BANCA D'ITALIA
EUROSISTEMA

Mercati, infrastrutture, sistemi di pagamento

(Markets, Infrastructures, Payment Systems)

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ISSN 2724-6418 (online)
ISSN 2724-640X (print)

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Designed and printing by the Printing and Publishing Division of Banca d'Italia

SEND ME MONEY ASAP: FAST PAYMENT SYSTEMS AND THE COST OF REMITTANCES

by Marco Brandi,* Alberto Di Iorio* and Andrea Nobili*

Abstract

This paper investigates the impact of Fast Payment Systems (FPS) on the cost of international remittances, using a staggered treatment econometric framework estimated on granular data at the country, firm, and payment instrument levels. The results show that, although FPS are primarily developed to improve the efficiency of domestic payments, the costs of remittances to countries adopting an FPS decline following its implementation. This decline is mainly driven by lower foreign exchange margins, a cost component that is often not fully visible to remittance senders, and is more pronounced for cash-collected remittances, which are traditionally more expensive than those to mobile wallets. Using an instrumental variable approach, we identify increased competition among remittance service providers as an important channel through which the benefits of fast payment services are transmitted to cross-border transactions. Overall, our findings suggest that introducing an FPS can lower remittance costs even in the absence of a direct linkage between domestic payment systems. Future interlinking of FPS across jurisdictions could further amplify these benefits.

JEL Classification: E42, E58, G21.

Keywords: Fast Payment Systems, Cost of Remittances, Interlinking.

Sintesi

Questo lavoro analizza l'effetto dei sistemi di pagamento istantaneo (Fast Payment Systems, FPS) sul costo delle rimesse internazionali, utilizzando un modello econometrico per trattamenti scaglionati nel tempo, stimato con dati granulari su paesi, intermediari e strumenti di pagamento. I risultati mostrano che, sebbene gli FPS siano sviluppati per rendere più efficienti i pagamenti domestici, successivamente alla loro adozione si riduce anche il costo delle rimesse in entrata. La riduzione dipende soprattutto da margini di cambio più contenuti, una componente di costo spesso poco visibile per chi invia denaro, ed è più marcata per le rimesse ritirate in contanti, tradizionalmente più onerose rispetto a quelle su portafogli elettronici. Attraverso un approccio a variabili strumentali, lo studio individua nella maggiore concorrenza tra gli operatori un importante canale attraverso cui i benefici dei pagamenti istantanei si trasferiscono alle transazioni transfrontaliere. Nel complesso, i risultati suggeriscono che introdurre un FPS può abbassare il costo delle rimesse anche senza un collegamento diretto tra sistemi domestici. Una loro futura interconnessione potrebbe amplificare ulteriormente questi benefici.

* Directorate General for Payments and Market Infrastructures, Banca d'Italia.

CONTENTS

1 Introduction[1]

In recent decades, globalisation of trade, capital and migration flows have been associated with a remarkable increase in the demand for cross-border payments all over the world. An efficient cross-border payment system at the international level is crucial not only for the functioning of the global economy, but also as a pillar of financial inclusion, financial stability, monetary sovereignty, and even geopolitics (Panetta, 2025a). However, despite technological progress, international payments remained slow, expensive, opaque, and unevenly accessible, especially if compared to domestic payments, limiting their effectiveness for households, businesses, and governments worldwide.

An improvement in cross-border payments has been on the agenda of policymakers and regulators for decades, which recognized the need for coordinated global actions across jurisdictions, market participants and standard-setting bodies. In November 2020, the G20 leaders endorsed the *Roadmap for Enhancing Cross-Border Payments* (G20, 2020), tasking international institutions, such as the Financial Stability Board (FSB), the Committee on Payments and Market Infrastructures (CPMI), the International Monetary Fund (IMF) and the World Bank (WB), with delivering an ambitious set of initiatives.[2]

Specific attention has been paid to remittances, the funds transferred by migrant workers to their home countries, which are crucial for economic development for a number of reasons (IFAD, 2025). They provide a direct, reliable lifeline to families, improving living standards and reducing poverty rates, particularly in developing nations. They often act as a counter-cyclical buffer, increasing during economic downturns or natural disasters and serving as an insurance mechanism that sustains local consumption when income falls. These flows help countries manage their current account deficits and help stabilize local currencies. Finally, remittances are a funding source for healthcare and education, as well as for the growth of small business start-ups. Recent World Bank data show that remittance flows to low- and middle-income countries exceeded $650 billion in 2023, representing more than 20% of GDP in some economies (Ratha *et al.*, 2024).

However, the market of remittances still faces significant challenges. First, fees and costs

[1]We thank Paola Giucca, Michele Lanotte, Marcello Pericoli, and participants at the *Economics of Payments XIV* conference, the *Advancing Cross-Border Payments: Opportunities and Challenges for Sub-Saharan Africa* conference, and the Banca d'Italia *MISP* seminar for helpful comments and valuable discussions. The views expressed in this paper are those of the authors and do not necessarily reflect those of Banca d'Italia. Any remaining errors are our own.

[2]The Roadmap aimed at driving improvements in wholesale, retail and remittance payments. To track progress and assess effectiveness, the G20 endorsed a series of ambitious quantitative targets, measured by key performance indicators (KPIs), with most set for achievement by the end of 2027. For a discussion of the state of play, achievements and remaining challenges, see Lammer andtextitet al. (2025).

for users are disproportionately high and heterogeneous across corridors (World Bank, 2024), dramatically reducing the amount received by the beneficiary. Second, access to remittance services remains difficult for some population groups, with delays in fund transfers and negative economic effects on recipients. This is the case of migrants and their families from rural and impoverished areas, who rely on income from the informal economy, are often unbanked and characterized by low levels of financial education. Finally, banks are engaged in de-risking practices, thus closing the accounts of money transfer operators, especially those serving fragile economies, due to tighter prudential standards and more complex and cumbersome regulations, aimed at combating money laundering and terrorist financing. These factors can create barriers to entry for new remittance providers and increase compliance costs, thus exacerbating the problems affecting the correspondent banking model.

The cost of remittances, in particular, is a crucial aspect of improvement by international organizations. The G20 roadmap aims to reduce the global average cost of sending remittances ($200) to less than 3% by 2030, with no specific corridor exceeding 5%. The roadmap also seeks to ensure transparency of remittances and that more than 90% of users have access to electronic remittance options.[3] Among key policy strategies, the implementation of Fast Payment Systems (FPS) and their interlinking are considered important levers to improve cross-border payments by international organizations (CPMI, 2021; FSB, 2024) and play a role in the recent Eurosystem's comprehensive payments strategy (ECB 2026). Some empirical literature documents the benefits of a FPS in terms of speed, safety and cost for domestic payments. A FPS, indeed, provides users an alternative to cash in countries with low penetration of cards (Frost *et al.*, 2024), acts as entry point to additional financial services (Pesme, 2023) and contributes to financial inclusion (Aurazo *et al.* 2024, 2025). However, little or nothing is known about their potential for cross-border payments.

In this paper we relate to this emerging literature and contribute to policy discussion by testing whether the introduction of a FPS is associated with a reduction in the cost of remittances. To this end, we combine granular information at the international level on the cost of remittances provided by the World Bank with a newly assembled country–level dataset from different sources containing information on the adoption of FPS in the various jurisdictions and apply staggered treatment econometric strategies adopted for the evaluation of policy interventions. To the best of our knowledge, this is the first paper that quantifies the impact of implementing FPS on remittance costs. In this regard, our aim is to examine whether the focus on FPS for the improvement of cross-border payments, and the actions undertaken by policymakers in this area, can find empirical support. While conceptual

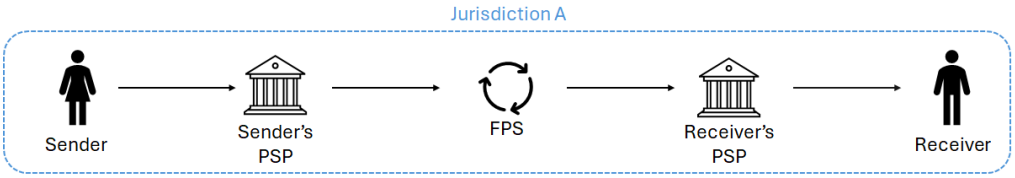
[3]The United Nations (UN) in 2015 set a target within the Sustainable Development Goals (SDGs) to reduce the cost of remittances to 3 percent of the value transferred by 2030.

discussions have always been extensive, empirical evidence has been, so far, scant; in this regard, the new improved corridor-level data and information on FPS implementation may allow economic research to make a step forward.

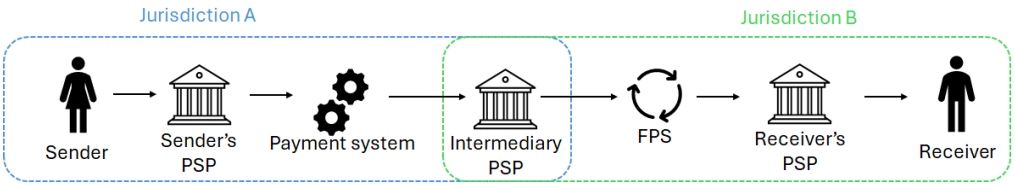
Ascribing a direct effect to FPS implementation on the cost of remittances may be challenging, as the majority of FPS mainly handle domestic transactions (Figure 1a). However, this effect cannot be ruled out. In some cases - such as cross-border payments processed by money transfer operators - the "last mile" of the transaction may effectively be routed through a FPS, as shown in Figure 1b. In addition, indirect mechanisms can be triggered by the adoption of a FPS at the domestic level, leading to a decrease in remittance costs. First, a FPS improves efficiency, transparency and competition in the payment market and can act as a catalyst for technological innovation (Cornelli *et al.*, 2024). Second, the adoption of a FPS is associated with a reduction in cash usage and an increase in digital payments, especially in emerging market and developing economies (Di Iorio *et al.*, 2025), leading to improvements in financial inclusion (Frost *et al.*, 2024). In the paper, we document the role played by these indirect mechanisms by exploiting our dataset and carrying out instrumental-variable regressions based on indicators of both market competition and financial inclusion.

Figure 1: Chain of a fast payment: domestic vs. cross-border setting

(a) Domestic



(b) Cross-border



Note: The first chart is a stylised representation of a domestic account-to-account payment; the second chart is a stylised representation of a cross-border account-to-account payment where the leg in the receiving jurisdiction is processed through a FPS.

Our analysis can also contribute to the literature on the economics of migrant remittances, as discussed, among others, in Yang (2011), and their link to financial development, as in Aggarwal *et al.* (2011). More specifically, we contribute to empirical studies based on cross-

country data on how innovation in payments affects the cost of international remittances. Existing panel studies based on the World Bank database mostly focused on retail payment instruments, finding that online platforms and mobile-money-based services are associated with lower remittance costs than traditional bank-based and cash-based services (Beck *et al.*, 2022). Other research, based on micro-level transaction data for single countries, showed that, in jurisdictions of Sub-Saharan Africa, mobile money has helped households to smooth consumption in the face of shocks, through increased remittances and risk sharing (Jack and Suri, 2014; Munyegera and Matsumoto, 2016; Blumenstock *et al.*, 2016; Riley, 2018). Finally, other studies argued that the beneficial effects of technology on remittance cost can be largely offset by regulatory frameworks designed to prevent anti-money laundering and terrorist financing in receiving countries, inducing remitters to bypass the formal systems and move to informal channels of money transfers like hawala (Gupta *et al.*, 2009; Freund and Spatafora, 2008).[4]

Our paper also relates to the growing research on the implications of developments in crypto assets for payments and the broader financial system. Market operators, notably crypto asset providers, argue that distributed ledger technology can be a solution to the inefficiencies of cross-border payments by enhancing speed, lowering costs, improving transparency and traceability, reducing the number of intermediary banks and minimizing reliance on legacy systems.[5] Adams *et al.* (2023) and Liao *et al.* (2023) argued that efficiency gains associated with the adoption of stablecoins mainly stem from shorter intermediation chains and the integration of the messaging and the settlement layers in payment systems. Auer *et al.* (2025) investigate trends and drivers of cross-border flows of major native crypto assets in a gravity framework, finding signs that transactions in stablecoins and low-value Bitcoin transfers act as a substitute for remittance payments, especially in country corridors characterised by high remittance costs or slow processing. While some of these benefits can be more evident, the impact of stablecoins on remittance cost still requires a sound real-world validation.[6] More recently, "mystery shopping" by Di Iorio *et al.* (2026) finds that measurable cost reductions can emerge in specific corridors but stablecoin-based solutions are not systematically cheaper than traditional methods, as cost-effectiveness depends on the on-

[4]We draw from and contribute to previous empirical research on the determinants of remittance costs using cross-country data (Freund and Spatafora, 2008; da Silva Filho, 2021; Beck *et al.*, 2022) as well as related studies evaluating the cost elasticity of remittance flows (Freund and Spatafora, 2008; Ahmed *et al.*, 2021; Kpodar and Imam, 2022).

[5]See, for example, the survey run by Artemis in 2024, involving a sample of 33 stablecoins-based payments companies and firms. They show that private entities are testing the potential of stablecoins for remittances, Business-to-Business payments (small and medium-sized enterprises treasury and supply-chain transactions), as well as for card-linked payments where merchants' acceptance of such instruments is wider.

[6]Monitoring use cases is currently hampered by the lack of official statistics and reporting to central banks and the reliance on private information, albeit useful, needs a careful interpretation as crypto markets are highly fragmented and commercial data providers use different and non-standardized methodologies.

and off-ramp fees charged by crypto-market operators, which account for the largest share of total costs.

The remainder of the paper is as follows. In Section 2 we describe the data used in the empirical analysis while Section 3 discusses the methodology employed to evaluate the effects of FPS implementation on the cost of remittances. Section 4 shows the main estimation results and their heterogeneity across macro-economic region, type of market service provider and payment instrument used to collect the funds. In Section 5 we investigate the main mechanisms through which the implementation of a FPS may be associated with a reduction in the cost of remittances. In Section 6 we test the robustness of our main findings along several dimensions, notably depending on the size of transactions, using alternative estimation techniques and data frequency. Finally, in Section 7 we offer some concluding remarks and discuss the related policy implications. In the Appendix A are additional figures and the tables summarising the results of the robustness checks.

2 Data and descriptive statistics

Our primary source of information is Remittance Prices Worldwide (RPW), the dataset on the cost of remittances provided by the World Bank. Launched in September 2008, the RPW is used as a reference to measure progress toward global cost reduction objectives, including the commitment of the G20 to reduce the global average to 3 percent.[7]

The data are quarterly and cover the period from the second quarter of 2016 to the third quarter of 2024. The granularity of the dataset is at the firm-level, where the firm is the remittance service provider. For each firm, the dataset includes the cost of sending the equivalent of both $200 and $500, expressed as a percentage of the amount of the transaction.[8] The total cost for remittance services consists of two main components charged by the remittance service provider. The first is the fixed fee, which can be flat or a percentage of the transaction amount, within set bands. This is the most visible cost component and usually represents the charge the sender pays at the initiation point. The second component, often hidden, is the foreign exchange margin (i.e. the difference between the exchange rate offered to the consumer and the interbank market exchange rate). Even though remittances can be paid in US dollars in some countries, the majority of remittance transactions are paid in local currencies, and, thus, an exchange operation is required. The relative importance of the two cost components can vary significantly both across countries and across market

[7] More information is available at http://remittanceprices.worldbank.org

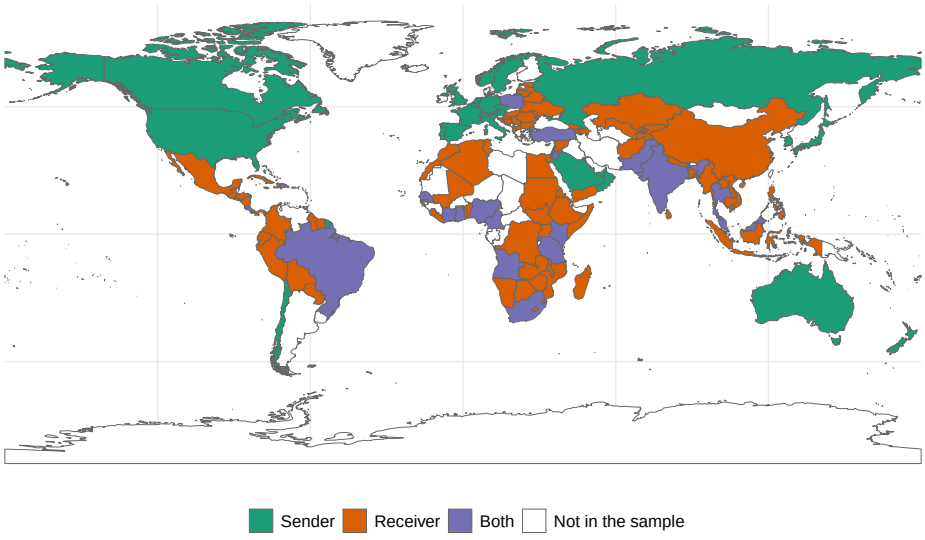
[8] Throughout this paper, the term cost refers to the amount paid by the remittance sender, expressed as a percentage of the amount sent.

operators.

Moreover, we have information on both the sending (where money is sent from) and the receiving country (where money is sent to), which we combine to identify remittance corridors. In this context, a corridor is defined as a country pair describing the origin and destination of funds. The dataset spans 49 sending and 105 receiving countries, resulting in 368 bilateral corridors worldwide.

Figure 2 shows all jurisdictions included in the dataset. Consistent with global remittance patterns, sending countries are primarily advanced economies with large migrant populations, such as the United States, European Union countries, Australia, while receiving countries are mainly emerging and developing economies, including China, countries in South and East Asia and the Pacific, Mexico, the Caribbean and Sub-Saharan Africa. Brazil, India and some African jurisdictions act as both receiving and sending countries. When analysing remittance costs, the World Bank groups countries in six major recipient regions: East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LATAM), Middle East and North Africa (MENA), South Asia (SA), and Sub-Saharan Africa (SSA).

Figure 2: Countries covered by the World Bank RPW dataset



Note: the map is for illustrative purposes only and the boundaries may not reflect the actual situation.

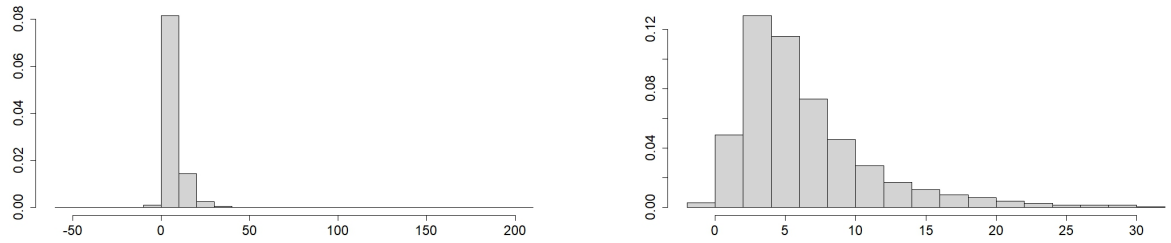
Data show a significant heterogeneity across regions in the cost of remittances. South Asia is, on average, the cheapest region to receive remittances with an average cost of 5% for a $200 remittance; on the contrary, Sub-Saharan Africa is the most expensive with an

average of 8.05%. The other regions show costs, on average, by about 6-7%.

The distribution of the cost of a $200 remittance is heavy-tailed with some extreme values in both right and left tails.[9] For this reason, we removed the 1% of most extreme observations from the sample (0.5% for each tail). Figure 3 shows the distribution of costs before and after the trimming procedure. We ended up with a dataset consisting of 182,825 observations, 94 of which exhibit small negative values.

Figure 3: Distribution of the total cost in percent of the amount sent for a $200 remittance

(a) Before trimming (b) After trimming



Note: Costs reported on the x-axis are expressed in percentage

The dataset is highly granular, capturing information across multiple dimensions. First, the cost of remittances can vary significantly according to the type of service provider. The RPW dataset, indeed, distinguishes between Banks, Money Transfer Operators (MTOs), Mobile Operators, and Post Offices.[10] As shown in Table 1 the vast majority of the data refer to MTOs, followed by Banks. The former are, on average, about two times cheaper than the latter.

The dataset also includes information on the pickup method used to disburse the funds to the recipient, which is mainly distinguished between cash, bank account and mobile wallet. There are others categories to collect remittances, such as ATM networks, debit card and home delivery but they are characterized by a very small number of observations. Cash is the most represented option to collect remittances followed by bank account. Both these traditional methods are much more expensive than other digital solutions, notably mobile wallets. The information on the pickup method may capture country-specific differences in

[9]In the RPW there can be some observations characterized by a negative value. The World Bank refer to these by saying *A negative total cost may be due to a promotion active at the time information was collected and does not mean that the sender is remunerated for using the service.*

[10]MTOs include both traditional providers and innovative fintech players. Thus far, it has included Western Union and MoneyGram, which operate in 95 percent and 90 percent of the country corridors covered in the database, respectively. Some MTOs can be defined as "digital-only" as they send remittances predominantly through digital channels. Examples in this regard are Wise, Remitly, WorldRemit, InstaReM and Xoom. Some of these remittance service providers also have physical channels.

access to the banking system, security needs, and desired speed of transfer by recipients. Cash pickup is a face-to-face option, allowing recipients to collect cash at a local agent or office without needing a bank account; it provides immediate access to funds, so it can be a good option for people living in areas with limited access to banking services but can involve higher fees and presents security risks for large amounts. Bank transfers and digital wallets, provide more convenience, security, and integration with other financial services but require in many cases the recipient to have a bank account.

Table 1: Descriptive Statistics for the cost of sending $200

	Min	Mean	Max	Std. Dev.	N. Obs
Remittances Cost					
Payment 200 USD	-0.06	6.46	31.44	4.87	182825
Firm-Type					
Bank	-0.06	10.02	31.44	7.28	28810
Money Transfer Operator	-0.06	5.75	31.44	3.88	148190
Other	-0.02	6.72	30.86	4.92	5825
Region					
East Asia & Pacific	-0.06	6.67	31.31	4.99	46569
Europe & Central Asia	-0.06	6.21	31.33	4.62	24335
Latin America & the Caribbean	-0.05	5.96	30.29	3.61	23114
Middle East & North Africa	-0.05	6.60	30.49	4.63	16612
South Asia	-0.06	5.00	31.44	4.33	36075
Sub-Saharan Africa	-0.05	8.05	31.44	5.65	36120
Pickup Method					
Bank account	-0.06	6.78	31.44	6.18	67532
Cash	-0.06	6.37	31.33	3.93	107512
Mobile wallet	-0.05	4.73	28.30	3.07	7653
Other	-0.06	4.00	12.47	2.75	128
Speed Category					
Less than one hour	-0.06	6.14	31.33	3.88	90409
Same day	-0.06	5.83	30.86	4.24	25097
Next day	-0.06	5.65	31.12	4.50	21784
2 days	-0.06	7.17	31.31	6.10	23167
3-5 days	-0.06	8.23	31.44	6.84	20315
6 days or more	0.00	10.91	31.07	7.81	2053
Negative values	-0.06	-0.03	-0.01	0.02	94

Note: Min, Max, Mean and Std. Dev. are expressed in percentage. The breakdown of cost by region refers to the cost of sending a remittance to that region. As for Firm-Type, the category "Other" includes categories for which it was difficult to attribute a unique label. As for the Pickup Method, the category "Other" includes: *ATM Network, Bank account/Cash, Home Delivery, Debit card.*

Finally, we have information on the speed of remittances, as captured by the time it takes for the money to be available for the receiver. This variable is categorical and ranges from "less than one hour" to "6 business days or more". The G20's roadmap for enhancing cross-border payments sets a specific target of 75% of cross-border remittance payments to provide

availability of funds for the recipient within one hour of initiation, with the remaining 25% within one business day by the end of 2027. This applies to all remittance corridors.

We acknowledge that a trade-off between transaction speed and cost may exist, with faster payment methods often being more expensive. Faster services may require additional investments and more resource-intensive processes. Moreover, ensuring the rapid availability of funds can entail higher liquidity costs for providers. These factors can ultimately be passed on to consumers through higher prices. Simple descriptive statistics in Table 1 do not clearly reveal this negative relationship, which may reflect the significant heterogeneity in the business models of the service providers included in the dataset.

We merge the World Bank data with a newly assembled country–year dataset containing information on the adoption of FPS at the global level. This dataset is built using several sources: the World Bank FASTT project[11], research papers from international organizations, mainly the Bank for International Settlements, and the websites of individual central banks. For each receiving jurisdiction, we identify whether a FPS is present and record the date of its implementation. Overall, we collect information on the implementation of Fast Payment Systems in 52 receiving jurisdictions.[12]

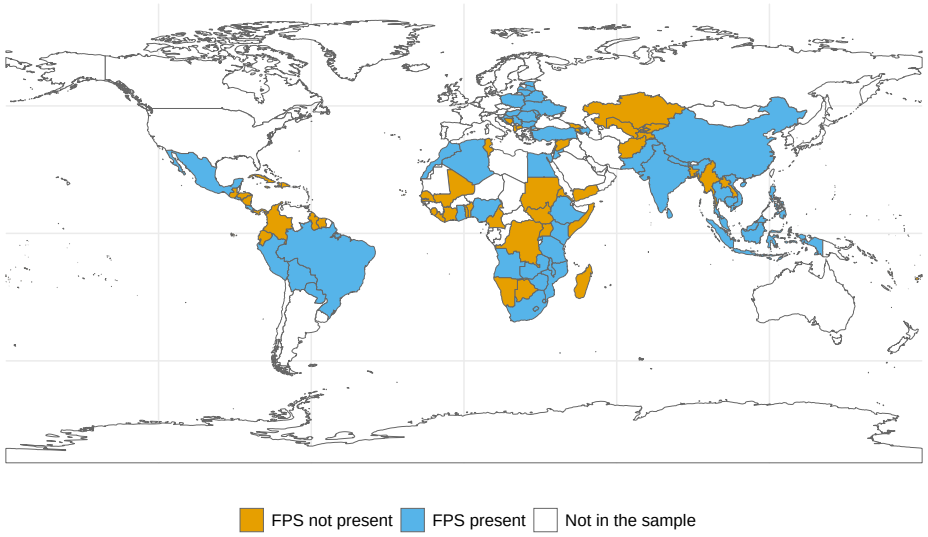
In this paper, we focus on the receiving jurisdictions that include many emerging and developing economies. It may be reasonable to assume a larger and more heterogeneous effect of introducing a FPS for receiving countries. In contrast, the sample of sending countries is smaller, comprising the most advanced economies and for which the issue of remittance efficiency might be less relevant. The set of receiving countries included in our dataset is shown in Figure 4. FPS are distributed among several geographic areas, particularly in Eastern Europe and Asia-Pacific.

A visual inspection of the data seems to support our hypothesis. As shown in Figure 5, remittance costs to jurisdictions with a FPS tend to be lower than those to jurisdictions without, with the gap widening after 2018 as FPS implementations increase. This pattern is purely descriptive and should not be interpreted as causal, as it may reflect the influence of other concurrent developments across jurisdictions.

[11] https://fastpayments.worldbank.org/

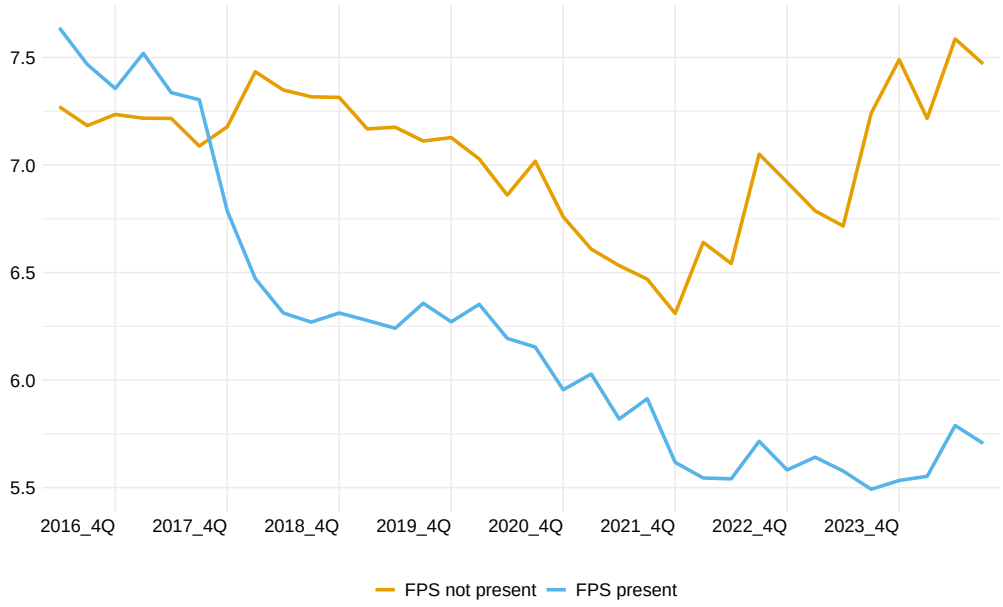
[12] The list of FPS was compiled on a best-effort basis, as no single comprehensive source on FPS implementation currently exists. Following a conservative approach, jurisdictions for which it was not possible to clearly determine the effective implementation of a FPS were classified as non-FPS jurisdictions. This choice minimizes the risk of false positives (i.e. mistakenly classifying a non-treated jurisdiction as treated). If a treated jurisdiction were incorrectly classified as non-treated, the estimated treatment effect would likely be attenuated relative to the case in which it were correctly assigned to the treated group.

Figure 4: Receiving jurisdictions by FPS presence



Note: The map is illustrative only; boundaries may be inaccurate. "FPS present" indicates jurisdictions where a FPS existed before Q3 2024

Figure 5: Average cost for a $200 remittance.



Note: Values on Y axis are in percent. Quarterly data. For each quarter, the lines plot the average cost of remitting funds to receiving jurisdictions with and without a FPS. Averages computed on the trimmed dataset.

A different pattern in the cost of remittances for jurisdictions that implemented a FPS with respect to the others is evident in all macro-regions, with the exception of Latin America and the Caribbean where an upward trend is recorded for both groups of countries. Moreover, at global level, the different dynamics in the cost for remittances is pretty visible when looking at the various categories of market service providers, especially as far as MTOs are considered. Finally, by looking at the components of the total cost, we observe that jurisdictions which have implemented a FPS show, on average, a substantially lower average fixed fee and foreign exchange margin than other jurisdictions. However, the trend in the fixed fee appears to be broadly the same for jurisdictions where a FPS is or is not implemented. In contrast, development in foreign exchange margin differs across countries, being quite stable in jurisdictions with a FPS while increasing in the others. This evidence, would suggest that the effect of implementing a FPS mainly transmits to foreign exchange margins (See Figures **??** - A3 of the Appendix A).

3 Specification and identification strategy

One of the most widely used econometric methods to estimate the impact of a policy introduction is the difference-in-differences (DiD), which allows researchers to compare changes in outcomes over time between a group affected by the policy and a group that is not, thereby isolating the causal effect of the intervention.

The so-called Average Treatment Effect on the Treated (ATT) is an approach that relies on the assumption that the timing of the treatment is the same for all treated units. However, in our context, the timing of the policy intervention, namely the implementation of a FPS, varies considerably between countries. This staggered adoption violates the assumption of a common treatment time required by the classical difference-in-differences framework. To address this, we rely on a two-way fixed effects (TWFE) model, which allows estimation of the ATT while controlling for both unit and time fixed effects across a staggered treatment design.[13] More formally, the model has the following specification:

$$Cost_{ij,ptm} = \beta_0 \cdot \text{FPS}_{jt}^{year} + \beta_1 \cdot \text{Speed}_{ij,ptm} + \text{Z}_{jt}^{year} + \delta_{ij} * D_{st} + \gamma_p * \tau_t + \omega_m * \tau_t + \epsilon_{ij,ptm} \quad (1)$$

where $Cost_{ij,ptm}$ is the remittance cost in the corridor ij - i.e. from the sending country i to the receiving country j - offered by firm p, collected through the payment method

[13] We also assessed the plausibility of the common pre-treatment trends assumption using an event-study specification, see Figure A4. Pre-treatment coefficients fluctuate around zero without displaying a systematic pattern and are not statistically significant, supporting the absence of differential trends prior to FPS adoption.

m, at quarter t. FPS_{jt}^{year} is a dummy variable taking the value of one since the year of adoption of a FPS in the receiving jurisdiction j. The superscript *year* indicates that the variable varies only at an annual frequency since we do not have information about the quarter of implementation of the FPS. A negative coefficient, consistent with our research hypothesis, would suggest that the remittance cost, on average, is lower in jurisdictions that implemented a FPS with respect to jurisdictions that did not, while controlling for other variables. Conversely, a positive coefficient would indicate that remittance costs are higher in jurisdictions with a FPS.

One may argue that the decision to implement a FPS in a jurisdiction may itself be driven by high cost levels, raising concerns about reverse causality and potential bias in the estimated coefficient of the FPS dummy. While this channel cannot be entirely ruled out, we believe it is unlikely to be the main driver of our results for two reasons.

First, the decision to implement a FPS typically reflects a broader country-level strategy aimed at improving domestic payment systems rather than specifically targeting cross-border remittance costs. Second, FPS implementation is a complex, multi-year process, making it less responsive to short-term fluctuations in remittance pricing.

At the same time, we acknowledge that FPS adoption may be correlated with broader structural and institutional developments, such as financial sector reforms and increased digitalisation, which could also affect remittance costs. In this respect, the richness and granularity of our dataset play a crucial role. Our empirical framework allows us to include a wide range of high-dimensional fixed effects—at the corridor-, country-, firm-, payment method- and time-level—thereby accounting for a large share of unobserved heterogeneity and mitigating concerns related to omitted variable bias, ultimately improving the identification of the policy effects.

Among corridor-specific variables, $\text{Speed}_{ij,ptm}$ is the speed of remittances in a specific corridor, measured by the hours necessary for the funds to be credited to the recipient.[14] Given its relevance as a key target for improvement in the G20 Roadmap, speed could also be examined as a dependent variable. However, we assume that, in many cases, it represents a premium feature, i.e. a value-added service that can influence the overall cost of remittances (i.e. a higher speed implies a higher remittance cost). For this reason, it is included as an explanatory variable. Moreover, we include corridor-level FE interacted with seasonal dummies at quarterly frequency ($\delta_{ij} * D_{st}$). Corridor-level fixed effects may control

[14] In the original RPW dataset speed is an ordinal categorical variable with 6 categories as shown in Table 1. We transformed this categorical variable in a numeric one by assigning to each category the equivalent amount of hours. Specifically: "Less than one hour" = 0, "Same day" = 24, "Next day" = 48, "2 days" = 72, "3-5 days" = 96, "6 days or more" = 192.

for geographic distance, structural economic integration or generally deeper and broader relationships between the involved countries; moreover, their interaction with seasonal quarterly dummies can control for potential seasonality of remittance flows at corridor-level. The inclusion of specific fixed effects at both sending and receiving country levels controls for structural differences across jurisdictions related to the population distribution and distance between users and service providers. Rural populations, for example, are more sparse and difficult to reach, thereby raising costs for providers and, in turn, for customers.

One important aspect is to control for conditions in the receiving country. The inclusion of a full set of fixed effects at receiving country*time level is not feasible in our dataset as they would totally absorb the effect of the FPS dummy. In any event, in the vector Z_{jt}^{year} we consider some variables at country-year level that may have a significant effect on the cost of remittances, such as per capita GDP and the annual value of all remittance inflows in the receiving jurisdiction. The expected sign on these variables is a priori ambiguous, as they capture several forces affecting both the supply and demand sides of the remittance market.

On the one hand, higher levels of economic development, proxied by per capita GDP, may be associated with more efficient financial systems, better infrastructure, and greater competition, all of which could contribute to lower remittance costs. On the other hand, higher income levels may also be associated with higher operating costs for financial intermediaries, including labour and compliance costs, which could translate into higher fees. In addition, remittances are typically countercyclical, increasing during periods of economic downturn in receiving countries, which may be associated with weaker financial infrastructure, greater reliance on cash-based channels, and higher perceived risk, potentially exerting upward pressure on observed transaction costs.

As for remittance inflows, they may also control for other factors not strictly related to economic conditions in receiving countries, such as changes in the stock of migrants living in sending countries and originated from receiving countries (the supply side of remittances), changes in population of the recipient country (the demand side of remittances), variations in regulatory policies on capital controls in both sending and receiving countries.

We also consider firm-quarter level FE ($\gamma_p * \tau_t$) to better control for changes in the supply-side of the remittance market. Pricing strategies of service providers are likely to reflect a mark-up charged over their operational cost and may be different across categories of service providers. Banks charge typically higher fees, which might be explained by higher regulatory costs faced by banks and remittance services not being the most important product of the larger package of services that clients receive. Post offices, on their side, have the advantage of being able to cross-subsidize remittance services with their main business and offering easy access given their wide outreach. Money Transfer Operators (MTOs), on the other hand, are

specialized providers and might benefit from scale economies and face different regulatory and compliance costs with respect to banks and Post offices. Pricing strategies can be also different across market operators belonging to the same category of remittance providers, because of differences in terms of market share, number of corridors served, responses to regulatory changes and the associated compliance costs, especially in relation to Anti-Money Laundering (AML) policies.

Finally, we include specific fixed effects for the method by which the remittance is collected by the recipient interacted with time ($\omega_m * \tau_t$). A different speed in delivery and convenience of access points associated with each method may come with different fees. For example, using Internet or mobile phones as access points could imply lower costs for the remittance service provider, and, in turn, lower fees for their clients. By interacting pickup method FE with time fixed effects, we may also control for financial developments and changes in payment habits such as higher mobile money adoption and diffusion of digital payments, which may also affect the remittance cost.

To address potential autocorrelation and heteroskedasticity in the error terms, we adjust standard errors for two-way clustering. Given the structure of our specification, this choice mirrors the main dimensions along which residual correlation is most likely to arise. In particular, one dimension is the corridor–seasonal component, which captures persistent shocks and seasonality at the corridor level, consistently with the inclusion of corridor fixed effects interacted with seasonal dummies. The second dimension relates to firms, reflecting the presence of persistent pricing strategies, business models, and other firm-level factors that may generate serial correlation in the residuals.[15]

4 Estimation results

4.1 The estimated effect of FPS implementation

In this section we report and discuss the main estimation results. We compare several specifications, each with an increasing set of control variables. The estimated coefficients and

[15]Under more conservative clustering assumptions, i.e. clustering at the corridor and firm level, our main findings remain virtually unaffected. In some instrumental variable regressions focusing on the competition channel - that usually exhibit larger standard errors - the p-values associated with the estimated coefficients are slightly above the 10 percent threshold. This suggests a mild loss of statistical significance, while the magnitude of the estimated effects and the economic interpretation of the results remain broadly unaffected. As an additional robustness check, we also explore alternative clustering schemes. In particular, we consider two-way clustering at the corridor × pickup method level, which captures shocks specific to the disbursement channel (e.g. technological changes or shifts in user behaviour). Results remain broadly unchanged.

model specifications are reported in Table 2. Overall, they suggest that the implementation of a fast payment system significantly reduces remittance costs. However, the average estimated effect ranges considerably, depending on the model specification. As expected, the magnitude of the effect decreases as more control variables are included in the models. The most conservative specification suggests that the implementation of a FPS reduces, on average, the cost of sending a $200 remittance by nearly 0.25 percentage points.

Interestingly, the bulk of the difference in the estimated coefficients reflects the inclusion of control variables for supply-side factors. By simply considering firm-level and pickup method in addition to corridor fixed effects, the estimated impact of FPS implementation reduces by approximately one half in magnitude; the effect further declines, again by about of one half, when considering firm*time and pickup method*time fixed effects alongside sending country*time. Overall, these results highlight the significant role played by payment service providers in determining remittance costs.

A visual comparison of columns (4) and (5) shows that the inclusion of control variables that are specific to sending jurisdictions has a small impact on the estimated coefficients. Similar considerations arise if we excluded sending country*time fixed effects (not reported to save space). This is also reassuring as one may wonder whether our results could partly be related to the 2022 spike in the cost of remittances observed in the control group of countries that did not implement a FPS system which seems to align with Russia's invasion of Ukraine and the increasing use of economic sanctions.[16]

Economic conditions and other institutional factors for both sending and receiving countries are likely to play an important role for remittance flows but seem to be less relevant for remittance pricing, provided that we exploit firm-level variation in addition to country-level variation. Another interesting outcome is the positive and statistically significant relationship between remittance speed and cost[17], which is also pretty stable in magnitude across all specifications. This result suggests that higher remittance costs are associated with shorter delivery times, in line with the expectations that faster payment services tend to be more expensive.

[16]Following the outbreak of the conflict, Western allies (the EU, UK, Canada, and the US) banned key Russian banks from Society for Worldwide Interbank Financial Telecommunication (SWIFT), the Belgian-based secure messaging system for thousands of banks worldwide, severely restricting Russia's access to international payments. This forced Russia to accelerate usage of its own system (SPFS) and prompted countries, particularly within BRICS, to look for alternatives to western-dominated payment systems to reduce future vulnerability. In any event, in our sample, Brazil, China, India and South Africa belong to the treated countries - not to control group countries - as all implemented a FPS.

[17]The sign of the coefficient is negative, but we refer to it as a positive relationship as the variable speed is defined as the number of hours needed for the delivery of funds to the beneficiary.

Table 2: Effect of FPS implementation on the cost of $200 remittances

	(1)	(2)	(3)	(4)	(5)
FPS dummy	-1.169***	-1.098***	-0.649***	-0.558***	-0.247***
	(0.186)	(0.236)	(0.173)	(0.138)	(0.096)
Speed (log)	0.230	0.145	-0.095**	-0.093***	-0.097**
	(0.149)	(0.098)	(0.038)	(0.035)	(0.038)
Fixed Effects					
Corridor × Seasonal Dummy		✓	✓	✓	✓
Firm			✓	✓	
Pickup method			✓	✓	
Sending Country × Time					✓
Firm × Time					✓
Pickup method × Time					✓
Control Variables for receiving country					
GDP				✓	✓
Remittances In				✓	✓
Observations	182,825	182,825	182,817	167,214	163,010
Adj. R^2	0.023	0.302	0.575	0.583	0.630
Within R^2		0.011	0.005	0.006	0.003

Note: Standard errors clustered at the corridor × seasonal dummy and firm level are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the percentage cost of sending a $200 remittance.

We investigate whether the effects of FPS implementation depend on developments in a few countries or are worldwide. As shown in Table 1, the geographical distribution of the cost of remittances exhibits substantial heterogeneity and FPS may have different characteristics in the various jurisdictions.[18]

For the sake of parsimony, we also report the estimation results of separate regressions for each macro-region, as defined by the World Bank for administrative purposes.[19]

We consider the specification including the largest set of control variables and, as a control group, we retained all countries without a FPS, regardless of whether they belong to the region under analysis. The results are presented in Table 3 and reveal that the average

[18]We carried out a "leave-one-out" robustness check by systematically excluding one country at a time and re-estimating the model to determine if the estimated coefficients and inference are driven by a single country or a specific subgroup. The results confirm that our main findings are not driven by a small number of countries.

[19]World Bank Country and Lending Groups

effect documented in the previous section masks substantial heterogeneity across regions. No significant effect is observed for either Latin America and the Caribbean or for Europe and Central Asia. In contrast, the Middle East and North Africa exhibit the largest reduction in the cost of remittances, about –0.9 percentage points. Other regions display a slightly smaller effect, around 0.7-0.6 percentage points. Sub-Saharan Africa, which has the highest remittance costs at the global level, shows a significant reduction of 0.5 percentage points. Again, the empirical link between transaction speed and cost is positive (faster payments are more expensive) and statistically significant in all regions, although its magnitude varies. In Europe and Central Asia, remittance costs are very sensitive to delivery speed. In other regions, the effect substantially declines, with jurisdictions in Middle East & North Africa showing the weakest relationship.

Table 3: Effect of FPS implementation on the cost of $200 remittances in macro-regions

	East Asia & Pacific	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
FPS dummy	-0.697***	-0.110	0.234	-0.876***	-0.723***	-0.468*
	(0.221)	(0.222)	(0.249)	(0.223)	(0.194)	(0.251)
Speed (log)	-0.054	-0.132***	-0.087*	-0.067*	-0.055	-0.051
	(0.044)	(0.044)	(0.045)	(0.038)	(0.039)	(0.033)
Observations	71,857	58,024	49,448	51,420	68,985	63,764
Adj. R^2	0.638	0.559	0.614	0.616	0.639	0.652
Within R^2	0.0041	0.0050	0.0043	0.0071	0.0035	0.0036

Note: Standard errors clustered at the corridor × seasonal dummy and firm level are in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variable is the percentage cost of sending a $200 remittance. All specifications include GDP and remittance inflows of receiving country as control variables, as well as corridor × Seasonal dummy, Sending country × Time, Firm × Time, and Pickup method × Time fixed effects.

4.2 Heterogeneity across payment methods and market operators

We further exploit the granularity of the dataset and assess whether the effects of FPS implementation may depend on the payment instrument used to collect the remittance. The results, presented in Table 4, indicate that FPS adoption significantly reduces costs for remittances collected in cash, which are often high also because they rely on physical agent networks. The magnitude of the effect is approximately -0.4 percentage points. In contrast, no significant impact seems to be observed for other pickup methods. A negligible effect for remittances credited directly to bank accounts is surprising, as bank account disbursement is the most expensive pickup method in the data, and therefore the one with a potential

for cost reduction. Interestingly, speed also appears to have a significant association only with cash remittances, while no significant relationship is found for mobile wallets and bank accounts.

Table 4: Effect of FPS implementation on the cost of $200 remittances: heterogeneity across pickup methods

	Cash	**Mobile Wallet**	**Bank Account**
FPS dummy	-0.386***	-0.060	0.047
	(0.112)	(0.561)	(0.129)
Speed (log)	-0.060***	-0.041	-0.021
	(0.019)	(0.081)	(0.050)
Observations	94,272	6,536	58,941
Adj. R^2	0.524	0.508	0.766
Within R^2	0.0036	0.0017	0.0015

Note: Standard errors clustered at the corridor × seasonal dummy and firm level are in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variable is the percentage cost of sending a $200 remittance. All specifications include GDP and remittance inflows of receiving country as control variables, as well as corridor × Seasonal dummy, Sending country × Time, Firm × Time, and Pickup method × Time fixed effects.

The benefits of FPS introduction appear to have materialized primarily through non-bank channels. Indeed, cash is the only receiving method for which the effect is significant and it is predominantly offered by MTOs, which have extensive physical agent networks, ideal for remote areas without bank infrastructure, whereas the role of banks is negligible (see Table 5). Conversely, banks play a significant role in offering remittance receipt via bank accounts, a channel for which no cost reduction is observed.

Table 5: Distribution of pickup methods by type of intermediary

Pickup Method	**Banks**	**MTOs**	**Others**
Bank account	34.5%	62.6%	2.8%
Cash	5.1%	91.6%	3.3%
Mobile wallet	0.2%	95.2%	4.6%
Others	6.2%	93.8%	0.0%

Note: the table reports the share of observations associated to each type of intermediary and pickup method in percentage points. The distribution is computed over the entire sample period and considering all macro-regions.

To corroborate this view, we replicate our analysis across macro-regions by restricting the sample to transactions handled by MTOs, while excluding those for banks and other intermediaries. Results are reported in Table 6. The estimated effects are generally stronger in all considered macro-regions, in particular in Europe and Central Asia.

Table 6: Effect of FPS implementation on the cost of $200 remittances offered only by Money Transfer Operators

	Global	**East Asia & Pacific**	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
FPS dummy	-0.366***	-0.854***	-0.431**	0.092	-0.972***	-0.763***	-0.587**
	(0.090)	(0.224)	(0.176)	(0.267)	(0.241)	(0.188)	(0.273)
Speed (log)	-0.113***	-0.070	-0.152***	-0.096**	-0.074*	-0.067*	-0.052
	(0.034)	(0.043)	(0.042)	(0.045)	(0.038)	(0.036)	(0.034)
Observations	133,114	57,378	47,523	40,327	41,520	55,803	52,482
Adj. R^2	0.510	0.492	0.501	0.526	0.524	0.537	0.526
Within R^2	0.0054	0.0076	0.0093	0.0080	0.0127	0.0065	0.0055

Note: Sample includes MTOs only. Standard errors clustered at the corridor × seasonal dummy and firm level are in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variable is the percentage cost of sending a $200 remittance. All specifications include GDP and remittance inflows of receiving country as control variables, as well as corridor × Seasonal dummy, Sending country × Time, Firm × Time, and Pickup method × Time fixed effects.

Finally, we examine the extent to which our main results for payment instruments vary across regions. To this end, we carry out separate regressions by combining the different regions and the different pickup methods. The estimation results reported in Table 7 corroborate the view that the cost reduction is mainly observed for cash remittances, with significant effects in all regions with the exception of Latin America and the Caribbean. However, costs of remittances credited to bank accounts are significantly lower for South Asia and Middle East and North Africa, even with stronger estimated effects compared to remittances collected in cash.

Table 7: Effect of FPS implementation on the cost of $200 remittances: heterogeneity across pickup methods and macro-regions

	East Asia & Pacific	Europe & Central Asia	Latin America & the Caribbean	Middle East & North Africa	South Asia	Sub-Saharan Africa
Cash	-0.867***	-0.390**	0.554**	-0.831***	-0.594***	-0.631**
	(0.270)	(0.151)	(0.220)	(0.197)	(0.195)	(0.311)
Bank account	-0.347	0.223	-0.487	-1.284***	-0.923***	0.236
	(0.258)	(0.419)	(0.532)	(0.432)	(0.286)	(0.307)

Note: The table reports the estimated coefficients for FPS dummy stemming from separate regressions for each region and payment method. Standard errors in parentheses are clustered at the corridor × seasonal dummy and firm level. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variable is the cost of sending a $200 remittance (percent). All specifications include GDP and remittance inflows of receiving country as control variables, as well as corridor × Seasonal dummy, Sending country × Time, Firm × Time, and Pickup method × Time fixed effects.

4.3 Fixed fee vs. foreign exchange margin

As shown in Figures A3a and A3b the two components of the total cost of a remittance, i.e. the fixed fee and the foreign exchange (FX) margin, show a different dynamic over the sampling period. For this reason, we investigated how the introduction of a FPS affected each of these components, separately. Table 8 shows the estimated coefficients.

The impact is, on average, statistically significant only for the FX margin. In other words, the reduction of remittance cost, following FPS implementation, mainly reflects a decline in the markup charged by market operator over exchange rate fluctuations. This result is interesting, as the FX margin usually acts as a hidden fee, making it difficult for customers to compare the true cost of different payment services. Speed does not show any significant relationship with the FX margin, while it is negatively related to the fixed fee, suggesting that the cost of speed is usually priced into this component. These results are largely confirmed even when heterogeneity across regions is considered. Separate regressions for each macro-region show significant effect of FPS implementation only on the foreign exchange margin, with the exception of South Asia where there is some evidence of a reduction via fixed fees (see Table 9).

Table 8: Effect of FPS implementation on the cost of $200 remittances: foreign exchange margin vs. fixed fee

	FX Margin	**Fixed Fee**
FPS dummy	-0.218**	-0.029
	(0.069)	(0.068)
Speed (log)	-0.014	-0.083**
	(0.009)	(0.035)
Observations	163,010	163,010
Adj. R^2	0.430	0.692
Within R^2	0.0030	0.0024

Note: Standard errors clustered at the corridor × seasonal dummy and firm level are in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variables are the FX margin and the fixed fee (in percentage points). All specifications include GDP and remittance inflows of receiving country as control variables, as well as corridor × Seasonal dummy, Sending country × Time, Firm × Time, and Pickup method × Time fixed effects.

Table 9: Effect of FPS implementation on the cost of $200 remittances: foreign exchange margin vs. fixed fee across macro-regions

	East Asia & Pacific	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
FX Margin	-0.625***	-0.220	-0.035	-0.712***	-0.351***	-0.397**
	(0.177)	(0.136)	(0.245)	(0.191)	(0.125)	(0.178)
Fixed Fee	-0.072	0.111	0.269**	-0.164	-0.372**	-0.071
	(0.112)	(0.183)	(0.114)	(0.126)	(0.162)	(0.220)

Note: The table reports the estimated coefficients for FPS dummy stemming from separate regressions for each region and cost component. Standard errors clustered at the corridor × seasonal dummy and firm level are in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variables are the FX margin and the fixed fee (percentage points). All specifications include GDP and remittance inflows of receiving country as control variables, as well as corridor × Seasonal dummy, Sending country × Time, Firm × Time, and Pickup method × Time fixed effects.

5 The role of market competition

As discussed above, the majority of FPS were thought to improve domestic transactions not cross-border ones. Therefore, it is likely that our estimation results mainly capture indirect mechanisms at work. An increase in market competition is frequently discussed in the literature, as a factor lowering the cost of remittances, for several reasons. First, a FPS enables instantaneous fund transfers between institutions, reducing frictions in deposit mobility. This empowers consumers to reallocate funds more freely, compelling financial institutions to compete more actively for deposits through better rates, lower fees, or improved services. FPS has increased liquidity mobility and challenged traditional deposit retention strategies (Sarkisyan, 2023). Second, fast payments support real-time integration with digital wallets and non-bank platforms, allowing users to top up their balances instantly. This removes a key bottleneck in the user experience and enhances the competitiveness of non-bank services (Capgemini and Royal Bank of Scotland , 2015). Finally, FPS serve as a catalyst for expanding access to and usage of formal transaction accounts and related financial services (Frost *et al.*, 2024). By facilitating the integration of informal economic actors into the formal financial system, FPS increases the number and diversity of participants, thereby expanding the addressable market and creating new customer segments for providers.

To empirically test the relevance of this channel, we rely on an instrumental variable (IV) approach and use the following system of equations:

$$\begin{cases} X_{ij,ptm} = \beta_0 \cdot \text{FPS}_{jt}^{year} + controls + \epsilon_{ij,ptm} \\ Cost_{ij,ptm} = \lambda_0 \cdot \widehat{X}_{ij,ptm} + controls + \eta_{ij,ptm} \end{cases} \tag{2}$$

In the first stage, we regress an indicator of market competition, denoted as $X_{ij,ptm}$, on the FPS implementation dummy. In the second stage, we regress the remittance cost on the predicted value $\widehat{X}_{ij,ptm}$ obtained from the first stage. Our approach allows us to evaluate the effect of FPS introduction on remittance costs through this transmission channel. Our key variable to measure market competition is the number of remittance service providers, constructed by counting all firms serving each corridor in each quarter. Since this variable varies only across corridors and time, in the dataset it is a repeated observation for all firms and pickup methods that are present in each corridor and quarter.

Results of regressions at both global and regional level are presented in Table 10. The estimated coefficients suggest that the number of market operators serving a specific corridor increased by 0.2, on average, following the implementation of a FPS. Estimates from the second stage indicate that each additional provider is associated with a reduction of about

1.3 percentage points in remittance costs. As for macro-regions, jurisdictions in South Asia show stronger effects than the global average, with an increase in the number of providers of about 0.4, and a corresponding cost reduction for each additional provider by about 1.6 percentage points. The introduction of FPS has an even greater impact on the number of market service providers in Sub-Saharan Africa, although the effect on remittance costs is smaller (-0.7 percentage points).

Table 10: Effects of FPS implementation via market competition

	Global	**East Asia & Pacific**	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
First-stage regression. Dependent variable: number of market service providers							
FPS dummy	0.188***	0.259	0.199	-0.310*	-0.225*	0.441***	0.681***
	(0.067)	(0.162)	(0.141)	(0.169)	(0.115)	(0.156)	(0.163)
Second-stage regression. Dependent variable: cost of remittances							
Fitted number of providers	-1.318**	-2.687	-0.552	-0.756	3.900*	-1.639**	-0.686*
	(0.573)	(1.827)	(1.114)	(0.873)	(2.243)	(0.669)	(0.370)
Speed (log)	-0.103***	-0.088	-0.136***	-0.090**	-0.046	-0.060	-0.053*
	(0.038)	(0.055)	(0.046)	(0.044)	(0.053)	(0.039)	(0.032)
Observations	163,010	71,857	58,024	49,448	51,420	68,985	63,764
Adj. R^2	0.630	0.638	0.559	0.614	0.616	0.639	0.652
Within R^2	0.0030	0.0041	0.0050	0.0043	0.0071	0.0035	0.0036
F-test (1st stage)	341.8***	143.4***	112.4***	179.8***	122.2***	345.5***	990.6***
Wu-Hausman	53.1***	89.6***	1.6	5.1**	123.2***	73.1***	33.9***

Note: Standard errors clustered at the corridor × seasonal dummy and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. All specifications include GDP and remittance inflows of receiving country as control variables, as well as corridor × Seasonal dummy, Sending country × Time, Firm × Time, and Pickup method × Time fixed effects.

For jurisdictions in remaining macro-regions, the estimation results do not seem to support our initial hypothesis. In the case of East Asia and Pacific, the estimated coefficients have the expected signs but statistical significance falls below the conventional threshold of 10 percent. For Latin America and the Caribbean and Middle East and North Africa the picture is more nuanced. Here, the estimates suggest a decline in the number of market service providers operating in corridors served by fast payment systems, accompanied by a non-significant effect in the remittance cost for the former and a significant increase in costs for the latter. While for Latin America and the Caribbean this result simply confirms that FPS had no effects, in our view, the outcome for Middle East and North Africa should be interpreted with caution. In this macro-region, the first implementation of a FPS occurred only in 2020. Therefore, a more reliable assessment will be possible once a longer time series becomes available. Figure A5 indeed, suggests that a larger number of market service providers in jurisdictions with a FPS emerges only from 2023 onward. In other macro-regions instead this is a more robust feature over the entire sample period.

6 Robustness checks

We test the robustness of our main results along several dimensions. We report the tables associated with the following experiments in Appendix A.

Larger transactions. We replicate our analyses using the cost of sending a $500 remittance, as reported in the RPW dataset.[20] This allows us to verify whether the estimated effects observed for $200 transfers differ for transactions of a larger amount. Results are presented in Tables A1 -A3. We find that a FPS implementation has a statistically significant effect also on total cost of $500 remittances, that is very similar in magnitude to that found in the $200 case. Again, the reduction in cost is primarily driven by a decline in the foreign exchange margin, while no significant effect observed for the fixed fee component, and the association with speed still persists only for the fixed fee. The results for $500 remittances confirm that FPS implementation mainly affects the cost especially for cash transactions. As for the breakdown by macro-regions, the estimated coefficients remain broadly unaffected.

We also investigate whether the effect of FPS implementation operates through increased market competition. The results are broadly consistent with those obtained for the $200 remittance amount, although the overall magnitude of the effect is smaller. Sub-Saharan Africa continues to stand out as the region where FPS adoption most strongly boosted competition, as reflected in a notable increase in the number of providers operating within each corridor. Overall, the analysis for $500 remittances confirms our main results and we do not find strong evidence that the effects of FPS implementation tend to change for larger transactions.

Regressions on annual data. Since our data for FPS implementation are only available at the yearly frequency, we deal with repeated observations for the independent variable, thus potentially inflating both size and inference on the coefficient estimates. We, therefore, repeat our analysis with all variables expressed at yearly frequency and including the same set of control variables. Although we deal on far fewer observations - about one fourth of those used in the regressions with quarterly data - Table A4 shows that the estimated coefficients are only modestly affected, confirming our main results.

Addressing "forbidden comparison" issues. The empirical literature did not reach a definite conclusion on whether the two-way fixed effect specification is appropriate in the context of a staggered treatment design. TWFE can still be a valid option if the treatment effects are homogeneous across units and constant over time. In our specific case, the estimated effects of the implementation of FPS may be biased because of "forbidden comparisons" where

[20] We exclude the top and bottom 0.5% of extreme observations for the $500 cost.

already-treated units (i.e. jurisdictions that have already implemented a FPS) are used as controls for newly-treated units (i.e. jurisdictions that have now implemented a FPS).

To address these potential concerns, we replicate our analysis using the estimator suggested by Callaway and Sant'Anna (2021) (hereafter CS), which relies exclusively on "never-treated" or "not-yet-treated" units as controls to estimate group-time average treatment effects. For feasibility reasons, however, we had to reduce the granularity of our dataset by collapsing observations at the yearly and receiving-jurisdiction levels (i.e., we construct a new dataset by computing simple averages of the original data across all dimensions, such as corridor, firm, and pickup method). To ensure comparability between the two approaches, we also estimate a TWFE model on the same less granular dataset, using an analogous specification without additional covariates and clustering standard errors at the receiving-jurisdiction level, consistently with the CS estimator. This allows us to isolate differences attributable to the estimators rather than to specification choices. The results indicate that the magnitude of the potential bias is limited. Both the TWFE and CS estimators yield negative coefficients of comparable size, with broadly similar levels of statistical significance. While the CS estimates for the full sample fall slightly short of conventional significance thresholds (with p-values marginally above 10%), the overall pattern of results remains consistent across the two approaches (see Table A5).

Additional transmission channel. We want to assess the relevance of financial inclusion as an alternative transmission channel. To this end we merge our dataset at yearly frequency with some indicators of financial inclusion provided by the World Bank in the Global Findex Database, the most popular survey-based dataset on how adults around the world access and use financial services, and apply IV-type regressions following the methodology described in Section 5 In particular, we consider country-specific indicators based on the replies to two specific questions:

i) "*The percentage of respondents who report having an account (by themselves or together with someone else) at a bank or similar financial institution, or report personally using a mobile money service in the past year.*"

ii) "*The percentage of respondents who report using mobile money, a debit or credit card, or a mobile phone to make a payment from an account, or report using the internet to pay bills or to buy something online or in a store–in the past year.*"[21]

The financial inclusion indicators are available only for the years when the survey was

[21] This includes respondents who report paying bills, sending or receiving remittances, receiving payments for agricultural products, receiving government transfers, receiving wages, or receiving a public sector pension directly from or into a bank or similar financial institution account or through a mobile money account in the past year.

carried out, namely 2017, 2021 and 2024. We, therefore, must assume that they did not change in the years between two surveys, given also that improvement in financial inclusion usually takes time to materialize. Another relevant econometric issue is that we cannot include year-specific fixed effects as they would fully explain the dependent variable in the fist-stage regressions. Therefore, our results should be interpreted having this important caveat in mind. Results are reported in Tables A6 - A9.

We find significant effects on the cost of remittances at global level via financial inclusion. Following a FPS implementation, account ownership and reliance on digital payment instruments increase, on average, by about 4 and 2.5 percentage points, respectively. The associated reduction in the cost of remittances is about 0.1-0.2 percentage points. As for heterogeneity across macro-regions, the estimated coefficients have the expected sign - with the exception of South Asia - and different magnitudes. As previously mentioned, these empirical results should not be taken as a definite answer, as based on few years and potentially affected by omitted variable concerns, but provide some interesting evidence that improving the domestic payment landscape might be transmitted to the cross-border dimension via financial inclusion in several jurisdictions.

7 Conclusions

In this study, we document a significant reduction in the cost of remittances sent to countries that have implemented a fast payment system. Although the estimated effect somewhat differs across economic regions, it is more pronounced for transactions in cash and, partly, for those credited via bank accounts which are more expensive compared to more advanced digital solutions (i.e., mobile wallets) and have room for improvements.

Our results are relevant and also encouraging, as addressing the inefficiencies in remittances and cross-border payments, more generally, remains a high-priority issue in the international policy agendas, notably in the context of the G20 Roadmap for enhancing cross-border payments. On the other hand, we are conscious that attributing a direct causal effect to FPS implementation on remittance cost can be challenging, as these systems are predominantly tailored to improve domestic transactions and typically operate within specific jurisdictions.

We argue that the observed reduction in remittance costs is, to a large extent, driven by indirect mechanisms. FPS implementation typically enhances the domestic payment ecosystem by improving efficiency, transparency, and competition. Recent literature highlights that FPS can act as a catalyst for financial digitalisation, fostering the adoption of digital

finance applications (Cornelli *et al.*, 2024). FPS are also associated with reduced cash usage and an increase in the number and frequency of small-value card payments (Di Iorio *et al.*, 2025). Furthermore, FPS development appears to support improvements in financial inclusion indicators (Frost *et al.*, 2024).

All these developments are consistent with a decline in remittance costs. Widespread technological innovation and greater competition among market service providers can lead to efficiency gains, which may be passed on to end users in the form of lower fees. In the paper we empirically test the relevance of these mechanisms and found significant evidence supporting them. The increase in the number of market service providers is particularly pronounced in Sub-Saharan Africa suggesting that the beneficial impacts of policy actions aiming at strengthening the payment ecosystem can be significant, especially in economic regions facing structural challenges (FSB, 2024).

However, our study also documents that faster payment services that tend to be more expensive. This outcome reveals a potential trade-off between key targets set by the G20 Roadmap that aim at reducing remittance costs while improving transaction speed. In this context, innovative interoperability solutions, designed to directly extend the benefits of FPS to the cross-border dimension, could represent an important area of investigation albeit posing significant challenges for their implementation, as discussed in a recent contribution by Di Giulio *et al.* (2025). In case such arrangements become more widespread, assessing their impact on the cost of remittances may constitute a natural extension of this empirical work.

Finally, our results support the view that the implementation of FPS, and, importantly, their interlinking across jurisdictions, can play a key role in improving the efficiency of cross-border payments. At the same time, they should be seen as part of a broader landscape of ongoing innovation in payment infrastructures. On the technological side, several initiatives are being explored, and there is increasing recognition that Distributed Ledger Technologies (DLT) may also contribute to the future architecture of payment systems, financial markets, and market infrastructures.

Stablecoins, probably the most promising application of DLT in retail payments, are nowadays at the basis of interesting projects by private entities, but their effective use and convenience in cross-border transactions remain difficult to assess. Some studies point to potentially significant efficiency gains stemming mainly from shorter intermediation chains and the integration of the messaging and the settlement layers in payment systems (Adams *et al.*, 2023; Liao *et al.*, 2023). A recent study by Di Iorio *et al.* (2026) finds that measurable cost reductions can emerge in specific corridors but stablecoin-based solutions are not systematically cheaper than traditional methods, as cost-effectiveness depends on the on-

and off-ramp fees charged by crypto-market operators, which account for the largest share of total costs. A widespread adoption of stablecoins can also imply significant financial risks, such as runs on redemptions, and create "closed-loop solutions" that restrict payments to users who adopt a particular tool, leading to high fragmentation in the cross-border market and increasing operational complexity. Private interoperability solutions can mitigate these risks but may introduce new concentration, governance, and cyber risks, also complicating oversight (Scotti, 2025; Panetta, 2025b).

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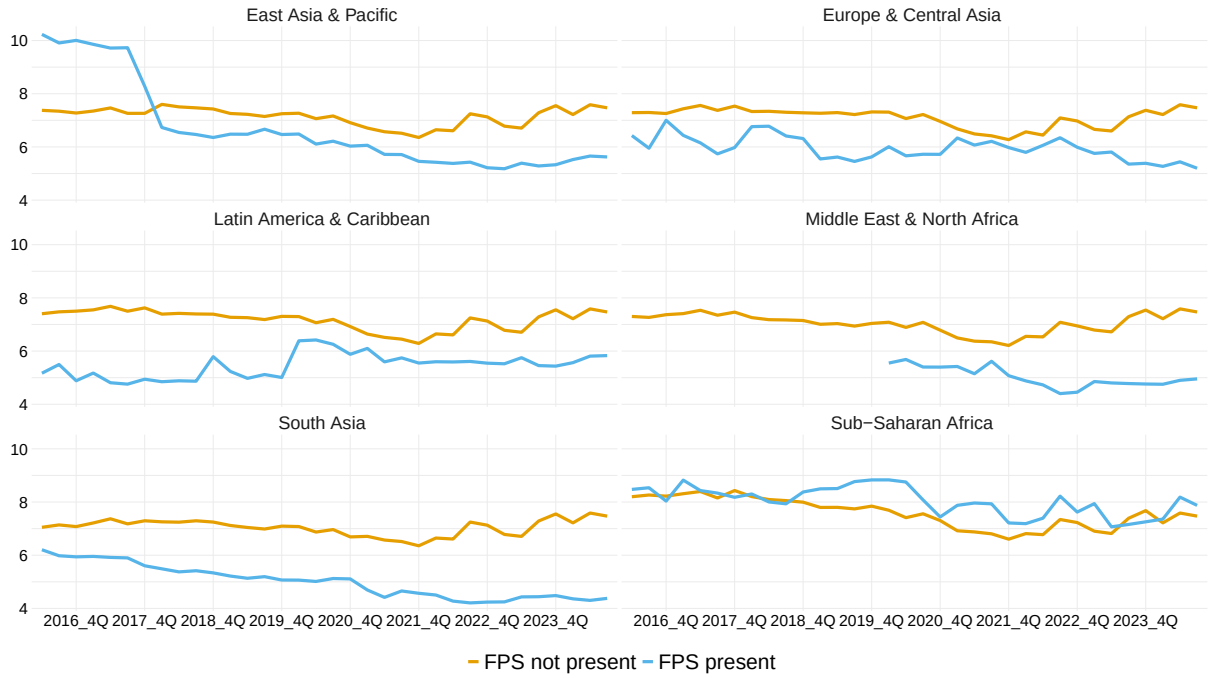
Appendix A

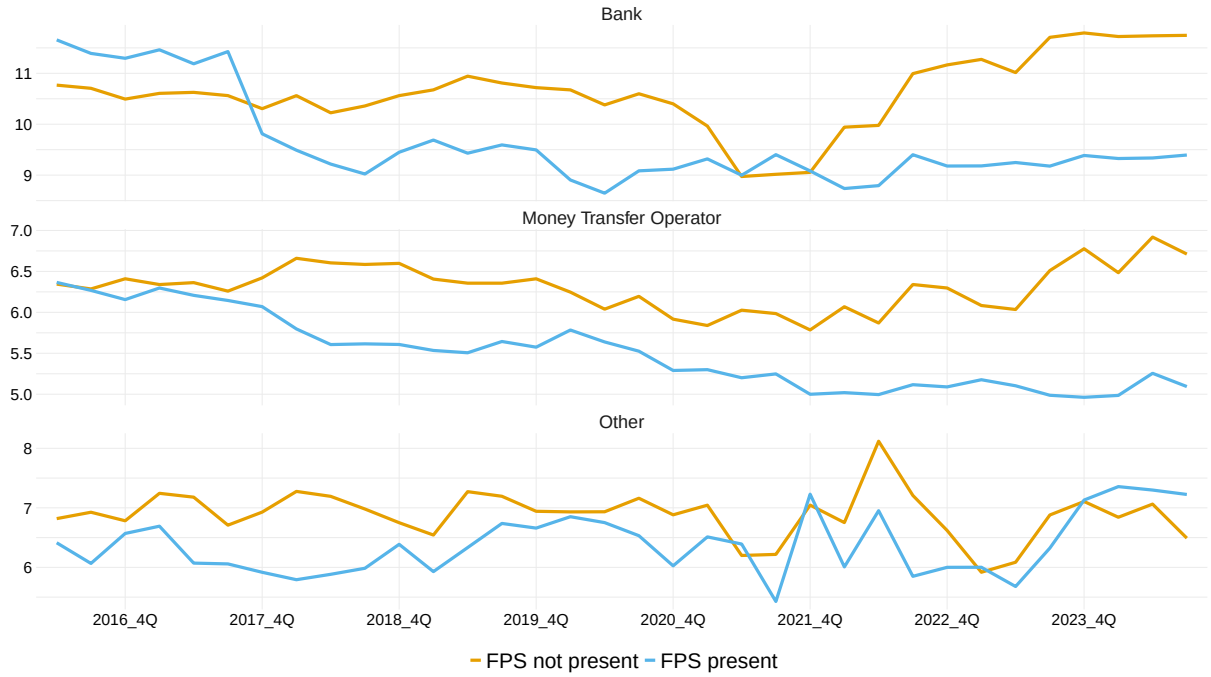
A.1 Additional figures

Figure A1: Average cost for a $200 remittance:
breakdown by macro-region



Note: Values in percent. Quarterly data. Averages are computed on the quarterly trimmed dataset. For each quarter, the lines plot the average cost of remitting funds to receiving jurisdictions with or without a Fast Payment System in each region. Panel composition varies over time. In Middle East and North-Africa no jurisdiction implemented a FPS before 2020.

Figure A2: Average cost for a $200 remittance:
breakdown by type of payment service provider

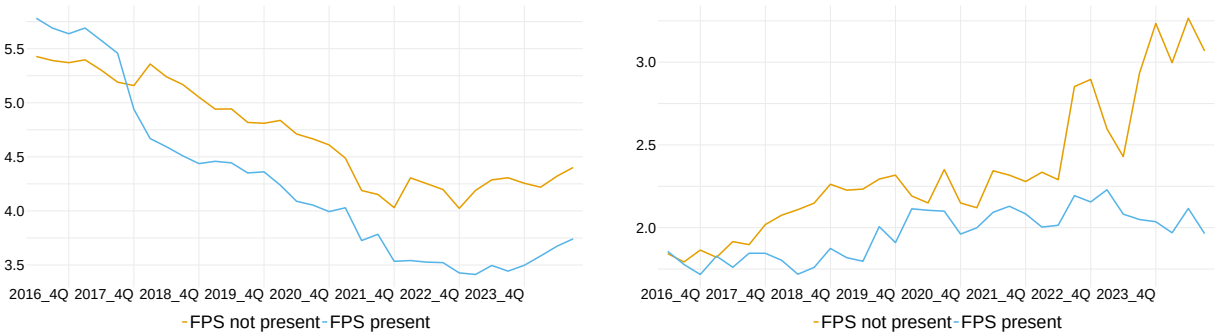


Note: Values in percent. Quarterly Data. Averages are computed on the trimmed dataset. For each quarter, the lines plot the average cost (as a percentage of the amount sent) of remitting funds to jurisdictions with and without a FPS for each category of payment service provider; consequently, the composition of the sample varies over time. The category *Other* refer to Mobile Money Operators and Post Offices.

Figure A3: Components of the total cost for a $200 remittance

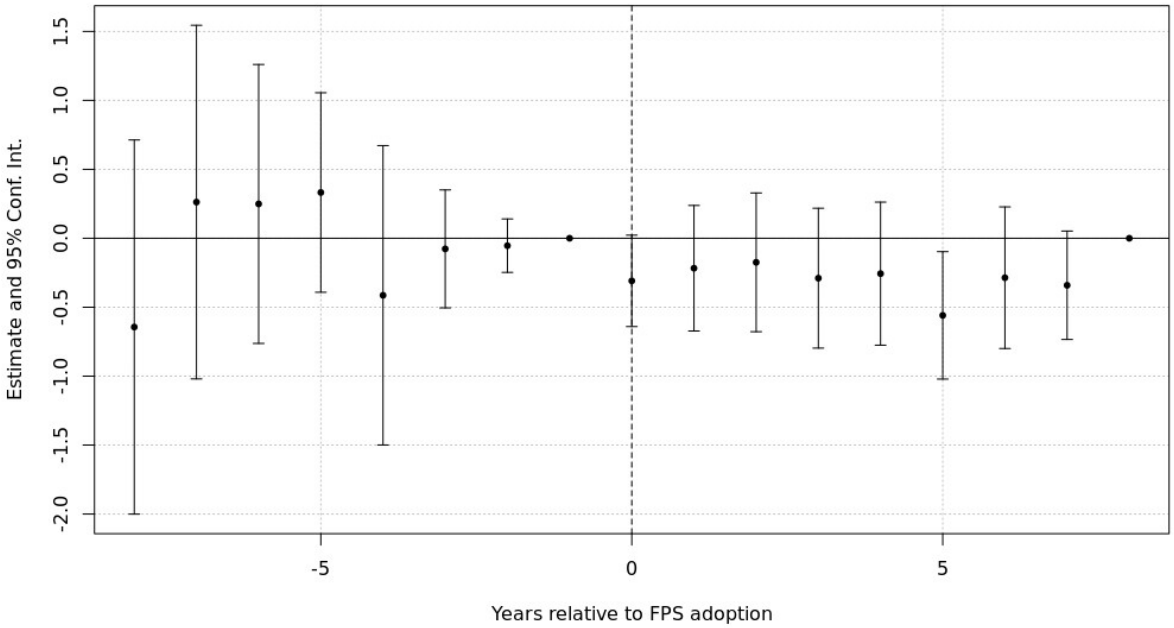
(a) Fixed fee

(b) Foreign exchange margin



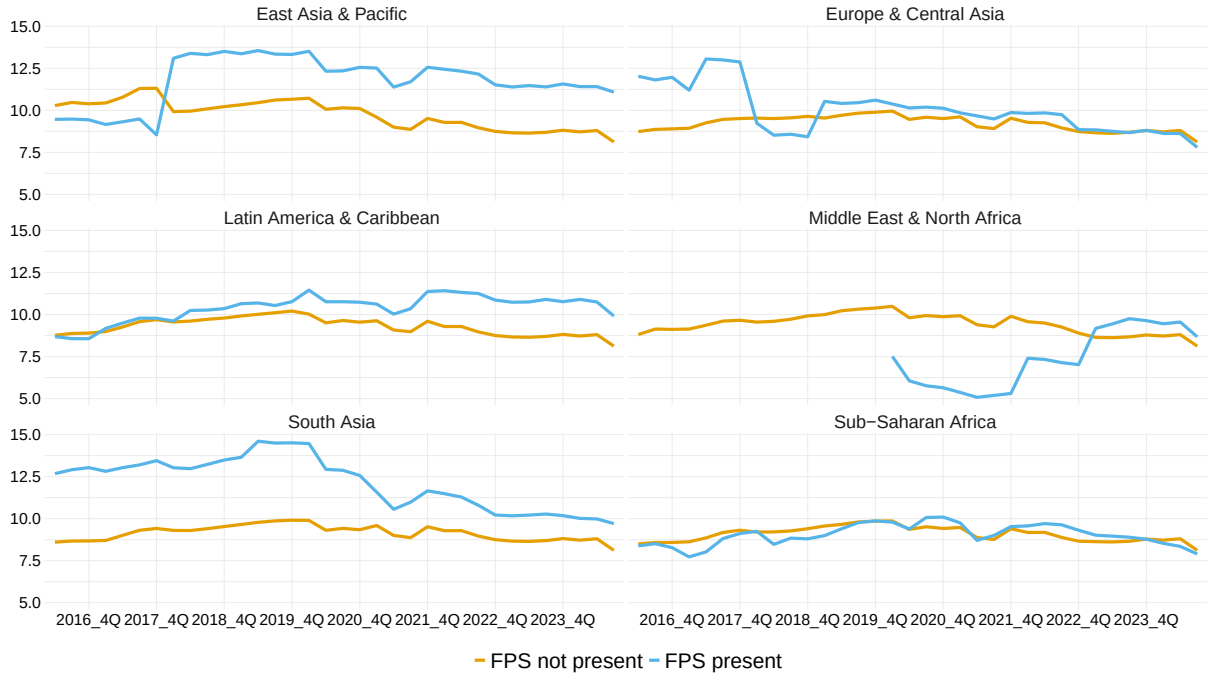
Note: Values in percent. Quarterly data. Averages are computed on the trimmed dataset. For each quarter, the lines plot the average cost (as a percentage of the amount sent) of remitting funds to jurisdictions with and without a FPS; consequently, the composition of the sample varies over time.

Figure A4: Event study to check pre-trend assumption



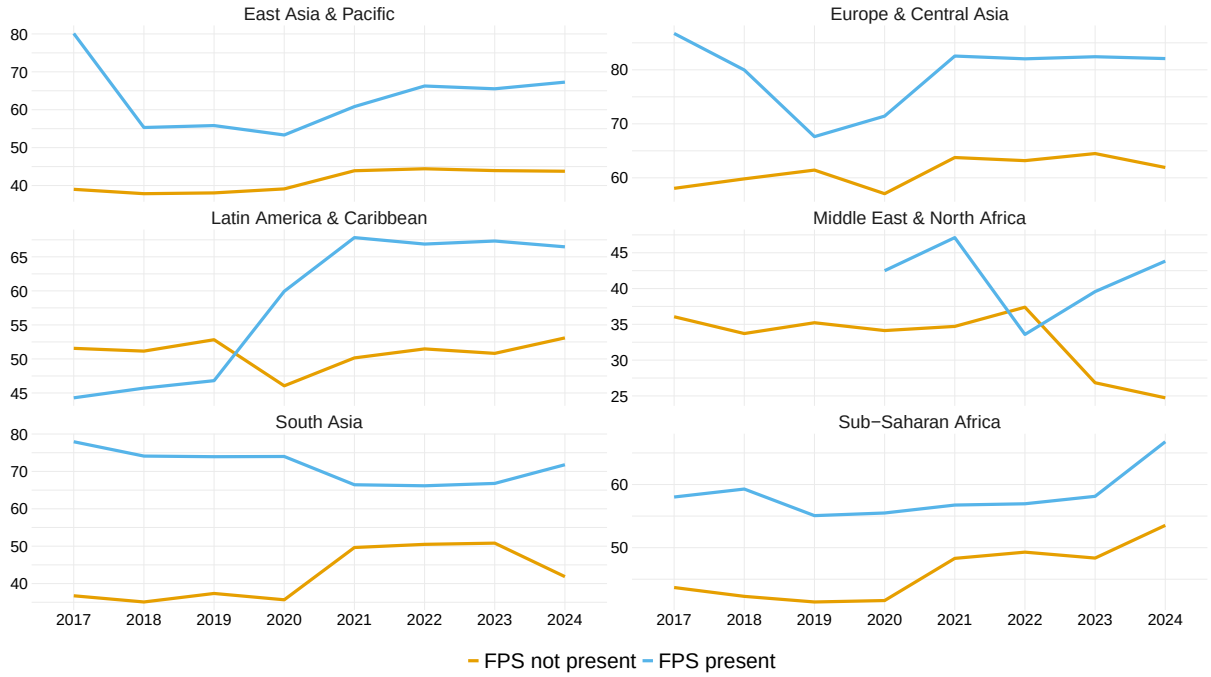
Note: Event-study estimates from a two-way fixed effects (TWFE) model on annual data with country and year fixed effects. The dependent variable is the average remittance cost (200 USD) at the country-year level. Coefficients are plotted relative to the year prior to FPS adoption (t = -1). Standard errors are clustered at the country level and 95% confidence intervals are shown.

Figure A5: Average number of payment service providers per corridor: breakdown by macro-regions



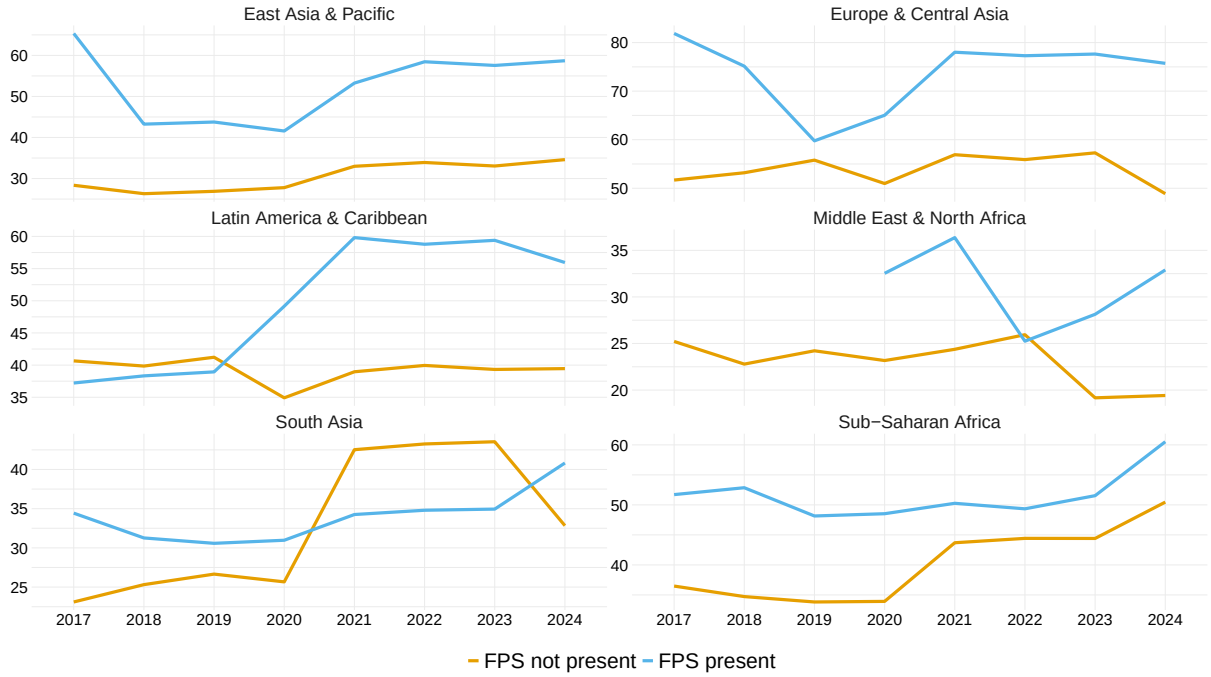
Note: Quarterly data. Averages are computed on the trimmed dataset.

Figure A6: Account ownership at a bank or similar financial institution



Note: Values are in percent. Yearly data. For each year, the figure reports the share of adults owning a bank account for jurisdictions where a FPS is present and for those where a FPS is not present in that year; consequently, the composition of the sample varies over time.

Figure A7: Share of people using digital payment instruments



Note: Values are in percent. Yearly data. For each year, the figure reports the share of adults who made or received a digital payment for jurisdictions where a FPS is present and for those where a FPS is not present in that year; consequently, the composition of the sample varies over time.

A.2 Results for larger transactions

Table A1: Effect of FPS implementation on the cost of $500 remittances

	Full sample	**Fixed Fee vs FX Margin**		**Payment Method Analysis**		
	Cost	FX Margin	Fixed Fee	Cash	Mobile Wallet	Bank Account
FPS dummy	-0.232***	-0.214***	-0.018	-0.314***	-0.226	-0.031
	(0.082)	(0.068)	(0.044)	(0.097)	(0.432)	(0.085)
Speed (log)	-0.079***	-0.013	-0.066***	-0.050***	-0.035	-0.045*
	(0.022)	(0.008)	(0.018)	(0.013)	(0.056)	(0.024)
Observations	162,202	162,202	162,202	93,491	6,251	59,265
Adj. R^2	0.539	0.445	0.630	0.501	0.549	0.697
Within R^2	0.0044	0.0033	0.0045	0.0042	0.0011	0.0038

Note: Standard errors clustered at the corridor × seasonal dummy and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variable is the percentage cost of sending a $500 remittance. All specifications include GDP and remittance inflows of receiving country as control variables, as well as corridor × Seasonal dummy, Sending country × Time, Firm × Time, and Pickup method × Time fixed effects.

Table A2: Effect of FPS implementation on the cost of $500 remittances across macro-regions

	East Asia & Pacific	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
FPS dummy	-0.646***	-0.128	0.067	-0.811***	-0.347**	-0.527***
	(0.212)	(0.145)	(0.275)	(0.191)	(0.172)	(0.193)
Speed (log)	-0.042	-0.093***	-0.066**	-0.043*	-0.036	-0.049**
	(0.030)	(0.032)	(0.028)	(0.025)	(0.026)	(0.020)
Observations	71,547	57,757	49,111	51,127	68,507	63,271
Adj. R^2	0.529	0.507	0.533	0.539	0.556	0.539
Within R^2	0.0057	0.0049	0.0044	0.0086	0.0031	0.0055

Note: Standard errors clustered at the corridor × seasonal dummy and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variable is the percentage cost of sending a $500 remittance. All specifications include log GDP and log remittance inflows as controls and a full set of fixed effects: *corridor × seasonal dummy, source-country × period, firm × period, and pickup method × period.*

Table A3: Effect of FPS implementation on the cost of $500 remittances via competition channel

	Global	**East Asia & Pacific**	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
First Stage (FirmNum)							
FPS dummy	0.185***	0.250	0.194	-0.317*	-0.224*	0.433**	0.682***
	(0.067)	(0.161)	(0.142)	(0.168)	(0.115)	(0.157)	(0.159)
Second Stage (Cost)							
FirmNum (fitted)	-1.257**	-2.579	-0.661	-0.211	3.612*	-0.803*	-0.774**
	(0.515)	(1.764)	(0.789)	(0.865)	(2.027)	(0.414)	(0.312)
Speed (log)	-0.085***	-0.074*	-0.098***	-0.067**	-0.024	-0.038	-0.052***
	(0.022)	(0.042)	(0.033)	(0.029)	(0.039)	(0.027)	(0.019)
Observations	162,202	71,547	57,757	49,111	51,127	68,507	63,271
RMSE	2.341	2.945	2.163	2.012	3.234	2.029	2.297
Adj. R^2	0.539	0.529	0.507	0.533	0.539	0.556	0.539
Within R^2	0.0044	0.0057	0.0049	0.0044	0.0086	0.0031	0.0055
F-test (1st stage)	328.5***	133.3***	106.3***	187.2***	122.1***	326.1***	981.9***
Wu-Hausman	88.4***	141.7***	4.21**	0.37	178.5***	29.8***	71.8***

Note: Standard errors clustered at the corridor × seasonal dummy and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The first stage regresses the number of firms on the FPS dummy, log speed, GDP and remittance inflows. The second stage estimates the effect of the fitted number of firms on the percentage cost of sending a $500 remittance. All specifications include the full set of fixed effects: *corridor* × *seasonal dummy, source-country* × *period, firm* × *period, and pickup method* × *period*.

A.3 Results using annual data

Table A4: Effect of FPS implementation on the cost of $200 remittances: regressions on annual data

	(1)	(2)	(3)	(4)	(5)
FPS dummy	-1.173***	-1.080***	-0.672***	-0.582***	-0.263**
	(0.254)	(0.233)	(0.165)	(0.142)	(0.118)
Speed (log)	0.246	0.158	-0.096***	-0.094***	-0.100***
	(0.160)	(0.102)	(0.034)	(0.032)	(0.038)
Fixed Effects					
Corridor		✓	✓	✓	✓
Firm			✓	✓	
Pickup method			✓	✓	
Source country × Year					✓
Firm × Year					✓
Pickup method × Year					✓
Control Variables					
GDP				✓	✓
Remittances In				✓	✓
Observations	47,722	47,722	47,696	43,592	42,517
Adj. R^2	0.024	0.297	0.562	0.573	0.628
Within R^2		0.012	0.006	0.006	0.004

Note: As per World Bank approach, annual data refer to Q3 observations. Standard errors clustered at the corridor and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The dependent variable is the percentage cost of sending a $200 remittance.

A.4 Results using Callaway and Sant'Anna estimator

Table A5: Two-Way Fixed Effects (TWFE) vs Callaway and Sant'Anna (CS): effect of FPS implementation on the annual cost of $200 remittances

	Global	**East Asia & Pacific**	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
TWFE	-0.672**	-1.547***	-0.436	0.373	-0.771**	-0.430	-1.632***
	(0.268)	(0.464)	(0.266)	(0.445)	(0.354)	(0.401)	(0.610)
CS	-0.512	-1.600**	0.307	-0.134	-0.558*	-0.136	-1.464**
	(0.335)	(0.642)	(0.485)	(0.539)	(0.336)	(0.402)	(0.605)

Note: Standard errors are clustered at the receiving-jurisdiction level. No time-varying covariates are included in the model. All regressions are based on yearly observations and include time and destination-country fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

A.5 Results on financial inclusion as transmission channel

Table A6: Effect of FPS implementation on remittance cost via financial inclusion (*share of adults having an account at a bank or similar financial institution*)

	(1)	(2)	(3)	(4)
First-stage regression. Dependent variable: account ownership				
FPS dummy	19.340***	8.999***	8.152***	3.802***
	(1.599)	(0.667)	(0.679)	(0.435)
Second-stage regression. Dependent variable: cost of remittances				
Account ownership	-0.049***	-0.110***	-0.075***	-0.147***
	(0.013)	(0.025)	(0.019)	(0.040)
Speed (log)	0.215	0.133	-0.086**	-0.077***
	(0.155)	(0.101)	(0.034)	(0.028)
Fixed Effects				
Corridor		✓	✓	✓
Firm			✓	✓
Pickup method			✓	✓
Control Variables				
GDP				✓
Remittances In				✓
Observations	41,016	41,016	40,982	37,894
Adj. R^2	0.016	0.282	0.559	0.563
F-test (1st stage)	10540.8***	7412.1***	5888.1***	1429.1***
Wu-Hausman	396.3***	100.3***	78.0***	60.0***

Note: Standard errors clustered at the corridor and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The first stage regresses the share of adults with an account on the FPS dummy and controls. The second stage estimates the effect of financial inclusion on the cost of sending remittances, instrumented by FPS.

Table A7: Effects of FPS implementation via financial inclusion
(*share of adults having an account at a bank or similar financial institution*)

	East Asia & Pacific	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
First-stage regression. Dependent variable: account ownership at bank or similar financial institution						
FPS dummy	2.776***	4.659***	7.623***	3.931***	0.577	4.010***
	(0.699)	(1.053)	(1.297)	(0.892)	(0.483)	(1.175)
Second-stage regression. Dependent variable: cost of remittances						
Account ownership	-0.391***	-0.253**	-0.018	-0.205***	-1.653	-0.141
	(0.117)	(0.099)	(0.051)	(0.068)	(1.462)	(0.108)
Speed (log)	-0.002	-0.109***	-0.078*	-0.055	-0.031	-0.064*
	(0.048)	(0.036)	(0.044)	(0.040)	(0.091)	(0.034)
Observations	15,978	12,698	10,650	11,093	15,347	13,978
Adj. R^2	0.594	0.491	0.562	0.567	0.603	0.584
Within R^2	0.0071	0.0115	0.0185	0.0192	0.0088	0.0168
F-test (1st stage)	182.5***	456.1***	732.1***	323.3***	5.19**	222.5***
Wu-Hausman	63.19***	52.85***	0.39	37.48***	37.56***	8.00***

Note: Standard errors clustered at the corridor and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. All specifications include controls for receiving-country GDP and remittance inflows, and fixed effects for corridor, source country × survey year, firm × survey year, and pickup method × survey year.

Table A8: Effect of FPS implementation on remittance cost via financial inclusion (*share of adults who made or received a digital payment*)

	(1)	(2)	(3)	(4)
First-stage regression. Dependent variable: digital payment usage				
FPS dummy	13.389***	9.124***	7.970***	2.595***
	(1.688)	(0.644)	(0.681)	(0.522)
Second-stage regression. Dependent variable: cost of remittances				
Digital payment usage	-0.070***	-0.109***	-0.076***	-0.216***
	(0.021)	(0.025)	(0.019)	(0.068)
Speed (log)	0.198	0.131	-0.086***	-0.071***
	(0.152)	(0.100)	(0.033)	(0.027)
Fixed Effects				
Corridor	✓	✓	✓	✓
Firm		✓	✓	
Pickup method		✓	✓	
Control Variables				
GDP			✓	✓
Remittances In			✓	✓
Observations	41,016	41,016	40,982	37,894
Adj. R^2	0.016	0.282	0.559	0.563
F-test (1st stage)	4605.2***	5852.7***	4397.4***	539.5***
Wu-Hausman	544.7***	101.7***	81.5***	66.6***

Note: Standard errors clustered at the corridor and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. The first stage regresses digital payment usage on the FPS dummy and controls. The second stage estimates the effect of digital payment usage on the cost of sending remittances, instrumented by FPS.

Table A9: Effects of FPS implementation via financial inclusion
(*share of adults who made or received a digital payment*)

	East Asia & Pacific	**Europe & Central Asia**	**Latin America & the Caribbean**	**Middle East & North Africa**	**South Asia**	**Sub-Saharan Africa**
First-stage regression. Dependent variable: digital payment usage						
FPS dummy	1.428*	3.959***	8.623***	3.809***	-0.772	3.629***
	(0.839)	(0.981)	(2.327)	(0.643)	(0.472)	(1.389)
Second-stage regression. Dependent variable: cost of remittances						
Digital payment usage	-0.761	-0.298**	-0.016	-0.211***	1.236	-0.155
	(0.465)	(0.128)	(0.045)	(0.062)	(0.834)	(0.130)
Speed (log)	0.057	-0.095**	-0.077*	-0.048	-0.019	-0.058*
	(0.109)	(0.038)	(0.044)	(0.040)	(0.114)	(0.035)
Observations	15,978	12,698	10,650	11,093	15,347	13,978
Adj. R^2	0.594	0.491	0.562	0.567	0.603	0.584
Within R^2	0.0071	0.0115	0.0185	0.0192	0.0088	0.0168
F-test (1st stage)	32.8***	308.0***	896.9***	325.9***	10.6***	155.5***
Wu-Hausman	69.46***	62.77***	2.07	44.83***	37.99***	10.40***

Note: Standard errors clustered at the corridor and firm level are reported in parentheses. Significance levels: * p< 0.10, ** p< 0.05, *** p< 0.01. All specifications include controls for receiving-country GDP and remittance inflows, and fixed effects for corridor, source country × survey year, firm × survey year, and pickup method × survey year.

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