

“Settlement speed, digital channels, and the cost of remittances in the world economy”

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	Yerkezhan Moldakenova, Taliat Bielialov, Vladyslav Kutsenko, Grigor Nazaryan, Maryna Salun, Ainur Imanaliyeva and Grigor Hayrapetyan (2026). Settlement speed, digital channels, and the cost of remittances in the world economy. <i>Investment Management and Financial Innovations</i> , 23(4), 1–23. doi: 10.21511/imfi.23(4).2026.01
DOI	http://dx.doi.org/10.21511/imfi.23(4).2026.01
RELEASED ON	Wednesday, 30 September 2026
RECEIVED ON	Tuesday, 07 July 2026
ACCEPTED ON	Friday, 11 September 2026
LICENSE	 This work is licensed under a Creative Commons Attribution 4.0 International License
JOURNAL	"Investment Management and Financial Innovations"
ISSN PRINT	1810-4967
ISSN ONLINE	1812-9358
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

		
NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
53	2	13

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BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine
www.businessperspectives.org

Type of the article: Research Article

Received on: 7th of July, 2026

Accepted on: 11th of September, 2026

Published on: 30th of September, 2026

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Conflict of interest statement:

Author(s) reported no conflict of interest

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SETTLEMENT SPEED, DIGITAL CHANNELS, AND THE COST OF REMITTANCES IN THE WORLD ECONOMY

Abstract

The cost of sending remittances remains above the 3% target of Sustainable Development Goal 10.c.1 even as digital technologies reshape cross-border payments. This study asks which dimension of the digital transformation of remittance markets is associated with lower costs and whether the association survives provider identity. Using the World Bank Remittance Prices Worldwide database (202,851 quotations, 372 corridors, 2016–2025), the study estimates fixed-effects models at the quotation and corridor-year levels with corridor $\times$ quarter and provider fixed effects. Three findings emerge. At the market level, corridors shifting toward instant settlement record lower costs ($b = -1.12$ percentage points, so a 10-point higher instant share corresponds to about 0.11 points), an association that runs through incumbent cash prices, survives stable provider sets, and is concentrated after 2022. At the quotation level, the instant discount (-0.44) reflects provider composition. Money transfer operators supply 94% of instant quotations at half the mean price of banks; within providers, speed carries a premium that eroded from 1.5 points in 2016 to -0.9 in 2025. What providers price lower is digital delivery (-0.9); mobile money is cheapest throughout (-2.85). The discount holds across developing destinations and reverses in high-income ones. Ukraine, Armenia, and Kazakhstan illustrate these margins at different adoption stages, where each point saved supports household resilience, economic security, and human capital. The results support faster end-to-end settlement, complemented by provider presence in low-income corridors, as the margins are associated with lower remittance costs.

Keywords

remittance costs, digital transformation, instant payments, world economy, financial inclusion, economic security, human capital

JEL Classification

F24, G23, J24

INTRODUCTION

Remittances have become one of the largest and most resilient sources of external finance for the developing world. Officially recorded flows to low- and middle-income economies reached an estimated USD 685 billion in 2024, exceeding foreign direct investment and official development assistance combined (Ratha et al., 2024). For millions of recipient households, these transfers underwrite consumption, schooling, health spending, and resilience to shocks, and in several economies, they finance a substantial share of national income (Ratha et al., 2024). The efficiency of the channels through which this money travels is therefore not a narrow technical matter but a first-order development question for the world economy.

Yet moving money across borders remains expensive. In the first quarter of 2025, the global average cost of sending USD 200 stood at 6.49 percent (World Bank, 2025b), more than double the 3 percent ceiling set by Sustainable Development Goal 10.c.1, which also commits countries to eliminating every corridor priced above 5 percent by 2030

(United Nations, 2024). The burden is deeply uneven. Sending money to Sub-Saharan Africa averaged 8.78 percent, and bank transfers 14.55 percent (World Bank, 2025b). Because these charges fall on comparatively low-income senders, each percentage point represents resources diverted from the households that remittances are meant to support. Digital channels are consistently cheaper. The digital remittances index stood at 4.85 percent (World Bank, 2025b), signaling that digital transformation of the market is central to closing the gap to the SDG target.

That transformation is reshaping the industry along several fronts at once, spanning the digitization of sending and receiving, the spread of near-instant settlement, the entry of fintech and mobile-money providers, and intensifying competition. These features are routinely bundled under the single label of “digitalization,” yet they are economically distinct, and neither policy debate nor the existing evidence base has clearly established which of them actually lowers the price paid by senders. Resolving this ambiguity matters because interventions aimed at the wrong margin may absorb resources without moving costs toward the SDG target. This study addresses the gap by using the World Bank’s Remittance Prices Worldwide microdata to separate these dimensions across 372 corridors over 2016–2025, asking which feature of the digital transformation is most closely associated with lower costs of sending money across the world economy, whether the association survives provider identity, and for which economies it is strongest. Ukraine, Armenia, and Kazakhstan, three remittance-receiving economies at markedly different stages of instant-settlement adoption, serve as illustrative cases in which the answer carries immediate stakes for household resilience, economic security, and human capital.

1. LITERATURE REVIEW

The economics of remittance pricing has developed from macro-level analyses of flows into an increasingly granular study of what cross-border transfers cost and why. Early evidence established that remittances deepen the financial systems of receiving economies, raising bank deposits and credit relative to GDP across the developing world (Aggarwal et al., 2011). A parallel line showed that recorded flows respond to prices themselves, with lower transaction costs pulling transfers from informal into formal channels and fees constituting the dominant share of the total cost of small transfers (Freund and Spatafora, 2008). The first systematic corridor-level examination attributed cheaper transfers to more intense provider competition and larger corridor scale, with bank-dominated corridors remaining the most expensive (Beck & Martínez Pería, 2011). Panel evidence a decade later confirmed that fees persist above international reduction targets and linked them to market concentration on one side and technology diffusion on the other (Beck et al., 2022). The development stakes of this price wedge extend well beyond finance. Remittance inflows alter labor supply and reduce employment, particularly among women, in post-transition economies (Peković, 2025); they interact with investment, emigration, and tourism

in shaping growth (Nikšić Radić & Bogdan, 2024); they finance household consumption to the point of raising carbon emissions in the largest recipient economies (Khatri et al., 2025); and they feed entrepreneurship and financial inclusion in migrants’ countries of origin (Mafruhah & Istiqomah, 2024). What this literature establishes firmly is that the price of remittances matters; what it leaves unclear is which feature of the ongoing digital transformation actually moves that price.

A second strand examines the demand side of digital payments and finds adoption governed by perception, trust, and capability rather than by price alone. Cross-border payment preferences among expatriates are shifting toward instant, QR-based schemes settled in national currencies, although regulatory frictions still allow incumbent card networks to dominate on speed and trust (Kurniawan & Achjari, 2024). Perceived security and usefulness emerge as central to customers’ acceptance of digital payment systems (Adhikari et al., 2025), while satisfaction fully mediates loyalty to mobile wallets, with rural users prioritizing trust in the platform and urban users responding to regulatory awareness (Thi Nguyen et al., 2026). Payment habits formed in daily life, however, carry surprisingly little over to the choice of a remittance channel specifically (Kosse & Vermeulen, 2014). On the inclu-

sion margin, digital financial inclusion strengthens financial literacy and well-being and, through them, the sustainability of small enterprises (Ratnawati et al., 2025), and inclusion conditions the literacy-welfare link among rural households (Mangudhla et al., 2025). Education stands out as a robust determinant of account ownership (Kuzior et al., 2022). Broader access is nonetheless double-edged. Microcredit expansion without financial literacy pushes borrowers into over-indebtedness (Thapa et al., 2025), and stable household saving ultimately rests on income, fiscal, and financial-development fundamentals (Alsubaie, 2025). At the infrastructure level, fintech penetration measured by ATM and internet coverage raises human development, with the strongest effects in middle-income economies (Ananzeh et al., 2025). Adoption and inclusion studies thus explain who uses digital financial services; they say little about what those services charge.

On the supply side, the digital transformation of financial institutions is documented mainly as an organizational and institutional process whose price consequences remain unmeasured. Banking-ecosystem digitalization clusters countries in ways that cut across conventional income boundaries (Abbasova et al., 2025), and banks allocate explicit investment budgets to personalization and artificial intelligence (Rysin et al., 2023), with digital advances reshaping corporate management practice more broadly (Krap et al., 2024). Readiness studies in insurance point to leadership, IT resources, and staff preparedness as the binding constraints (Al-Smadi, 2025), while sectoral resilience still rests on classical liquidity and solvency fundamentals (Ige-Gbadeyan & Swanepoel, 2025). Transformation succeeds where employee engagement and trust in leadership are secured (Hernik et al., 2025), regulatory design is being rethought toward integrated resilience oversight (Morin, 2025), and bibliometric mapping traces the same shift in accounting systems (Asare, 2026). Corporate reporting is moving in the same direction, with financial information presented in digital formats for analysis and audit (Shygun et al., 2023) and sustainability disclosure treated as an instrument of social responsibility (Shygun & Bezverkhyi, 2026). The distributional dimension is visible among firms. Under market disruption, undercapitalized enterprises face financial stratification and borrow at consumer rates while capitalized peers retain access to cheap funds (Sartamorn et al., 2025). For Ukraine,

the digitalization of finance is credited with shrinking the shadow economy and supporting financial stability (Bozhenko et al., 2024), and anti-crisis liquidity frameworks are proposed to keep the banking system, through which transfers are ultimately received, operational under stress (Vakhovych et al., 2023). Whether any of this institutional change reaches end users as lower prices is assumed more often than tested.

In the three economies highlighted in this study, the cost of moving money intersects directly with economic security and human capital. For Ukraine, economic security is analyzed through export capacity and import dependence (Tsymbal & Demediuk, 2025) and through the institutional mechanisms that hold the system together under extreme shocks (Stadnichuk et al., 2025); a persistent institutional gap still separates the country from mature European markets (Kyzenko et al., 2026). Demographic and migration shifts compound these pressures (Zahorodnia et al., 2026), so retraining and lifelong learning (Yeremenko, 2026) and dual education models (Davlikanova, 2025) are advanced as instruments for preserving human capital, while innovative digital public services are associated with lower corruption (Yefimenko et al., 2025), which analytical anti-corruption procedures are designed to reinforce at the enterprise level (Parasii-Verhunencko et al., 2024). Enterprises respond with digital anti-crisis management tools (Mykhalchenko et al., 2023) and with adaptation strategies to the digital transformation of the economy (Galoyan et al., 2023); adaptation to extreme business shocks has become a research object in its own right (Sitnicka & Serhienko, 2025). In Armenia, digital logistics is proposed as a route around geographic isolation toward regional integration (Mkrtchyan et al., 2026). In Kazakhstan, regional income inequality persists, widened by income concentration and unemployment and narrowed by social support floors (Kurmanov et al., 2026). Across Central and Eastern Europe more broadly, education, migration, and labor markets form a tightly coupled chain (Mukhtarova et al., 2024); immigration raises income per capita only under particular economic models (Yeremenko et al., 2025); growth is inclusive only under identifiable structural conditions (Saher et al., 2025); and affordable fintech-based remittances stabilize migrant employment itself (Privara, 2025). For households in these economies, every percentage point of transfer

cost is a tax on the resources that sustain security and human capital, yet none of this work identifies which technological margin sets that price.

Against this background, the gap is specific. Existing pricing studies rely on corridor-average prices collected from a few large operators rather than on substantially more granular firm-level quotation data (Freund & Spatafora, 2008), so within-corridor price dispersion, and the provider composition behind it, remain unobserved. “Digitalization” typically enters as an aggregate index or a binary cash/non-cash distinction, leaving settlement speed, the breadth of digital channels, mobile money, provider presence, and the role of provider business models unseparated (Abbasova et al., 2025; Ananzeh et al., 2025). The total price has not been decomposed into its transaction-fee and exchange-rate-margin components within a unified microdata design, and the heterogeneity of any cost association across destination income groups remains untested. The present study addresses these four gaps jointly. It exploits 202,851 firm-level quotations across 372 corridors over 2016–2025 with corridor $\times$ quarter fixed effects, estimated with and without provider fixed effects, to separate the association of instant settlement with price from digital-channel breadth, mobile money, provider presence, and the composition of provider types; decomposes the total cost into its fee and exchange-rate-margin components; and re-estimates the associations within destination income groups. In sum, the literature demonstrates that remittance costs carry first-order development consequences and that digital transformation is reshaping both the demand and the supply side of transfer services. What it has not established is which specific component of that transformation lowers the price paid by senders. This study addresses that question.

2. DATA AND METHODOLOGY

2.1. Data

The analysis draws on the World Bank Remittance Prices Worldwide (RPW) database, which records the price of sending money along major remittance corridors. Each observation is a firm-level price quotation for sending the equivalent of USD 200 (the benchmark amount underlying SDG indicator 10.c.1), reported with the total cost as a

percentage of the principal, comprising the transaction fee and the foreign-exchange margin. The sample spans 37 quarterly collection rounds from the second quarter of 2016 to the third quarter of 2025 (the extract contains no round for the second quarter of 2025). Quotations with missing key fields or with a total cost outside the 0–50% range are excluded, leaving 202,851 quotations from 709 providers across 372 corridors linking 49 sending and 105 receiving economies; Appendix A lists all 134 sampled economies by role and income group.

RPW measures the exchange-rate margin as the percentage difference between the rate applied by the provider and an interbank reference rate observed on the collection date, so the margin is negative whenever the provider offers a more favorable rate than the reference, most often in destinations where official and market exchange rates diverge, and RPW substitutes alternative reference rates (World Bank, 2025c). Negative margins cover 3.9% of quotations and only 0.7% fall below -1 percentage point; excluding them or setting them to zero leaves all results essentially unchanged (Appendix C).

The destination income classification embedded in the RPW extract is time-varying and follows the annual July updates of the World Bank, so 41 of the 105 receiving economies change group at least once within the sample. For the heterogeneity analysis, each economy is therefore assigned its modal group over 2016–2025, with the time-varying and latest-observation classifications retained as robustness checks, and one label variant in the raw extract (Lower income) is harmonized to Low income (1,434 quotations). Appendix A reports each economy’s modal group and flags those whose group changed within the sample period.

2.2. Variables

The dependent variable is the total cost of sending USD 200 (percent of principal). Three indicators capture the digital transformation of the service, all coded from each quotation’s product attributes. An instant dummy equals one when settlement completes in under one hour; a digital-pickup dummy equals one when funds are received into an account or wallet rather than collected in cash; and a mobile-money dummy equals one when either leg of the transfer uses mobile money. Each

Table 1. Variable definitions

Variable	Level	Definition
Total cost	Quotation / corridor-year	Cost of sending USD 200, % of principal (fee + FX margin); SDG 10.c.1 measure
Transaction fee	Quotation / corridor-year	Fee component of total cost, % of principal
FX margin	Quotation / corridor-year	Exchange-rate-margin component of total cost, % of principal
Instant	Quotation	= 1 if settlement is completed in under one hour
Digital pickup	Quotation	= 1 if funds are received into an account or wallet (not cash)
Cash pickup	Quotation	= 1 if funds are collected in cash; complement of digital pickup
Digital sending instrument	Quotation	= 1 if the transfer is funded by a non-cash instrument rather than cash
Mobile money	Quotation	= 1 if either leg of the transfer uses mobile money
Quarter	Quotation	RPW quarterly collection round (2016Q2 to 2025Q3); defines the corridor × quarter cells
Provider	Quotation	Identity of the remittance service provider; enters equation (2) as fixed effects
Provider type	Quotation	RPW provider category (money transfer operator, bank, mobile operator, post office)
Instant share	Corridor-year	Share of quotations that are instant
Digital share	Corridor-year	Share of quotations with digital pickup
Mobile-money share	Corridor-year	Share of quotations using mobile money
Observed providers	Corridor-year	Number of distinct providers with at least one quotation in the corridor and year; a proxy for provider presence, not for market concentration
Providers	Corridor-year	Number of distinct providers active in the corridor
Cash-channel cost	Corridor-year	Mean total cost of quotations paid out in cash; dependent variable in the baseline corridor-level model
Digital-channel cost	Corridor-year	Mean total cost of quotations credited to an account or wallet
Destination income	Receiving economy	World Bank income group
Destination income	Receiving economy	Modal World Bank income group over 2016–2025; time-varying classification used as robustness

quotation also carries the identity of the provider and its type (money transfer operator, bank, mobile operator, post office), which the analysis uses to separate service attributes from provider business models. Aggregated to the corridor-year level, the indicators become the share of quotations that are instant, the share with digital pickup, and the share using mobile money, while the number of distinct observed providers quoting in a corridor proxies provider presence; RPW does not record market shares, so this count is not a measure of market concentration. The total cost is additively split into a transaction-fee component and an exchange-rate-margin component, used in the decomposition analysis. Table 1 defines all variables.

2.3. Model specification

Cost differences across service types are estimated at the quotation level with corridor × quarter fixed effects, so that all time-invariant corridor characteristics and all shocks common to a collection round are absorbed, and identification rests on differences between competing quotations observed in the same corridor and quarter:

$$\begin{aligned} cost_{i,f,c,q} = & b_1 Instant_{i,f,c,q} \\ & + b_2 DigitalPickup_{i,f,c,q} \\ & + b_3 MobileMoney_{i,f,c,q} + \delta_{cq} + \varepsilon_{i,f,c,q}, \end{aligned} \quad (1)$$

where $cost_{i,f,c,q}$ is the total cost of quotation i offered by provider f in corridor c and quarter q , b_1 to b_3 are unstandardized coefficients expressed in percentage points of cost, δ_{cq} is a full set of corridor × quarter fixed effects, and $\varepsilon_{i,f,c,q}$ is the idiosyncratic error term. Standard errors are clustered by corridor throughout.

Equation (2) augments this specification with provider fixed effects.

$$\begin{aligned} cost_{i,f,c,q} = & b_1 Instant_{i,f,c,q} \\ & + b_2 DigitalPickup_{i,f,c,q} \\ & + b_3 MobileMoney_{i,f,c,q} \\ & + \delta_{cq} + \varphi_f + \varepsilon_{i,f,c,q}, \end{aligned} \quad (2)$$

where φ_f absorbs everything constant about provider f , including its business model and pricing policy, and the strictest variant replaces φ_f with

provider $\times$ corridor effects φ_{fc} . In equation (2), the coefficients are identified from products of the same provider in the same corridor and quarter that differ in the relevant attribute, so the comparison of equations (1) and (2) separates a market-composition component, cheaper types of providers offering faster products, from the within-provider price of an attribute.

Market-level associations are estimated at the corridor-year level with separate corridor and year fixed effects:

$$\begin{aligned} \overline{cost}_{c,t} = & \gamma_1 \text{ObservedProviders}_{c,t} \\ & + \gamma_2 \text{DigitalShare}_{c,t} \\ & + \gamma_3 \text{InstantShare}_{c,t} + \mu_c + \lambda_t + \varepsilon_{c,t}, \end{aligned} \quad (3)$$

where the bar denotes the corridor-year mean cost, t indexes years, γ_1 to γ_3 are unstandardized coefficients in percentage points, μ_c and λ_t are corridor and year fixed effects, *ObservedProviders* is the number of distinct providers observed in the corridor, and the digital and instant shares are the corridor-year penetration measures. A coefficient of -1.12 on the instant share, for example, means that a 10-percentage-point rise in the share of instant quotations corresponds to about 0.11 percentage points lower mean cost. To reduce a mechanical composition effect, whereby the average falls simply because cheaper digital quotations enter the mix, the baseline corridor-level model uses the cost of the traditional cash channel as the dependent variable. This choice reduces channel-composition concerns rather than eliminating them, because the mix of providers and products within the cash channel can itself change, so Appendix C re-estimates it on providers observed throughout their corridor's sampling window. The same specification is re-estimated on the overall mean cost and within destination-income groups.

Heterogeneity across destination-income groups is assessed in two complementary ways. Separate estimates within each group are reported with the number of corridor clusters, p -values from the t distribution with $G-1$ degrees of freedom, where G is the number of clusters, and wild cluster bootstrap p -values (Rademacher weights, null imposed, 9,999 replications), because the smallest group rests on fewer than 25 corridors. Equality

of coefficients across groups is then tested with Wald tests on pooled specifications interacting the instant indicator, and at the corridor level the instant share and provider count, with income-group indicators.

2.4. Estimation and robustness

All models are estimated by ordinary least squares with high-dimensional fixed effects and corridor-clustered standard errors. A total of 135 quotations in singleton corridor-quarter cells are absorbed by the fixed effects, so the quotation-level estimation sample is 202,716; the corridor-level sample comprises 3,604 corridor-years, of which 3,564 contain cash quotations. Because fixed-effects coefficients are identified only by cells that contain both values of an indicator, Appendix E reports the identifying variation directly. The instant indicator varies within 87% of corridor-quarter cells, covering 95% of quotations and 365 of 372 corridors; digital pickup varies within 83% of cells (93% of quotations), mobile money within 27% of cells (35% of quotations, 186 corridors), and within provider $\times$ corridor $\times$ quarter cells, instant varies for 26% of quotations. Appendix C further checks the annual corridor $\times$ year specification, transparent-only quotations, the exclusion of high-income destinations, negative-margin treatments, logarithmic specifications, alternative income classifications, and a 2016–2021 versus 2022–2025 split. Multicollinearity is not a concern. The strongest correlation among the corridor-level regressors is -0.59 , and all variance-inflation factors are below 1.8, with the full correlation matrices reported in Appendix B.

2.5. Limitations

Four caveats apply. First, RPW covers only the corridors monitored by the World Bank, which over-represent larger and more formal corridors, so the sample is not the universe of remittance flows, and quotations reflect advertised prices for a fixed USD 200 benchmark that are not weighted by transaction volume. Second, the fixed-effects design identifies associations rather than causal effects, and reverse causation cannot be ruled out; corridors that are already cheaper may adopt instant settlement sooner. Third, the observed provider count reflects RPW survey coverage and does not measure mar-

ket concentration, market shares, or the intensity of price competition. Fourth, the instant indicator captures the end-to-end settlement speed of a product rather than the underlying infrastructure, which may be a domestic fast-payment system, a prefunded account network, card rails, or an internal arrangement of the provider.

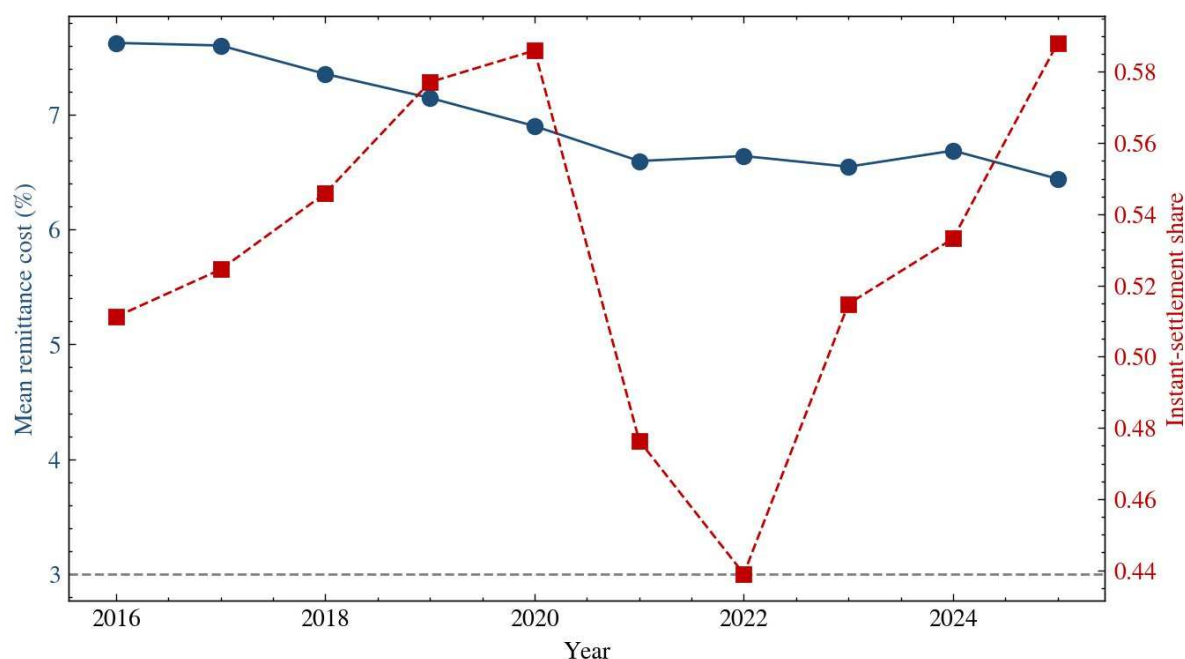
3. RESULTS

3.1. Descriptive statistics

The empirical sample comprises 202,851 firm-level price quotations covering 372 remittance corridors that link 49 sending and 105 receiving economies over 2016–2025, drawn from the World Bank Remittance Prices Worldwide database. The dependent variable is the total cost of sending USD 200, expressed as a percentage of the amount sent. The sample includes three remittance-receiving economies of direct relevance to this study. Ukraine, observed across six corridors, records a mean cost of 5.52% with an instant share of 0.52; Armenia, across two corridors, records 5.31% and 0.69; and the single Kazakhstani corridor, observed through 2021, records 1.41% and 0.85. Appendix D reports the full coverage.

Table 2 reports the descriptive statistics. At the quotation level, the average transfer cost is 6.53% (Panel A). Digital instruments are already widespread on the sending side, where 67.8% of quotations use a non-cash instrument, yet cash collection still dominates the receiving side, with 58.2% of quotations paid out in cash versus 41.8% credited to an account or wallet. Half of all quotations (50.0%) settle in under one hour, whereas mobile money remains a thin segment (5.1%). Aggregated to the corridor-year level (Panel B), the mean cost is 6.96%, the average corridor has 8.9 observed providers (ranging from 1 to 31), and instant settlement covers 53.0% of quotations on average.

Panel C shows that these attributes are distributed very unevenly across provider types. Money transfer operators supply 82.0% of all quotations at a mean cost of 5.73% and an instant share of 0.57, and they account for 94% of all instant quotations. Banks supply 16.6% of quotations at a mean cost of 10.59%, with an instant share of only 0.15 and a digital-pickup share of 0.79, so faster products and cheaper providers largely coincide by business model. Mobile operators are few but cheap (3.52%), and post offices resemble banks in speed but not in price.



Note: The dashed line marks the 3% SDG 10.c.1 target. The associations reported in Tables 3 and 4 are identified within corridors and collection rounds, not from these aggregate series.

Figure 1. Mean remittance cost and instant-settlement share across corridors, 2016–2025

Table 2. Descriptive statistics

Panel A. Quotation level (N = 202,851)					
Variable	Mean	SD	Min	Max	
Total cost, %	6.53	5.28	0.00	49.99	
Transaction fee, %	4.39	4.61	0.00	49.12	
FX margin, %	2.15	2.58	-13.08	42.58	
Digital pickup	0.42	0.49	0	1	
Digital sending instrument	0.68	0.47	0	1	
Instant	0.50	0.50	0	1	
Mobile money	0.05	0.22	0	1	
Cash pickup	0.58	0.49	0	1	

Panel B. Corridor-year level (N = 3,604)					
Variable	N	Mean	SD	Min	Max
Mean cost, %	3,604	6.96	3.68	0.69	30.17
Cash-channel cost, %	3,564	6.74	3.20	0.53	33.69
Digital-channel cost, %	3,112	7.00	5.06	0.24	43.64
Digital share	3,604	0.37	0.24	0.00	1.00
Instant share	3,604	0.53	0.24	0.00	1.00
Mobile-money share	3,604	0.04	0.09	0.00	0.67
Observed providers (count)	3,604	8.94	4.31	1	31
Quotations (count)	3,604	56.3	36.9	1	256

Panel C. Provider types (quotation level)					
Provider type	Share of quotations	Mean cost, %	Instant share	Digital-pickup share	Providers
Money transfer operator	0.820	5.73	0.57	0.34	462
Bank	0.166	10.59	0.15	0.79	253
Post office	0.008	5.94	0.06	0.70	10
Mobile operator	0.005	3.52	0.74	0.60	12
Other	0.001	16.66	0.13	0.50	4

Note: Panel A reports quotation-level statistics; Panel B aggregates quotations to the corridor-year level. Total cost is the cost of sending USD 200 as a percentage of the principal, the SDG 10.c.1 measure, and equals the sum of the transaction fee and the exchange-rate margin. Panel C groups quotations by the RPW provider category, with mixed categories assigned to their first-listed type; provider counts are distinct providers observed within each type, and a provider whose recorded type changes over the sample is counted under each type, so the column sums to more than the 709 distinct providers.

The cost of remittances declined steadily over the period, from a corridor-year average of 7.63% in 2016 to 6.44% in 2025, a fall of roughly 16% that coincided with the diffusion of faster settlement.

Figure 1 plots these series. The steady decline in cost contrasts with an aggregate instant-settlement share that rose on net but is sensitive to the changing composition of corridors sampled each year (notably a 2021–2022 dip).

3.2. Service-level cost differences and provider composition

Table 3 estimates quotation-level cost differences within corridor $\times$ quarter cells, so that all corridor characteristics and all shocks common to a collection round are absorbed; standard errors are clus-

tered by corridor. In the market-level specification of column (1), a digital receiving channel carries no robust cost advantage ($b = 0.206$, $p = 0.285$), an instant transfer costs about 0.44 percentage points less than a slower transfer offered in the same corridor and quarter ($b = -0.439$, $p < 0.001$), and mobile money is cheaper still ($b = -2.847$, $p < 0.001$). The corridor $\times$ year specification of the originally submitted version yields nearly identical estimates (Appendix C).

Columns (2) to (4) show that the instant discount of column (1) reflects who offers instant products rather than a within-provider price of speed. Once provider type fixed effects are added, the instant coefficient falls to 0.098 and loses significance; with provider fixed effects it turns positive ($b = 0.342$, $p < 0.001$), and it remains positive in the strictest provider $\times$ corridor specification ($b = 0.400$). The same

Table 3. Quotation-level cost regressions under alternative fixed effects

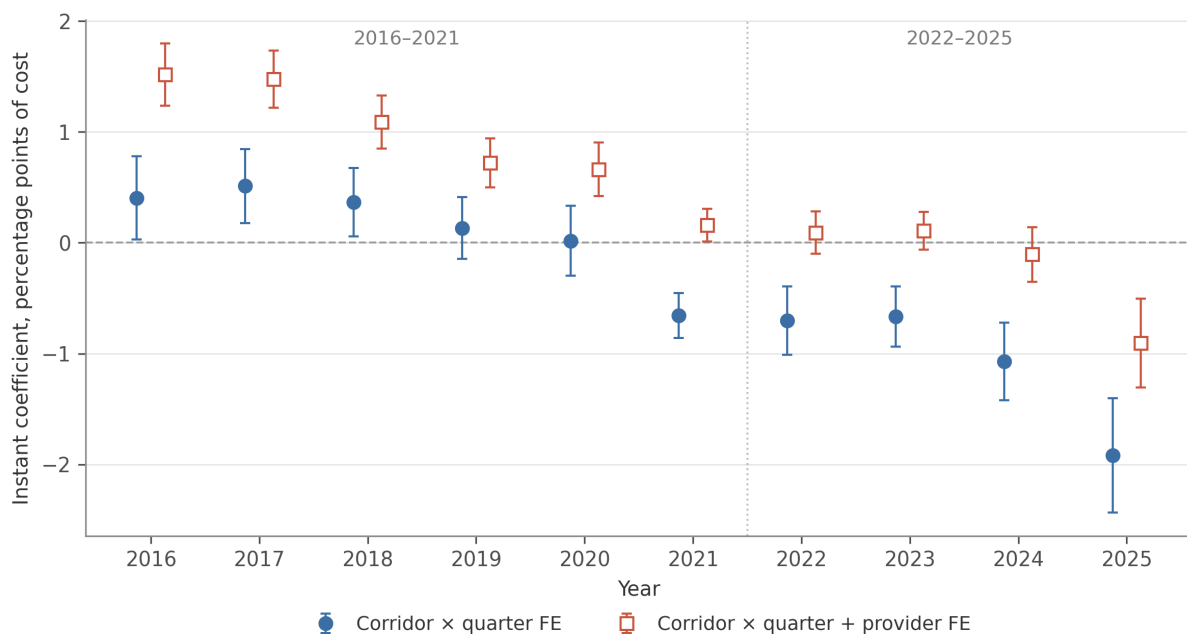
Dependent variable: total cost (%)	(1)	(2)	(3)	(4)
Digital pickup	0.206 (0.192)	-0.693*** (0.143)	-0.904*** (0.091)	-1.124*** (0.097)
Instant	-0.439*** (0.109)	0.098 (0.078)	0.342*** (0.059)	0.400*** (0.055)
Mobile money	-2.847*** (0.267)	-1.734*** (0.216)	-0.668*** (0.175)	-0.578*** (0.180)
Corridor × quarter FE	Yes	Yes	Yes	Yes
Provider type FE	No	Yes	No	No
Provider FE	No	No	Yes	No
Provider × corridor FE	No	No	No	Yes
Observations	202,716	202,716	202,712	202,520
Within-R ²	0.022	0.017	0.015	0.022

Note: Standard errors clustered by corridor (372 clusters) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the total cost of sending USD 200 (% of principal), the SDG 10.c.1 measure. Coefficients b are unstandardized, in percentage points of cost. Singleton fixed-effect cells are dropped from the estimation samples.

provider, selling in the same corridor and quarter, prices its faster product slightly above its slower one. What the provider prices below its other products is digital delivery, with the digital-pickup coefficient at -0.904 to -1.124 percentage points, and mobile money stays cheaper in every specification. The pattern matches the composition in Table 2, Panel C. Money transfer operators supply 94% of instant quotations at roughly half the mean price of banks, which supply 28% of non-instant quotations, so speed marks a low-cost business model at the market level while digital delivery is the attribute that is priced lower within providers.

3.3. The price of speed over time

Figure 2 traces the instant coefficient year by year and shows that the discount is a recent phenomenon. In the corridor × quarter specification, the coefficient is positive in 2016–2018 (up to 0.51), statistically zero in 2019–2020, and turns negative from 2021 onward, reaching -0.66 in 2021, -1.07 in 2024, and -1.92 in 2025. Within providers, the same movement appears as an eroding premium. The provider fixed-effects series starts at 1.52 in 2016, declines steadily, is indistinguishable from zero in 2022–2024, and turns negative (-0.91) in 2025, so

**Figure 2.** Estimated instant-settlement coefficient by year, 2016–2025

by the end of the sample even the same provider prices its instant product below its slower one.

A split of the sample confirms the shift. Over 2016–2021 the pooled instant coefficient is 0.04 ($p = 0.753$) and the corridor-level instant share is unrelated to the cash-channel cost (0.25, $p = 0.578$); over 2022–2025 the quotation-level coefficient is -0.94 ($p < 0.001$) and instant-share penetration is associated with a -1.56 point lower cash-channel cost ($p = 0.007$) and a -1.80 point lower mean cost ($p = 0.011$). Mobile money, by contrast, is equally cheap in both sub-periods (-2.83 and -2.92).

Note: Coefficients on the instant indicator interacted with year dummies, estimated on the full quotation sample with digital pickup and mobile money as controls. Circles use corridor $\times$ quarter fixed effects; squares add provider fixed effects. Bars are 95% confidence intervals from corridor-clustered standard errors; the dotted line separates 2016–2021 from 2022–2025.

3.4. Corridor-level results

Table 4 moves to the corridor-year level with corridor and year fixed effects. To reduce mechanical composition effects, columns (1) to (3) use the cost of the traditional cash channel as the dependent variable, so that the regressors capture market-level pressure on incumbent prices. Instant-settlement penetration is associated with a significantly lower cash-channel cost ($b = -0.884$,

$p = 0.012$). The number of observed providers carries the expected negative sign but is only marginally significant ($b = -0.053$, $p = 0.098$), and the digital share enters positively ($b = 1.395$, $p = 0.044$ in column 2), consistent with cash becoming a higher-priced niche as digital options absorb volume. For the overall corridor cost (column 4), instant penetration is again associated with lower cost ($b = -1.123$, $p = 0.002$), so a 10-percentage-point rise in the instant share corresponds to about 0.11 points lower mean cost.

Columns (5) and (6) probe the remaining composition concern within the cash channel. Recomputing the cash-channel cost only from providers observed throughout their corridor's sampling window leaves the association intact ($b = -1.043$, $p = 0.003$), but holding the provider $\times$ product mix fixed eliminates it ($b = 0.184$, $p = 0.699$). The market-level association is therefore consistent with incumbents renewing their product lines rather than repricing unchanged products, although a null coefficient on a smaller sample is weaker evidence than the estimates in columns (3) to (5).

3.5. Heterogeneity by destination income

Table 5 assigns each receiving economy its modal World Bank income group over 2016–2025 and re-estimates the models within groups; because the smallest group contains only 16 corridors, the

Table 4. Corridor-year cost regressions (corridor and year fixed effects)

Variable	Cash cost (1)	Cash cost (2)	Cash cost (3)	Mean cost (4)	Stable providers (5)	Stable products (6)
Observed providers	-0.032 (0.031)	-0.046 (0.032)	-0.053^* (0.032)	-0.021 (0.033)	0.002 (0.037)	-0.007 (0.041)
Digital share		1.395^{**} (0.690)	0.976 (0.751)	1.269 (1.091)	0.579 (0.761)	1.235 (0.757)
Instant share			-0.884^{**} (0.351)	-1.123^{***} (0.359)	-1.043^{***} (0.347)	0.184 (0.475)
Observations	3,564	3,564	3,564	3,604	3,478	3,049
Within- R^2	0.001	0.007	0.013	0.019	0.010	0.003
Corridor & year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors clustered by corridor in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the cash-channel cost in columns (1)–(3), (5) and (6) and the corridor-year mean cost in column (4), each as a percentage of the principal. Forty corridor-years without cash quotations are dropped from the cash-channel columns. Column (5) recomputes the cash-channel cost from providers observed in every year in which their corridor is sampled; column (6) additionally holds the provider $\times$ product combination fixed, where a product is defined by the sending instrument, settlement speed, and mobile-money attributes. Coefficients b are unstandardized, in percentage points of cost.

table reports cluster counts, p-values from the t distribution with G-1 degrees of freedom, and wild cluster bootstrap p-values. At the quotation level (Panel A) the instant coefficient is negative and significant in all three developing groups, at −1.337 for low-income, −0.981 for lower-middle-income, and −0.478 for upper-middle-income destinations, and it reverses to 1.048 in the small high-income segment. Formal tests (Panel C), however, show that the three developing-group coefficients

are statistically indistinguishable, with pairwise p-values from 0.066 to 0.574 and a joint equality p-value of 0.125, so the data support a robust contrast between developing and high-income destinations rather than a monotonic income gradient.

At the corridor-year level (Panel B) instant penetration is significantly associated with a lower cash-channel cost only for lower-middle-income destinations ($b = -0.991$, $p = 0.015$, bootstrap

Table 5. Heterogeneity by destination income group (modal classification)

Panel A. Quotation level (dependent variable: total cost; corridor × quarter FE)						
Destination income		Instant b (SE)	p (t, G-1)	p (wild bootstrap)	Obs.	Clusters
Low income		−1.337 (0.614)	0.034	0.046	17,391	53
Lower middle income		−0.981 (0.166)	< 0.001	< 0.001	120,553	196
Upper middle income		−0.478 (0.217)	0.030	0.029	55,248	106
High income		1.048 (0.247)	0.001	0.003	9,524	16

Panel B. Corridor-year level (dependent variable: cash-channel cost; corridor and year FE)						
Destination income	Variable	b (SE)	p (t, G-1)	p (wild bootstrap)	Obs.	Clusters
Low income	Instant share	−1.052 (0.797)	0.193	0.230	520	54
	Observed providers	−0.433 (0.169)	0.013	0.011	520	54
Lower middle income	Instant share	−0.991 (0.402)	0.015	0.015	1,890	193
	Observed providers	0.006 (0.030)	0.847	0.850	1,890	193
Upper middle income	Instant share	−0.576 (0.751)	0.445	0.458	1,006	106
	Observed providers	−0.035 (0.074)	0.638	0.746	1,006	106
High income	Instant share	−0.458 (3.546)	0.899	0.901	148	16
	Observed providers	−0.137 (0.162)	0.412	0.433	148	16

Panel C. Wald tests of coefficient equality across groups (pooled models with interactions)			
Level	Test	Difference (SE)	p
Quotation	Instant, Low = Lower middle	−0.356 (0.631)	0.574
Quotation	Instant, Low = Upper middle	−0.858 (0.646)	0.185
Quotation	Instant, Lower middle = Upper middle	−0.503 (0.272)	0.066
Quotation	Instant, Upper middle = High	−1.526 (0.323)	< 0.001
Quotation	Joint: Instant equal across the three developing groups	$\chi^2 = 4.16$	0.125
Corridor-year	Instant share, Low = Lower middle	−0.061 (0.884)	0.945
Corridor-year	Instant share, Lower middle = Upper middle	−0.415 (0.851)	0.626
Corridor-year	Observed providers, Low = Lower middle	−0.439 (0.170)	0.010
Corridor-year	Observed providers, Low = Upper middle	−0.398 (0.183)	0.030

Note: Each economy is assigned its modal income group over 2016–2025 (Appendix A); results under the time-varying and latest-observation classifications are similar (Appendix C). Panels A and B report separate regressions within groups; standard errors are clustered by corridor, p-values use the t distribution with G-1 degrees of freedom, where G is the number of corridor clusters in the estimation sample, and wild cluster bootstrap p-values use Rademacher weights with the null imposed and 9,999 replications. Panel C reports Wald tests from pooled models that interact the regressors with income-group indicators (quotation level with corridor × quarter FE; corridor level with corridor and year × group FE); p-values use t(G-1) and, for the joint test, the χ^2 distribution. Coefficients b are unstandardized, in percentage points of cost.

$p = 0.015$), whereas the count of observed providers matters only for low-income destinations ($b = -0.433$, $p = 0.013$, bootstrap $p = 0.011$), where it also differs significantly from the lower-middle-income and upper-middle-income coefficients ($p = 0.010$ and 0.030). Provider presence and instant penetration thus bind in different, and in both cases developing, parts of the income distribution.

3.6. Decomposition of the total cost into fees and exchange-rate margins

Table 6 splits the total cost into its transaction-fee and exchange-rate-margin components. In the market-level specification, the instant association runs through fees. An instant quotation carries a 0.68-point lower fee and a 0.24-point higher margin, which sum to the -0.44 total difference, so instant services compete on headline fees while recovering a smaller part on the exchange rate. Mobile money is a pure fee discount (-2.93), and digital pickup carries higher fees and lower margins in roughly offsetting measure. Once provider fixed effects are added, the components mirror the composition finding of Table 3. Within providers the faster product carries a slightly higher fee (0.27) and margin (0.07), whereas digital delivery carries lower values of both components (-0.54 and -0.36). At the corridor-year level, instant penetration is associated with lower average fees ($b = -0.758$, $p = 0.006$) but not margins, and the observed-provider count with a marginally lower margin ($b = -0.044$, $p = 0.053$). This decomposition documents the components through which the associations operate; it does not establish a causal mechanism.

3.7. Robustness

The three-level pattern is stable across specifications (Appendix C). The market-level instant estimates are essentially unchanged under the annual corridor $\times$ year fixed effects of the original submission, in the transparent-only sub-sample (-0.456), when high-income destinations are excluded (-0.509 at the quotation level, -0.819 for the cash channel, -1.102 for the mean cost), under alternative treatments of negative exchange-rate margins, with the provider count in logarithms (instant share -1.120 , $p = 0.002$), and with a log-transformed dependent variable (-0.180 , $p < 0.001$). The positive within-provider instant coefficient likewise persists in the transparent-only (0.328) and non-high-income (0.296) sub-samples, and the corridor-level association survives on stable provider sets while vanishing when the provider $\times$ product mix is held fixed. Across all specifications the absence of a broad digital-channel discount at the market level, the within-provider discount on digital delivery, and the unconditional cheapness of mobile money persist.

4. DISCUSSION

The central quotation-level finding, that the instant discount dissolves once provider identity is held fixed, refines rather than overturns the price-determinants literature. Beck and Martínez Pería (2011) attributed expensive corridors to bank dominance; the present estimates locate the same divide inside corridors, where banks form the slow and expensive segment while money trans-

Table 6. Cost decomposition into transaction fee and exchange-rate margin (quotation level)

Variable	Fee (1)	FX margin (2)	Fee (3)	FX margin (4)
Digital pickup	0.746*** (0.173)	-0.540*** (0.066)	-0.539*** (0.074)	-0.364*** (0.048)
Instant	-0.676*** (0.102)	0.238*** (0.039)	0.271*** (0.052)	0.071** (0.030)
Mobile money	-2.932*** (0.265)	0.085 (0.091)	-0.591*** (0.119)	-0.076 (0.122)
Corridor $\times$ quarter FE	Yes	Yes	Yes	Yes
Provider FE	No	No	Yes	Yes
Observations	202,716	202,716	202,712	202,712
Within- R^2	0.042	0.023	0.010	0.006

Note: Standard errors clustered by corridor (372 clusters) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variables are the transaction-fee and exchange-rate-margin components of the total cost (% of principal); the two components sum to the total cost. Coefficients b are unstandardized, in percentage points.

fer operators supply nearly all instant products at far lower prices, so settlement speed marks a business model rather than commanding a discount of its own. The within-provider premium on speed, which erodes from a sizeable markup at the start of the sample to a small discount by its end, is consistent with technology diffusion observed at the level of an individual price list, and it complements panel evidence that diffusion compresses fees, while concentration sustains them (Beck et al., 2022). The pattern also sharpens the reading of demand-side studies. Since migrants respond to perceived rather than full costs (Kosse and Vermeulen, 2014), providers could in principle recover visible discounts through less visible margins; within providers, however, the faster product carries slightly higher fees and margins alike, so the perceived-cost channel appears to operate through the choice of provider rather than through pricing within a provider's menu. Where regulatory frictions and entrenched networks keep incumbents dominant on speed and trust (Kurniawan & Achjari, 2024), such premia can persist, and their erosion here is consistent with the entry and scaling of specialized operators over the sample period.

At the market level, the association between instant penetration and lower incumbent cash prices, which survives stable provider sets but vanishes once the provider and product mix is held fixed, is consistent with competitive pressure travelling through the renewal of incumbents' product lines rather than through the repricing of unchanged products. This is a product-level counterpart to the corridor evidence linking cheaper transfers to technology diffusion (Beck et al., 2022), and it operates on the component that dominates the cost of small transfers, the fee rather than the exchange-rate margin (Freund & Spatafora, 2008). The two results on digital breadth are complementary rather than contradictory. Broad digital availability carries no market-level discount once corridor and collection round are fixed, yet digital de-

livery is precisely the attribute that providers price below their own cash products, so infrastructure accounts of cheaper access hold within price lists even where they fail in corridor aggregates. The conditional role of observed provider presence, confined to low-income corridors, contrasts with the unconditional competition effect reported for the 2000s (Beck & Martínez Pería, 2011); the unit of analysis, the far lower baseline margins of 2016–2025, and the distinction between provider presence and market concentration plausibly account for the difference. The developing-versus-high-income contrast in the instant association, with no detectable gradient among the developing groups themselves, parallels the finding that fintech yields its largest returns outside mature high-income systems (Ananzeh et al., 2025).

The three receiving economies highlighted in this study illustrate these margins without testing them. Their corridor sets differ in origins, periods, and provider composition; the cheapest corridors of all three are Russian-origin corridors observed only through 2021, and Ukraine's corridor set itself changes after 2022 as one origin exits coverage and another enters, so the cross-country ordering of costs and instant shares is a descriptive backdrop rather than independent confirmation of the corridor-level estimates. Kazakhstan's position is at least consistent with evidence that its banking ecosystem clusters with more digitalized peers (Abbasova et al., 2025), and the welfare stakes of the comparison follow from evidence that affordable fintech transfers stabilize migrants' employment and thereby the flows themselves (Privara, 2025). A final boundary concerns policy inference. The RPW speed variable characterizes the end-to-end settlement of a product, which may run over domestic fast-payment systems, prefunded accounts, card rails, or providers' internal arrangements, so the results support faster settlement and, in low-income corridors, broader provider presence as margins associated with lower costs, while remaining silent on which specific infrastructure investment delivers them.

CONCLUSION

This study set out to identify which dimension of the digital transformation of remittance markets is associated with lower transfer costs and whether that association survives provider identity. Drawing on 202,851 firm-level quotations across 372 corridors linking 49 sending and 105 receiving economies

over 2016–2025 from the World Bank Remittance Prices Worldwide database, it estimated fixed-effects models at the quotation and corridor-year levels, with corridor $\times$ quarter and provider fixed effects and corridor-clustered inference.

Three results emerge. Corridors shifting toward instant settlement record lower costs, by about 1.12 percentage points of the mean cost for a full shift, an association that runs through incumbent cash prices and fees, survives stable provider sets, and is concentrated after 2022. The quotation-level instant discount of 0.44 points reflects provider composition, since money transfer operators supply 94% of instant quotations at half the price of banks, while within providers, speed carries a premium that eroded from 1.5 points in 2016 to a 0.9-point discount in 2025. What providers price below their own alternatives is digital delivery, at about 0.9 points, and mobile money remains the cheapest instrument in every specification, while the instant association holds across developing destinations, reverses in the high-income segment, and coexists with a provider-presence association confined to low-income corridors.

For policy, the findings shift attention from digitalization as a label to the margins that are actually associated with lower prices. Faster end-to-end settlement, broader provider presence in low-income corridors, and the mobile-money channel emerge as reasoned priorities, though the data identify products' settlement speed rather than the underlying rails, so specific infrastructure choices remain implications rather than tested effects. Ukraine, Armenia, and Kazakhstan illustrate these margins at different stages of adoption, and in these remittance-receiving economies each percentage point saved supports household resilience, economic security, and human capital. With the global average cost still near 6.4%, the 3% target of Sustainable Development Goal 10.c.1 remains distant, and future work could extend the analysis to remittance volumes, provider entry dynamics, and the post-2022 reconfiguration of corridors.

AUTHOR CONTRIBUTIONS

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DATA AVAILABILITY

The data that support the findings of this study are publicly available and no new data were created. The analysis uses the World Bank Remittance Prices Worldwide database, distributed through the World Bank Data Catalog under a Creative Commons Attribution 4.0 license (World Bank, 2025a; accessed 9

June 2026), with the cost measure defined by the metadata for Sustainable Development Goal indicator 10.c.1 (United Nations, 2024) and the collection procedure set out in the RPW methodology (World Bank, 2025c). Appendix F documents the path from that source to the reported results.

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APPENDIX A. Economies in the sample

Appendix Table A1 lists the 134 economies in the sample, 105 receiving and 49 sending, of which 20 appear in both roles. The income group shown is the modal World Bank classification of the economy over 2016–2025, computed from the classification embedded in the RPW extract, which follows the annual July updates; economies whose group changed at least once within the sample period are marked with an asterisk. This modal classification is the one used in the heterogeneity analysis (Table 5).

Table A1. Economies in the sample by income group and role

Economy	Income group (modal)	Role
Afghanistan	Low income	Receiving
Albania	Upper middle income	Receiving
Algeria*	Upper middle income	Receiving
Angola	Lower middle income	Both
Armenia*	Upper middle income	Receiving
Australia	High income	Sending
Austria	High income	Sending
Azerbaijan	Upper middle income	Receiving
Bahrain	High income	Sending
Bangladesh*	Lower middle income	Receiving
Belarus	Upper middle income	Receiving
Belgium	High income	Sending
Benin*	Low income	Receiving
Bolivia	Lower middle income	Receiving
Bosnia and Herzegovina	Upper middle income	Receiving
Botswana	Upper middle income	Receiving
Brazil	Upper middle income	Both
Bulgaria*	Upper middle income	Receiving
Cabo Verde*	Lower middle income	Receiving
Cambodia	Lower middle income	Receiving
Cameroon	Lower middle income	Both
Canada	High income	Sending
Chile	High income	Sending
China	Upper middle income	Receiving
Colombia	Upper middle income	Receiving
Comoros*	Lower middle income	Receiving
Congo, Dem. Rep.*	Low income	Receiving
Costa Rica*	Upper middle income	Both
Croatia*	High income	Receiving
Cuba	Upper middle income	Receiving
Czechia	High income	Sending
Côte d'Ivoire	Lower middle income	Both
Dominican Republic	Upper middle income	Both
Ecuador	Upper middle income	Receiving
Egypt, Arab Rep.	Lower middle income	Receiving
El Salvador*	Lower middle income	Receiving
Eritrea	Low income	Receiving
Estonia	High income	Receiving
Eswatini	Lower middle income	Receiving
Ethiopia	Low income	Receiving
Fiji	Upper middle income	Receiving
France	High income	Sending
Gambia, The	Low income	Receiving
Georgia*	Upper middle income	Receiving
Germany	High income	Sending
Ghana	Lower middle income	Both

Table A1 (cont.). Economies in the sample by income group and role

Economy	Income group (modal)	Role
Guatemala*	Upper middle income	Receiving
Guyana*	Upper middle income	Receiving
Haiti*	Lower middle income	Receiving
Honduras	Lower middle income	Receiving
Hungary*	High income	Receiving
India	Lower middle income	Both
Indonesia*	Lower middle income	Receiving
Israel	High income	Sending
Italy	High income	Sending
Jamaica	Upper middle income	Receiving
Japan	High income	Sending
Jordan*	Lower middle income	Both
Kazakhstan	Upper middle income	Receiving
Kenya*	Lower middle income	Both
Korea, Rep.	High income	Sending
Kosovo*	Upper middle income	Receiving
Kuwait	High income	Sending
Kyrgyz Republic	Lower middle income	Receiving
Lao PDR	Lower middle income	Receiving
Latvia	High income	Receiving
Lebanon*	Upper middle income	Receiving
Lesotho	Lower middle income	Receiving
Liberia	Low income	Receiving
Lithuania	High income	Receiving
Madagascar	Low income	Receiving
Malawi	Low income	Receiving
Malaysia	Upper middle income	Both
Mali	Low income	Receiving
Mexico	Upper middle income	Receiving
Moldova*	Lower middle income	Receiving
Morocco	Lower middle income	Receiving
Mozambique	Low income	Receiving
Myanmar*	Lower middle income	Receiving
Namibia*	Upper middle income	Receiving
Nepal*	Lower middle income	Receiving
Netherlands	High income	Sending
New Zealand	High income	Sending
Nicaragua	Lower middle income	Receiving
Nigeria	Lower middle income	Both
North Macedonia	Upper middle income	Receiving
Norway	High income	Sending
Oman	High income	Sending
Pakistan	Lower middle income	Both
Panama*	High income	Receiving
Paraguay*	Upper middle income	Receiving
Peru	Upper middle income	Receiving
Philippines	Lower middle income	Receiving
Poland	High income	Both
Portugal	High income	Sending
Qatar	High income	Sending
Romania*	High income	Receiving
Russian Federation	Upper middle income	Sending
Rwanda	Low income	Both
Samoa*	Lower middle income	Receiving
Saudi Arabia	High income	Sending

Table A1 (cont.). Economies in the sample by income group and role

Economy	Income group (modal)	Role
Senegal*	Lower middle income	Both
Serbia	Upper middle income	Receiving
Sierra Leone	Low income	Receiving
Singapore	High income	Sending
Somalia	Low income	Receiving
South Africa	Upper middle income	Both
South Sudan*	Low income	Receiving
Spain	High income	Sending
Sri Lanka*	Lower middle income	Receiving
Sudan*	Low income	Receiving
Suriname	Upper middle income	Receiving
Sweden	High income	Sending
Switzerland	High income	Sending
Syrian Arab Republic*	Low income	Receiving
Tajikistan*	Low income	Receiving
Tanzania*	Lower middle income	Both
Thailand	Upper middle income	Both
Togo	Low income	Receiving
Tonga	Upper middle income	Receiving
Tunisia	Lower middle income	Receiving
Türkiye	Upper middle income	Both
Uganda	Low income	Receiving
Ukraine*	Lower middle income	Receiving
United Arab Emirates	High income	Sending
United Kingdom	High income	Sending
United States	High income	Sending
Uzbekistan	Lower middle income	Receiving
Vanuatu	Lower middle income	Receiving
Vietnam	Lower middle income	Receiving
West Bank and Gaza*	Lower middle income	Receiving
Yemen, Rep.*	Low income	Receiving
Zambia*	Lower middle income	Receiving
Zimbabwe*	Lower middle income	Receiving

Note: Role indicates whether an economy appears in the sample as a remittance destination (Receiving, 85 economies), an origin (Sending, 29), or both (20). An asterisk marks the 41 economies whose World Bank income group changed at least once within 2016–2025. By modal group over the sample period the counts are low income 21, lower middle income 41, upper middle income 36, high income 36. Counts by role and group are reported for the 134 unique economies; the 105 receiving and 49 sending totals overlap in the 20 dual-role economies.

APPENDIX B. Correlation matrices

Pairwise Pearson correlations among the model variables. Aside from the mechanical link between total cost and its fee component, correlations among the regressors are modest; the strongest, between the instant and digital-pickup shares, is -0.59 , consistent with variance-inflation factors below 1.8.

Table B1. Quotation-level correlations

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Cost	1.00						
(2) Fee	0.87	1.00					
(3) FX margin	0.49	0.00	1.00				
(4) Instant	-0.09	-0.15	0.09	1.00			
(5) Digital pickup	0.04	0.11	-0.10	-0.44	1.00		
(6) Digital send	-0.05	-0.07	0.01	-0.14	0.33	1.00	
(7) Mobile money	-0.08	-0.12	0.04	0.08	0.24	0.11	1.00

Table B2. Corridor-year correlations

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Cost	1.00						
(2) Fee	0.87	1.00					
(3) FX margin	0.52	0.03	1.00				
(4) Instant share	−0.16	−0.20	0.03	1.00			
(5) Digital share	0.15	0.21	−0.06	−0.59	1.00		
(6) Mobile-money share	0.02	−0.06	0.14	−0.04	0.15	1.00	
(7) Providers	−0.14	−0.09	−0.13	−0.29	0.38	−0.00	1.00

APPENDIX C. Robustness under alternative specifications

Table C1 collects the robustness checks. The market-level instant association is negative and stable across the annual specification of the original submission, transparent-only quotations, the exclusion of high-income destinations, both treatments of negative exchange-rate margins, logarithmic specifications, and stable provider sets, while it is absent within a fixed provider $\times$ product mix and in the 2016–2021 sub-period; the positive within-provider coefficient persists in every sub-sample in which it is estimated. The group pattern of Table 5 is unchanged under the alternative income classifications. With the latest-observation classification the pooled instant coefficients are −1.37, −1.00, and −0.62 in the three developing groups and 1.14 in the high-income group, and with the time-varying classification embedded in the extract they are −1.17, −0.97, −0.44, and 0.87.

Table C1. Robustness of the instant-settlement association

Specification	Variable	b	SE	p	N
Corridor $\times$ year FE (original submission), quotation	Instant	−0.432	0.106	< 0.001	202,847
Transparent-only quotations, quotation	Instant	−0.456	0.111	< 0.001	199,330
Transparent-only, provider FE, quotation	Instant	0.328	0.059	< 0.001	199,326
Excl. high-income destinations, quotation	Instant	−0.509	0.109	< 0.001	195,175
Excl. high-income, provider FE, quotation	Instant	0.296	0.057	< 0.001	195,171
Excl. quotations with FX margin < 0, quotation	Instant	−0.457	0.111	< 0.001	194,810
FX margin clipped at zero, quotation	Instant	−0.447	0.109	< 0.001	202,716
Excl. high-income destinations, corridor cash-channel cost	Instant share	−0.819	0.354	0.021	3,448
Excl. high-income destinations, corridor mean cost	Instant share	−1.102	0.367	0.003	3,488
Provider count in logarithms, corridor mean cost	Instant share	−1.120	0.360	0.002	3,604
Log(1 + cost) dependent variable, corridor mean cost	Instant share	−0.180	0.044	< 0.001	3,604
Stable providers (all years), corridor cash-channel cost	Instant share	−1.043	0.347	0.003	3,478
Stable providers (75% of years or more), cash-channel cost	Instant share	−0.928	0.333	0.006	3,542
Stable provider $\times$ product mix, cash-channel cost	Instant share	0.184	0.475	0.699	3,049
Sub-period 2016–2021, quotation	Instant	0.038	0.120	0.753	107,222
Sub-period 2022–2025, quotation	Instant	−0.943	0.138	< 0.001	95,494
Sub-period 2016–2021, corridor cash-channel cost	Instant share	0.253	0.454	0.578	2,172
Sub-period 2022–2025, corridor cash-channel cost	Instant share	−1.562	0.575	0.007	1,383

Note: Quotation-level rows use corridor $\times$ quarter fixed effects unless labeled otherwise; corridor-level rows use corridor and year fixed effects. Standard errors are clustered by corridor. Coefficients b are unstandardized, in percentage points of cost (log rows in log points)

APPENDIX D. Remittance-cost coverage for the illustrative receiving economies

Ukraine, Armenia, and Kazakhstan appear in the global sample as receiving economies. Table D1 reports their coverage by corridor and sub-period, splitting the sample at 2022. Coverage is uneven across the three economies and changes over time. The three cheapest corridors, all with the Russian

Federation as the origin, are observed only through 2021, one Ukrainian origin exits coverage after 2021, while Poland enters from 2022, and the single Kazakhstani corridor ends in 2021, so cross-country comparisons of averages describe different corridor sets and periods and serve as illustration rather than as evidence on the estimated associations.

Table D1. Coverage of the illustrative receiving economies by corridor and sub-period

Economy	Corridor (origin)	Period	Quotations	Mean cost, %	Instant share
Ukraine	Czechia	2016–2021	238	8.55	0.37
	Czechia	2022–2025	209	5.43	0.45
	Germany	2016–2021	225	6.55	0.36
	Germany	2022–2025	242	3.58	0.51
	Italy	2016–2021	374	5.22	0.44
	Italy	2022–2025	356	6.76	0.62
	Poland	2022–2025	142	3.92	0.55
	Russian Federation	2016–2021	67	1.92	0.70
	United States	2016–2021	205	5.45	0.75
	United States	2022–2025	279	4.39	0.58
Armenia	Russian Federation	2016–2021	69	1.55	0.88
	United States	2016–2021	186	6.15	0.73
	United States	2022–2025	179	5.89	0.59
Kazakhstan	Russian Federation	2016–2021	137	1.41	0.85

Note: Remittance Prices Worldwide covers only the corridors monitored by the World Bank. Totals over 2016–2025 are 2,337 quotations across six corridors for Ukraine (mean cost 5.52%, instant share 0.52), 434 across two corridors for Armenia (5.31%, 0.69), and 137 in the single Russia-Kazakhstan corridor observed through 2021 (1.41%, 0.85). By modal classification over the sample, Ukraine is lower middle income and Armenia and Kazakhstan are upper middle income.

APPENDIX E. Identifying variation behind the fixed-effects estimates

Fixed-effects coefficients are identified only by cells that contain both values of an indicator. Table E1 reports, for each indicator and each cell definition, the share of cells with within-cell variation, the share of quotations located in such cells, and the number of corridors contributing them. The corridors with within-cell mobile-money variation are concentrated in Sub-Saharan Africa (63), East Asia and Pacific (57), and South Asia (41), and by destination income in the lower-middle (107) and low-income (45) groups.

Table E1. Within-cell variation of the service indicators

Cell definition	Indicator	Cells varying, %	Quotations covered, %	Corridors
Corridor × year	Instant	91.1	97.0	367
	Digital pickup	85.2	94.3	347
	Mobile money	30.3	38.7	186
Corridor × quarter	Instant	87.3	95.2	365
	Digital pickup	83.2	93.3	347
	Mobile money	26.9	35.4	186
Provider × corridor × quarter	Instant	13.1	25.7	323
	Digital pickup	14.1	29.2	302
	Mobile money	3.0	7.8	149

Note: A cell varies when it contains at least one quotation with and one without the indicator. Quotations covered is the share of all 202,851 quotations located in varying cells; Corridors is the number of corridors containing at least one varying cell. Out of 372 corridors, 370 record at least one instant quotation, 350 at least one digital-pickup quotation, and 186 at least one mobile-money quotation.

APPENDIX F. From the raw RPW extract to the reported tables

The full analytical pipeline runs from a single public file to every reported estimate. Table F1 documents each step with the exact field names of the RPW extract, so the construction of the dataset, all derived variables, and all specifications can be reproduced from the public source without additional information. Estimation uses ordinary least squares with high-dimensional fixed effects, standard errors clustered by corridor, and the small-sample adjustment $G(N - 1)/((G - 1)(N - k))$; singleton fixed-effect cells are dropped. Wild cluster bootstrap p-values use Rademacher weights with the null imposed, 9,999 replications, and seed 42.

Table F1. Processing and estimation workflow

Step	Operation	Specification
1	Source	World Bank Remittance Prices Worldwide complete dataset, 2025Q3 release, worksheet covering the collection rounds from 2016Q2 (204,469 rows, 37 quarterly rounds, 2016Q2 to 2025Q3)
2	Time fields	year and quarter parsed from the field period (format YYYY_NQ)
3	Dependent variable and filters	cost = cc1 total cost % (USD 200 benchmark); drop rows with missing cost, year, corridor, destination_code, or pickup method; keep $0 \leq \text{cost} \leq 50$, leaving 202,851 quotations
4	Cost components	fx margin = cc1 fx margin; fee = cost – fx margin
5	Service indicators	cash pickup: pickup method equals Cash; digital pickup is its complement; digital sending instrument: payment instrument differs from Cash; mobile money: payment instrument contains Mobile money, or pickup method contains Mobile wallet, or access point contains Mobile phone; instant: speed actual contains less than one hour; transparency flag normalized from transparent
6	Provider fields and income groups	provider identity from firm and provider type from firm type; destination income from the classification embedded in the extract, with the label Lower income harmonized to Low income; each economy assigned its modal group over 2016–2025 for the heterogeneity analysis
7	Corridor-year aggregation	means of cost, fee, and margin; shares of instant, digital-pickup, and mobile-money quotations; observed providers as the count of distinct firms; cash-channel (digital-channel) cost as the mean cost of cash (non-cash) pickup quotations, giving 3,604 corridor-years
8	Quotation-level models	Tables 3 and 6 and Figure 2: cost, fee, or margin on the service indicators with corridor $\times$ quarter fixed effects, alone and with provider type, provider, or provider $\times$ corridor fixed effects; Figure 2 interacts the instant indicator with year indicators
9	Corridor-level models	Table 4: cash-channel or mean cost on observed providers, digital share, and instant share with corridor and year fixed effects; columns (5) and (6) recompute the dependent variable on stable provider and provider $\times$ product sets
10	Heterogeneity and inference	Table 5: models of steps 8 and 9 within modal income groups, with cluster counts, p-values from $t(G - 1)$, wild cluster bootstrap, and Wald tests on pooled interaction models
11	Robustness and appendices	Appendix C re-estimates steps 8 and 9 under the listed alternative samples and functional forms; Appendix B reports correlations of the step 7 variables; Appendix E counts within-cell variation; Table 2 and Figure 1 summarize the files of steps 3 and 7