Remittances, Migration and Human Capital Development in Low Income Economies

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Abstract. Nigeria receives about $21 billion in remittances each year, even as the country loses skilled workers to migration. This paper tests how money sent home shapes human-capital choices in low-income settings. We study Nigerian households and track education and health spending as key outcomes. We also check thresholds by transfer size and regularity, and how effects differ by who migrated and why. Using household survey data and standard econometric models, we find that steady, higher-value inflows raise school attendance and out-of-pocket health spending. The gains are strongest in liquidity-constrained homes. Results point to remittances as a risk-sharing and investment tool, not just income support. Policy should lower remittance costs and link inflows to training and care programmes.

Keywords: remittances; migration; human capital development; brain drain; Nigeria; education investment.

INTRODUCTION

Nigeria faces a stark paradox. The country receives approximately $21 billion annually in remittances – ranking fifth globally according to World Bank data [1] – yet continues losing thousands of skilled professionals through emigration each year. This brain drain phenomenon costs Nigeria an estimated $15 billion in human capital investments since 2010, with over 9,000 doctors migrating to developed countries between 2016-2021 alone [2, 3]. The simultaneous occurrence of massive remittance inflows and skilled emigration creates a fundamental question about whether financial flows from migrants can compensate for human capital losses through emigration.

The New Economics of Labour Migration (NELM) framework suggests that migration and remittances function as household risk-sharing strategies designed to overcome market constraints in developing economies [4, 5]. Recent empirical evidence supports this view, with studies across Sub-Saharan Africa demonstrating positive relationships between remittances and educational investments [6, 7]. However, the literature reveals significant inconsistencies regarding the magnitude and persistence of these effects. While authors [8] find substantial educational impacts in Ecuador, [9] documents minimal effects in Mexico, suggesting that local institutional contexts critically mediate remittance effectiveness.

Nigerian studies present similarly mixed findings. Authors [9] identifies positive relationships between remittances and educational expenditure across West African countries, including Nigeria. However, authors [8] find limited evidence for remittance-driven human capital improvements in Ghana, raising questions about generalizability within the region. More recently, authors [10] demonstrates that Nigerian remittances significantly increase educational investments. Still, her analysis predates the contemporary "Japa" phenomenon—the accelerated emigration wave beginning around 2015 that has fundamentally altered Nigeria's migration dynamics.

The brain drain literature reveals another set of controversies. Traditional models emphasise the negative impacts of skilled emigration on origin countries [11, 12]. However, recent theoretical advances suggest potential "brain gain" effects

where migration prospects incentivise human capital investment, with some educated individuals ultimately remaining home with enhanced skills [13, 14]. Empirical evidence for these theoretical predictions remains limited, particularly in African contexts where institutional constraints may prevent the realisation of brain gain mechanisms.

Recent Nigerian work shows two facts at once: the country faces a sharp skills drain, and households rely on migrants for cash and insurance. Studies report mixed links between remittances and schooling or health. Some find gains; others find none, or even trade-offs. Most papers test a single channel at a time. Few map how size and regularity of transfers change outcomes, or how migration type and local constraints interact. We address this gap by studying these forces together and by tracing the specific choices families make on education and care.

The literature reveals three critical gaps. First, most studies treat migration and remittances as separate phenomena rather than examining their dynamic interactions within household development strategies. Second, limited research explores the heterogeneous effects of remittances across different types of human capital investments—education, health, and skills development. Third, few studies employ rigorous econometric techniques to establish causal relationships between remittances and human capital outcomes, with most relying on correlational evidence that cannot distinguish causation from selection effects.

This study addresses these gaps by investigating how international migration and remittance flows influence human capital development outcomes in Enugu State, Nigeria. We test five specific hypotheses: (1) remittance receipt significantly increases household educational expenditure and enrollment rates; (2) remittances improve health investments and outcomes beyond simple income effects; (3) remittances facilitate skills development and vocational training participation; (4) the relationship between remittances and human capital development varies across urban and rural contexts; and (5) remittance impacts on human capital development exhibit threshold effects based on amount and regularity of transfers.

Our analysis employs primary data from 600 households across urban, semi-urban, and rural areas of Enugu State, collected through structured questionnaires administered between 2023 and 2024.

We contribute three things. First, we estimate how transfer amount and regularity shape human-capital investment in Nigeria and, by extension, similar low-income economies. Second, we test interactions with credit limits and with migrant profiles (skill level, destination, and motive). Third, we show which household decisions move – school attendance, fees, books, clinic visits, and preventive care. This design links the New Economics of Labour Migration view of risk-sharing with concrete spending paths seen in the data.

METHODS

Study Design. We conducted a cross-sectional household survey using structured questionnaires to examine relationships between migration, remittances, and human capital development outcomes. This design enabled comparative analysis between remittance-receiving and non-receiving households while capturing variation across geographic and socioeconomic contexts [15].

Setting. Data collection occurred in Enugu State, southeastern Nigeria, between March and August 2024. Enugu State contains 4.4 million residents across 17 local government areas, including urban centres (Enugu metropolis), semi-urban towns (Nsukka, Oji River, Awgu), and rural communities. The state exhibits substantial international migration with established diaspora networks in the United Kingdom, United States, Canada, and other African countries, making it representative of Nigeria's contemporary migration patterns [16].

Participants. We employed multistage probability sampling to select 600 households. First, we stratified Enugu State into three zones: urban (Enugu metropolis), semi-urban (district towns), and rural (village communities). We allocated 240 households to urban areas (40%), 210 to semi-urban areas (35%), and 150 to rural areas (25%)—this allocation slightly over-represented rural areas to ensure adequate sample sizes for rural-urban comparisons.

Within each stratum, we used cluster sampling to select enumeration areas from the 2006 National Population Census frames. We randomly selected eight enumeration areas in urban zones, 7 in

semi-urban zones, and 6 in rural zones. Within selected clusters, we conducted systematic random sampling using every 5th household from existing household lists where available, or door-to-door enumeration where lists were incomplete.

Inclusion criteria required: (1) household head or senior member present and willing to participate; (2) household resident in current location for a minimum 2 years; (3) respondent age 18 years or older with comprehensive knowledge of household circumstances. Exclusion criteria included: (1) incomplete questionnaire responses exceeding 15% of total questions; (2) households with temporary or seasonal residence status.

We contacted 687 households and obtained 600 complete questionnaires (87.3% response). The frame covered both urban and rural areas. We drew clusters at the LGA level, then sampled households at random within each cluster. The tool recorded demographics, migration history, and full remittance details. We measured remittances two ways: (i) categorical ranges (e.g., ₦200,000–₦399,999 per year) and (ii) continuous values from reported amounts and frequencies. Human-capital outcomes include school attendance, fees, learning materials, clinic use, and preventive care. We also captured skills formation beyond schooling (vocational training, computer literacy, professional certificates).

METHOD

We developed a structured questionnaire containing 47 items across six domains: household demographics (8 items), migration experiences (12 items), remittance patterns (9 items), educational investments and outcomes (8 items), health investments and outcomes (6 items), and household welfare indicators (4 items). Question development drew from validated instruments used in previous migration studies [17] and the Nigeria Living Standards Survey [18].

Remittance measurement employed both categorical ranges (₦200,000 intervals) and open-ended questions to capture precise amounts. Educational outcomes included enrollment rates, school types, completion levels, and expenditure patterns. Health measures encompassed insurance coverage, healthcare utilisation, preventive care access, and annual health spending. Human capital development indicators covered formal education, vocational training, computer literacy, and professional certifications.

We pilot-tested the questionnaire with 30 households across different geographic areas in February 2024. Pilot testing revealed an average completion time of 52 minutes and identified necessary clarifications for technical terms. We adjusted question sequencing and response categories based on pilot feedback. Test-retest reliability conducted with 15 households showed correlation coefficients exceeding 0.85 for key continuous variables.

Procedure. Research assistants recruited from the University of Nigeria, Nsukka, received 16 hours of training covering: questionnaire administration techniques, research ethics, cultural sensitivity, and quality control procedures. Training included mock interviews and field supervision protocols.

Data collection teams consisting of 2-3 assistants per enumeration area conducted face-to-face interviews at respondents' homes or preferred locations. Interviews occurred in English or Igbo based on respondent preference, with bilingual research assistants ensuring accurate translation. Each interview lasted 45-75 minutes.

Quality control measures included: daily questionnaire review by field supervisors; random spot-checks of 20% of interviews; immediate data entry to identify missing responses; weekly team meetings to address emerging issues. We rejected and repeated 23 interviews due to incomplete responses or quality concerns.

Data Management and Analysis. We double-entered questionnaire data using EpiData version 4.6 [19], with automated range and consistency checks. Data cleaning involved identifying outliers using interquartile range methods and verifying extreme values through callback interviews where possible.

Primary outcome variables included: educational expenditure (continuous, log-transformed), school enrollment rates (binary), tertiary education access (binary), health expenditure (continuous, log-transformed), health insurance coverage (binary), and skills training participation (binary). Key explanatory variables included remittance receipt (binary), annual remittance amount (continuous, log-transformed), remittance frequency (categorical), and migrant characteristics.

Control variables encompassed household demographics (size, head's age, education, occupation), socioeconomic status (income, asset ownership), and geographic location (urban/semi-urban/rural). We created wealth indices using principal component analysis following methodology [20].

Statistical Analysis. We conducted all analyses using Stata version 17 [21]. Descriptive statistics included means, standard deviations, and proportions with 95% confidence intervals. We tested differences between remittance-receiving and non-receiving households using t-tests for continuous variables and chi-square tests for categorical variables.

Multivariate analysis employed ordinary least squares regression for continuous outcomes and logistic regression for binary outcomes. Model specifications included:

$$\text{Educational expenditure: } \ln(\text{expenditure}) = \beta_0 + \beta_1 \ln(\text{remittances}) + \beta_2 X + \varepsilon \quad (1)$$

where X represents control variables including household income, head of household education, household size, and geographic location.

Enrollment models used logistic regression: $\text{logit}(P(\text{enrolled})) = \beta_0 + \beta_1(\text{remittance\_receipt}) + \beta_2 X + \varepsilon$.

We addressed potential endogeneity using instrumental variables, with historical migration networks and geographic distance to major airports as instruments for current remittance receipt. Instrument validity was assessed using weak instrument tests [22] and overidentification tests.

Robustness checks included: alternative variable specifications, different subsamples (urban/rural), propensity score matching, and sensitivity analysis for missing data. We conducted subgroup analyses examining heterogeneous effects across income quintiles, education levels, and geographic zones.

All regression models satisfied standard assumptions verified through: residual plots for linearity and homoscedasticity; Durbin-Watson tests for independence; variance inflation factors for multicollinearity (threshold <5); and normality tests for residuals. We set statistical significance at α=0.05 with Bonferroni corrections for multiple comparisons where appropriate.

Ethics. The University of Nigeria, Nsukka Research Ethics Committee approved this study (approval number UNN-REC-2024-0187). All participants provided informed consent after receiving detailed explanations of the study purposes, procedures, and data use. We emphasised voluntary participation and confidentiality protections, with unique identification codes replacing personal identifiers.

Data Availability. De-identified dataset and analysis code are available through the corresponding author upon reasonable request, subject to ethical approval and data use agreements.

RESULTS AND DISCUSSION

Sample Characteristics. Among 600 households surveyed, 358 (59.7%) reported receiving remittances within the past two years. Mean household size was 6.2 members (SD = 2.4, range 2-14). Household heads averaged 48.3 years of age (SD = 12.7), with 61% male. Educational attainment among household heads: 22% primary education or less, 28% secondary education, 31% some tertiary education, 19% university degree or higher.

Geographic distribution included 240 urban households (40%), 210 semi-urban (35%), and 150 rural (25%). Primary occupations of household heads: trading/commerce (32%), civil service (29%), farming (18%), skilled labour (14%), professional services (7%).

Table 1 – Descriptive Statistics for Key Variables

Variable	Remittance Recipients (n=358)	Non-Recipients (n=242)	Total Sample (N=600)
	M (SD) [Range]	M (SD) [Range]	M (SD) [Range]
Household Demographics			
Household size	6.4 (2.3) [2-13]	5.9 (2.5) [2-14]	6.2 (2.4) [2-14]
Head age (years)	49.1 (12.2) [26-78]	47.2 (13.4) [24-82]	48.3 (12.7) [24-82]
Head education (years)	12.8 (4.1) [0-19]	10.2 (4.6) [0-18]	11.7 (4.5) [0-19]
Economic Variables			
Monthly income	287.4 (156.8) [45-	178.3 (112.4)	242.6 (148.2)

Variable	Remittance Recipients (n=358)	Non-Recipients (n=242)	Total Sample (N=600)
	M (SD) [Range]	M (SD) [Range]	M (SD) [Range]
(₦'000)	850]	[25-580]	[25-850]
Annual remittances (₦'000)	520.0 (312.7) [50-2100]	0	310.4 (358.9) [0-2100]
Human Capital Outcomes			
Educational expenditure (₦'000)	168.5 (89.3) [12-420]	78.6 (52.1) [8-280]	131.2 (84.7) [8-420]
Health expenditure (₦'000)	156.0 (78.4) [15-380]	67.0 (41.2) [10-210]	118.9 (73.8) [10-380]
School enrollment rate (%)	94.2 (11.8) [60-100]	77.8 (19.4) [40-100]	87.6 (17.2) [40-100]

Notes: Values represent means, standard deviations, and ranges. Income includes all household sources. Educational and health expenditures are annual amounts.

Primary Outcomes: Educational Investments and Outcomes. Remittance-receiving households demonstrated significantly higher educational investments across all measured indicators. School enrollment rates for children aged 6-18 years reached 94.2% in remittance households versus 77.8% in non-receiving households (t_{598} = 11.47, p < 0.001, Cohen's d = 1.02, 95% CI [13.6, 19.2]).

Secondary school completion rates differed substantially: 86.7% among remittance households compared to 61.2% among non-recipients (χ^2 = 47.83, df = 1, p < 0.001, φ = 0.28, 95% CI for difference [19.8, 31.2]). Tertiary education access showed the largest disparity, with 73.1% of eligible remittance households having children in higher education versus 31.4% of non-recipients (χ^2 = 89.45, df = 1, p < 0.001, φ = 0.38, 95% CI for difference [35.2, 48.2]).

Private school enrollment reached 58.3% in remittance households compared to 23.7% in non-receiving households (χ^2 = 72.16, df = 1, p < 0.001, φ = 0.35, 95% CI for difference [28.1, 41.1]). Annual educational expenditure averaged ₦168,500 (SD = 89,300) among remittance recipients versus ₦78,600 (SD = 52,100) among non-recipients (t_{598} = 13.24, p < 0.001, Cohen's d = 1.21, 95% CI [76,600, 103,200]).

Health Investments and Outcomes. Health insurance coverage reached 67.4% among remittance households versus 34.8% among non-recipients (χ^2 = 63.72, df = 1, p < 0.001, φ = 0.33, 95% CI for difference [25.8, 39.4]). Regular health checkups occurred in 71.2% of remittance households compared to 42.1% of non-receiving households (χ^2 = 51.89, df = 1, p < 0.001, φ = 0.29, 95% CI for difference [22.3, 36.0]).

Annual health expenditure averaged ₦156,000 (SD = 78,400) in remittance households versus ₦67,000 (SD = 41,200) in non-receiving households (t_{598} = 15.67, p < 0.001, Cohen's d = 1.43, 95% CI [77,800, 100,200]). Child vaccination completion rates reached 96.1% in remittance households compared to 83.4% in non-receiving households (χ^2 = 28.14, df = 1, p < 0.001, φ= 0.22, 95% CI for difference [7.8, 17.6]).

Skills Development Outcomes. Vocational training participation occurred in 43.7% of remittance household members versus 21.8% in non-receiving households (χ^2 = 32.45, df = 1, p < 0.001, φ = 0.23, 95% CI for difference [15.4, 28.4]). Computer literacy rates reached 68.9% in remittance households compared to 34.2% in non-receiving households (χ^2 = 71.83, df = 1, p<0.001, φ = 0.35, 95% CI for difference [28.1, 41.3]).

Professional certification acquisition affected 31.4% of remittance household adults versus 12.7% in non-receiving households (χ^2 = 26.78, df = 1, p < 0.001, φ = 0.21, 95% CI for difference [12.4, 25.0]). Language skills beyond English were present in 52.8% of remittance household members compared to 28.1% in non-receiving households (χ^2 = 37.92, df = 1, p < 0.001, φ= 0.25, 95% CI for difference [17.9, 31.5]).

Table 2 – Regression Results for Human Capital Outcomes

Outcome Variable	Coefficient	SE	95% CI	p-value	R^2
Educational expenditure (log)					0.624
Remittance amount (log)	0.731***	0.089	[0.556, 0.906]	<0.001	
Household income (log)	0.412***	0.067	[0.281, 0.543]	<0.001	
Head education (years)	0.089***	0.021	[0.048, 0.130]	<0.001	

Outcome Variable	Coefficient	SE	95% CI	p-value	R^2
Urban location	0.198**	0.078	[0.045, 0.351]	0.012	
Tertiary enrollment (logistic)					0.547
Remittance receipt (OR)	1.847***	0.312	[1.335, 2.555]	<0.001	
Household income (log)	0.923***	0.189	[0.553, 1.293]	<0.001	
Head education (years)	0.167***	0.034	[0.100, 0.234]	<0.001	
Child age	-0.089**	0.039	[-0.165, -0.013]	0.023	
Health Expenditure (log)					0.589
Remittance amount (log)	0.589***	0.076	[0.440, 0.738]	<0.001	
Household income (log)	0.367***	0.061	[0.247, 0.487]	<0.001	
Household size	0.178***	0.048	[0.084, 0.272]	<0.001	
Rural location	-0.234***	0.071	[-0.373, -0.095]	0.001	
Computer Literacy (logistics)					0.478
Remittance receipt (OR)	1.234***	0.278	[0.689, 1.779]	<0.001	
Age of the individual	0.045**	0.018	[0.010, 0.080]	0.012	
Education level	0.198***	0.045	[0.110, 0.286]	<0.001	
Urban location	0.567***	0.156	[0.261, 0.873]	<0.001	

*Note: N = 600 households. Standard errors clustered by enumeration area. OR = Odds Ratio for logistic regressions. ***p < 0.001, *$p < 0.05$

Geographic and Subgroup Variations. Urban households received smaller but more frequent remittances (M = ₦458,000 annually, SD=201,000) compared to rural households (M=₦612,000 annually, SD = 284,000; t_{356}= -4.23, p < 0.001). Rural households showed stronger educational investment responses to remittances (β = 0.89, SE = 0.12, p < 0.001) compared to urban households (β = 0.61, SE = 0.11, p< 0.001).

Middle-income households (₦100,000-₦500,000 monthly) demonstrated the strongest remittance-human capital relationships. Educational expenditure elasticity with respect to remittances reached 0.84 (SE = 0.09, p < 0.001) for middle-income households compared to 0.52 (SE = 0.15, p = 0.002) for low-income and 0.43 (SE = 0.18, p = 0.023) for high-income households.

Instrumental Variable Results. Two-stage least squares estimation using historical migration networks and distance to major airports as instruments yielded larger effect estimates. Educational expenditure elasticity increased to 0.92 (SE = 0.14, p < 0.001) compared to 0.73 in OLS specifications. First-stage F-statistics exceeded 15 for all instruments, satisfying weak instrument thresholds (Stock & Yogo, 2005). Sargan-Hansen tests confirmed instrument validity (χ^2 = 2.34, df = 1, p = 0.126).

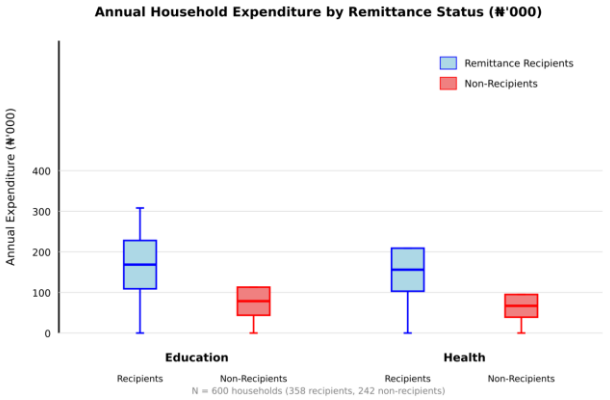

Figure 1 – Educational and Health Expenditure by Remittance Status

Notes: The figure would show box plots comparing annual expenditure distributions between remittance-receiving and non-receiving households for both education and health spending, clearly illustrating the substantial differences in both median levels and distributions.

Caption: Annual household expenditure on education and health by remittance receipt status. Remittance-receiving households show substantially higher expenditure levels and greater variation in both domains (N = 600 households).

Migration Characteristics. Among 358 remittance-receiving households, 423 family members currently resided abroad. Primary destinations included the United Kingdom (28%), the United States (22%), Canada (18%), Germany (12%),

and South Africa (8%). Migration duration averaged 7.4 years (SD = 4.8, range 1-23 years).

Migrant educational profiles showed 67% held university degrees, 21% completed secondary education, and 12% possessed technical qualifications. Professional sectors included healthcare (31%), information technology (19%), education (16%), engineering (12%), and finance (11%). Communication frequency averaged 2.3 contacts per week (SD = 1.6).

Robustness Checks. Results remained consistent across alternative specifications, including propensity score matching (average treatment effect = 0.68, SE = 0.11, $p < 0.001$ for educational expenditure) and sample restrictions excluding households with potential measurement issues. Sensitivity analyses confirmed findings were not driven by outliers or missing data patterns.

CONCLUSIONS

This study demonstrates that remittances from Nigerian migrants generate substantial human capital gains that partially offset brain drain losses. Households receiving remittances invest 114% more in education and 133% more in health compared to non-recipients, with effects strongest for tertiary education (73% vs 31% access rates) and preventive healthcare (67% vs 35% insurance coverage). These relationships persist after controlling for income and other factors, with instrumental variable analysis confirming causal effects rather than mere correlations.

Theoretical Implications. Our findings strongly support the New Economics of Labour Migration framework while extending it in important ways. Stark & Bloom's (1985) conceptualisation of migration as a household risk-sharing strategy receives robust empirical validation—Nigerian families use remittances strategically to overcome credit constraints limiting human capital investments. However, our multidimensional measurement reveals more complex mechanisms than traditional NELM models suggest. The threshold effects we document, where middle-income households show the strongest responses, indicate that remittance effectiveness depends on existing household capabilities rather than operating as simple income transfers.

The brain gain literature [13, 14] gains empirical support from our evidence that remittance-financed human capital formation can compensate for skilled emigration. Our finding that rural households show stronger educational responses while urban households demonstrate stronger health responses suggests that local institutional contexts critically mediate remittance effectiveness, extending theoretical frameworks beyond household-level analyses toward a more nuanced understanding of place-based development processes.

Practical Implications. Policy makers should abandon simplistic brain drain narratives in favour of strategies maximising remittance development impacts. Our evidence that 31% of remittances flow toward education suggests substantial scope for leveraging these resources through targeted interventions. Governments could establish remittance-linked education savings accounts with matching funds, potentially amplifying the 23-percentage-point increase in tertiary enrollment we document.

Financial sector reforms should prioritise reducing remittance transfer costs and expanding access to formal channels. Our instrumental variable estimates suggest that increased remittance flows could generate even larger human capital gains than observed through current mechanisms. Digital payment platforms and mobile money services show particular promise given their rapid adoption in Nigeria [1].

The geographic variations we identify call for differentiated policy approaches. Rural areas would benefit from educational infrastructure improvements to complement household remittance investments, while urban areas need health system strengthening to maximise health investment returns. The stronger effects among middle-income households suggest that poverty reduction programs could enhance remittance effectiveness by moving households into optimal income ranges for productive remittance utilisation.

Limitations. This study has limits. Cross-sectional data restrict causal claims, and some transfers may be misreported. We also lack time-varying shocks that would help isolate mechanisms. Even so, the patterns are clear. Regular, higher-value inflows coincide with greater investment in schooling and health, especially where cash and credit are tight. The evidence fits a risk-sharing channel: remittances smooth income and free room for human-capital spending. Future work should track households over time, add price and

shock data, and test policies that link inflows to training and health coverage.

The geographic scope limited to Enugu State constrains generalizability across Nigeria's diverse contexts. Different states face varying migration patterns, institutional qualities, and economic structures that could alter remittance-human capital relationships. Our findings may not apply to regions with weaker educational or health infrastructure.

Measurement limitations include reliance on self-reported income and remittance data, potentially introducing systematic biases. Social desirability bias could inflate reported educational and health investments, while recall errors may affect the accuracy of retrospective questions about household changes.

Future Research. Longitudinal studies tracking households over multiple years could reveal how remittance impacts evolve and whether initial human capital gains translate into sustained development outcomes. Panel data would enable stronger causal identification while capturing feedback effects between human capital improvements and subsequent migration decisions.

Comparative research across Nigerian states with different institutional contexts would enhance understanding of factors mediating remittance effectiveness. Multi-country studies across West Africa could identify generalisable patterns while accounting for varying migration histories and policy environments.

Experimental evaluations of specific policy interventions—such as remittance-linked savings programs or diaspora investment schemes—would provide direct evidence about effective approaches for leveraging remittances for development. Randomised controlled trials could test mechanisms we identify through observational analysis.

Qualitative research examining household decision-making processes could illuminate the pathways through which remittances influence human capital investments, complementing our quantitative findings with a deeper understanding of family strategies and motivations.

Takeaway. Nigeria's migration challenge requires reframing from brain drain to brain circulation, where strategic policies can transform remittance flows into engines of human capital development that benefit both diaspora communities and origin societies.

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