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Learning from Brazil and India's Instant Payment Systems

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Executive Summary

This PAE addresses the question, "What can be learned from Brazil and India's instant payment systems for other countries aiming to introduce similar systems?". It does so by reviewing the systems in both countries and creating a guidebook for policymaking, focusing on organizational decisions.

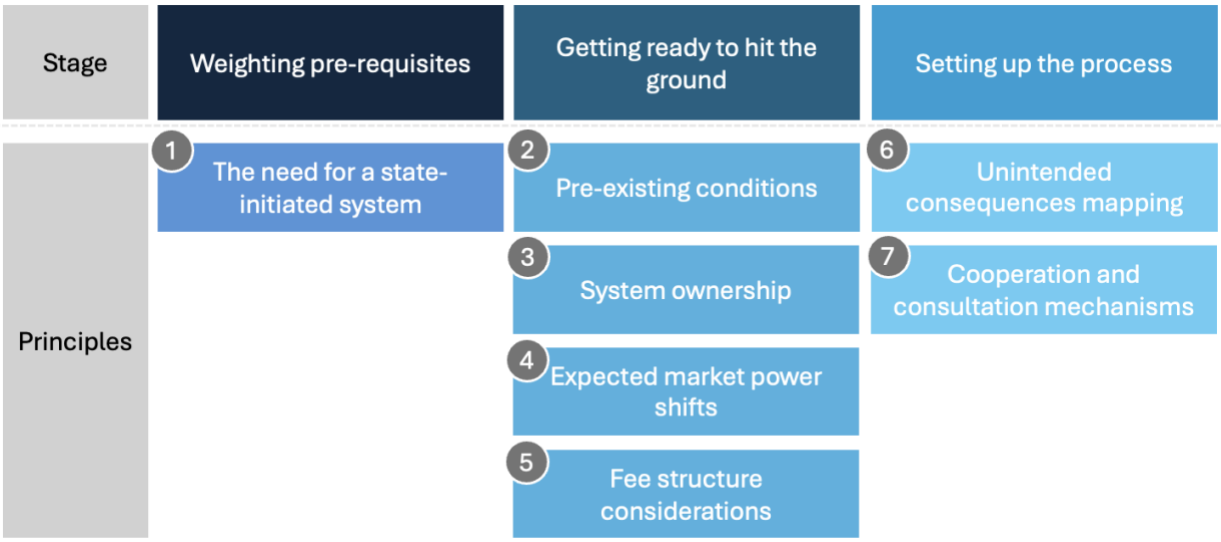
The background for this work is the successful implementation of instant payment systems in Brazil and India – Pix and UPI, respectively. These systems have enhanced financial inclusion, driven fintech growth, and become the dominant payment method in their countries. However, their implementation has also led to challenges, such as increased fraud and a disruption of the power balance between traditional financial institutions and newly emerged players, such as fintechs and payment system providers. The guidebook for policymakers includes recommendations for three planning and implementation stages:

1. **Pre-requisites for the system – the need for a state-initiated system**: India and Brazil have greatly benefitted from governmental payments innovation. Learning from their experience, the need for such systems can be derived from three factors. First, such systems are most relevant for states with a low prevalence of other types of payment methods, such as debit and credit cards or mobile network-based payments. Second, the cost and time to develop must be considered and weighted against the potential benefit from the process, and the potential alternatives emerging during the development. Lastly, states should assess their ability to execute and enforce market participation, ensuring that state efforts pay off.
2. **Getting ready to hit the ground – assessment of current and future market dynamics**: Brazil and India diverge in how their payment systems have influenced respective markets. Brazil's antitrust landscape, central bank ownership, strong fintech ecosystem, and the choice to introduce merchant fees have supported the growth of domestic fintechs and neobanks. India's decision to develop its system outside the central bank, openness to international players, and the creation of a no-fee system have facilitated the entrance of large multinationals. Both countries have seen accelerated growth in credit card usage driven by the introduction of new

user cohorts into the market. States considering the implementation of such systems can leverage this accumulated knowledge for their own system design.

3. **Setting up the process – mapping unintended consequences and developing engagement mechanisms**: with the decision to set up the systems comes the need to set up the mechanics to engage relevant stakeholders in design, development and implementation, as well as to plan for unintended consequences. Both systems have mechanisms to conduct consultations on various topics, such as system development, governance, fraud, etc. Based on these experiences, this paper outlines proposed approaches for planning for unintended consequences across each stage of the process and engaging stakeholders.

The illustration below is a summary of all seven proposed principles for implementation based on these three stages:



In terms of its structure, this PAE begins with a brief outline of the significance of instant payments and examines the cases of Brazil and India. The second part provides a comparative analysis of Pix and UPI, focusing on their governance structures, stakeholder engagement mechanisms, and market impact. Lastly, the third and key section is a recommendation map for policymakers who want to implement similar systems in their respective geographies.

Introduction

Over the past decade, India and Brazil have launched instant payment systems (UPI and Pix, respectively), achieving national scale and transforming the payment landscapes of both countries. With 350 million UPI users[1] and 140 million Pix users,[2] approximately 25% of India's population and about 65% of Brazil's population utilize these systems. In global terms, one in every 11 adults worldwide uses either Pix or UPI to send or receive instant payments.[3]

Brazil's instant payments policy is relatively narrow, focused specifically on payments (over a more general financial services/identity offering), with the Brazilian Central Bank (BCB) owning Pix and pushing it forward in cooperation with domestic market players. Pix was launched in 2020, following a two-year ideation and development period, becoming the world's fastest-growing payment method.[4]

India's UPI is part of a broad Digital Public Infrastructure (DPI) effort.[5] India's decades-long DPI approach, including UPI, has been for the state to develop the basic infrastructure (including three pillars - digital identity, data exchange, and payments), allowing private sector innovation on top of it.[6] UPI was developed under the National Payments Corporation of India (NPCI) and launched in 2016, later becoming India's most popular digital payment method, processing over 75% of the nation's retail digital payments today.[7] Both systems have accelerated financial inclusion, supported growth in the fintech sector, and become the payment standards in their respective geographies.[8] However, they have also created externalities, such as increasing fraud and reshaping the financial market power balances.

[1] Routh, Aditi, "The Role of Nonbanks and Fintechs in Boosting India's UPI Person-to-Merchant Transactions."
[2] Statista, "Number of People Who Are Registered to Use Local Real Time Payment Scheme Pix in Brazil from March 2021 to January 2023."
[3] Assuming world population of 8.2 billion people, adults over 18
[4] International Monetary Fund. Western Hemisphere Dept., "Pix: Brazil's Successful Instant Payment System."
[5] Mehta, Nalin, "G20: India's New Soft Power Is Digital Public Infrastructure."
[6] D'Silva, Derryl et al., "The Design of Digital Financial Infrastructure: Lessons from India."
[7] Routh, Aditi, "The Role of Nonbanks and Fintechs in Boosting India's UPI Person-to-Merchant Transactions."
[8] Kosse, Anneke, Frost, Jon, and Aurazo, Jose, "Faster Digital Payments: Global and Regional Perspectives."

With multiple states considering or actively developing such systems,[9] the need for a systematic review of the organizational features of Pix and UPI becomes clearer, learning from each of the systems as a separate use case, and from the comparison between the two.

The following sections include an extensive review of Pix and UPI's governance structures, collaboration mechanisms, and resulting changes in their respective markets. The information was obtained and analyzed through on and off-record interviews with individuals working for market players, regulators, international organizations, and think tanks. Additionally, dozens of articles, reports, and datasets were reviewed. Lastly, market dynamics were analyzed using a power/interest approach.

[9] Kosse, Anneke, Frost, Jon, and Aurazo, Jose.

2. Deep Dive: Pix

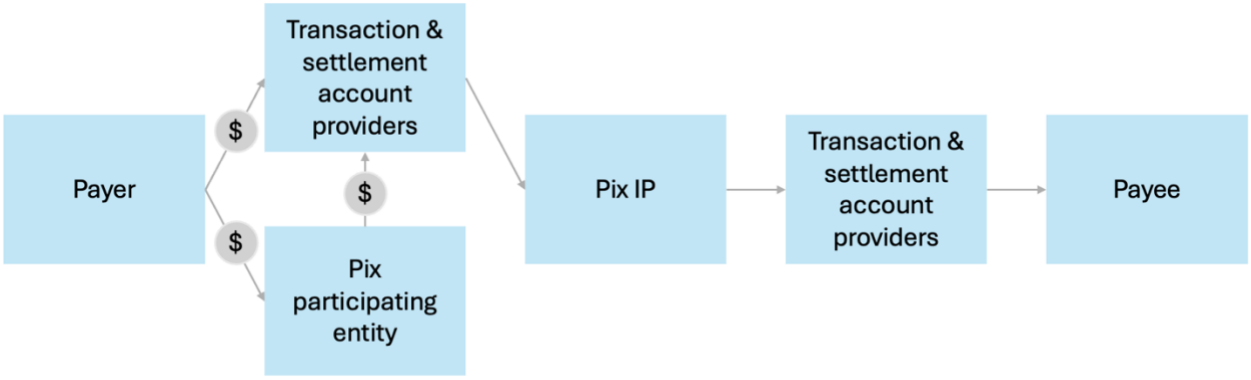
- A “lean” system that scaled up in two years, focused on payment and payment-related products only.
- A success story of a regulator deciding to provide and own an instant payments infrastructure.
- A growth story driven by mandatory participation of financial institutions and a pre-existing infrastructure of innovation in the country.
- A high focus on domestic tech and partial fee structure prevented big tech from gaining control over the system.

2.1. The "Why"

In 2018, BCB announced the launch of Pix – a domestically owned, developed, and managed instant payments system. The need for such a system was driven by several factors. [10] The first was Brazil's heavy reliance on cash, with 77% of financial transactions in Brazil at that time being conducted in cash, resulting in high social costs (for production and storage) and limited the ability to transition to online transactions (i.e., e-commerce). The second factor was the lack of a prevalent alternative to cash, such as credit/debit cards or mobile-based networks; for example, only 62% of adults in Brazil had a credit or debit card in 2017.[11] Third, despite BCB's signal to the market, players refused to transition to an interoperable payment solution, requiring BCB to intervene. Lastly, there was an increase in the adoption of digital technologies among the population, with metrics indicating that 93.2% of households had mobile phones in 2018,[12] laying the groundwork for a mobile-based solution.

2.2. Technical baseline: what is Pix

At a high level, Pix operates as follows:[13]



[10] Banco Central Do Brasil, "Pix Management Report - Conception and First Years of Operation (2020-2022)."
[11] Global Findex 2021, "The Global Findex Database 2021."
[12] Laricchia, Federica, "Share of Households with Mobile Phones in Brazil from 2016 to 2020."
[13] Carlos Eduardo de Andrade Brandt Silva, "Pix | The Brazilian Instant Payment."

The “last mile” delivery is provided by private market players (e.g., banks), with a standardized user interface, enabling provider mobility for users.[14] The system has partial transaction fees, which include fees for merchants, and no fees for consumers.

As of 2025, Pix has six key offerings: [15]

1. Instant payments and transfers: 3-second settlement average (compared to 2 days for debit cards and 28 for credit cards),[16] allowing for transactions of any size (no minimal/maximal size). Transactions are not revocable except in cases of fraud/operational failures.
2. Scheduled transfers
3. Payments requests (invoices)
4. Cash withdrawal
5. Short-term borrowing (installment payment)
6. Activity tracking of activities (e.g., locations, transaction types, etc.) [17]

The following features are planned to be launched next: [18]

7. Installment payments (“Garantido”): By working with banks, retailers will bear the lending risk, and banks will charge a fee for transaction underwriting.[19]
8. Recurring payments (“Automatic Pix”): An auto-debit function. Users will be able to authorize payments for utility bills and recurring services through their bank accounts.[20]
9. International remittances in LATAM[21]
10. Contactless payments[22]

[14] International Monetary Fund. Western Hemisphere Dept., “Pix: Brazil’s Successful Instant Payment System.”
[15] Carlos Eduardo de Andrade Brandt Silva, “Pix | The Brazilian Instant Payment.”
[16] International Monetary Fund. Western Hemisphere Dept., “Pix: Brazil’s Successful Instant Payment System.”
[17] International Monetary Fund. Western Hemisphere Dept.
[18] Ayres, Marcela, “Brazil’s Pix Payments Are Killing Cash. Are Credit Cards Next?”
[19] Euromoney, “Brazil’s PIX Moves in the Banks’ Favour.”
[20] Lehr, Lindsay and Boralli, Cesar, “Brazil’s Pix Is Coming for the Card Industry.”
[21] Fernanda Garibaldi, Background interview - Fernanda Garibaldi.
[22] Fernanda Garibaldi.

2.3. System mapping

2.3.1. Types of players within the system

Five key types of players are involved in the Pix ecosystem. Below is a high-level power/interest/power shift mapping, with a detailed review to follow:

Player type	Power (ability to influence decisions at onset)	Interest	Power shift due to Pix		Key Gains/Losses
			Market share	Decision making power	
Brazil Central Bank (BCB)	High	High		↑ Increase	Created Pix as a regulator and operator, expanded financial inclusion, and prevented competing schemes from emerging.
Incumbent Banks	Medium	High	↓ Decrease	Retained	Payment revenue dropped, and competition from neobanks increased.
Neobanks	Medium	High	↑ Increase	↑ Increase	Increased customer acquisition, TAM growth, gained competitive edge and legitimacy.
Credit Card Schemes	Medium	High	Accelerate long term growth but share market with Pix	↓ Decrease	Threatened by Pix on a power level (another payments rail option), with accelerated long-term growth driven by maturing consumer cohorts
Big techs	Low	Medium		↓ Decrease	Own immediate payment schemes blocked by Pix's launch (Facebook was planning to launch WhatsApp-based immediate payments).

1) Brazil Central Bank (BCB)

BCB's involvement in the payment space increased after a 2013 legislation mandating it to regulate payments to ensure efficiency, security, interoperability, and financial inclusion.[23] The goal of the legislation was to prioritize Brazil's domestic fintech and banking system over international players.[24]

In 2018, BCB established a working group on instant payments to tackle current challenges with market players and experts, comprising over 100 members. This working group served as the foundation for the creation of Pix, which was announced in 2018.[25] Thus, BCB became the controlling and decision-making authority over Pix, with private sector players participating as advisors and counterparts.[26]

[23] Durate, Angelo et al., "Central Banks, the Monetary System and Public Payment Infrastructures: Lessons from Brazil's Pix."
[24] Fernanda Garibaldi, Background interview - Fernanda Garibaldi.
[25] Schapiro, Mario, Mouallem, Pedro, and Dantas, Eric, "PIX: Explaining a State-Owned Fintech."
[26] Klein, Ahron, "Structural Conflicts in Central Banking: Regulator or Operator of a Payment System?"

BCB plays three key roles in Pix:[27]

- **Scheme owner**: create and manage the "Pix rulebook," including rules and manuals for operation in accordance with Pix's mandate for retail payments.
- **Platform operator**: Pix is run by BCB as a public good. It includes DICT ownership (database alias and anti-fraud), as well as the day-to-day operations of the system.[28]
- **Platform regulator**: oversee Pix and the broader payments ecosystem in Brazil.

To maintain market trust in BCB and Pix, several mechanisms are in place. The first is separation, with BCB having distinct teams responsible for regulation and Pix ownership/operation at a department head level. However, all final decisions at BCB are made by a unified board of directors. Another mechanism is regulatory transparency, which includes publishing the rationale for all new regulations.[29]

Nonetheless, a relevant example of the complexity of BCB's multiple roles came into play in June 2020, when BCB blocked the launch of WhatsApp's planned payment system – launching Pix later that year.[30]

While BCB owns the system, it does not bear all the development and implementation costs. As of 2022, BCB has reported investing 12 million Brazilian Dollars in the development, with the rest of the costs borne by other participating entities.[31] The total development cost, divided among all relevant players, is unavailable.

2) Incumbent Banks

Brazil's banking system is highly concentrated. In 2018, the five largest banks controlled approximately 80% of the country's total commercial banking assets. Of those, two were

[27] de Andrade Brandt Silva, Carlos Eduardo, Background interview - Carlos Eduardo de Andrade Brandt Silva.
[28] International Monetary Fund. Western Hemisphere Dept., "Pix: Brazil's Successful Instant Payment System."
[29] de Andrade Brandt Silva, Carlos Eduardo, Background interview - Carlos Eduardo de Andrade Brandt Silva.
[30] Schapiro, Mario, Salomon Bezerra Mouallem, Pedro, and Gil Dantas, Eric, "PIX: Explaining a State-Owned Fintech."
[31] Fernanda Garibaldi, Background interview - Fernanda Garibaldi.

state-owned and two were controlled by Brazilian groups. As a result, they had a strong pro-domestic sentiment and limited power to veto policies. [32]

Upon Pix's launch, BCB mandated that banks and other payment institutions with more than 500,000 transaction accounts participate, kicking off a network effect that accelerated Pix's adoption and incentivizing smaller players to participate.[33]

However, established banks were relatively slow to adapt, as they were generating revenue from legacy payment systems. As a result of Pix's launch, revenues from payment services at those banks decreased by 8% between 2020 and 2021.[34] While ideally, this revenue loss was meant to be offset in the long run by an increase in customer base, reduced cash handling costs, and lower branch costs,[35] Brazilian traditional banks created high barriers to entry for consumers and did not benefit from this anticipated outcome.[36] Moreover, the country's market concentration decreased by approximately 10% between 2018 and 2022 due to Pix and other factors, putting traditional banks at a disadvantage.[37]

3) Neobanks and fintechs

Brazil is recognized as a global hub for neobanks and fintech innovation, thanks to its market size, favorable regulatory environment, and consumers' willingness to adopt new products.[38] With this baseline, while established banks were slow to adapt to Pix, neobanks quickly embraced Pix and innovated on top of it. Neobanks gained traction through Pix. Furthermore, the domestically centered approach and willingness to cooperate fostered a positive relationship between these companies and BCB, through the Pix Forum and beyond.[39]

[32] Schapiro, Mario, Salomon Bezerra Mouallem, Pedro, and Gil Dantas, Eric, "PIX: Explaining a State-Owned Fintech."
[33] Durate, Angelo et al., "Central Banks, the Monetary System and Public Payment Infrastructures: Lessons from Brazil's Pix."
[34] Schapiro, Mario, Salomon Bezerra Mouallem, Pedro, and Gil Dantas, Eric, "PIX: Explaining a State-Owned Fintech."
[35] de Andrade Brandt Silva, Carlos Eduardo, Background interview - Carlos Eduardo de Andrade Brandt Silva.
[36] Fernanda Garibaldi, Background interview - Fernanda Garibaldi.
[37] Feliba, David, "The Rise of Fintechs Reduces Banking Concentration in Brazil."
[38] Fernanda Garibaldi, Background interview - Fernanda Garibaldi.
[39] Background interview with former Nubank employee.

Neobanks often use the no-cost-for-consumers and low-cost-for-merchants model as a selling point (e.g., Nubank even absorbs all transaction costs as a sales strategy). Revenue from additional services (e.g., credit) has increased, and customer acquisition has grown alongside the target addressable market, as consumers shift from a cash-based economy to a formal economy.[40]

Another type of impact that Pix has on this ecosystem involves fintechs not directly engaged in payments but benefiting from fast transactions. For example, Nomad, a fintech focused on international transactions, utilizes Pix as it reduces its exposure to fluctuations in the USD/Brazilian dollar exchange rate. Before Pix, transaction delays posed a risk for the company in the event of a significant sudden rate change. With Pix, timeframes are shortened, thereby driving down risk.[41]

4) Credit/debit card schemes

Pix directly threatens credit card schemes on a strategic level. However, the financial reality is more complex, given long-term card growth attributable to Pix.

Considering market power, in 2022 BCB's governor predicted that Pix would make credit cards obsolete. [42]

Throughout the establishment process, credit card schemes raised several objections to Pix. Their primary concern was BCB's dual role as a scheme operator and regulator, which they argued made it a regulator with vested market interests.[43]

However, there is evidence that consumers are not replacing credit cards. In a 2023-2024 survey, when asked about "the frequency of Pix usage as a % of daily transactions," under 50% of users said they use it for over 50% of transactions. Users indicated that they use Pix and credit cards in distinct ways – for example, Pix was a preferred option for groceries, while credit cards were used to purchase larger items (e.g., TVs).[44]

Moreover, credit cards have started enjoying accelerated growth following Pix's scaleup, mainly driven by "maturing cohorts", with consumers starting with Pix, gaining credit

[40] Background interview with former Nubank employee.
[41] Lucas Vargas, Background interview - Lucas Vargas.
[42] Central Banking Newsdesk, "Campos Neto Predicts End of Credit Cards."
[43] Fernanda Garibaldi, Background interview - Fernanda Garibaldi.
[44] Suominen, Kati, "Uptake, Use, and Inclusion Gains from Fast Payment Systems: Early Comparative Data."

history and transitioned to credit cards by financial institutions, traditional players and neobanks alike (further details in the financial inclusion data section).

5) Big techs

In 2020, WhatsApp and Cielo, a credit card operator, announced they would be providing instant payments in Brazil. Shortly afterward, BCB suspended this partnership, claiming it needed to re-evaluate the associated risks. On the same day, the country's Antitrust Tribunal (CADE) has also suspended WhatsApp's operations, claiming it would be risky.[45] Pix was launched the same year.

As such, Pix's launch is part of Brazil's attempt to ensure that big tech companies don't gain more power than they already have in the country.[46]

[45] Schapiro, Mario, Salomon Bezerra Mouallem, Pedro, and Gil Dantas, Eric, "PIX: Explaining a State-Owned Fintech."

[46] Fernanda Garibaldi, Background interview - Fernanda Garibaldi.

2.3.2. Revenue mapping

The table below summarizes key revenue drivers for Brazil's market players post-Pix:

	Short term	*Short term*	*Long term*	*Long term*
	Payment revenue	**Non-payment revenue**	**Payment revenue**	**Non-payment revenue**
Incumbent banks	(D) # of clients ≅ Revenue/client ↓	(N) # of clients ≅ Revenue/client ≅	(G) # of clients ↑ Revenue/client ≅/↑	(G) # of clients ↑ Revenue/client ≅/↑
Fintechs and neobanks	(G) # of clients ↑ Revenue/client ↑	(I) Varies by added service offer	(G) # of clients ↑ Revenue/client ↑	(G) # of clients ↑ Revenue/client ↑
Card issuers	(D) # of clients ≅ Revenue/client ↓*[47]	(N) # of clients ≅ Revenue/client ≅	(I) # of clients ↑ Revenue/client – TBD*	(I) # of clients ↑ Revenue/client – TBD**[48]

The colors represent:

(G) Growth (D) Decrease (I)Inconclusive (N) No change

[47] For (*) – assuming that Pix's low cost competitive offering can drive down card interchange fees, given that there's no single regulatory-mandated fee in Brazil

[48] For (**) – The ability to generate revenue from card clients, specifically credit cards, can be defined as a function of three main components: card payment pricing and quantity (with prices decreasing but quantity increasing) and value-added services (which grow alongside the increase in the number of users) over a longer trajectory.

2.3.3. Power mapping – commercial players

The table below summarizes key trends in power balance for Brazil's market players following Pix's launch:

Financial institution	**Power balance shift outcome – short term**	**Power balance shift outcome – Long term**
Incumbent banks	(D) Low benefits from the new system, with neobanks growing and increasing competition.	(I) Growth in number of customers creating more negotiation power, with neobanks retaining power
Fintechs and neobanks	(G) High ability to leverage the system for direct payments monetization/loss-lead to attract business to other revenue streams.	(G) Retain ability to leverage system for growth, potentially setting up further partnerships with card providers and incumbents
Credit cards	(D) "Replaced" by the new system as a key mean of payments, introducing more competition	(D) Growth in customers supportive of revenue, but negotiation power as key payment service provider decreased

The colors represent:

(G) Growth (D) Decrease (I)Inconclusive (N) No change

2.3.4. Stakeholder engagement mechanisms

Pix's primary stakeholder engagement mechanism is the "Pix Forum." The concept originated in 2018 when BCB created a consultative forum, which subsequently announced the launch of Pix. The current Pix Forum was established in August 2020 as a permanent consultative group to facilitate discussions between BCB and stakeholders within the Pix ecosystem.[49]

The forum was created for two primary reasons:

1. **Enhance the legitimacy** of Pix being a central bank-led initiative, with BCB holding multiple roles
2. Create a way for BCB to **learn how to address end-users**, given that BCB's focus as a regulator is mainly on bank-to-bank over consumer-focused operations

Pix's governance structure is centered around BCB, which owns the rulebook dictating transaction rules, participant eligibility, technical requirements, and user experience standards. While BCB has the legal mandate to define these regulations, it does not operate unilaterally. Instead, it engages in structured dialogues with various stakeholders through the Pix Forum to ensure that decisions reflect the ecosystem's needs. The forum consists of four fixed working groups (WGs) that focus on distinct aspects of Pix: business, technical standardization, messaging, and security (focusing on fraud and security). Additional working groups are established to address emerging challenges.

Each working group follows one of two quarterly operational protocols. The security working group is particularly critical. BCB sets the agenda, asking participants to provide advice and solutions, as BCB is not the expert.

The other three working groups operate on an ad hoc basis, responding to consultations initiated by BCB. When BCB proposes a change to Pix, it drafts an initial proposal, submits

[49] Breno Santana Lobo, Background interview.

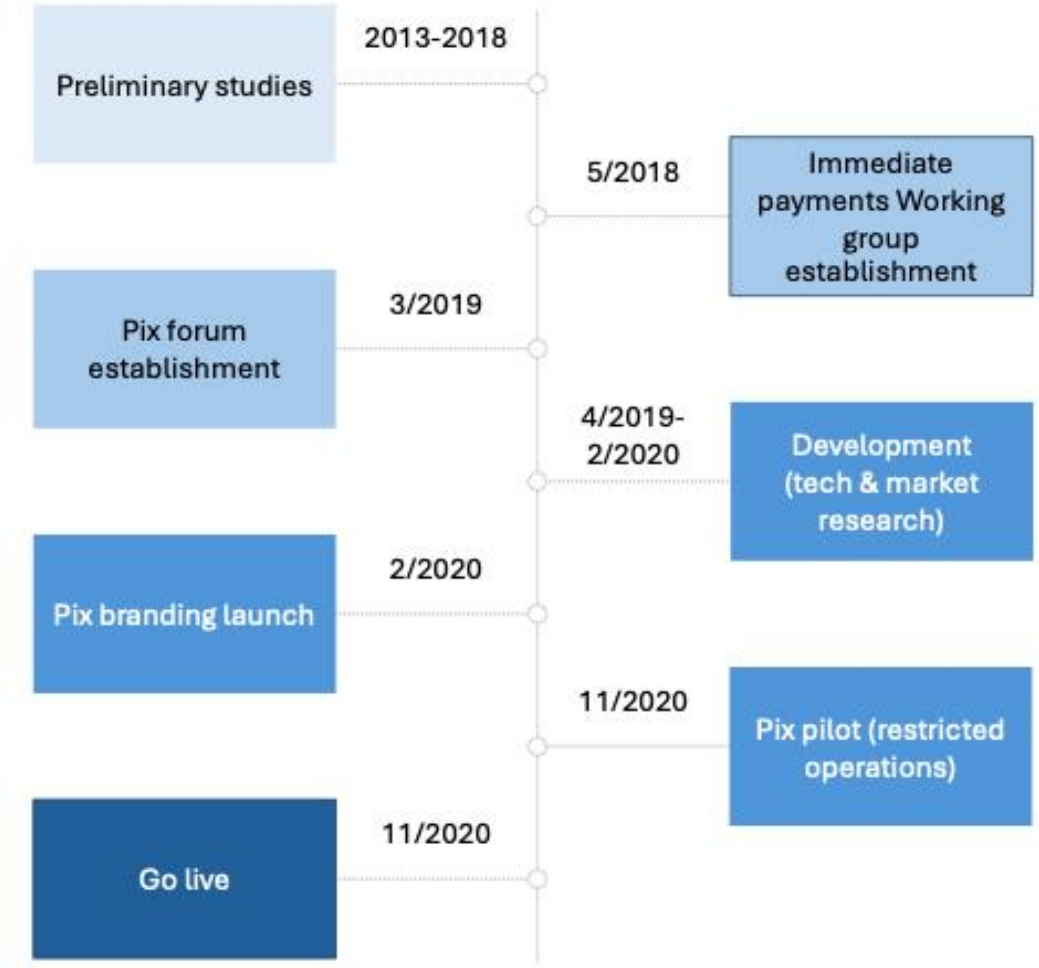
it for analysis, and allows working group members to review and provide feedback before implementation.

Participation in the forum is open to various stakeholders, with around 200 current participants representing consumers, retailers, consultancies, law firms, banks, IT services, and government agencies. Regular plenary meetings promote transparency, allowing for reviews of past actions and upcoming agendas. The sessions are conducted online and streamed on YouTube.

In addition to the structured engagement through the Pix Forum, BCB also conducts informal bilateral consultations with individual stakeholders. These discussions facilitate direct dialogue on user experience and implementation issues. However, all consultations remain public, ensuring that decisions are made transparently and with broad input.

2.4. Development timeline

Pix took 2 years from initiation to launch:[50]



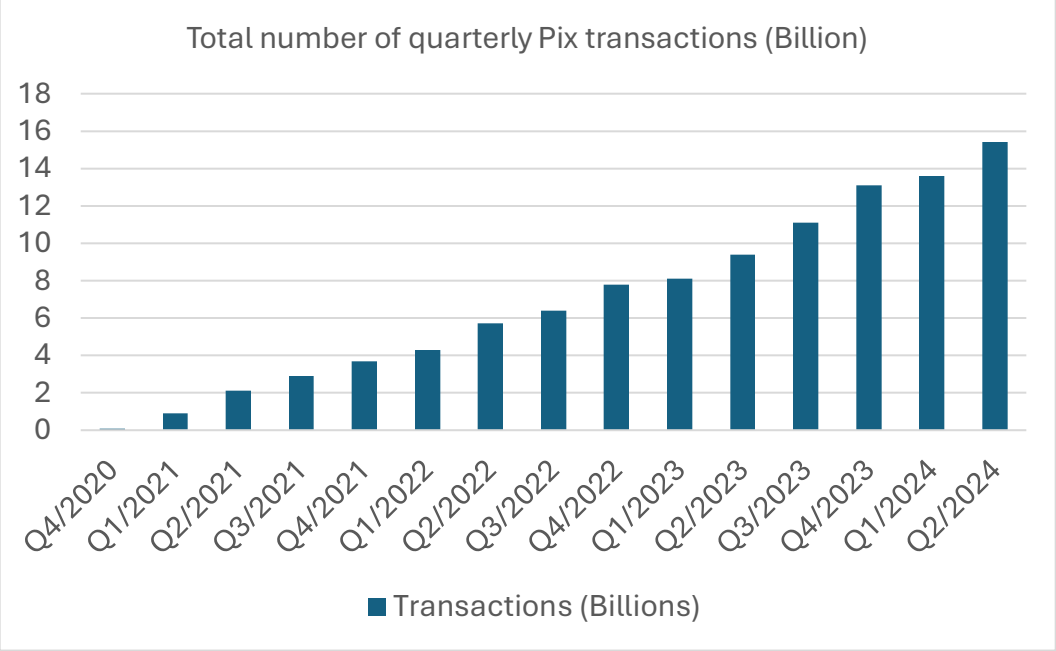
Pix's rollout was accompanied by a marketing strategy, (inc. press releases, collaboration with digital influencers, and work with financial institutions). Additionally, multiple tools were deployed to make it easy to understand and accessible, including a landing page with FAQ, a TV campaign, and numerous public events.

[50] Carlos Eduardo de Andrade Brandt Silva, "Pix | The Brazilian Instant Payment."

2.5. Scaleup timeline

Pix is the fastest-adopted instant payment system globally, with 75% of the adult population of Brazil using it within three years of its introduction,[51] making it Brazil's most popular payment method.[52]

As of Q2/2024, it reached 15.4 billion quarterly transactions,[53][54] exceeding initial expectations.[55]



This rapid adoption can be attributed to several factors, including mandatory use by financial institutions and its low cost. As of Q1/2023, Pix transaction costs were approximately 12% of a credit card transaction and 26% of a debit card transaction.[56]

[51] Suominen, Kati, "Uptake, Use, and Inclusion Gains from Fast Payment Systems: Early Comparative Data."
[52] Carlos Eduardo de Andrade Brandt Silva, "Pix | The Brazilian Instant Payment."
[53] Banco Central Do Brasil, "Pix Statistics - BCB."
[54] Banco Central Do Brasil, "Pix Management Report - Conception and First Years of Operation (2020-2022)." Values up to Q3/2022 (inc.) were extrapolated from a graph in the report, therefore are approximate, as values on BCB's website only go 2 years back.
[55] International Monetary Fund. Western Hemisphere Dept., "Pix: Brazil's Successful Instant Payment System."
[56] Carlos Eduardo de Andrade Brandt Silva, "Pix | The Brazilian Instant Payment."

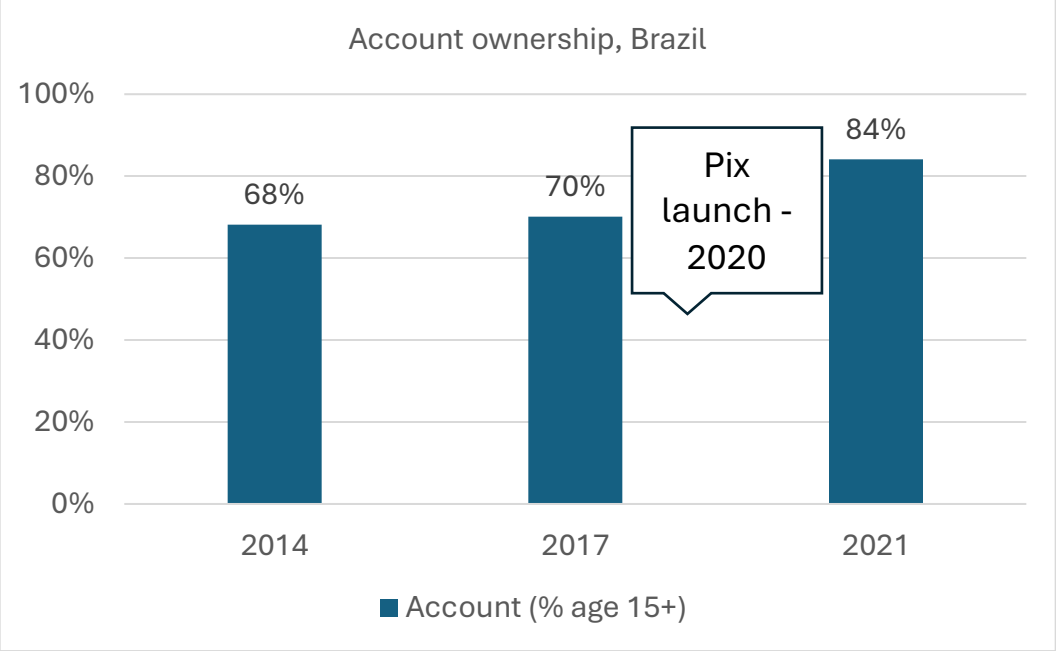
2.6. Financial inclusion impact

Pix's impact on financial inclusion can be measured using several metrics. The most straightforward metric is its usage. For example, the 71.5 million individuals making transactions through Pix in 2022 after not conducting any electronic transactions in the previous year.[57]

Considering the broader picture, as outlined in the subsequent sections, Pix has contributed to an increase in account ownership and access to formal lending, particularly among low-income consumers. However, it also resulted in a rise in credit card usage, raising potential questions about the effects of government investment versus incentives for private market players to engage in financial inclusion.

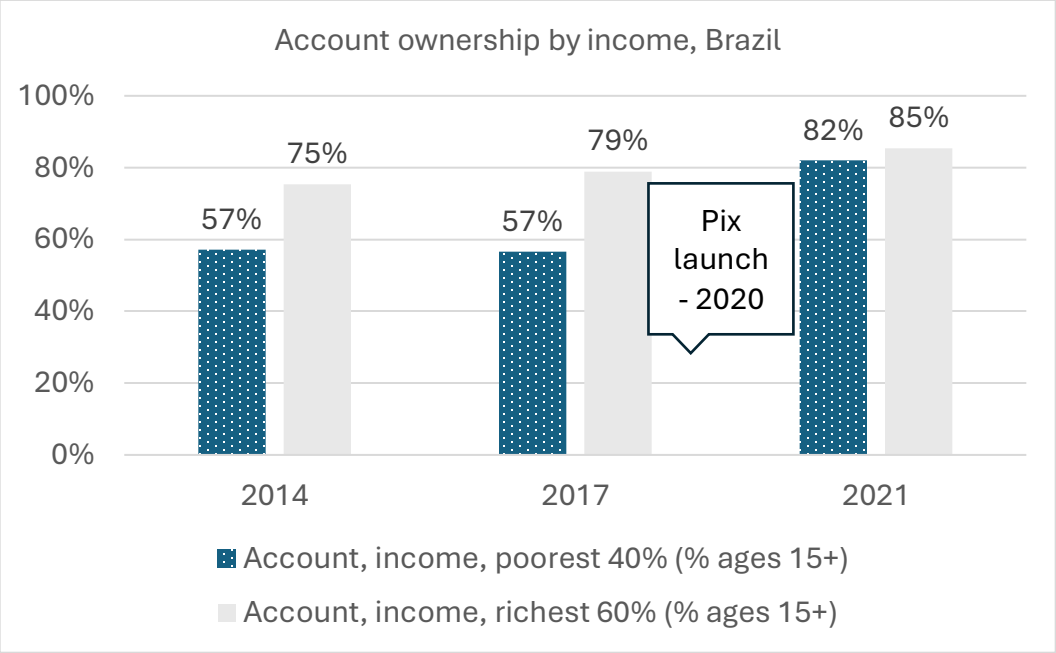
2.6.1. Pix's impact on bank account ownership

Bank account ownership grew by 20% between 2017 (before Pix) and 2021 (after Pix), following a plateau in the previous 3-year period.[58]



[57] International Monetary Fund. Western Hemisphere Dept., "Pix: Brazil's Successful Instant Payment System."
[58] Global Findex 2021, "The Global Findex Database 2021."

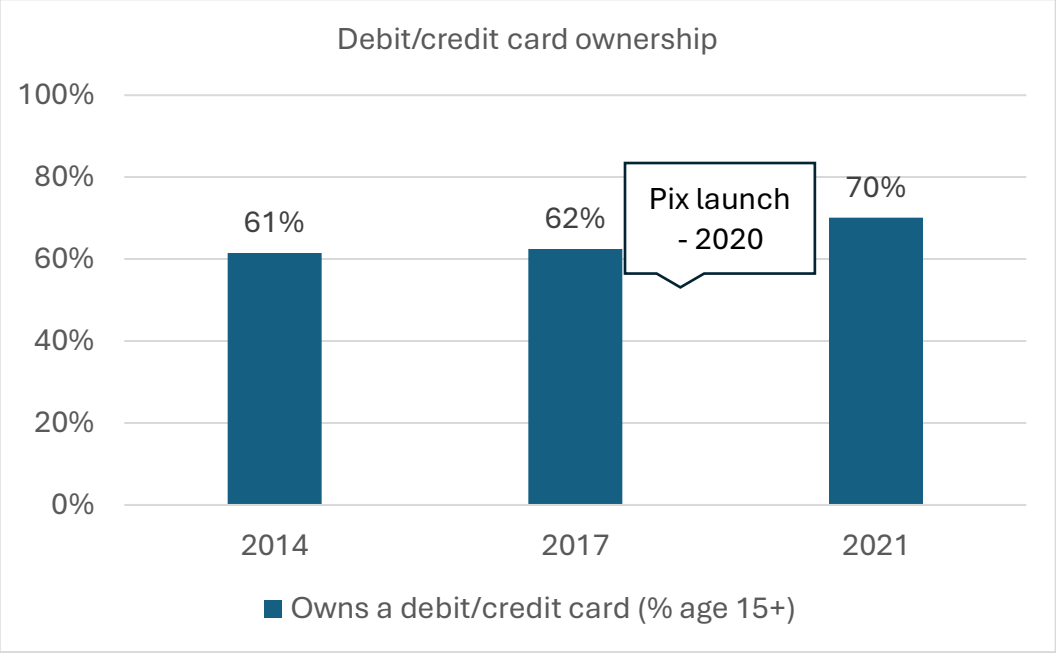
Moreover, account ownership among the poorest 40% increased by 44%, reaching 82% in 2021, a data point relevant specifically for financial inclusion.[59]



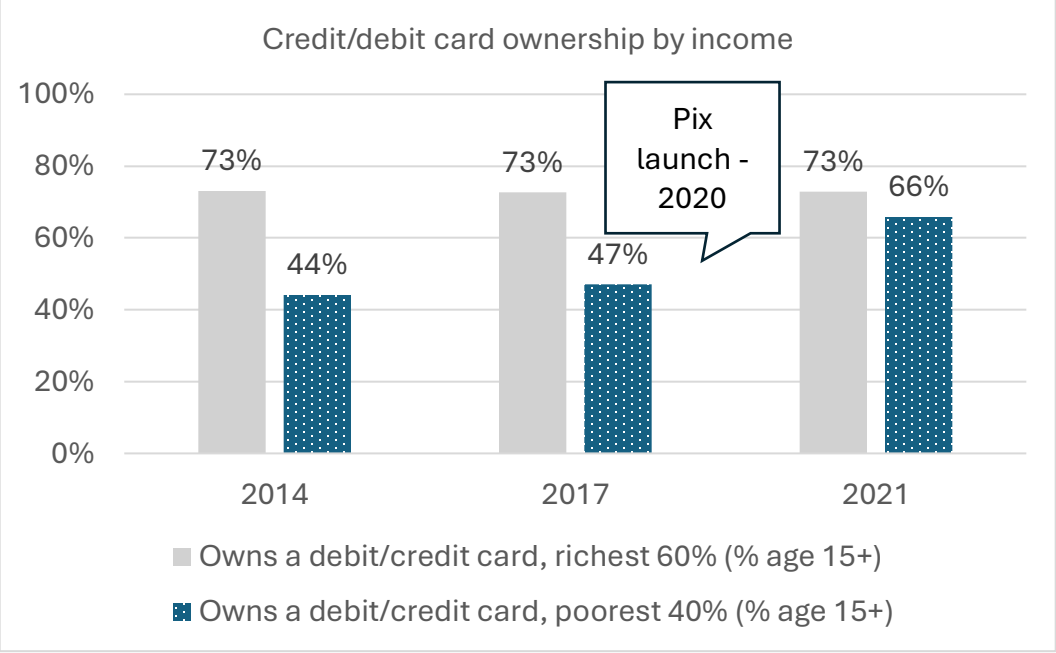
[59] Global Findex 2021.

2.6.2. Pix's impact on card usage and ownership

Overall, card ownership in Brazil grew by 13% between 2017 and 2021.[60]



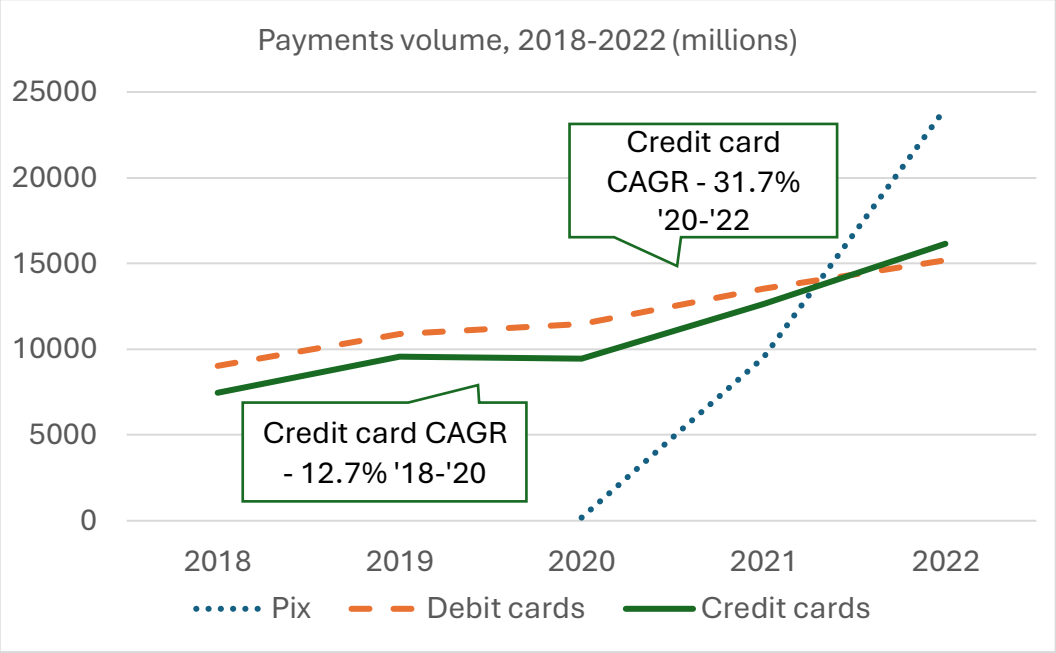
This was mainly driven by growth in card ownership among the poorest 40%. While there was little growth in 2014-2017, a 40% growth in 2017-2021 brought card usage to 66%.[61]



[60] Global Findex 2021.
[61] Global Findex 2021.

The data presented above is particularly interesting when considering the role of Pix in the broader context of financial inclusion. Pix prompted the establishment of bank accounts, generating transaction histories and trust in the financial system for consumers and merchants, along with the establishment of digital POS systems. This, in turn, drove card usage.

This can be further explored looking at payment volumes. The 2018-2020 CAGR for debit and credit cards was at 12.6% and 12.7%, respectively. After the launch of Pix, debit card CAGR increased to 15.1% in 2020-2022. Credit card CAGR increased even further, to 31.7% in 2020-2022.[62]



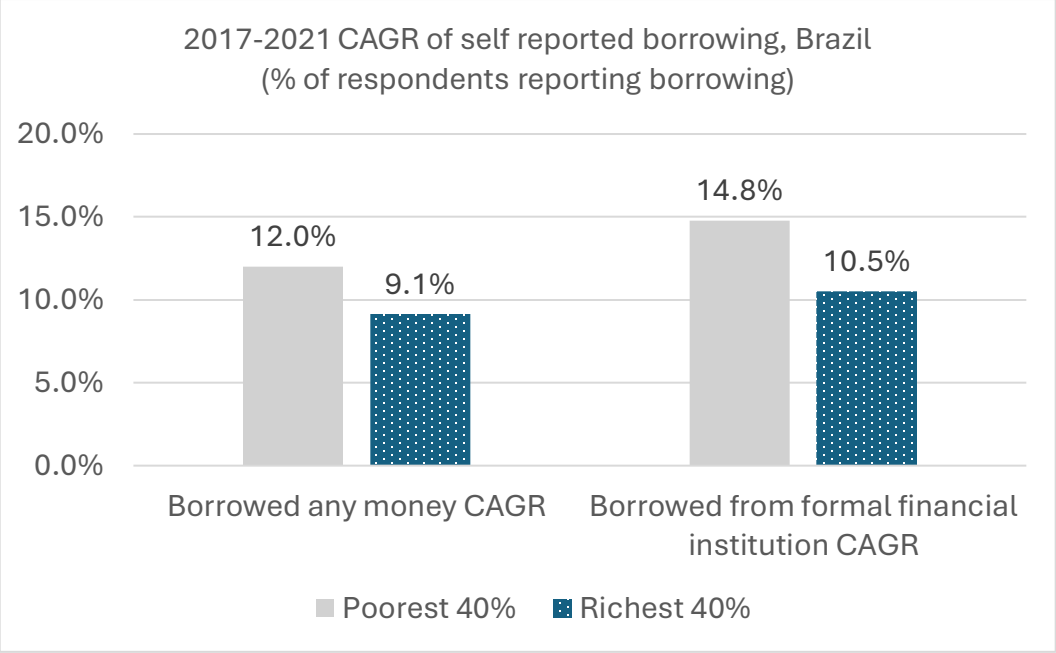
Overall, the card spread and volume data potentially raise questions about the role of Pix as an alternative, standalone payment method, or as a stepping stone for legacy payment methods.

[62] BIS, "T5: Volume of Cashless Payments and Withdrawal/Deposit Transactions."

2.6.3. Pix's impact on lending

The discussion on the "card catalyst or standalone tool" could be enriched by considering additional indicators of financial inclusion, such as lending. It is an adjacent financial tool that may gain from growth in payments through credit scoring data accumulation, along with familiarity and trust in the financial system.

The introduction of Pix seems to have supported the growth of the formal economy. Borrowing from formal institutions has increased more rapidly than overall borrowing (based on the share of consumers reporting they have taken a loan), for both poorer and richer consumers. Furthermore, the growth among poorer consumers has notably exceeded that of richer consumers.[63]



Connecting this data to the discussion about credit cards emphasizes that Pix was not only relevant as a catalyst in the payment sector but also a crucial instrument for inclusion in other financial services.

[63] Global Findex 2021, "The Global Findex Database 2021."

2.7. System externalities

While Pix has significantly improved Brazil's financial inclusion and payment transparency, several externalities must also be considered.

1. **A rise in fraud**, driven by the instant nature of Pix. Fraudsters are exploiting the fact that transactions are instantaneous and irreversible to quickly transfer funds in a way that is difficult to trace. Various entities in the system are working to address the issue, including private companies that are deliberately slowing down transactions and BCB's efforts to mitigate risks.[64]
2. **A rise in gambling** is part of a larger gambling epidemic in the country. Pix allows for instant fund transfers, simplifying transactions. For example, reports in August 2024 indicated that gambling transfers via Pix reached approximately USD 550 million, accounting for about 20% of Brazil's largest direct conditional cash transfer program.[65]
3. **An increase in credit card adoption**, which is not necessarily a negative externality, should be considered given the significant governmental investment in Pix as an alternative, universal means of payment.

Looking ahead, it's important to consider the potential negative implications of extensive government involvement in the payment ecosystem over the long term, which may deter market players from entering or innovating in this space. Another possible risk is a bank run on the system, leading to a crash during a severe economic crisis.

[64] Lucas Vargas, Background interview - Lucas Vargas.
[65] Gracia, Nathalia, "Brazilian Social Program Beneficiaries Spent $549 Million on Bets in Just One Month."

3.Deep Dive: UPI

- A part of India's tech stack (identity, payments and data sharing), driving an impact beyond payments alone.
- Provided through NPCI, a non-profit owned by India's banks and co-managed by the government.
- Successful scaleup driven by big techs and international corporations taking roles as last-mile providers.
- No fee structure results in high barriers to entry for local players not backed up by significant capital.

3.1 The “Why”

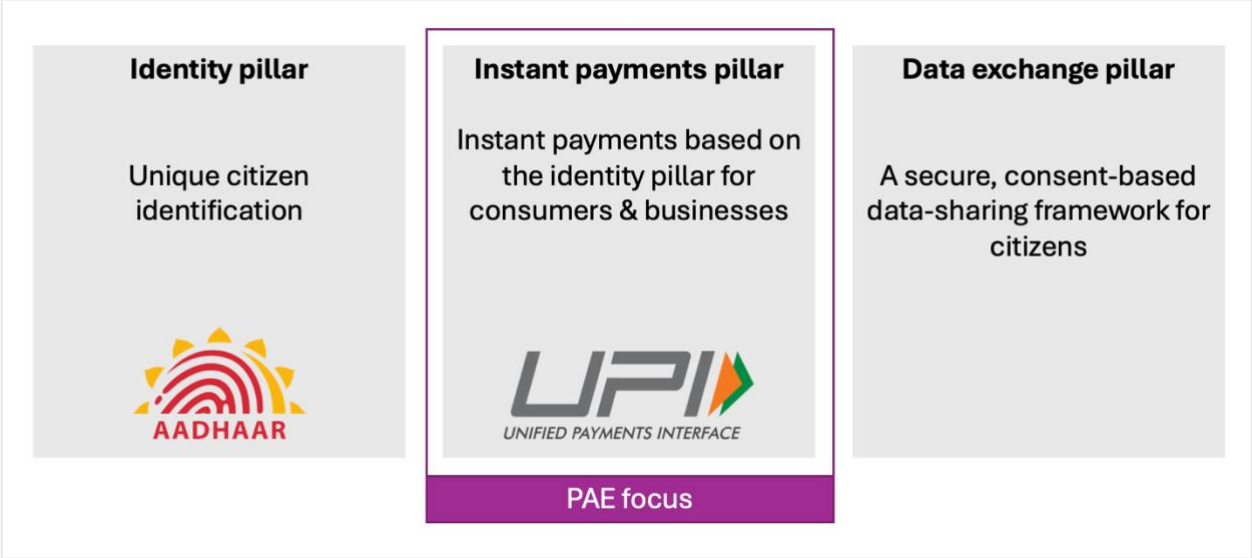
UPI is a vital part of India’s technology stack (DPI), aimed at advancing the nation's financial and digital inclusion objectives and provided as a public good. DPI was initiated as a response to India’s lagging in connectivity and low banking penetration (under 20% of the population banked). India distributed over $50B annually in various social services but experienced high leakage (20-40%), driven by a lack of identity verification methods. The leakage included duplicate/ghost beneficiaries, double payments, beneficiary exclusions, and delays. With these needs at hand, the government decided to step in, setting up a governmental infrastructure baseline.[66]

While many potential payment solutions existed, similarly to Brazil, the choice to offer mobile-based payments was driven by the high penetration of mobile phones. In 2016, when UPI was launched, there were 893 million mobile phone internet users in India – over half of the population.[67] By the time UPI scaled, around 2020, the number was at 1055 million users – over 75% of the population.[68]

[66] Varna, Pramod, “India’s Financial Inclusion Journey: Building Blocks for Resilient Economies.”
[67] UPI relies on household phone ownership as a minimal requirement, over personal ownership
[68] Basuroy, Tanushree, “Number of Mobile Phone Internet Users in India from 2010 to 2023, with Estimates until 2050.”

3.2 Technical background: UPI's offering

India's DPI consists of three main pillars:[69]



Each pillar interconnects with the other two, supporting and enhancing them. For example, the identity pillar is essential for scaling UPI, which required an identification method.[70]

UPI, conceived by the Reserve Bank of India (RBI) and a private sector study group in 2012-2013,[71] is a building block established by the government to facilitate private sector innovation. Consequently, it functions as an underlying network and a specification of the "rules of the game" for private players to follow.

UPI is interoperable, meaning it allows universal access to payment systems. Additionally, it remains agnostic to various features, promoting even greater access, including mobile devices, authentication methods, and currencies. Users link their bank accounts to any UPI-enabled app to use it for payments.[72] The customer interface (payment app) is separate from account holding, supporting the system's growth.[73]

[69] Kant, Amitabh and Mishra, Satwik, "The International Significance of India's Digital Public Infrastructure."
[70] Tellez, Camilo, Background interview - Camilo Tellez.
[71] Shah, Jas, "Fintech R&R-India's Digital Payments Locomotive."
[72] D'Silva, Derryl et al., "The Design of Digital Financial Infrastructure: Lessons from India."
[73] Rai, Suyash and Burman, Anirudh, "Comparing India's UPI and Brazil's Pix | How Censorship Shaped Literature and Expression."

3.3 System mapping

3.3.1 Types of players within the system

Six types of players involved in the UPI ecosystem. Below is a high-level mapping of power, interest, and shifts, followed by a detailed review:

Player type	Power (ability to influence decisions at onset)	Interest	Power shift due to UPI		Key Gains/Losses
			Market share	Decision making power	
NPCI	High	High		↑ Increase	Became the operator of India's largest payments system.
Big techs & TPAPs	High	High	↑ Increase	↑ Increase	The introduction of UPI gave rise to TPAPs, with ~90% Market share with big tech-based TPAPs.
RBI	High	Medium		Retained	Retained standing as a regulator.
Ministry of Finance	Medium	Medium		Retained	Supported larger goal of financial inclusion in India.
Banks	Medium	High	↑ Increase	Fluctuate	Banks saw a growth in customer base and transactions, owning NPCI. However, they are funding UPI, unable to change that.
Card providers	Low	High	↑ Increase	Retained (low)	Card payments were low before UPI, but TPAPs pushing card usage

1. **National Payments Corporation of India (NCPI):**

NPCI is a non-profit organization founded by RBI and commercial banks in India, and is owned by the commercial banks that provided the initial funding for its activities. Since 2010,[74] NPCI has operated various payment systems, launching UPI's development in 2016. Initially, UPI was tasked with creating efficiency in low-value transactions. Eventually, it became a legacy system unifier through an open API architecture.[75] NCPI's organizational culture is described as "like a startup," contributing to its separation from RBI. However, it is experiencing pressure from RBI, banks, and TPAPs due to its reliance on them.[76]

[74] NPCI, "Equity Shareholding Pattern as on 1st December 2024."
[75] D'Silva, Derryl et al., "The Design of Digital Financial Infrastructure: Lessons from India."
[76] Background interview with a former consultant to NPCI.

2. Big tech and Third-party app providers (TPAP)

TPAPs are creating solutions for end-users, including customers, merchants, billers, and others. To operate, TPAPs require partnerships with banks at their back end, with RBI mandating a minimal number of partnerships for each TPAP to operate.[77]

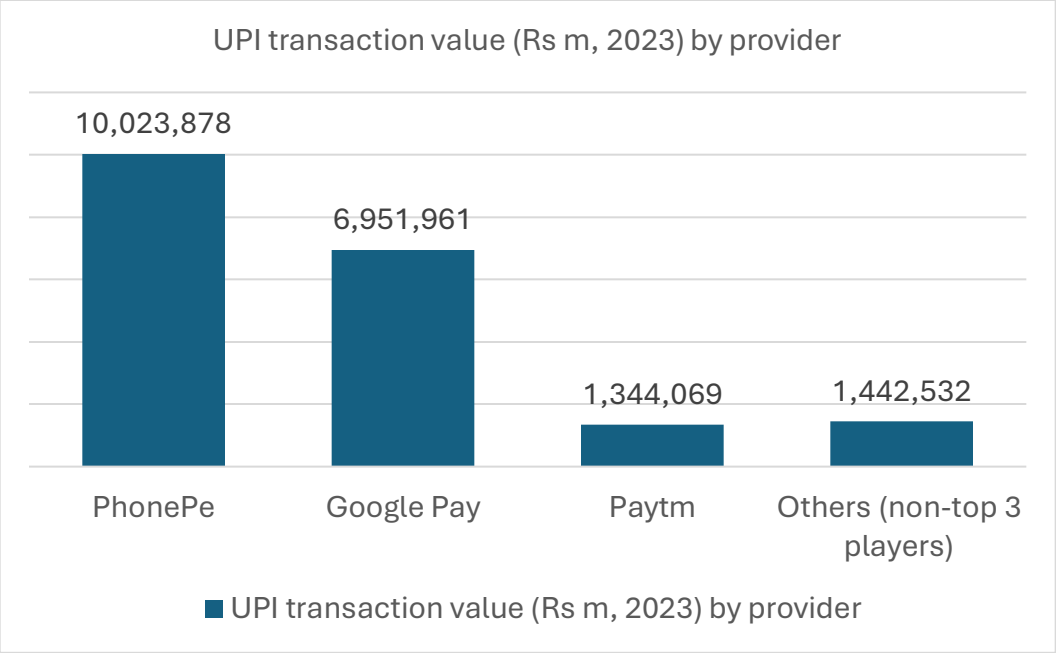
TPAPs are a crucial part of the system, with a 2024 BIS report stating that "UPI payments… only took off when third-party application providers (now dominant) were allowed to connect in 2018" (p.8).[78]

When UPI was first initiated, banks opposed it. TPAP providers, such as PhonePe, and large multinational corporations, like Google Pay, infused the system with innovation by investing funds in developing UPI-related solutions and reaching out to the market. Other players followed them and expanded the network once they recognized UPI's potential.[79]

TPAPs offer features that allow payments (e.g., QR code generation and voice payment enablement), and value-adding services, such as marketing services, business analytics, payment insurance, and loans.[80]

About 30 TPAPs participate in UPI.[81] However, the market is dominated by the three largest players (PhonePe, Google Pay, and Paytm), accounting for over 90% of market transactions.[82]

[77] Background interview with a former consultant to NPCI.
[78] Carstens, Agustin and Nilekani. Nandan, "Finternet: The Financial System for the Future."
[79] Siddarth Shetty, Background interview - UPI founding team member.
[80] Routh, Aditi, "The Role of Nonbanks and Fintechs in Boosting India's UPI Person-to-Merchant Transactions," Payments System Research Briefing (Federal Reserve Bank of Kansas City, August 30, 2024), https://www.kansascityfed.org/research/payments-system-research-briefings/the-role-of-nonbanks-and-fintechs-in-boosting-indias-upi-person-to-merchant-transactions/.
[81] Routh, Aditi.
[82] Economist Intelligence Unit, "Financial Services: India."



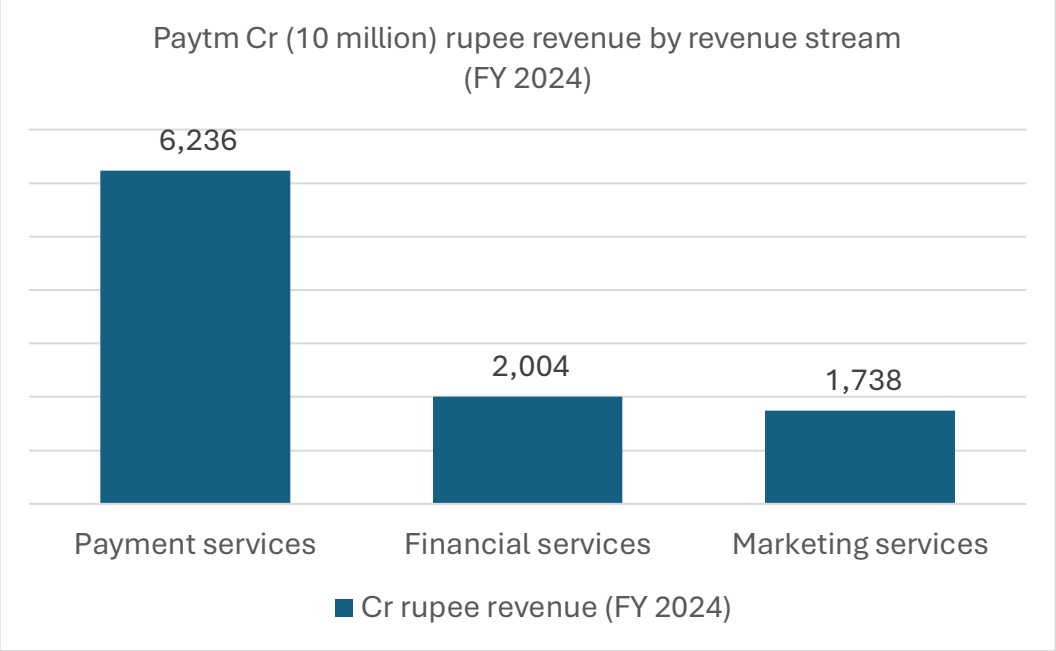
This high market concentration is sparking significant debate about the government's role in potentially establishing new monopolistic systems. On one hand, there are concerns about data ownership by these players. On the other hand, there is a claim that these systems can be easily replicated if a decision is made to regulate market shares due to the system's distributive nature.[83] An attempt to introduce market share caps of 30% for PhonePe and Google Pay, which was set to take effect at the end of 2024, has recently been postponed until 2026.[84]

The no-fee system also creates barriers to entry for players without substantial capital. With Google Pay owned by Alphabet and PhonePe backed by Walmart,[85] these claims gain further traction since such players can absorb the costs of operating a free payments system to access consumers and gather data, having the capacity to benefit from lending, data, and other revenue streams in the future.[86] Additionally, another concern with this setup is the perception of governmental favoritism towards these players.

[83] Aakash Guglani, Background interview - manager at the Digital India Foundation.
[84] Reuters, “India Delays UPI Payments Market Share Cap in Relief for Walmart-Backed PhonePe, Google Pay.”
[85] Reuters.
[86] Background interview with a former consultant to NPCI.

Since 2022, the government has started distributing subsidies to participating players. Subsidies are paid to participating banks, on a per-transaction basis, which they can share with TPAPs.[87] According to PhonePe's financial statement, 10% of the company's revenue was derived from that subsidy in 2024.[88]

Paytm's 2024 report exemplifies the mechanism described above. By gaining access to consumers through UPI, Paytm was able to expand other lines of business, eventually offering cards via UPI as an additional revenue stream.[89]



Payment services, which account for approximately 60% of revenue, encompass governmental subsidies, card payments, online transactions, and platform fees for online sales. Financial services involve loan distribution. Marketing services consist of data usage for merchants, card launches, and loyalty programs.

3. **Reserve Bank of India (RBI):**[90]

UPI and NPCI are separated from RBI, due to the broad scope of the RBI's activities and the growing demand for efficient payment systems. RBI officials state that the RBI is one of the most multifaceted central banks in the world. Therefore, adding the development and

[87] Ranjan, Amitav, "Exclusive: Indian Government Plans Rs 50 Billion Incentive to Promote RuPay, BHIM-UPI."
[88] PhonePe, "Annual Report 2024 - PhonePe."
[89] Paytm, "Annual Report 2024 - Paytm."
[90] RBI employee, Background interview - RBI employee.

operation of a large-scale retail payment infrastructure like UPI to its already extensive mandate would dilute focus and resources.

Recognizing this, the Indian Parliament enacted the Payments and Settlements Act in 2007, designating the RBI as the primary regulator for payment systems. In doing so, RBI could concentrate on its core functions, while NPCI, as a dedicated entity, could leverage fintech expertise to develop scalable and efficient solutions like UPI.

RBI regulates NPCI as an entity rather than UPI as a product. While UPI is NPCI's flagship product, RBI's regulatory focus remains on NPCI's overall compliance with principles related to cybersecurity, customer service, and fee structures. Additionally, banks operating UPI are directly regulated by the RBI. Only licensed banks that adhere to the central bank's guidelines can participate in the UPI network.

4. **Ministry of Finance**

The ministry is a regulator overseeing UPI, along with RBI,[91] and was a key to creating the regulatory framework to nudge players into participating, including the following:[92]

- A requirement for all businesses with over 500M rupees of annual sales to accept UPI (with a fine for each day of non-compliance) was passed in 2019.
- A subsidy of approximately 300 million USD for banks and TPAPs providing instant payments was launched in 2022 and will continue into 2023 and 2024.[93]
- A decrease of 86% in circulated currency was implemented in 2016.

Additionally, the ministry hosted and orchestrated workshops and other advocacy measures to encourage UPI adoption. [94]

5. **Banks**

UPI has approximately 600 partner banks. While participation is not mandated by the government for smaller banks, several policies have been designed to encourage banks to adopt UPI, as described in the section above. Additionally, various factors have

[91] Chandra, Kamya et al., "From Brasilia to Bombay: The Unlikely Twins Leading A Global Open FInance Revolution."
[92] Rai, Suyash and Burman, Anirudh, "Comparing India's UPI and Brazil's Pix | How Censorship Shaped Literature and Expression."
[93] Express News Service, "Centre Clears Rs 2,600 Cr Scheme to Promote RuPay, BHIM-UPI."
[94] Chandra, Kamya et al., "From Brasilia to Bombay: The Unlikely Twins Leading A Global Open FInance Revolution."

contributed to UPI adoption, including the inherent reduction in cash processing and lending costs.

Banks are functioning as both issuers and acquirers in two networks. The first network, consisting of acquirers, includes 77 banks that partner with front-end applications and merchants. The second network, comprising issuers, has 535 banks providing accounts to end users.[95]

A key criticism of the system comes from banks facing the costs of payment transactions, which are partially alleviated by RBI's subsidies. However, the counterargument is that UPI has also expanded the banks' customer base, potentially offsetting the additional payment costs with revenue from other products, such as deposits and credit.[96]

6. Credit cards providers

Similarly to the case of Pix, UPI initially emerged as a parallel to credit cards within a context of low credit card usage, starting from just 3% ownership among adults over 15 in 2017.[97] However, with TPAPs seeking alternative revenue sources, the number of card-accepting POS terminals (which also accommodate UPI) has experienced significant growth, tripling from 2.5 million to 7.5 million between 2016 and 2022.[98] As a result of this trend, along with commercial offerings from TPAPs,[99] card usage has grown considerably alongside UPI usage. Nevertheless, credit cards still represent a small share of total economic activity in India, with credit card usage volume falling below 3 billion in 2022, compared to UPI's 80 billion,[100] and only 4.6% of adults owning a credit card.[101]

[95] Chandra, Kamya et al.
[96] Background interview with a former consultant to NPCI.
[97] Global Findex 2021, "The Global Findex Database 2021."
[98] de Best, Raynor, "Total Number of POS Terminals Reported in India from 2012 to 2022."
[99] Paytm, "Annual Report 2024 - Paytm."
[100] BIS, "T5: Volume of Cashless Payments and Withdrawal/Deposit Transactions."
[101] Global Findex 2021, "The Global Findex Database 2021."

3.3.2 Revenue mapping – commercial players

The table below summarizes key revenue drivers for India's market players post-UPI:

	Short term	*Short term*	*Long term*	*Long term*
	Payment revenue	**Non-payment revenue**	**Payment revenue**	**Non-payment revenue**
Incumbent banks	(D) # of clients ≅ Revenue/client ↓	(N) # of clients ≅ Revenue/client ≅	(G) # of clients ↑ Revenue/client ≅/↑	(G) # of clients ↑ Revenue/client ≅/↑
Payment service providers	(N) # of clients ↑ Revenue/client – 0	(I) Varies, added service offer differs	(N) # of clients ↑ Revenue/client – 0	(G) # of clients ↑ Revenue/client ↑
Card issuers	(D) # of clients ≅ Revenue/client ≅ [102]	(N) # of clients ≅ Revenue/client ≅	(I) # of clients ↑ Revenue/client – TBD*	(I) # of clients ↑ Revenue/client – TBD*[103]

The colors represent:

(G) Growth (D) Decrease (I)Inconclusive (N) No change

[102] Card interchange fees are not regulated in India, creating a difficulty in assessing the price pressure from introducing UPI

[103] For (*) – The ability to generate revenue from card clients, specifically credit cards, can be defined as a function of three main components: card payment pricing and quantity (with prices decreasing but quantity increasing) and value-added services (which grow alongside the increase in the number of users) over a longer trajectory.

3.3.3 Power mapping – commercial players

The table below summarizes key trends in power balance for India's market players following UPI's launch:

Financial institution	Power balance shift outcome – short term	Power balance shift outcome – Long term
Incumbent banks	(D) Low benefits from the new system, with multiple new players entering the market and increasing competition.	(I) Growth in number of customers creating more negotiation power, but new players still in the system
Payment service providers	(G) Access to the market, with benefits from consumer data and upselling opportunities.	(G) Power retained - access to the market, with benefits from consumer data and upselling opportunities.
Credit cards	(D) "Replaced" by the new system as a mean of digital payments, introducing more competition	(D) Growth in customers supportive of revenue, negotiation power remained low given small share of payment volume

The colors represent:

(G) Growth (D) Decrease (I)Inconclusive (N) No change

3.3.4 Stakeholder engagement mechanisms

UPI has a four-tier governance system:[104]

1) National Payments Corporation of India Board (reporting to RBI)
    a. Including representatives from banks with a holding at NPCI
2) Steering committee (bank representatives):
    a. 23 members representing 430 institutions, inc. issuers, fintechs, and key acquirers.
    b. The committee receives suggestions for discussion from NCPI, decisions are made by reaching a consensus, with decisions abiding all member banks.
    c. The committee meets twice a year (January and August)[105]
3) User council (inc. 3rd party applications)
4) Ecosystem council

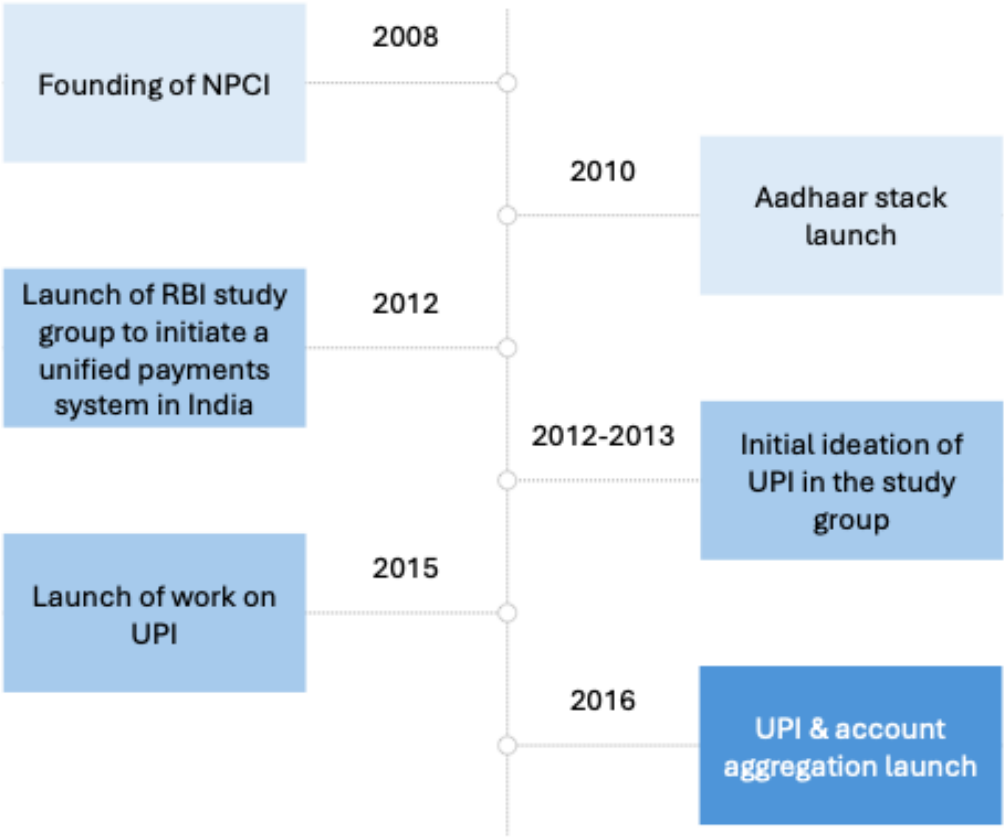
This structure, comprising both private entities and the government, is supporting trust creation in the system and feedback loops from consumers to NPCI.

Additionally, regulators such as the RBI and NPCI are engaging in both bilateral and multilateral dialogues with relevant entities, including banks and TPAPs, regarding regulatory decisions on an ongoing basis.[106]

[104] Chandra, Kamya et al., "From Brasilia to Bombay: The Unlikely Twins Leading a Global Open Finance Revolution."
[105] "UPI & Services Steering Committee."
[106] Reuters, "RBI Meets Stakeholders to Discuss Strategies to Widen Scope, Reach of UPI."

3.4 Development timeline

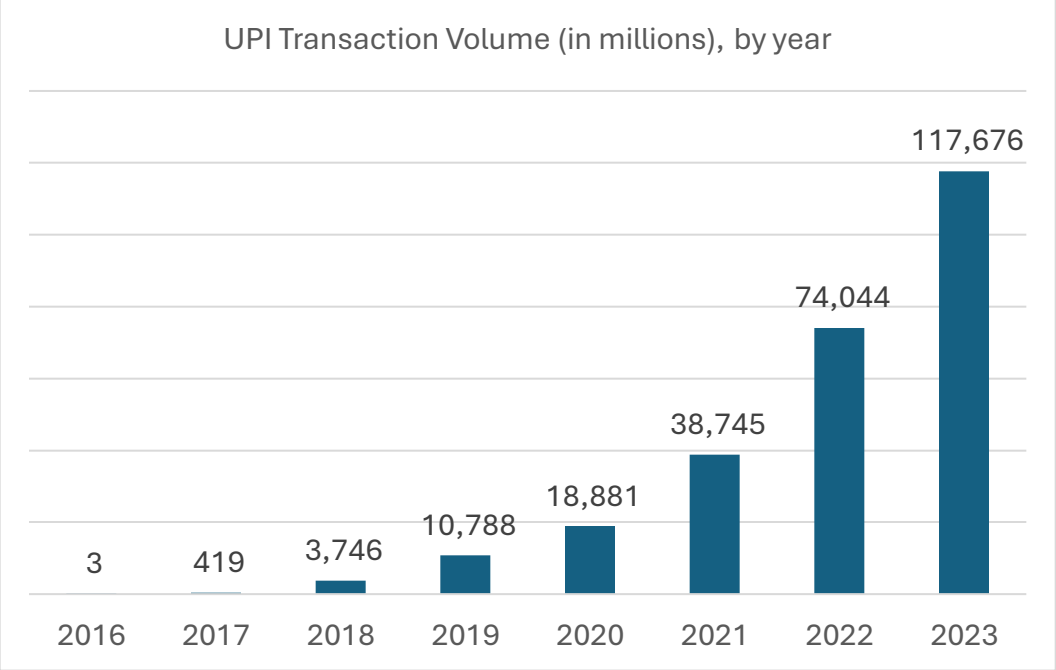
UPI was developed as a part of India's DPI. Therefore, it is important to consider the process that led up to the development of UPI within that context:[107]



[107] Shah, Jas, "Fintech R&R-India's Digital Payments Locomotive."

3.5 Scaleup timeline

UPI's growth was initially slow, taking approximately 3 years to reach 1 billion monthly transactions.[108] UPI took 5 years to reach 20% of the population (2021) – slower than Pix, which reached 75% of the population in less than 3 years.[109]

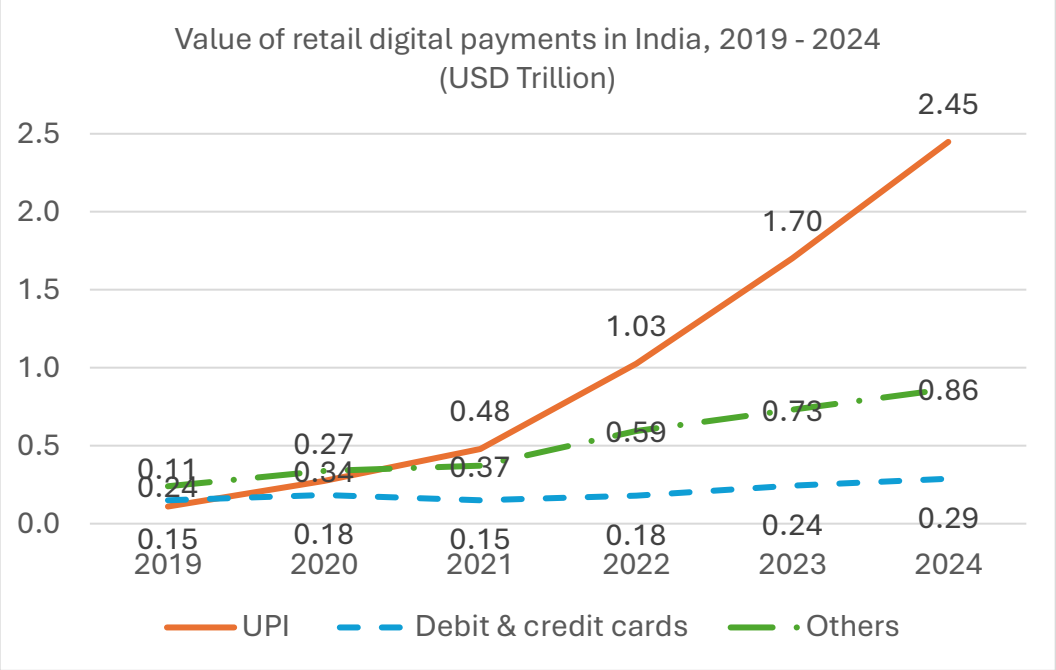


One explanation for the scale-up is that UPI's growth accelerated once it was adopted by TPAPs.[110] Additionally, it was bolstered by the government's push against cash and the demonetization effort launched in 2016, when the government demonetized 86% of the cash in circulation,[111] compelling citizens to switch to digital payment methods.[112] Lastly, COVID-19 was also a significant event that facilitated the transition to digital payments over cash.[113]

Today, UPI is India's fastest-growing retail payment method, with a transaction value (i.e., amount of money) CAGR of ~86% from 2019 to 2024, reaching almost $2.5Tr in 2024 from

[108] NPCI, "UPI Product Statistics."
[109] Suominen, Kati, "Uptake, Use, and Inclusion Gains from Fast Payment Systems: Early Comparative Data."
[110] Shah, Jas, "Fintech R&R-India's Digital Payments Locomotive."
[111] Routh, Aditi, "The Role of Nonbanks and Fintechs in Boosting India's UPI Person-to-Merchant Transactions."
[112] Chaturvedi, Arpan, "India's Supreme Court Upholds Legality of 2016 Demonetisation."
[113] Routh, Aditi, "The Role of Nonbanks and Fintechs in Boosting India's UPI Person-to-Merchant Transactions."

$0.11Tr in 2019.[114] It is also India's most popular digital payment method, processing over 75% of the country's retail digital payments volume (i.e., number of transactions).



[114] Sharma, Shashwat and Tiwari, Nidhi, "How Urban India Pays."

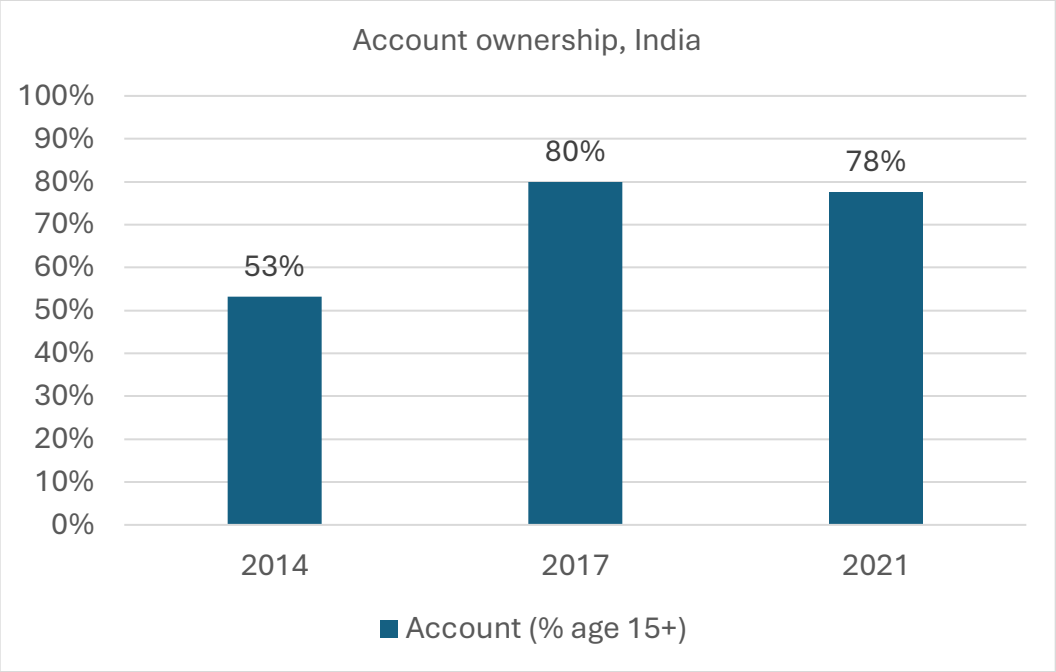
3.6 Financial inclusion impact

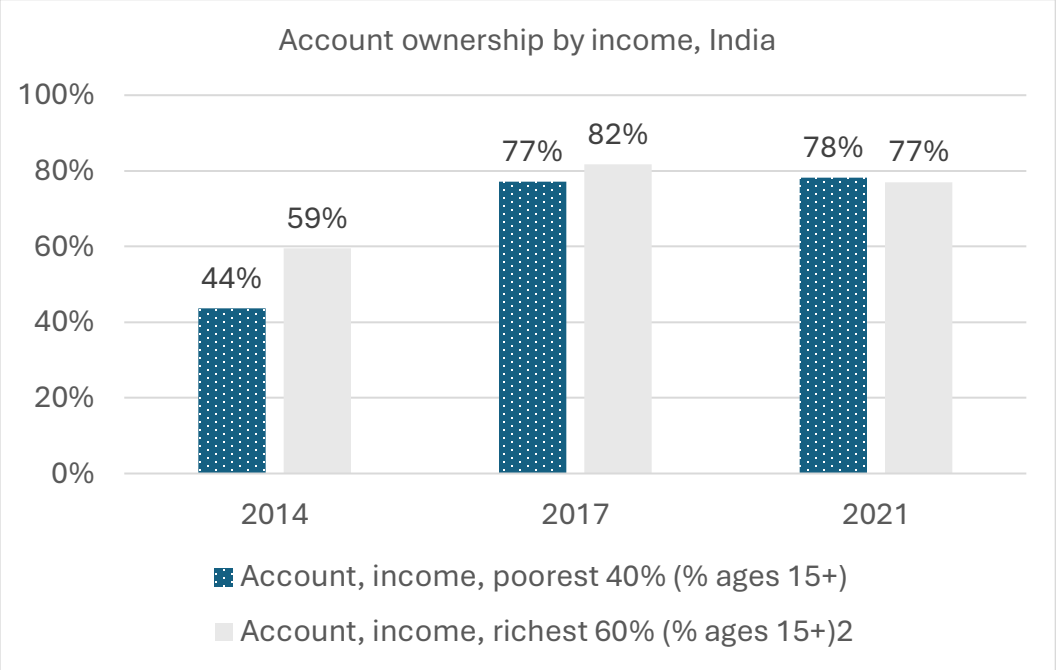
UPI transformed not only the payment ecosystem but also acted as a catalyst for financial inclusion. The data below highlights an intriguing discussion about the actual impact of the system. Like Pix, UPI spurred accelerated growth in credit card usage. This raises the question of the value of such systems in relation to existing technologies. By examining the data on lending growth from formal financial institutions, I claim that the significance of this system extends beyond payments to encompass the larger issue of financial inclusion across various financial tools and income levels.

3.6.1 UPI's impact on bank account ownership

Account ownership in India increased significantly from 2014 to 2017, particularly among the poorest 40% of the population, following the introduction of DPI, predating UPI.[115] Beyond simplifying identification through the Aadhaar scheme for account setup, government policies required state-owned banks to establish at least one bank account for every unbanked household. Furthermore, government transfers were increasingly conducted through bank accounts, including housing and cooking gas subsidies, rural employment wages, and scholarships, which raised the demand for accounts.[116]

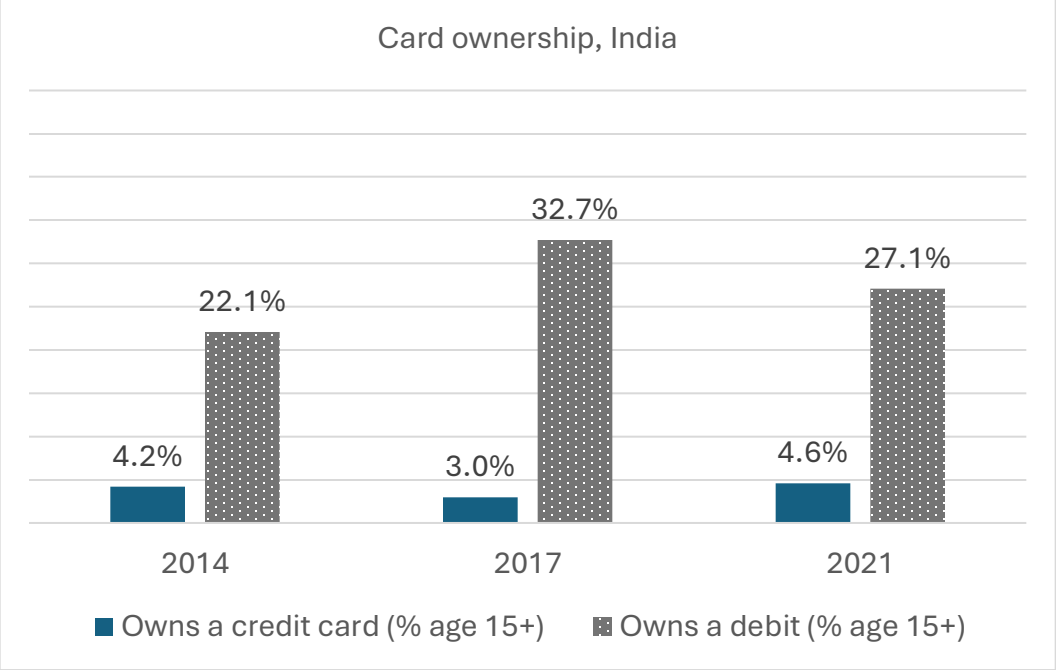
[115] Global Findex 2021, "The Global Findex Database 2021."
[116] Raman, Anand, "India Moves Toward Universal Financial Inclusion."


Account ownership, India
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
53%
80%
78%
2014
2017
2021
Account (% age 15+)


Account ownership by income, India
100%
80%
60%
40%
20%
0%
44%
59%
77%
82%
78%
77%
2014
2017
2021
Account, income, poorest 40% (% ages 15+)
Account, income, richest 60% (% ages 15+)2

3.6.2 UPI's impact on card usage

Examining card ownership rates, the data reveals a mixed trend, with a decline in 2017. However, it was caused by an RBI decision mandating banks to replace old magstripe cards with chip-based cards to combat fraud. Therefore, the data is presented below, but insights from this section will focus on payment volumes rather than card ownership.[117]

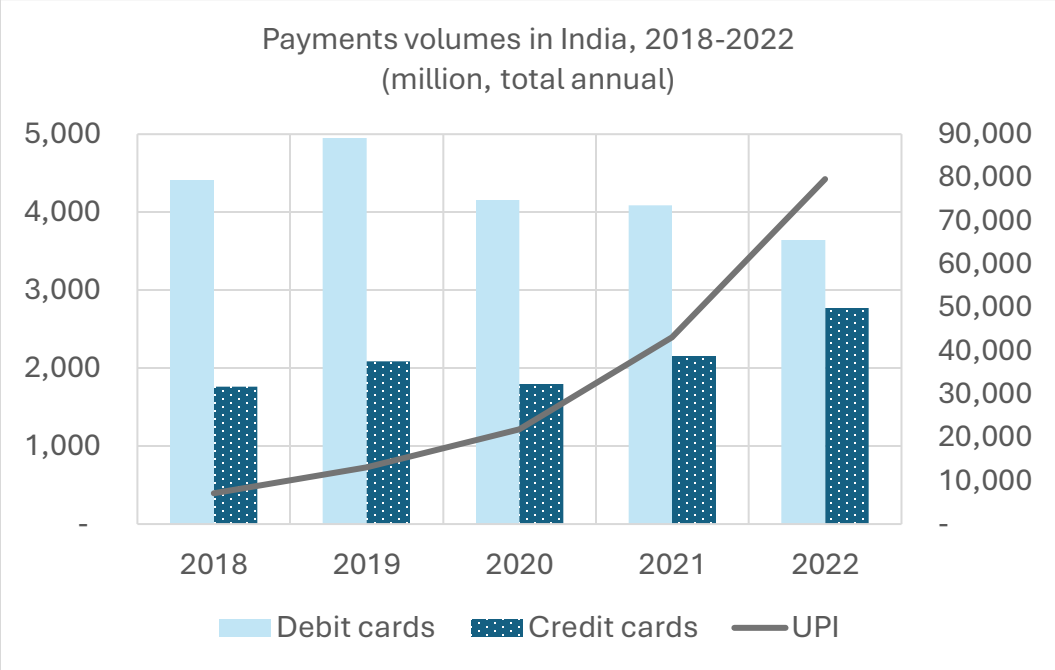


Exploring the impact of UPI on card payment volumes reveals a mixed trend. Debit card usage has declined over all the mentioned years, experiencing a -2.9% CAGR in 2018-2020, prior to UPI gaining traction. That decline accelerated in 2020, as UPI began to grow more rapidly, reaching -6.4% in 2020-2022. Conversely, credit cards exhibited the opposite trend. Starting from a -7.3% CAGR in 2018-2020, the introduction of UPI has fostered their growth – reaching 24.2% in 2020-2022.

These trends can be explained similarly to the Pix and other product connections: UPI can be seen as a free substitute for debit, providing even simpler operations. UPI supports credit, serving as an initial financial product from which consumers can "grow" to more sophisticated options, including credit cards.

[117] Bhalla, Tarush, "Debit Card Numbers Are Falling across India. Here's Why."

In the graph below, the left axis represents debit and credit cards, while the right axis represents UPI.[118]

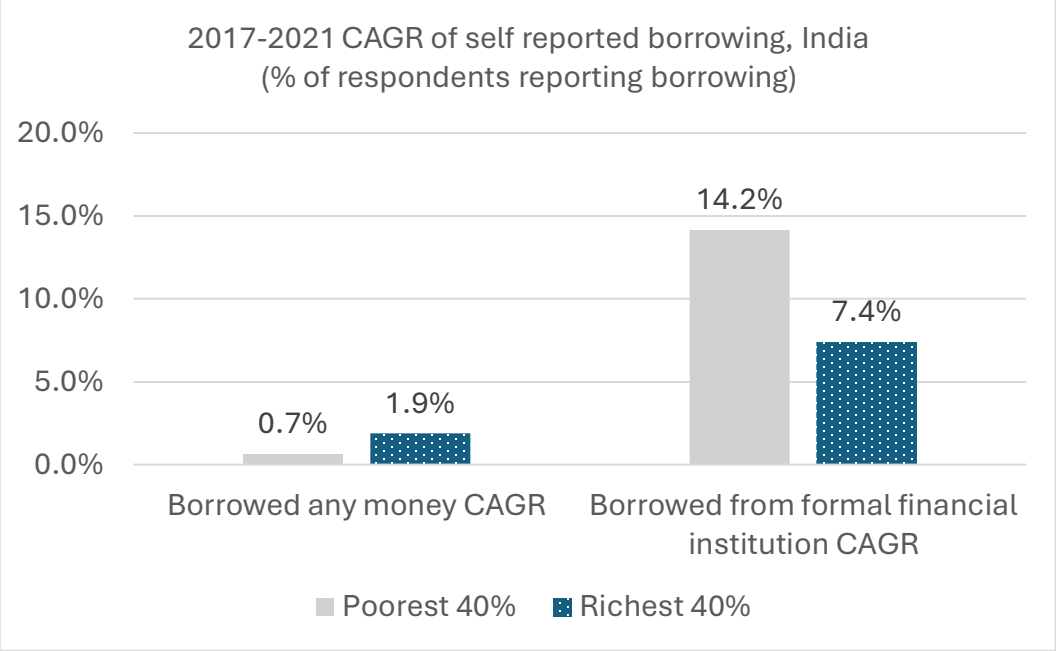


3.6.3 UPI's impact on lending

Like Pix, UPI also fueled growth in borrowing from financial institutions. In UPI's case, the difference is particularly striking. While the overall percentage of respondents reporting borrowing did not increase significantly (staying around 40-45%, with a CAGR below 2% across income categories), there was substantial growth in borrowing from formal financial institutions – especially among the poorest 40%, which reached a CAGR of 14.2%. The poorest 40% rose from 6.3% to 10.7% during 2017-2021, the period of UPI's expansion.[119]

This data further demonstrates the significance of UPI not only as a payment system but also as a catalyst for financial inclusion.

[118] BIS, "T5: Volume of Cashless Payments and Withdrawal/Deposit Transactions."
[119] Global Findex 2021, "The Global Findex Database 2021."


2017-2021 CAGR of self reported borrowing, India
(% of respondents reporting borrowing)
20.0%
15.0%
10.0%
5.0%
0.0%
0.7%
1.9%
14.2%
7.4%
Borrowed any money CAGR
Borrowed from formal financial institution CAGR
Poorest 40%
Richest 40%

3.7 Externalities

UPI has several key externalities to be considered when evaluating the system.

The first is an **increase in fraud**: The growing popularity of UPI has made users targets for fraud, driven by their frequent lack of financial literacy and the ease of using technology.[120]

The second refers to the **system's implications for women**. While the system allows for participation in the financial market, it also has some negative impacts on some women, including:

1. Harassment by obtaining an individual's contact details through UPI (as many UPI apps feature a chat function)
2. Loss of financial anonymity, characterized by:
    a. Loss of emergency funds by women, driven by the 2016 banknote demonetization
    b. Loss of women's ability to control their cash flows, as UPI is often creating a single fund management system per household (e.g., ownership of a single device per household)

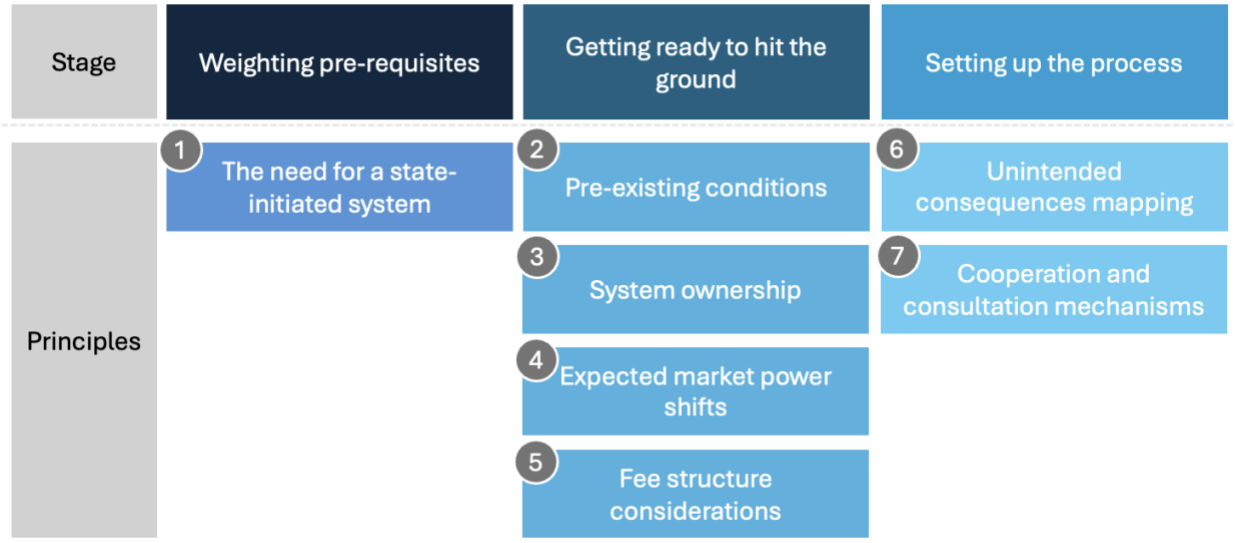
Additionally, heavy government intervention in the market can potentially create distortions, such as reduced investment in innovation for other payment products or a decreased willingness of new players to enter the market in the long term.

Lastly, there is a risk of a bank run in the event of a significant financial crisis.

[120] Dixit, Pranav, "Digital Payment Frauds Surge in India as UPI Transactions Skyrocket: RBI Report."

4. Implementation Principles

This section outlines key principles for policymakers to consider when implementing a government-led instant payments scheme, based on the experiences of Pix and UPI. It is organized into the following components:

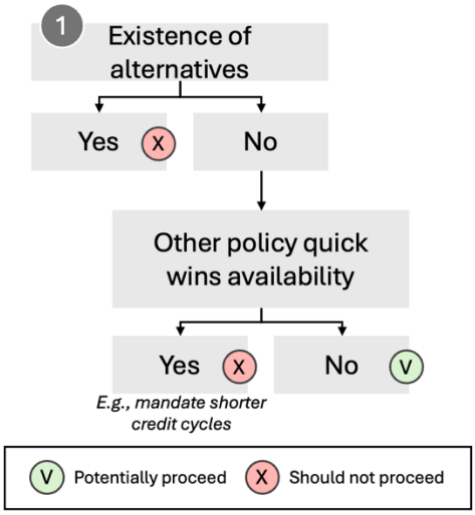


4.1. The need for a state-initiated system

Before addressing the "how," states should consciously determine the "should" based on clear criteria. Although there is no single, straightforward formula, the following section outlines seven assessment criteria and how they interact with one another. Finally, the section provides an initial review of states that could potentially benefit from such systems, driven by market needs and state capacity.

1 Existence of alternatives	Existence of current market alternatives (e.g., widespread cards) or ability to provide another quick policy fix (e.g., legally mandate shorter card cycles)	
2 Economic impact	Economy size multiplied by maximal & minimal per-person outcome, creating a best/worst case	Decision made based on minimal and maximal gap between cost & benefit
3 Cost to develop	Cost range to develop (min/max)	
4 Time to develop	Potential time range to develop (min/max)	Decision made based on temporal approach to development time (e.g., if longest time to develop – is it going to be redundant?)
5 Alternatives emerging during development	Expected alternatives emerging during development time	
6 Ability to execute	Probability of success as a function of execution state capacity	
7 Ability to enforce	Ability to enforce market player participation in the system – or to set up an entity/legal frameworks to do so	

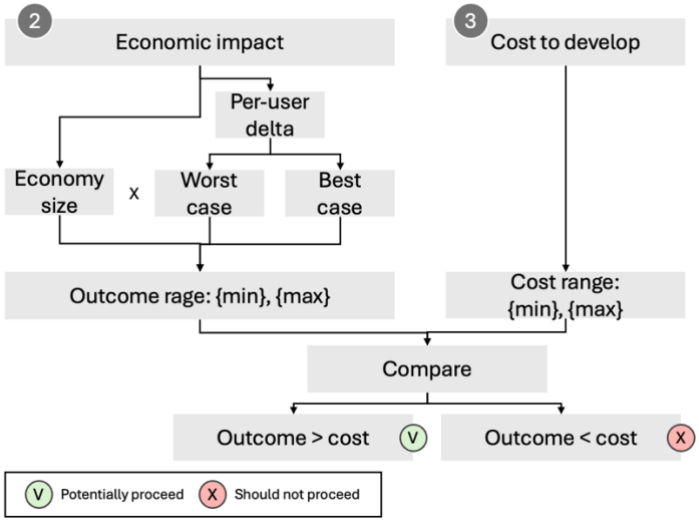
1. Existence of alternatives



A government investment in instant payments may be justified when there are no prevalent market alternatives to cash (e.g., widespread credit or debit cards and cellular network-based payment systems). Furthermore, policy "quick wins, " such as mandating shorter credit card cycles, should be considered carefully.

High fit case	**Low fit case**
Countries with: - Under 70% of population banked - Under 70% of population using credit cards - No other alternatives to cash	Countries with a highly banked population, or with an established alternative as M-Pesa (Kenya)[121] or super apps like Kaspi (Kazakhstan)[122]

2. Economic impact



Per user delta: Instant payment systems can provide substantial economic benefits in cases of low financial inclusion, marked by a high dependence on cash and a significant unbanked population. In more financially inclusive economies, consumers and merchants generally have access to alternative payment options, diminishing the incremental impact

[121] "Https://Worldpopulationreview.Com/Country-Rankings/m-Pesa-Countries."
[122] Tietoevry.com, "How Kaspi.Kz Created a Kazakh Paytech Revolution with Tietoevry Banking's Card Platform."

of such systems. Policymakers should evaluate both the minimal and maximal per-user delta to determine a potential outcome range.[123]

High fit case	**Low fit case**
Countries with high unbanked population and no alternatives such as Azerbaijan, Uzbekistan	Highly banked countries – e.g., most EU member states

Economy size: The economic impact from the development should be significant enough to justify the intervention cost, driven by the size of the economy.[124] For smaller economies, the cost of development might exceed potential benefits (i.e., the difference of 2% GDP increase in Brazil versus Azerbaijan).

Multiplying $(per\ user\ delta) * (economy\ size)$ for minimum and maximum cases provides a potential outcome range.

In the absence of a "golden metric", several relevant benchmarks for generated benefits can be used:

- Pix's impact is expected to reach ~2% added growth to GDP by 2026.[125]
- Between 2016-2023, UPI saved the Indian economy $67 billion (through a reduction in cash handling and card transaction costs).[126]
- 1 p.p. increase in digital payments is associated with 0.04 p.p. growth in total factor productivity, 0.1 p.p. growth in per capita GDP and 0.06 p.p. decline in the share of informal employment.[127]

[123] Global Findex 2021, "The Global Findex Database 2021."
[124] The project should be evaluated within the framework of options – i.e., initial cost evaluation, with ongoing iterations and re-evaluations of impact throughout the development process, to ensure relevancy.
[125] Sampaio, Matheus and Renato Haas Ornelas, Jose, "Payment Technology Complementarities and Their Consequences in the Banking Sector: Evidence from Brazil's Pix."
[126] Chopra, Chirag and Gupta, Piyush, "India's Digital Leap: The Unified Payment Interface's Unprecedented Impact on the Financial Landscape."
[127] Frost, Jon et al., "Fast Payments: Design and Adoption."

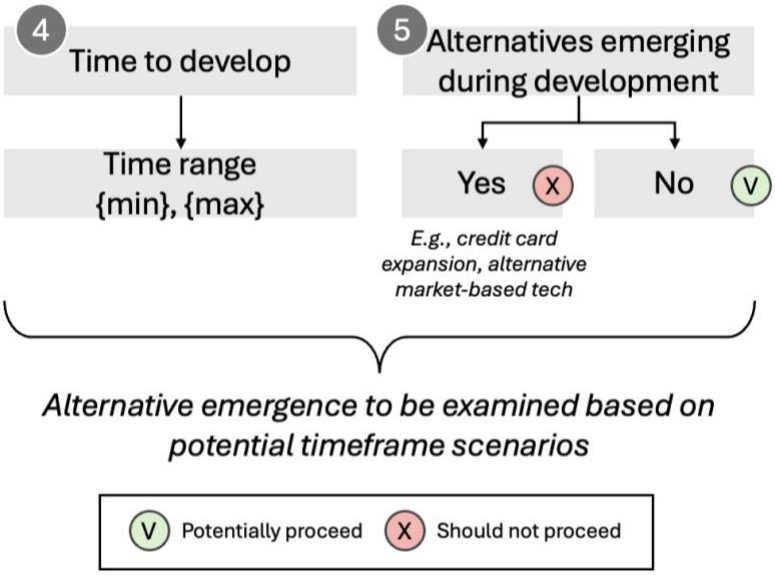
High fit case	Low fit case
Benefits exceeding costs	Costs exceeding benefits

3. Cost to develop

Consideration should be given to initial development, ongoing maintenance and adoption costs. The Pix cost benchmark is 1% of GDP, either shared with private market players or fully funded by the government.[128] Another possible benchmark is UPI's estimated maintenance cost of $1.5 billion a year.[129]

High fit case	Low fit case
Benefits exceeding costs	Costs exceeding benefits

4. Time to develop



Consider the potential minimal and maximal development times, influenced by various factors including the state's capacity to execute within specific timeframes, talent availability, budget considerations, and other case-specific topics.

[128] Sampaio, Matheus and Renato Haas Ornelas, Jose, "Payment Technology Complementarities and Their Consequences in the Banking Sector: Evidence from Brazil's Pix."
[129] Aakash Guglani, Background interview - manager at the Digital India Foundation.

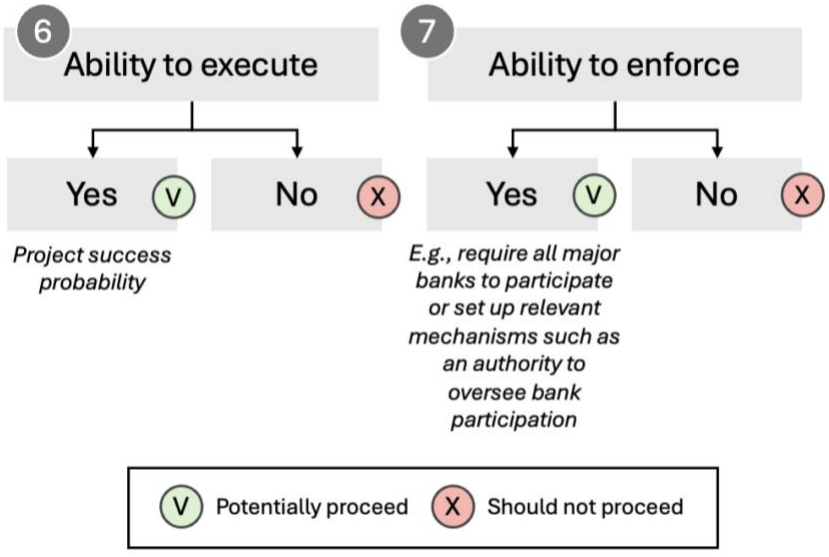
Additionally, development time depends on the system's scope (e.g., a narrow focus on payments or the establishment of a comprehensive identity system) and the existing technological conditions. Overall, useful benchmarks are Pix and UPI, which took two and eight years, respectively, due to their differing scopes.

5. Alternatives emerging during development

A topic closely linked to the issue of development time is the emergence of alternatives during that process. For instance, a significant rise in credit card usage or the widespread adoption of cryptocurrency technology could render such systems obsolete. Therefore, development time becomes a critical factor, surpassing the fundamental costs of extended projects.

High fit case	**Low fit case**
Potential alternatives are not expected to emerge during the development period	Potential alternatives can emerge during the development period

6. Ability to execute



The ability of governments to effectively implement policies and achieve objectives influences the likelihood of a project's success. This can be assessed by examining the success rates of similar past projects, as well as political feasibility.

High fit case	**Low fit case**
High probability of successful execution, assessed using past cases and political feasibility	Low probability of successful execution, assessed using past cases and political feasibility

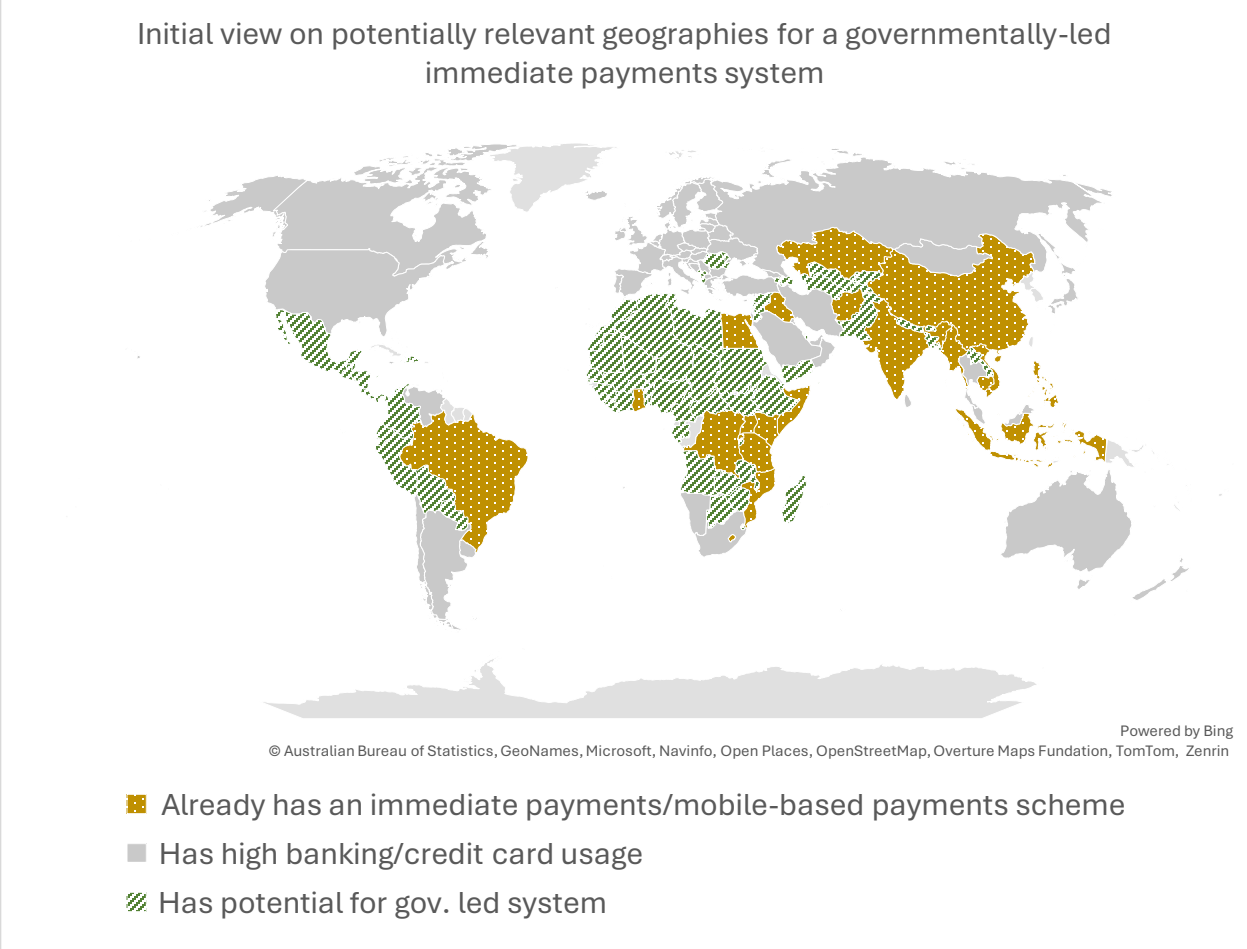
7. Ability to enforce

Pix and UPI's success was bolstered by their governments and central banks' capacity to ensure participation through mandating the involvement of large players and offering financial incentives. A system lacking an enforcement mechanism can turn into a white elephant.

Another relevant question is the capacity to ensure the financial system's stability, whether through a ministry of finance, a central bank, or other pertinent entities. Without this, such systems can become targets for bank runs in a turbulent financial environment.

High fit case	**Low fit case**
High ability to enforce participation and financial system stability	Low ability to enforce participation and financial system stability

Based on the first criteria of "existence of alternatives", an initial assessment shows a potential of ~70 states for developing such a system, as shown in the map below:



The map is based on the following:

1) Initial cutoff – states with low banking/card:[130]
    a) % of population over 15 with a bank account (relevant if % is below 70)
    b) % of population over 15 that owns a debit or credit card (relevant if % of card ownership is below 70%)
    c) The data used is 2021-2022 data, except for the following, due to low data availability:

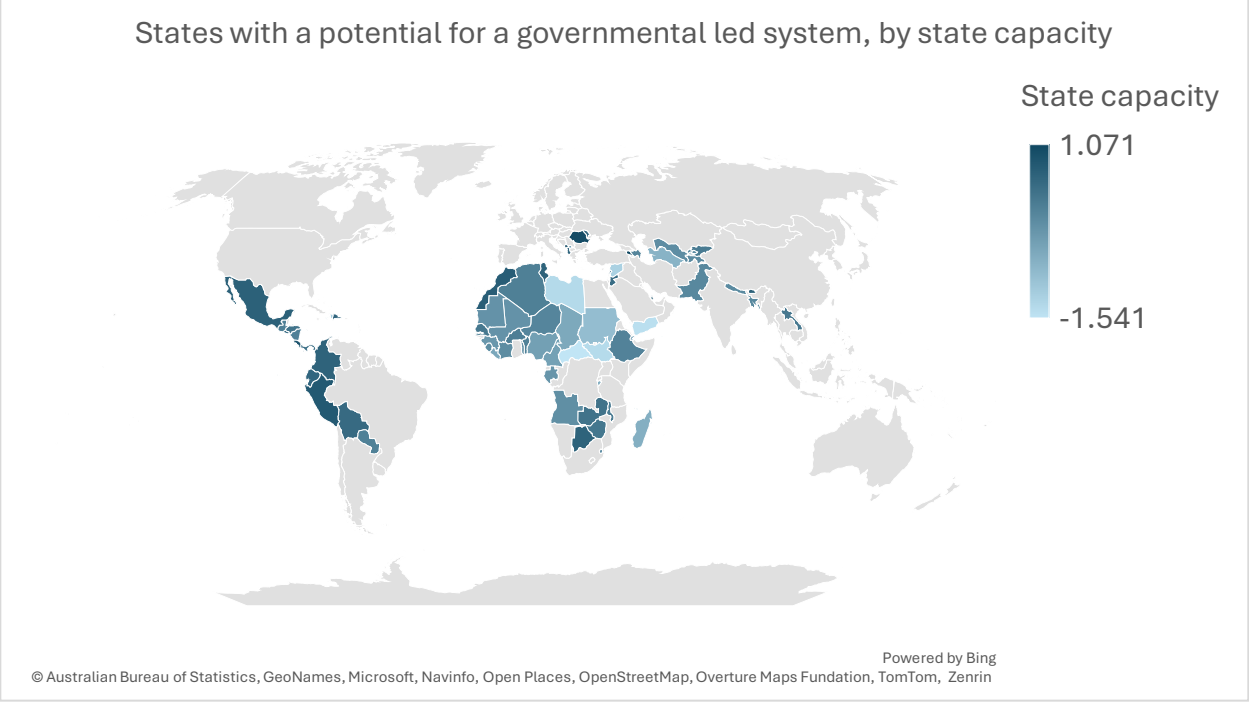
[130] World Bank, "The Global Findex Database 2021."

i) 2017 data: Rwanda, Bahrain, Belarus, Kuwait, Luxembourg, Maldives, Trinidad and Tobago, Central African Republic, Haiti, Libya, Montenegro, Turkmenistan
ii) 2014 data: Somalia, Angola, Belize, Bhutan, Burundi, Sudan
iii) 2011 data: Oman, Djibouti, Qatar, Syrian Arab Republic

2) Among states fitting the criteria – the following already have alternative solutions:
   a) Brazil, India – Pix and UPI
   b) China – WeChat
   c) Kazakhstan – Kaspi
   d) Iraq, Afghanistan, Congo, Egypt, Ghana, Mozambique, Lesotho, Uganda, Kenya, Tanzania, Rwanda, Somalia – M-Pesa[131] and other forms of mobile-based payments[132]
   e) Cambodia, Myanmar, Philippines, Vietnam, Indonesia - Grab[133]

[131] World Population Review, "M-Pesa Countries 2024."
[132] McCaffrey, Mike, "Where in the World Is Mobile Money Prominent?"
[133] Grab, "Where We Are."

Factoring in state capacity, based on "Our World in Data" state capacity index,[134] the following picture emerges:[135]



The map shows that leading geographies for exploration include Mexico and the LATAM states, which are neighboring Brazil (Columbia, Ecuador, Peru, and Bolivia), as well as states in northwest Africa (Morocco).

It is important to recognize that geographies do not operate in isolation. For instance, Mexico has an instant payment system called SEPI, primarily for B2B transactions, while Peru has recently launched a consultative forum on instant payment systems.[136] In other cases, like Romania, systemic constraints exist, as Romania is part of the EU and might transition to the Euro in the coming years.

[134] Higher state capacity score means higher state capacity and vice versa
[135] Our World in Data, "State Capacity Index."
[136] Pinedo, Antony, "These Are Latin America's Instant Payment Systems."

4.2. Pre-existing conditions

Three key questions arise regarding pre-existing conditions

Condition for consideration	Details
Existing market structure	Mapping existing players to understand potential collaborations/risks, looking at groups such as Incumbent banks, challenger banks, Fintechs, credit card companies, and big techs
Consumer & merchant needs	Mapping needs to understand the required scope of work. E.g., is there a need for a wide A-Z reimagination of the financial system – or for a tailored, local payments solution
Regulatory framework	What parts of the framework support developing an immediate payments system as envisioned – and what should be changed? Specifically, the role of the central bank and relevant ministries, antitrust regulations, and private-public collaborations

1. **What is the current market structure, and who are the development counterparts?**

This question is the basis for mapping potential collaborators, opponents, and required changes to financial market regulation.

More specifically, existing players should be categorized into the following groups: incumbent banks, challenger banks, fintechs, credit card companies, and big techs.

While there is no single way to describe the relevant market components, India serves as a good example, showcasing a market characterized by strong public-private partnerships (e.g., the robust Delhi-Bangalore connection), a DPI base, and a competitive, cost-effective mobile network.

2. **What are consumers and merchants need?**

This question supports mapping the scope of required development and implementation efforts (e.g., a comprehensive system like UPI or an additional payments layer like PIX). The mapping should include:

- Financial inclusion (% of population banked)
- Payment alternatives prevalence (e.g., credit cards, A2A mobile network-based payments)
- Segmentations such as regional/societal differences, genders, generations etc
- Smartphone/phone ownership levels (% of population/households with access)

3. What is the current regulatory framework?

Based on the findings from the previous sections, one should map the current regulatory framework and potential required changes. These include:

- Regulation defining the role and scope of work of the central bank.
- Regulation defining the role and scope of work of the Ministry of Finance or any other ministry relevant to overseeing the payment system.
- Existing antitrust regulation.
- Existing regulations relevant to private-public collaborations.

4.3. Deciding on system ownership

This section details the pros and cons of three key ownership models for comparison.

Topic	Within central bank	Within an external body	Through a hybrid model	Key insights
Description	*Central bank as a provider and regulator (PIX)*	*Task a private player with system development*	*Set up an entity co-managed by central bank & market players (UPI)*	
Operational complexity	Case specific	Positive	Negative	Operational complexity increases with multiple owners/required changes to role definitions
Ability to prioritize national needs	Positive	Positive	Case specific	National needs more easily prioritized when there's a governmental ownership
Power to incumbent market players	Case specific	Case specific	Negative	High when co-own the system, case-specific for other options, depending on the relationship with the central bank
Power to new market players	Case specific	Case specific	Case specific	Case-specific, depending on the relationship with the central bank or other players
Trust at rollout	TBD	TBD	TBD	Trust in government-initiated systems depends on country-specific context
Central bank conflict of interests	Negative	Negative	Negative	High for all cases, driven by dual role as a regulator and a stakeholder/provider of a payments scheme

Decision impact on topic: Positive Negative Case specific/neutral TBD

Detailed description below:

	Within the central bank	**Within an external body**	**Through a hybrid model**
Description	*Central bank as a provider and regulator (PIX)*	*Task a vendor with system development*	*Set up an entity co-managed by central bank and market players (UPI)*
Operational complexity for central bank	Medium: requires re-organization at setup (e.g., splitting regulatory and operational departments), but easier to manage once set (one owner)	Low: new entity, separate from regulator	High: multiple players involved in managing and prioritizing development and maintenance (e.g., pressuring entity from different perspectives and priorities)

Ability to prioritize national needs	High: A single decision-making entity (central bank)	High: service acquisition, with a single decision-making entity (central bank)	Medium: national needs balanced with commercial needs given co-ownership (e.g., ability to change fee structure is limited due to variance in policy, political and commercial needs)
Power to incumbent market players	Case specific: depending on relationship with central bank	Case specific: depending on relationship with central bank	High: co-own the entity
Power to new market players	Case specific: depending on relationship with central bank	Case specific: depending on relationship with central bank	Case specific: depending on relationship with central bank
Trust at rollout	Depends on country-specific context (e.g., some with high trust, other cases with low)	Depends on country-specific context (e.g., some with high trust, other cases with low)	Depends on country-specific context (e.g., some with high trust, other cases with low)
Central bank conflict of interests	High: can lead to prioritization of system if the central bank is also the regulator of the rest of the payment systems	High: can lead to prioritization of system if the central bank is also the regulator of the rest of the payment systems	High: can lead to prioritization of system if the central bank is also the regulator of the rest of the payment systems

The colors represent:

Decision impact on topic: Positive Negative Case specific/medium TBD

4.4. Thinking about expected market power balance shifts

The establishment of an instant payment system should consider the consequences for financial institutions, anticipating necessary policy concessions.

Financial institution	Financial/customer centered high-level results	Power balance shift outcome
Incumbent banks	(D) Decrease in payment revenue and stable revenues/costs from other streams.	(I) Low benefits from the new system at first, with multiple new players entering the market and increasing competition.
Fintechs & Neo banks (PIX model)	(G) Increase in payment revenue, number of clients and other revenue streams.	(G) High ability to leverage the system for direct payments monetization/loss-lead to attract business to other revenue streams.
Payment service providers (UPI model)	(I) Mixed results – Initial "loss" funding free payment services, with later gain from additional services (e.g., lending, data), structured on top of payments.	(G) Access to the market, with benefits from consumer data and upselling opportunities.
Credit cards	(I) The new payment tool served as a "first step" financial service offering, driving a growth in adoption over time.	(D) "Replaced" by the new system as a key mean of payments, introducing more competition

(G) Growth (D) Decrease (I)Inconclusive (N) No change

To explore the above, it's useful to recollect the specific details of Pix and UPI as examples. The basis for the below, as well as further detailing, can be found under the system mapping sections for Pix and UPI (2.3 and 3.3).

4.4.1. The similarities (impact on banks and credit cards)

The introduction of new payment rails affected incumbent payment systems and banks. These effects differ in the short and long terms.

In the short term, payment revenue decreased for banks, shifting the balance of power within the payment industry. In Brazil, credit card providers, which held a central role in shaping payment policies due to their dominance in cash and card-based economies now share the market with Pix. In India, where credit card starting point was low due to limited market penetration, their power could be described as almost negligible.

However, in the long term, banks and other card-providing entities can potentially gain revenue and profits from the influx of maturing cohorts of new users. Credit cards

experience growth as consumers transition to them from Pix and UPI, which provide additional benefits such as lending, thereby accelerating growth over time.
Therefore, while on a superficial level banks and card providers may lose market share, financially they can potentially be better off.

4.4.2. The differences (impact on neobanks and TPAPs)

TPAPs (UPI)

With India's focus on rapid scaling, the government adopted a "no-fee" model, as previously discussed, enabling TPAPs supported by financial institutions and international corporations to take the lead.
Thus, the impact on TPAPs is mixed when balancing revenue against market power, among large, capital backed players. On the revenue side, TPAPs offered UPI as a loss-leading product, attracting consumers and merchants to revenue-generating financial services (e.g., lending distribution). However, concerning market power, by acting as intermediaries between the government and end users, TPAPs established themselves as critical players in the ecosystem, creating a highly concentrated market.

Neobanks and Fintechs (Pix)

Brazil's regulators emphasized domestic players and allowed optional merchant transaction fees, thereby enabling bottom-up domestic growth and creating a link between revenue generation and market influence.
New players like Nubank have built upon Pix's infrastructure to broaden their services. They not only increased their revenue (through payment fees or supplementary financial offerings), but also gained more influence in decision-making processes. Their growing market presence translated into enhanced leverage in shaping the future of Brazil's payments ecosystem.

4.5. Deciding on a fee structure

The comparison of UPI and Pix reveals three potential categories of fee structures, each with distinguished pros and cons.

Category	No Fees at All (UPI)	Fees for Merchants Only (PIX)	Fees for All Transactions
Potential outcome	*Pay for fast growth by creating market concentration*	*Enable domestic growth but create complexity*	*Potentially replicate the current card system*
Key pros	• Quick consumer & merchant adoption • Simplified operations by not distinguishing between user types	• Balances payment profit & consumer usage growth • Flexibility for financial institutions if fees are optional	• Lower operational complexity • Lower barriers to entry for firms
Key Cons	• Costs incurred on incumbent players/gov. • Barriers to entry for players without significant funding • Subsidies can create a sense of governmental preference for certain players • Difficult to incur new fees once the system is operating	• Higher complexity distinguishing businesses & individuals	• Slower adoption among price-sensitive customers • Potential to replicate the current card scheme

4.5.1. UPI – no fee scheme

UPI has no fees for merchants and consumers, with TPAPs potentially charging setup fees for businesses or fees for value-added services (e.g., marketing, financing, etc.). Although discussions about incurring fees are ongoing, they are not being implemented.[137]

- **Key pros**: rapid scale-up, particularly among price-sensitive customers, and low complexity in differentiating between consumers and merchants.
- **Key cons**:
    a. Banks report a decline in profitability, absorbing the cost along with TPAPs.
    b. With UPI not generating immediate revenue streams and providing long-term access to data and consumers, players have entry barriers without substantial backing. In India, current "winners" are owned or backed by big techs or multinationals.

[137] Background interview with a former consultant to NPCI.

c. The entrance or subsidizing of backed TPAPs can create a sense of governmental preference for certain players, reducing trust in the system.
d. Once the system operates on a no-fee basis, fee introduction is difficult.

4.5.2. Pix – no fees for consumers, low fees for merchants

Pix has no consumer transaction fees and optional merchants ~0.22% fee (per transaction), with potential setup fees according to provider and value-added service fees (e.g., lending). The institution providing the payment service can waive merchant transaction fees, thus carrying the costs themselves (e.g., Nubank waives fees).[138]

- **Key pros**: quick scaleup for price-sensitive consumers, flexibility for financial institutions in value offering (i.e., balance with other offers)

  Key cons: A potential for further market complication, driven by the need to tell apart microbusinesses from consumers to support tax equality (currently not implemented in Brazil).[139]

4.5.3. Fees for all transactions

Several features of fees for all transactions can be relevant for the discussion:

- **Key pros:** Minimal operational complexity (fees apply to all transactions), reduced barriers to entry for various firms (can start generating revenue in the short term)
- **Key cons:** slower adoption among price-sensitive customers and merchants, and the potential to replicate the current card scheme.

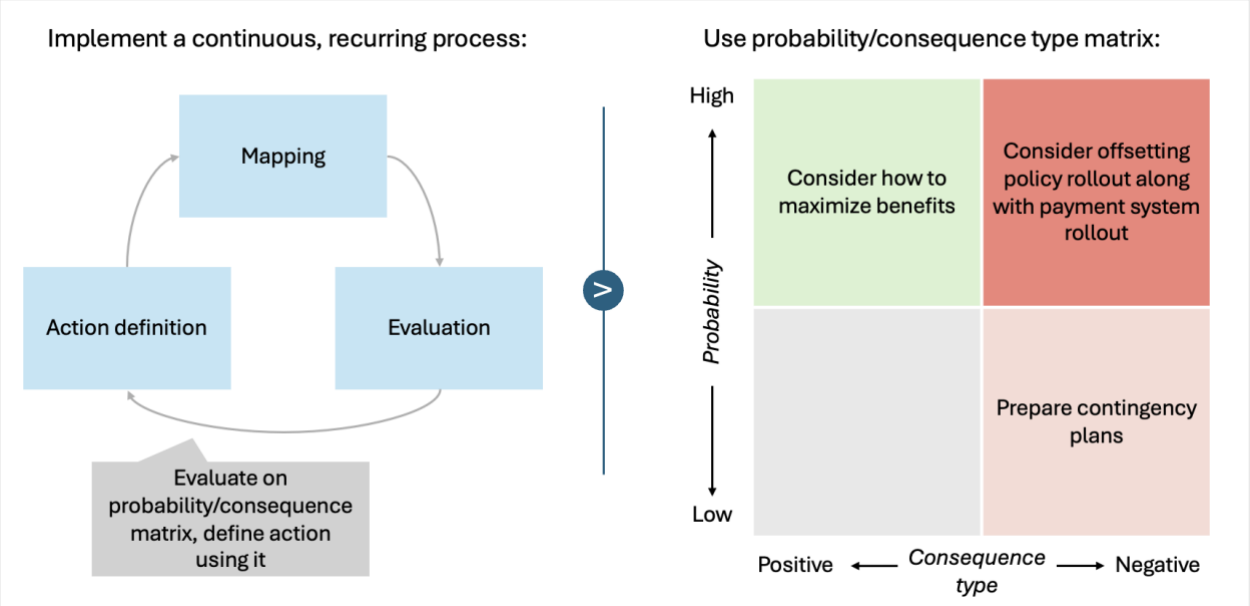
[138] Background interview with former Nubank employee.
[139] Tellez, Camilo, Background interview - Camilo Tellez.

Thus, the following model can be utilized to facilitate high-level pricing discussions, aligning with local priorities:

Category	**No Fees at All**	**Fees for Merchants Only**	**Fees for All Transactions**
User adoption	(Positive) No price-based barriers for adoption	(Medium) Lower user adoption for price-sensitive merchants	(Negative) Lower user adoption for price-sensitive consumers and merchants
Barriers to Entry	(Negative) May limit entry for players without significant funding	(Medium) Potentially lower barriers for unfunded players	(Positive) Low barriers to entry for all players
Economic impact on developing authority or involved players	(Negative) Costs borne by developing entity and participants	(Positive) Can potentially cover development costs and generate profit	(Positive) Can potentially cover development costs and generate profit
Pricing complexity	(Medium) Simplified operations but risk of price wars if fees are optional Difficulty to incur fees if becomes necessary in the future	(Negative) Higher complexity in distinguishing merchants, micro businesses, and consumers	(Positive) Lower complexity compared to other models

Decision impact on topic: Positive Negative Medium

4.6. Considering unintended consequences



Although both Pix and UPI have yielded significant positive results, they have also led to unintended consequences, as previously discussed in the paper and briefly mentioned below:

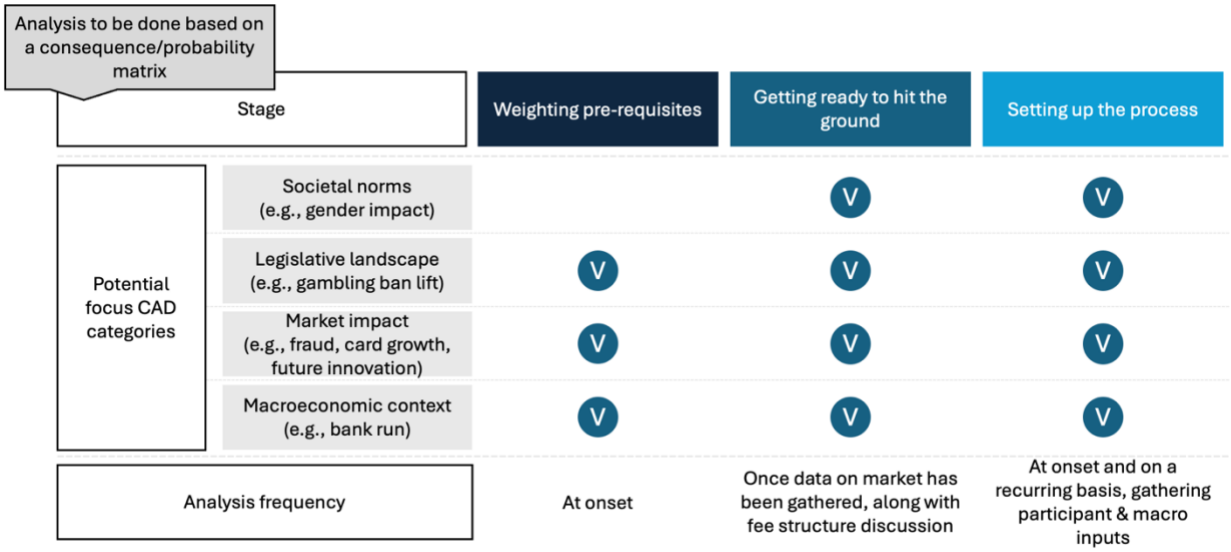
Unintended consequence	**Location**	**Brief explanation**
Growth in fraud	Brazil and India	Driven by the fast nature of the payments – enabling fund transfer before the victim notices/manages to report the fraud
Negative implications for women	India	Multiple outcomes, including loss of emergency cash funds due to the de-monetization in 2016, sexual harassment over payment platforms allowing for messaging and a loss of privacy in finance management in cases of a single mobile device in the household
Rise in gambling	Brazil	Driven by the ease of sending and receiving funds, coupled with an initial lax regulatory approach to the topic

Expedited credit card adoption	Brazil and India	Fintechs and TPAPs leveraging the introduction of new consumers and merchants to “mature” cohorts into expedited credit cards (over the original Pix/UPI goal of alternative rails)

Additional potential future outcomes to consider include the implications of a strong governmental presence in the market, potentially reducing future innovation. Another possible outcome could be a bank run on the system, driven by currency fluctuations or inflation.

Although this paper's central premise does not concentrate on analytical frameworks for decision-makers, it is crucial to outline a potential reference framework for evaluating outcomes in future systems. Zeckhauser and Roy present two key insights regarding the management of CADs (consequential amazing developments). The first is the recognition that CADs exist. The second is the prompt assessment of potential outcomes at critical decision-making junctures. By implementing these two actions, policymakers can develop action plans to address the issues effectively.[140]

Below is a potential approach to consider the types of CADs to address, the stages for doing so, and recommended frequencies, with details to follow:



[140] Devjani, Roy and Zeckhauser, Richard, “Grappling with Ignorance: Frameworks from Decision Theory, Lessons from Literature.”

While every country has its own set of societal needs and unique consequences, the following CAD areas can be useful to consider:

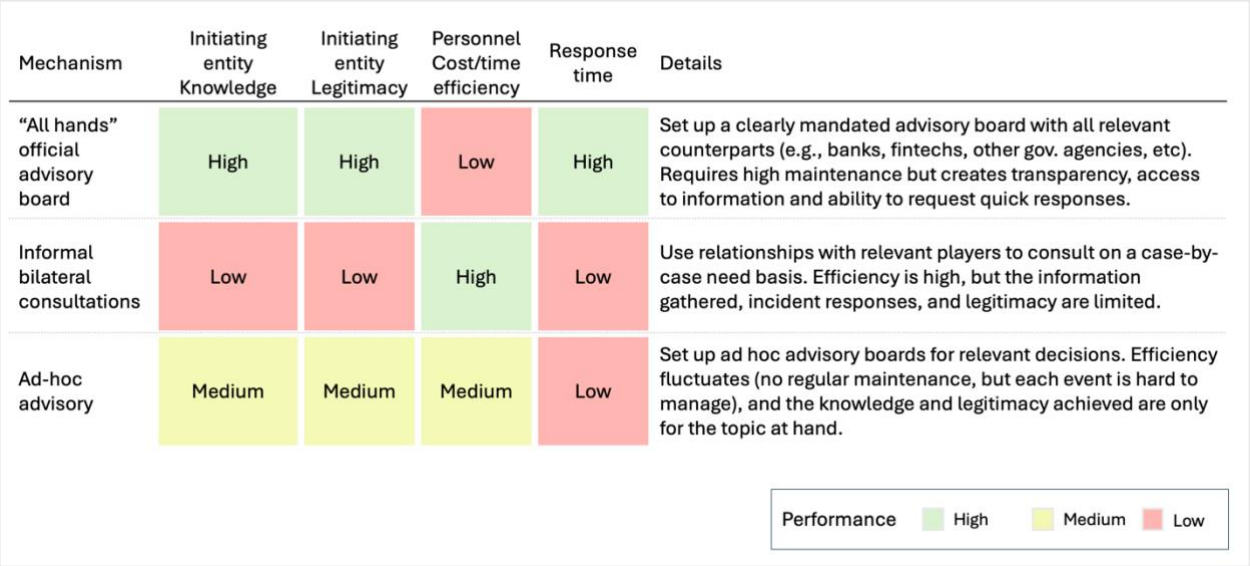
1. Interaction with **existing societal norms**: will it significantly reshape domestic gender/ethnic/race balances? If so, can policy interventions be enacted to mitigate the negative consequences?
2. Interaction with the current and proposed **legal frameworks and legislative landscape**: Are there existing legal frameworks that should be modified to reduce potential negative externalities? Are there upcoming legislative actions, such as gambling legalization, that could have adverse implications when combined with instant payment systems?
3. Interaction with the existing **market impact**: What could be the effect on fraud? Is there another payment tool (e.g., cards) that could benefit or lose from this process? Is there a possibility that this action will restrict future market-based innovation?
4. Interaction with **the macroeconomic context**: What macroeconomic conditions could trigger a run on the system? (e.g., hyperinflation)

While CADs are important, their mere existence should not deter the development of instant payment systems. Considering CADs is a means to strive for maximizing benefits or minimizing losses based on a consequence/probability matrix, as presented at the beginning of the section. [141]

[141] Devjani, Roy and Zeckhauser, Richard.

4.7. Consultation and cooperation mechanisms

To establish a trust relationship with market entities, initiating entities should implement consultation and cooperation mechanisms.



Each of the mechanisms described above is used by Pix and UPI, with the following serving as examples –

Mechanism	Pix	UPI
"All hands" official advisory board	Pix forum	NPCI board
Informal bilateral consultations	Consultations with neobanks and incumbent players on various topics, inc. fraud and feature prioritization	Consultations with TPAPs and banks on various topics, inc. fraud and feature prioritization
Ad-hoc advisory	Fraud prevention, B2C dynamics	Last-mile delivery, B2C dynamics

Four potential considerations are relevant for deciding which mechanisms should be set up, driven by the experience of Pix and UPI:

1) **Initiating knowledge accumulation for entities** is particularly important for systems established within the central bank, which is unaccustomed to B2C operations. In these situations, learning from experienced market players about past and ongoing experiences can be crucial for the success of the system, providing access to consumer insights and immediate user feedback. For instance, Pix is utilizing members of the Pix forum to gain insights on these topics.[142]
2) **Creating legitimacy for the initiating entity** is especially relevant when the central bank's role as a regulator and provider is in question, or when there is low trust in the government and in financial services. In these instances, such mechanisms can help build trust among stakeholders by fostering a long-term cooperative relationship.
3) **Personnel cost and time efficiency**: different mechanisms require varying levels of time and personnel involvement. This includes large, recurring forums that necessitate dedicated, ongoing attention from high-level stakeholders, as well as informal, sporadic bilateral consultations that mainly involve quick outreach to relevant stakeholders and can be conducted by team members focused on specific topics.
4) **Response time**: Different systemic needs lead to varying required response times. A prominent example is addressing widespread fraud. By establishing a stable, ongoing consultation mechanism, the response can be swift and clear. In other instances, when parties need to be identified and recruited on a case-by-case basis, the policy response may take longer.

[142] Breno Santana Lobo, Background interview.

Focusing specifically on fraud response and prevention, although this paper does not concentrate on the technical aspects of the system, it is important to note the tools that can be learned from Pix:

Key consultation mechanism	- "All hands" official advisory forum – "Pix forum" - 4 working groups, one of which is a security group, tasked with fraud
Key requirements from forum	- Knowledge (high) – requires inputs mainly on B2C operations and security - Legitimacy (high) – requires player approval for dual role as provider and regulator - Cost/time effectiveness (low) – working teams with a significant time "expenditure" on the forum - Response time (high) – quick turnaround for key security-related topics driven by established cooperation mechanisms
Fraud policy setup and response	- Fraud is a core issue for instant payments in general and for Pix as well - BCB's team doesn't have in-house expertise on the topic, requiring it to work closely with industry and academia - The security working group meets every quarter, following a straightforward procedure: BCB setting the agenda – "question for discussion", Working group members discuss and provide solutions and potential approach, BCB gathers inputs and implements relevant features and then BCB reports back to the group, along with continued discussion

Conclusions

This paper compared Pix and UPI, Brazil and India's instant payment systems, to derive relevant lessons for countries wishing to follow a similar path. In its last section, it outlined an approach for policymakers to wishing to design their own instant payment systems, considering institutional setup, market forces, and mechanisms to manage recurring challenges and opportunities. Beyond the details for various approaches provided in its sections, this paper can yield three key learnings.

The first is the incredible impact governmental entities can have on their citizens' lives by choosing to cooperate with private market players in establishing and operating a financial infrastructure for instant payments. With one in eleven adults worldwide using either Pix or UPI, the experiment of building a new, government-operated system at scale can be described as a success.

The second is the significance of context and decisions made early on. Two decisions made at an early stage of development, or even before the conception of Pix and UPI, drove significant differences in market outcomes. UPI's completely free scheme and low barriers to entry for big techs drove multinationals to enter the market. Brazil's choice to introduce optional merchant fees and significant domestic focus created a space for domestic player growth, further fueling its position as a global fintech and Neobanking hub.

Lastly, this paper presents a structured methodology for learning from the experiences of India and Brazil. Many countries where instant payment systems could create a significant positive impact are not as populous as Brazil and India. Nevertheless, this paper could serve as a foundation to learn from the experiences of both countries, gain an initial understanding of the potential market, government, and academic resources required, and potentially begin a process of establishing instant payment systems for consumers worldwide.

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