Payment Infrastructure and Pricing of Cross-Border Transfers: Evidence from Banks and Money Transfer Operators*

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Abstract

We analyse the pricing of cross-border transfers by banks as well as money transfer operators (MTOs) when direct links connect national payment systems. Comparing remittance price quotes across the staggered activation of these links, we find that banks lower total fees at activation. However, this reduction does not extend to MTOs; their transfer fees rise at activation and their total fees are higher after one year, while bank fees remain lower. Both provider types initially lower FX margins. These results show that payment links lower banks' prices and suggest that providers with other settlement models do not share the benefit.

JEL codes: E42, F24, G15, G21, G23.

Keywords: remittances, cross-border payment links, fast payment systems, money transfer operators, non-bank competition, FX margins, cost pass-through.

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1 Introduction

How financial intermediaries respond to changes in the infrastructure through which they transact is a first-order question in banking and market microstructure. Recent work studies how bank regulation shifts lending from banks to non-bank intermediaries (Buchak et al., 2018; Erel & Inozemtsev, 2025), how cost changes pass through to end-user prices (Weyl & Fabinger, 2013; Wang et al., 2022) and how market structure mediates the transmission of policy interventions (Benetton & Fantino, 2021; Eisenschmidt et al., 2024). Payment networks also generate participation externalities and information about their users, and payment innovation can change banks' role in both payments and credit (Parlour & Rajan, 2025). Recent theory shows that public interoperability can alter competition and fees in payment markets (Frost et al., 2026). We examine how these infrastructure changes transmit to cross-border retail prices when providers use different settlement models. Infrastructure shocks can change settlement costs and competitive conditions simultaneously, making their net price effects an empirical question.

We study this question in the cross-border remittance market. The setting offers three advantages. First, two intermediary types with different settlement models serve the same corridors[1]: banks settle transfers through the correspondent banking chain, while money transfer operators (MTOs) use alternative arrangements that reduce their per-transaction dependence on interbank rails. Both are observed around the same corridor activation, but may be affected through different cost channels. Second, the market has recently been reshaped by a wave of cross-border payment links, whose staggered global rollout (which we hand-collect) provides variation in activation timing for our difference-in-differences design. Third, remittances to low- and middle-income countries totalled about $650 billion in 2023 (World Bank, 2024), and sending remittances remains expensive (6.5% average total cost in the first quarter of 2025, more than double the SDG target of 3%; United Nations, 2015; World Bank, 2025), so the welfare stakes are substantial. Whether this public infrastructure reduces remittance fees, and for which provider types, is the question we address.

The pricing response differs across provider types, whose settlement arrangements offer one possible explanation. Banks settle through the correspondent banking chain that cross-border links can shorten (Committee on Payments and Market Infrastructures [CPMI], 2022). MTOs use alternative arrangements that reduce their per-transaction reliance on interbank settlement, while retaining net settlement and treasury needs (Du et al., 2026). Our framework links these settlement arrangements to providers' marginal costs and quoted prices.

[1]A remittance corridor is a directed pair of sending and receiving countries. Transfers from the United Kingdom to India and transfers in the reverse direction therefore constitute separate corridors.

Banks may benefit from lower settlement costs, while changes in regulatory requirements or access arrangements may affect MTO operating costs. The pricing response depends on the resulting balance of cost savings and other cost changes.

Our analysis draws on several data sources. We hand-collect the global rollout of cross-border payment links from BIS reports, central bank announcements and platform documentation, identifying 65 platforms (multilateral and bilateral) that connect 121 countries with staggered adoption across corridors. We date treatment to each corridor's first recorded cross-border payment link activation, including where additional platforms subsequently connect the same country pair. We combine this with quarterly remittance pricing from the World Bank's Remittance Prices Worldwide database (367,901 product-level observations across 738 firms and 334 corridors, 2013–2025). We also collect data on providers' access to domestic payment systems, documenting the connections through which cross-border links can affect providers' costs and remittance prices.

The staggered rollout of cross-border links across corridors provides the basis for a difference-in-differences design. A key empirical challenge is that remittance pricing panels are highly unbalanced, as providers enter and exit the remittance price data over time. We accommodate the unbalanced observations using the Borusyak et al. (2024) imputation estimator, which fits the fixed-effects model on untreated observations only, uses it to predict each treated observation's outcome without treatment, and averages the differences between actual and predicted outcomes. The estimator yields horizon-specific average treatment effects for the observed provider-product quotes in an unbalanced panel. We estimate separate models for banks and MTOs, with corridor and source-by-quarter fixed effects for banks and corridor and destination-by-quarter fixed effects for MTOs. This asymmetric fixed-effect structure reflects both the different margins of competition each type faces (banks face common source-country regulatory and correspondent banking conditions, MTOs compete on destination-country agent networks) and the different corridor linkages in the data. The design also requires that the timing of adoption be unrelated to pre-existing fee trends, which we examine directly. Link adoption is more common in corridors with larger baseline shares of bank quotes, a common official language and a regional trade agreement. Pre-link fee changes do not significantly predict quarterly adoption.

The baseline results show contrasting pricing responses around link activation. Bank total-fee estimates are negative throughout the first year after activation, with an impact coefficient of -0.129 in asinh units. MTO total fees show no statistically detectable impact effect, with a positive estimate by quarter four (asinh coefficient 0.106). We report pre-trend diagnostics separately from the post-treatment estimates. We subject the pooled specification to the Rambachan and Roth (2023) sensitivity analysis; its impact estimate remains negative under

the reported bounds on violations of parallel trends. To examine which pricing components are affected, we decompose total fees into FX margins and explicit transfer fees. Banks cut FX margins sharply (an asinh coefficient of -0.160 at impact). Bank transfer-fee point estimates are negative throughout the post-treatment window (-0.061 and -0.051 in quarters three and four, with only the former significant at 5%). For MTOs, FX margins fall at impact (-0.118), with later estimates no longer statistically distinguishable from zero, while transfer fees rise immediately (0.099) and persist.

We then examine whether the MTO response varies with bank presence in the corridor. The slopes relating the MTO fee response to banks' pre-treatment share of price quotes are negative, but their confidence intervals include zero at the 5% level for all three fee outcomes. The total-fee slope is -0.263 with a standard error of 0.189. Neither the pre-treatment price gap nor product overlap is precisely associated with the MTO response. These estimates are consistent with competitive discipline from bank presence.

Taken together, our results show contrasting quoted-price estimates across provider types: lower bank fees at impact and higher MTO total fees by the fourth quarter. The question of who benefits connects to the broader literature on how the expansion of bank branch networks can have uneven distributional effects (Fonseca & Matray, 2024), and to the cost pass-through literature showing that competitive conditions mediate the transmission of cost shocks to prices (Weyl & Fabinger, 2013; Benetton & Fantino, 2021).

These findings yield three contributions. First, we study how cross-border payment links affect remittance pricing. Research on remittance costs documents the roles of market structure, regulation and informality (Beck & Martínez Pería, 2011; Freund & Spatafora, 2008; Beck et al., 2022). Du et al. (2026) compare costs across bank, fintech and stablecoin payment arrangements. We focus on links between national systems and compare banks and MTOs around their activation. Related work examines settlement liquidity and lending (Parlour et al., 2022a), how a central bank digital currency affects bank funding (Niepelt, 2024), competition among digital currencies (Cong & Mayer, 2025), and the effects of internet infrastructure on banking (D'Andrea & Limodio, 2024). The contrasting price movements for banks and MTOs around link activation add a pricing dimension to this literature and show why the average price effect can conceal differences across provider types.

Second, we contribute to the literature on competition between banks and non-bank financial intermediaries. A substantial body of work compares banks and non-bank intermediaries in lending markets, including the role of regulation: Buchak et al. (2018) estimate in a quantitative model that regulation accounts for roughly 60% of shadow bank growth in US mortgage lending; Erel and Inozemtsev (2025) review the growing role of less-regulated intermediaries; Di Maggio and Yao (2021) find that fintech borrowers default more often than

comparable bank borrowers; and Bao and Huang (2021) and Allen et al. (2023) study how banks and non-banks respond differently to exogenous shocks. Payment-specific theory also studies how fintech entry changes bank payment fees and lending through the information contained in payment flows (Parlour et al., 2022b). We add evidence on infrastructure-induced pricing differences between banks and MTOs in cross-border remittances: their quoted fees move in opposite directions after link activation. Asymmetric cost transmission offers one interpretation: cheaper settlement may lower bank costs while accompanying compliance requirements raise MTO operating costs. The fee decomposition is consistent with this interpretation.

Third, we show why assessments of payment infrastructure should distinguish price responses across provider types. The cost pass-through literature in banking shows that the transmission of policy interventions to end-user prices depends on market power (Wang et al., 2022), competition (Benetton & Fantino, 2021) and market segmentation (Eisenschmidt et al., 2024). Regulatory-cost incidence also varies with customers' demand elasticity (Capelle-Blancard & Havrylchyk, 2017). Our results extend this insight to payment infrastructure: negative bank price estimates at impact coexist with higher quoted MTO total fees by four quarters after activation. Policymakers evaluating cross-border links on the basis of average remittance costs may therefore miss differences across providers. The results support evaluating total remittance charges separately for banks and MTOs, including both explicit transfer fees and FX margins.

Section 2 describes the institutional landscape of the remittance market and cross-border payment links and reviews the related literature. Section 3 develops a conceptual framework for conditional cost and pricing scenarios. Section 4 describes the data and the construction of the estimation sample. Section 5 develops the empirical strategy. Section 6 presents the main event-study estimates. Section 7 examines the fee decomposition and heterogeneity by bank quote share. Section 8 reports longer-run dynamics, and Section 9 concludes.

2 Background

2.1 The remittance market

Remittances provide recipient households with income and insurance against economic shocks (Yang & Choi, 2007). They consist of frequent, relatively small transfers, making transaction fees consequential for migrants and their families (Yang, 2011). The aggregate flows and international cost targets described in Section 1 motivate attention to how these fees are set.

Remittance costs vary widely across corridors, from below 3 per cent to above 15 per

cent. Cross-country variation in fees is associated with the degree of competition, the size of the migrant population in a corridor, and the share of banks among providers (Beck & Martínez Pería, 2011; Beck et al., 2022). Fees also affect the amount remitted: cross-country and bilateral studies associate lower transfer costs with larger formal remittance flows (Ahmed et al., 2021; Kpodar & Imam, 2024).

The total cost of a remittance transfer comprises an explicit transfer fee charged by the provider, as well as a foreign-exchange (FX) margin. The transfer fee covers processing, compliance screening, and charges from intermediary institutions along the payment chain. The FX margin is defined as the gap between the interbank exchange rate and the rate offered to the customer. Measuring the FX margin requires comparing the customer exchange rate with a reference rate, rather than observing the advertised transfer fee alone (Du et al., 2026). Models of retail financial pricing show that price visibility and endogenous repricing can redistribute costs across consumers (Kosfeld & Schüwer, 2017), motivating attention to the two fee components. Figure 1 shows the quarterly evolution of these fee components in our sample, separately for banks and MTOs. Bank total fees average roughly 8–10 percentage points over the period, driven primarily by high transfer fees; MTO total fees are substantially lower (4–6 pp) and decline steadily. FX margins are similar in magnitude across provider types (1.5–2.5 pp) but more volatile.

Two provider types dominate the market. *Banks* treat remittances as one product among many, typically offered through existing retail banking infrastructure. Beck et al. (2022) document that banks have historically charged substantially higher fees than non-bank providers. Differences in settlement arrangements (Section 2.2) and business models can affect pricing incentives. In a model of competition between banks and a digital payment provider, Verdier (2024) shows how banks trade off payment-fee revenue against the liquidity costs associated with payments. *Money transfer operators* (MTOs) are specialised non-bank remittance providers. The largest, Western Union and MoneyGram, operate in the vast majority of priced corridors worldwide, leveraging scale economies across extensive agent networks (Beck & Martínez Pería, 2011). Between 2011 and 2020, the average share of banks among providers in a corridor declined from roughly 27 to 17 per cent, while the MTO share rose from around 69 to 80 percent (Beck et al., 2022). More recently, digital-only entrants such as Wise, Remitly, and WorldRemit have begun to challenge incumbent MTOs. Du et al. (2026) document lower costs for fintech MTOs than traditional retail bank wires and evaluate stablecoin transfers as a separate payment arrangement. Banks and MTOs also differ in their geographic footprint. Banks tend to be concentrated in a limited set of source countries, typically major financial centres, and serve many destination countries from there. MTOs, by contrast, maintain dense presence across destination countries through local agent networks.

Remittance pricing reflects both provider costs and competition. Corridors with fewer providers tend to have higher fees (Beck & Martínez Pería, 2011; Beck et al., 2022). Compliance can also affect pricing: Stebunovs (2025) finds evidence of pricing of source- and destination-country anti-money-laundering (AML) risk among MTOs, while the corresponding bank estimates are not statistically significant.

2.2 Cross-border payment infrastructure

Remittance infrastructure comprises both settlement arrangements and the local institutions connecting users to them (Rodima-Taylor & Grimes, 2019). In correspondent banking, banks use relationships with other banks to move funds across jurisdictions. Most cross-border payment value between financial institutions is routed through intermediaries in third economies (Cerutti et al., 2025). These intermediaries provide messaging, funding, screening and currency conversion, each of which can add costs. The currency conversion itself is performed by one or more of the correspondent banks along the chain (Bech et al., 2020). Each conversion carries a cost.[2]

The building blocks of faster cross-border settlement are *domestic fast payment systems* (FPS), infrastructure that enables real-time or near-real-time domestic settlement, typically with central bank involvement in governance or operation. Fast payment systems now operate in more than 100 jurisdictions (Lammer et al., 2026). Examples include UPI (India, 2016), RT1 (euro area, 2017) and Pix (Brazil, 2020). These domestic systems can be connected through cross-border links, alongside other clearing and settlement systems. Research on mobile-payment interoperability shows that connecting networks can change entry incentives and competition as well as technical reach (Bianchi et al., 2023).

Cross-border links connect payment systems across jurisdictions. An FPS interlink can route a payment from the sender's domestic system to the recipient's system, shortening the correspondent chain. Depending on its design, the link may reduce intermediary fees, funding needs and processing delays (CPMI, 2022). Direct local-currency settlement can also avoid an intermediate conversion where the link supports the relevant currency pair. The availability of these potential savings depends on payment eligibility, currency coverage and provider access.

Cross-border payment links take different forms. Bilateral links, such as PayNow–UPI (Singapore–India, 2023) and PromptPay–DuitNow (Thailand–Malaysia), connect two national systems directly. Multilateral platforms connect many countries through shared infrastructure; examples include PAPSS (Pan-African Payment and Settlement System), TIPS (the Eurosystem's TARGET Instant Payment Settlement), and Buna (the Arab Monetary Fund's

[2]Appendix A provides further descriptions of the settlement architectures.

cross-border platform). These links also differ in the extent to which they span different tiers of the settlement stack, ranging from retail instant payment systems to wholesale real-time gross settlement systems. These arrangements aim to improve cross-border payment connectivity, but differ in eligible payment types, currencies, settlement arrangements, and participation rights. Appendix B lists the platforms that overlap treated corridors.

2.3 Provider type and payment system access

Banks typically settle cross-border transfers through interbank arrangements, participating directly or through another institution. Many MTOs instead maintain prefunded local accounts in the sending and receiving countries, usually through partner banks, pay recipients from the local balance, and offset customer flows in opposite directions internally. Only the residual imbalances are settled through wholesale FX markets or cross-border bank transfers (Du et al., 2026). This reduces reliance on a separate cross-border interbank transfer for each customer payment, but leaves MTOs exposed to funding, rebalancing and foreign-exchange costs.

Payment-system design involves trade-offs between open and restricted participation and between public and private settlement arrangements (Kahn & Roberds, 2009). In international systems, access rules also depend on counterparty risk and the incentives of national supervisors and participating banks (Holthausen & Rønde, 2002). Access to domestic fast payment systems depends on the system and the provider: some admit non-bank providers directly, while others restrict direct participation to banks, so that non-banks connect indirectly. Eligibility also depends on technical and operational requirements (CPMI, 2021). Bank-mediated access leaves MTOs exposed to the withdrawal of banking services, a concern documented in the correspondent banking literature (Financial Stability Board, 2017).

These arrangements imply different exposure to settlement improvements. Banks using correspondent chains may save on intermediation and settlement, while MTOs may benefit through treasury operations or access to linked domestic systems. The relative gains depend on routing and participation rights. Regulatory changes accompanying a link could also affect operating costs. Section 3 develops the implications for remittance costs.

3 Conceptual Framework

We use a simple framework to organise how cross-border payment links may affect quoted remittance prices. Different settlement arrangements create different exposures to infrastructure improvements; other variable-cost changes can reinforce or offset the resulting

savings.

Costs and exposure. Consider a bank ($j = B$) or money transfer operator (MTO, $j = M$) serving a given corridor. We fix the send amount $A > 0$ and hold service attributes constant when comparing direct cost effects. The total quoted price p_j and marginal cost c_j are measured in percentage points of A, so $Ac_j/100$ is the monetary cost of an additional transfer. We write

$$c_j = \sigma_j + \kappa_j. \tag{1}$$

The term σ_j includes marginal funding, currency-conversion and settlement expenses; κ_j includes other marginal expenses, such as transaction screening and customer distribution. These categories reflect economic function, whether costs are incurred internally or paid to third parties. Fixed monetary expenditure F_j, such as licensing, integration and compliance capacity, is excluded from c_j. Changes in F_j can affect participation without mechanically changing per-transfer marginal cost.

Let Δ denote a change associated with link availability relative to otherwise comparable provision without it. We consider effective settlement savings and accompanying operating-cost changes:

$$\Delta c_j = -a_j\delta_j + g_j, \qquad a_j \in [0,1], \quad \delta_j \geq 0. \tag{2}$$

Here a_j captures effective exposure through eligibility and routing or use, δ_j is the settlement saving under full exposure, and g_j is the change in other marginal operating costs. Both δ_j and g_j are measured in percentage points of A; g_j can be positive, zero or negative. The framework is static: δ_j and g_j are one-off changes in the level of marginal cost. Cost changes alone therefore imply price responses that appear at activation and persist.

Netting economises on the funds needed for settlement (Kahn & Roberds, 1998), and MTOs net customer flows internally (Du et al., 2026). Banks using correspondent chains may benefit from avoiding intermediary charges and funding delays, while traditional MTOs' netting can limit their per-transfer exposure to this channel. MTOs may nevertheless benefit through treasury operations or access to linked systems (Section 2.3). Settlement savings vary with providers' eligibility and routing. Changes in per-transfer screening obligations, where they accompany link adoption, enter the operating-cost term g_M.

Conditional pricing responses. For continuing providers, we assume positive local own-cost pass-through, holding rivals' prices, demand and service quality fixed (Weyl & Fabinger, 2013). A local approximation allowing changes in these other pricing conditions is

$$\Delta p_j \simeq \rho_j \Delta c_j + v_j, \qquad \rho_j > 0. \tag{3}$$

Here ρ_j is the conditional own-cost pass-through rate, including any markup adjustment induced by the cost change. The conceptual term v_j captures additional price effects of rivals' responses, changing demand or quality, and other markup shifts. The sign of v_j is not determined a priori. Markups can rise if the demand for providers' services becomes less elastic, and can fall if providers follow rivals' price reductions. In the benchmark holding these other conditions fixed ($v_j = 0$), bank prices fall if $a_B\delta_B > g_B$, including positive savings with $g_B = 0$; MTO prices rise if $g_M > a_M\delta_M$. Equation (3) separates direct cost pass-through from the additional pricing responses captured by v_j.

Empirical interpretation. We write $p_j = f_j + x_j$, where f_j is the explicit transfer fee and x_j the FX margin, both in the same percentage-point units. Each component can recover both costs and markups. Section 7 estimates the responses of total fees and their components and examines heterogeneity by pre-treatment bank presence. The estimates average over the provider–product quotes observed after activation (Section 5). They therefore combine the repricing of continuing providers in Equation (3) with changes in the set of providers and products quoted. Destination-by-quarter fixed effects absorb cost and pricing changes common to MTOs serving the same destination in a given quarter. Source-by-quarter fixed effects do the same for banks serving the same source country. The estimates therefore reflect the corridor-specific parts of $a_j\delta_j$, g_j and v_j.

4 Data

Our analysis combines three main data sources: a hand-collected dataset on the global rollout of cross-border payment links, quarterly remittance pricing from the World Bank, and hand-collected information on providers' access to domestic payment systems.

4.1 Cross-border payment link adoption

We construct a dataset of cross-border payment link activations from primary sources: BIS committee reports and working papers (CPMI, 2020; CPMI, 2022; Di Iorio et al., 2025), central bank press releases and technical documentation, platform operator websites, and industry coverage. For each platform, we record the participating countries, the go-live date (year and quarter), the link type (bilateral or multilateral), and, where applicable, the closure date. The dataset covers 65 distinct platforms connecting 121 countries (Appendix B lists those overlapping treated RPW corridors). The registry includes systems dating to 1974; our pricing sample begins in 2013. Recorded launches accelerate after 2020, following the G20/FSB roadmap for enhancing cross-border payments (Financial Stability Board, 2020).

The platforms vary considerably in scope. Multilateral systems generate the bulk of corridor coverage: TIPS (the Eurosystem's instant payment settlement) covers 506 directed country pairs among euro area and connected countries; PAPSS (Pan-African Payment and Settlement System) covers 306 directed pairs across the African Union; and SADC-RTGS covers 182 directed pairs in southern Africa. Bilateral links are more targeted: PayNow–UPI (Singapore–India), PromptPay–DuitNow (Thailand–Malaysia), and similar arrangements each connect two countries directly. The platforms also span different tiers of the settlement stack, from retail instant payment links (TIPS, PromptPay, UPI) to wholesale real-time gross settlement systems (Zengin, T2). We include both tiers because remittance transfers, although a retail product, settle through the interbank infrastructure that these systems connect. Wholesale links can reduce the cost of interbank settlement used by remittance providers.

The registry contains 2,032 platform–corridor records covering 1,606 distinct directed country pairs. Of the 65 platforms, 20 overlap at least one treated RPW corridor, accounting for 22 platform–year entries in Appendix B. This list includes later overlapping links; 16 platforms determine the earliest recorded activations used in estimation. For the causal analysis, we define treatment at the corridor level. A corridor is treated from its earliest recorded cross-border link activation quarter. Where multiple platforms serve the same corridor, we use the earliest activation date. In the analysis sample, this yields 31 switcher corridors (treated during the sample period) with 12 distinct treatment cohorts and 303 never-treated corridors that serve as the control group. The staggered rollout across cohorts provides the identifying variation for our event-study design.

4.2 Remittance costs

Remittance pricing data come from the World Bank's Remittance Prices Worldwide (RPW) database. The RPW employs a mystery-shopping methodology: each quarter, trained surveyors contact remittance service providers and record the total cost of sending a standardised amount along surveyed corridors (World Bank, 2025). For each provider–corridor–quarter observation, the database records the total fee as a percentage of the send amount, the FX margin (the gap between the interbank exchange rate and the rate offered to the customer), and the transfer fee (the explicit charge levied by the provider). Appendix C defines all variables. These components sum to the total cost: total fee = FX margin + transfer fee. The survey prices two transfer amounts ($200 and $500), capturing potential non-linearities in the fee schedule.[3]

The RPW also records product characteristics for each observation: the payment instru-

[3]We stack both tiers into a single panel and include a $500 tier indicator among the controls.

ment (cash, account transfer, card, mobile, or online), the access point through which the transfer is initiated (agent, branch, online, mobile app, or call centre), the pickup method at the destination, and the speed of delivery. Our estimating equations control for payment instrument, access point and the transfer-size tier; pickup method and delivery speed are not included among the controls.

We use RPW data from Q1 2013 to Q1 2025 (49 quarters), dropping the 2011–2012 waves during which the survey was conducted biannually.[4] We retain total fees between 0 and 50 pp and remove exact duplicate quotes. We exclude always-treated corridors, linked corridors with fewer than four observed pre-treatment quarters, cohorts without post-treatment observations, and Singapore–Thailand (no survey at $t = -1$). We also exclude Sudan destinations because of the war, Austria–Croatia and Germany–Croatia because of Croatia's euro adoption, and Ghana–Nigeria following a large fee jump coinciding with Nigerian FX policy changes; the last exclusion is informed by the observed outcome. Within each provider type, corridors with fewer than 20 quotes are removed, as are quotes without an FX margin.

The resulting analysis sample comprises 367,901 product price quotes at the provider–corridor–quarter–tier level, covering 738 distinct firms, including 229 banks and 527 MTOs (18 firm names are classified as both across observations) across 334 corridors linking 40 source countries to 98 destination countries. Banks contribute approximately 1,300 observations per quarter; MTOs approximately 6,200.

For the adoption diagnostics in Section 5.5, we supplement RPW with bilateral remittance flows from the World Bank's 2013 matrix, geographic and historical ties and trade agreements from CEPII Gravity (V202211), 2013 GDP per capita from World Development Indicators, World Bank region classifications, and country-level domestic FPS launch dates. Appendix D describes the common variable construction and the measurement dates used in each analysis.

4.3 Provider access to domestic payment systems

We hand-collect data on how remittance providers access domestic payment systems, either directly or through another institution. For each provider–country pair, we record the payment channel, the institution providing access, and its relationship to the provider. The data distinguish FPS or RTGS access from card, wallet, correspondent-account and cash payout arrangements. The September 2026 snapshot contains 1,866 provider–country records across 136 countries. We match these documented capabilities to RPW by provider name and corridor, retaining separate source and destination classifications. RPW supplies the characteristics of each priced product. Appendix A.5 describes the sources, coding and coverage, and compares banks' and MTOs' access.

[4]The RPW is a repeated survey; provider and product coverage can change within corridors over time.

4.4 Summary and descriptive statistics

Table 1 reports summary statistics for the pooled sample, banks, and MTOs separately. Table 2 summarises the remittance products offered by banks and MTOs. Banks charge higher total fees on average (8.8 pp vs. 5.1 pp for MTOs), driven by substantially higher transfer fees (6.8 pp vs. 3.0 pp). FX margins are similar across provider types (2.0 pp for banks, 2.2 pp for MTOs). The product mix differs: bank transfers are predominantly account-based, while cash funding and agent access are more prevalent among MTO quotes than bank quotes, consistent with the different distribution models described in Section 2.3.

The two provider types differ in their observed geographic footprint. In 2013, before the first treatment cohort in the retained sample, 47.1% of MTO quotes belong to provider–destination–quarter cells observed from more than one source country, compared with 21.3% of bank quotes. Cross-destination coverage within an origin is common for both types: 77.7% of bank quotes and 88.1% of MTO quotes belong to provider–source–quarter cells serving more than one destination. These statistics use the same definitions and quote weights for both provider types. They document greater scope for same-provider, cross-origin comparisons in the MTO sample, alongside substantial cross-destination coverage in both samples.

These differences in product mix and geographic footprint across provider types have implications for the fixed-effect design. Fixed effects define the comparison group for each treated quote and absorb time-varying shocks along the chosen dimension; if that dimension does not match where the shocks to a provider type arise, shocks that coincide with link activation remain in the residual and are attributed to the link. Specifically, we use source×quarter fixed effects for banks to absorb source-country shocks common across destination corridors, including the common component of changes in regulation and correspondent banking conditions. For MTOs, we use destination×quarter fixed effects to absorb destination-country shocks common across origins, including changes in payout infrastructure, competition and domestic FPS adoption. These choices reflect the hypothesised geographic incidence of pricing conditions. Both specifications retain corridor fixed effects and product controls, and their comparison groups pool providers within the respective country–quarter cells.[5]

5 Empirical Strategy

This section describes the empirical strategy used to estimate the causal effect of cross-border payment links on remittance fees. We follow the forward-engineering approach

[5]As illustrations of observed geographic coverage, Commonwealth Bank appears in 14 destinations from Australia, while Western Union appears in India from 19 source countries. These counts describe the full sample.

advocated by Baker et al. (2026): we define the treatment, state the estimand, describe the estimating equation, and discuss the identifying assumptions.

5.1 Treatment definition

Our treatment variable is an indicator equal to one from the earliest recorded activation quarter of a cross-border payment link connecting the corridor. The 65 platforms in our dataset are architecturally diverse: they include bilateral retail FPS links (e.g. PayNow–UPI), multilateral wholesale RTGS systems (e.g. T2, SADC-RTGS), regional clearing and settlement platforms (e.g. PAPSS, Buna), and hybrid arrangements that span multiple tiers of the settlement stack (Appendix B). We group these heterogeneous platforms into a single treatment for two reasons.

First, the platforms provide cross-border payment connectivity, although their services and eligible users differ. Links providing direct interbank settlement can reduce dependence on the correspondent banking chain (Section 2.2). A potential cost channel operates through the settlement arrangements used for remittances. Both wholesale RTGS and retail FPS links may affect these costs where providers can use the relevant services. Interlinking also requires arrangements for governance, risk management and compliance across participating jurisdictions (CPMI, 2022; Di Iorio et al., 2025).

Second, pooling platform types uses the staggered rollout across all 31 switcher corridors and 12 treatment cohorts. The resulting estimates average responses to recorded link activations, with weights determined by the supported quotes at each event-time horizon.

5.2 Estimand

We treat our data as a repeated cross-section rather than a balanced panel. The set of firms observed in a given corridor–quarter cell changes over time, potentially reflecting both survey coverage and changes in providers or products. Following the discussion in Baker et al. (2026), this compositional variation affects the population represented by an average treatment effect on the treated. Our estimand at each event-time horizon $e \in \{0, 1, 2, 3, 4\}$ is the ATT among the provider–corridor observations actually present at that horizon:

$$\begin{aligned} &ATT(\text{horizon} = e \mid \text{treated at } g,\ \text{observed}_{ic,\,g+e}) \\ &= \mathbb{E}\Big[Y_{ic,g+e}(g) - Y_{ic,g+e}(\infty) \;\Big|\; \text{treated at } g,\ \text{observed}_{ic,\,g+e}\Big], \end{aligned} \tag{4}$$

where i indexes a provider–product, c the corridor, g the cohort quarter in which corridor c's first cross-border payment link activates, and $Y_{ict} \equiv \text{asinh}(\text{fee measure}_{ict})$ with fee measure $\in$ {total fee, FX margin, transfer fee}. The potential outcomes $Y_{ic,g+e}(g)$ and $Y_{ic,g+e}(\infty)$ are

the transformed fee that would obtain under treatment at g and under no treatment, and observed$_{ic,\,g+e}$ indicates that provider–product i in corridor c appears in the sample e quarters after activation. Each horizon-specific ATT averages over the observed treated quotes with identified counterfactuals at that horizon. The contributing providers and cohort weights can therefore vary with event time.

5.3 Estimating equation

We estimate the horizon-specific ATTs using the imputation estimator of Borusyak et al. (2024). The procedure has two stages. In the first stage, the following outcome model is estimated by OLS using only not-yet-treated and never-treated observations:

$$\text{asinh}(\text{fee measure}_{ict}) \;=\; \alpha_c + \gamma_{jt} + \mathbf{X}'_{ict}\boldsymbol{\beta} + \varepsilon_{ict}, \tag{5}$$

where c indexes the corridor, t the quarter, i the provider–product (a quote characterised by firm, instrument, access point and transfer amount), and j the country—defined as the source country for banks and the destination country for MTOs, motivated by the observed geographic coverage and hypothesised incidence of pricing conditions discussed in Section 4. The term α_c is a corridor fixed effect, γ_{jt} is a country×quarter fixed effect, and $\mathbf{X}_{ict}$ is a vector of product-level controls comprising indicators for the payment instrument (cash, card, mobile, mobile/online, other), the access point (agent, branch, mobile, call centre, other, unknown), and whether the transfer amount is \$500. We use the inverse hyperbolic sine transformation of fees as our dependent variable to accommodate the right-skewed distribution and zero-valued observations while allowing a log-like interpretation for sufficiently large positive fee values. Coefficients are reported in asinh units; they are not exact percentage changes, particularly for small or zero fee components.[6]

In the second stage, the estimated model is used to impute the counterfactual outcome $\widehat{\text{asinh}(\text{fee measure})}_{ict}(\infty)$ for treated observations whose corridor and country–quarter effects are connected through the untreated data. Observations without an identified counterfactual are excluded from the treatment-effect target. The horizon-specific treatment effect is then the average difference between observed and imputed outcomes among treated units at event

[6]The specification uses corridor fixed effects and product-level controls rather than provider fixed effects. This identifies treatment from the full cross-section of providers in each corridor, combining within-firm repricing with changes in the observed provider/product mix.

time e:

$$\begin{aligned}\hat{\tau}_e &= \widehat{ATT}(\text{horizon} = e) \\ &= \frac{1}{N_e} \sum_{(i,c) \in \mathcal{T}_e} \Big[\text{asinh}(\text{fee measure}_{ict}) - \text{asinh}(\widehat{\text{fee measure}})_{ict}(\infty) \Big], \end{aligned} \tag{6}$$

where $\mathcal{T}_e$ is the set of observed treated quotes at horizon e with identified counterfactuals and $N_e = |\mathcal{T}_e|$. Each quote receives equal weight, so cohorts contribute in proportion to their supported quote counts at that horizon. Interpreting this average causally also requires that changes in the observed provider/product mix do not generate differential untreated price trends beyond those captured by the outcome model. Standard errors are clustered at the source-country level in both the bank and MTO specifications. Treatment timing is determined by central bank adoption decisions, which can be coordinated across corridors sharing a source country: multilateral launches can affect several corridors sharing an origin. Source-country clustering allows arbitrary dependence among observations sharing an origin.

As a starting point, we also estimate a pooled specification that combines banks and MTOs in a single sample with corridor and quarter fixed effects (without country×quarter interactions), a bank indicator among the controls, and standard errors clustered at the source-country level. The split-sample specifications described above then allow the treatment effect to differ across provider types.

5.4 Identifying assumptions

Three assumptions underpin the causal interpretation of $\hat{\tau}_e$. First, *parallel trends*: absent a cross-border link, remittance fees in treated corridors would have evolved on the same trajectory as fees in not-yet-treated and never-treated corridors, conditional on the fixed effects in equation (5). An auxiliary regression on untreated observations tests whether pre-treatment event-time coefficients differ from zero relative to quarter -1. We report these pre-trend coefficients for all specifications and subject the pooled estimates to the Rambachan and Roth (2023) sensitivity analysis, which asks how robust the post-treatment conclusions are to bounded violations of parallel trends.

Second, *no anticipation*: providers do not adjust fees in advance of a cross-border link going live. We assess possible anticipation using the pre-treatment event-time coefficients and examine whether prior prices and fee changes predict adoption in Section 5.5.

Third, *no interference*: a corridor's treatment status does not affect outcomes in other corridors. In practice, providers that operate across multiple corridors may adjust pricing in untreated corridors after encountering a cross-border link elsewhere. We examine this

possibility in Section 6 through a firm-level spillover test.

5.5 Selection into cross-border payment links

Central-bank adoption decisions may respond to corridor characteristics, including remittance costs. Ferrari Minesso et al. (2025) show that economic, technical and geopolitical ties help explain FPS interlinking, motivating explicit attention to adoption selection. We therefore distinguish which corridors receive a link from when they receive it. The former informs the population to which our estimates apply; the latter probes whether adoption follows recent price movements. All three diagnostics use the same $200 bank and MTO quotes and common definitions of fees, bank quote shares and provider counts. Baseline characteristics use each corridor's first four RPW calendar quarters, which precede adoption; hazard regressors use prices observed before each quarter at risk. Appendix D gives the construction and results.

Linked corridors have higher baseline fees than never-linked corridors (10.7 versus 8.3 percentage points), but also a larger bank quote share (0.42 versus 0.19). Once market structure and corridor ties are included, the baseline-fee coefficient is close to zero (-0.111, SE 0.614; Table 8, column 4). Bank quote share, a common official language and a regional trade agreement are positively associated with adoption. Thus the treated sample is selected towards bank-heavy corridors with established bilateral ties. These comparisons use fee levels and bank quote shares measured in each corridor's first four RPW quarters, which precede its first link (Appendix D). Corridor fixed effects absorb such level differences but not selection on subsequent price paths, which the hazard and timing analyses below examine.

Table 9 shows that neither lagged remittance fees nor recent fee changes significantly predicts link adoption. Adoption is positively associated with domestic fast payment systems at both endpoints, consistent with technical readiness facilitating the rollout of cross-border links.

Among the 31 linked corridors, higher-fee corridors were linked earlier: a one-percentage-point higher baseline fee is associated with adoption 1.56 quarters earlier (SE 0.30; Table 10, column 1). Using the same pre-link fee level and change as the hazard, and adding the common baseline market-structure controls, the fee-change coefficient is 1.30 quarters per percentage-point fee change (SE 0.63; 95% interval $[-0.08, 2.68]$). These small-sample timing associations reflect in part the contrast between early, high-fee southern African links and later, lower-fee Gulf links. The adoption analyses show that linked corridors tend to have larger bank quote shares and established bilateral ties, while earlier launches are concentrated in higher-fee corridors.

6 Main Results

This section presents the main empirical findings. We begin with the pooled estimates, then split by provider type to examine the responses of banks and MTOs. We report a within-firm spillover diagnostic and conclude by discussing cost interpretations and quote composition.

6.1 Pooled results

Figure 2 presents the aggregate effect of cross-border payment link activation on remittance fees. We pool banks and MTOs into a single sample with corridor and quarter fixed effects, a bank indicator among the controls, and standard errors clustered at the source-country level.[7] The dependent variable throughout is asinh(Total Fee). Coefficients are reported in asinh units.

Panel (a) plots the cumulative number of sample corridors with an activated cross-border payment link from 2013 Q1 to 2025 Q1. The series reaches 31 corridors across 12 activation quarters.[8] The variation in timing permits comparisons with not-yet-treated and never-treated corridors, conditional on the fixed effects and identifying assumptions.

Panel (b) plots unadjusted cohort-average fees for treated and control corridors around link activation. Treated-corridor fees are relatively stable before activation and fall at $t = 0$, while the control-group trajectory remains comparatively flat.

Panel (c) moves from raw means to the Borusyak et al. (2024) imputation estimator. The estimator uses untreated observations to fit a high-dimensional fixed effects model, then projects counterfactual outcomes ($\hat{Y}^0$) for treated units, that is, what their fees would have been absent the cross-border link. The panel overlays the actual treated-unit fee path with this counterfactual prediction. The pre-treatment paths are close but do not coincide. Actual fees lie below the fitted counterfactual from activation through quarter three; the gap closes by quarter four. The difference between the two lines at each post-treatment quarter is an average fitted difference under equal corridor–firm weights.

Panel (d) reports the quote-level dynamic treatment effect estimates (Table 3, column 1). Their weighting differs from the equal corridor–firm weights in Panel (c), so the plotted gap need not equal the estimated ATT. Pre-treatment coefficients are individually insignificant at the 5% level at the three displayed leads (maximum $|t| = 1.76$). At activation, the total-fee coefficient is -0.079 ($p < 0.01$). The estimate at $t = 1$ is negative but not statistically

[7] The provider-type split that follows uses richer fixed effects and source-country clustering, as discussed below and in Section 5.

[8] The initial merged panel contains 50 switcher corridors before the sample restrictions in Section 4. The final pooled sample contains 31 switcher corridors (27 for banks, 31 for MTOs).

significant; the estimate at $t = 2$ is -0.066 ($p < 0.05$), followed by imprecise estimates at quarters three and four. Under the reported relative-magnitude restrictions, the Rambachan and Roth (2023) 95% confidence interval at impact excludes zero through $\bar{M} = 0.3$ (Table 3). The calculation retains the covariance between pre- and post-treatment estimates.

The pooled estimate is negative at impact and attenuates over subsequent quarters. One possible explanation is that it averages over providers with different exposure to settlement savings and other pricing changes. We next estimate separate models for banks and MTOs to examine the provider differences underlying these aggregate patterns.

6.2 Estimates by provider type

To investigate, we estimate the Borusyak et al. (2024) model separately for banks and MTOs (Figure 3). We use different fixed effects structures to reflect the hypothesised geographic incidence of pricing conditions, motivated by the institutional setting and descriptive coverage in Section 4.4. Banks offering remittance services tend to be concentrated in a few source countries and serve many destinations from there; source×quarter fixed effects therefore compare corridors served by the same source-country banking sector, absorbing time-varying shocks to regulation, compliance costs and correspondent banking arrangements. MTOs maintain dense agent networks across destination countries; destination×quarter fixed effects compare corridors into the same destination, absorbing shocks to last-mile infrastructure, mobile money penetration and destination-side competition (Section 4.4). Both specifications include corridor fixed effects and cluster standard errors at the source-country level.

Banks. The total-fee coefficient is -0.129 at $t = 0$ ($p < 0.01$). Point estimates remain negative through quarter four: -0.063, -0.144, -0.122 and -0.073 at $t = 1, 2, 3, 4$, respectively. Only the impact and quarter-three intervals exclude zero at the 5% level. The three displayed pre-treatment coefficients are individually insignificant (maximum $|t| = 1.23$).

Mean bank fees in the sample are approximately 8.8 percentage points of the send amount. Banks account for a minority of remittance price quotes in the data.

MTOs. The total-fee coefficient is indistinguishable from zero at impact (-0.014, $p = 0.62$), then becomes positive. It reaches 0.058 at $t = 3$ ($p = 0.08$) and 0.106 at $t = 4$ ($p < 0.01$). The displayed pre-treatment total-fee coefficients are individually insignificant (maximum $|t| = 0.55$).

The total-fee dynamics combine two component responses (Section 7.1). The initial FX-margin decline offsets higher transfer fees; total-fee estimates become positive as the FX-margin decline fades.

6.3 Within-firm spillovers

Our baseline design identifies treatment at the corridor level, comparing fee trajectories in corridors that gain a cross-border link against corridors that do not. A potential concern is that many remittance providers operate across both treated and untreated corridors simultaneously. If a firm adjusts its pricing globally after encountering a cross-border link in one corridor, the treatment spills over into the control group and contaminates the counterfactual. This concern is particularly relevant for MTOs with networks spanning multiple corridors, because the same firm can contribute price quotes to both the treatment and control groups. If these firms raise fees in their untreated corridors after cross-border link exposure elsewhere, our baseline MTO estimate is biased towards zero.

To test for this, we construct a treatment intensity measure for each firm: the share of the firm's corridors with an active cross-border payment link at each point in time. This measure builds up gradually as successive links activate. We regress fees on treatment intensity in the sample of never-treated corridors, with corridor×quarter and firm fixed effects, clustering standard errors at the firm level (335,163 estimation observations; 303 corridors; 702 firms).

The coefficients on treatment intensity are imprecisely estimated across all fee components: total fees -0.103 (SE 0.166, $p = 0.53$), FX margins 0.003 (SE 0.233, $p = 0.99$), and transfer fees 0.058 (SE 0.235, $p = 0.80$; Table 6). After controlling for firm identity, we do not detect a systematic pricing response to exposure elsewhere.

6.4 Costs, composition and the aggregate effect

The provider-specific estimates describe contrasting price paths around link activation. Bank total-fee estimates are negative throughout the first post-activation year. For MTOs, lower FX margins initially offset higher transfer fees; total fees rise as that offset fades. One interpretation relates these patterns to differences in settlement savings and operating costs across providers. Section 7 examines the fee components and how MTO responses vary with pre-link bank presence.

7 Fee Components and Heterogeneity

The preceding section reports lower bank total fees at impact and higher MTO total fees by quarter four. Two questions sharpen the interpretation: through which fee component do the quoted-price changes appear, and how does the MTO response vary across corridors?

7.1 Fee decomposition

We re-estimate the Borusyak et al. (2024) model separately for the FX margin and the transfer fee, using the same fixed effects and controls as the baseline total-fee specification. Figure 3 reports the results alongside the total fee estimates.

Banks. The FX margin falls sharply at $t = 0$ (asinh coefficient -0.160, SE 0.039), consistent with lower settlement-related costs (Section 2.2). The point estimate remains negative through $t = 3$ but is close to zero at $t = 4$ (0.002, SE 0.033). Transfer-fee estimates are negative throughout the post-treatment window, but only the estimate at $t = 3$ is statistically distinguishable from zero: -0.061 (SE 0.024), compared with -0.051 (SE 0.037) at $t = 4$.

MTOs. The MTO fee decomposition reveals two distinct dynamics. At impact ($t = 0$), FX margins fall (asinh coefficient -0.118, SE 0.023) while transfer fees rise (0.099, SE 0.039). The total-fee estimate is close to zero at activation. Because the components are transformed separately, the asinh coefficients do not add up to the total-fee coefficient. Over subsequent quarters, the FX margin effect fades. The estimates are no longer statistically distinguishable from zero after impact, and the point estimate turns positive at $t = 4$. The transfer fee increase persists alongside the later positive total-fee estimates documented above.

Lower FX or rebalancing costs and higher variable operating costs could contribute to this pattern. Changes in markups or the allocation of charges between fee components could also contribute. We next examine how the MTO response varies across corridors.

7.2 Bank quote share and the MTO fee response

Banks and MTOs coexist in most remittance corridors. Prior work finds that more competitors in a corridor are associated with lower remittance fees (Beck & Martínez Pería, 2011), and industry participants view bank pricing as a reference point for the market.[9] We examine whether the MTO transfer fee increase documented above varies with the presence of banks in the corridor.

We use a two-step procedure. In the first step, we estimate the Borusyak et al. (2024) imputation model for MTOs (corridor and destination×quarter fixed effects) and extract product-level treatment effects at $t = 4$. In the second step, we regress these product ATTs on pre-treatment corridor characteristics, clustering standard errors at the corridor level. These second-stage standard errors condition on the imputed effects and do not propagate first-stage estimation uncertainty. We measure bank presence using banks' share of all pre-treatment

[9]Western Union's CEO describes banks as providing "the pricing umbrella under which all MTOs compete" (McGranahan, FQ2 2024). Appendix E collects additional earnings call evidence on how MTOs perceive banks as market participants.

price quotes in the corridor, pooled across quarters and both amount tiers. The denominator uses the broader filtered RPW sample, including provider types other than banks and MTOs, before restricting the outcome regressions to MTOs. It measures quote share, not transaction share.[10]

Table 5 reports the results. The slopes on bank quote share are negative but imprecise: −0.263 (SE 0.189) for total fees, −0.606 (SE 0.333) for FX margins, and −0.370 (SE 0.285) for transfer fees. All three 95% confidence intervals include zero. The regressions use 468 product-level effects from 25 corridors and 72 firms. Figure 4 presents the corresponding corridor-level scatter plots, weighting each corridor equally rather than each product-level effect. The negative slopes are consistent with smaller MTO fee increases where banks account for more quotes.

We also explore direct price and product competition. One hypothesis is that bank presence is associated with a smaller MTO response where banks and MTOs price close to each other. We compute the pre-treatment fee gap between banks and MTOs for each corridor. The slopes are imprecisely estimated across all fee components (Table 5, Panel B). These regressions use 404 effects from 21 corridors and 65 firms; the fee gap is undefined where there are no pre-link bank quotes. We therefore do not detect a price-proximity relationship on this smaller sample.

Banks and MTOs also differ in their product offerings. Account transfers account for 84.2% of bank quotes, whereas MTOs offer a mix of cash (45.2%), account transfer (27.2%) and card (23.6%) payment instruments (Table 2). We construct a product overlap index for each corridor, measuring the overlap between banks and non-bank providers in the same instrument×access segments.[11] Product-overlap slopes are also imprecisely estimated: −0.045 (SE 0.220) for total fees, −0.300 (SE 0.304) for FX margins, and −0.105 (SE 0.237) for transfer fees (Table 5, Panel C).

Bank quote share, the fee gap, and product overlap capture different dimensions of the competitive environment.

[10]Each RPW quote records a provider–instrument–access–amount combination in a survey quarter. In one quarter, a corridor with 2 banks offering 10 products each and 5 MTOs offering 2 products each would have a bank quote share of $20/30 = 0.67$. The measure thus captures both the number of bank firms and the breadth of their product offerings.

[11]We use the Bhattacharyya coefficient: $\sum_k \sqrt{s_k^B \cdot s_k^M}$, where s_k^B and s_k^M are the within-group shares of bank and non-bank quotes in product cell k. The non-bank group includes MTOs and other non-bank provider types; the outcome regressions remain restricted to MTOs. See Appendix C for details.

8 Longer-Run Dynamics

8.1 Specification and estimates

We examine the evolution of remittance prices beyond the baseline first-year window by estimating responses up to 12 quarters after link activation.

Longer horizons are estimated from progressively fewer treatment cohorts: only cohorts treated by 2023 Q1 can contribute at $t = 8$, and only those treated by 2022 Q1 can contribute at $t = 12$. We pool banks and MTOs and include corridor and quarter fixed effects and product controls. This specification omits the bank indicator included in the pooled baseline. Figure 5 presents the results.

The total-fee effect is -0.088 at $t = 0$ (SE 0.025) and attenuates over subsequent quarters. It is close to zero at $t = 4$ (0.017, SE 0.033) and $t = 12$ (0.000, SE 0.029), with both confidence intervals including zero. The path is not monotonic: the estimate at $t = 6$ remains negative and statistically distinguishable from zero. These pooled estimates also reflect changes in the set of contributing corridors and cohorts.

The fee components reveal more persistent dynamics. FX margins fall at treatment onset (-0.215, SE 0.019) and remain negative throughout the displayed post-treatment window, including $t = 4$ (-0.038, SE 0.032) and $t = 12$ (-0.140, SE 0.026), although the $t = 4$ confidence interval includes zero. At $t = -4$, the total-fee and FX-margin coefficients are positive: 0.069 (SE 0.035) and 0.148 (SE 0.057), respectively. Transfer-fee estimates are positive at most horizons; their displayed 95% intervals exclude zero at $t = 1$, $t = 11$, and $t = 12$, with a $t = 12$ estimate of 0.090 (SE 0.041).

9 Conclusion

This paper asks how public payment infrastructure affects the pricing of cross-border transfers. We hand-collect the global rollout of cross-border payment links and combine it with quarterly remittance pricing data to estimate the effect of cross-border link adoption on fees charged by banks and money transfer operators. Using the staggered rollout across corridors and the Borusyak et al. (2024) imputation estimator, we find that the estimates differ across provider types: bank total fees decline at impact (asinh coefficient -0.129), with an initial reduction in FX margins, while the MTO total-fee coefficient reaches 0.106 by four quarters after activation. Bank total-fee estimates are negative throughout the first year after activation. The persistent MTO transfer-fee increase is initially offset by lower FX margins. This pattern is consistent with different settlement and operating-cost channels.

One interpretation is that public infrastructure can lower settlement costs for some

providers while accompanying regulatory or access changes raise variable operating costs for others. In the remittance market, the fee decomposition shows an initial FX-margin decline for both provider types and a more persistent increase in MTO transfer fees. A tighter compliance environment is one possible explanation, alongside changes in markups or the allocation of charges.

These findings support evaluating cross-border payment links through the retail prices quoted by different providers. Monitoring should distinguish banks from MTOs, include both explicit transfer fees and FX margins, and follow prices beyond the launch quarter. Aggregate measures alone can conceal different pricing responses across providers. Provider access and competitive conditions should therefore form part of assessments of how greater payment connectivity translates into lower remittance costs.

Declaration of Generative AI and AI-Assisted Technologies in the Manuscript Preparation Process

During the preparation and revision of this manuscript, the authors used OpenAI's ChatGPT and Codex and Anthropic's Claude to assist with locating and downloading public data and source material, preparing and validating data, writing and debugging code, running empirical analyses, and drafting and editing text. These tools were accessed through the providers' web and coding interfaces. AI assistance supported the authors' work; the research design, empirical choices, interpretation of results and conclusions remained the authors' responsibility. The authors reviewed and edited the AI-assisted material and take full responsibility for the accuracy and integrity of the manuscript.

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Competing Interests

The authors declare no competing interests.

Data Availability

Remittance price data are from the World Bank's Remittance Prices Worldwide database, which is publicly available. The adoption diagnostics also use publicly available data from the

World Bank (the 2013 bilateral remittance matrix, World Development Indicators and region classifications) and the CEPII Gravity database. The dataset of cross-border payment link activations and the data on providers' access to domestic payment systems are hand-collected from public sources, including BIS committee reports, central bank and payment-system documentation and participant lists, regulatory records, platform operator websites and company disclosures (Section 4 and Appendices A.5 and B). The hand-collected datasets, the transcript search protocol and the code used to construct the analysis files and replicate the empirical analysis are available from the authors upon request.

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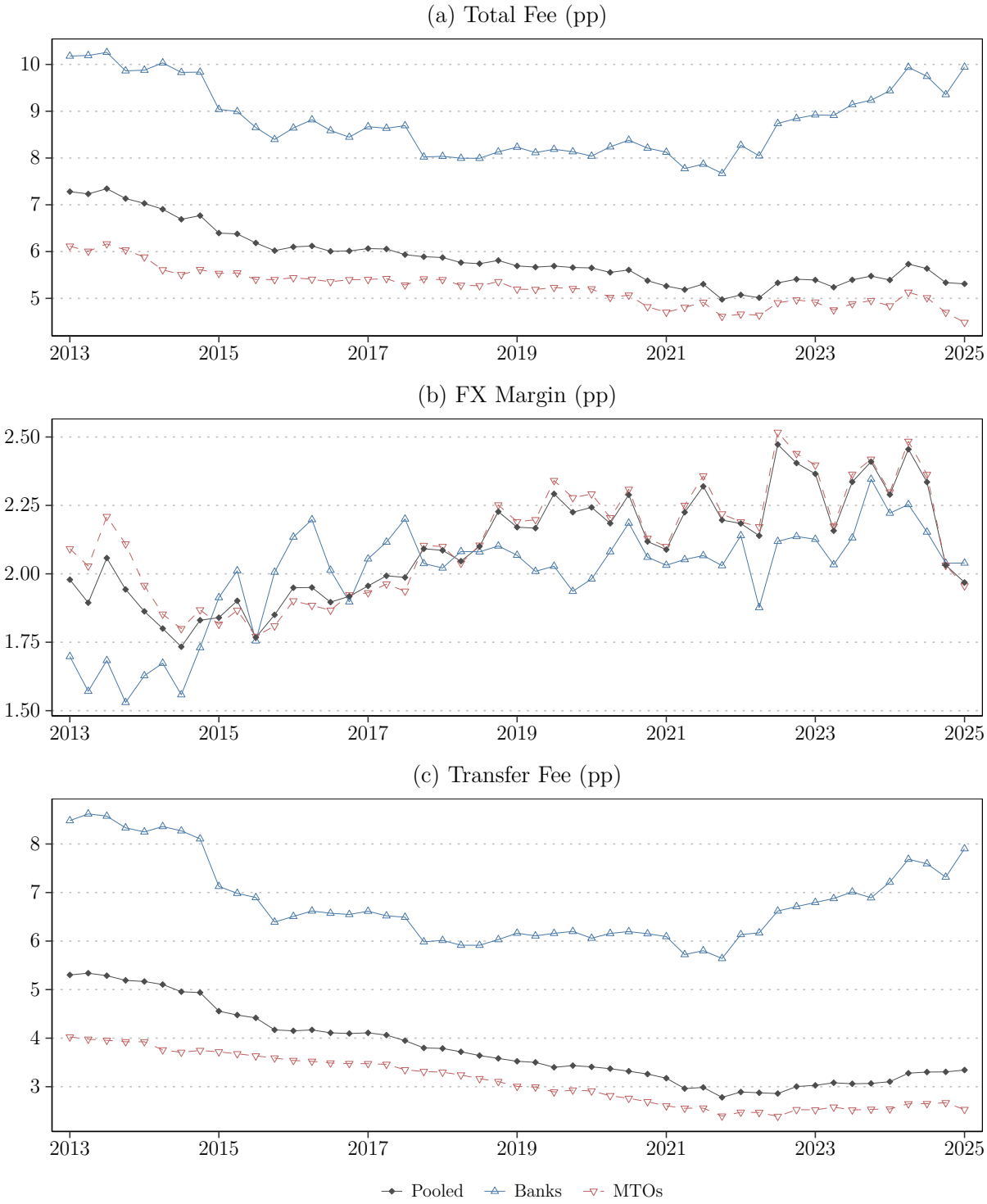
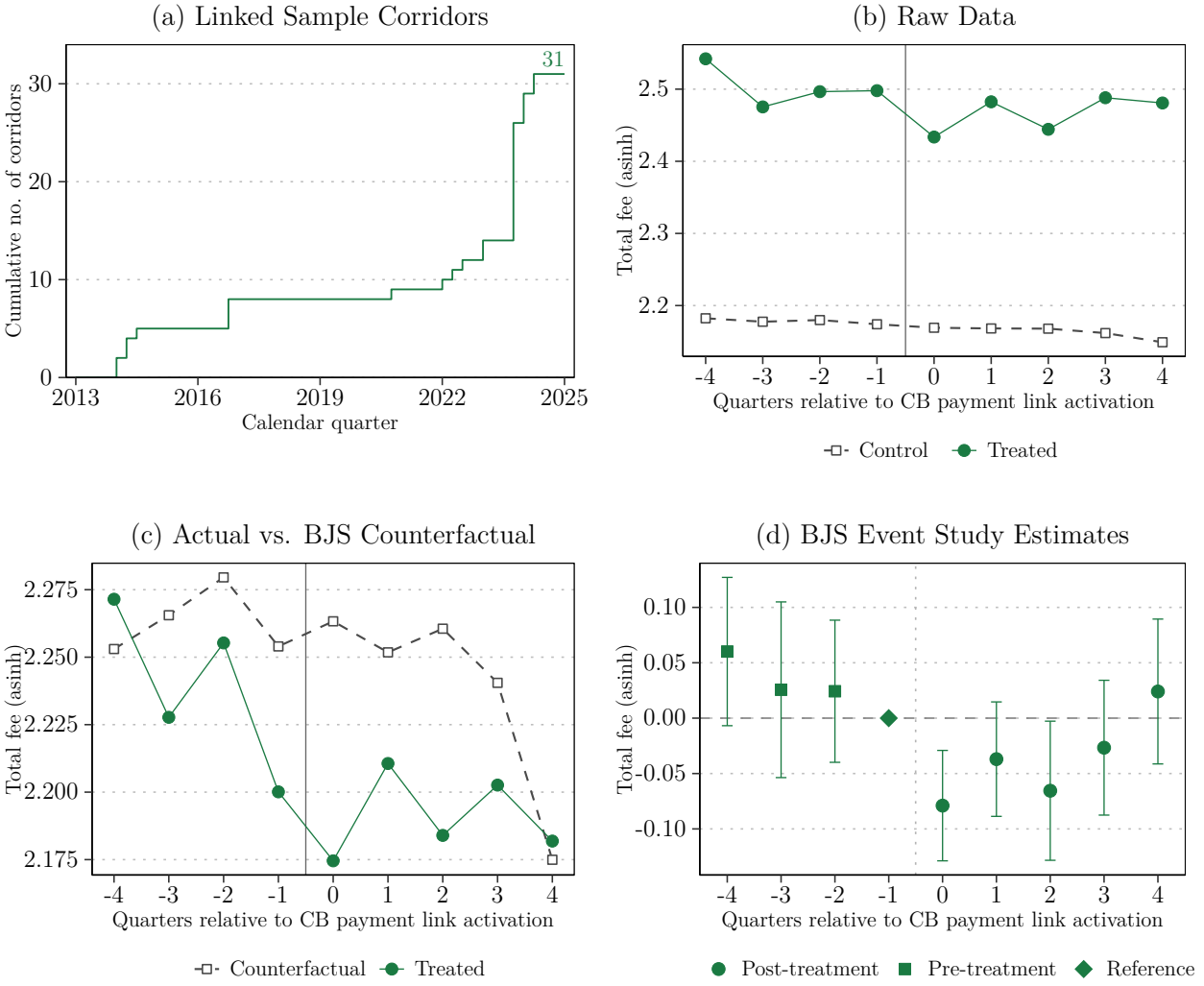
Figure 1: Evolution of remittance fees, 2013 Q1–2025 Q1



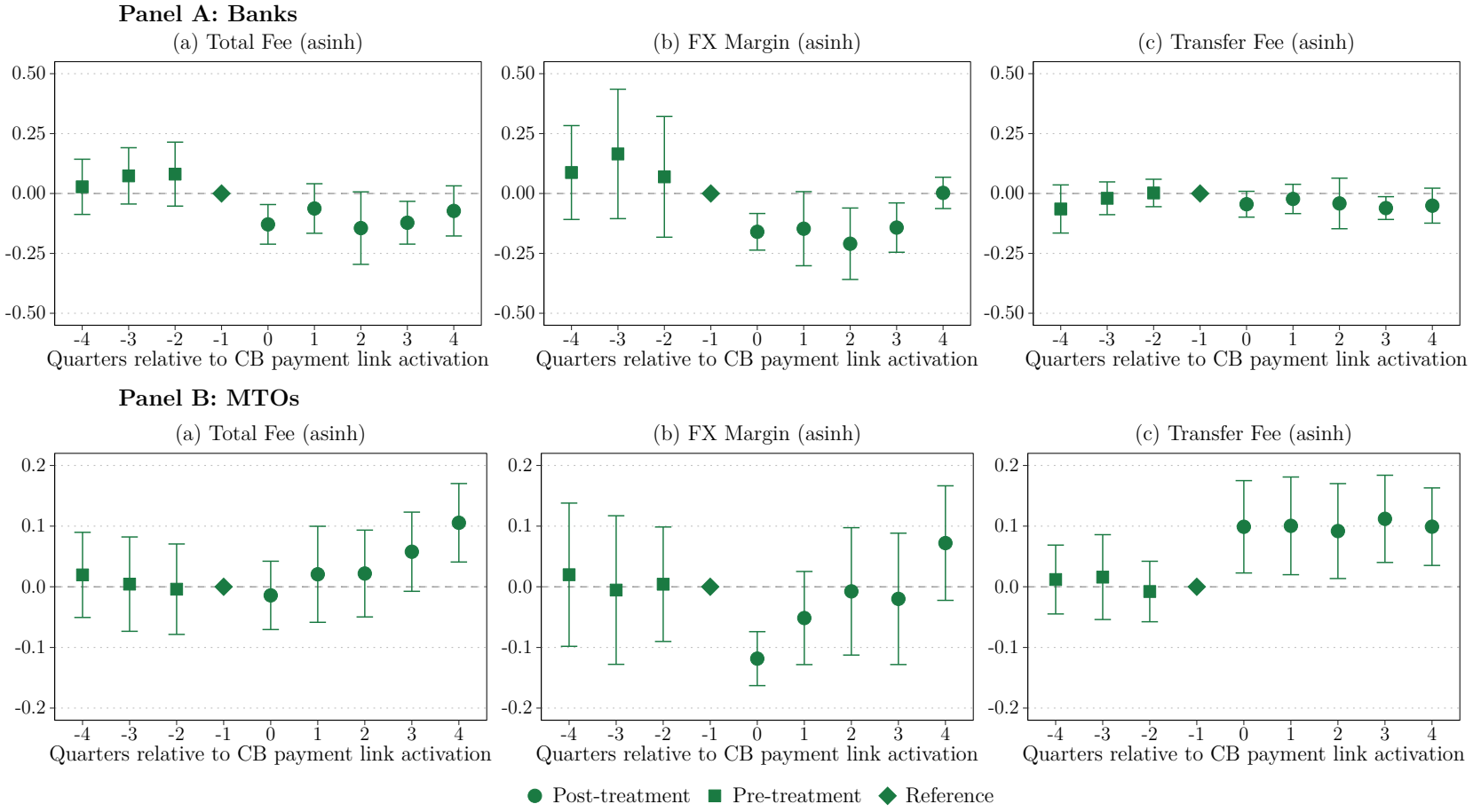
Notes: This figure plots quarterly average fees in percentage points of the send amount for the pooled sample (banks and MTOs combined), banks, and money transfer operators (MTOs). Detailed variable definitions are reported in Appendix C. The sample spans 2013 Q1 to 2025 Q1 (49 quarters) and comprises 367,901 product price quotes (banks: 61,990, or 1,064–1,424 per quarter; MTOs: 305,911, or 3,374–9,154 per quarter). Source: World Bank Remittance Prices Worldwide database.

Figure 2: Cross-Border Payment Links and Remittance Fees



Notes: This figure summarises the pooled (banks and MTOs combined) difference-in-differences design. Panel (a) plots the cumulative number of sample corridors with an activated cross-border payment link from 2013 Q1 to 2025 Q1. The step series includes all 31 treated sample corridors and changes at each of the 12 activation quarters; each jump equals the number of corridors first linked in that quarter. Panel (b) averages quote-level asinh(Total Fee) within each cohort–quarter cell and its not-yet/never-treated control group, then weights available cohorts equally. Panel (c) averages actual asinh fees and BJS counterfactual predictions within each treated corridor–firm/event-time cell, then weights these cells equally. Panel (d) plots dynamic treatment effect estimates from the imputation estimator of Borusyak et al. (2024); post-treatment estimates weight treated quotes equally within each event time. Whiskers denote 95% confidence intervals, filled squares are pre-trend tests, filled circles are post-treatment estimates, and the diamond marks the reference period ($t = -1$). Fixed effects: corridor and quarter. Controls: bank indicator, payment instrument, access point, \$500 tier indicator. Standard errors clustered at the source-country level. CB stands for cross-border. Detailed variable definitions are reported in Appendix C.

Figure 3: Event Study Estimates for Banks and MTOs



Notes: This figure reports dynamic treatment effect estimates from the imputation estimator of Borusyak et al. (2024), separately for banks (Panel A) and money transfer operators (Panel B). The dependent variable is the inverse hyperbolic sine of the total fee, FX margin, and transfer fee, respectively. Panel A uses corridor and source × quarter fixed effects; Panel B uses corridor and destination × quarter fixed effects. Controls: payment instrument, access point, $500 tier indicator. Standard errors clustered at the source-country level. Whiskers denote 95% confidence intervals. Squares are pre-trend coefficients; circles are post-treatment estimates; the diamond marks the reference period ($t = -1$). Vertical scales differ by row: $[-0.5, 0.5]$ for banks and $[-0.2, 0.2]$ for MTOs. CB stands for cross-border. Detailed variable definitions are reported in Appendix C.

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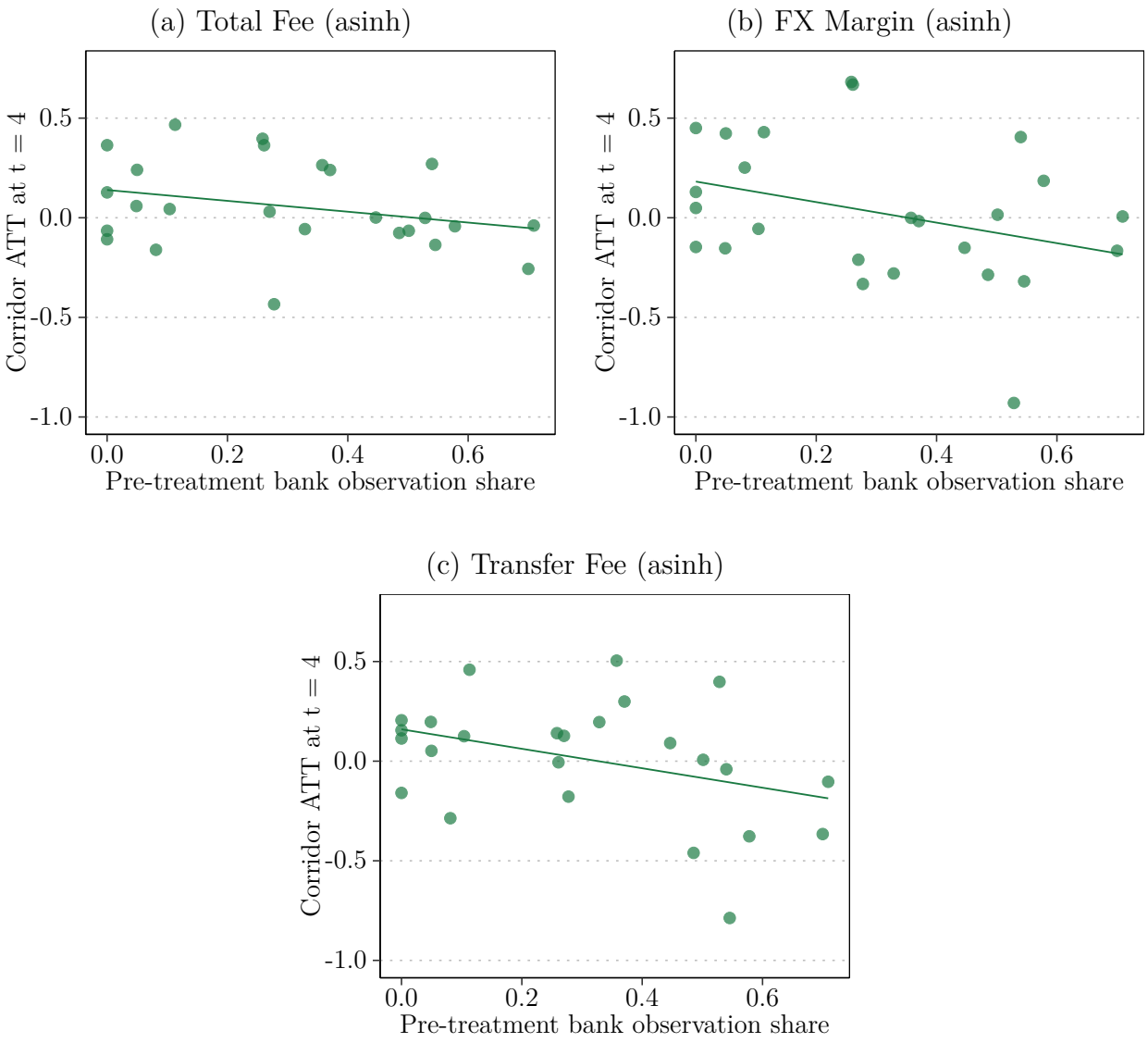
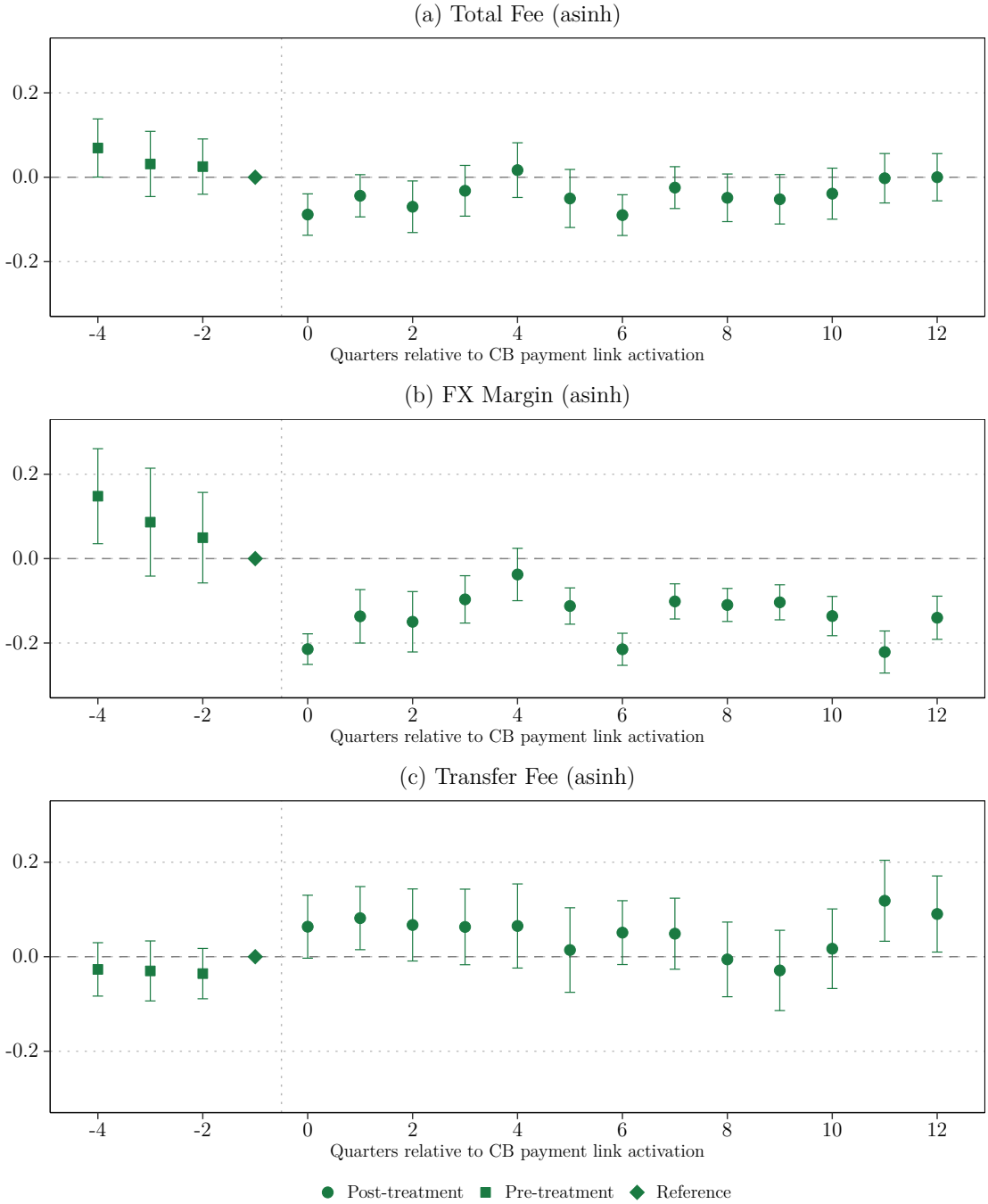
Figure 4: Bank Presence and MTO Fee Response



Notes: This figure plots corridor-level MTO treatment effects against pre-treatment bank presence for the total fee (panel a), FX margin (panel b), and transfer fee (panel c). The y-axis is the imputed MTO treatment effect at $t = 4$ from the imputation estimator of Borusyak et al. (2024) with corridor and destination×quarter fixed effects. The x-axis is the pre-treatment share of quotes from banks among all provider types and both amount tiers in the filtered RPW sample. Each point averages MTO quote-level effects within a corridor; each OLS best-fit line weights all 25 corridors equally. Detailed variable definitions are reported in Appendix C.

Figure 5: Longer-Run Event Study Estimates



Notes: This figure extends the pooled event study over a longer horizon (four quarters before to twelve quarters after activation) using the imputation estimator of Borusyak et al. (2024). Panels show the total fee (a), FX margin (b), and transfer fee (c). The pooled sample includes banks and MTOs. Fixed effects: corridor and quarter. Controls: payment instrument, access point, $500 tier indicator. Standard errors clustered at the source-country level. Whiskers denote 95% confidence intervals. CB stands for cross-border. Detailed variable definitions are reported in Appendix C.

Table 1: Summary Statistics

	N	Mean	SD	P25	P50	P75
Panel A: Pooled sample						
Remittance prices						
Total fee (pp)	367,901	5.74	4.70	2.58	4.54	7.38
FX margin (pp)	367,901	2.14	2.52	0.33	1.48	3.09
Transfer fee (pp)	367,901	3.61	3.97	1.24	2.49	4.50
Treatment						
CB payment link active	367,901	0.03	0.18	0.00	0.00	0.00
Payment instrument						
Cash	367,901	0.40	0.49	0.00	0.00	1.00
Account transfer	367,901	0.37	0.48	0.00	0.00	1.00
Card	367,901	0.20	0.40	0.00	0.00	0.00
Mobile/Online	367,901	0.03	0.18	0.00	0.00	0.00
Access point						
Online	367,901	0.43	0.50	0.00	0.00	1.00
Branch	367,901	0.21	0.40	0.00	0.00	0.00
Agent	367,901	0.31	0.46	0.00	0.00	1.00
Send amount						
USD 500 tier	367,901	0.50	0.50	0.00	0.00	1.00
Sample composition						
Observations	367,901					
Firms	738					
Corridors	334					
Source countries	40					
Destination countries	98					
Panel B: Banks						
Remittance prices						
Total fee (pp)	61,990	8.81	7.11	3.57	6.95	12.04
FX margin (pp)	61,990	1.99	2.47	0.00	1.18	2.93
Transfer fee (pp)	61,990	6.82	6.76	1.97	4.61	9.52
Treatment						
CB payment link active	61,990	0.06	0.24	0.00	0.00	0.00
Payment instrument						
Cash	61,990	0.12	0.33	0.00	0.00	0.00
Account transfer	61,990	0.84	0.37	1.00	1.00	1.00
Card	61,990	0.02	0.13	0.00	0.00	0.00
Mobile/Online	61,990	0.02	0.12	0.00	0.00	0.00
Access point						
Online	61,990	0.28	0.45	0.00	0.00	1.00
Branch	61,990	0.63	0.48	0.00	1.00	1.00
Agent	61,990	0.01	0.09	0.00	0.00	0.00
Send amount						
USD 500 tier	61,990	0.50	0.50	0.00	0.00	1.00
Sample composition						
Observations	61,990					
Firms	229					
Corridors	202					
Source countries	36					
Destination countries	68					

Continued on next page

Table 1: Summary Statistics *(continued)*

	N	Mean	SD	P25	P50	P75
Panel C: MTOs						
Remittance prices						
Total fee (pp)	305,911	5.12	3.75	2.49	4.28	6.74
FX margin (pp)	305,911	2.17	2.52	0.40	1.53	3.11
Transfer fee (pp)	305,911	2.95	2.67	1.16	2.27	4.00
Treatment						
CB payment link active	305,911	0.03	0.16	0.00	0.00	0.00
Payment instrument						
Cash	305,911	0.45	0.50	0.00	0.00	1.00
Account transfer	305,911	0.27	0.45	0.00	0.00	1.00
Card	305,911	0.24	0.42	0.00	0.00	0.00
Mobile/Online	305,911	0.04	0.19	0.00	0.00	0.00
Access point						
Online	305,911	0.47	0.50	0.00	0.00	1.00
Branch	305,911	0.12	0.33	0.00	0.00	0.00
Agent	305,911	0.37	0.48	0.00	0.00	1.00
Send amount						
USD 500 tier	305,911	0.50	0.50	0.00	0.00	1.00
Sample composition						
Observations	305,911					
Firms	527					
Corridors	334					
Source countries	40					
Destination countries	98					

Notes: This table reports summary statistics for the pooled sample (Panel A), banks (Panel B), and MTOs (Panel C). The unit of observation is a provider–corridor–quarter–tier price quote from the World Bank Remittance Prices Worldwide database, 2013 Q1–2025 Q1. Fees are expressed as a percentage of the send amount. CB payment link active equals one from the quarter in which the first cross-border payment link connecting the corridor goes live. CB stands for cross-border. Detailed variable definitions are reported in Appendix C.

Table 2: Payment Instrument Details by Banks and MTOs

Banks			MTOs		
	N	%		N	%
Panel A: Sending-side access point					
Branch	38,945	65.8	Online	142,648	47.7
Online	17,339	29.3	Agent	113,964	38.1
Call centre	2,051	3.5	Branch	36,769	12.3
Agent	536	0.9	Call centre	4,800	1.6
Mobile	258	0.4	Mobile	948	0.3
Other	98	0.2	Other	10	0.0
Panel B: Payment instrument					
Account transfer	52,170	84.2	Cash	138,292	45.2
Cash	7,623	12.3	Account transfer	83,295	27.2
Card	1,024	1.7	Card	72,259	23.6
Mobile/Online	959	1.5	Mobile/Online	10,128	3.3
Multiple/Other	214	0.3	Mobile	1,137	0.4
			Multiple/Other	800	0.3
Panel C: Destination-side pickup method					
Bank account	40,655	89.9	Cash	175,614	67.9
Cash	4,563	10.1	Bank account	72,310	28.0
Other	16	0.0	Mobile wallet	10,578	4.1
			Other	170	0.1

Notes: This table reports the distribution of payment instruments and access points used by banks and MTOs. Panel A reports where the sender initiates the transaction. Panel B reports how the sender pays. Panel C reports how the recipient collects funds at the destination. Percentages are computed within provider type, conditional on non-missing values; observations classified as "Unknown" are excluded for clarity. Each observation is a provider–corridor–quarter–tier price quote. Detailed variable definitions are reported in Appendix C.

Table 3: BJS Event Study Estimates (Pooled) and Pre-Trend Sensitivity

		HonestDiD Robust 95% CI			
	(1)	$\bar{M} = 0.0$	$\bar{M} = 0.1$	$\bar{M} = 0.2$	$\bar{M} = 0.3$
$t = -4$	0.060				
	(0.03)				
$t = -3$	0.026				
	(0.04)				
$t = -2$	0.024				
	(0.03)				
$t = 0$	-0.079^{***}	$[-0.129, -0.030]^{\dagger}$	$[-0.131, -0.027]^{\dagger}$	$[-0.134, -0.025]^{\dagger}$	$[-0.138, -0.022]^{\dagger}$
	(0.03)				
$t = 1$	-0.037	$[-0.088, 0.014]$	$[-0.096, 0.020]$	$[-0.103, 0.027]$	$[-0.115, 0.034]$
	(0.03)				
$t = 2$	-0.066^{**}	$[-0.128, -0.003]^{\dagger}$	$[-0.139, 0.006]$	$[-0.153, 0.017]$	$[-0.170, 0.031]$
	(0.03)				
$t = 3$	-0.027	$[-0.086, 0.033]$	$[-0.103, 0.047]$	$[-0.124, 0.063]$	$[-0.150, 0.084]$
	(0.03)				
$t = 4$	0.024	$[-0.041, 0.089]$	$[-0.057, 0.104]$	$[-0.081, 0.126]$	$[-0.116, 0.156]$
	(0.03)				
Corridor FE	✓				
Quarter FE	✓				
Product controls	✓				
Observations	367,901				

Notes: This table reports pooled (banks and MTOs combined) event study estimates with a pre-trend sensitivity analysis. Column (1) reports horizon-specific treatment effects from the imputation estimator of Borusyak et al. (2024) with standard errors (in parentheses) clustered at the source-country level. The remaining columns report robust 95% confidence intervals under relative magnitudes restrictions (Rambachan & Roth, 2023). $\bar{M}$ bounds the ratio of the maximum post-treatment violation of parallel trends to the maximum pre-treatment violation. The dependent variable is asinh(Total Fee). Fixed effects: corridor and quarter. Controls: bank indicator, payment instrument, access point, \$500 tier indicator. † CI excludes zero. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Detailed variable definitions are reported in Appendix C.

Table 4: BJS Event Study Estimates by Banks and MTOs

	Panel A: Banks			Panel B: MTOs		
	(1) Total Fee	(2) FX Margin	(3) Transfer Fee	(4) Total Fee	(5) FX Margin	(6) Transfer Fee
$t = -4$	0.028	0.088	-0.065	0.020	0.020	0.012
	(0.059)	(0.100)	(0.051)	(0.036)	(0.060)	(0.029)
$t = -3$	0.074	0.165	-0.020	0.004	-0.005	0.016
	(0.060)	(0.138)	(0.035)	(0.040)	(0.062)	(0.036)
$t = -2$	0.081	0.069	0.002	-0.004	0.004	-0.008
	(0.068)	(0.129)	(0.029)	(0.038)	(0.048)	(0.025)
$t = 0$	-0.129***	-0.160***	-0.045	-0.014	-0.118***	0.099**
	(0.042)	(0.039)	(0.027)	(0.029)	(0.023)	(0.039)
$t = 1$	-0.063	-0.147*	-0.023	0.021	-0.052	0.100**
	(0.053)	(0.079)	(0.031)	(0.040)	(0.039)	(0.041)
$t = 2$	-0.144*	-0.210***	-0.042	0.022	-0.008	0.092**
	(0.077)	(0.076)	(0.054)	(0.037)	(0.054)	(0.040)
$t = 3$	-0.122***	-0.142***	-0.061**	0.058*	-0.020	0.112***
	(0.046)	(0.053)	(0.024)	(0.033)	(0.055)	(0.037)
$t = 4$	-0.073	0.002	-0.051	0.106***	0.072	0.099***
	(0.053)	(0.033)	(0.037)	(0.033)	(0.048)	(0.033)
Corridor FE	✓	✓	✓	✓	✓	✓
Source × Qtr FE	✓	✓	✓			
Dest × Qtr FE				✓	✓	✓
Product controls	✓	✓	✓	✓	✓	✓
Sample quotes	61,990	61,990	61,990	305,911	305,911	305,911

Notes: This table reports horizon-specific treatment effects from the imputation estimator of Borusyak et al. (2024), separately for banks (Panel A) and MTOs (Panel B). The dependent variable is the inverse hyperbolic sine of each fee component. Panel A uses corridor and source × quarter fixed effects; Panel B uses corridor and destination × quarter fixed effects. Controls: payment instrument, access point, $500 tier indicator. Standard errors clustered at the source-country level. Sample quotes count all retained observations; horizon-specific effects use treated quotes whose counterfactual is identified by the untreated fixed-effect support. The reference period is $t = -1$. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Detailed variable definitions are reported in Appendix C.

Table 5: MTO Effects by Bank Presence

	(1) Total Fee	(2) FX Margin	(3) Transfer Fee
Panel A: Bank quote share and MTO fee response			
Bank quote share	−0.263	−0.606*	−0.370
	(0.19)	(0.33)	(0.29)
Observations	468	468	468
Corridors	25	25	25
Firms	72	72	72
Panel B: Does the price distance between banks and MTOs matter?			
Fee gap	0.014	0.011	−0.000
	(0.02)	(0.03)	(0.02)
Observations	404	404	404
Corridors	21	21	21
Firms	65	65	65
Panel C: Does product overlap between banks and non-banks matter?			
Product overlap	−0.045	−0.300	−0.105
	(0.22)	(0.30)	(0.24)
Observations	468	468	468
Corridors	25	25	25
Firms	72	72	72

Notes: This table examines which dimensions of pre-treatment bank competition predict the MTO fee response. Each panel regresses product-level MTO treatment effects on a different corridor characteristic. Treatment effects are estimated in a first step using the imputation estimator of Borusyak et al. (2024) for MTOs with corridor and destination×quarter fixed effects, and extracted at $t = 4$. Bank quote share (Panel A) is the proportion of pre-treatment quotes from bank providers among all provider types and both amount tiers. Fee gap (Panel B) is the average pre-treatment bank fee minus the average MTO fee, measuring the price distance between providers. Product overlap (Panel C) is the Bhattacharyya coefficient measuring similarity of bank and non-bank product distributions across instrument×access cells. Counts are reported for each panel's estimation sample. Standard errors (in parentheses) are clustered at the corridor level and conditional on the first-step imputed effects. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Detailed variable definitions are reported in Appendix C.

Table 6: Within-Firm Spillover Effects

	(1) Total Fee	(2) FX Margin	(3) Transfer Fee
Treatment intensity	−0.103	0.003	0.058
	(0.17)	(0.23)	(0.23)
Corridor × Qtr FE	✓	✓	✓
Firm FE	✓	✓	✓
Product controls	✓	✓	✓
Observations	335,163	335,163	335,163
Corridors	303	303	303
Firms	702	702	702

Notes: This table tests whether firms exposed to a cross-border payment link in one corridor adjust fees in their other, untreated corridors. The sample is restricted to corridors that never receive a cross-border link. Treatment intensity is the share of each firm's corridors with an active cross-border payment link at each quarter. The dependent variable is the inverse hyperbolic sine of each fee component. Banks and MTOs are pooled. Controls: payment instrument, access point, $500 tier indicator. Standard errors (in parentheses) clustered at the firm level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Detailed variable definitions are reported in Appendix C.

A Cross-Border Payment Settlement Arrangements

Cross-border retail payments can be settled through four back-end arrangements, as classified by CPMI (2018). These arrangements differ in the number of intermediaries involved, the infrastructure used, and their implications for cost, speed, and accessibility. This appendix describes the four arrangements most relevant to the remittance market in detail. Appendix A.5 documents how the providers in our sample connect to domestic payment infrastructure.

A.1 Correspondent banking

In correspondent banking, one bank (the correspondent) holds deposits owned by other banks (respondents) and provides payment and settlement services on their behalf. To execute a cross-border payment, the payer's bank sends an instruction, typically via SWIFT, to its correspondent, which credits the recipient's bank, which in turn credits the beneficiary. In practice, a series of correspondent banking relationships may be involved in a single transaction, with each intermediary charging message fees, maintaining nostro accounts that tie up liquidity, and performing independent compliance screening. Large transaction banks frequently offer correspondent banking services to smaller and domestically focused institutions. For transfers between large transaction banks, settlement typically occurs through the respective national payment systems. Correspondent banking is the dominant arrangement for bank-intermediated cross-border transfers and a potential channel for banks in our sample.

A.2 Interlinking of payment and market infrastructures

An alternative to correspondent banking is the direct interlinking of national payment infrastructures. Such a link can connect the automated clearing houses (ACHs) or real-time gross settlement (RTGS) systems of two countries, allowing payment service providers participating in country A's infrastructure to send payments directly to providers participating in country B's infrastructure. Where the linked infrastructures settle in different currencies, arrangements must accommodate foreign exchange conversion. The forms of integration range from (i) relatively simple agreements facilitating direct or indirect cross-participation, through (ii) interoperability arrangements involving technical interfaces between separate operating platforms, to (iii) full harmonisation into a common unified system for cross-border transactions. Links between payment infrastructures are more likely to be established between countries with considerable bilateral economic activity or migration flows. The dataset includes links between fast payment systems, alongside wholesale and regional

settlement arrangements.

A.3 Closed-loop (in-house)

In a closed-loop or in-house arrangement, the payment service provider of the payer is the same entity (or part of the same group) as the provider of the payee. This is the case for money transfer operators with agent networks in both the sending and receiving country, and for multinational banks with branches in multiple jurisdictions. Rather than relying on a connection between institutions or infrastructures, the provider itself bridges the two jurisdictions through internal account entries. The provider maintains prefunded accounts or agent floats in both countries; when a customer initiates a transfer, the provider debits its account in the source country and credits its account in the destination country. The provider's treasury function aggregates and nets flows across corridors, settling only the residual imbalance periodically through the banking system. This netting mechanism economises on per-transaction settlement costs and enables near-instant payouts. The large money transfer operators in our sample, including Western Union and MoneyGram, operate primarily under this arrangement.

A.4 Peer-to-peer

The peer-to-peer model eliminates the financial intermediary between payer and payee. Until recently, this arrangement mainly involved paper-based transactions such as sending cash by mail. The emergence of distributed ledger technologies and digital currencies now allows peer-to-peer transfers to be executed electronically, with the payer transferring a digital token or cryptocurrency directly to the payee without a traditional payment service provider intermediating the transaction. While peer-to-peer arrangements are growing in importance, particularly through stablecoin-based remittance services, they remain a small share of the global remittance market and are not the focus of our empirical analysis.

A.5 Remittance providers' access to domestic payment systems

We document how remittance providers in RPW access domestic payment systems. The collection concentrates on providers serving many RPW corridors and records their access to payment infrastructure separately for each country. We combine central bank and payment-system participant lists with regulatory records, company disclosures and dated partnership announcements. Each coded item retains the supporting source, quotation and date. The September 2026 snapshot contains 1,866 provider–country records across 136 countries.

The access classification uses four inputs: the documented payment infrastructure, the

entity providing access, that entity's relationship to the remittance provider, and its status in the payment-system participant register. Direct access (R0) requires the provider or an entity within its corporate group to be a direct FPS or RTGS participant. Sponsored access (R1) covers access through a named third-party sponsor or aggregator, as well as participation through an affiliated entity in an indirect tier. In both categories, the documentation connects the provider's payment service to the relevant domestic infrastructure. Other categories record card payouts (R2), wallet or mobile-money payouts (R3), correspondent bank-account credit (R5), and cash pickup (R6). Documented absence of access and unresolved evidence are recorded separately.

The categories describe the best documented access available among a provider's products in a country. We retain the source dates and treat the September 2026 collection as a cross-sectional description of those capabilities. The unit of measurement is access to a domestic FPS or RTGS; the platform dataset in Section 4.1 records the systems connected across borders. Source and destination access are retained separately, and the corridor classification records whether both legs fall in R0 or R1. Unresolved legs remain unclassified. Matching the provider names and country codes to the analysis sample yields a destination classification for 228,566 price quotes (62.1% of the sample), including 15,795 quotes from providers with direct or sponsored FPS or RTGS access.

Access differs across provider types and across the two ends of a corridor. Weighting the classifications by post-activation quotes in treated corridors, 93.0% of bank quotes with a classified source leg have direct or sponsored FPS or RTGS access in the sending country. The corresponding share at the destination is 45.6%. For MTOs, these shares are 16.8% at the source and 9.7% at the destination. Each share uses quotes with a resolved classification on the relevant leg. These patterns show why the settlement arrangements available to a provider depend on its local payment-system connections as well as its institutional type.

Cross-border links can reduce intermediary charges and liquidity costs when they connect systems a provider can access. These savings can affect remittance prices through providers' own settlement operations or through their sponsor and payout relationships. The documented access patterns therefore help explain the variation in settlement-cost exposure underlying the framework in Section 3.

B Cross-Border Payment Link Platforms

Table 7 lists recorded platform–year entries overlapping at least one treated corridor in the analysis sample. Our full dataset covers 65 distinct platforms connecting 121 countries; the table reports 22 entries across 20 platforms. This includes later overlapping links: 16 platforms determine the earliest recorded activations used in estimation. The country lists show cumulative platform membership by the listed year, rather than the corridors that identify the estimates. Treatment is assigned at the corridor level from its earliest recorded activation quarter, subject to the timing and coverage qualifications in Section 4.1.

Table 7: Cross-Border Payment Link Platforms and Rollout Timeline

Platform	Year	Countries
Panel A: Multilateral platforms		
ARPS (Buna)	2023	ARE, BHR, EGY, IRQ, JOR, KWT, MAR, PSE, QAT, SAU, SDN, TUN
EAPS	2014	KEN, RWA, TZA, UGA
PAPSS	2024	COM, DJI, EGY, GHA, GIN, GMB, KEN, LBR, MWI, NGA, RWA, SLE, TUN, ZMB, ZWE
REPSS	2014	KEN, MUS, MWI, RWA, SWZ, UGA, ZMB
SADC-RTGS	2014	LSO, MUS, MWI, NAM, SWZ, TZA, ZAF, ZMB, ZWE
SADC-RTGS	2016	AGO, BWA, COD, LSO, MOZ, MUS, MWI, NAM, SWZ, SYC, TZA, ZAF, ZMB, ZWE
SADC-TCIB	2022	NAM, ZAF, ZWE
SADC-TCIB	2024	NAM, ZAF, ZMB, ZWE
Panel B: Bilateral platforms		
DuitNow–PromptPay	2022	MYS, THA
DuitNow–QRIS	2022	IDN, MYS
EAC	2025	RWA, TZA
KHQR–PromptPay	2024	KHM, THA
NETS QR–QRIS	2023	IDN, SGP
NETSQR–DuitNow QR	2023	MYS, SGP
PayNow–DuitNow	2023	MYS, SGP
PayNow–UPI	2023	IND, SGP
PromptPay–Japan	2020	JPN, THA
PromptPay–LaoQR	2024	LAO, THA
QRIS–PromptPay	2022	IDN, THA
UPI–France	2024	FRA, IND
UPI–NEOPAY	2024	ARE, IND
VietQR–PromptPay	2024	THA, VNM

Notes: Recorded platform–year entries overlapping at least one treated corridor in the analysis sample, including later links that do not determine first treatment. Countries show cumulative platform membership by the listed year, not the set of estimating corridors. Compiled from central bank announcements, BIS publications, and regional clearing house records. Country codes follow ISO 3166-1 alpha-3.

C Variable Definitions

Variable	Definition	Source
Remittance price variables		
Total fee	Total cost of sending a remittance, expressed as a percentage of the send amount. Sum of FX margin and transfer fee. Trimmed to $[0, 50]$.	RPW
FX margin	Foreign exchange margin: percentage difference between the interbank exchange rate and the rate offered to the customer, expressed as a percentage of the send amount.	RPW
Transfer fee	Explicit fee charged by the provider, expressed as a percentage of the send amount. Computed as total fee minus FX margin.	RPW
Treatment variables		
Cross-border payment link active	Equals 1 from the quarter in which the first cross-border payment link connecting the source and destination country is recorded as active. Zero otherwise.	Hand-collected
Cohort	Quarter of earliest recorded cross-border payment link activation on the corridor. Never-treated corridors are encoded as zero in the estimator; ∞ denotes no treatment in the potential-outcome notation.	Hand-collected
Treatment intensity	Share of a firm's full-sample corridor portfolio with an active cross-border payment link in the current quarter. Used in the within-firm spillover test (Section 6).	Constructed
Competition and market structure variables		
Bank quote share	Proportion of pooled pre-treatment price quotes in a corridor from bank providers, including both amount tiers and all provider types in the denominator. Captures both the number of bank firms and the breadth of their product offerings.	Constructed
Fee gap	Difference between the average pre-treatment bank fee and the average pre-treatment MTO fee in the corridor (bank − MTO). Positive values indicate banks are more expensive.	Constructed
Product overlap	Bhattacharyya coefficient measuring the overlap between bank and non-bank product distributions across instrument×access cells: $\sum_k \sqrt{s_k^B \cdot s_k^N}$, where B denotes banks and N non-banks. Ranges from 0 (no overlap) to 1 (identical distributions).	Constructed

Continued on next page

Variable definitions (continued)

Variable	Definition	Source
Product characteristics (controls)		
Payment instrument indicators		
Cash	Equals 1 if the payment instrument is cash.	RPW
Account transfer	Equals 1 if the payment instrument is a bank account transfer.	RPW
Card	Equals 1 if the payment instrument is a debit card, credit card, or prepaid card.	RPW
Mobile/Online	Equals 1 if the payment instrument is mobile money or an online transfer.	RPW
Access point indicators		
Online	Equals 1 if the sender initiates the transfer via the internet.	RPW
Branch	Equals 1 if the sender initiates the transfer at a bank branch.	RPW
Agent	Equals 1 if the sender initiates the transfer at a retail agent location.	RPW
Send amount		
USD 500 tier	Equals 1 if the observation corresponds to a $500 send amount, 0 if $200. The RPW surveys both amounts; we stack both tiers and include this indicator as a control.	RPW

Notes: RPW = World Bank Remittance Prices Worldwide database. "Pre-treatment period" refers to all quarters before cross-border payment link activation for treated corridors and all available quarters for never-treated corridors. Remittance price outcomes use the inverse hyperbolic sine (asinh) in the treatment-effect regressions; the adoption diagnostics use fee levels in percentage points. Competition and market structure variables are computed once per corridor from the pre-treatment period and used as moderators in the second-stage regressions described in Section 7.2. The analysis panel is constructed from the RPW database (2013 Q1–2025 Q1) merged with the hand-collected cross-border payment link dataset. The unit of observation is provider–corridor–quarter–send-amount tier.

D Determinants of Cross-Border Payment Link Adoption

The three analyses use the same 334-corridor universe and the same RPW price quotes: banks and MTOs, the $200 transfer tier, and the final analysis sample. Total fees are measured in percentage points of the send amount. The baseline is each corridor's first four calendar quarters beginning with its first RPW appearance. Every baseline window ends before the corridor's first link. Baseline total fees and bank quote shares are computed over all quotes in that window; provider counts are the number of distinct firms. Thus the means weight quotes, rather than quarters, equally. Bank share uses bank and MTO quotes in the denominator. This differs from the whole-pre-link, both-tier, all-provider share used in Section 7.2; the baseline measure is held fixed across all three adoption analyses.

The external covariates are log bilateral remittance flows in 2013, log distance, a common-border indicator, a common-official-language indicator, an indicator for a historical colonial tie, a regional-trade-agreement indicator, log GDP per capita at each endpoint in 2013, and a same-World-Bank-region indicator. Sources are the World Bank bilateral remittance matrix, CEPII Gravity V202211, World Development Indicators, and the World Bank country classification. The common external-control specification is used in the richest cross-sectional and hazard columns. The most saturated timing regression adds only the common baseline market-structure controls because these regressions have at most 31 observations.

FPS readiness means that both endpoints have a domestic fast payment system. It is measured at the end of the baseline window in the cross-section and at $t-1$ in the hazard. When only the launch year is known, readiness begins in its fourth quarter; countries absent from the FPS list are coded as not ready. The hazard uses the mean fee in quarter $t-1$ and its change from $t-5$ to $t-1$. The timing regressions use these identical measures at the activation quarter. No post-link prices enter these regressors. Missing covariates and price lags produce the sample differences reported in each table. All results are descriptive selection diagnostics.

Table 8: Corridor Characteristics and Cross-Border Link Adoption

	(1)	(2)	(3)	(4)
Baseline total fee (pp)	0.202	−0.160	−0.111	−0.111
	(0.872)	(0.652)	(0.608)	(0.614)
Baseline bank quote share	36.191***	38.455***	26.577**	26.592**
	(11.465)	(12.330)	(10.962)	(11.044)
Log baseline providers	−0.004	−0.537	2.816	2.472
	(3.251)	(3.509)	(3.798)	(3.722)
Log remittance flow (2013)		−1.094	−0.682	−0.588
		(1.465)	(1.339)	(1.371)
Log distance			−4.714*	−4.011
			(2.667)	(3.541)
Common border			5.984	5.979
			(12.364)	(12.310)
Common official language			16.457***	16.093***
			(5.410)	(5.315)
Colonial tie			−14.339**	−13.557**
			(6.010)	(5.554)
Regional trade agreement			12.213***	11.745**
			(4.448)	(4.646)
Log GDP per capita, source (2013)			−4.086	−3.798
			(4.741)	(4.916)
Log GDP per capita, destination (2013)			−1.921	−2.270
			(1.504)	(1.525)
Same region				2.873
				(5.925)
FPS at both ends, baseline end			−6.306	−6.151
			(6.461)	(6.445)
Baseline-year fixed effects	Yes	Yes	Yes	Yes
Mean dependent variable	9.309	9.585	9.709	9.709
Corridors	333	313	309	309
Linked corridors	31	30	30	30
Source-country clusters	39	39	39	39
R^2	0.095	0.097	0.309	0.310

Notes: The dependent variable is an indicator for ever receiving a link during the sample period, multiplied by 100. Coefficients are therefore percentage-point differences in link probability. All columns are linear probability models with baseline-year fixed effects. Bank quote share and log providers use the common baseline defined above. Columns add remittance flows and the external-control block; column (4) also includes same-region status. FPS readiness is measured at baseline-window end. One baseline-year singleton is removed. Standard errors are clustered by source country. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 9: Pre-Link Prices and the Quarterly Probability of Adoption

	(1) LPM	(2) LPM	(3) Logit
Total fee at $t-1$ (pp)	0.044	0.018	−0.010
	(0.050)	(0.032)	(0.058)
Fee change, $t-5$ to $t-1$ (pp)	−0.025	−0.012	0.008
	(0.026)	(0.022)	(0.045)
Baseline bank quote share		0.505*	2.971***
		(0.273)	(1.110)
Log baseline providers		−0.016	−0.162
		(0.112)	(0.332)
Log remittance flow (2013)		−0.024	−0.150
		(0.051)	(0.178)
Log distance		−0.138	−0.877***
		(0.106)	(0.299)
Common border		0.295	−0.526
		(0.419)	(0.920)
Common official language		0.444***	2.108***
		(0.136)	(0.494)
Colonial tie		−0.430**	
		(0.161)	
Regional trade agreement		0.458**	2.354***
		(0.169)	(0.720)
Log GDP per capita, source (2013)		−0.152	0.082
		(0.171)	(0.171)
Log GDP per capita, destination (2013)		−0.132**	−0.780**
		(0.063)	(0.321)
Same region		0.121	1.251**
		(0.167)	(0.490)
FPS at both ends, $t-1$		0.297**	0.831**
		(0.129)	(0.396)
Calendar-year fixed effects	Yes	Yes	Yes
Mean dependent variable	0.234	0.242	0.006
Corridor-quarters	12,386	11,574	4,976
Linked corridors	29	28	28
Source-country clusters	38	37	34
Corridors	331	307	265
Link events	29	28	28
R^2 / pseudo-R^2	0.006	0.015	0.319

Notes: The risk set includes corridor–quarters from 2014 Q2 to first activation or 2025 Q1, requiring observed fees at $t-1$ and $t-5$. Corridors leave after activation. The dependent variable is activation in the current quarter, multiplied by 100 in the LPM columns (1)–(2). Column (3) reports logit coefficients on the unscaled indicator, not marginal effects. All columns include calendar-year fixed effects. Bank quote share and log providers are fixed at their common baseline values; FPS readiness is measured at $t-1$. The full external-control block matches Table 8, column (4). In the logit, colonial ties and years with no activation generate perfect prediction and corresponding observations are excluded; the colonial-tie regressor is omitted. Standard errors are clustered by source country. $^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$.

Table 10: Activation Timing Among Linked Corridors

	(1)	(2)	(3)
Baseline total fee (pp)	-1.561^{***}		
	(0.300)		
	[0.203]		
Total fee at $L-1$ (pp)		-1.666^{***}	-1.864^{***}
		(0.314)	(0.264)
		[0.181]	[0.194]
Fee change, $L-5$ to $L-1$ (pp)		1.224	1.296^{*}
		(0.768)	(0.627)
		[0.894]	[0.866]
Baseline bank quote share			6.601
			(7.516)
			[6.037]
Log baseline providers			5.394
			(5.192)
			[5.078]
Baseline-year fixed effects	Yes	Yes	Yes
Mean dependent variable	33.194	35.207	35.207
Corridors	31	29	29
Linked corridors	31	29	29
Source-country clusters	14	12	12
R^2	0.678	0.826	0.857

Notes: The dependent variable is the activation quarter, measured in quarters since 2013 Q1; negative coefficients indicate earlier adoption. Column (1) uses the baseline fee. Columns (2)–(3) use the same fee level at $t-1$ and change from $t-5$ to $t-1$ as the hazard, evaluated at activation. Column (3) adds baseline bank quote share and log providers. All columns include baseline-year fixed effects. The two 2014 Q1 adopters lack the required fee lags and are excluded from columns (2)–(3). Source-clustered standard errors are in parentheses and HC1 standard errors in brackets. Stars use the source-clustered standard errors. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

E MTO Earnings Call Transcripts

This appendix documents evidence from earnings call transcripts of five MTOs represented in the Remittance Prices Worldwide dataset: Western Union (FQ4 2010–FQ4 2025, 61 calls), MoneyGram (2008–2026), Euronet/Ria (2011–2026), Remitly (2021–2026), and Wise (2022–2026).[12] All quotes are verbatim with speaker, role, and date identified. The statements describe firms' arrangements and positioning at the dates cited.

E.1 Settlement architecture

Western Union's CEO explicitly describes the firm's payment system as "a closed-loop system with largely a singular use case, consumer remittances. Today, it is by us for us" (Devin McGranahan, FQ3 2025). The firm positions its network as a substitute for correspondent banking: "[Financial institutions] outsource the processing of international payments to [us] for our capabilities and to avoid the expense of the traditional correspondent banking networks" (Business Solutions Presentation, FQ2 2011). However, WU acknowledges reliance on correspondent banking for net settlement: "Today, we use a highly inefficient legacy system called SWIFT. Anything that could make that easier, faster or cheaper is better for my business" (McGranahan, Q&A, FQ1 2025). The CFO confirms capital is tied up in this process: "We've got hundreds of millions of dollars trapped in our business every day to be able to enable real-time payments [. . .] it will help us move away from the correspondent bank system where you typically have money in process for a couple of days" (Matthew Cagwin, Q&A, FQ4 2025).

In 2019, MoneyGram described its use of blockchain-based settlement: "The Ripple blockchain enables MoneyGram to achieve what we are calling real-time settlement [. . .] we purchased the cryptocurrency XRP on a U.S. exchange, transfer it to an exchange in Mexico and sell the XRP [. . .] all within about 60 seconds. Essentially, we're using cryptocurrency as a unit of measure [. . .] reducing our working capital needs" (Larry Angelilli, CFO, Q3 2019). This is consistent with MoneyGram facing the same prefunding frictions as WU but pursuing a different solution.

Remitly describes a hybrid architecture: "Our network is now hybrid, combining direct fiat rails and with stablecoin and blockchain-enabled settlement, allowing us to move liquidity more efficiently, operate 24/7 and bypass many limitations of traditional correspondent banking" (Ankur Sinha, CTO, Investor Day 2025). Notably, "over 60% of our global volume is routed directly to the recipient's value store with no intermediary hops" (Sinha, Investor Day 2025).

Euronet/Ria's settlement is powered by its parent company's Dandelion infrastructure: "Ria and XE are powered by Dandelion and now Dandelion is available to power other players [. . .] such as banks, fintechs, wallets" (Juan Bianchi, EVP, Q&A, FQ3 2021). Ria's "correspondent banks" are payout partners for last-mile delivery, not settlement intermediaries: in 2023, Ria "launched

[12] Transcripts were searched using a systematic keyword protocol with 80+ search terms covering both supporting and potentially disconfirming evidence. The protocol and complete extraction results are available from the authors on request.

97 correspondent banks and payment partners" (FQ4 2023 Presentation), and these same partners also serve Dandelion's B2B clients.

Wise is the outlier. It explicitly replaces the correspondent banking chain: "In a traditional correspondent setup, you'll have a payment order, which is transmitted through multiple corresponding banks in multiple countries [...] With our end-to-end infrastructure built by Wise, we replaced these intermediaries with our direct connections" (Harsh Sinha, CTO, Owners Day 2025). Wise has direct integrations with six central banks and over 100 banking partners. Its CEO identifies "the world's largest correspondent banks" as its primary competitors (Kristo Käarmann, Owners Day 2025).

The reviewed extracts emphasise alternatives to routing each consumer transfer through a correspondent banking chain. They illustrate how MTOs can limit per-transaction reliance on correspondent banking while retaining net settlement and treasury needs (Section 2.3).

E.2 Customer segmentation and dual channel access

MTO management consistently describes their customer base as differentiated from bank customers, yet with substantial overlap. WU's CFO states: "We've got a customer base that generally is underbanked. And most of the traditional banks are not interested in our customer base" (Cagwin, Q&A, FQ4 2023). The CEO adds: "Nobody is really trying to bank my customer" (McGranahan, Q&A, FQ1 2023). WU describes a *graduation* pattern: "[Migrants] go to a Western Union agent location to pick up money first when they arrive [...] and at some point, they bring up enough credit, enough financial worthiness to be able to get a bank account, and they graduate from us" (Cagwin, Q&A, FQ4 2023).

However, this does not mean MTO customers lack bank accounts. MoneyGram's CFO reports that "around 70% of our customers have a bank account. And what they're using us for is something that their bank can't do [...] there isn't really a low-cost solution for them to send money across the border" (Angelilli, Barclays Conference 2016). He adds: "if we go to a level playing field in terms of the technology that we can offer [...] we can deal with the bank customers, too, that we're not just a product that the unbanked uses" (Angelilli, Barclays Conference 2016). Remitly's CEO echoes this: "Those customers have a bank account, but they may actually still go to a physical location [...] because they can't get their needs met via their existing financial services institution [...] most of those banks do not offer remittances back to emerging markets" (Oppenheimer, Q&A, Q3 2021).

The segmentation is therefore not about banking access per se, but about whether banks serve the cross-border transfer need. Crucially, customers do switch between channels. WU's CEO documents: "You've got customers switching from banks to MTOs and within MTOs, you've got retail customers switching to digital" (McGranahan, Q&A, FQ2 2024). MoneyGram's COO reports "gaining market share from consumers that traditionally sent cross-borders with the bank" (Chytil, Q&A, Q2 2020).

E.3 Competition with banks

The traditional MTOs discussed here describe banks as indirect rather than direct competitors for their core customers, but acknowledge competitive overlap at the margin. WU notes: "You've got customers switching from banks to MTOs [...] the banks are net share losers" (McGranahan, Q&A, FQ2 2024). WU describes bank pricing as a benchmark: "Banks still hold a substantial share of the global market and continue to provide the pricing umbrella under which all MTOs compete. With the World Bank estimating that the average cost to send a remittance through bank channels globally is roughly 12%" (McGranahan, Presentation, FQ2 2024). MoneyGram's COO states: "Banks that we clearly don't compete with directly, but we are also gaining market share from consumers that traditionally sent cross-borders with the bank" (Kamila Chytil, Q&A, Q2 2020). Remitly frames remittances as "a very separate product that our customers specifically need" (Oppenheimer, Q3 2021).

Wise also describes banks as customers for its infrastructure: "We're definitely not in the business of attacking banks [...] instead of hooking up to a classic correspondent banking network, they're hooking up to Wise" (Matt Briers, CFO, Barclays Conference 2023). Its Wise Platform serves over 60 bank partners.

E.4 MTO access to domestic fast payment systems

The transcripts also describe MTO connections to domestic fast payment systems (FPS), including several expansions after 2023. WU's CFO explains: "We set out a journey about 2.5 years ago [...] we had a benefit of having a couple of banking licenses [...] That's allowed us to plug into things like PIX [...] UPI, SEPA and so forth" (Cagwin, Q&A, FQ4 2025). Remitly has "a direct integration with Pix" in Brazil (Oppenheimer, Q1 2025) and direct bank integrations that bypass domestic payment switches like UPI in India (Oppenheimer, Q2 2023). Wise has the deepest FPS access, with "6 integrations directly into central banks throughout the world" (Nilan Peiris, CPO, Goldman Sachs Conference 2023).

A crucial distinction is that MTO connections to *domestic* FPS (e.g., Remitly connecting to Brazil's Pix for last-mile disbursement) differ from the cross-border arrangements recorded in our treatment variable. Eligibility for domestic systems and for cross-border links is governed by scheme-specific participation rules. Some cross-border links admit non-bank providers: Liquid Group participated in PayNow–UPI at its February 2023 launch.[13] The WU account illustrates the investment involved in obtaining domestic access.

[13]Monetary Authority of Singapore, *Launch of Real-time Payments between Singapore and India*, 21 February 2023, https://www.mas.gov.sg/news/media-releases/2023/launch-of-real-time-payments-between-singapore-and-india.

E.5 Additional observations

MoneyGram experienced substantial revenue losses from compliance-related derisking: "In 2018, we realized $122 million negative impact from derisking" (Alex Holmes, CEO, Q4 2018). MoneyGram also reports corridor-level pricing optimisation: "We've put a lot of pricing increases in, just little incremental ones [...] we've been much more focused on how do we competitively price and how do we sort of maximize returns" (Holmes, Credit Conference 2018). Both WU and MoneyGram offer white-label services to banks, and Remitly has launched an embedded B2B product for financial institutions, further blurring the bank/MTO boundary at the firm level while leaving the per-transaction settlement distinction intact.