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Digital Financial Service Adoption among Farming and Business Income Earners in Northern Nigeria: Microfinance Experience, Individual Characteristics and Geographic Heterogeneity

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Abstract
Digital financial services (DFS) have spread rapidly in Nigeria, but use in the North remains low. We study which characteristics of individuals and places are associated with DFS adoption among farm and business earners (adults whose income comes from farming, including some farm wage work, or from their own business) in seven North West and seven North Central states. Using the EFInA Access to Financial Services in Nigeria Survey 2023, we analyse 6,960 farm and business earners (6,936 in the preferred model after dropping 24 with missing age). Adoption is defined as mobile-money transfers or any use of a digital microfinance bank. We estimate survey-weighted logit models with standard errors clustered by enumeration area, in zone and state fixed-effect specifications, and report Firth penalised estimates, discrimination statistics and models for each component of adoption. Weighted adoption is 3.3 per cent: 192 earners use mobile money and 48 a digital microfinance bank (4 use both), and none has borrowed digitally. Post-secondary education, holding a National Identification Number, being male and being younger are associated with higher adoption. The 27 earners with microfinance loan experience, of whom 8 have adopted, have a predicted adoption probability of 26.4 per cent against 3.2 per cent for others (AME 23.2 points, 95% CI 8.4 to 38.0); this large but imprecisely estimated association is positive in every specification and is consistent both with lower onboarding costs and with selection of more financially capable people into microfinance; the data cannot distinguish these. North Central residence is associated with 2.9 points higher adoption, but state effects show that this reflects a few states, notably Niger, rather than a uniform zonal gap. Farmers' weighted adoption (3.0 per cent) is not clearly different from that of other earners (3.7 per cent); the larger gap in the unweighted sample shrinks once education, identification and location are taken into account. Among these earners in 2023, DFS use was a payments phenomenon: digital borrowing was not observed in the survey. Education, identification and existing microfinance relationships are the strongest observed correlates, but the models discriminate only modestly (AUC 0.75 to 0.78); the evidence is associational and supports piloting, not scaling, interventions built on them.

Keywords: *Digital Financial Services; Financial Inclusion; Mobile Money; Microfinance; Northern Nigeria; Agriculture; Identification; Efina; Rare Events* ***JEL Classification:*** *G21; O16; O33; Q14.*

I. INTRODUCTION

Nigeria's financial inclusion strategy relies increasingly on digital channels: mobile money operators, agent networks and app-based digital microfinance banks that serve customers without a branch visit. Northern Nigeria, where financial exclusion is highest, is where these channels could matter most and where their reach appears weakest. Among adults in fourteen northern states who earn income from their own farm or business, about three in a hundred use any digital financial service, and use ranges from none in Kebbi to 12.1 per cent in Niger.

We ask which characteristics of earners and their locations are associated with DFS adoption. We consider prior experience with formal credit, stated barriers to bank use, agricultural activity, individual characteristics (education, identification, gender and age) and location. All estimates are associations: prior financial relationships in particular are likely to reflect unobserved traits that also drive adoption.

The paper contributes in three ways. It shows that adoption among northern earners consists almost entirely of mobile-money transfers, with no digital borrowing in the sample, so the determinants of digital credit cannot be inferred from these data. It shows that education, identification and microfinance experience are the strongest observed correlates, and that farmers do not clearly adopt less than other earners once the survey weights and their characteristics are taken into account. And it shows that the North Central versus North West contrast is better described as state-level heterogeneity.

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II. RELATED LITERATURE

Mobile money reduced transaction costs and improved risk sharing in Kenya (Jack & Suri, 2014) and has been linked to poverty reduction among female-headed households (Suri & Jack, 2016). Global survey data show large gaps in account ownership and digital payments by income, education, gender and rural residence (Demirgüç-Kunt, Klapper, Singer, & Ansar, 2022).

Adoption of financial technologies is often analysed with technology-acceptance frameworks, in which perceived usefulness and ease of use shape intentions (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003). The EFInA survey does not measure these perceptions; we use education, prior financial experience and identification as observable proxies for the capacity and documentation that make digital services easier to use. The financing-hierarchy literature (Myers & Majluf, 1984) offers a complementary lens in which information costs determine which providers a client can access. We use both as interpretive frameworks rather than tested theories.

III. MECHANISMS AND HYPOTHESES

Table 1. Mechanisms, predictions, measures and results

Mechanism	Prediction	Measure	Result (Section)	Alternatives
Familiarity and documentation from formal credit lower onboarding costs	H1: microfinance loan experience positively associated with adoption	(mf1_7 = 2, 3)	Positive in all specifications; magnitude imprecise (5.2, 5.4)	cy, income, proximity to providers
Bank frictions push or keep users away from digital channels	gn is an empirical question	INTBAR, DOCBAR, DISTBAR	Not detected; questions asked only of non-bank users (5.2, 5.3)	Measures describe bank use, not digital barriers
Capability and KYC requirements	H3: education and identification positively associated	EDU_TER, NIN	Supported (5.2)	ne and connectivity unobserved
Sector-specific product fit	H4: farmers less likely to adopt, conditional on characteristics	AGRI	Not supported: weighted gap small and imprecise; sample gap shrinks with characteristics (5.2)	nectivity, agent distance
Provider presence varies by place	H5: adoption differs by zone, reflecting states	NC_ZONE; state effects	Supported; driven by a few states (5.2)	Unobserved provider networks

IV. DATA AND METHODS

4.1. Data and population

The EFInA Access to Financial Services in Nigeria Survey 2023 (Enhancing Financial Innovation & Access [EFInA], 2023) is a nationally representative household survey of 28,392 adults drawn by stratified multi-stage sampling with enumeration areas (EAs) as primary sampling units. The northern subsample covers 10,702 adults in the North West (Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto, Zamfara) and North Central (Benue, FCT, Kogi, Kwara, Nasarawa, Niger, Plateau) states. Kaduna is classified in the North West, its official zone. The North East is not included.

The population is defined from the question on sources of money (e9). We include adults who report income from their own farm (e9_5, e9_6) or own business or trade (e9_7 to e9_10); a respondent qualifies if any of these six items is reported. This gives 6,960 farm and business earners (hereafter "earners"), of whom 5,401 report non-farm business or trading income. The wider group of all 7,669 adults who answered the income-sector question includes 709 wage earners without their own farm or business; these are more educated (71 per cent with post-secondary education) and more likely to adopt (10.7 per cent). The 3,033 adults who did not answer the income-sector question are mostly supported by family members; 74 per cent are women and 1.9 per cent have adopted. The e9_5 category also covers people paid wages on farms, so the population includes some farm workers alongside own-account farmers. The survey category for small-scale farming (e9_5) combines working one's own farmland with receiving wages from such farms, so the two cannot be separated; this is why the title refers to income earners rather than business operators. As a check, we exclude the 1,033 people whose only qualifying source is e9_5; the results are similar (Appendix Table A1). Estimates use the revised EFInA weight, normalised to a mean of one, with standard errors clustered on EAs.

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4.2. Variables

Table 2. Variable definitions

Variable	EFInA items	Definition
DFS_ADOPT	6, mt7a_7, qf1_16, qf4_16, qf6_16_10	1 if received or sent money by mobile money in the past six months, or ever used, holds an account with, or borrowed from a digital microfinance bank
MM; DMFB	mt2a_6, mt7a_7; qf1_16, qf4_16, qf6_16_10	Component outcomes: mobile money; any digital microfinance bank use or account
MFIEX	mf1_7	1 if the respondent used to have or currently has a microfinance loan (codes 2 or 3)
BANKEX	ba1_10	1 if never had a bank loan, including respondents not asked because they do not use banks
INTBAR, DOCBAR, DISTBAR	ba4_2, ba4_5, ba4_8	for not using banks: interest too high; too much documentation; banks too far (asked only of non-bank users)
AGRI	e13a_1	1 if income from agriculture, forestry or fishing
SIZE; SIZE_DK	e13b	log(1 + employees); "do not know" (190 earners) coded 0 with an indicator in sensitivity checks
URBAN; DSHOCK	sector; e13d_5	Urban EA; naira redesign affected debt servicing negatively
FEMALE, AGE, education	e6, e7, e8	Female; age in decades and its square; secondary complete; post-secondary; Quranic education only (reference: incomplete secondary or less)
NIN	e14_1	1 if the respondent has a National Identification Number
Variable	**EFInA items**	**Definition**
NC_ZONE; state	state_name	North Central (reference North West); state indicators (reference Kano)

4.3. Estimation

Model 1 includes the financing, sector, size and location covariates only; Model 2, the preferred specification, adds individual characteristics; Model 3 replaces the zone indicator with state fixed effects. Because no earner in Kebbi adopted, Kebbi's 388 observations are perfectly predicted in Model 3 and excluded from it.

$$\text{logit } \Pr(DFS_ADOPT_i = 1) = \alpha + \beta\, MFIEX_i + Barriers_i\,\theta + \gamma\, AGRI_i + Z_i\,\lambda + D_i\,\pi + \delta\, NC_ZONE_i \text{ (or state effects)}$$

Each estimator has a distinct purpose. The weighted logit with EA-clustered errors gives population-representative AMEs and is the primary estimate. The unweighted logit describes the sample. The Firth (1993) penalised logit addresses small-sample bias in rare-event maximum likelihood (King & Zeng, 2001); it is unweighted and reports odds ratios, so it checks the direction and approximate strength of associations, not the magnitude of the weighted AMEs.

Model performance is summarised by the weighted AUC and by sensitivity and specificity at a threshold equal to the weighted adoption rate; accuracy at a 0.5 threshold is uninformative when 97 per cent of earners are non-adopters.

V. RESULTS

5.1. Descriptive statistics

Table 3. Descriptive statistics, earners (N = 6,960)

Variable	Unweighted	Weighted	Number = 1
DFS adoption (any)	3.4%	3.3%	236
Mobile money	2.8%	2.8%	192
Digital MFB use or account	0.7%	0.6%	48
Borrowed from digital MFB	0.0%	0.0%	0
Microfinance loan experience	0.4%	0.2%	27
Never had bank loan	98.2%	98.3%	6,833
Interest barrier	1.2%	0.9%	84
Documentation barrier	3.3%	3.1%	229
Distance barrier	14.0%	12.8%	971
Agriculture	55.7%	55.6%	3,880
Urban	33.0%	35.0%	2,294
Negative debt-service shock	55.7%	52.4%	3,880
Female	43.3%	41.2%	3,017
Secondary complete	27.5%	27.3%	1,913
Post-secondary	10.4%	9.4%	724
Variable	**Unweighted**	**Weighted**	**Number = 1**
No formal or Quranic only	33.5%	33.2%	2,333

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Has NIN	68.3%	70.8%	4,751
North Central	54.3%	39.5%	3,781
Non-farm business or trading income	77.6%	78.9%	5,401
Employment "do not know"	2.7%	2.4%	190

Note: Weighted mean age 35.9 years.

Table 4. DFS adoption by state, earners

State	Zone	N	Adopters	Weighted rate
Niger	NC	512	58	12.1%
Kogi	NC	420	36	7.8%
Benue	NC	692	26	4.6%
Kwara	NC	608	28	4.3%
Sokoto	NW	429	10	4.1%
Nasarawa	NC	614	8	3.0%
FCT	NC	364	21	2.7%
Kano	NW	427	13	2.6%
Kaduna	NW	490	11	2.4%
Jigawa	NW	583	11	2.3%
Plateau	NC	571	8	1.4%
Katsina	NW	499	4	0.7%
Zamfara	NW	363	2	0.6%
Kebbi	NW	388	0	0.0%

Note: Weighted zone rates: North Central 5.4%, North West 1.9%. State rates rest on 0 to 58 adopters.

Adoption is low and almost entirely mobile money. Of the 236 adopters, 192 use mobile money and 48 a digital microfinance bank; the two are not mutually exclusive (4 use both). No earner in the sample has borrowed from a digital microfinance bank. Almost all earners (98.2 per cent) have never had a bank loan. Of the 27 earners with microfinance loan experience (16 past, 11 current), 8 have adopted (29.6 per cent), against 3.3 per cent of others; 7 of the 8 had a past rather than current microfinance loan, and none of the 27 has borrowed digitally, so the measure refers to conventional microfinance credit distinct from the digital outcomes, and for most adopters to experience that has ended, although the survey does not date it relative to adoption.

Adoption varies widely within zones: in the North Central, Niger (12.1 per cent) and Kogi (7.8 per cent) are well above Plateau (1.4 per cent); in the North West, Sokoto (4.1 per cent) is well above Katsina, Zamfara and Kebbi (0.0 to 0.7 per cent).

5.2. Main estimates

Table 5. Average marginal effects on DFS adoption (percentage points, 95% CI), survey-weighted logit

	(1) Baseline	(2) Preferred: with individual characteristics	(3) State fixed effects
Microfinance loan experience	+23.34** [2.5, 44.2]	+23.22*** [8.4, 38.0]	+25.59*** [6.8, 44.4]
Never had bank loan	-2.30 [-6.5, 1.8]	-1.21 [-4.3, 1.9]	-0.94 [-4.4, 2.5]
Interest barrier	+0.38 [-4.0, 4.7]	+0.18 [-3.9, 4.3]	+0.62 [-4.0, 5.2]
Documentation barrier	-1.59 [-3.9, 0.8]	-1.21 [-4.0, 1.6]	-1.31 [-3.9, 1.3]
Distance barrier	+0.11 [-1.8, 2.0]	+0.98 [-1.2, 3.2]	+0.88 [-1.2, 3.0]
Agriculture	-1.07 [-2.7, 0.5]	-0.47 [-1.9, 1.0]	-0.62 [-2.0, 0.8]
log(1 + employees)	+0.58 [-0.9, 2.1]	+0.38 [-0.9, 1.7]	+0.70 [-0.7, 2.1]
	(1) Baseline	(2) Preferred: with individual characteristics	(3) State fixed effects
Urban	+0.75 [-1.1, 2.6]	+0.06 [-1.8, 1.9]	-0.26 [-2.2, 1.7]
Debt-service shock	+0.35 [-1.2, 1.9]	+0.55 [-0.8, 1.9]	+0.77 [-0.5, 2.1]
Female	-	-1.49** [-2.7, -0.3]	-1.47** [-2.7, -0.3]
Age (decades)	-	-2.48** [-4.9, -0.1]	-2.45* [-5.0, 0.0]
Secondary complete	-	+0.56 [-1.2, 2.3]	+0.61 [-1.3, 2.5]
Post-secondary	-	+6.18** [0.7, 11.7]	+5.76** [0.6, 11.0]
No formal / Quranic only	-	-0.22 [-2.4, 2.0]	-0.54 [-2.8, 1.7]
Has NIN	-	+1.65** [0.3, 3.0]	+1.72** [0.4, 3.1]
North Central	+3.34*** [1.3, 5.4]	+2.90*** [1.0, 4.8]	-
State: Niger	-	-	+7.67** [1.0, 14.4]
State: Kogi	-	-	+2.76 [-3.1, 8.6]

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State: Benue	-	-	+2.72 [-2.6, 8.1]
State: Sokoto	-	-	+1.80 [-3.9, 7.5]
State: Kwara	-	-	+0.74 [-3.7, 5.2]
State: Nasarawa	-	-	+0.54 [-4.5, 5.6]
State: Jigawa	-	-	+0.04 [-3.4, 3.5]
State: Kaduna	-	-	-0.63 [-3.7, 2.4]
State: FCT	-	-	-0.98 [-3.9, 2.0]
State: Plateau	-	-	-1.22 [-3.8, 1.4]
State: Katsina	-	-	-2.62*** [-4.2, -1.1]
State: Zamfara	-	-	-2.43*** [-4.2, -0.7]
Observations	6,960	6,936	6,548
Adopters	236	234	234
Pseudo-R^2	0.048	0.110	0.142
AUC	0.680	0.748	0.784
Sensitivity	0.788	0.675	0.679
pecificity	0.475	0.671	0.713

Note: CIs from EA-clustered standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. State effects relative to Kano, whose weighted adoption rate is 2.6% (13 of 427); Kebbi excluded from (3). Sensitivity and specificity at a threshold equal to the weighted adoption rate; at 0.5, all models classify 96.4 to 96.7% correctly, the same as predicting non-adoption for everyone

Microfinance experience (H1). In the preferred model, earners with microfinance loans have a predicted adoption probability of 26.4 per cent against 3.2 per cent, an AME of 23.2 points (95% CI 8.4 to 38.0). The estimate rests on 8 adopters among 27 earners, so the interval spans modest to very large associations. It is barely changed by adding education, identification, gender and age, which suggests that it is not simply a proxy for these characteristics, although income, connectivity and proximity to providers remain unobserved. We treat microfinance experience as the strongest observed correlate of adoption, with an uncertain magnitude, and not as evidence that microfinance lending causes digital inclusion. The temporal ordering is unresolved: most adopters with microfinance experience had past loans, but the survey does not record whether the loan came before digital adoption.

Individual characteristics (H3). Post-secondary education is associated with 6.2 points higher adoption (95% CI 0.7 to 11.7), holding a NIN with 1.7 points (0.3 to 3.0), and being female with 1.5 points lower adoption (-2.7 to -0.3). Adoption declines with age. Relative to a 3.3 per cent base, these associations are substantial. Adding these characteristics raises the AUC from 0.68 to 0.75.

Barriers (H2). None of the stated barriers is associated with adoption. These questions are asked only of people who do not use banks and describe reasons for not using banks, not barriers to digital services, so they are weak instruments for this question. The non-significant estimates should be read as an absence of evidence from these measures, not as evidence that cost, documentation or distance are unimportant.

Agriculture (H4). In the weighted population, 3.0 per cent of farmers (SE 0.5) and 3.7 per cent of other earners (SE 0.6) have adopted, an unadjusted difference of -0.8 points (95% CI -2.3 to 0.8; $p = 0.33$). The difference is -1.1 points ($p = 0.19$) in the baseline model and -0.5 points ($p = 0.52$) once individual characteristics are added. In the unweighted sample the raw gap is larger (2.7 against 4.3 per cent) and significant in the baseline unweighted and Firth models, but it too shrinks and loses significance when characteristics are added (Table 7). Farmers in the sample are less often urban (20 against 49 per cent), less often hold a NIN (62 against 76 per cent) and less often have post-secondary education (6 against 16 per cent). We therefore do not find a clear farmer gap in the population; the gap visible in the sample is consistent with these differences in characteristics. H4 is not supported.

Geography (H5). North Central residence is associated with 2.9 points higher adoption (1.0 to 4.8). Model 3 shows that relative to Kano (2.6 per cent), Niger is 7.7 points higher, Katsina and Zamfara about 2.5 points lower, and the remaining states, including Kaduna, Kogi, FCT and Plateau, not significantly different. Niger's high adoption is the main source of the zonal gap.
The survey does not record agent density or provider presence, and we could not identify a documented explanation; establishing why Niger differs is a priority for qualitative and provider-level work. One hypothesis is proximity: Niger borders the Federal Capital Territory, and agent networks and commerce linked to Abuja may extend into neighbouring areas; FCT's own rate (2.7 per cent) suggests this cannot be the whole story.

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5.3. Components of adoption

Table 6. AMEs by component outcome (percentage points, 95% CI), preferred specification

	Mobile money	Digital MFB
Microfinance loan experience	+16.04** [2.6, 29.5]	+11.97* [-0.2, 24.1]
Never had bank loan	-1.47 [-4.4, 1.5]	-0.20 [-1.3, 0.9]
Interest barrier	+0.55 [-3.4, 4.5]	-
Documentation barrier	-0.88 [-3.6, 1.9]	-
Distance barrier	+1.39 [-0.7, 3.5]	-
Agriculture	-0.03 [-1.4, 1.4]	-0.43* [-0.9, 0.0]

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	Mobile money	Digital MFB
log(1 + employees)	+0.25 [-1.1, 1.6]	+0.20 [-0.1, 0.5]
Urban	-0.11 [-1.9, 1.7]	+0.28 [-0.3, 0.9]
Debt-service shock	+0.28 [-1.0, 1.6]	+0.21 [-0.2, 0.7]
Female	-1.57*** [-2.7, -0.5]	+0.08 [-0.3, 0.5]
Age (decades)	-2.35** [-4.5, -0.2]	-0.27 [-1.3, 0.8]
Secondary complete	+0.92 [-0.8, 2.7]	-0.04 [-0.6, 0.5]
Post-secondary	+6.03** [0.0, 12.0]	+0.59 [-0.2, 1.4]
No formal / Quranic only	+0.50 [-1.7, 2.7]	-0.46* [-1.0, 0.1]
Has NIN	+1.64*** [0.5, 2.8]	+0.08 [-0.7, 0.9]
North Central	+3.26*** [1.4, 5.1]	-0.38 [-0.9, 0.1]
Observations / adopters	6,936 / 192	6,936 / 46
AUC	0.777	0.787

Note: Barrier indicators are omitted from the digital MFB model because none of the 48 digital MFB users was asked the barrier questions (which are put only to non-bank users), so the indicators perfectly predict non-use. *** p < 0.01, ** p < 0.05, * p < 0.10.

The mobile-money model mirrors the composite: microfinance experience (16.0 points, p = 0.019), education, NIN, gender and the North Central zone. Digital microfinance banking, with 46 users in the estimation sample, is associated with microfinance experience (12.0 points, p = 0.054) and, weakly, with lower use among farmers (-0.4 points on a 0.6 per cent base, p = 0.063), but not with the zone. The barrier questions cannot be used for this outcome because no digital microfinance bank user was asked them.

5.4. Robustness

Table 7. Robustness of the preferred specification: estimators and coding (AMEs in percentage points with 95% CI; Firth odds ratios)

	Unweighted logit	Size "do not know" indicator	Firth penalised logit, OR (unweighted)
Microfinance loan experience	+17.85*** [6.5, 29.2]	+22.65*** [8.0, 37.3]	9.93*** [3.97, 24.84]
Agriculture	-0.68 [-1.7, 0.4]	-0.50 [-1.9, 0.9]	0.80 [0.59, 1.09]
Female	-1.64*** [-2.5, -0.8]	-1.52*** [-2.7, -0.4]	0.58*** [0.43, 0.78]
Post-secondary	+5.25*** [2.6, 8.0]	+6.35** [0.8, 11.9]	3.36*** [2.22, 5.07]
Has NIN	+2.31*** [1.4, 3.2]	+1.65** [0.3, 3.0]	2.46*** [1.64, 3.71]
North Central	+2.71*** [1.4, 4.0]	+2.93*** [1.1, 4.8]	2.68*** [1.89, 3.79]
Never had bank loan	-0.77 [-3.5, 2.0]	-1.41 [-4.7, 1.9]	0.77 [0.37, 1.58]
Observations	6,936	6,936	6,936
Adopters	234	234	234

Note: All columns include the full preferred covariate set. Sample variations are in Appendix Table A1. *** p < 0.01, ** p < 0.05, * p < 0.10.

The signs of the main associations are stable. The microfinance AME ranges from 17.8 (unweighted) to 29.5 points (all income earners), and the Firth odds ratio is 9.9 (95% CI 4.0 to 24.8). Agreement in direction across estimators does not establish the magnitude. Earners who answered "do not know" about employment are less likely to adopt (-2.5 points, p < 0.001), but coding them separately, or dropping them, leaves other estimates unchanged. Restricting to non-farm business earners, excluding those whose only qualifying income is small-scale farming, widening to all income earners, or excluding Kaduna gives similar results (Appendix Table A1).

VI. DISCUSSION

Digital financial service use among northern earners is mostly about receiving and sending money. The near-absence of digital borrowing means that these data cannot inform debates about digital credit in the North. The strongest observed correlates are human capital and documentation: post-secondary education and a NIN are associated with markedly higher use, and women are less likely to adopt. These patterns are consistent with capability and know-your-customer requirements limiting uptake, but income, phone ownership and connectivity are not observed and could explain part of them.

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Microfinance experience remains associated with adoption after accounting for education and identification. Because only 27 earners have such experience, any policy built on this association should rest on its direction, not its magnitude, and should be tested: for example, by offering digital onboarding at microfinance disbursement points in some branches and comparing uptake with others.

A farmer gap is sometimes attributed to a mismatch between seasonal cash flows and loan terms. In these data, any farmer gap in the weighted population is small and imprecise, and the gap in the sample is consistent with farmers' lower education, identification and urban residence. A residual gap may remain for digital microfinance banking, but with few users it is imprecisely estimated. The geographic results argue for state-level diagnosis rather than zone-level programmes.

6.1.Limitations

The design is cross-sectional. The outcome is rare, and digital microfinance use and microfinance experience are rarer. The income-source definition includes some farm wage workers as well as own-account farmers. Barrier questions are asked only of non-bank users. Income, phone ownership and agent density are not observed. The results describe adults meeting the stated farming or business income-source criteria in these fourteen states, not all farmers, all business owners or all adults in Northern Nigeria. The survey predates changes to mobile-money regulation and agent networks in 2024 and 2025. Publication of state-level rates should follow EFInA's data-use terms.

VII. CONCLUSION AND IMPLICATIONS

northern Nigerian farm and business earners in 2023, digital financial service use was rare, consisted mainly of mobile-money transfers, and did not include digital borrowing.

Education, identification, gender, microfinance experience and state of residence are its main observed correlates, and the models discriminate only modestly between adopters and non-adopters, so they are of limited use for targeting individuals. That no earner in the sample had borrowed digitally is itself a finding about the northern frontier in 2023: digital credit had not reached this population in measurable numbers. It does not show that digital credit is unimportant in the North, only that it was not observed among these earners in this survey.

Table 8 sets out three implications as proposals for pilots, each linked to the result that motivates it, the mechanism it would address, and a design that could test whether it changes adoption.

None is an intervention shown to work by this analysis.

Table 8. Proposals for testing

Proposal	Motivating result	Mechanism addressed	Pilot design	Primary outcome	Secondary outcome; comparison
Link NIN registration with digital account opening	NIN holders 1.7 points more likely to adopt	Know-your-customer documentation	Offer account opening at NIN enrolment points in randomly chosen LGAs	Digital account opened within 3 months	Any transaction at 6 months; non-selected LGAs
Digital onboarding through microfinance relationships	MFI loan experience associated with adoption (direction robust, magnitude uncertain)	Familiarity and trust	Offer onboarding at disbursement in randomly chosen branches	Digital account opened within 3 months	Active use (monthly transaction) at 6 months; other branches
State diagnostic in Niger and low-adoption states	Niger 7.7 points above ; Katsina, Zamfara below	vider and agent presence	Map agents and providers; ew users and non-users	Agent density per 10,000 adults	Distance to nearest agent and reported use; comparison states

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APPENDIX

Table A1. Sample variations, preferred specification (AMEs in percentage points with 95% CI, survey-weighted)

	Non-farm business only	Excluding small-scale-farming-only earners	All income earners	Excluding Kaduna
Microfinance loan experience	+19.66** [3.6, 35.7]	+19.82** [2.9, 36.8]	+29.51*** [8.8, 50.2]	+25.03*** [9.6, 40.4]
Agriculture	-0.58 [-2.0, 0.8]	-0.22 [-1.6, 1.2]	-0.58 [-2.0, 0.8]	-0.45 [-2.0, 1.1]
Female	-1.34** [-2.6, -0.1]	-1.40** [-2.6, -0.2]	-1.85*** [-3.0, -0.7]	-1.57** [-2.8, -0.3]
Post-secondary	+4.88** [0.8, 8.9]	+4.23** [0.2, 8.3]	+5.69** [1.0, 10.3]	+7.22** [1.0, 13.4]
Has NIN	+1.88*** [0.6, 3.2]	+1.93*** [0.6, 3.3]	+1.84** [0.4, 3.3]	+1.60** [0.2, 3.0]
North Central	+3.43*** [1.3, 5.6]	+3.66*** [1.6, 5.7]	+2.71*** [0.8, 4.6]	+2.75*** [0.8, 4.7]
Observations	5,383	5,909	7,638	6,448
Adopters	195	214	310	223

Note: Weights renormalised within each sample; EA-clustered CIs. The all-income-earners model uses 7,638 of the 7,669 adults who answered the income-sector question; 31 lack age or other individual characteristics. *** p < 0.01, ** p < 0.05, * p < 0.10.

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[12]. Data and code availability: The data are from the Access to Financial Services in Nigeria Survey 2023, accessible at www.a2f.ng, and are used under EFInA's Data User Licence; they are not redistributed. EFInA bears no responsibility for the analysis or interpretation. The replication package (variable construction, estimation and table code, data dictionary and README) accompanies this submission.