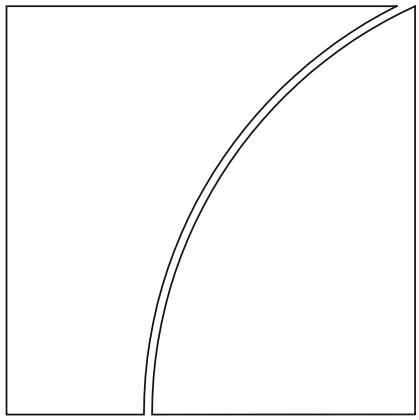

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by Jose Aurazo, Holti Banka, Guillermo Galicia, Nilima Ramteke, Vatsala Shreeti and Kiyotaka Tanaka

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Pricing in Fast Payments: A Practical and Theoretical Overview

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Abstract

Fast payments are at the forefront of payments digitalisation globally. By enabling immediate availability of funds on a 24/7 basis, they offer the potential to enhance efficiency, promote financial inclusion, drive innovation and foster competition. Despite their growing adoption, key questions remain regarding the design of fast payments systems (FPS), particularly concerning pricing. Open issues around pricing of fast payments exist at three levels: between the FPS owner and participants (system level), among participants themselves (participant level) and finally between the participants and their customers (end user level). This paper provides a comprehensive overview of global practices in FPS pricing at these three levels. To relate these practices with the academic literature, particularly for the person-to-merchant (P2M) payments, we use a classical two-sided market model and analyse how different pricing schemes at the end user level might influence the volume of fast payments and overall social welfare. Our expository model shows that fast payment usage may be lower than socially optimal in many cases. Moreover, when all fees are zero, fast payments are unsustainable without external subsidies or alternative revenue streams for participants.

JEL codes: O3, E42, G28.

Keywords: financial inclusion; digital payments; fast payments; interchange fee; pricing

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Executive Summary

Fast payments (also called instant, or real-time payments) are rapidly reshaping the way that people transact. They provide a convenient alternative for payment cards and cash in many jurisdictions around the world. They are characterized by the instant transmission of the payment message and by the immediate availability of funds to the beneficiary on a 24/7 basis. A fast payment system (FPS) facilitates these payments for individuals and businesses through participants like banks and non-banks.

More than 120 jurisdictions around the world have access to fast payments, and several others are planning to adopt them soon (Annex A). In 2023, 266 billion fast payments were conducted, an increase of 42 percent from the previous year (ACI Worldwide, 2024). Moreover, fast payments accounted for 19 percent of all digital payments conducted in 2023, and it is projected that by 2028, they will reach 575 billion in volume and account for 27 percent of all digital payments (ACI Worldwide, 2024).

As the use of fast payments expands, their benefits are becoming more evident. To start with, fast payments offer a reliable and secure alternative to cash, which can be especially important in countries with a low penetration of payment cards (i.e., debit, credit or prepaid cards) and low financial inclusion. Even where payment cards are popular, fast payments can offer a cheaper way to make payments, particularly for small and medium-sized businesses (Aurazo et al, 2024). Implementation of FPS can also spur savings in formal financial institutions, and foster competition and interoperability (Aurazo et al, 2025; Sarkisyan, 2023). Recent research shows that access to FPS improves household incomes, activities of small business enterprises, as well as the supply of credit (Dubey and Purnanandam, 2023; Alok et al, 2025). At the same time, fast payments can also generate useful data that can enable underbanked users to move from digital payments to other financial services like credit (Aurazo et al, 2024).

Even as the adoption of fast payments is increasing across jurisdictions, many FPS are still in early stages, with active policy discussions around the best ways to promote wider adoption and use. A key element of these discussions is the role of pricing in balancing the adoption and use of fast payments with the incentives of the FPS participants (often bank or non-banks, or generally payment service providers (PSPs)). Both system-level pricing (charges to participants by the FPS owner, and among participants) and end user pricing (charges to end users by banks and non-banks) are important in this discussion and as such, several questions arise. For instance, what are the main economic trade-offs arising from different schemes of system-level pricing and end user pricing of fast payments? What is the relationship between system-level and end user pricing? What are the implications of current pricing schemes of live FPSs for adoption and market incentives of participants?

Answering these questions comprehensively is a challenging task for several reasons. First, these are largely empirical questions and detailed data on pricing schemes, cost structures and end-user adoption of fast payments remain scant. The alternative could be looking towards economic theory for answers but since fast payments are a relatively recent innovation, theoretical work analysing it is also limited. In light of this, this paper seeks to fill these gaps in two ways. First, we provide a thorough overview of pricing in FPS in several jurisdictions around the world. Second, we use a widely accepted theoretical model from the payment card literature to shed light on the incentives and trade-offs arising in different

pricing schemes in FPS. Our analysis focuses specifically on person-to-merchant (P2M) transactions, which represent an important and growing category of fast payments.

Our theoretical model formalizes a P2M transaction in a very simple expository framework. We assume heterogeneous consumers and homogeneous merchants, perfect competition on both sides of the markets and the possibility that merchants factor in individuals' benefits of using fast payments (known as merchant internalization in the literature). We consider five different stakeholders in an FPS: the individual (payer), the individual's PSP, the merchant (payee), the merchant's PSP and the FPS owner. The key prices in this set up are fees that end users pay to their PSP, the merchant fee that merchants pay to their PSP, and the interchange fee that is a transfer between the two PSPs. The model explores different pricing schemes.[2] Three main findings emerge from this setup. First, when individual fees, merchant fees, and interchange fees are all set to zero, fast payments will not be provided in equilibrium. In this case, in the absence of external sources of funding, participating PSPs will not have sufficient incentives to provide fast payments. Second, under our assumptions, a pricing scheme that imposes zero merchant fees (with non-zero interchange and individual fees) will lead to lower FPS adoption than a scheme that imposes zero individual fees (with non-zero interchange fees and merchant fees). Third, compared to schemes that impose zero individual or merchant fees, and given sufficient competition among PSPs, the demand for fast payments is higher when the FPS network reduces the participation fees for PSPs.

Overall, the effectiveness and sustainability of fast payment ecosystems require continuous innovation, adaptable regulatory frameworks, and proactive engagement by both public and private stakeholders. There is no one-size-fits all approach and as such, different factors should be considered in fast payments pricing. These include hybrid pricing models, differentiated fee structures, and innovative merchant acquisition strategies.

The rest of the paper is organised as follows: in section 1, we describe the FPS ecosystem and highlight the key differences between fast payments and other payment methods. In section 2, we outline the incentives, cost structures and pricing in FPS, focusing on the interaction between the FPS owner and the participating PSPs, among the PSPs themselves and between the PSPs and end users. In section 3, we present a simple theoretical framework to formalise the incentives of different stakeholders and the ensuing economic trade-offs. Section 4 outlines broader policy implications. Section 5 concludes and draws a roadmap for future work.

I. The FPS Ecosystem

1.1. Fast payments compared to other payment methods

Fast payments, known for their ability to process and settle transactions instantly or near-instantly, provide significant convenience for end users, particularly compared to cash or payment cards. Cash is universally accessible and fully anonymous, making it a widely accepted payment method. However, it may lack security (i.e. be prone to theft), is less convenient for large-value or remote transactions, and poses logistical challenges such as handling, storage and management. Debit and credit cards offer widespread acceptance and security. However, credit cards may involve higher costs due to interest rates for consumers and processing fees for merchants. Additionally, card payments typically involve delayed settlement, often taking

[2] The FPS owner may also charge PSPs, we take these fees as exogenously set for the purpose of this expository model.

at least one or two business days (i.e., T+1 or T+2), which can be less appealing for businesses requiring immediate liquidity (e.g., small merchants).

Another commonly used payment instrument is electronic money (e-money). E-money refers to a record of funds available to a consumer and stored on prepaid cards or mobile phones. E-money usually offers the speed and convenience of fast payments but usually operates as a small closed-loop scheme. This means that it is often limited to specific networks, restricting interoperability and broader use. Table 1 provides an overview of different payment instruments and how they compare with each other.

Access to fast payments is associated with significant economic benefits. In addition to reducing settlement times and upfront cost for merchants, fast payments have been shown to increase household incomes and the activity of small business enterprises, particularly in areas underserved by financial services (Dubey and Purnanandam, 2023). Additionally, the introduction of FPS is also associated with an increase in the supply of credit, both by banks and fintechs (Alok et al, 2025). As many FPS introduce interoperability in payment systems, they are also associated with a general increase in the usage of digital payments (Copestake et al, 2025).

Comparison of different payment instruments[1] Table 1

	Fast payments	Cash	Debit cards	Credit cards	E-Money
Access to funds for end users	Instant or near-instant	Instant	Typically delayed	Typically delayed	Depends on level of interoperability among PSPs.
Use cases	Nearly universal	Nearly universal	Limited	Limited	Limited
Accessibility	Requires internet access and transaction account	Universal	Requires transaction account and debit card	Requires credit card	Requires internet/mobile phone network access and e-money account
Security	High (encryption, 2FA)	Low (prone to theft)	High (PIN, chip, tokenisation)	High (PIN, chip, tokenisation)	High (encryption, 2FA)
Transaction channels	Mobile apps, point- of-interaction, internet, USSD, agent	Point-of-interaction	Mobile apps, point-of-interaction, online	Mobile apps, point-of-interaction, online	Mobile apps, point-of-interaction, online, USSD, agent
Monetary cost to end-users	Low	Low	Medium to high	Medium to high	Low
Anonymity	Traceable	Fully anonymous	Traceable	Traceable	Traceable

[1] For the purpose of this table, the underlying payment instrument associated with a fast payment is assumed to be a credit transfer and across different PSPs.

Source: Authors' elaboration

1.2. Actors

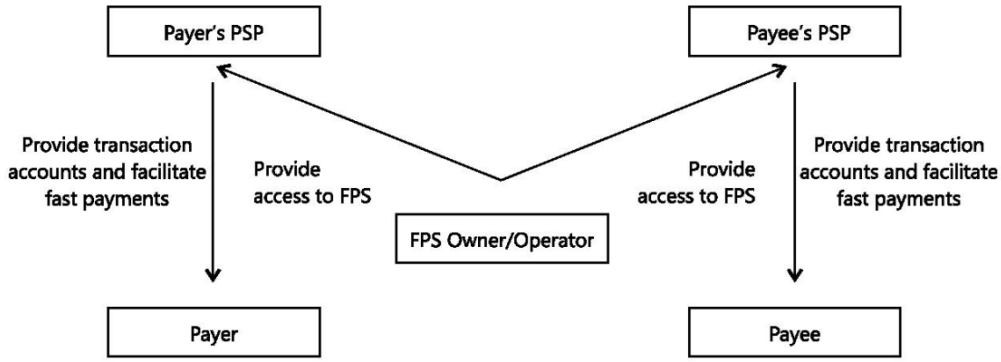
Fast payments are provided through a collaborative ecosystem involving multiple participants that include public entities (e.g. treasury, central banks), banks and non-banks (Graph 1). At the core of an FPS is the **owner (operating the system by themselves or outsourcing it to a dedicated entity)**, which can be a central bank, a private entity (e.g., a consortium of banks), or a joint venture between a private entity and public entity. The owner manages the system's infrastructure, establishes operational rules, and ensures compliance with regulations. Acting as a facilitator, the FPS owner ensures interoperability among participants and oversees the system's security and efficiency.

The **payer's payment service provider (PSP)** and **payee's PSP,** either banks or non-banks, are critical intermediaries that connect end-users to the FPS. PSPs typically provide transaction accounts, enabling payers to initiate fast payments and payees to receive funds in real time. The payer's PSP authenticates the payer, verifies whether there are sufficient funds in their account, and forwards the payment request to the FPS. The payee's PSP receives the payment instruction, credits the payee's account instantly, and notifies them of the successful transfer. PSPs also ensure compliance with know-your-customer (KYC) and anti-money laundering (AML) requirements, safeguarding the integrity of the payment process. In some cases, **indirect access** to the FPS is supported, allowing third-party (often non-bank) PSPs to connect through an intermediary PSP participant. These third-party PSPs can provide either transaction accounts and fast payment services or only facilitate fast payment services (e.g.,

when payment initiation is allowed), promoting inclusivity and expanding access to fast payments.

The **payer** and **payee** are the end-users of the FPS. The payer uses their PSP-provided transaction account and channels (e.g., a mobile application) to initiate payments, ensuring the accuracy of payment details and authorizing the transfer. The payee receives the funds in their transaction account and reconciles the payment. When the payer is an individual and the payee is a merchant, the transaction is classified as a person-to-merchant (P2M) transaction, which is common for retail purchases. Conversely, when both the payer and payee are individuals, the transaction is referred to as a person-to-person (P2P) transaction, typically used for purposes such as sending money to family or peers. The FPS can also support a plethora of other use cases involving not just individuals and merchants, but government agencies as well.

Participants in an FPS Graph 1



Source: Authors' elaboration.

1.3. Layers and components

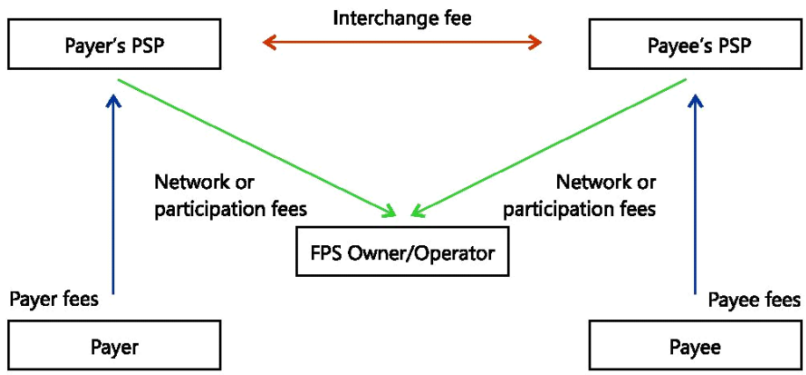
An FPS typically consists of several different layers. From a technical perspective, the first layer is the underlying **infrastructure**, including clearing (in some cases settlement also happens in the FPS itself). FPS infrastructure also comprises functional **technologies (hardware and software)** and communication channels, including network connectivity and messaging standards. The next layer is the FPS **scheme**, or rulebook, that sets out the rules and standards governing the relationship between the participants of the system, the owner and other relevant parties. Another layer contains the different payment **instruments/methods supported by the system (push and/or pull)**. Next is the layer of basic and value-added **services** such as aliases (e.g. phone numbers, emails), quick response (QR) code initiation/acceptance, request-to-pay, among others. These can be offered directly or facilitated through the FPS. The final layer consists of use cases and transaction channels. FPS can cover a variety of **use cases** (e.g., transactions like person-to-person, person-to-business,

person-to-government, business-to-business) and enable these use cases through different **transaction channels** (eg internet, unstructured supplementary service data (USSD), mobile apps, branches, agents, QR codes).

II. Incentives, cost structure and pricing in FPS

The activities carried out by the FPS owner and participants influence the pricing structure of the services offered to system participants, and consequently to end users. There are three broad pricing relationships within an FPS: (i) between the FPS owner and participants (system level); (ii) among participants themselves (participant level); and iii) between the participants and their customers / end users (end user level). Graph 2 depicts these relationships. At the system level, the FPS owner may charge network or participation fees to the PSPs facilitating fast payments. At the participant level, there may be an interchange fee transferred the payer's PSP to the payee's PSP, or vice versa. At the end user level, the payer and/or the payee may be charged by their PSPs or by the FPS owner. Ultimately, the goal of pricing in all three layers is to strike a balance between costs incurred and the need to attract participants and end users, and in some cases to generate a profit.

Fees involved in a simple FPS design — Graph 2



Green line indicates system level. Red line indicates participant level. Blue line indicates end-user level.

Source: Authors' elaboration

Pricing arrangements in fast payments depend on multiple factors. These include the ownership model of the system, whether there is some type of initial or ongoing funding from public authorities and other operational arrangements. Pricing also ultimately depends on the role envisioned for the FPS within the broader payment system of the jurisdiction (that is, whether the system is developed to support objectives of public policy such as financial inclusion), penetration of other payment methods, market structure and industrial organisation in the payments industry, the extent of network externalities in payment usage, and the elasticity of demand of end-users, among others.

2.1. Interaction between the FPS owner and the participating PSPs

The pricing strategy at the system level depends on ownership, the underlying cost structure and policy frameworks. Private ownership will generally entail seeking profits or at least fully covering costs. In contrast, public ownership will put more emphasis on public services considerations and may pursue policy objectives such as financial inclusion while subsidising or operating under a cost-recovery basis.

Most FPS follow a similar fee structure at the system level. The pricing structure (**network fees)** for participants generally comprises a combination of joining fees, variable (or per-transaction processing) fees and fixed fees (typically annual or monthly). We observe three main categories of system-level fees around the world (see Table 2 for illustrative examples):

- **Application/joining fees**: Many FPS have one-off application and/or joining fees, which can be the same for all PSPs or can vary depending on the size of participants, as well as other factors. In Thailand, National ITMX defines an individual joining fee based on two components: (i) the size of the PSP (large, medium, small) and (ii) the number of services subscribed to by the participants through PromptPay, Thailand's FPS. In Australia, new participants are required to pay an application fee. In Iceland, there is also a one-off fixed cost for initial connection that differs according to the size of the balance sheet of participants. In a few jurisdictions, such as Türkiye, the FPS owner decided not to set any joining fees.

- **Fixed fees**: FPS can also charge fixed fees for all participants, to be paid on a monthly or annual basis. In most cases, this fixed fee differs for all participants and depends on the type of participant, its size, and the services subscribed. For SPEI, the FPS in Mexico, Banco de México has established a fixed fee that allows participating PSPs to send and receive an unlimited amount of transactions. This fee is calculated for each participant by distributing the projected costs of the system between them, in line with their share of the transaction volumes in the past five years. In the Single Euro Payments Area (SEPA), all participants are required to pay annual scheme participation fees to the European Payments Council (EPC), which is based on the number of payment schemes they adhere to.

- **Variable fees**: FPS across the world also have variable fees on a per transaction basis. In Türkiye, fees charged by the Central Bank of the Republic of Türkiye (CBRT) are solely based on the transaction value, and different bands exist (transactions below 8,000 TL (USD 200), transactions between 8000 (USD 200) and 1.23 million TL (USD 31000), and transaction above 1.23 million TL). Other jurisdictions have established a tiered system and calculate variable fees based on the monthly or yearly volumes of transactions submitted by a participant. In Thailand, large banks that process a higher number of transactions are given a cheaper tier (i.e., they are charged a lower per transaction percentage fee).

Although variable fees are generally charged to the payer's PSP, exceptions exist. In Brazil, only the receiving participant is charged to stimulate uptake and incentivise PSPs to initiate Pix transactions.

In addition, the pricing arrangement can include guidelines for additional fees for specific operations, such as for refunds, dispute and arbitration processes, or maintenance fees. For instance, the SEPA Credit Transfer Instant rulebook published by the EPC defines specific cases where payment service providers can charge a fee for so-called R-transactions (reject, refusal, return, refund).[3] In India, the National Payments Corporation of India (NPCI) charges a fee in case of dispute and arbitration, as well as a maintenance fee in the proportion of participant's transaction throughput for the month.[4] In Mexico, participants must pay an operations fee, calculated based on the number of returns for which a participant is liable and money transfer orders done through the Continuous Linked Settlement (CLS). In Pakistan, the State Bank of Pakistan (the owner of the country's FPS) levies penalties for non-compliance to operating rules and regulations.

The mix between the different categories (joining, fixed and variable fees) varies depending on the strategy followed by the FPS owner to incentivise market participants in the jurisdiction. In addition, the business objective pursued by the FPS is a decisive factor for system-level pricing. In Australia, all direct participants are required to become shareholders of the New Payments Platform Australia (NPPA), which operates entirely on a fixed cost recovery model, with operating costs of the NPPA recovered from shareholders according to their size. This model provides an incentive for participants to increase the volume of fast payments they process. In the longer term, once volumes stabilize, NPPA's goal is to move to a per transaction cost. In Pakistan, RAAST, the country's FPS, was fully funded by the Bill and Melinda Gates Foundation. In light of this, and with the objective of fostering user adoption and affordability, the State Bank of Pakistan (SBP) has decided not to charge any fee to participants, at least initially. Participants are only charged a nominal fee for using the VPN and are responsible for the cost of internet connectivity. SBP plans to introduce different categories of charges once volumes increase sufficiently (e.g., registration fee, participation fee, processing fees, interchange fees). These aspects can be influenced by the ownership structure of the FPS: cost recovery models are more common when the central bank operates the FPS. Ultimately, some owners will provide fast payments on a cost recovery basis or in a cross-subsidized environment. On the other hand, others will aim at generating profits in the long run. In both cases, the projected time horizon for cost recovery, breakeven, or profit making will have an impact on pricing.

[3] SCT Inst rulebook version 1.1, October 2022

[4] FPS toolkit case study, September 2021

Examples of different categories of system-level fees introduced by FPS

Table 2

	Application/Joining fees	Fixed fees	Variable fees
Australia (NPP)	X	X	X
Brazil (SPI/Pix)			X
Iceland (EXP)	X	X	
India (UPI)	X	X	X
Mexico (SPEI)		X	X
Thailand (PromptPay)	X		X
Türkiye (FAST)			X
United Kingdom (FPS)	X	X	X
United States (FedNow)			X

Source: Authors' elaboration

2.2. Interaction among participating PSPs

Several FPS have introduced compensation mechanisms and interchange and access fees between participating PSPs. Such mechanisms mainly originate from payment cards and remain valid for other two-sided submarkets in the payment landscape, particularly when pricing P2M transactions conducted through FPS.

In a payment card framework, an interchange fee typically refers to the fee charged by the issuer (payer's PSP) to the acquirer (payee's PSP). Typically, PSPs that acquire merchants charge them a fee known as merchant discount rate (MDR), which includes the interchange fee (the largest component), acquiring fee and network fee, while issuers usually charge nothing or provide rewards (e.g., cashback, air miles, etc.) to cardholders. The interchange fee allows the issuer to cover costs like rewards, security, and innovation in each transaction. In simple terms, a high interchange fee could promote card issuance (usage) while a low interchange fee enhances merchant acceptance. Ultimately, the interchange fee is key to balance adoption on two sides of the market.[5]

Fast payments are usually free of charge for individuals, while merchants may be charged a small fee. This suggests that, in absence of interchange fees, PSPs on the consumers' side may not have sufficient incentives to onboard consumers on the FPS. Interchange fees can correct this, while also providing a source of revenues for participants in the system to recover processing costs. However, even when interchange fees are set to zero, PSPs may have incentives to participate and offer fast payments if there are adjacent revenue streams (i.e., data monetization or cross-selling other financial services).

In addition to interchange fees, another type of fee that can arise among participants is the access fee. Most FPS accommodate both direct and indirect participation of PSPs, with

[5] In some cases, interchange fees are also applicable for other use cases such as automated teller machines (ATM) withdrawals in Brazil and South Africa. In Türkiye, there is an interchange fee that the acquirer must pay to the issuer for all kinds of person-to-merchant payments conducted through the FPS. In Thailand, a Joint Steering Committee composed of members from commercial banks determines the level of interchange fees based on consensus among participants.

indirect participants typically paying an access fee to direct participants. This setup allows smaller PSPs (often non-banks) to access the FPS through a sponsor (the direct participant) and leverage the sponsor's direct access to the FPS and/or the settlement account with the central bank for final settlement. This allows for the participation of smaller PSPs that nevertheless reach many end consumers but may struggle to bear the costs or meet the technical requirements of direct participation. Some FPS also offer a hybrid model, where PSPs can connect directly to initiate transactions while relying on a sponsor for settlement. In most cases, the pricing arrangements between indirect participants and their sponsor fall within the competitive space and are governed by bilateral contracts and commercial agreements.

2.3. Interaction between participating PSPs and end users

The third pricing relationship in an FPS is between participating PSPs and end users. Participants typically recover the costs they incur by charging fees to the end users. Some participants provide fast payments to both the payer and the payee, while others may offer the service to only one of them. This distinction may influence participants' incentives, particularly if they cross-subsidise fast payments using revenue from other streams, such as payment cards or checks. End user fees should be set in a way that incentivises the adoption and of use fast payments.

End user pricing depends on the business strategy of the system participant, as well as regulatory actions, public objectives and the ownership model of an FPS. Four common pricing schemes for end-users are (see Table 3 for illustrative examples):

- **Free of charge model.** In this model, fast payments are offered free of charge for the payer and/or the payee. This approach is often used to attract new users and achieve critical mass, particularly in earlier stages of implementation. Under this scheme, end users can make and/or receive fast payments without incurring any fees. Zero fees may apply to all types of users or transactions, or only to specific subsets (e.g., P2P transactions).

- **Paid model.** In this model end users are charged a fee for each fast payment transaction. The fee can either be a flat amount or a percentage of the transaction value. Pricing may also vary depending on the type of end user (individual or merchant).

- **Freemium model.** Hybrid applications of the free and paid models, often referred to as "freemium" models are also possible. For example, a participant may offer small-value transactions (below a predefined threshold), a limited number of transactions (e.g., per month), or transactions in specific use cases (for example, P2P) for free, while charging fees for other types of transactions.

- **Subscription model.** The subscription pricing model allows end users to pay a subscription fee (monthly or annual) for making fast payments. This fee may include a certain number of free transactions, or it may be a flat fee that covers all transactions.

In many jurisdictions, per-transaction fees charged to end users have been capped to promote adoption, thereby limiting the avenues of revenue for the participants. For example, it is common to see fees for P2P transactions set to zero for both the payer and the payee, while participants are allowed to charge fees to merchants for P2M transactions. In some cases, regulations are stricter and prohibit any charges or impose a cap on the merchant side as well. These measures explicitly aimed at reducing the cost incurred for merchants to foster the adoption of fast payments among them.

Merchant fees vary significantly across jurisdictions due to differences in regulatory approaches. For instance, in Türkiye, the central bank has set a maximum merchant fee, while in Mexico, Banco de Mexico has waived off end user charges including merchant fees for transactions carried out through the CoDi (request-to-pay) service. In Brazil, merchant fees are determined by PSPs and are typically around 0.3 percent and 0.35 percent of the transaction value (Duarte et al, 2025). In India, the regulator has mandated that no fees be charged to merchants, so as to promote P2M transactions and encourage UPI acceptance among small merchants. While competition among PSPs on the merchant side generally drives merchant fees down, distortions can sometimes emerge. For instance, insufficient competition amongst merchant PSPs or a high proportion of merchants deemed "risky" (e.g., small merchants) may lead to higher fees or exclusion of merchants. In such cases, regulatory interventions may be necessary to address these imbalances and ensure lower fees.

In some jurisdictions, public authorities have opted to leave end user pricing to the private sector (e.g., Australia). This approach appears to be better tailored for markets with a high level of competition and price transparency. However, in countries where participants are allowed to charge customers to initiate or receive fast payments, regulators often implement disclosure and reporting obligations for financial institutions regarding end-user pricing. Such measures aim to enhance transparency, foster competition among market players, and enable customers to compare service offerings more easily. For example, in Mexico, all participants in the SPEI system are required to register their end-user fees with Banco de Mexico. Similarly, in the Philippines, financial institutions are mandated to submit details of all fees charged to their clients to the central bank. These fees are then publicly disclosed by the central bank, ensuring greater transparency for consumers.[6]

[6] Another important aspect of the cost of using fast payments (for P2M transactions) for end users is surcharging. When surcharging is allowed, merchants are free to price discriminate on the basis on the method of payment that the individual uses i.e. the merchant charges a different price for the same product or service depending on whether the individual uses cash, card or fast payments. Surcharging has been the subject of regulatory attention in the case of cards, with some jurisdictions explicitly forbidding it and some allowing it. Ultimately, surcharging (or the lack of it) will impact how system-level and end-user prices are set in FPS. See Bolt et al (2010), Bourguignon et al (2014), Gomes and Tirole (2018) for more insights from the card literature.

Examples of different end-user pricing Table 3

Australia (NPP)	Charges for end users depend on the commercial decisions of participating financial institutions and no upper cap has been provided by the regulator. In practice, it is typically free for retail customers and there is a small per-transaction cost for corporate customers.
Bahrain (Fawri+)	No end user charges for Fawri+ transactions up to 100 BD (USD 480). Customers can be charged for transactions above this amount.
Brazil (SPI/Pix)	The general approach is that individuals cannot be charged any fee to send Pix transactions. However, the 31st and additional Pix transaction received in a month can be charged by participants. Depending on use cases, businesses can be charged a fee to send and/or receive payments.
Malaysia (DuitNow)	Transactions are entirely free for individuals and SMEs to send and receive money up to 5,000 MYR (USD 1,200). For a payment above this amount, a 0.50 MYR fee may be applicable by participants (in practice many of them waive it).
Mexico (SPEI)	Banco de Mexico forbids charges for receiving payments but allows participants to decide on end user charges for sending payments.
Thailand (PromptPay)	Participants charge very low fees compared to other payment instruments, which can vary depending on use cases and digital channels. Transfers of up to 5,000 THB (USD 155) are free of charge, while transfers above 5,000 THB incur a small fee, generally ranging between 2–10 THB (USD 0.06–0.30).
Türkiye (FAST)	Participants can charge their customers for account-to-account payments, but there is no fee for merchant payments. There are upper limits that can be charged based on the transaction value: • Transactions below 1,000 TL (USD 25) can be charged a maximum of 1,56 TL (USD 0.04). • Transactions between 1,000 (USD 25) and 50,000 TL (USD 1,254) can be charged a maximum of 3,12 TL (USD 0.08). • Transactions above 50,000 TL (USD 1, 254) can be charged a maximum of 38,99 TL (USD 1).

Source: Authors' elaboration.

III. **Fast Payments from a theoretical perspective**

3.1. Card network pricing model as a basis

We focus on the academic literature on pricing in card networks as a basis for formalising pricing of P2M fast payments, a growing and important use case (Annex B provides a review of pricing in other payment systems). The most contentious issue concerning pricing in card networks is the determination of the interchange fees. The stated role of the interchange fee is to balance the network externalities arising in card networks. As more consumers use cards, acquirers would also generate additional revenues. If this externality is not taken into account, the fees charged by the issuer to the consumers can be too high, leading to too few card transactions. At the same time, as more merchants accept cards, additional transactions will be generated for the issuers, leading to a similar problem. Interchange fees provide a way to internalize these externalities and balance the two sides of the market (Rysman and Wright, 2012). Typically, the interchange fee is calculated as a percentage of the transaction and could be differentiated based on parameters such as the card type (e.g., credit vs debit, or commercial vs consumer, industry) and the domestic or cross-border nature of the transaction.

In the four-party card model, interchange fees are typically set by the card network either to maximize the aggregate profit of the network or the volume of card transactions. The economics literature has evaluated several aspects of interchange fee setting under different

modelling assumptions. In general, theoretical models with a wide variety of assumptions find the interchange fee to be positive in equilibrium (Rysman and Wright, 2012). As noted in Rysman and Wright (2012), different models also identify different types of market failures that can occur in the market arising from merchant internalization (Rochet and Tirole, 2011), revenue shifting between issuers and acquirers (Wright, 2004; Schmalensee, 2002) and asymmetric choice between consumers and merchants (Bedre-Defolie and Calvano, 2010). On the other hand, there is limited empirical work that can discipline or validate the wide range of theoretical findings.

The other key aspect to consider is the level of interchange fees. Over the last decades, there have been concerns among policy makers that interchange fees are too high. In light of this, several jurisdictions have introduced regulations around the interchange fee. In the European Union, the Interchange Fee Regulation (IFR) was introduced in 2015 to limit interchange fees to 0.2 percent of the value of a transaction for consumer debit cards (including prepaid cards), and 0.3 percent for consumer credit cards. Similar regulations were also introduced in Australia and the US for debit cards. Regulatory initiatives to reduce interchange fees serve also the objective of reducing the MDR. Some countries, like India, have chosen to regulate the MDR directly. However, an interchange or merchant fee that is too high must be so in comparison to a benchmark socially desirable level. But it is not clear, theoretically or in practice, what these benchmark fees are.

What does the economics literature tell us about the rationale behind these regulations? Are privately determined interchange fees "too high" compared to a welfare, efficiency or consumer surplus benchmark? How should this benchmark be calculated? There are theoretical benchmarks that exist like the Baxter interchange fee or the tourist test (Baxter, 1984; Rochet and Tirole, 2011) based on different modelling assumptions (see Box 1). The Baxter interchange fee balances the costs and benefits between merchants and card issuers under perfect competition in both sides of the market. The tourist test or avoided cost test aims to set the maximum interchange fee so that merchants do not refuse card transactions at the point of sale (Rochet and Tirole, 2011). The Baxter interchange fee or the tourist test ensures that cardholders are not over-incentivized, such that the decision of using a card payment does not exert negative externalities on merchants.

Empirical work on pricing of digital payments is limited, even for payment cards. Through counterfactual analyses, Koulayev et al (2016) document that in the US, making debit cards more expensive to use has disproportionately bigger (negative) effects on consumer welfare for low-income users than high-income users. The opposite holds for credit cards. Wang (2025) finds that uniform caps on merchant fees (for both credit and debit cards) increases total welfare. Beyond this, empirical evidence on the impact and design of different pricing policies is limited. In the absence of empirical work on FPS pricing and the data required to conduct such analyses, we turn to economic theory in the next section to guide the discussion.

Box 1: What is the tourist test?

Merchants frequently claim that they are charged excessively by PSPs to accept card payments. Acquiring PSPs typically pay issuing PSPs an interchange fee which is used to incentivize card holders to use cards. From an ex-post perspective—i.e., once the cardholder is at the point of sale—merchants will accept card payments if, and only if, they provide convenience savings, such as eliminating cash handling and depositing costs or reducing the risks of theft and fraud associated with cash. From an ex-ante perspective—i.e., before the cardholder enters the store—merchants may be willing to accept merchant fees that exceed their convenience savings because they also take into account the consumer's benefits from using cards instead of cash. For example, consumers avoid the need to visit an ATM to withdraw cash and the associated costs and risks of holding physical cash (Tirole, 2011).

Unlike cardholders, who make decisions in two steps—first deciding to obtain a payment card and then deciding whether to use it—merchants make a single-step decision regarding the adoption of card payment systems. Once merchants adopt card payments, they usually cannot refuse to accept cards when a cardholder chooses to pay with one. From an ex-ante perspective, merchants often decide to accept card payments for strategic reasons, such as attracting more customers, even if accepting cards may result in higher costs.

This raises an important question: What should the optimal interchange fee be to ensure that merchants are not disadvantaged every time a cardholder chooses to pay by card? To address this, Rochet and Tirole (2011) developed the tourist test (also known as the merchant avoided-cost test). The tourist test determines an interchange fee that makes merchants indifferent between accepting cash or accepting a card payment from a tourist (i.e., a non-repeated customer with enough cash in her pocket) at the point of sale. This is achieved when the costs that the merchant faces of accepting both payment instruments are equal. The tourist test ensures that merchants pay no more than their net convenience benefit from card payments. By capping the merchant fees at this threshold, the tourist test prevents card payment systems from exploiting the internalization effect to compel merchants to accept card payments they would otherwise reject. From an economic standpoint, the tourist test eliminates overpayment by merchants and ensures that cardholders are not excessively incentivized to use cards. Under certain assumptions, the tourist test threshold aligns with the interchange fee that maximizes total user surplus, i.e., the combined welfare of cardholders and merchants. Note, however, that the tourist test threshold may not maximize social welfare, leading to an under-provision of payments from a social point of view (Rochet and Tirole, 2011).

The tourist test approach is based on observations from most developed countries, where merchants' primary costs for accepting payment instruments are operational expenses (e.g., front-office, back-office, and fraud management). However, in developing countries and some developed ones, the shadow economy is significant, cash payments dominate, and merchants often evade taxes through cash transactions. Aurazo and Vasquez (2020) extend the Rochet and Tirole framework by incorporating tax evasion. They observe that cash payments are often underreported, allowing merchants to retain a portion of the value-added tax (VAT). This practice makes cash appear less costly than card payments.

Consequently, they argue that the tourist test threshold should be lowered in such contexts to account for this hidden advantage, reflecting the reduced net operating cost of cash.

From an empirical perspective, applying the tourist test is challenging because it requires detailed data on merchants' private costs of accepting cash and cards. Empirical studies, such as those by Bolt et al. (2013), Gorka (2014), Fung et al. (2018), Arango et al. (2022), and Aurazo and Vega (2021), have explored this issue. These studies conclude that the level of the interchange fee depends on factors such as economies of scale, transaction value, and the distribution of costs between value-related and volume-related components.

3.2. A simple model for fast payments

We build upon the card payments literature outlined in the previous section to analyse fast payment pricing for P2M transactions. This model considers a mass of heterogeneous individual consumers, homogeneous merchants, distinct PSPs on each side of the market and the FPS network itself. In a P2M transaction, an individual purchases a product or service from a merchant at price p and has two payment services at her disposal: fast payments[7] which are provided by PSPs and processed through the FPS and an alternative payment service based on cash.[8]

Individuals

There is a continuum of individual buyers (hereafter individuals) with a total mass normalized to one. We assume that individuals are heterogeneous in the benefit they get from using fast payments. This is net benefit in the sense that it is measured relative to the benefit of using the alternative payment instrument (which is assumed to be zero). For example, this benefit could be interpreted as the cost saving to the individual of not having to go to an ATM to withdraw cash in each transaction. Individuals' benefit $\widetilde{b_b}$ is drawn from a distribution H with associated density $h(b_b) = H'(b_b)$ and a monotone hazard rate $h(b_b)/\big(1 - H(b_b)\big)$, which is non-decreasing in b_b. They pay a per transaction fee f to use fast payments.[9] Individuals use fast payments if and only if the per transaction benefit exceeds the per transaction fee of using FPS, i.e.

$$b_b \geq f.$$

We denote the expected benefit of individuals of using fast payments by $v_b(f)$, i.e.

$$v_b(f) = E[b_b - f | b_b \geq f] = \frac{\int_f^\infty (b_b - f) dH(b_b)}{D_b(f)}.$$

[7] In this context, the model is agnostic to the underlying payment instrument and payment mechanism of the P2M fast payment.
[8] This alternative payment service could also be based on other payment instrument such as debit cards. We do not consider credit card as a potential alternative as they offer a product distinct from payments: credit. Most FPS do not offer credit lines currently.
[9] This fee should also be understood in relative terms to the alternative payment instrument. We assume that the individual pays nothing to use cash.

We denote the individuals' demand for fast payments by $D_b(f)$, which is the mass of individuals for whom the net benefit of using fast payments exceeds the net cost, that is,

$D_b(f) = 1 - H(f)$. (1)

Merchants

There is a continuum of merchants with total mass normalized to one. We assume that merchants are homogeneous in their per transaction benefit from accepting fast payments denoted by b_s. Similarly, this benefit is relative to cash, and we assume that the benefit from accepting cash is zero. For example, accepting fast payments is quicker than accepting cash because the merchant does not have to handle banknotes and coins. Or, the merchant can benefit by getting access to credit lines or merchandising support by accepting fast payments. The per transaction fee for accepting fast payments is denoted by m, while the cost of accepting cash is normalized to zero. Merchants accept fast payments if and only if:

$m \leq b_s + \alpha v_b(f)$. (2)

where v_b is the expected benefit of individuals of using fast payments and α is the probability that consumers know whether the merchant will accept fast payments. This reflects merchants' willingness to accept fast payments even when merchant fees are higher than their net benefit cost of accepting fast payments. This can be because merchants are afraid to lose sales and customers if they do not accept fast payments (Vickers, 2005). In the following model, we assume full merchant internalization, that is, $\alpha = 1$.[10]

Individual PSPs[11]

Individuals make fast payment transactions through their PSPs, which have access to the FPS. We assume that PSPs on the individual side of the market (denoted by b) are perfectly competitive. They set the individual fee f. The profit function of individual PSPs is given by the following:

$$\pi_b = (f - c_b + i)D(f),$$

where c_b is the PSP's per transaction cost of providing fast payments and i is the per transaction interchange fee it receives from the merchant's PSP.[12] Since individual side PSPs are assumed to be perfectly competitive, the individual fee f is set such that the net benefit of providing fast payments equals the cost incurred, that is,

$f = c_b - i$. (3)

[10] Two other scenarios that we do not consider here are: i) no merchant internalization when $\alpha = 0$ and ii) partial merchant internalization when $0 < \alpha < 1$ (Rochet and Tirole, 2011).

[11] Individual and merchant PSPs can have other revenue streams from adjacent services, but we do not consider them in this simple expository model.

[12] PSP costs and fees should also be understood in relation to the alternative payment instrument, i.e. cash. We assume that PSPs do not incur any costs or receive any revenues when providing cash. Note that $c_b$could also include per transaction costs of participating in the FPS network.

Merchant PSPs

We assume that merchant PSPs are perfectly competitive as well. Thus, the merchant fee m is set so that it equals the marginal cost incurred by the PSP:

$m = c_s + i$,(4)

where $c_s$is the per transaction cost incurred by the PSP and i is the per transaction interchange fee paid to the individual PSP.[13]

FPS owner

The FPS network provides the infrastructure for fast payments to occur and operates an FPS scheme in which the PSPs participate. Similarly to a card network, we assume that the FPS owner cannot directly set end user prices, but indirectly through an interchange fee (i) to be paid between FPS participants.[14] This can be paid from the merchant PSP to individual PSP (if $i > 0$) or from the individual PSP to the merchant PSP (if $i < 0$).

The timeline of the model is as follows:

Stage 1: The FPS network or a social planner sets the interchange fee i.

Stage 2: Individual and merchant PSPs simultaneously and non-cooperatively set the individual fees f and merchant fees m.

Stage 3: Merchants decide whether to accept fast payments ex ante and set their retail prices p.

Stage 4: Individuals decide which merchants to patronize, and, after the realization of the benefit of using fast payments, they decide which payment instrument to use.

This timing implies that merchants are not able to refuse fast payments ex post (ie at the point of sale), i.e. once they decide to be affiliated to fast payments based on the merchant fee m, they accept all fast payments.

3.2.1 Equilibrium end user and interchange fees

For simplicity, we assume full merchant internalization, i.e. $\alpha = 1$. By taking into account individuals' benefits of using FPS, merchants are willing to accept higher fees since i) they can lose sales if they do not accept fast payments, and ii) they can charge a higher price to individuals if they accept fast payments. Note that, using (2) and (4) the highest interchange fee $\bar{i}$ at which the merchant will still participate in the fast payments market is given as follows:

$\bar{i} = b_s - c_s + v_b(f)$. (5)

We consider two scenarios: i) an FPS network maximizes the total volume of fast payments and ii) a social planner that maximizes social welfare.[15]

[13] Similar to the individual PSP case, $c_s$could also include per transaction costs of participating in the FPS network.
[14] For simplicity, we assume that the costs of participating in the FPS network for the PSPs are exogenously given.
[15] Note that the case of a private FPS that maximizes profits is trivial. Joint profits will be zero following the perfect competition assumption.

3.2.1.1. Maximization of total volume of fast payments

The maximization problem facing the FPS owner is given by the following:

$$\max_i D_b\big(f(i)\big) = \max_i\big[1 - H\big(f(i)\big)\big] \; s.t. \; i \leq \bar{i}, \text{ (6)}$$

where $D_b(f)$ is the total demand for fast payments. It is a function only of the individuals' fee f since we assume that merchants are homogeneous in their benefits of accepting fast payments.

Note that this maximization problem has a corner solution: since $h\big(f(i)\big) > 0$, the FPS owner will set the highest possible interchange fee while ensuring that merchants still participate, that is,

$$i_v^* = \bar{i} = b_s - c_s + v_b(f). \text{ (7)}$$

Plugging this in (3), we have the equilibrium individual fees:

$$f_v^* = c_b + c_s - b_s - v_b(f_v^*). \text{ (8)}$$

Using (4) and (7), we have the equilibrium merchant fees as:

$$m_v^* = b_s + v_b(f_v^*). \text{ (9)}$$

3.2.1.2. Maximization of social welfare

In this section, we now consider the socially optimal benchmark where the social planner maximizes social welfare to directly set the end user fees f and m. As the interchange fee is simply a transfer between the two PSPs, the social planner sets the end user fees directly. The social welfare is defined as total benefit of fast payments use net of the cost of providing them.

$$W = \int_f^{\infty}(b_b + b_s - c_b - c_s)dH(b_b), \text{ (10)}$$

where $dH(.)$ is the marginal distribution of the individuals' benefit.

Taking first order conditions with respect to individual fee f to maximize the welfare function defined above, we have:

$$[b_b + b_s - c_b - c_s]_f^{\infty} = 0,$$

$$\Rightarrow f_w^* = c_b + c_s - b_s. \text{ (11)}$$

Plugging this in equation (3), we have the optimal interchange fee:

$$i_w^* = b_s - c_s. \text{ (12)}$$

Plugging i_w^* into (4), we find that the optimal merchant fees is:

$$m_w^* = b_s. \text{ (13)}$$

The findings from the two different objective functions of the FPS network lead to the following propositions:

PROPOSITION 1: *The interchange fee that maximizes social welfare will be equal to the interchange fee that maximizes the volume of transactions when there is no merchant internalization.*

PROPOSITION 2: *Privately determined optimal interchange fees (in case of volume maximization) will lead to an over-provision of fast payments compared to the social welfare benchmark, that is,*

$$D_b(f_w^*) < D_b(f_v^*)$$

3.3. Scenario analysis

3.3.1. Alternative pricing schemes

Fast payments can be subject to price regulation, either end-user (individual and/or merchants) fees or interchange fee regulation. In this section, we discuss four scenarios for fast payments pricing and asses their main implications in terms of total volume of fast payments and total welfare.

A. Zero interchange fees and zero end-user fees

If we consider the same model but impose $f = 0$ (or $m = 0$) and $i = 0$, fast payments will not occur. The individual (or merchant) side PSPs will not have an incentive to participate in the fast payments market without incurring losses. In this case, fast payments can occur only if there is external funding.

PROPOSITION 3: *If end-user fees and interchange fees are both set to zero, fast payments will not occur in the absence of external funding.*

B. Zero interchange fees and non-zero end user fees

Consider the case where the interchange fee is mandated to be zero, i.e. $i = i^0 = 0$, but end-user prices can be non-zero. In this case, due to perfect competition among individual PSPs, the individual fee is set so that the marginal cost equals the marginal revenue of the PSP:

$f^0 = c_b$. (14)
And the merchant fee at equilibrium is as follows:
$m^0 = c_s$. (15)

PROPOSITION 4: As long as the merchant's benefit of accepting fast payments is sufficiently high, that is, $b_s > c_b + c_s$, there will be under-provision of fast payments compared to the

social welfare benchmark. This is because the individual fee charged in this case will be higher than the individual fee charged in the social welfare benchmark.

C. Zero individual fees

If we allow for a non-zero interchange fee but impose zero individual fees ($f = \hat{f} = 0$), the interchange fee will be set so that the participation constraint of the individual PSP is met and it can recover its cost: $\hat{\imath} = c_b$. Note that the interchange fee is a fund transfer from the merchant PSP to the individual PSP. In this case, positive interchange fees are seen as an extra cost for merchants' PSP which is passed on to the merchant. Given the model setup, the merchant fee covers the total cost incurred by the merchant PSP in providing fast payments:

$\hat{m} = c_s + \hat{\imath} = c_s + c_b$. (16)

D. Zero merchant fees

If instead, we allow for non-zero interchange fee but impose zero merchant fees ($m = \tilde{m} = 0$), the interchange fee will be set so that the participation constraint of the merchant PSP is met and it can recover its cost: $\tilde{\imath} = -c_s$. Note that the interchange fee is now a fund transfer from the individual PSP to the merchant PSP.

Given that the individual side is perfectly competitive, the individual should pay the total costs of a fast payment,
$\tilde{f} = c_b - \tilde{\imath} = c_b + c_s$. (17)

Note that the equilibrium individual fee in this case is higher than in the social welfare benchmark, and of course, higher than with zero individual fees. When zero merchant fees are imposed, negative interchange fees are seen as an extra cost for individuals' PSP which has to be borne by individuals (since by definition, by imposing $m = 0$ it cannot be borne by merchants). This means that in equilibrium, there is a higher cost to users and lower use of fast payments than is socially optimal.

Summary of results

The Table A.1 in Annex C summarizes the results obtained under each alternative pricing scheme.

PROPOSITION 5:

i. *A pricing scheme characterized by zero merchant fees, leads to under-provision of fast payments relative to the welfare maximization benchmark.*
ii. *When $b_s > c_b + c_s$, pricing schemes characterized by zero individual fees or zero interchange fees also lead to an under-provision of fast payment relative to the welfare maximization benchmark.*

iii. *When $b_s + v_b(f) < c_b + c_s$, a pricing scheme characterized by zero individual fees leads to non-acceptance by merchants.*

iv. *When $v_b(f)$, the individual's expected benefit of using fast payments, is large enough, all of the pricing schemes (B-D) lead to an under-provision of fast payments relative to the volume-maximization outcome with privately determined prices.*

3.4. Zero per transaction fees for PSPs

Consider now the case where the PSPs cost per transaction is waived (for example, by exogenously setting the cost of participating in the FPS network to zero) so that $c_b = 0$ and $c_s = 0$.[16] In this case, the equilibrium fees under the social welfare benchmark are given as follows:

$f_w^{*\prime} = -b_s$, (18)

$i_w^{*\prime} = b_s$, (19)

and

$m_w^{*\prime} = b_s$. (20)

The equilibrium fees under the volume-maximization case are given by:

$f_v^{*\prime} = -b_s$, (21)

$i_v^{*\prime} = b_s$, (22)

and

$m_v^{*\prime} = b_s$. (23)

PROPOSITION 6: *Both in the case of volume maximization and the social welfare benchmark, the demand for fast payments is higher when the per transaction costs of PSPs are waived.*

3.5 Policy insights related to the model

This simple expository theoretical model lends itself to insights for policy discussion, as outlined in the propositions in the previous section. We summarize the key lessons below:

1. In the absence of external subsidies, data monetization or cross-selling, it is not viable to provide fast payments with individual fees, merchant fees and interchange fees all set to zero.
2. When the merchant's benefit of accepting fast payments is higher than the per transaction cost of providing fast payments, even with a zero individual fee (and non-zero interchange fee), usage will be lower than in the social welfare benchmark.
3. Usage is even lower when the merchant fee is set to zero (while allowing non-zero individual and interchange fees).

[16] For the sake of exposition, we assume that in this case the cost parameters of the PSPs (c_b and c_s) are identical to the participation fees incurred by the PSP. In reality, the cost parameter will have other elements, but this should not change the spirit of the results in this section.

4. If PSPs' per transaction cost of providing fast payments is reduced, or set to zero, the demand for fast payments increases both in the social welfare benchmark and under volume maximization.

Note, however, that these insights highlight the key trade-offs related to pricing, and the propositions are a function of the model set up and assumptions. We highlight the limitations of the model in Box 2 and outline areas for future research in the following sections.

Box 2: Key theoretical assumptions and limitations

While the theoretical framework that we use in this paper illustrates key trade-offs arising in pricing fast payments, it rests on important assumptions. We summarise these assumptions below and outline how they may be relaxed in future work.

Merchant benefits

We assume that merchant benefits from accepting fast payments are homogenous. This is a simplifying assumption. In reality, the benefits of fast payments can differ depending on characteristics of merchants (for example, turnover, location etc). Introducing merchant heterogeneity would imply that for a given merchant fee, m, some merchants will adopt fast payments while others will refuse them, depending on their benefit b_s. The total volume of fast payments would now be $D(f)D(m)$, where $D(m)$ is the demand for fast payments by merchants. The implications of each pricing policy on adoption will ultimately depend on the elasticity of each side's demand to f and m.

Competition among PSPs

We assume that individual and merchant PSPs compete perfectly. In reality, although FPS promote competition and greater access, it is more likely that PSPs only compete imperfectly, with some degree of market power on one or both sides. It is possible to extend our framework to capture these nuances. For example, in the case where merchant (or individual) PSPs compete imperfectly and charge a constant markup, our policy insights remain largely consistent. Endogenising the markup of PSPs may alter some of our conclusions and is an important avenue for further work.

Alternate revenue streams

In the theoretical framework, when we consider the objective function of the PSPs, we consider only revenues arising from providing fast payments to individuals and merchants. PSPs may have other revenue sources from providing ancillary services or monetising data. PSPs may also receive external funding from governments or private markets. Ultimately, this means that in practice, PSPs can sustain zero (or negative) prices for individuals and merchants through cross-subsidisation or external funding.

FPS owner

We assume that the FPS owner sets only the interchange fee and the fees for PSPs to participate in the FPS is exogenously determined (for example, by regulation). An interesting and realistic extension to the model is to consider the case where the FPS owner sets both the interchange fee and the participation fees for PSPs. This could help capture the different

incentives of private and public providers of FPS in a more nuanced way. In this case, the interchange fee and participation fees will be determined through the FPS owner's maximization of the total volume of fast payments, or its total profits or social welfare.

Competition between payment systems
In the theoretical framework, we abstract away from competition between different payment systems, for example, between FPS and card networks. It is likely that pricing in one payment system influences adoption and pricing in other payment systems. A particularly interesting case would be to analyse pricing in FPS when fast payments compete closely with debit cards.

IV. Broader Policy Considerations

4.1 Variation in pricing models around the world

End user fast payments pricing strategies vary significantly worldwide and also evolve with time. They depend on use cases, public policy objectives, maturity of digital payments market, and competitive dynamics. Countries strategically adopt pricing policies aligned with broader socio-economic goals, often employing differentiated fee structures based on local conditions.

The two ends of the spectrum in pricing strategies for fast payments include zero-fee caps (based on regulation) and market-based pricing, with variations in-between. Zero-fee models, prevalent in countries like India, treat fast payments as public goods, aimed at boosting financial inclusion. Free pricing models, such as the one in the United States, rely on competition to dictate pricing structures. An in-between model exists in countries like Brazil whereas for certain use cases of fast payments (SPI/Pix) such as P2P there is no end user charge, while for P2M, there is a regulatory cap imposed on merchant discount rate.

Differentiating pricing for P2P versus P2M transactions is a common strategy for fast payments in many regions. Free or low-cost P2P transactions encourage widespread consumer adoption and cash displacement, while modest fees for P2M transactions allow financial institutions and payment providers to generate revenue, ensuring ecosystem innovation.

Tiered pricing models, exemplified by Nigeria, offer practical solutions that ensure affordability for low-value transactions while maintaining profitability for higher-value ones. Although fully dynamic pricing remains uncommon, tiered models increasingly provide a balanced approach by accommodating varied transaction sizes. This tiered approach has similarly been adopted by countries such as Costa Rica, where zero-fee transactions were implemented through its Sinpe Móvil system to encourage digital adoption, allowing fees only beyond specified transaction value thresholds.

4.2 Implications of zero-fee policies

Zero-fee policies, where they exist, require continuous assessment to ensure long-term ecosystem sustainability. Extended zero-fee regimes without alternative revenue streams

could lead to under-provision or no provision of fast payments, especially for P2M transactions, as our model has shown. Zero-fee regimes also have implications for competition and could result in market capture by larger participants. In some contexts, specialized payment service providers encounter challenges under zero-fee conditions due to limited revenue diversification opportunities. Regulatory restrictions on cross-selling financial products, such as loans or insurance, exacerbate these challenges, emphasizing the importance of adaptable regulatory frameworks that allow diversified revenue streams. Malaysia provides a nuanced case of evolving central bank-led pricing policies. Initially, Bank Negara Malaysia mandated zero fees to drive rapid adoption, later removing this requirement to encourage market-driven sustainability. However, the private sector voluntarily retained a zero-fee model, particularly for micro and small merchants.

4.3 The relevance of other revenue streams

In addition, acquiring micro and small merchants, particularly in remote or underserved areas, presents unique operational and economic hurdles. Providers must implement innovative, cost-effective solutions such as digital onboarding, scalable technologies, tiered know-your-customer (KYC) models, and low-cost acquiring mechanisms. Complementary measures like targeted government support or alternative revenue opportunities through value-added services and data-driven business models are critical to sustainably expand digital payment acceptance.

Moreover, in some contexts, payment acquirers and aggregators bundle various payment solutions—such as zero-fee fast payments alongside other fee-generating payment instruments—to achieve a sustainable revenue mix. This strategy allows providers to offset costs associated with zero-fee fast payments by earning revenue through alternative solutions, such as credit or debit cards. However, in remote or underserved regions, where merchants primarily accept low-value transactions and prefer free payment methods due to affordability constraints, providers often struggle to leverage such revenue diversification effectively. In these settings, high reliance on zero-fee solutions coupled with low usage of other payment methods limits the revenue potential, challenging the sustainability of expanding payment acceptance networks. Conversely, bundling free services alongside fee-generating ones with a blended price can also raise competition concerns.

4.4 Role of the regulator

Central banks have a key role in FPS as their regulator and in some cases even as FPS owners. Often, publicly owned FPS operate on a cost recovery basis, which could also have implications for keeping fees paid by system participants and end users at a modest level. Authorities in India, for example, adopted a zero-fee approach for its Unified Payments Interface (UPI) to rapidly boost digital transaction volumes and promote financial inclusion, as there was a subsidy fund mechanism was put in place (Payment Infrastructure Development Fund), to compensate issuers and acquirers. Similarly, Mexico introduced the CoDi overlay service on its FPS (SPEI) with zero fees, aimed at accelerating digital payments adoption and combating informality. Within the Single Euro Payments Area (SEPA) in Europe, pricing for fast payments (SCT Inst) is regulated to ensure that the cost of processing these transactions remains

competitive with traditional credit transfers (SCT). The framework prohibits banks and non-bank payment service providers from charging a premium for instant credit transfers.

4.5 Context and flexibility matter

Whether through caps or market-driven mechanisms, pricing strategies significantly shape the adoption and sustainability of digital payments ecosystems. Countries leveraging zero-fee or caps have effectively catalyzed rapid adoption, enhancing financial inclusion and shifting significant transaction volumes from cash to digital. However, the sustained success of these strategies hinges upon careful management and regular reassessment, balancing immediate adoption incentives with the ecosystem's long-term economic viability. When regulators intervene in pricing, it is imperative that they do so with a clear policy assessment, recognizing the nuances across use cases. Users may be willing to pay a premium for fast payments given their convenience, particularly in underserved areas where cash transactions still dominate, and financial infrastructure is scarce. A zero-fee policy in these contexts may inadvertently restrict provision of an essential service.

Ultimately, the effectiveness and sustainability of fast payment ecosystems require continuous innovation, adaptable regulatory frameworks, and proactive engagement by both public and private stakeholders. Further, it should be recognized that pricing strategies are dynamic in nature as markets continuously evolve. Specialized payment providers and those serving remote or underserved segments face unique operational challenges, requiring flexible, cost-efficient solutions, and diversified revenue streams to maintain viability. By thoughtfully navigating these complexities—through hybrid pricing models, targeted support, differentiated fee structures, and innovative merchant acquisition strategies, countries can optimize digital fast payments adoption, enhance financial inclusion, and sustain robust, inclusive, and economically viable fast payment ecosystems.

V. Conclusions and future work

The adoption of fast payments has surged in the last years, with over 120 jurisdictions having access to fast payments, leading to 266 billion transactions in 2023, a 42 percent increase from 2022. The FPS ecosystem comprises various layers, including infrastructure, scheme rules, payment instruments, and transaction channels. The pricing strategies for system participants typically involve joining fees, transaction fees, and fixed fees. End user pricing models vary widely, with some jurisdictions adopting zero-fee structures to encourage adoption, while others charge fees based on transaction types. Hybrid models, such as freemium or subscription pricing also exist.

Our paper describes different pricing strategies for fast payments and explores how some of them relate to end user uptake. Using experiences from live FPS and a theoretical economic model, we highlight the incentives of different market participants. What are the main economic trade-offs arising from different schemes of system-level pricing and end user pricing of fast payments? What are the implications of current pricing schemes of live FPS for adoption and market incentives of participants? The paper provides an overview of different

pricing models for system participants and end users, while also comparing fast payment systems with other legacy payment systems. Further, the paper relies on the theoretical literature on payment cards and applies it to the context of fast payments to construct a simple expository model of two-sided payments for the P2M use case.

Effective pricing strategies are essential for the sustainability of fast payment ecosystems. Policymakers must consider various factors, including market conditions, public policy objectives, and the competitive landscape, to optimize pricing structures that enhance financial inclusion and support robust payment systems. Continuous innovation and adaptable regulatory frameworks are vital for fostering a healthy fast payment ecosystem. The pricing of fast payments is a multifaceted issue that requires careful consideration of economic theories, empirical evidence, and regulatory frameworks to ensure the successful adoption and sustainability of these systems in the global financial landscape.

The paper has laid the groundwork for further research and exploration of pricing in FPS, particularly for the P2M use case, which will continue to receive attention as fast payments usage expands around the world. Future work should focus both on theoretical analyses and empirical analyses. While we provide an expository theoretical setting, there are several interesting avenues for extending our analysis. The first step could be to introduce imperfect competition between PSPs with endogenous markups that capture more general settings. Another avenue could be formally modelling alternate revenue streams or data monetization by PSPs. This can help capture pricing schemes in FPS that take into account cross-selling by PSPs. Future theoretical work could also consider pricing when PSPs operate both in the issuing and acquiring markets, or PSPs that offer more than one use case (for example, P2P services or cross-border payments in addition to P2M services). A distinct but important extension of the expository model would be to analyse the incentives of FPS owners by modelling network fee setting under public, private and joint ownership settings. This would neatly highlight the difference between the FPS set-up and the four-party card model.

Empirical research has even more ground to cover. A valuable starting point would be systematically collecting and analysing data on pricing schemes at the system, participant and end-user level in FPS across jurisdictions. Ultimately, answers to open policy questions on pricing will be drawn from empirical evidence. As such, research quantifying the adoption of fast payments, measuring the price elasticities of individuals and businesses that use fast payments and evaluating their responses to different pricing schemes will be paramount.

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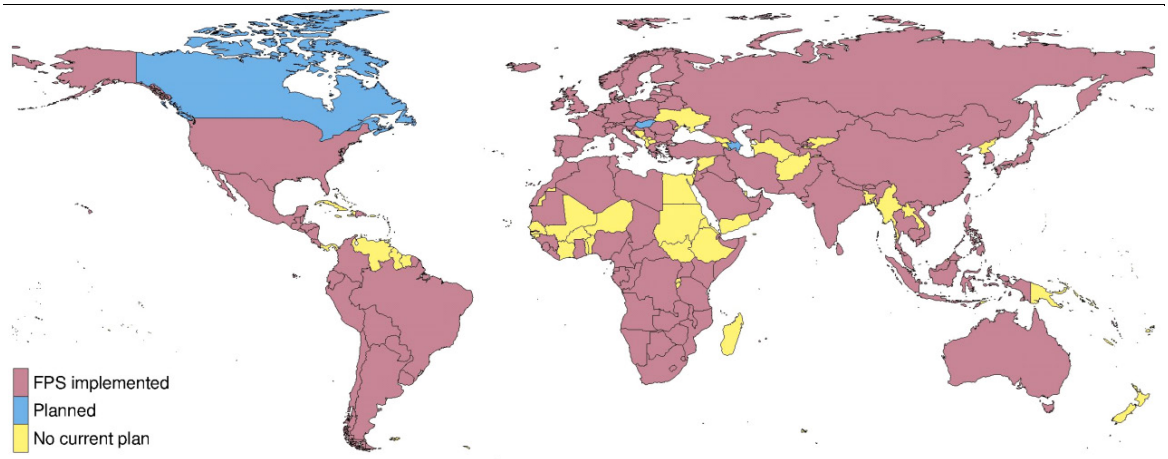
Annex A: Fast payments around the world

End user in about 120 countries around the world have access to fast payments via domestic and/or regional FPS

Graph A1



The use of this map does not constitute, and should not be construed as constituting, an expression of a position by the BIS regarding the legal status or sovereignty of any territory or its authorities, the delimitation of international frontiers and boundaries, and/or the name and designation of any territory, city or area. Updated as of July 2025.

Source: Aurazo et al (2025).

Annex B: Pricing and cost structures in other payment systems

Real-Time Gross Settlement (RTGS) Systems

These are infrastructures that enable real-time settlement of payments, transfer instructions or other obligation individually on a transaction-by-transaction basis (CPMI, 2016). Typically, they are used for the transfer of high value funds and may not incorporate all the layers of an FPS. Due to the systemically important nature, RTGS systems are almost always owned and operated by central banks. As owners, they may charge transaction fees to participating financial institutions. They also often times operate on a cost recovery basis. Moreover, central banks may require participating institutions to provide collateral against their potential exposures. Offering additional services like data analytics, fraud prevention, and compliance tools can be another source of revenue for RTGS owners.

The direct costs of an RTGS system consist primarily of the costs of implementing, maintaining and operating the system. There are also indirect costs borne by the participating institutions, which need to maintain higher levels of liquidity to handle real-time settlements of transactions and update systems and business processes. The nature of these costs presents a trade-off between an efficient system and increased liquidity risk among participants.

Holthausen and Rochet (2006) study efficient pricing in large value systems such as the RTGS, providing optimal pricing schemes in theoretical settings where a public monopoly provides a large value payment system, as well as when such a public system competes with private competitors. Further, Humphrey et al (1997) provide a general discussion of cost recovery and pricing in payment systems.

Automated Clearing House (ACH)

An ACH allows for the clearing and/or settlement of credit or debit transfers, or cheques between their participating financial institutions and non-banks, though typically end user settlement is not necessarily on a real-time basis and the operational hours are not 24/7. Many central banks around the world own and operate an ACH (according to the latest World Bank Global Payment Systems Survey, in the Middle East and North Africa region, 75 percent of the central banks own/operate the ACH), though there are also some that are owned privately (ie consortium of banks only, or banks and non-bank PSPs) or jointly between public and private sectors. The core revenue component for ACH owners comes from the per transaction fee charged to participating financial institutions. These fees vary based on the type of transaction and network owner. Some ACH owners also charge an annual membership fee for financial institutions to access the network. Additional revenue streams can include value-added services including data analytics, fraud prevention, and compliance tools. The operating costs of ACH owners include costs arising from maintaining and upgrading the infrastructure, managing settlements and adhering to regulatory requirements.

On the side of the participants of the ACH, the main source of revenue is the transaction fees charged to end users. Participants can pursue different approaches, including (and potentially leveraging a combination of) per-transaction fees, tiered pricing schedules, and subscription models. Some participants might also offer free ACH services if the user maintains a minimum

balance in their account or has a certain level of overall account activity. The main costs for system participants arise from integrating with the ACH network, developing internal systems and handling customer support for ACH transactions.

Electronic Money (e-money) Switch

An e-money switch allows the routing and authorization processing of e-money transactions. As with RTGS and ACH, the owner of e-money switches charges participants for its switching services. These transaction fees are the main source of revenue for system operators. Fees can be fixed or variable based on the transaction amount and type, and are levied on use cases like money transfers, bill payments or airtime top-ups. Often, participants of the e-money switch may employ "freemium" models for end-users as a way to drive adoption and usage. With this approach, the participating PSP would offer a basic service at no price while applying some limitations (for example, a limit to the number of free transactions, or to transaction amounts).

Card Networks

Card networks are generally operated according to a "four-party model"[17], with separate entities issuing cards to the cardholders (the issuer) and acquiring merchants to accept card payments (the acquirer). In this setup, cardholders pay a fee to issuers, or can receive rewards like air miles, cashback) and merchants pay a fee to acquirers, known as the merchant discount. Part of this fee (the largest component), the interchange fee, goes to the issuer to cover costs like rewards, security, and innovation in each transaction. The rest covers the acquirer's costs, including point of service (POS) provision and operational expenses. The issuers and acquirers may also have to pay fees to the card network itself.

[17] In some cases, there are three-party models where the same entity can be an issuer and acquirer both.

interchange fees					
Case IV: Zero merchant fees and negative interchange fees	$f > 0$	$m = 0$	$i < 0$	• FPS owner sets the interchange fees such that individual PSPs and merchants participate, that is $i = i^* = c_b$ • Consumers use fast payments if $b_b \geq f$ • Merchants always adopt as $m = 0$ and $b_s + v_b(f) \geq 0$. • Merchants PSPs participate if $-i \geq c_s$. • Individual PSPs must charge $f \geq c_b - i$ to incur no losses. • FPS owner sets the interchange fees such that merchant PSPs participate, that is $i = i^* = -c_s$.	A fast payment will take place if and only if consumers also agree and use it; that is: $b_b \geq f = c_b + c_s$ In this scenario, there will be an under-efficient use of fast payments, making it the least optimal of the three cases.

Source: Authors' elaboration.

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