

Remittances and Ghana's Economy

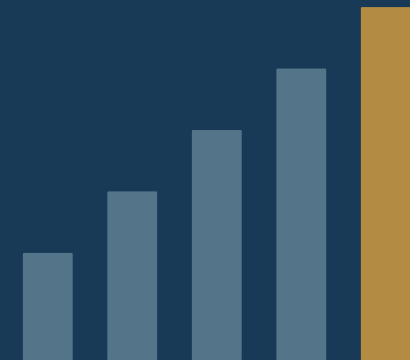
Consumption, Enterprise and Foreign Exchange

Household resources. Housing. Enterprise. FX supply.

Commissioning institution: Institute of Development and Economic Research (IDER)

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25 SEPTEMBER 2026

Dated evidence: 1991/92–August 2025
Scenarios: household / project / settlement

About this publication

Independent research • transparent evidence • reproducible calculations

TITLE AND SERIES

Remittances and Ghana's Economy: Consumption, Enterprise and Foreign Exchange

IDER's Ghana Macroeconomic Policy and Business Intelligence Briefings

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RESPONSIBILITY AND INTERPRETATION

The analysis is the responsibility of the author and IDER. This is not a World Bank or IMF publication. Published estimates are attributed; new calculations are descriptive or conditional. No new nationally representative causal estimate is claimed.

DATA, CODE AND ENQUIRIES

The companion archive provides source-labelled inputs, executable code, figure data, model assumptions and verification records.
Research and corrections: info@iderafrica.com.

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Page numbers match the printed folios and the PDF page count; entries link to their destinations.

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EMPIRICAL VALIDATION Observed tariffs, selection and funding: pp. 48–66

NAVIGATION Click a running header to return here. Source IDs link to references; model IDs link to the catalogue.

Read the transfer, the household use and the FX settlement separately

Three connected analytical pillars; a recorded payment is not an identified macroeconomic effect.

01 WHAT IS MEASURED?

Personal transfers, employee compensation, formal-channel records and broader estimates have different scopes. Match the statistic, population, source vintage and currency before comparing totals.

02 WHAT REACHES HOUSEHOLDS?

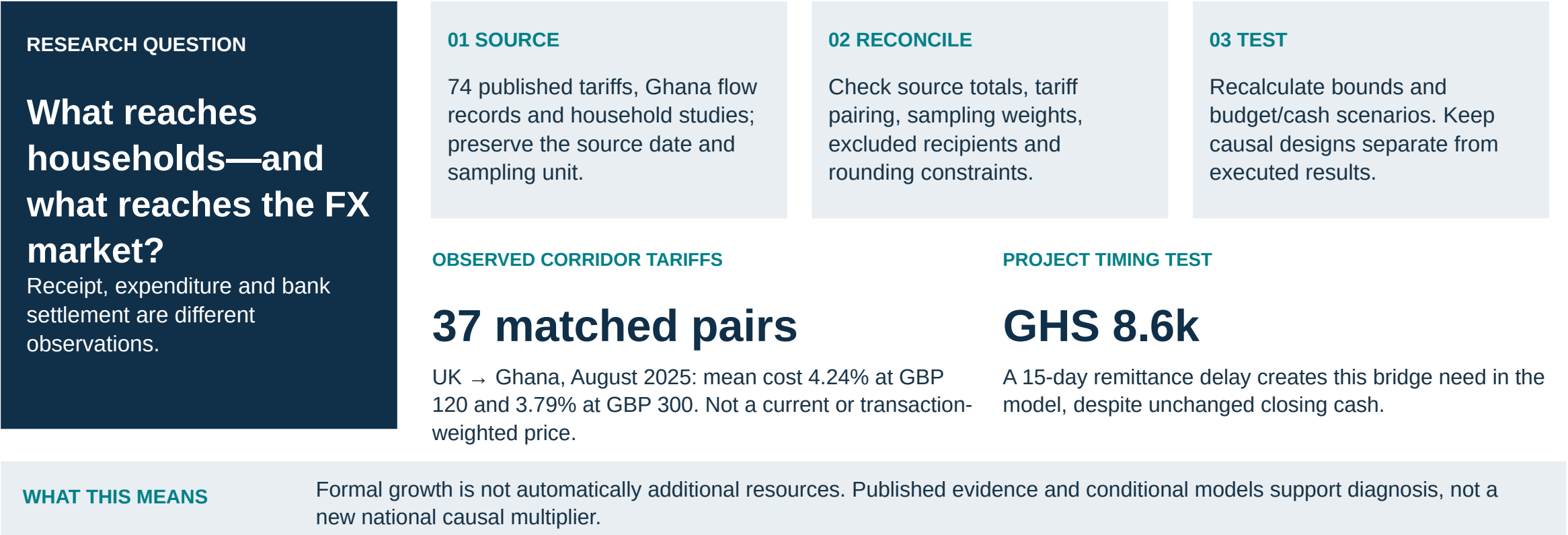
Track the total sender budget, fees, offered rate, amount received and real purchasing power. Separate spending instructions from actual consumption, new housing and enterprise activity.

03 WHAT REACHES THE FX MARKET?

Match origination, payout and inter-agent settlement to the same transfer. Currency conversion and induced demand occur at different dates; gross receipts do not identify a net cedi effect.

Remittances connect household resources to investment and FX markets

Research question: what reaches households, what is invested, and what becomes domestic foreign-exchange supply?



Measure the resources delivered—not only the channel headline

The transfer definition, all-in cost, use of funds and settlement date determine the interpretation.

01 DEFINITIONS	02 RECIPIENT VALUE	03 INVESTMENT TIMING
MEASUREMENT BOUNDARY	PUBLISHED AUGUST 2025 SNAPSHOT	SYNTHETIC PROJECT LEDGER
Formal ≠ total Do not subtract incompatible series	4.24% / 3.79% GBP 120 / GBP 300: service means	GHS 100 Closing cash in both timing cases
No verified current pair A formal-payment record, WDI personal-remittance indicator and all-channel estimate require an explicit reconciliation.	23 of 37: zero fee UK → Ghana: zero-fee configurations still span –0.03% to 18.85% total cost. Compare the FX margin as well as the sender fee.	GHS 8,600 bridge A 15-day receipt delay causes an interim financing need. Capital commitments and transfer dates must be matched.

DECISION RULE	Verify the concept, delivered value, intended versus realised use, and settlement date before assigning an economic effect.
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A 90-day route to a reconciled remittance evidence system

Proposed sequence begins after authorised access; acceptance criteria are research controls, not achieved coverage.

DAYS 0–30

Research + data owners

DEFINE

Build a concept and source register. Record residency, currency, purpose, dates, refunds and reporting coverage.

Acceptance: every series has a definition, vintage and exception record.

DAYS 31–60

Banks/providers + survey lead

LINK & TEST

Match origin, beneficiary payout and bank settlement. Link authorised household and project observations with consent.

Acceptance: known transfer IDs reconcile; missing outcomes and duplicate amounts are disclosed.

DAYS 61–90

IDER + reviewer + partners

REPRODUCE & USE

Publish matched-price and funding diagnostics; register the evaluation design before estimating policy or business effects.

Acceptance: calculations replay; source differences and unsupported causal claims are removed.

READING THE TARGETS

Proposed control standards apply to the captured pilot data, not all Ghanaian transfers. Access, confidentiality and institutional mandates require agreement.

Abbreviations and reading terms

Definitions support the analysis; source-specific concepts and denominators remain controlling.

BOP	Balance of payments; residency-based international accounts.	MSME	Micro, small and medium enterprise.
BoG / MoF	Bank of Ghana / Ministry of Finance.	OLS / 2SLS	Ordinary / two-stage least squares; source-study methods here.
FX / GHS	Foreign exchange / Ghana cedi; state the quotation direction.	RPW	Remittance Prices Worldwide; quoted-service cost database.
GBP / USD	Pound sterling / US dollar; tariff principals and fees use GBP.	SSA	Sub-Saharan Africa; regional cost benchmark, not a Ghana quote.
GLSS	Ghana Living Standards Survey; round and population matter.	pp / %	Percentage points / percent; not interchangeable.
IFAD	International Fund for Agricultural Development.	Principal / fee	Transferred amount / sender charge; total outlay may include both.
IDER	Institute of Development and Economic Research.	FX margin	Difference between benchmark and offered conversion rates.
IMTO / MTO	International / money transfer operator; verify provider status.	WDI	World Development Indicators; use the exact indicator definition.
ITT / IV	Intention-to-treat / instrumental variables; designs and estimands differ.	Vintage	Publication or data-extraction version; not the observation year.
KNOMAD	Global Knowledge Partnership on Migration and Development.	k / m / bn	Thousand / million / billion; 1 billion = 1,000 million.

How to interpret the evidence

Separate reported statistics, published study estimates, new calculations and hypothetical scenarios.

SOURCE-REPORTED / DATED

Historical flows, quotes and study samples retain their source vintage and population. The research cut-off does not make older data current.

PUBLISHED EMPIRICAL ESTIMATES

Ghana and external study estimates are attributed to the source. No regression is re-estimated without its underlying microdata.

EXECUTED DIAGNOSTICS

Tariffs, paired costs, weighting, inclusion and rounding are recalculated. Unknown outcome allocations yield estimator ranges, not national confidence bounds.

ILLUSTRATIVE / PROSPECTIVE

Household, housing, enterprise and settlement scenarios remain conditional. P01–P02 have no fitted coefficient or completed experiment.

UNITS AND DENOMINATORS

Money, people, transactions, mentions and marginal budget shares differ. Percentage-point changes and percent changes are distinct.

DATES AND DUPLICATION

Origination, payout and FX settlement are different events. Count each underlying transfer once; retain refunds and late settlements.

RANGES AND MISSINGNESS

Nonresponse bounds address a selected sample; scenario ranges have no statistical confidence interpretation. Missing coverage is not zero.

SOURCE AND MODEL IDS

S01–S12 link to references. E01–E30 map to executed calculations; P01–P02 are prospective. Source exceptions accompany interpretation.

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Model and equation index

Stable model IDs identify executed accounting and conditional scenarios; prospective designs are labelled separately.

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E01–E30 are executed descriptions, accounting diagnostics or conditional scenarios. P01–P02 are prospective and unestimated.

Four questions require four distinct evidence records

Consumption, housing, enterprise formation and FX supply cannot be inferred from one remittance total.

Table 1. Four questions require four distinct evidence records

Question	Measurement needed	What the total alone cannot establish
Household purchasing power	Amount actually received, transfer costs, prices and other income	The real gain after inflation and any offsetting reduction in other support.
Housing investment	New construction or improvement, stage payments and financing source	Housing service use or purchase of an existing asset is not automatically new construction.
Enterprise formation	Pre-transfer plans, start-up spending, registration, survival and comparison group	A reported investment use is not a count of additional firms caused by remittances.
Foreign-exchange supply	Currency collected, inter-agent settlement, conversion and subsequent demand	A cedi wallet credit need not coincide with an FX settlement to a local bank.

Sources: World Bank WDI metadata [\[S03\]](#); Adams et al. (2008) [\[S05\]](#); Ratha / IMF (2019) [\[S09\]](#); IDER calculations [\[S10\]](#).

Note: The report presents dated source evidence and executed diagnostics; it does not manufacture a national causal multiplier.

Formal-channel totals and personal-remittance statistics are not interchangeable

Match residency, transfer purpose, employment status, channel, date and valuation before comparing series.

Table 2. Formal-channel totals and personal-remittance statistics are not interchangeable

Record	Statistical scope	Comparison rule
Formal payment-channel record	Transactions processed by reporting banks or payment providers	Remove duplicates, refunds and non-remittance purposes before defining its household-transfer subset.
WDI personal remittances received	Personal transfers plus compensation of employees	Gross employee compensation is not identical to the amount actually transferred home.
Broader all-channel receipt estimate	A defined total including modelled or surveyed coverage adjustments	Document the estimator and uncertainty; the word “estimate” does not guarantee full informal coverage.
Domestic household transfer	Transfer between residents within Ghana	May finance consumption or investment; does not itself bring new FX into Ghana.
Net current transfers / inward payments	Different netting or purpose perimeter	Do not relabel either as gross personal remittances.

Sources: World Bank WDI metadata [\[S03\]](#); Ratha / IMF (2019) [\[S09\]](#); IDER calculations [\[S10\]](#).

Note: No subtraction of incompatible series is interpreted as a measured informal-channel amount.

Every dataset retains its own observation window and population

This report does not splice a historical benchmark onto a current headline.

Table 3. Every dataset retains its own observation window and population

Evidence	Window / population	Use in this report
IFAD Ghana diagnostic	2014–2022 flows; 2021–2022 quote costs, published 2023	Historical level/growth and fee–FX-margin accounting.
World Bank RPW	2021 Q2–2025 Q1 global/SSA quote indices	Cost context and service-composition sensitivity; not Ghana quotes in 2025.
Ghana household studies	GLSS 5 2005/06; repeated surveys to 2016/17; Kumasi field 2020	Published estimates and respondent-level diagnostics with explicit scope.
World Bank MDB40	2023 Ghana estimate, published June 2024	Separately dated rounded benchmark, not a 2026 current-flow estimate.
IDER scenarios	Declared household, project, enterprise and settlement inputs	Conditional resource and timing tests; no sampled firms or forecast probabilities.

Sources: IFAD (2023) [\[S01\]](#); World Bank RPW (2025) [\[S02\]](#); World Bank MDB40 (2024) [\[S04\]](#); Adams et al. (2008) [\[S05\]](#); Akobeng (2022) [\[S06\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: A matched current Ghana administrative/BOP pair and linked household microdata were not retrieved.

A formal-channel increase has several possible explanations

Separate growth in resources from changes in the recording system.

RESOURCE CHANGE	CHANNEL CHANGE	STATISTICAL CHANGE
The same reporting institutions may process more transfers, larger transfer amounts or different sender cohorts. Count and value should be reported separately.	A sender can move the same transfer from an unrecorded route to a reporting provider. Formal receipts rise even when the beneficiary’s total resources do not.	New reporters, revised purposes, late returns, refunds or double counting can alter recorded totals. Reconcile the transaction perimeter before attributing an economic cause.

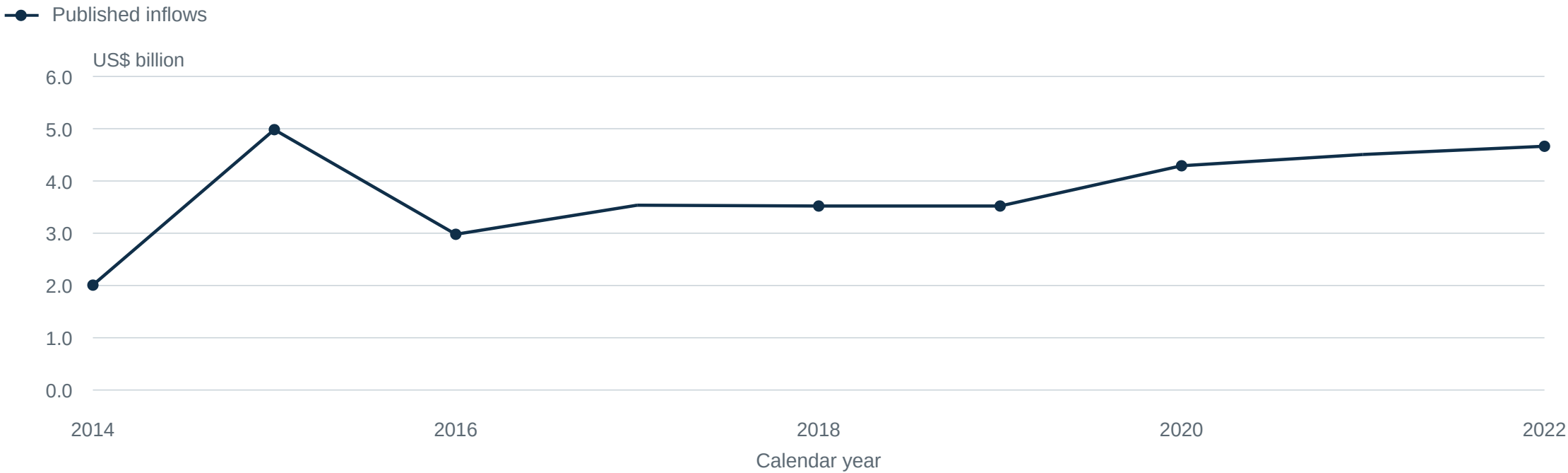
Sources: World Bank WDI metadata [\[S03\]](#); IDER calculations [\[S10\]](#).

Note: These are competing mechanisms, not an estimated decomposition of Ghana’s recent formal remittance growth.

The published flow record rose after 2019 but includes a large earlier reversal

Nine annual inflow observations from the 2023 IFAD diagnostic; no recent values appended.

Figure 1. The published flow record rose after 2019 but includes a large earlier reversal



Sources: IFAD (2023) [\[S01\]](#); IDER calculations [\[S10\]](#).

Note: Published vintage, not a complete all-channel census. No stationary trend, forecast or causal model is fitted to these nine points.

The historical numbers remain visible with their publication vintage

Annual inflows, US\$ million; calculated growth uses the adjacent displayed values.

Table 4. The historical numbers remain visible with their publication vintage

Year	Published inflow	Calculated change	Interpretation
2014	2,008	Not applicable	2023 diagnostic vintage
2015	4,982	148.11%	2023 diagnostic vintage
2016	2,980	−40.18%	2023 diagnostic vintage
2017	3,536	18.66%	2023 diagnostic vintage
2018	3,521	−0.42%	2023 diagnostic vintage
2019	3,521	0.00%	2023 diagnostic vintage
2020	4,291	21.87%	2023 diagnostic vintage
2021	4,507	5.03%	2023 diagnostic vintage
2022	4,664	3.48%	2023 diagnostic vintage

Sources: IFAD (2023) [\[S01\]](#); IDER calculations [\[S10\]](#).

Note: The 2019–2022 increase is 32.46%. The record does not identify how much reflects underlying transfers versus reporting/channel shifts.

A more recent publication is not automatically a like-for-like data point

Record unresolved scope and vintage differences rather than manufacturing a continuous series.

Table 5. A more recent publication is not automatically a like-for-like data point

Comparison	Verified record	Treatment
2022 Ghana benchmark	US\$ 4.664 bn in IFAD2023 Figure 4	Retain the full displayed figure and the 2023 publication date.
2023 Ghana benchmark	US\$ 4.6 bn in MDB40 FigureA.6.2, marked estimate	Keep separate; its one-decimal precision and revised vintage do not identify exact year-on-year growth.
2021 outward flow in IFAD	US\$ 813 m in Figure 4; US\$ 895 m in the narrative	Do not publish a definitive2021 net-flow estimate from conflicting entries.
2024–2026 formal/all-channel gap	No matched authenticated pair obtained for this edition	No latest national headline or residual called “informal remittances” is inserted.

Sources: IFAD (2023) [\[S01\]](#); World Bank MDB40 (2024) [\[S04\]](#); IDER calculations [\[S10\]](#).

Note: The research cut-off is 25 September 2026; it is not the observation date of every reported statistic.

The same formal inflow can arise with or without more household resources

Illustration uses a fully comparable transfer universe; units are normalised, not Ghana dollars.

Table 6. The same formal inflow can arise with or without more household resources

Case	Total resources	Recorded fraction	Formal record	Outside record
Baseline	1,000	60%	600	400
Resource growth only	1,200	60%	720	480
Channel shift only	1,000	72%	720	280
Both changes	1,200	72%	864	336

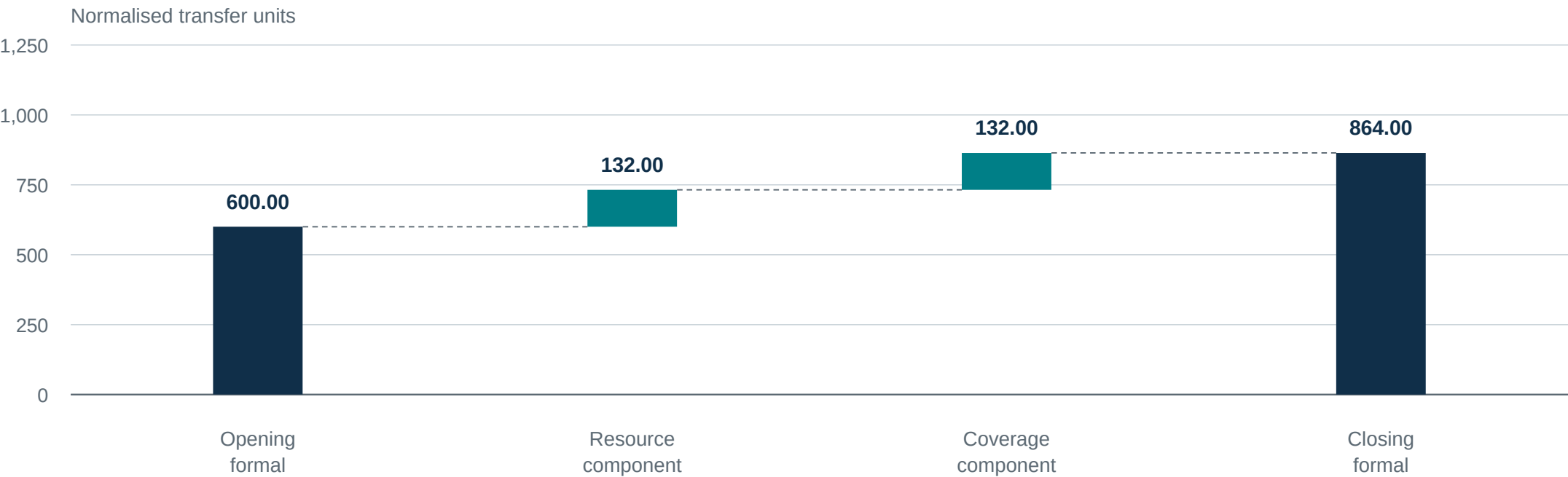
Sources: IDER calculations [\[S10\]](#).

Note: A rise from 600 to 720 can reflect 20% more resources or only a 12 percentage-point shift into recorded channels.

Total resources and recording coverage can be separated algebraically

Illustration: total resources 1000 → 1200; recorded fraction 60% → 72%.

Figure 2. Total resources and recording coverage can be separated algebraically



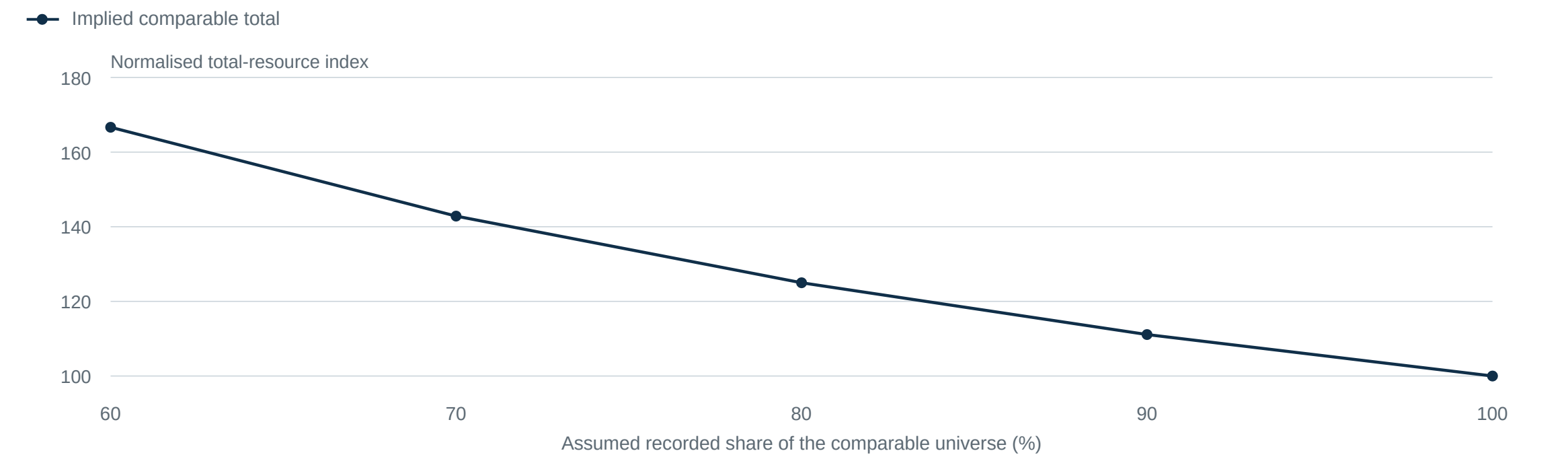
Sources: IDER calculations [\[S10\]](#).

Note: Symmetric attribution allocates 132 units to each component. These are imposed inputs, not identified Ghana contributions.

An informal-flow estimate requires a defensible coverage model

Illustrative comparable formal index held at 100; no national total is inferred.

Figure 3. An informal-flow estimate requires a defensible coverage model



Sources: IDER calculations [\[S10\]](#).

Note: Dividing incompatible BOP and channel concepts by an assumed capture rate would not make them comparable.

Consumption, new construction and financial investment enter different accounts

The use of a remittance and the classification of the cross-border transaction are separate questions.

Table 7. Consumption, new construction and financial investment enter different accounts

Recipient action	Economic accounting distinction	Required record
Purchases of goods and services	Consumption expenditure; imported content may raise FX demand	Actual prices, quantities and final expenditure.
New dwelling or major improvement	Capital formation can occur when construction is produced	Work certified, materials, invoices and timing.
Purchase of existing land or dwelling	Asset transfer is not all new current-period production	Transaction purpose, fees and new improvement spending.
Family gift versus equity or loan	A transfer does not create the same repayment/ownership claim as finance	Beneficial owner, contract and residency; do not label all diaspora investment remittances.

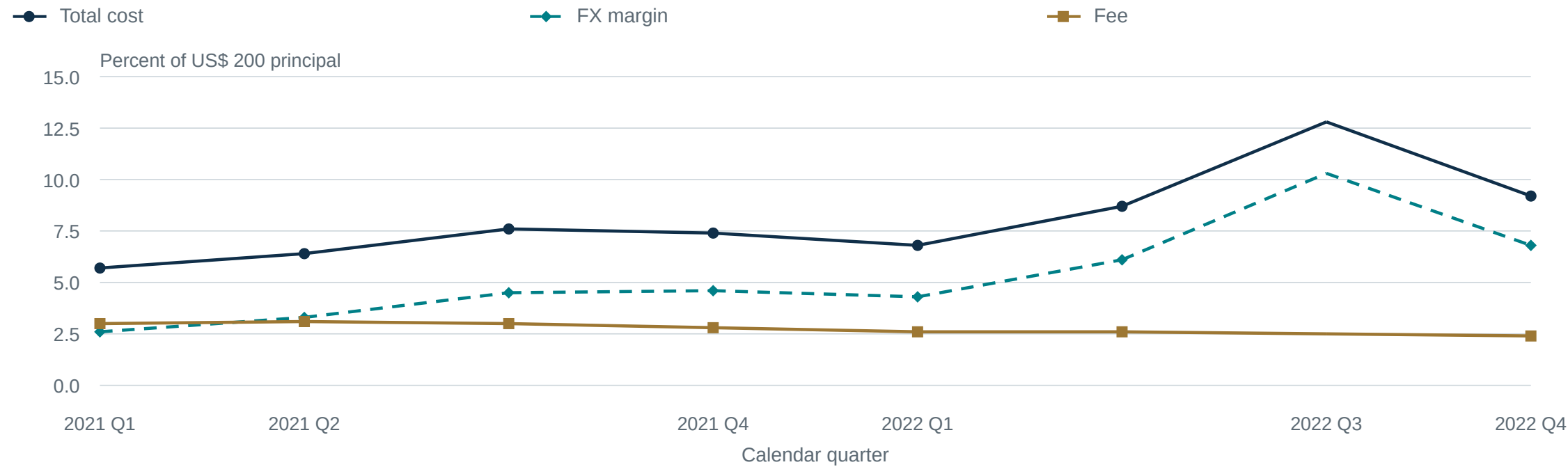
Sources: World Bank WDI metadata [\[S03\]](#); IDER calculations [\[S10\]](#).

Note: Gross receipts are not added to GDP as though they were domestic production; investment and income effects need separate measurement.

The exchange-rate margin explains most of the higher reported cost

Average costs of sending US\$ 200,2021 Q1–2022 Q4; same displayed component series.

Figure 4. The exchange-rate margin explains most of the higher reported cost



Sources: IFAD (2023) [\[S01\]](#); IDER calculations [\[S10\]](#).

Note: These are historical quote averages, not current provider prices or transaction-weighted household costs.

Small source-rounding differences remain explicit

The fee and FX-margin percentages need not add exactly to the displayed total.

Table 8. Small source-rounding differences remain explicit

Quarter	Total %	FX margin %	Fee %	Residual pp
2021 Q1	5.7	2.6	3.0	0.1
2021 Q2	6.4	3.3	3.1	0.0
2021 Q3	7.6	4.5	3.0	0.1
2021 Q4	7.4	4.6	2.8	0.0
2022 Q1	6.8	4.3	2.6	-0.1
2022 Q2	8.7	6.1	2.6	0.0
2022 Q3	12.8	10.3	2.5	0.0
2022 Q4	9.2	6.8	2.4	0.0

Sources: IFAD (2023) [\[S01\]](#); IDER calculations [\[S10\]](#).

Note: 2022 Q4 FX margin 6.8% / total 9.2%=73.91%. The residual is retained, not assigned to an unobserved fee.

Lower fees did not offset the increase in the quoted FX margin

2021 Q1 → 2022 Q4 change in reported cost; percentages of the transferred principal.

Figure 5. Lower fees did not offset the increase in the quoted FX margin



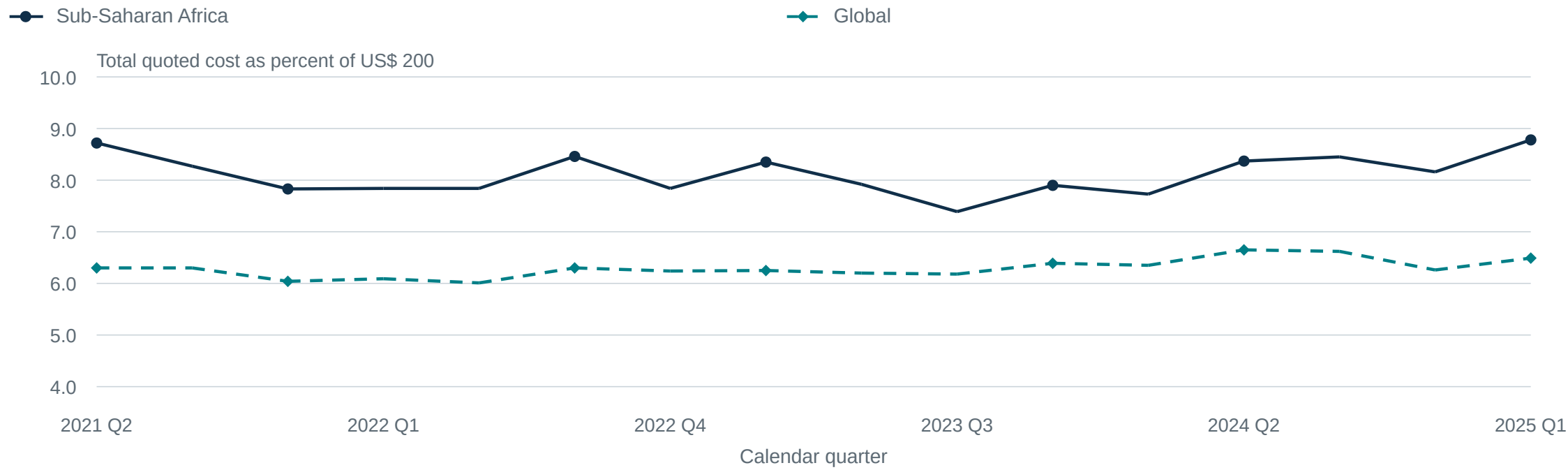
Sources: IFAD (2023) [\[S01\]](#); IDER calculations [\[S10\]](#).

Note: The total increased 3.5 pp: FX margin+4.2 pp, fee-0.6 pp and residual-0.1 pp. This is accounting, not a causal market-conduct finding.

The Sub-Saharan Africa index remains above the global benchmark

World Bank RPW:16 quarters,2021 Q2–2025 Q1; unweighted quoted-service indices.

Figure 6. The Sub-Saharan Africa index remains above the global benchmark



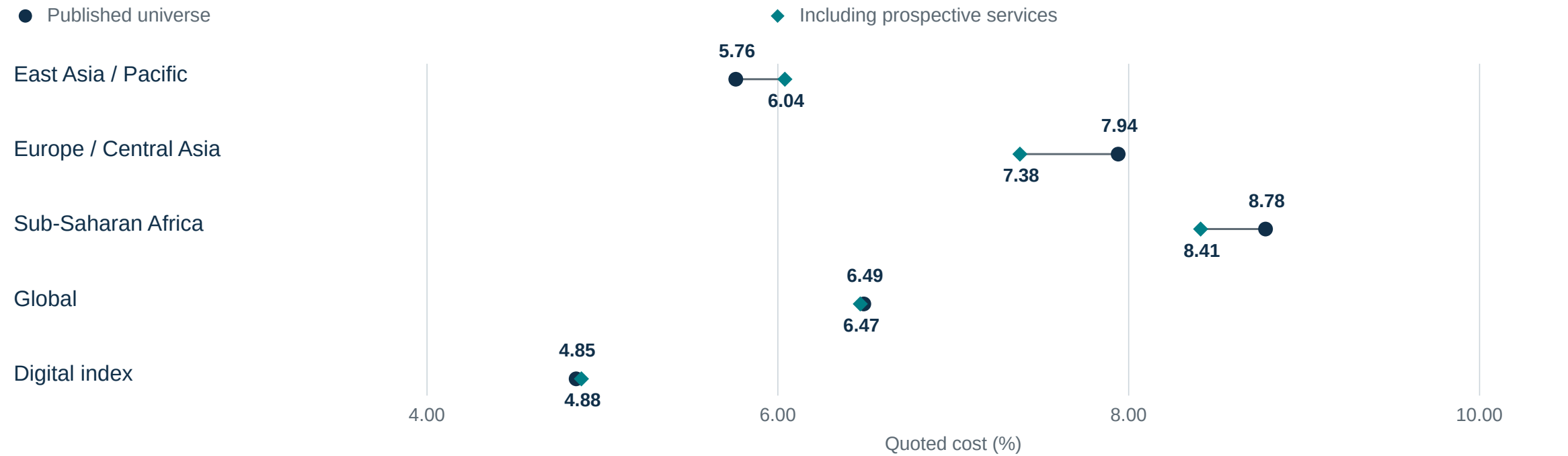
Sources: World Bank RPW (2025) [\[S02\]](#); IDER calculations [\[S10\]](#).

Note: 2025 Q1:8.78% versus 6.49%; the 2.29 pp gap equals US\$ 4.58 perUS\$200 as a cost-equivalent comparison, not a Ghana quote.

Adding services changes the average without demonstrating a price cut

Published 2025 Q1 index versus the same-quarter would-be index including prospective services.

Figure 7. Adding services changes the average without demonstrating a price cut



Sources: World Bank RPW (2025) [\[S02\]](#); IDER calculations [\[S10\]](#).

Note: SSA falls 8.78 → 8.41 with 158 added services. This is a sample-composition comparison, not matched-service price change or causal programme impact.

A lower advertised fee can still deliver fewer cedis

Illustrative fixed sender budget US\$ 206; benchmark GHS 10/USD; no recipient cash-out charge.

Table 9. A lower advertised fee can still deliver fewer cedis

Quote	Fee US\$	FX margin	Principal US\$	Recipient GHS
Baseline	6	3%	200	1,940.00
Lower fee; wider FX margin	2	5%	204	1,938.00
Lower fee and FX margin	4	1%	202	1,999.80

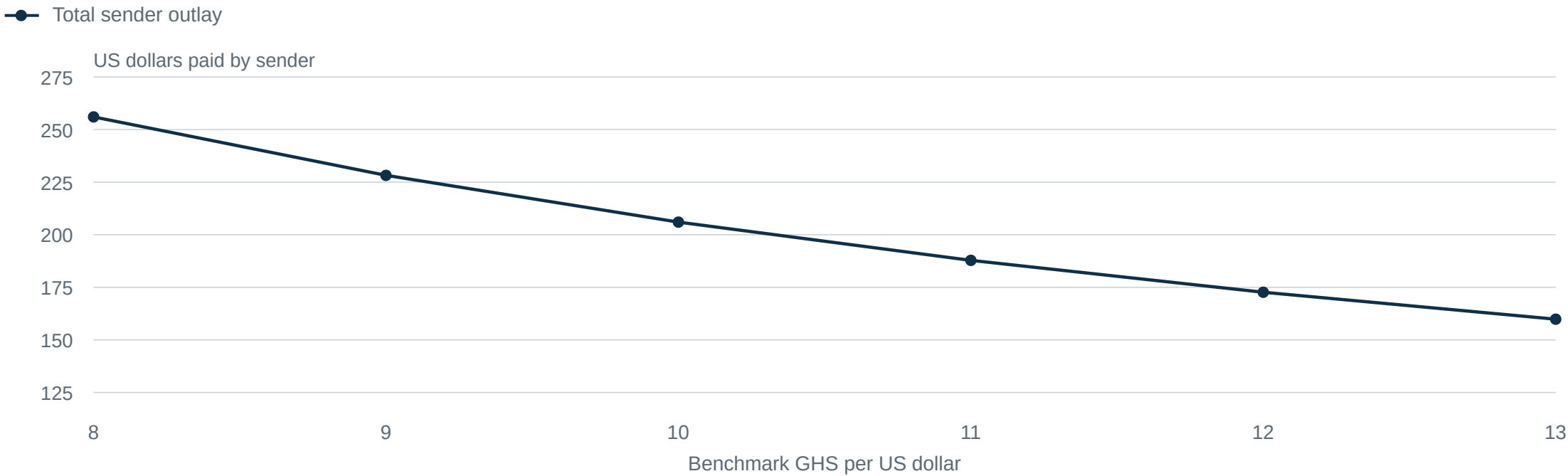
Sources: IDER calculations [\[S10\]](#).

Note: Compare the delivered amount for the same total sender outlay. No provider or current market quote is represented.

A fixed cedi target changes the foreign-currency amount required

Recipient target GHS 1,940; constant 3% FX margin and US\$ 6 sender fee.

Figure 8. A fixed cedi target changes the foreign-currency amount required



Sources: IDER calculations [\[S10\]](#).

Note: The schedule is a conditional budget identity, not an estimated sender-response elasticity. A cedi-value rise need not imply more dollars arrive.

More cedis do not necessarily buy more goods

Fixed US\$ 200 principal; unchanged fee/margin arrangement; domestic price-level change imposed separately.

Figure 9. More cedis do not necessarily buy more goods

	GHS/USD -20%	GHS/USD +0%	GHS/USD +20%	GHS/USD +30%
Prices +0%	-20.0	0.0	20.0	30.0
Prices +10%	-27.3	-9.1	9.1	18.2
Prices +20%	-33.3	-16.7	0.0	8.3

Change in real recipient purchasing power (%)

Sources: IDER calculations [\[S10\]](#).

Note: A 20% currency-conversion gain exactly offsets 20% domestic price inflation only when the foreign principal and transfer terms remain fixed.

A smaller foreign transfer can reverse apparent exchange-rate relief

Same framework, but the foreign principal is 10% lower; no source-based elasticity is imposed.

Figure 10. A smaller foreign transfer can reverse apparent exchange-rate relief

	GHS/USD -20%	GHS/USD +0%	GHS/USD +20%	GHS/USD +30%
Prices +0%	-28.0	-10.0	8.0	17.0
Prices +10%	-34.5	-18.2	-1.8	6.4
Prices +20%	-40.0	-25.0	-10.0	-2.5

Change in real recipient purchasing power (%)

Sources: IDER calculations [\[S10\]](#).

Note: At+20% GHS/USD,+20% prices and-10% principal, real resources fall 10%. This scenario does not predict remitter behaviour.

Support, insurance and earmarking imply different expenditure responses

Treat receipt, spending authority and household need as separate variables.

INCOME SUPPORT	RISK RESPONSE	EARMARKING
A regular transfer can finance food, rent, school and health commitments. The observed share spent on food is not the causal food response to an extra transfer.	Support may rise precisely when agricultural or employment income falls. A negative income–remittance association can reflect insurance rather than harm from remittances.	Some receipts carry instructions; others are discretionary. Earmarking, household bargaining and money’s fungibility can alter which member’s resources are released.

Sources: Adams et al. (2008) [\[S05\]](#); Akobeng (2022) [\[S06\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: The analysis does not equate discretionary funds with productive investment or consumption with economic waste.

The Ghana evidence answers different questions in different populations

Published findings are attributed to their original studies; no source coefficient is presented as a new IDER estimate.

Table 10. The Ghana evidence answers different questions in different populations

Study / period	Design and population	What it can inform
Adams et al.2008 GLSS 5 2005/06	Published expenditure equations with migration-selection/IV treatment	Budget-pattern comparison; results depend on identification and adding-up treatment.
Akobeng 2022 surveys1991/92–2016/17	Institutional abstract describes rainfall-based2SLS	Income-support response; full covariance and international-only scope not verified.
Ofori-Appiah et al.2024 field 2020	Kumasi financial-institution recipient frame; 689 responses	Instructions, spending authority and source-quality diagnostics; not all Ghana households.
Yang2008 Philippines1997 shock	Destination-specific exchange-rate shock for migrant households	External identification example, not a Ghana coefficient or a clean remittance-only instrument.

Sources: Adams et al. (2008) [\[S05\]](#); Akobeng (2022) [\[S06\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); Yang (2008) [\[S08\]](#).

Note: Different dates, populations, estimands and outcome definitions prevent mechanical pooling or meta-analysis here.

The published expenditure analysis is not the full national survey sample

Source sample construction; count arithmetic is reproduced without inventing survey weights.

Table 11. The published expenditure analysis is not the full national survey sample

Stage / group	Households	Research consequence
Survey sample	8000	The remittance module is a smaller subsample.
Module subsample	4000	59 incomplete records are excluded.
Complete module	3941	57 households receiving both internal and international transfers are removed.
Exclusive analysis groups	3884	2515 nonrecipients +1159 internal +210 international recipients.
International group	210	Small outcome cells and exclusion restrictions matter; this is not a new2026 sample.

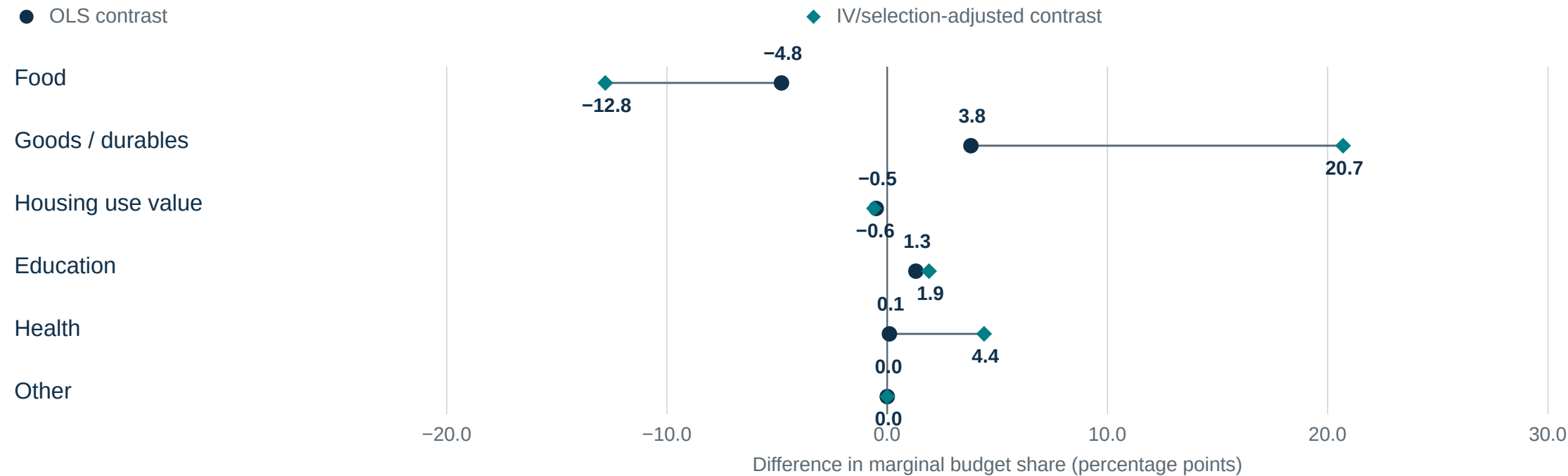
Sources: Adams et al. (2008) [\[S05\]](#).

Note: Recipient status is endogenous to migration, networks, income and household shocks; group differences are not automatically treatment effects.

The estimated budget contrast changes substantially with the estimator

International-recipient minus nonrecipient marginal budget share; source Table 11a.

Figure 11. The estimated budget contrast changes substantially with the estimator



Sources: Adams et al. (2008) [\[S05\]](#); IDER calculations [\[S10\]](#).

Note: No confidence intervals are fabricated. These are source-model budget contrasts, not the allocation of each additional remittance dollar.

Larger point estimates do not establish stronger causal evidence

Source Table 11b: international recipients versus nonrecipients; annotations retained as printed.

Table 12. Larger point estimates do not establish stronger causal evidence

Category	OLS statistic	Source OLS level	IV statistic	Source IV level
Food	9.24	5%	0.34	Not marked
Goods / durables	6.76	10%	0.56	Not marked
Housing use value	3.53	Not marked	0.11	Not marked
Education	5.26	5%	0.01	Not marked
Health	2.14	Not marked	0.01	Not marked
Other	2.55	Not marked	0.03	Not marked

Sources: Adams et al. (2008) [\[S05\]](#).

Note: “Not marked” means no significance marker in the source table, not proof of zero effect. F and chi-square statistics are not directly comparable effect sizes.

Published marginal shares do not consistently add to one

All six displayed categories are summed without silently repairing the original table.

Table 13. Published marginal shares do not consistently add to one

Source model / group	Sum of categories	Printed total	Sum minus1
OLS / none	1.010	1.011	0.010
OLS / internal	1.009	1.011	0.009
OLS / international	1.009	1.011	0.009
IV / none	0.971	0.974	-0.029
IV / internal	1.170	1.083	0.170
IV / international	1.107	1.109	0.107

Sources: Adams et al. (2008) [\[S05\]](#); IDER calculations [\[S10\]](#).

Note: The IV international column sums 1.107, while its printed total is 1.109. Neither is renormalised into household scenario weights.

Housing expenditure in an Engel curve is not new housing investment

The source’s annual housing-use value cannot answer a construction-financing question by itself.

MEASURE IN THE STUDY	MEASURE NEEDED FOR INVESTMENT	CAUSAL COMPARISON
An annual use-value measure captures housing services. It is not a schedule of remittance-funded building materials, contractor payments or additional dwellings.	Record new structures, extensions, completion milestones, land acquisition and existing-property purchases separately. Follow cash, progress and ownership—not only stated purpose.	A household that builds may also be wealthier, have a migrant relative or have planned construction before receipt. Baseline plans and a credible comparison are required.

Sources: Adams et al. (2008) [\[S05\]](#); IDER calculations [\[S10\]](#).

Note: No published housing coefficient is converted into a Ghana-wide construction multiplier.

Ghana’s rainfall-based study reports only a partial income offset

Institutional abstract of Akobeng 2022; reported change associated with a GHS 100 agricultural-income reduction.

Table 14. Ghana’s rainfall-based study reports only a partial income offset

Source outcome	Reported change	Scope restriction
Remittance receipts	+GHS 30	Remittance measure not verified as international-only in the retrieved abstract.
Total household consumption	–GHS 60	This is a source-study estimate, not recalculated from microdata here.
Rural food expenditure	–GHS 36	Subpopulation and price-base details require the full study; no interval is invented.

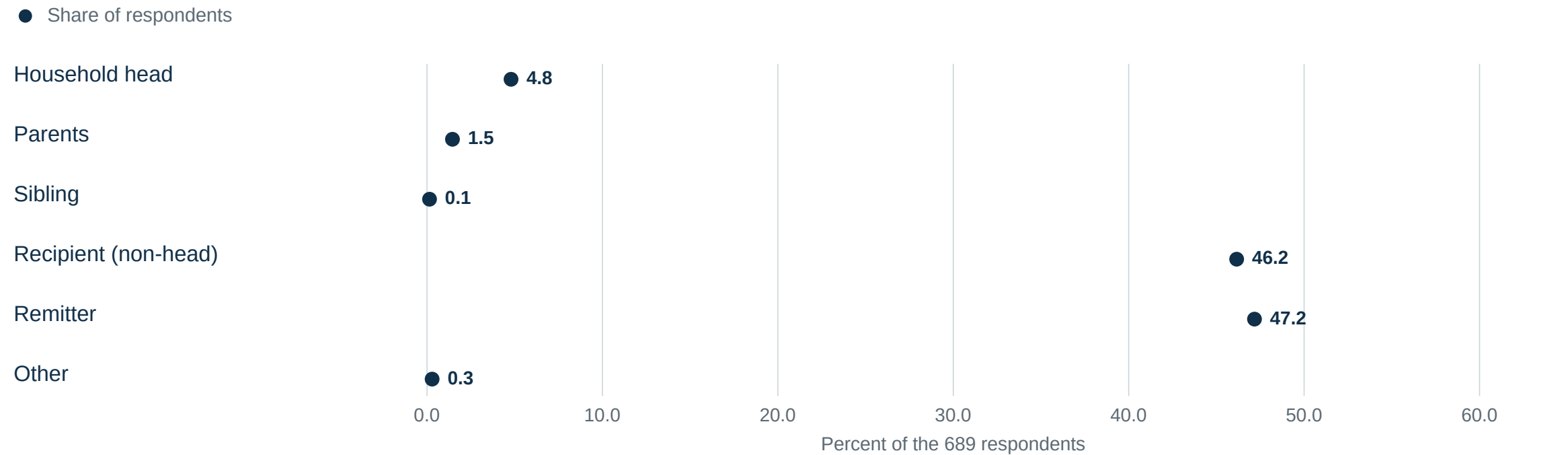
Sources: Akobeng (2022) [\[S06\]](#).

Note: The result motivates joint modelling of income shocks and transfers; it does not identify the consumption effect of an independently assigned international remittance.

The remitter and the recipient dominate reported spending decisions

Kumasi study, field 2020; raw percentages calculated from 689 respondents.

Figure 12. The remitter and the recipient dominate reported spending decisions



Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: 325 respondents identify the remitter; 318 identify the non-head recipient. These are unweighted respondent counts, not population spending shares.

Unequal sampling fractions prevent treating raw counts as frame estimates

Published sampling allocation; the outcome breakdown by stratum is unavailable.

Table 15. Unequal sampling fractions prevent treating raw counts as frame estimates

Stratum	Frame count	Selected	Sampling fraction	Base weight N/n
1	1996	333	16.68%	5.994
2	533	232	43.53%	2.297
3	231	147	63.64%	1.571

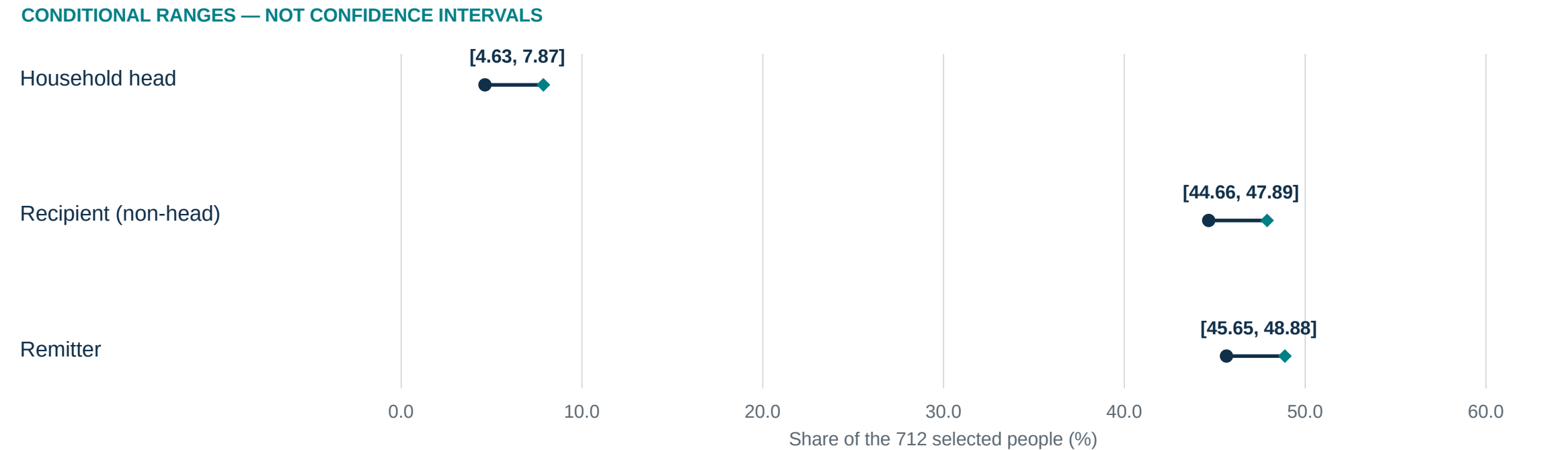
Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: The financial-institution frame excludes unlisted recipients. Response adjustments cannot be reconstructed from aggregate totals alone.

The 23 nonresponses imply a finite bound for the selected sample

All missing selected respondents are assigned 0 or 1 for the binary decision-maker indicator.

Figure 13. The 23 nonresponses imply a finite bound for the selected sample



Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: Remitter control:45.65%–48.88% of the selected sample. These are missing-outcome bounds, not design-weighted frame intervals or national confidence limits.

58.03% is a share of recorded money—not a share of recipients

Source Table 8, field 2020; recalculated from the disclosed GHS amounts.

Table 16. 58.03% is a share of recorded money—not a share of recipients

Transfer instruction	Recorded amount GHS	Share of total amount	Amount / all 689
Restricted	1,176,275	41.97%	1,707.22
Unrestricted	1,626,381	58.03%	2,360.49

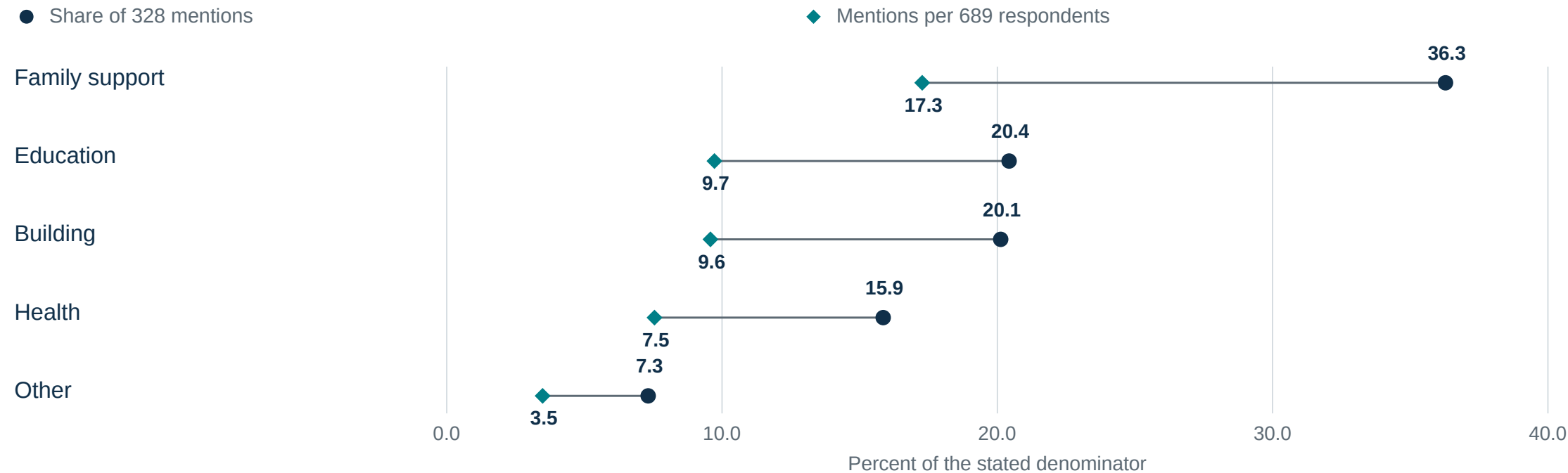
Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: The source reports 58.02% unrestricted; exact displayed amounts give 58.03% rounded. The means divide by all respondents, not identified subgroup counts.

Building is a reported instruction, not an observed completion outcome

Source Table 9:328 restricted-use mentions; denominators are kept separate.

Figure 14. Building is a reported instruction, not an observed completion outcome



Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: 66 building mentions represent 20.12% of mentions or 9.58% of respondents. Neither is the share of remitted money spent on new housing.

The reported investment allocation cannot be validated from the displayed tables

Do not turn the study’s capital-goods narrative into a verified national enterprise estimate.

Table 17. The reported investment allocation cannot be validated from the displayed tables

Source record	Displayed value	Audit treatment
Table 8 unrestricted total	GHS 1,626,381	Retained for the restricted/unrestricted amount split.
Table 11 unrestricted-use total	GHS 1,726,381	GHS 100,000 larger; no unexplained balancing transfer is created.
Table 11 percentages	8% consumer +82% capital =90%	Not used as validated expenditure shares.
Table 11 capital category	GHS 1,409,986	An unresolved aggregate cannot establish new firms, new housing or incremental investment.

Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: These are document-level inconsistencies, not an allegation about research intent. The publisher-provided full text was inspected; table images were unavailable.

The validation adds observed tariffs and explicit selection diagnostics

New quote records are dated August 2025; published household evidence retains its original population and survey period.

Table 18. The validation adds observed tariffs and explicit selection diagnostics

Evidence layer	Additional record or calculation	What is not inferred
UK → Ghana RPW snapshot	37 service configurations at each of GBP 120 and GBP 300; 74 displayed tariffs	Not 74 customers, independent providers or market-share-weighted transfers.
Ghana household study designs	GLSS dual-recipient exclusions; Kumasi stratum composition and missing outcome allocation	No recovered household microdata or nationally representative prevalence.
Published model precision	All six marginal-share columns tested against their displayed rounding precision	No renormalised spending weights or re-estimated causal coefficients.
Funding sensitivity	155 delay–FX combinations and exact transfer-margin break-even calculation	No delay probability, optimal transfer schedule or observed household default.

Sources: Adams et al. (2008) [\[S05\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: The inputs, feasible sets and output files are separately registered. Computational replication is not independent sampling.

The corridor snapshot has a defined amount, time window and service unit

World Bank Remittance Prices Worldwide: UK → Ghana, 8–22 August 2025; source quarter Q3 2025.

Table 19. The corridor snapshot has a defined amount, time window and service unit

Dimension	Record retained	Analytical treatment
Transfer amounts	GBP 120 and GBP 300; source labels US\$ 200 / US\$ 500	Use GBP for fee ratios. Do not convert these historical labels using today’s exchange rate.
Observation unit	37 payment/receiving configurations per amount; 13 displayed provider labels	Pair the same provider, payment mode, receiving mode and access point across the two amounts.
Service composition	36 internet rows and one agent row per amount	No causal internet-versus-agent estimate: the single agent service is not a comparison sample.
Pricing fields	Flat fee, FX margin, total percentage cost, benchmark and offered GHS/GBP	Keep source values; report residuals within displayed precision.
Dependence and coverage	Several rows belong to one provider; one label operates via Western Union	Show service, provider-label and combined-network weighting; transaction volumes are absent.

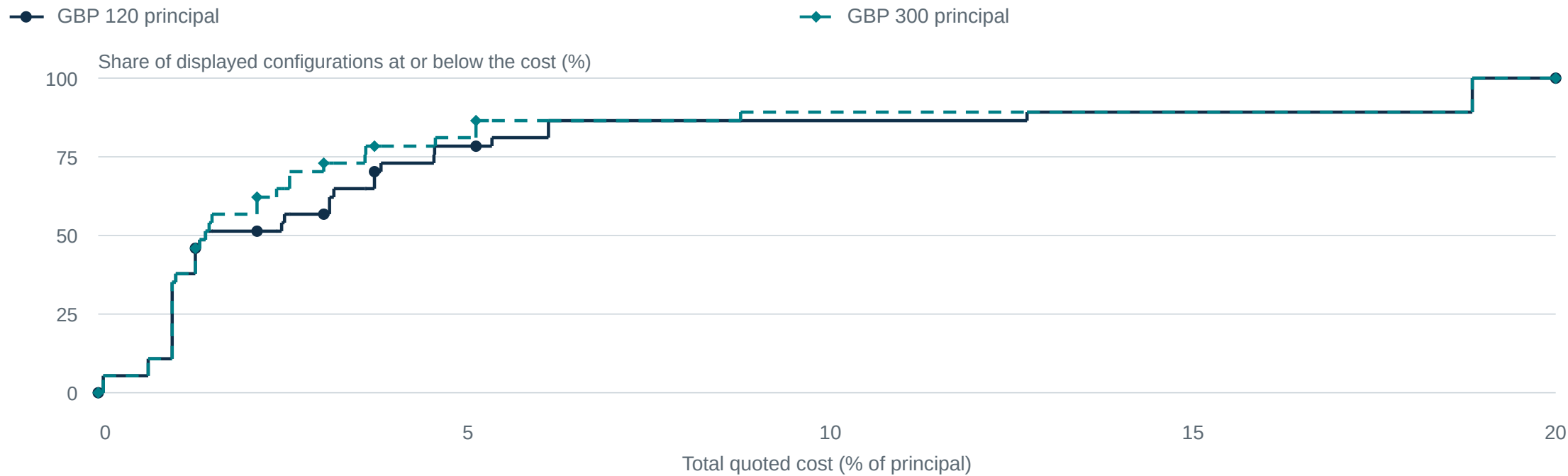
Sources: World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); World Bank RPW methodology [\[S12\]](#); IDER calculations [\[S10\]](#).

Note: This is a historical tariff snapshot. Availability, promotional eligibility, receiving charges and completed transaction values need separate verification.

The quote distribution is skewed; its mean is not the typical tariff

Empirical cumulative distribution of the 37 displayed service configurations at each amount.

Figure 15. The quote distribution is skewed; its mean is not the typical tariff



Sources: World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: GBP 120: mean 4.24%, median 1.38%; GBP 300: mean 3.79%, median 1.38%. Service frequency is not transaction frequency.

The chosen weighting changes the reported cost statistic

The same tariff rows are reused; only the averaging unit changes.

Table 20. The chosen weighting changes the reported cost statistic

Statistic	GBP 120	GBP 300	Units	Meaning
Service-row mean	4.242%	3.795%	37	Equal rows
Equal displayed-provider mean	3.851%	3.321%	13	Average within label, then equally across labels
Equal network-label mean	3.669%	3.208%	12	Average within label, then equally across labels
Service-row median	1.380%	1.380%	37	Equal rows

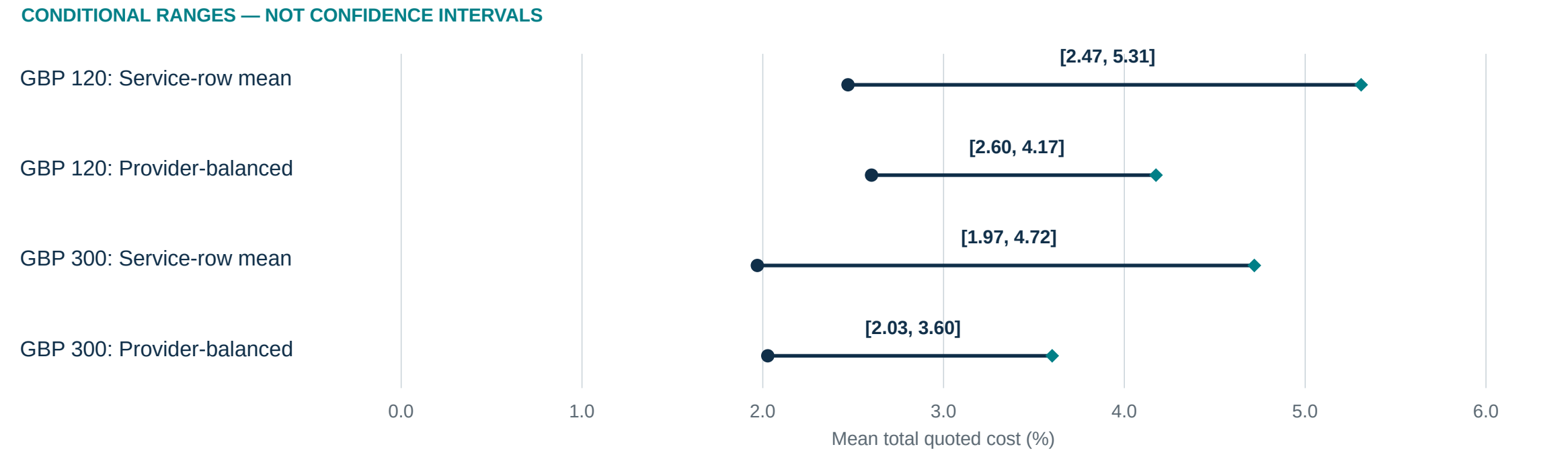
Sources: World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: The network variant merges “Post Office UK via Western Union” with Western Union for this sensitivity only; it is not an ownership audit or official RPW index.

Dependence on the provider mix remains visible after one-label exclusions

All 13 leave-one-displayed-label-out calculations are retained for each amount and statistic.

Figure 16. Dependence on the provider mix remains visible after one-label exclusions



Sources: World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: Ranges diagnose sample-composition sensitivity. They are not confidence intervals, trimmed preferred estimates or a reason to discard an expensive valid quote.

The larger-principal tariff lowers the percentage cost in 14 of 37 matched services

Within-service comparison of GBP 300 versus GBP 120; no customer chooses or receives a random treatment here.

Table 21. The larger-principal tariff lowers the percentage cost in 14 of 37 matched services

Paired statistic	Calculated result	Interpretation
Configurations with lower / unchanged / higher total cost	14 / 23 / 0	Counts refer to published tariff pairs, not an estimated behavioural response.
Mean total-cost change	−0.447 pp	Source means fall 4.242% → 3.795%; median remains 1.38%.
Mean fee-ratio change	−0.446 pp	The flat fee is divided by a larger principal; some absolute fees also increase.
Mean FX-margin change	0.000 pp	All paired margin values are unchanged in the displayed snapshot.
Zero-fee configurations	23 at each amount	Their total costs span −0.03% to 18.85%; zero sender fee does not establish zero FX cost.

Sources: World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: Larger transfers can delay urgently needed funds. The tariff comparison alone cannot justify consolidating payments or switching providers.

Provider-label reconstruction — 1 of 2

Arithmetic means within each displayed provider label; alphabetical order; cost percentages of stated principal.

Table 22. Provider-label reconstruction — 1 of 2

Displayed provider label	Services per amount	GBP 120 mean %	GBP 300 mean %
ACE Money Transfer	2	3.090	2.090
ATL Money Transfer	4	18.850	18.850
CashMinute	2	−0.030	−0.030
MoneyGram	2	2.450	1.450
Post Office UK via Western Union	2	4.535	3.585
Remitly	9	0.920	0.920
Ria	2	3.710	2.540

Sources: World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: These are not provider rankings or current offers. The companion CSV retains all 74 rows, payment instruments, receiving modes, fees, rates and locators.

Provider-label reconstruction — 2 of 2

Arithmetic means within each displayed provider label; alphabetical order; cost percentages of stated principal.

Table 23. Provider-label reconstruction — 2 of 2

Displayed provider label	Services per amount	GBP 120 mean %	GBP 300 mean %
Sendwave	2	1.340	1.340
TapTap Send	1	0.970	0.970
Unity Link	2	0.590	0.590
Western Union	3	8.310	6.327
Wise	3	4.093	3.307
WorldRemit	3	1.240	1.240

Sources: World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: These are not provider rankings or current offers. The companion CSV retains all 74 rows, payment instruments, receiving modes, fees, rates and locators.

Rounded exchange rates do not justify overwriting published margins

Reference and offered rates are shown to two decimals; propagate ±0.005 GHS/GBP on each rate.

Table 24. Rounded exchange rates do not justify overwriting published margins

Example tariff	Published margin %	Margin from displayed rates %	Conditional rounding range %
Q01 CashMinute	-0.03	0.000	[-0.068, 0.068]
Q20 MoneyGram	0.77	0.776	[0.705, 0.846]
Q24 Wise	0.02	0.000	[-0.068, 0.068]

Sources: World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: All 74 margins are compatible with the imposed rounding envelopes; fee-plus-margin residuals are at most 0.005 pp. This is not an audit of provider pricing systems.

Excluding dual recipients removes 21.35% of known international-recipient households

Published GLSS 5 analytical-sample counts; these percentages are unweighted count diagnostics.

Table 25. Excluding dual recipients removes 21.35% of known international-recipient households

Analytical definition	International count	Denominator	Raw count percentage / range
Exclusive analysis	210	3,884	5.407%
Complete module, dual recipients included	267	3,941	6.775%
Entire module, missing status bounded	267	4,000	[6.675, 8.150]%

Sources: Adams et al. (2008) [\[S05\]](#); IDER calculations [\[S10\]](#).

Note: Known international recipients: 210 exclusive +57 dual =267. The 59 incomplete module records have unknown receipt status; no survey weights or national prevalence are reconstructed.

Displayed rounding cannot explain the marginal-share adding-up gaps

All six source categories retained; ± 0.0005 per three-decimal entry and ± 0.005 for the printed IV internal housing value 0.10.

Table 26. Displayed rounding cannot explain the marginal-share adding-up gaps

Model / group	Category sum	Rounding-feasible sum	Contains 1?	Printed total compatible?
OLS / none	1.010	[1.0070, 1.0130]	No	Yes
OLS / internal	1.009	[1.0060, 1.0120]	No	Yes
OLS / international	1.009	[1.0060, 1.0120]	No	Yes
IV / none	0.971	[0.9680, 0.9740]	No	Yes
IV / internal	1.170	[1.1625, 1.1775]	No	No
IV / international	1.107	[1.1040, 1.1100]	No	Yes

Sources: Adams et al. (2008) [\[S05\]](#); IDER calculations [\[S10\]](#).

Note: All six ranges exclude 1. The primary table image was checked; values are not repaired or converted into household spending weights. A point-estimate audit is not a new causal test.

The source instruments require economic restrictions beyond first-stage relevance

The Ghana expenditure paper uses group-level migration/remittance networks and a multi-stage procedure.

Table 27. The source instruments require economic restrictions beyond first-stage relevance

Identification component	Source treatment	Remaining restriction
Group instruments	Earlier and leave-one-household-out ethno-religious network measures	Networks and group income may also affect preferences, opportunities and expenditure directly.
Dependence / generated stages	Source clusters by ethno-religious group and bootstraps multi-stage estimation	Many households do not imply many independent instrument shocks; no new small-cluster inference is supplied.
Published tests	Table 11 b reports F / chi-square statistics and source significance markers	An absent marker is not evidence of a zero effect; model covariance was not recovered.
Interpretation	Reported marginal expenditure-pattern contrasts, not assigned transfer increments	No source contrast is relabelled as the return to one remitted dollar or the cause of a new enterprise.

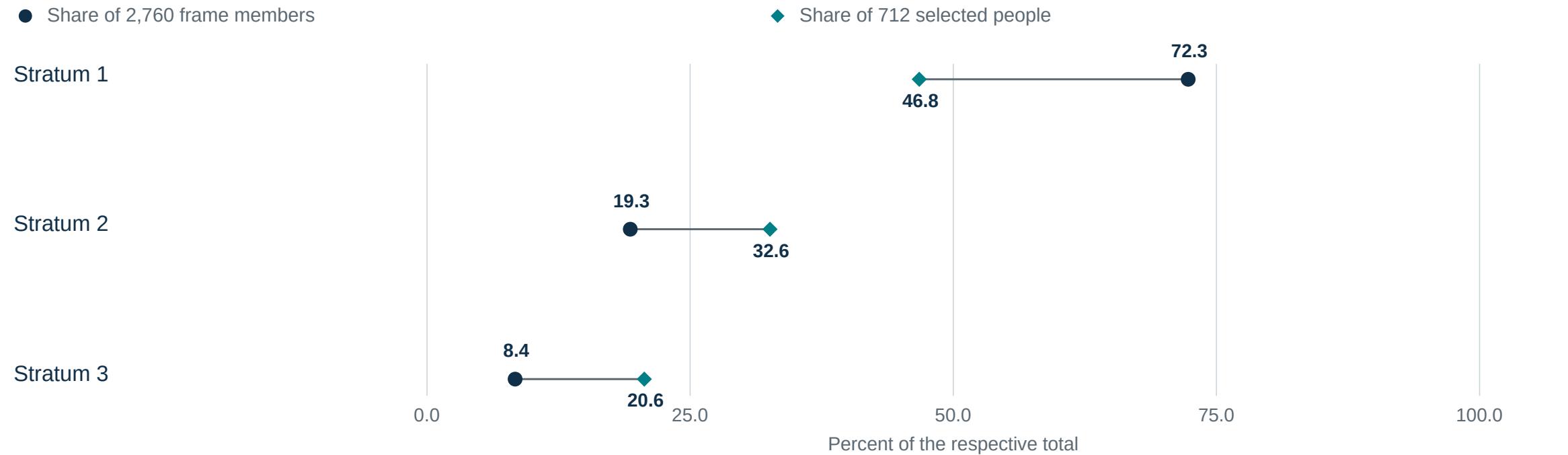
Sources: Adams et al. (2008) [\[S05\]](#); IDER calculations [\[S10\]](#).

Note: No IV estimate is rerun from the published coefficients. Rainfall, migration networks and destination FX changes are not treated as automatically valid instruments.

The largest recipient-frame stratum is underrepresented in the selected sample

Published Kumasi frame and selected counts; a design issue distinct from the 23 nonresponses.

Figure 17. The largest recipient-frame stratum is underrepresented in the selected sample



Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: Sampling fractions range from 16.68% to 63.64%. Base weights differ by a factor of 3.81; the outcome-to-stratum cross-tabulation is unavailable.

Unknown stratum membership creates a much wider estimator range

Range of a hypothetical full-response, base-weighted point estimator across all feasible outcome assignments—not a population interval.

Table 28. Unknown stratum membership creates a much wider estimator range

Decision-maker indicator	Raw respondent %	Selected-only missingness range %	Weighted-estimator allocation range %
Household head	4.79	[4.63, 7.87]	[1.88, 12.16]
Recipient (non-head)	46.15	[44.66, 47.89]	[22.60, 72.98]
Remitter	47.17	[45.65, 48.88]	[23.19, 73.57]

Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: Assume the published stratum sizes and within-stratum sampling fractions. Allocate all 23 missing outcomes adversely and retain every feasible stratum allocation. Sampling uncertainty is additional.

The remitter-authority endpoints are attained by explicit integer allocations

Each row is a feasible allocation—not a recovered respondent record or an estimated stratum outcome.

Table 29. The remitter-authority endpoints are attained by explicit integer allocations

Bound	Yes in stratum 1	Yes in stratum 2	Yes in stratum 3	Total yes /712	Weighted estimator %
Lower	0	178	147	325	23.19
Upper	333	15	0	348	73.57

Sources: Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: Lower: 325 positives assigned to the lowest base weights first. Upper: 348 positives assigned to the highest weights first. Linear programming and greedy allocations agree; the endpoints are sharp for this estimator.

Validation separates a source conflict from a missing-value display error

The study records and this publication have different responsibilities; neither is silently rewritten.

Table 30. Validation separates a source conflict from a missing-value display error

Record	Verified issue	Refinement
Original report Table 12	Absent source significance markers appeared as a missing-value token	Display “Not marked”; retain every published statistic and the source-specific significance legend.
Kumasi sampling cohort	Section 3.1 says eligible 2019 recipients; section 3.3 says the 2018 recipient frame	Retain field 2020 and both eligibility-year statements. Seek the frame metadata; do not select a year by assumption.
Kumasi unrestricted-use amounts	Table 8 and Table 11 differ by GHS 100,000; the printed shares sum to 90%	Do not use the 82% capital-goods claim as a validated investment allocation.
RPW page metadata	Two amount panels give conflicting disbursing-network labels; unrelated corridor footer	Analysis uses tariffs and explicitly matched service identities only, not disputed coverage or footer entries.

Sources: Adams et al. (2008) [\[S05\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: The empirical inputs remain source-labelled. No hypothetical quote, household, completed business or corrected source amount is introduced.

The bridge need responds to the precise arrival delay, not only the total receipts

Selected rows from all 155 tested delay–FX combinations; three remittances remain inside the 90-day horizon.

Figure 18. The bridge need responds to the precise arrival delay, not only the total receipts

	FX –20%	FX –10%	FX unchanged	FX +10%	FX +20%
0-day delay	5.72	2.81	0.00	0.00	0.00
5-day delay	12.48	10.54	8.60	6.66	5.36
10-day delay	12.48	10.54	8.60	6.66	5.36
15-day delay	12.48	10.54	8.60	6.66	5.36
20-day delay	13.48	11.54	9.60	7.66	6.36
25-day delay	13.48	11.54	9.60	7.66	6.36
30-day delay	13.48	11.54	9.60	7.66	6.36

Required zero-floor bridge, GHS thousands

Sources: IDER calculations [\[S10\]](#).

Note: The full grid uses every integer delay from 0 to 30 days. Same-day payments precede receipts; each cell is a conditional calculation, not a likelihood or confidence limit.

A 0.333-percentage-point wider FX margin exhausts the baseline closing buffer

Same synthetic project: three US\$ 1,000 receipts, GHS 5,000 opening cash and GHS 34,000 scheduled payments.

Table 31. A 0.333-percentage-point wider FX margin exhausts the baseline closing buffer

FX margin (%)	Change from 3% (pp)	Closing cash GHS	Minimum cash GHS	Bridge GHS
3.000	0.000	100.00	100.00	0.00
3.100	0.100	70.00	70.00	0.00
3.333	0.333	0.00	0.00	0.00
3.500	0.500	-50.00	-50.00	50.00
4.000	1.000	-200.00	-200.00	200.00

Sources: IDER calculations [\[S10\]](#).

Note: At 3.333333% the closing balance is zero. A 0.3436% reduction in total foreign principal also exhausts the GHS 100 baseline buffer. These thresholds are not observed project resilience.

The expanded evidence supports specific decisions, not broader causal claims

The release gate follows the actual observation unit and available comparison.

Table 32. The expanded evidence supports specific decisions, not broader causal claims

Decision question	Evidence available now	Data required for stronger inference
Are fees sufficient to compare value?	74 published tariffs: 23/37 zero-fee configurations at each amount, with materially different FX margins	Matched all-in transaction receipts, promotional terms, recipient charges and cancellation outcomes.
Did a larger transfer cause a lower cost?	14 matched tariff reductions; no random assignment or realised transfer response	Prespecified offer/assignment or a suitable natural experiment, with all-channel receipts and customer outcomes.
Who controls remittance spending?	Raw counts, unequal weights, sharp unknown-allocation diagnostics	Respondent stratum IDs, nonresponse patterns, survey weights and a verified eligible frame.
Did transfers create investment or FX supply?	Funding identities and settlement chronology; source-study estimates remain attributed	Baseline plans, failed projects, matched transfer/settlement records and a defensible counterfactual.

Sources: Adams et al. (2008) [\[S05\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); World Bank RPW: UK–Ghana (Aug 2025) [\[S11\]](#); IDER calculations [\[S10\]](#).

Note: No sampling standard error is fabricated for tariff rows or unknown household allocations. P01–P02 remain prospective; endogeneity is not declared eliminated.

Four housing-finance channels need separate outcome measures

The appropriate measure depends on who owns the property and who makes the payment.

Table 33. Four housing-finance channels need separate outcome measures

Channel	Traceable resource flow	Outcome to observe
Family transfer for construction	Nonresident gift to resident household; certified project invoices	New work completed, delays, defects and remaining financing need.
Diaspora’s own property investment	Owner’s capital allocation, property rights and payment contract	Asset purchase/new construction classified separately from household transfers.
Mortgage or developer finance	Loan proceeds, debt service and borrower income sources	Debt affordability under transfer interruptions, not just expected annual receipts.
Payment to contractor or supplier	Sender may pay directly rather than through recipient account	Match beneficiary, ownership and purpose; avoid counting both gift and supplier settlement.

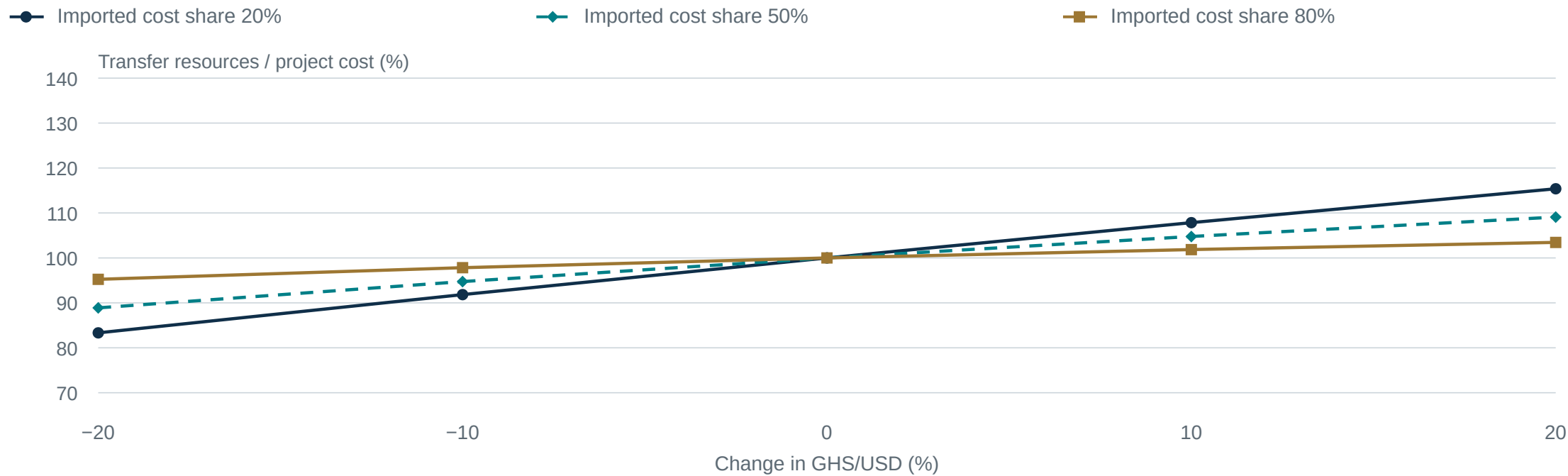
Sources: World Bank WDI metadata [\[S03\]](#); IDER calculations [\[S10\]](#).

Note: No current mortgage product, legal title opinion, tax rule or national remittance-funded housing share is inferred.

Dollar-funded construction still depends on imported-input intensity

Hypothetical US\$ 10,000 transfer and GHS 100,000 baseline project; fees excluded to isolate the currency mechanism.

Figure 19. Dollar-funded construction still depends on imported-input intensity



Sources: IDER calculations [\[S10\]](#).

Note: Foreign quantities and local prices are fixed. Funding coverage is not a housing return or a causal construction response.

Joint material-price increases can consume the currency-conversion gain

Same project; local component price+10%, foreign component unit price+15%; no additional funds.

Figure 20. Joint material-price increases can consume the currency-conversion gain

	GHS/USD -20%	GHS/USD +0%	GHS/USD +20%
Imported share 20%	-26.4	-11.0	4.4
Imported share 50%	-21.0	-12.5	-4.0
Imported share 80%	-15.6	-14.0	-12.4

Transfer less project cost, GHS thousands

Sources: IDER calculations [\[S10\]](#).

Note: Imported-cost conversion multiplies the exchange-rate and foreign-price factors. Negative cells are model financing gaps, not actual household losses.

Start-up finance must include working capital and a cash reserve

Three analytical archetypes; all input amounts are assumed GHS values, not estimated average Ghana firms.

Table 34. Start-up finance must include working capital and a cash reserve

Profile	Fixed capital	Working capital	Reserve	Own funds	Imported shares: K / W
Local service	15,000	5,000	3,000	5,000	10% / 10%
Import retailer	30,000	14,000	5,000	8,000	65% / 80%
Agro-processor	80,000	20,000	8,000	15,000	55% / 40%

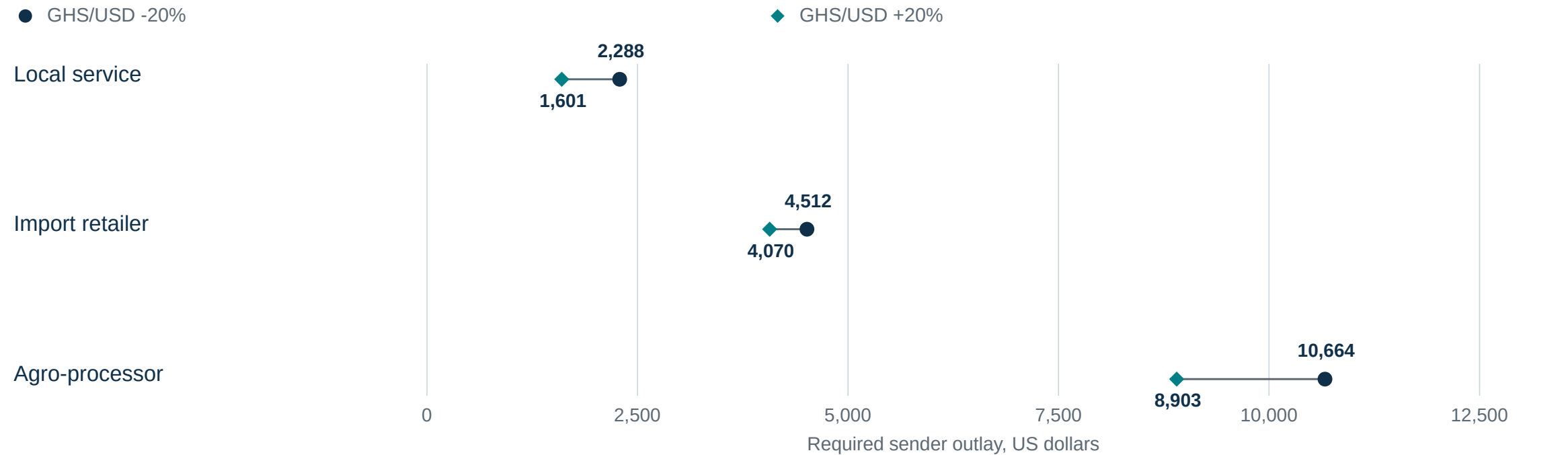
Sources: IDER calculations [\[S10\]](#).

Note: Equipment, inventories, retained liquidity and own contributions are recorded separately to avoid treating a remittance as pure fixed investment.

The dollars needed to start a business depend on both sides of the budget

Total sender outlay required to fund the capital, working-capital and reserve gap after own funds.

Figure 21. The dollars needed to start a business depend on both sides of the budget



Sources: IDER calculations [\[S10\]](#).

Note: A US\$ 20 flat fee and 3% FX margin are assumed. Funding sufficiency does not establish registration, survival, profit or additional jobs.

Funding an enterprise is not the same as causing a new enterprise

Follow the sequence from financing to operation before attributing an effect.

ADDITIONAL FINANCE	ADDITIONAL ACTIVITY	ADDITIONAL IMPACT
Identify whether transfers replace savings, family loans or bank credit. A remittance-financed invoice can occur without raising total enterprise investment.	Track start date, sales, capital use, employment and survival. Include enterprises that never opened or closed; successful recipients alone create survivorship bias.	Compare outcomes against a credible counterfactual with baseline plans. Financing thresholds in this report are exact conditional budgets—not business-creation coefficients.

Sources: Yang (2008) [\[S08\]](#); IDER calculations [\[S10\]](#).

Note: No national start-up incidence or remittance-to-jobs conversion factor is estimated.

Declared project cash schedule — 1 of 2

Synthetic 90-day schedule; US\$ 1,000 per receipt; GHS 10/USD and 3% FX margin at baseline.

Table 35. Declared project cash schedule — 1 of 2

Day	Event ID	Purpose	Currency	Amount
0	O1	Opening	GHS	5,000
0	R1	Remittance	USD	1,000
10	P1	Construction	GHS	−9,000
20	H1	Household	GHS	−1,000
30	R2	Remittance	USD	1,000

Sources: IDER calculations [\[S10\]](#).

Note: Opening cash is GHS 5000. Sender fees are paid outside this ledger; no interest, borrowing, taxes or construction-price response is assumed.

Declared project cash schedule — 2 of 2

Synthetic 90-day schedule; US\$ 1,000 per receipt; GHS 10/USD and 3% FX margin at baseline.

Table 36. Declared project cash schedule — 2 of 2

Day	Event ID	Purpose	Currency	Amount
35	P2	Construction	GHS	−12,000
50	H2	Household	GHS	−1,000
60	R3	Remittance	USD	1,000
65	P3	Construction	GHS	−10,000
80	H3	Household	GHS	−1,000

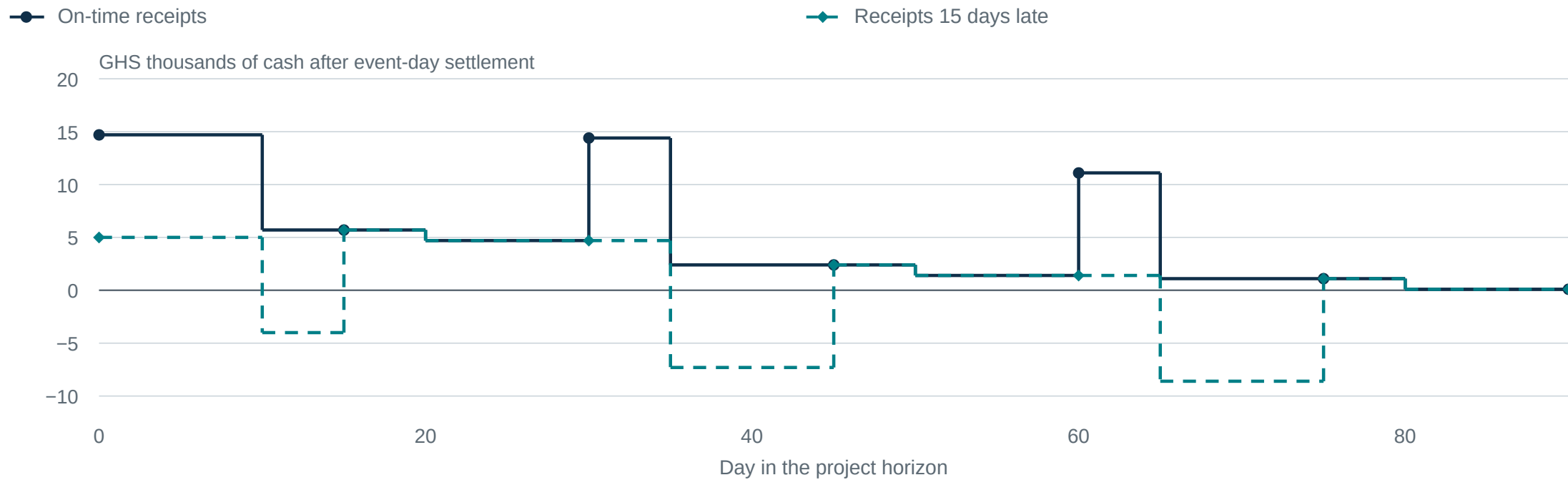
Sources: IDER calculations [\[S10\]](#).

Note: Opening cash is GHS 5000. Sender fees are paid outside this ledger; no interest, borrowing, taxes or construction-price response is assumed.

The same closing cash can conceal an earlier funding gap

All receipts remain within the 90-day horizon; only remittance arrival dates move.

Figure 22. The same closing cash can conceal an earlier funding gap



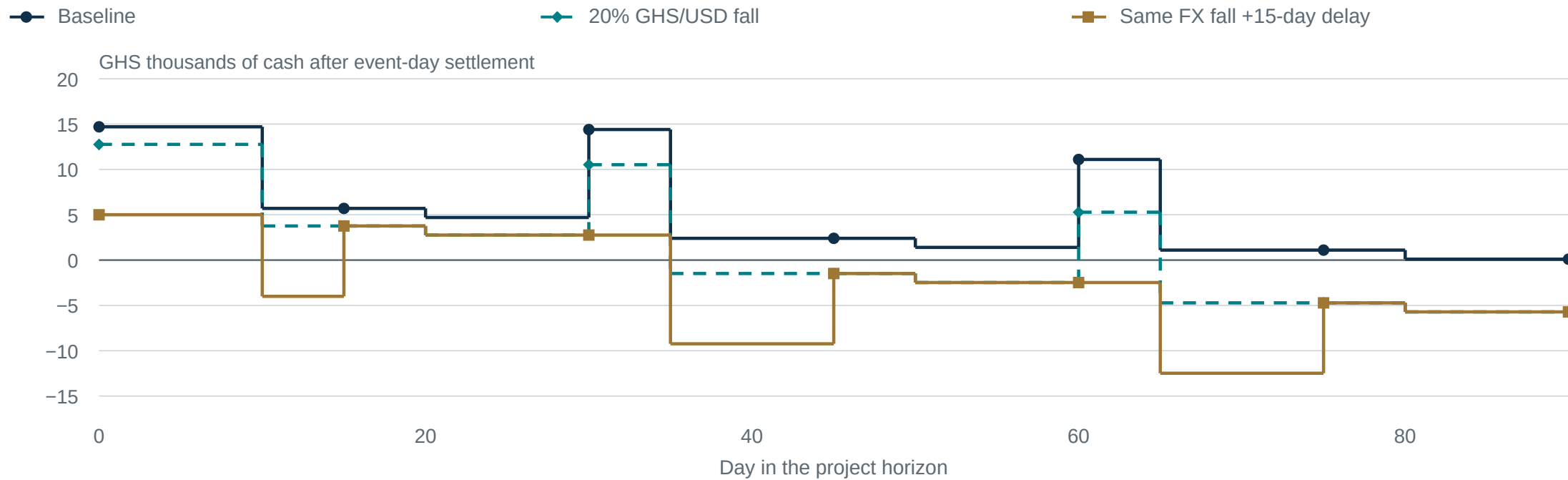
Sources: IDER calculations [\[S10\]](#).

Note: Both cases close at GHS 100. A 15-day receipt delay requires a GHS 8,600 bridge in this scenario; the deficit is not authorised borrowing.

Currency and arrival timing change different parts of the funding problem

Project cedi invoices stay fixed; the sender keeps the foreign principal unchanged.

Figure 23. Currency and arrival timing change different parts of the funding problem



Sources: IDER calculations [\[S10\]](#).

Note: The joint appreciation/delay case requires GHS 12,480 of bridge funding. No exchange-rate or payment-delay probabilities are assigned.

The minimum cash balance—not the annual transfer sum—sets the bridge need

Exact event-ledger calculation; all amounts are GHS.

Table 37. The minimum cash balance—not the annual transfer sum—sets the bridge need

Scenario	Minimum cash	Closing cash	Required bridge
On time / baseline FX	100	100	0
15-day delay	−8,600	100	8,600
30-day delay	−9,600	100	9,600
GHS/USD −20%	−5,720	−5,720	5,720
GHS/USD +20%	5,000	5,920	0
GHS/USD −20% +15 days	−12,480	−5,720	12,480

Sources: IDER calculations [\[S10\]](#).

Note: Bridge need=max(0,−minimum cash). Actual facilities require approval and add interest, collateral and drawdown conditions not modelled here.

Four foreign-exchange amounts must not be counted as four inflows

A transfer can generate several records in a payment chain, but only one underlying cross-border resource.

Table 38. Four foreign-exchange amounts must not be counted as four inflows

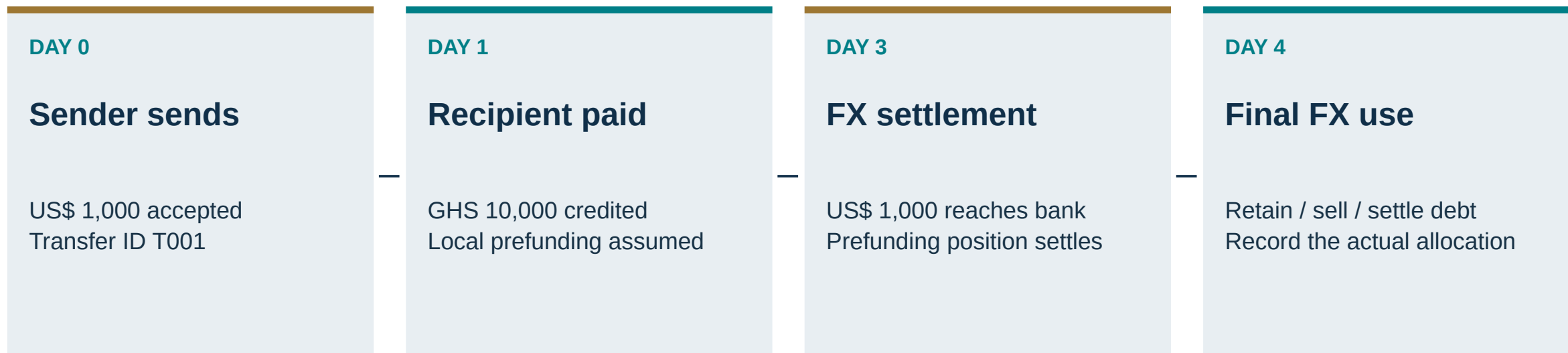
Measurement stage	What is recorded	What remains unknown
Sender origination	Amount accepted by the sending provider	Completion, refunds, deductions and final recipient.
Beneficiary payout	Cedi or FX amount credited or paid locally	Whether provider settlement preceded or followed the payout.
Inter-agent settlement	FX credited through a settlement bank or netted obligation	Whether it is retained, sold domestically, used for offshore obligations or recycled.
Dealer-market delivery	FX actually offered into a named market and value date	The net exchange-rate effect after other demand, intervention and expectations.

Sources: Ratha / IMF (2019) [\[S09\]](#); IDER calculations [\[S10\]](#).

Note: Use one transfer identifier and distinguish payment events from stocks, netting and final use.

A beneficiary can be credited before FX reaches the local settlement bank

Synthetic US\$ 1,000 transfer; zero fees and GHS 10/USD solely for the settlement example.



ONE RESOURCE • MULTIPLE EVENTS • DIFFERENT VALUE DATES

Sources: Ratha / IMF (2019) [\[S09\]](#); IDER calculations [\[S10\]](#).

Note: The cumulative unique principal stays US\$ 1000. Summing origination, payout and bank settlement would triple-count the transfer.

Gross receipts can create both currency supply and import demand

NormalisedUS\$1000 receipt; conversion and induced import-demand shares are independently imposed.

Figure 24. Gross receipts can create both currency supply and import demand

	Converted 25%	Converted 50%	Converted 75%	Converted 100%
Import demand 10%	150	400	650	900
Import demand 30%	-50	200	450	700
Import demand 50%	-250	0	250	500

Converted FX less additional import requirement, US dollars

Sources: IDER calculations [\[S10\]](#).

Note: This partial cash-flow accounting excludes capital flows, dealer inventories, behavioural feedback and intervention. It is not an exchange-rate equation.

Remittances are a funding source, not a predetermined cedi effect

The marginal market effect depends on timing, substitution and the response of other agents.

HOUSEHOLD CHANNEL	INTERMEDIARY CHANNEL	MACROECONOMIC CHANNEL
Receipts can finance imports or domestic goods containing imported inputs. Domestic purchases also support local incomes; neither first-round import content nor an output multiplier is estimated here.	Providers and banks may prefinance local payouts and later receive settlement. Market FX supply can therefore lead or lag the household credit rather than match it one-for-one each day.	The cedi, domestic prices and remitter choices can respond together to income and financial shocks. A gross annual inflow and a currency change are insufficient for causal attribution.

Sources: Ratha / IMF (2019) [\[S09\]](#); IDER calculations [\[S10\]](#).

Note: No remittance-induced appreciation coefficient, national consumption multiplier or reserve accumulation share is asserted.

The identifying assumption must correspond to the exact research question

Additional regression sophistication does not repair a mismatched denominator or an invalid comparison.

Table 39. The identifying assumption must correspond to the exact research question

Threat	Required design response	What is implemented here
Income losses trigger support	Separate the remittance response to need from the effect of externally assigned transfers	Published Ghana insurance evidence is not relabelled as a transfer-treatment effect.
Migration and networks are selected	Baseline characteristics, credible assignment and exclusion restrictions	Source OLS/IV differences shown; no claim that networks are automatically valid instruments.
Formal providers select users	Defined recipient frame; channel-switch and non-user coverage	Kumasi sampling fractions and nonresponse bounds disclosed, not extrapolated nationally.
FX responds to remittances and common shocks	Date-matched settlement data plus a defensible shock design	Accounting supply/demand scenarios remain distinct from causal exchange-rate estimates.
Post-receipt controls are mediators	Define total versus direct effects before conditioning on savings or work	Prospective protocols require pre-treatment covariates and an explicit estimand.

Sources: Adams et al. (2008) [\[S05\]](#); Akobeng (2022) [\[S06\]](#); Yang (2008) [\[S08\]](#); IDER calculations [\[S10\]](#).

Note: Unobserved confounding and non-random frame coverage are not certified as eliminated.

A migrant exchange-rate shock is broader than a remittance-income shock

Yang’s Philippines study is used as an identification example—not as Ghana calibration.

DESIGN	ESTIMAND	GHANA APPLICATION
The 1997 crisis generated different destination-currency shocks for households with migrants abroad before the shock. The timing and exposure construction improve on a simple recipient/nonrecipient comparison.	The shock can change remittances, overseas savings, future earnings and return-migration choices. Its reduced-form effect is therefore not automatically the effect of an extra remittance dollar.	A sending-country shock may also affect Ghana’s exports, investment or family wealth. These direct paths must be investigated before using it as an instrument for remittance receipts.

Sources: Yang (2008) [\[S08\]](#); IDER calculations [\[S10\]](#).

Note: No Philippines coefficient is imported into a Ghana housing, enterprise or FX forecast.

A transfer-cost experiment should measure all-channel resources and real outcomes

Proposed randomised offer of a transparent transfer-cost rebate; no trial has been conducted.

Table 40. A transfer-cost experiment should measure all-channel resources and real outcomes

Element	Prespecified measure	Identification safeguard
Treatment assignment	Offer randomised across eligible sender–recipient pairs or clusters	Document allocation and non-take-up; report intention-to-treat before any instrument-based effect.
Primary resource outcome	Total household receipts across all channels, net of costs	A rise in partner-provider volume alone may be channel substitution.
Primary investment outcome	Verified start-up spending or construction progress over a fixed horizon	Record baseline plans; retain failed projects and non-completers.
Welfare outcome	Real consumption and unmet essential payments	Separate nominal conversion from price-level changes and other transfer offsets.
Inference and access	Randomisation-level uncertainty, attrition and spillovers	Power planning needs real clusters and variance; no invented sample-size precision.

Sources: IDER calculations [\[S10\]](#).

Note: The offer’s total effect includes liquidity and price-information channels; take-up-based IV requires additional exclusion and monotonicity assumptions.

A panel must preserve missing recipients and transaction identities

The data requirements differ for household outcomes, enterprise performance and daily FX supply.

Table 41. A panel must preserve missing recipients and transaction identities

Panel component	Essential variables	Release condition
Household / migrant pair	Baseline income, migration timing, recipient authority, all-channel receipts	Stable IDs, survey weights, attrition and pre-treatment outcomes.
Construction / enterprise	Amounts committed and paid, import content, milestones, completion and survival	Audit reported uses against invoices; do not condition only on successful projects.
Payment transaction	Originated, paid, refunded, netted and settled amounts with currency/value date	No duplication across provider and bank records; anonymised linkage.
Analytical inference	Exposure, assignment, comparison, controls and dependence structure	An association is released as such when causal assumptions remain unsupported.

Sources: World Bank WDI metadata [\[S03\]](#); IDER calculations [\[S10\]](#).

Note: No current national household microdata or bank/provider settlement panel was supplied or constructed in this edition.

The investable demand is more specific than the national remittance headline

Applications are due-diligence questions, not recommendations to buy a security or finance a named provider.

Table 42. The investable demand is more specific than the national remittance headline

Business line	Evidence of demand to establish	Unit-economics / risk test
Transfer and payout services	Verified corridor volume, completion, repeat use and all-in recipient value	Acquisition cost, fraud/refunds, FX inventory, settlement lag and prefunding.
Housing / construction services	Costed stages, recipient authority, title/ownership and certified progress	Currency of materials, project overruns, escrow controls and transfer interruption.
MSME funding and equipment	Business plans, own funds, demand and working-capital gap	Capital threshold alone is insufficient; test cash cycles, import content and repayment.
Savings / insurance links	Recipient consent, retention, liquidity need and actual product use	Do not convert transfers into illiquid assets without suitability and transparent costs.

Sources: IDER calculations [\[S10\]](#).

Note: No national addressable-market estimate is manufactured by multiplying incompatible recipient counts and flow totals.

Different audiences require different remittance measurements

Match the denominator and horizon to the institution’s decision.

Table 43. Different audiences require different remittance measurements

Audience	Analytical use	Avoid
Banks and FX desks	Value-date settlement, net currency inventory and prefunding	Treating beneficiary payout as simultaneous central-bank reserve inflow.
Corporate / private-equity teams	Unit economics, corridor retention, household and enterprise use	Treating channel capture as growth in total household resources.
Pension funds / insurers / retirees	Liability liquidity, product risk and recipient purchasing power	Assuming remittance growth guarantees asset returns or household affordability.
Diaspora organisations / MSMEs	Delivered value, verified project milestones and contingency finance	Using a cheap headline fee or stated project purpose as proof of value or completion.
Researchers / media / partners	Dated comparable statistics and uncertainty disclosure	Presenting historical household studies as 2026 national prevalence.

Sources: IDER calculations [\[S10\]](#).

Note: These are evidence requirements; neither optimal portfolio allocations nor institution-specific compliance judgements are supplied.

Measurement reform has benefits and implementation trade-offs

Neutral analytical options for public authorities and development partners; no policy ranking.

Table 44. Measurement reform has benefits and implementation trade-offs

Option	Information gained	Trade-off / prerequisite
Bank–provider reconciliation	Comparable formal household-transfer flows and settlement timing	Reporting burden, agreed definitions, data access and confidentiality.
Representative recipient survey	All-channel receipts, income, housing and enterprise use	Recall error, informal coverage, nonresponse and seasonality.
Matched quote monitoring	Net recipient value by amount, corridor and payment method	Provider/service entry and changing sample composition require controls.
Randomised cost / information pilot	Additional resources, channel shifts and outcome responses	Consent, fairness, spillovers, attrition and sufficient independent assignment units.

Sources: World Bank WDI metadata [\[S03\]](#); IDER calculations [\[S10\]](#).

Note: Current legal mandates, taxes and permitted operating models require separate up-to-date regulatory review.

A 90-day programme should deliver reconciled records before causal claims

Proposed pilot begins after permission and partner agreements; no national coverage target is claimed.

Table 45. A 90-day programme should deliver reconciled records before causal claims

Period / owner	Deliverable	Measurable acceptance criterion
Days 0–30 IDER + data owners	Definition register; source inventory; sender/recipient and settlement schemas	Every series tagged by concept, currency, date, vintage and coverage; all gaps listed.
Days 31–60 providers/banks + survey lead	De-duplicated pilot transfer chain and consented household/project records	All known transactions have IDs; origin, payout, refunds and settlement reconcile; unresolved amounts explicit.
Days 61–90 analysis lead + independent reviewer	Matched-price dashboard, household/project diagnostics and preregistered next-stage design	Replay outputs; disclose attrition and source changes; approve only claims supported by the obtained evidence.

Sources: IDER calculations [\[S10\]](#).

Note: “All known” is a captured-data denominator, not proof of all Ghanaian remittance exposure. Staffing and secure linkage are required.

Monitor resources, costs, investment execution and FX delivery separately

Suggested operating record; thresholds are set by participating institutions, not inferred national standards.

Table 46. Monitor resources, costs, investment execution and FX delivery separately

Indicator	Definition	Frequency / owner
Delivered value	Cedi/FX received for the same total sender budget, including disclosed fees	Quote snapshot pricing/data lead
Completion and refunds	Completed and reversed transfers by cohort of origination	Weekly operations
Settlement delay	Time between beneficiary credit and matched FX settlement	Daily/weekly treasury
Receipt and project continuity	Missed expected transfers; certified project payments and funding gaps	Monthly/project stage household/project lead
Frame and source exceptions	Unmatched transactions, missing users, coverage/vintage changes	Every release quality reviewer
Additionality outcomes	All-channel receipts, net new investment and prespecified welfare outcomes	Evaluation waves research team

Sources: IDER calculations [\[S10\]](#).

Note: Programme activity indicators are not causal effects; a service user count is not a beneficiary household count.

A useful briefing states what changed and what has not been measured

Public communication should preserve the measurement boundary of the underlying evidence.

STATE THE RECORD	STATE THE MECHANISM	STATE THE LIMIT
Give the observation year, source vintage, population and unit. Describe a 2023 published estimate as such; do not call it a current formal-channel total.	Specify fees, FX margins, recipient decisions, investment timing and bank settlement. Distinguish a calculated funding threshold from a behavioural effect.	Do not attach a national multiplier, informal-flow residual, survival probability or product return to data that do not identify it. Publish material source conflicts with the finding.

Sources: IDER calculations [\[S10\]](#).

Note: The report’s comparisons support diagnosis and research design, not a universal recommendation on remitting, investing or currency positions.

Assumptions are part of every numerical result

The model catalogue separates executed identities and conditional calculations from unestimated research designs.

Table 47. Assumptions are part of every numerical result

Principle	Maintained condition	Interpretation boundary
A 1 Definition and vintage	Match source concept, residency, population, units and observation period	A formal record is not automatically the WDI indicator or a complete all-channel estimate.
A 2 No double counting	One resource ID across origination, payout, settlement and subsequent use	Sequential records of the same transfer are not additive new receipts.
A 3 Source fidelity	Preserve raw values, rounding and documented discrepancies	Recalculation does not certify the underlying survey or reporting system.
A 4 Explicit scenarios	Fees, margins, FX, costs, timing and coverage fractions are imposed	Scenario settings are not estimated Ghana elasticities or probabilities.
A 5 Coverage and counterfactual	Sampling fractions, missingness and causal assumptions must be explicit	No national reweighting, causal coefficient or trial result is manufactured.

Sources: World Bank WDI metadata [\[S03\]](#); IDER calculations [\[S10\]](#).

Note: Every E-model maps to a supplied output. P01–P02 are prospective only.

Flow and capture measurement

Variables and assumptions accompany each model; output mappings are in the evidence package.

E01 Historical flow growth

EXECUTED DESCRIPTION

$$g_t = 100(R_t/R_{t-1} - 1) \tag{E01a}$$

$$\text{Index}_t = 100R_t/R_{2019} \tag{E01b}$$

R is the displayed annual inflow in US\$ million from the fixed 2023 publication vintage.

ASSUMPTIONS / INTERPRETATION

Positive prior values, unchanged interpretation within the published series. Growth is descriptive; coverage and revisions can change the result.

E02 Comparable capture and total

CONDITIONAL MEASUREMENT

$$F = pT \tag{E02a}$$

$$T \in [F/p_{\max}, F/p_{\min}] \tag{E02b}$$

F is the compatible formal-record total; T the same-scope all-channel total; p the captured fraction.

ASSUMPTIONS / INTERPRETATION

Requires matched definitions and $0 < p_{\min} \leq p_{\max} \leq 1$. No Ghana capture fraction or current total is estimated.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Capture attribution and transfer costs

Variables and assumptions accompany each model; output mappings are in the evidence package.

E03 Resource–capture decomposition

EXECUTED ILLUSTRATION

$$\Delta F = \bar{p}\Delta T + \bar{T}\Delta p \tag{E03a}$$

$$\bar{p} = (p_0 + p_1)/2; \bar{T} = (T_0 + T_1)/2 \tag{E03b}$$

Endpoint averages split the interaction symmetrically. Example: T rises from 1,000 to 1,200; p rises from 0.60 to 0.72.

ASSUMPTIONS / INTERPRETATION

Both inputs are imposed. The arithmetic does not identify Ghana’s actual formalisation versus resource-growth contributions.

E04 Quoted-cost component audit

EXECUTED SOURCE ACCOUNTING

$$c = \text{fee} + \text{margin} + \rho \tag{E04a}$$

$$\text{CostEq}_{200} = 200c/100 \tag{E04b}$$

c, fee and margin are source percentages of a US\$ 200 principal. The symbol ρ is the displayed-source rounding residual.

ASSUMPTIONS / INTERPRETATION

Cost-equivalent comparison, not a recipient-payment formula. Do not deduct a fee twice when the sender pays it on top.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Cost indices and the recipient budget

Variables and assumptions accompany each model; output mappings are in the evidence package.

E05 Price-index composition

EXECUTED SOURCE COMPARISON

$$\Delta c_{\text{scope}} = c_{\text{including}} - c_{\text{original}} \tag{E05a}$$

$$\text{Gap} = c_{\text{SSA}} - c_{\text{global}} \tag{E05b}$$

Indices are published quoted-service averages; composition change uses the same 2025Q1time period.

ASSUMPTIONS / INTERPRETATION

Different service universes and weights. Changes do not identify matched-service price reductions or causal digitalisation effects.

E06 Fixed sender-budget receipt

EXECUTED CONDITIONAL BUDGET

$$H = (B - F)e(1 - m) - k \tag{E06a}$$

$$\text{Principal} = B - F \tag{E06b}$$

B is the total sender budget (USD); F the flat sender fee (USD); e the GHS/USD rate; m the FX margin; k the recipient charge (GHS).

ASSUMPTIONS / INTERPRETATION

B>F;e>0;0 ≤ m<1. Sender fee comes from total budget once. No hidden charge, non-completion or taxes assumed.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Purchasing power and the sender target

Variables and assumptions accompany each model; output mappings are in the evidence package.

E07 Real receipt sensitivity

EXECUTED CONDITIONAL BUDGET

$$H_1/H_0 = (1 + s)(1 + d) \tag{E07a}$$

$$\text{RealGain} = (H_1/H_0)/(1 + \pi) - 1 \tag{E07b}$$

s is the foreign-principal change; d the GHS/USD change; π the domestic price-level change. The FX margin stays unchanged.

ASSUMPTIONS / INTERPRETATION

The fee is paid separately in this exercise; no endogenous remitter or consumption response is estimated. All factors must stay positive.

E08 Sender cost of a cedi target

EXECUTED REVERSE BUDGET

$$S^* = (H^* + k)/[e(1 - m)] \tag{E08a}$$

$$B^* = S^* + F \tag{E08b}$$

H* is the target in recipient cedis; S* the principal in USD; B* the total sender outlay in USD. Other symbols follow E06.

ASSUMPTIONS / INTERPRETATION

Fixed target and costs; this is not a fitted sender elasticity. Required transfer may not be affordable to a particular migrant.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Respondent shares and sampling design

Variables and assumptions accompany each model; output mappings are in the evidence package.

E09 Respondent counts and shares

EXECUTED SOURCE DESCRIPTION

$$\hat{p}_j = n_j/n_{obs} \tag{E09a}$$

$$\sum_j n_j = 689 \tag{E09b}$$

n_j is the Table 6 decision-maker count; n_{obs} is 689 Kumasi respondents. Categories are mutually exclusive as printed.

ASSUMPTIONS / INTERPRETATION

Raw selected-respondent proportions. No design-weighted frame prevalence or national recipient percentage is claimed.

E10 Sampling fractions and weights

EXECUTED DESIGN DIAGNOSTIC

$$f_h = n_h/N_h \tag{E10a}$$

$$w_h = N_h/n_h \tag{E10b}$$

h identifies the source sampling stratum; n_h is selected people; N_h is the frame count. Base weights exclude nonresponse adjustments.

ASSUMPTIONS / INTERPRETATION

No respondent outcome-by-stratum file was obtained. Calculated base weights are not applied to invent a weighted result.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Missingness bounds and value denominators

Variables and assumptions accompany each model; output mappings are in the evidence package.

E11 Selected-sample missingness bounds

EXECUTED CONDITIONAL BOUND

$$p_L = n_{\text{yes}}/n_{\text{selected}} \tag{E11a}$$

$$p_U = (n_{\text{yes}} + n_{\text{missing}})/n_{\text{selected}} \tag{E11b}$$

The selected sample is 712; 689 responded and 23 did not. The indicator is binary, such as remitter decision authority.

ASSUMPTIONS / INTERPRETATION

Bounds address the 23 selected nonrespondents only. They exclude frame undercoverage, unequal weights and measurement error.

E12 Amount shares and mention shares

EXECUTED DENOMINATOR AUDIT

$$\text{ValueShare}_j = V_j/\Sigma V \tag{E12a}$$

$$\text{MentionShare}_j = M_j/\Sigma M \tag{E12b}$$

V_j is reported restricted/unrestricted money; M_j is restricted-use mentions. Respondent percentages instead use 689.

ASSUMPTIONS / INTERPRETATION

Money, mentions and people have different denominators. Neither intended use nor an amount total establishes new completed investment.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Published-model contrast and adding-up

Variables and assumptions accompany each model; output mappings are in the evidence package.

E13 Published budget-share contrast

EXECUTED SOURCE CONTRAST

$$\Delta b_k = b_{k,\text{international}} - b_{k,\text{none}} \tag{E13a}$$

$$\text{ContrastPP}_k = 100\Delta b_k \tag{E13b}$$

b_k is the published marginal budget share for category k . OLS and IV source results remain separate.

ASSUMPTIONS / INTERPRETATION

No new regression or covariance is estimated. Contrast is not the spending allocation of an extra remittance dollar.

E14 Published adding-up check

EXECUTED SOURCE AUDIT

$$A_g = \sum_k b_{k,g} \tag{E14a}$$

$$\text{ClosureGap}_g = A_g - 1 \tag{E14b}$$

Sum the six displayed categories for model/group g ; compare separately to the printed source total.

ASSUMPTIONS / INTERPRETATION

No renormalisation or invented omitted expenditure category. Source discrepancies remain visible in the report.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Construction costs and funding

Variables and assumptions accompany each model; output mappings are in the evidence package.

E15 Construction-cost conversion

EXECUTED CONDITIONAL MODEL

$$K_1 = K_0[(1 - \mu)(1 + \ell) + \mu(1 + d)(1 + u)] \tag{E15a}$$

$$\Delta K = K_1 - K_0 \tag{E15b}$$

K_0 is the GHS 100,000 baseline project; μ the imported-cost share; ℓ local price growth; u USD material-price growth; d FX change.

ASSUMPTIONS / INTERPRETATION

Fixed quantities and scope; no land-price, wage-feedback, delay penalty or quality response. Not a Ghana construction-cost estimate.

E16 Housing funding and coverage

EXECUTED CONDITIONAL MODEL

$$H = S e_0(1 + d) \tag{E16a}$$

$$\text{Gap} = H - K_1; \text{Cover} = 100H/K_1 \tag{E16b}$$

S is US\$ 10,000 of support; e_0 is GHS 10/USD. Fees are excluded here to isolate currency and cost exposure.

ASSUMPTIONS / INTERPRETATION

Fixed foreign support, no loan or additional own funds. A coverage ratio does not measure asset return or building completion.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Enterprise finance and required transfers

Variables and assumptions accompany each model; output mappings are in the evidence package.

E17 Start-up financing requirement

EXECUTED CONDITIONAL BUDGET

$$\text{Need} = K_0(1 + \mu_K d) + W_0(1 + \mu_W d) + L - O \tag{E17a}$$

$$\text{Need} = \text{capital} + \text{working capital} + \text{reserve} - \text{own funds} \tag{E17b}$$

K is fixed capital; W working capital; L the liquidity reserve; O own funds. Imported shares affect only the associated cost component.

ASSUMPTIONS / INTERPRETATION

Three assumed profiles, not representative firm estimates. Costs do not include all taxes, licences, revenues or business-risk contingencies.

E18 Remittance-funded start-up threshold

EXECUTED REVERSE BUDGET

$$S^* = \text{Need} / [e_0(1 + d)(1 - m)] \tag{E18a}$$

$$B^* = S^* + F \tag{E18b}$$

F is US\$ 20; m is 3%; e_0 is GHS 10/USD. B^* is the total sender budget needed after the declared own contribution.

ASSUMPTIONS / INTERPRETATION

A sufficient budget does not prove the venture is viable or caused by remittances. Transfer and capital costs must be updated for actual projects.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Dated cash and bridge finance

Variables and assumptions accompany each model; output mappings are in the evidence package.

E19 Dated project cash

EXECUTED SYNTHETIC LEDGER

$$C(t) = C(0) + \sum_{\tau \leq t} [\text{Receipts}(\tau) - \text{Payments}(\tau)] \tag{E19a}$$

$$\text{FXreceipt}(\tau) = S(\tau)e(\tau)(1 - m) \tag{E19b}$$

Flows convert once on the event date. Opening cash is GHS 5,000; three receipts are US\$ 1,000 each; the FX margin is 3%.

ASSUMPTIONS / INTERPRETATION

No borrowing or interest. Same-day outflows precede receipts; source IDs unique; sender fee paid outside the ledger.

E20 Bridge and receipt timing

EXECUTED CONDITIONAL TIMING

$$\text{Bridge} = \max[0, -\min_t C(t)] \tag{E20a}$$

$$t^{\text{new}}_{\text{receipt}} = t^{\text{old}}_{\text{receipt}} + \text{delay} \tag{E20b}$$

Minimum includes every event date, not just month-end. Receipt amounts stay unchanged under pure delay.

ASSUMPTIONS / INTERPRETATION

Negative cash denotes unmet funding, not an approved overdraft. A facility's price, collateral and approval are not modelled.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Settlement records and FX supply

Variables and assumptions accompany each model; output mappings are in the evidence package.

E21 Unique resource across settlements

EXECUTED MEASUREMENT EXAMPLE

$$\text{UniqueR} = \sum_{\text{unique transfer IDs}} \text{Principal} \tag{E21a}$$

$$\text{EventCount} \neq \text{TransferCount} \tag{E21b}$$

One US\$ 1,000 transfer, T001, has origination, payout, settlement and allocation events on separate days.

ASSUMPTIONS / INTERPRETATION

Do not add successive records of the same resource. Refunds, splits and netting require linked parent/child transaction IDs.

E22 First-round FX cash balance

EXECUTED CONDITIONAL ACCOUNTING

$$\text{Supply} = aR; \text{ImportNeed} = bR \tag{E22a}$$

$$\text{FirstRoundBalance} = (a - b)R \tag{E22b}$$

R is a normalised US\$ 1,000 receipt; a the locally converted fraction; b the incremental import requirement as a fraction of R.

ASSUMPTIONS / INTERPRETATION

No causal exchange-rate equation or GDP multiplier. Offsetting financial flows, inventories, demand feedback and intervention are excluded.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Observed quotes and alternative weighting

Variables and assumptions accompany each model; output mappings are in the evidence package.

E23 Observed tariff component identity

EXECUTED QUOTE ACCOUNTING

$$c_{ja} = 100f_{ja}/a + m_{ja} + \rho_{ja} \tag{E23a}$$

$$\bar{c}_a = \sum_j c_{ja}/J \tag{E23b}$$

a is GBP 120 or GBP 300 principal; f is the fee in GBP; m and c are percent. j identifies one of 37 matched service configurations; J = 37.

ASSUMPTIONS / INTERPRETATION

Snapshot dated 8–22 August 2025. Repeated configurations are not independent customers. Preserve rounded margins and residuals; averages are not transaction weighted.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

E24 Provider and network weighting

EXECUTED COMPOSITION SENSITIVITY

$$\bar{c}_{\text{provider}} = G^{-1} \sum_g [J_g^{-1} \sum_{j \in g} c_j] \tag{E24a}$$

$$\bar{c}_{-g} = \sum_{j \notin g} c_j / (J - J_g) \tag{E24b}$$

G = 13 displayed provider labels; J_g is its configuration count. Alternative network grouping merges Post Office via Western Union with Western Union, giving 12 labels.

ASSUMPTIONS / INTERPRETATION

Equal-label and service-row means answer different descriptive questions. Leave-one-label ranges are sensitivity checks, not standard errors or preferred trimmed estimates.

Paired tariffs and rate rounding

Variables and assumptions accompany each model; output mappings are in the evidence package.

E25 Matched amount comparison

EXECUTED PAIRED TARIFF CONTRAST

$$\Delta c_j = c_{j,300} - c_{j,120} \tag{E25a}$$

$$\Delta c_j = 100(f_{j,300}/300 - f_{j,120}/120) + \Delta m_j + \Delta p_j \tag{E25b}$$

Pair by provider label, payment instrument, receiving mode and access point. All 37 service identities are present at both amount levels.

ASSUMPTIONS / INTERPRETATION

The tariff comparison has no random assignment, customer response or volume weights. A lower percentage charge does not make a delayed larger payment optimal.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

E26 Quote-rate rounding compatibility

EXECUTED ENDPOINT CHECK

$$m_L = 100[1 - (q + h)/(r - h)] \tag{E26a}$$

$$m_U = 100[1 - (q - h)/(r + h)] \tag{E26b}$$

q is the offered GHS/GBP rate; r is the reference rate. h = 0.005 applies to each displayed two-decimal rate; require r>h.

ASSUMPTIONS / INTERPRETATION

Compare the source margin's own rounding interval to these endpoints. Negative margins are permitted when q>r. Compatible rounding does not authenticate the provider quotation.

Weighted allocations and receipt definitions

Variables and assumptions accompany each model; output mappings are in the evidence package.

E27 Unknown stratum-outcome allocation

EXECUTED SHARP ESTIMATOR RANGE

$$p_L = \min_y \sum_h w_h y_h / N \tag{E27a}$$

$$p_U = \max_y \sum_h w_h y_h / N \tag{E27b}$$

Weights equal frame/selected counts within each stratum; $N = 2,760$.
Constrain integer y_h to $0 \dots n_h$ and total k (lower) or $k+23$ (upper); k is the observed positive count.

ASSUMPTIONS / INTERPRETATION

Range of hypothetical full-response weighted point estimates over unknown allocations—not a confidence bound for frame or national prevalence. Assumes source stratum counts and sampling fractions.

E28 Dual-recipient inclusion diagnostic

EXECUTED SOURCE-COUNT COMPARISON

$$p_{\text{exclusive}} = 210/3884; p_{\text{inclusive}} = (210 + 57)/3941 \tag{E28a}$$

$$p_{\text{module}} \in [267/4000, (267 + 59)/4000] \tag{E28b}$$

Counts are from the GLSS5 analysis described in WPS4515. The 57 dual recipients were excluded; 59 module records were incomplete.
Percentages multiply each ratio by 100.

ASSUMPTIONS / INTERPRETATION

No survey weights or outcome data are imputed. Bounds cover missing receipt status within the module, not the national population or migration-selection process.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Printed-share and funding sensitivity

Variables and assumptions accompany each model; output mappings are in the evidence package.

E29 Marginal-share rounding feasibility

EXECUTED SOURCE-PRINT AUDIT

$$A = \sum_k b_k; H = \sum_k h_k \tag{E29a}$$

$$A_{\text{true}} \in [A - H, A + H] \tag{E29b}$$

Six published expenditure categories. $h_k = 0.0005$ for three-decimal values; 0.005 for IV internal housing printed 0.10 . Printed total has its own half width.

ASSUMPTIONS / INTERPRETATION

“True” here means the unrounded value underlying the display, not a population parameter. No source share is renormalised or silently corrected.

E30 Project fee and daily-delay sensitivity

EXECUTED CONDITIONAL FUNDING TEST

$$m^* = 1 - (\sum \text{Payments} - C_0) / (e \sum S) \tag{E30a}$$

$$\text{Bridge}(d, \ell) = \max[0, -\min_t C(t; d, \ell)] \tag{E30b}$$

Opening cash GHS 5,000; payments GHS 34,000; foreign principal US\$ 3,000; $e = 10$. The margin threshold is 3.333333%. All 155 FX/delay combinations reuse the original event ledger.

ASSUMPTIONS / INTERPRETATION

No transfer demand, event probability or financing approval is estimated. Each event date is tested, with outflows before same-day receipts; fees paid separately by the sender.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Prospective causal research designs

Variables and assumptions accompany each model; output mappings are in the evidence package.

P01 Randomised-offer intention to treat

PROSPECTIVE ONLY — NOT ESTIMATED

$$ITT = E[Y|Z = 1] - E[Y|Z = 0] \tag{P01a}$$

Y = all-channel resources or prespecified real outcome (P01b)

Z is random assignment of a cost-rebate offer; Y is a defined outcome for eligible sender–recipient pairs at a fixed horizon.

ASSUMPTIONS / INTERPRETATION

Randomisation, appropriate interference assumptions, attrition control and assignment-level inference required. No trial has been run.

P02 Pre-exposure household panel

PROSPECTIVE ONLY — NOT ESTIMATED

$$Y_{it} = \alpha_i + \lambda_t + \beta(X_{i0} \times Shock_t) + \Gamma W_{it} + u_{it} \tag{P02a}$$

X_{i0} = pre-shock exposure; W = valid pre-treatment controls (P02b)

Y is a household/project outcome; X is baseline exposure; Shock is externally justified variation. Fixed effects do not guarantee exogeneity.

ASSUMPTIONS / INTERPRETATION

Credible counterfactual trends or exclusion, no uncontrolled direct channels, coverage and appropriate clustering required. No panel fitted.

Sources: IDER calculations [\[S10\]](#).

Note: Executed calculations are not all causal estimates. Prospective designs have no fitted coefficients or empirical standard errors.

Four checks make the model meaning reproducible

The calculations use either attributed source records or declared scenario values.

Table 48. Four checks make the model meaning reproducible

Model	Substitution	Meaning
E04 Cost-margin share	$6.8 / 9.2 \times 100 = 73.91\%$	Historical share of the total quoted cost, not a share of national remittances.
E11 Remitter-decision bound	$325/712 \text{ to } 348/712 = 45.65\% - 48.88\%$	Binary nonresponse bounds for selected people, not a national confidence interval.
E06 Lower fee with wider margin	$(206 - 2) \times 10 \times 0.95 = \text{GHS } 1,938$	Two cedis less than the higher-fee baseline for the same total sender outlay.
E20 Delayed project receipts	$\max(0, -[-8600]) = \text{GHS } 8,600$	Illustrated bridge need despite the same GHS 100 closing cash.

Sources: IFAD (2023) [\[S01\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: Source statistics, bounds and scenario outputs are deliberately not pooled into one empirical effect.

Material source limitations — 1 of 2

Retain incompatible definitions and unresolved source entries rather than silently harmonising them.

Table 49. Material source limitations — 1 of 2

Record	Issue	Treatment
2024–2026 Ghana headline flows	Current matched formal-channel and total-estimate series not authenticated	No current point estimate or residual labelled informal; retain historical vintages.
S01 outbound 2021	Figure 4 shows USD 813 m; text elsewhere shows USD 895 m	Retain both in exception record; no definitive net-flow calculation.
S01 cost totals	Rounded fee and FX-margin components differ from displayed totals by up to 0.1 pp	Retain separate rounding residual; do not force exact source closure.
S02 index composition	Quoted-service universe changes; corridor averages not transaction weights	No country-level price treatment effect from an aggregate index.
S05 marginal shares	Published category sums do not consistently equal one or the printed total	No renormalisation or use as household scenario spending weights.
S07 Table 11	GHS 1,726,381 unrestricted-use total versus Table 8 GHS 1,626,381; 8%+82% !=100%	Do not publish an 82% investment share as a validated estimate.

Sources: IFAD (2023) [\[S01\]](#); World Bank RPW (2025) [\[S02\]](#); Adams et al. (2008) [\[S05\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: No source ambiguity is repaired by fabricating observations, informal totals, spending shares or precision.

Material source limitations — 2 of 2

Retain incompatible definitions and unresolved source entries rather than silently harmonising them.

Table 50. Material source limitations — 2 of 2

Record	Issue	Treatment
S07 sample	Selection 333/1996,232/533,147/231; no outcome-by-stratum file	Raw respondent proportions are not design-weighted frame estimates.
S07 Table 7	Reaction counts sum271 while total cell689	Table excluded from quantitative analysis.
S06 scope	Institutional abstract only; remittances not verified as international-only	Report directional source result without transferring elasticities or inventing intervals.
Current regulation	Current BoG remittance guidance could not be fully retrieved	No current licence, tax, settlement mandate or compliance opinion is stated.
Original source binaries	Network copying unsuccessful	URLs and locators supplied; inspected primary pages are not claimed as bundled PDFs.

Sources: IFAD (2023) [\[S01\]](#); World Bank RPW (2025) [\[S02\]](#); Adams et al. (2008) [\[S05\]](#); Ofori-Appiah et al. (2024) [\[S07\]](#); IDER calculations [\[S10\]](#).

Note: No source ambiguity is repaired by fabricating observations, informal totals, spending shares or precision.

Trace each result from its source or assumption to executable output

The evidence package separates primary-source transcriptions from scenario settings.

Table 51. Trace each result from its source or assumption to executable output

Analytical layer	Input / implementation	Output / verification
Ghana flows and costs	ghana_flows_vintage2023.csv; ghana_cost_components.csv	Historical growth, costs and rounding-residual bridges.
Published household evidence	published_budget_shares.csv; kumasi counts/strata/amounts	Estimator contrasts, adding-up audit, sampling and nonresponse diagnostics.
Household / investment models	declared_assumptions.json; startup_profiles.csv	Recipient value, real resources, construction funding and start-up thresholds.
Event and settlement logic	cash_ledger.csv; unique transfer-chain example	Minimum cash, bridge requirements and non-duplicated settlement records.
Validation extension	inputs/validation; code/validate_extend.py	74 tariffs, pairing, weighting, feasible allocation bounds and source-rounding diagnostics.
Reproduction and publication	code/analyse.py; build_report.py; finalise.py; verify.py	Frozen inputs, regenerated outputs, figure/table datasets and document checks.

Sources: IDER calculations [\[S10\]](#).

Note: Original source PDF binaries were not copied; URLs and precise locators are supplied. Reproducibility is not an independent source-system audit.

References and source links — 1 of 4

Titles link to source publications; the source register retains scope and retrieval limitations.

S01 IFAD / DMA Global | 2023

Ghana country diagnostic 2023: Preliminary release

PDF pp.17,30; printed pp.15,28; Figures 4 and 9.

S02 World Bank | 2025 Q1

Remittance Prices Worldwide: Issue 53, March 2025

PDF pp.21–22 and 30; historical cost tables and Table 11.

S03 World Bank | Accessed 25 September 2026

WDI metadata: Personal remittances, received (current US\$)

Indicator BX.TRF.PWKR.CD.DT; definition and methodology.

References and source links — 2 of 4

Titles link to source publications; the source register retains scope and retrieval limitations.

S04 World Bank / KNOMAD | June 2024

Migration and Development Brief 40

PDF p.46 / printed p.36, Figure A.6.2.

S05 Adams, Richard H.; Alfredo Cuecuecha; John Page | 2008

Remittances, Consumption and Investment in Ghana

PDF pp.7–8,13–15,35,44; sample exclusions, instrument assumptions, outcome definitions and Tables 11 a–b. Table images rechecked; printed inconsistencies retained.

S06 Akobeng, Eric | 2022

Migrant remittances and consumption expenditure under rain-fed agricultural income: micro-level evidence from Ghana

University of Ghana institutional abstract; Oxford Development Studies 50(4):352–371; DOI 10.1080/13600818.2022.2077924.

References and source links — 3 of 4

Titles link to source publications; the source register retains scope and retrieval limitations.

S07 Ofori-Appiah, Eugene Danquah; Kwaku Dwumor Kessey; Eric Oduro-Ofori | 2024

Expenditure decisions on international remittances received by households in Ghana

Sections 3.1–3.3; Tables 6,8,9,11. Frame strata and field 2020 retained; source eligibility years 2018/2019 conflict.

S08 Yang, Dean | 2008

International Migration, Remittances and Household Investment: Evidence from Philippine Migrants’ Exchange Rate Shocks

Economic Journal 118(528):591–630; DOI 10.1111/j.1468-0297.2008.02134.x; research design and identification discussion.

S09 Ratha, Dilip / IMF Finance & Development | 2019

Remittances: Funds for the Folks Back Home

Back to Basics article; transfer and settlement description.

References and source links — 4 of 4

Titles link to source publications; the source register retains scope and retrieval limitations.

S10 Institute of Development and Economic Research | 2026

Remittances: Measurement, Household and FX Scenario Protocol

Final companion archive: code/analyse.py; code/validate_extend.py; code/refine_design.py; 40 unchanged numerical result/summary files; source, model and final-design verification registers.

S11 World Bank Remittance Prices Worldwide | 2025 Q3

United Kingdom to Ghana: historical corridor tariff snapshot

Data collected 8–22 August 2025; GBP 120 and GBP 300 panels; 37 service configurations per panel. Snapshot CSV preserves row identities and locators.

S12 World Bank Remittance Prices Worldwide | Accessed 26 September 2026

Methodology: measuring the cost of sending remittances

Official methodology webpage; fee, exchange-rate margin, service speed and comparability.

Remittance intelligence requires a chain of evidence—not a single headline

The report’s strongest conclusions concern measurement, recipient value and the timing of resources.

HOUSEHOLD RESOURCES	INVESTMENT AND ENTERPRISE	FOREIGN EXCHANGE
Compare net delivered value and real purchasing power. Distinguish money shares, respondent shares and marginal budget estimates. Household need can itself drive transfer receipts.	Separate building use value, intended spending and verified new work. Include working capital, own funds and cash reserves; test whether transfers arrive before committed payments.	Reconcile formal transactions to comparable statistical concepts. Track inter-agent settlement and dealer-market delivery once; gross transfer receipts do not identify the net cedi effect.

Sources: World Bank WDI metadata [\[S03\]](#); Adams et al. (2008) [\[S05\]](#); Ratha / IMF (2019) [\[S09\]](#); IDER calculations [\[S10\]](#).

Note: No 2026 national remittance total, informal-flow residual, causal investment multiplier or exchange-rate forecast is claimed.

Institute of Development and Economic Research

EVIDENCE FOR YOUR NEXT DECISION

Evidence for informed decisions.

For research enquiries, supporting data, methodological documentation or corrections to this report, contact the Institute of Development and Economic Research.

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