retail financial services in Brazil, a country where until very recently 5 major banks had a combined market share of over 80% in the provision of loans and account services. Second, the regulator has been facing an intense process of financial services digitalization over the last 5 years, expedited by the hyper-growth of neobanks (Nubank, C6, Inter), digital wallet fintechs (PicPay, Mercado Pago) and a growing presence of big tech companies in financial services (Facebook Pay, Google Pay). Digitalization was further amplified due to a shift of habits related to social isolation measures to fight the Covid-19 pandemic.

This paper explores central aspects of Pix regulation against a backdrop of experimental regulatory policy responses to promote competition in digital financial services (Brummer & Yadav, 2019). Recent initiatives and the Pix infrastructure governance are further put into perspective considering the central bank's efforts

to renovate its role not only as a catalyst of competition, innovation and inclusion, but also as a provider of financial stability. In this regard, the creation and existence of Pix can be deemed as an endeavor to build a contemporary agenda of digital finance regulation through payments system governance. So as to achieve this goal, BC plays a hybrid role as regulator, system operator and catalyst of innovation and change (CPMI, 2021).

The text that follows is organized in two parts. The first one addresses recent milestones on competition and innovation policy in financial services in Brazil, with special regard to payments services. There is a focus on legal and regulatory reforms which boosted the emergence of new entrants, including fintechs and other digital challengers, and expanded the connection between digital economy and payments market realms. Additionally, the first part addresses instant payments as a solution that matters to the digitally-native environment, in which network effects are fundamental. The second part explains the core regulatory aspects of Pix, focusing on scope of participation, account data and liquidity provision infrastructures and new features perspective. Finally, the paper highlights the role of Pix as an adjustable tool for steering digital payments governance, thus central to promoting and gatekeeping new digital topologies in the financial system.

2. Payment services competition and digitalization in Brazil

The provision of payment services has been historically attached to the existence of commercial banks. Not by nature, but rather by legal constructions which until very recently restricted the provision of payment services mostly to those institutions (Awrey, 2021). Those legal measures created barriers to entry which only recently began to be tackled by a combination of innovative market forces, technological advancements and contemporary public policy goals reflected in the regulatory agendas worldwide, as is the case of Brazil.

The country went through a process of banking consolidation and market concentration which took place from the late 1990s until early 2010s. Five major commercial banks² got to own over 80% of financial assets and held around 75%

² Itaú and Bradesco - private, national; Santander - private, international; Banco do Brasil and Caixa Econômica Federal - public, national (federal government).

of credit operations in their balance sheets (BCB, 2018, p. 144-145). This transformation resulted from a series of federal government and BC articulated responses to the Brazilian banking crisis throughout the mid-90s and following the 2008 global financial crisis (Mouallem, 2021). The institutional architecture of the payments market followed this pattern and was closely linked to the provision of services through entities controlled by major banks, which would vertically control key infrastructures of the payments industry, including card transactions acquirement, processing and compensation (BCB, 2005; Salama, 2020). Transferring pocket money or paying a bill at the restaurant would therefore imply using a bank-controlled chain of services through a handful of providers with exclusivity to operate in private payment schemes³, yielding negative effects over consumers (BCB, SEAE, CADE, 2010).

In 2013, the National Congress approved Law 12.865/2013, also known as the Means of Payment Law. The legislation resulted from a bill presented by the federal government and backed by the central bank to create new parameters for regulating and supervising the National Payments System (SPB). As a result, BC's powers were widened so as to fully include the payments system (Aguiar et. al., 2021). The Means of Payment Law introduced the regulated figure of Payments Institutions (IPs), licensed under BC authorization and which would then start offering payment accounts, which resemble checking accounts, convert cash into electronic money and provide a variety of payment services independently from commercial banks and other incumbent institutions.

The central bank would further require that resources deposited into payment accounts provided by new IPs to be fully backed by federal bonds held by payment institutions or in central bank reserves, an important measure to ensure liquidity. Law 12.865/2013 and BC regulation also determined that payment schemes and IPs would be supervised so as to ensure interoperability, non-discriminatory access to payments infrastructure, and further pursue financial inclusion through quality, safety and transparency. The new legislation also provided BC with full autonomy to issue infralegal regulation related to IPs, increasing the room for agile calibrations and policy experimentation.

³ Visa and Mastercard, for instance, pushed for exclusivity over acquirers' point-of-sale and merchant fidelization.

As a result, new IP licenses granted by the BC paved the way for experimentation and growth of new business models centered on payment services and digital wallets. As autonomous IPs began to consolidate, regulatory reforms also gave room for the provision of payment services provided by digital e-commerce platforms, such as Mercado Pago, and to the astonishing growth of digital challenger fintechs like Nubank, which has grown its customer base and market value to the size of commercial banks, but centered on payments services and relying on IP as a core license. Payment institutions grew and started playing a key role in the industry digitalization process.

In may 2017, the Board of the Central Bank expressed they would extend the competition-based regulatory agenda so as to enable credit provision directly by fintechs. BC had already been conducting a *de facto* regulatory sandbox by allowing credit fintechs to operate under a scheme of correspondent banking contracts, through which they would act on the final interface with the customer (e.g. offering credit through lending marketplaces), on behalf of an authorized credit provider, such as a commercial bank. BC then issued Resolution 4.656/2018, creating new regulatory licenses for a Balance Sheet Lending Society (SCD) and a Peer-to-Peer Lending Society (SEP). These two simplified financial institutions were aimed not only at bringing credit fintechs directly under the regulatory perimeter, but also at providing them with autonomy to raise capital and formally undertake final decisions in credit operations, also providing digital wallets and payment services. Those measures further incremented the offer of digitally-native, bank-independent payment services.

In that regard, both Payment System legislative reform and credit fintech regulation were milestones in the process of unbundling financial and payment services in Brazil, thus fostering alternatives to incumbent bank institutions. The regulator demonstrated it wanted to push towards a different topology in the financial system, less dependent on a proprietary logic of services provided exclusively by commercial banks, which had been consolidating market share and power through horizontal and vertical integrations⁴.

⁴ Brazilian federal government and BC had pushed a policy agenda and a set of reforms including PROER and PROES aimed both at reducing the direct role of the state in retail financial services provision, and also at concentrating assets and services with a smaller number of financial institutions, so as to mitigate the costs of regulatory supervision and enable economies of scale.

As of march 2020, the Covid-19 pandemic outbreak increased the pace of payment services digitalization (CPMI, 2021). Policymakers were faced by challenges resulting from social distancing measures, which included promoting new forms of fast cash remittance for emergency reliefs (Didenko et. al., 2020, p. 40). For instance, the Brazilian federal emergency relief was transferred to over 66 million beneficiaries through newly created digital payment accounts at *Caixa Tem*, an app provided by Caixa Economica Federal, a state-owned federal bank. This arrangement promoted the first contact of tens of millions of users with digital finance and payments, thus fostering a massive change of habits relevant for accepting new payment technologies (Hartman et. al., 2020, p. 11).

Following the outbreak of the pandemic, BC and CMN introduced new open banking regulation in the country in may of 2020⁵. The new regulation was aimed at defining the ecosystem governance framework, such as minimal scope and criteria for mandatory participation, and also paved the way for Payment Initiation Service Provision (PISP) - or third-party payment services - as a mandatory scope for banks and IPs, and which would be integrated with the Pix scheme. In june of 2020, shortly after the regulation of open finance, Facebook (Meta) announced the launch of WhatsApp Pay in Brazil. The Brazilian market had been chosen for the global debut of Facebook's payments product . The solution was based on the messaging app and designed as an arrangement including payment schemes Mastercard and Visa, major transaction acquirers such as Cielo and Rede, as well as Banco do Brasil, a federal government state-controlled bank, and Nubank, the biggest neobank in Brazil. They would enable a private system of digital transactions embedded in the social network platform.

However, Facebook's announcement was followed by a backlash from public authorities (Aguiar et. al., 2021a). CADE, the national competition and antitrust watchdog, issued a preliminary injunction preventing the payments system from going live. Its rationale was based on anti-competitive risks that could be caused by the private arrangement between Facebook and Cielo, an important payment acquirer (CADE, 2020). The preliminary measure was lifted shortly after,

This trend was predominant until the mid 2010s, when payment institutions, fintechs and more recently big techs entered the playing field and started to compete for what was exclusive of banks, thus enhancing competition while accelerating digitally-native products and channels.

⁵ Resolução Conjunta n. 1/2020

but Facebook's initiative would remain vetoed by the central bank. BC issued a public statement communicating it had determined Mastercard and Visa to suspend the announced partnership with Facebook and immediately cease using WhatsApp for payment initiation and money transfer within their supervised payment schemes (BC, 2022). Furthermore, BC stated that the intended WhatsApp Pay operation would have to be preceded by the process of authorization of Facebook as a regulated PISP⁶.

Both the approval of the new payments legislation in 2013 and the regulation of credit fintechs in 2018 were turning points for the arrival of new entrants in the payments market. There are currently 134 companies licensed under those regulatory regimes, ranging from niche-focused fintechs, to massive neobanks and digital wallet providers. BC policymaking thus actively promoted the entrance of those players, demonstrating an intent to stimulate new topologies in the organization of the financial system. The aim was to promote institutions less dependent on banks, but still under BC supervision. In sharp contrast, BC's recent response to Facebook indicates greater caution with network effects and policy matters regarding big tech companies and payment services. In this sense, payments were defined as an important channel to define governance in the digital financial system.

2.1 Payment services and the digital economy

The convergence between the financial sector and the digital economy has been especially intense in emerging economies, where the provision of digital wallets and other payment services by tech companies has been playing a fundamental role in fostering innovation, promoting competition and expanding financial inclusion through the use of new technologies (CCAF, 2020; Croxson et. al., 2022, p. 10;). In India, for instance, there is a central instant payments platform, the Unified Payments Interface (UPI⁷), which has been bolstering the range of payment services due to its integration with a public digital identification

⁶ Although the framework regulation for PISP services in open banking had already been included in Resolução Conjunta n. 1/2020 (open banking regulation - May of 2020), the specific license for PISP as a modality of regulated Payment Institution would only be incorporated in the National Payments System later, on October of 2020.

⁷ UPI is owned and operated by the National Payments Corporation of India (NPCI), a not for profit company controlled by the Reserve Bank of India (RBI) and Indian Banks' Association (IBA).

infrastructure (the "India Stack") as well as other utility-like services which are connected with final user interface provided by tech companies and new entrants⁸. The combination of public infrastructure and private digital platforms run by tech companies was central for increasing the access to transactional accounts in the country, which in 2008 was restricted to 10% of the adult population and by 2021 had skyrocketed to 80% (Croxson et. al., 2022, p. 11).

India is an important example of how non-banking corporations and big technology platforms are increasingly connected with payment services. Core activities performed by those platforms, also known as big techs, consist of promoting interactions among different groups of users in a multi-sided market structure that promotes unique exchanges of information and therefore generate value which would not exist otherwise (Rochet and Tirole, 2003; Gawer, 2014; Pfeiffer, 2019). This platform structure enables a combination of different products and cross-subsidies between different business modules⁹, as a source for increasing network effects - the larger the amount of end users, the greater the value from a given good or service marketed through the platform¹⁰.

Financial products, including payments, begin therefore to be gradually incorporated as part of the platform architecture portfolio. Frost. et. al. (2019, p.3) argue that this new structure has the potential of transforming the financial industry as whole, since it would progressively resemble the digital economy dynamics, in which the dispute for data-driven markets is the one that prevails. Lagarde (2018) claims that this new model of financial intermediation relies on the disaggregation of financial services provided by banks, and also on artificial intelligence and data processing capabilities provided by digital platforms, which would then be gatekeeping market access to regulated financial institutions, including their balance sheets, thus challenging the current regulatory rationale. Payment capabilities would play an important role in this ongoing transformation.

⁸ including Google Pay, WhatsApp Pay (Facebook - Meta), PhonePe (Walmart) and Paytm (Ant Group).

⁹ On possible offer side cannibalization, see generally OECD (2017).

¹⁰ As a platform decreases prices, a larger number of buyers are prone to engage and connect to platform services, which further stimulates more sellers to also connect to the platform, from the supply side. A greater variety on supply, on its hand, boosts the demand side (Rochet & Tirole, 2003).

Brunnermeier, James and Landau (2019) argue that payment services are the ideal partners to digital platforms such as social networks and online commerce. Payments - unbundled from strictly financial institutions - would connect the realm of financial services provided by banks (i.e. loans, insurance) and the platform-based universe. This industry reorganization could reverse the position occupied by payments in the financial services hierarchy. It used to orbitate as an ancillary element to other services provided by commercial banks, such as credit, insurance and deposit accounts. Hence, payments occupied a lower position in the hierarchy of financial services and was dependent on more profitable functions exercised by banks (Brunnermeier, James and Landau, 2019). However, this position could be completely reversed in a platform-based digital economy of financial services.

This applies not only to big tech platforms entering financial services, but also to new PSP and fintech entrants and, most importantly, to incumbent actors, such as commercial banks which have been gradually altering their business models so as to partially replicate the digital platform logic (Croxon et. al., 2022; Aguiar et. al., 2021b, p. 183). On one hand, the operational rationale of digital platforms accounts for turning them into conduits for expanding financial services at low costs - especially through payment capabilities. Nonetheless, on the other hand, they also pose significant threats to competition which are related to its role as gatekeepers and to conflicts of interest that emerge between platform and service provider (Khan, 2019; Croxon et. al., 2022). However, those emerging risks could be addressed by a wider approach towards regulatory policymaking, combining elements of specific sectorial regulation (payments) with broader aspects of competition and data portability (Gonçalves, Coutinho and Kira, 2022).

2.2 Instant payments governance: opportunity and challenge for policymaking

The retail payments market organization presents significant economies of scale and scope. A significant share of those are a result of high fixed costs related to technology infrastructure, in particular to setting up a reliable messaging traffic and to compensating financial resources between institutions, combined

with a low marginal cost to offer services to new customers on top of the existing infrastructure (BCB, 2005; BCB, SEAE, SDE, 2010). Network effects - or externalities - are amplified in cases of vertical integration among payment service providers (PSPs), such as banks, and payment infrastructure controllers, like acquirers, or payment scheme owners (Rosenbaum et. al., 2017). The urge of redistributing those network effects was one the major drivers to support previous payment system reforms in Brazil, including the 2013 legislation. It is once again a priority in the regulatory agenda, so as to cope with the integration of payments and the digital economy.

Accordingly, central banks and regulatory authorities have been working to update their regulatory governance playbook. This has to some extent included the adoption of fast or instant payments services¹¹, partially or totally controlled by the government and integrated with private PSPs (Ponce, 2020, pp. 128, 131-132; Carstens, 2019, p. 145). The creation of those systems and schemes gives rise to new competition dynamics among PSPs, considering they comprise a new common infrastructure as a basis to develop new products and offer high-valued services for end users (CPMI, 2016, p. 56).

It is fundamental to coordinate efforts regarding the common technical and governance frameworks of fast payments, so that open access and interoperability are materialized and serve as a factor of distribution of network effects, thus preventing its capture by a handful of players (CPMI, 2016, p. 29; Ponce, 2020, p. 143). As different as each fast payment service might be, policymakers have therefore a challenge of directly tackling or overseeing common issues related to technological requirements, minimal product and business standards and compliance duties that apply to private participants (CPMI, 2016, p. 58). Building an FPS also requires that regulators consider clear parameters of governance for decision-making processes including tech and product requirements, which is fundamental to fostering competition, rather than promoting concentration (Awrey and Macey, p. 4-9).

¹¹ Fast or instant payments enable final and irrevocable payments, executed real-time and available 24 hours a day, everyday of the week (CPMI, 2016, p. 6; Alfonso, Tombini e Zampoli, 2020, p. 77). The availability of funds to the payee should be simultaneous to the payment order message sent by the payer (CPMI, 2016).

This policy approach is relevant to preserve digital platform's vocation of expanding access to payment services at a low cost, while also ensuring that positive network externalities are available at the industry level (Croxson et. al., 2022, p. 6). In that regard, public authorities' action would be a justifiable way to prevent both excessive infrastructure fragmentation - which would lead to inefficiencies - and control over common infrastructure leads to barriers of entry to fast payments (Ponce, 2020, p. 153-154).

Instant payments are further considered a tool to prevent incumbent banks obsolescence before new solutions presented by new non-banking actors, which have been confronting banks' control over payments systems on a worldwide scale (Adrian et. al., 2019; Hartman et. al., 2020, p.8). As a result, FPS matters both to incumbent banks and new digital challenger entrants. In addition, Hartman et. al. argue that the degree of openness to non-bank PSPs can increase pro-competition benefits in the long run (2020, p.14).

Therefore, there is a fundamental policy challenge faced by public authorities not only in keeping the integrity of payment systems, but also in channeling the creativity and innovation drivers of private actors - old and new entrants - and steering them towards public policy goals to foster competition, consumer protection and inclusion (Carstens, 2019; Alfonso, Tombini and Zampoli, 2020).

3. Central aspects of the PIX infrastructure governance

Pix is a fast payment scheme (CPMI, 2016) created and operated by the Central Bank of Brazil which enables immediate fund transfers, at any time of the day, and during all days of the week¹². It can be used both by individuals and companies so as to order payments or transfer resources from their transactional accounts - which contemplate both checking and savings accounts, offered by banks, as well as pre-paid payment accounts, which are offered by payment institutions and the majority of fintechs. Unlike other payment methods (e.g. TED transfers, *boletos* payment slips, credit and debit cards), there are no fees charged for Pix payments made by individuals, nor is there a minimum value for

¹² Specific transaction limits might apply according to PSP anti fraud policy and time of the day.

transactions. This contributes to its boosting popularity and wide use for small transactions, including informal economy.

The list of participant institutions in the BC-run Pix scheme encompasses a wide range of authorized institutions. These range from commercial banks and credit cooperatives, to payment institutions and credit fintechs, which can all be part of the FPS. However, Pix participation is mandatory under certain circumstances, for instance when a bank or payment institution has over 500 thousand active transaction accounts. Once meeting this threshold, PSPs must formally enter Pix and start providing their clients with a basic set of Pix functionalities, run by the PSP in accordance with Pix standards debated at the Pix Forum¹³ and regulated by BC. Government bodies like the National Secretary of Treasury can participate in order to collect taxes or receive payments related to their activities. There are currently 776 Pix-participant institutions - both mandatory and voluntary (BCB, 2022), meaning that the majority of retail banking and payments institutions in the country are part of the scheme.

3.1 Transaction Accounts Identifiers Directory (DICT)

The payment receiver end user can be easily identified through the use of Pix Keys, a proxy lookup functionality offered through the Transaction Accounts Identifiers Directory (DICT¹⁴). DICT is a repository for all simplified identification keys registered by the end users through their PSPs. One could register, say, their email address, social security number, or cellphone as a Pix Key. Once the key is registered, the payer end user only needs to know this Pix Key information so as to identify the payee, which facilitates the process of identification, reduces friction and further ensures that individuals have a central log of their identifications, which also enables the portability of those keys among Pix participant institutions. This kind of functionality has been growing among FPS around the world (CPMI, 2021, p.3), and reduces the burden for individuals of switching accounts from a bank to a fintech, vice-versa.

¹³ Forum with recurrent meetings where regulator and industry meet to discuss central aspects of the scheme, new feature rollout, technology etc.

¹⁴ Diretório de Identificadores de Contas Transacionais.

The expenses incurred by the Central Bank with systems and technology resources deployed to operate Pix are funded through fees collected from the participant PSPs on a pay-per-use basis, especially considering DICT and SPI operations. The fees are charged exclusively for reimbursing the Central Bank for operational expenses, and are not aimed at yielding profit. They are calculated based on the traffic volume of files requested to the Pix Key Directory (DICT), so that PSP users can easily identify the address of the transaction receiver, or by the amount of credits resulting from the settlement of an instant payment order.

2.2 Instant Payments Settlement System (SPI) and compensation among participant PSPs

Liquidity risks in fast payment systems are usually associated with positions' settlement mismatch between participant institutions. This risk is mitigated when the time gap between payment order and its settlement is reduced, and also when each payment order is settled between participant PSPs in real time (Didenko et. al., 2020). Furthermore, deferred settlement between PSPs could result in difficulties to scale FPS among new entrants (Conti-Brown and Wishnick, 2020, pp. 395-397).

The compensation of funds transferred through Pix between participant PSPs is individualized per transaction and also made in real-time through the Instant Payments System Settlement System (SPI), run by the central bank to sustain Pix. Participant PSPs can be either direct or indirect participants of the SPI facility. Direct participation is mandatory for commercial banks, multiple banks and savings banks, while optional to other institutions. Indirect participants settle their Pix transactions by contracting either with a direct participant, or with a special liquidation provider¹⁵.

Moreover, the central bank is authorized to provide liquidity to SPI direct participants through rediscount lines. BC runs a repurchase operation of federal

¹⁵ BC is allowed to use the SPI in order to provide liquidity to direct participants. BC can undertake repurchase operations of federal SELIC bonds, thus through lines of redescout that are exclusive for PIX. These institutions clear their positions regarding each individual payment order in real time through and IP Account, a wholesale central bank account. The goal of the redescout mechanism is to ensure liquidity for Pix participants out of the time window for settlement through the Sistema de Transferência de Reservas (STR), a Real-Time Gross Settlement mechanism (RTGS).

bonds with direct SPI participants, so as to ensure liquidity to Pix institutions, in particular outside regular banking hours¹⁶. Hence, the SPI operation nearly eliminates financial risks associated with credit and liquidity, which otherwise would be present in a system of deferred settlement (CPMI, 2016, p. 48), thus reducing the burden for smaller institutions to enter the payment scheme.

2.3 Progressive rollout agenda and new use cases

In November of 2021, BC launched the functionalities Pix "saque" (cash withdrawal) and Pix "troco" (cash for change), moving towards the adoption of Pix as an offline solution as well. Both functionalities allow for the end user to withdraw money in cash at retail commercial establishments registered as Pix agents. By using Pix saque, the end user orders an instant money transfer to the registered withdrawal agent - say, a bakery - who in turn will hand him over the value in specie equivalent to the transfer. Pix troco has a similar dynamics, but instead the client orders a Pix payment related to an item with a determined price, plus an additional amount that client would like to withdraw from their account - through to baker, rather than through an ATM - and this additional value is then handed to them in cash, in a similar way to the change for a payment made in BRL bills. This arrangement is an alternative to services offered by bank agencies, ATMs and correspondent banks, with a special appeal to remote areas and countrysides of Brazil, where handling cash is a challenge for financial institutions.¹⁷

Furthermore, BC plans to use Pix for automated debit transactions and cover recurring payments use cases, such as utilities bills, and also variable recurring payments ones, like ordering food through a delivery app. These capabilities embedded in Pix are expected to enable solutions for e-commerces checkout, boost smart savings and smart investment solutions and further decouple financial and payment services from distribution channels, thus further extending the ubiquity of payments in the digital economy.

¹⁶ Other account-to-account transaction schemes are covered by Sistema de Transferência de Reservas (STR), a different liquidity facility.

¹⁷ The client can withdraw money free of charge up to eight times per month in both modalities. The baker or restaurant owner participating in the arrangement, in turn, are compensated by the end user PSP for each transaction and withdrawal made.

The Pix initiative is still deeply connected to the Brazilian open banking ecosystem, a set of rules and technological parameters for permissioned data and service sharing among banks and a wide range of institutions. BC defined that Pix would be the first payment scheme to enter open banking, meaning that certain Pix participant institutions will have to open their payment APIs so that every authorized PISP¹⁸, which is a third-party provider, can initiate a payment as ordered by the account holder. As a result, Pix and its progressive agenda are incorporated as the backbone of open banking payments in Brazil. This should enable Pix to further escalate and enhance additional network effects. Guimarães (2021, p. 134) argues that the creation of Pix, its connection to open banking and the rise of new digital entrants in the financial system are mutually reinforcing factors, presenting new elements of competition dynamics in the digital payments market.

Finally, BC aims at enabling offline Pix transactions, which are useful for situations in which there is no stable internet connection, as well as providing international remittances and transactions. BC also refers to Pix as a preview of the financial and payments systems redesign around the Real Digital, a project for a CBDC lead by the Brazilian authority.

2.4 Pix infrastructure as a tool of public policy

Public authorities have been playing a central role not only in conceiving, but also in developing and operating fast payment systems (CPMI, 2021). In that regard, the Brazilian central bank's engagement as the catalyst of Pix, as regulator, gatekeeper and operator, is in line with public policy motivations driving public authorities' roles in promoting fast payments in other countries (CPMI, 2021). In the Brazilian experience, BC also determines the perimeter of mandatory and optional participants, as well as fee exemptions and rules for end users. Pix is

¹⁸ Payment Initiation Service Provider. A special license created by the central bank to operate on the open banking ecosystem. Payment initiation services occur through API calls ordered by the end user and executed between open banking participant institutions, so that the Payment Initiator Service Provider will order the client PSP - where they hold money in transaction accounts - to undertake a certain transaction or payment, following the flows defined by the open banking arrangement. It is a third-party payment capability. Payment initiation services are being rolled out during the third phase of open banking, as an additional service layer on top of existing payment schemes.

considered an example of success among fast payment systems in Latin America (Alfonso, Tombini e Zampoli, 2020, pp. 77-78).

Table 1 - Pix as tool for digital finance governance

	Central Bank Policy tool	Digital topologies of finance calibration courses	
	Pix scheme regulatory governance	Competition: new entrants vs. incumbents	Network effects: digital payments & tech platforms
1	General rules of mandatory and voluntary participation	Mandatory incumbent participation positive for population outreach. Flexibility for new entrants, but with a proportional compliance bar.	BC as ultimate manager of network effects resulting from digital instant payments
2	Account information directory control	Simplifies client acquisition for new entrants, increases contestability.	Data portability under governance rules and supervision
3	Special facility for real-time compensation	Nearly eliminates liquidity risks and reduces burden for new entrants, especially through partnership arrangements	-
4	Progressive agenda and future perspective	Standardization of operational requirements and conduit for industry engagement	Room for innovation in products, services, UX and end user interface. However, vigilant for infrastructures that could capture network effects. Backbone of CBDC and other innovations.

Source: self-elaborated

Wide PSP participation, either directly or through indirect arrangements, is a key aspect of its relevance for the digital payments system in Brazil. The regulator managed to assemble commercial banks, small credit cooperatives, neobanks, payment institutions and credit fintechs, all of which had to develop service features under the Pix governance standards. By promoting Pix, BC has built within its perimeter of governance an infrastructure in which banks, fintechs and digital platforms might operate interconnected solutions - either competing of

cooperating with one another¹⁹. Hence, it presents a new level playing field of standardized parameters of technology and architecture, which nonetheless recognizes differences across players of multiple sizes and roles and set a proportional baseline for challengers (Omarova, 2020). This ongoing action has been important to promote and distribute positive network externalities at the industry level.

4. Conclusion

The ongoing processes of finance digitalization - with special regard to payments - pose emerging challenges for central banks and public authorities in their role as ultimate financial architecture gatekeepers. Regulating and implementing fast payments systems are feasible measures for policymakers at the national level to increment the existing tools to manage the transition towards new digital dynamics, aligned with public policy objectives (Alfonso, Tombini & Zampoli, 2020; Didenko et. al., 2020, p. 48). The Brazilian BC has chosen this path as part of its policy towards digital entrants.

The Pix endeavor should also be considered as a response which is twofold. On one hand, promoting competition and transitioning towards a less concentrated financial system amidst a growing presence of fintech entrants and tech companies, as well as new business models being operated by incumbent banks. On the other hand, the need to coordinate the digital transition and ensure that new entrants and digital platforms provide inclusion at a low cost, while also preserving competition standards and financial stability.

In a nutshell, BC has increased its efforts towards a pro-competition agenda through Pix. In this regard, it remains a pro-Fintech movement, but with a more direct and operational role led directly by the public authority. It is not an uncontested agenda, though. Incumbent bank federations, payment acquirers controlled by banks and credit card company associations have been resisting this agenda indirectly, by advocating against simplified requirements for new entrants²⁰

¹⁹ Through embedded solutions, such as white label payment services.

²⁰ See, generally, a narrative of regulatory asymmetries for similar activities, sponsored by FEBRABAN, incumbent banks federation. BC responded and raised regulatory compliance requirements for large fintechs licensed as Payment Institutions.

and classifying Pix simply as another payment scheme, rather than a public infrastructure²¹. In this sense, incumbents argue that BC should also beware of its own exercise of power vis-a-vis Pix's market position.

It is also worthy to notice that while adopting a more flexible approach towards fintechs and being actively favorable to open the market to new entrants (Ferreira, 2019), BC has demonstrated that it will undertake command-and-control actions whenever needed as gatekeeper of the digital governance, such as in the Facebook Pay event. BC played a more defensive role in order to preserve Pix as the ultimate facility for dealing with instant payments.

Finally, the Brazilian fast payments scheme should thus be deemed as a critical infrastructure on top of which the future of digital payments and finance is being shaped incrementally by public authorities and private parties. Its core governance framework - participation requirements, account information directory, special liquidity facilities and evolving agenda - along with a propensity to consolidate as a universal fast payments system position the scheme as a key element in BC's strategy towards the digital financial system. So far, the results point to a milestone in policymaking for promoting and calibrating new topologies in the Brazilian digital financial system.

²¹ See, for instance, a recent event promoted by ABECS association of credit card companies and bank-controlled payment institutions, debating "asymmetries between open payment schemes and the Central Bank scheme" - available at: <https://www.youtube.com/watch?v=QmhQ5B5lvGg>

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