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Financial Inclusion and Poverty: Micro-level Evidence from Nigeria

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1 Introduction

There has been a major expansion in access to financial services across developing countries. In 2017, the share of the global adult population with a bank or mobile money account was 69%, which is a significant improvement over the corresponding figure of 51% in 2011. This includes about 515 million adults who have opened new accounts since 2014. In sub-Saharan

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Africa, about 21% of the adult population now has access to mobile money services—the highest in any region of the world (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018). This observed upward trend in financial inclusion has been largely driven by innovations in financial services delivery as well as initiatives by governments and international agencies to promote financial inclusion. Following the World Bank's declaration of universal financial inclusion by 2020 as a strategic priority, governments around the world have developed various programs to promote financial inclusion. Thus, in most countries, the provision of financial services through mobile phones, and other digital platforms has become a key approach to promoting financial inclusion and improving economic outcomes for poor households and firms (Chauvet & Jacolin, 2017; Demirguc-Kunt, Klapper, & Singer, 2017; Ibrahim & Alagidede, 2017).

However, the precise impact of financial inclusion on economic outcomes is not settled (see, e.g., Aghion & Bolton, 1997; Ang, 2008; Galor & Zeira, 1993; King & Levine, 1993; Levine, 2005; Van Rooyen, Stewart, & De Wet, 2012). One strand of literature posits that financial inclusion provides a sustainable pathway for poor households to escape poverty, by significantly lowering price and non-price barriers. Studies belonging to this strand of the literature suggest that financial inclusion relaxes firm and household credit constraints for the poor who are usually more credit constrained, thus enhancing investment in human capital and income-generating activities (see, e.g., Galor & Zeira, 1993). Financial inclusion provides poor households with opportunities to access credit, make investments, build savings and hedge against unforeseen shocks (see, e.g., Beck, Demirgüç-Kunt, & Honohan, 2009; Ellis & Lemma, 2010; Ghosh & Vinod, 2017). Access to finance is also likely to reduce information and transaction costs, which can enhance savings and investment decisions, technological innovation and, consequently, economic growth in the long-run (Beck et al., 2009). Additionally, it is argued, that in settings in which government welfare programs exist, financial inclusion can help households to more reliably access these services.

On the other hand, another strand of the literature argues that access to financial services could generate negative outcomes for poor households (see, Galor & Zeira, 1993). This strand of the literature suggests that poor households end up being caught in a debt-trap in an attempt to keep up with consumption (Awaworyi Churchill & Nuhu, 2016; Frank,

Levine, & Dijk, 2014). Thus, according to this alternative view, financial inclusion acts as an incentive for borrowing for consumption purposes, as opposed to saving and investing in capital accumulation.

In this chapter, we examine the impact of financial inclusion on poverty in Nigeria using survey data from the 2016 Financial Inclusion Insights (FII) program. To do this, we construct a composite measure of financial inclusion that captures the banking, credit and insurance dimensions of financial inclusion. We use various measures of poverty including the Poverty Probability Index (PPI), household deprivation and a measure of poverty reflecting the poverty line. The relationship between financial inclusion and poverty is potentially endogenous. On the one hand, while having access to financial services could improve household's ability to save, access credit and invest in income-generating activities, thus influencing poverty, it is also plausible that poor households are less likely to pursue financial services, due to entry costs and other barriers that may significantly impact on the level of participation of poor households in financial markets.

To address the issue of endogeneity, we consider the average time (in minutes) taken to reach the nearest financial institution as a source of exogenous variation in the financial inclusion variable. To do so, we take advantage of the fact that in Nigeria, banks are fairly evenly distributed across rural and urban areas. Specifically, households that are reasonably closer to financial institutions are more likely to access financial services than households that are farther away, all things equal. However, the time taken to reach a financial institution does not directly affect the poverty status of households, thus satisfying the exclusion restriction. Our two-stage least squares (2SLS) estimates suggest that endogeneity biases our estimates downwards, reducing the magnitude of the impact. Specifically, using average time (in minutes) taken to reach the nearest financial institution as our external instrument, we find that a standard deviation increase in financial inclusion is associated with a decline in poverty of between 0.277 and 0.672 standard deviations, depending on how poverty is measured. We complement our 2SLS estimates with propensity score matching (PSM), using a range of matching techniques. In robustness checks, we apply our external instrument to rural and urban samples separately and adopt a heteroskedasticity-based identification strategy.

Across all estimation methods, we find significant poverty-reducing effects of financial inclusion.

Nigeria makes for an important case study for at least two reasons. It hosts the largest financial inclusion program in Africa and has the highest number of people in poverty. Not only is Nigeria Africa's largest economy, but it is also the poorest in Africa, and, indeed, one of the poorest in the world. Of the 87 million people in Nigeria, evidence from the FII program suggests that 60% of Nigerians live below the poverty line of $2.50 per day (FII, 2018; Roser & Ortiz-Ospina, 2018). Further, Nigeria currently has a negative poverty escape rate of −5.6% (World Poverty Clock, 2018), suggesting that rather than escaping poverty, more people are actually falling into poverty.

Nigeria was one of the first countries globally to commit to the Maya Declaration,[1] and since making this commitment, the Nigerian government launched the National Financial Inclusion Strategy in 2012, with the objective of reducing the number of people who are financially excluded to 20% by 2020 (Central Bank of Nigeria, 2012). However, since the implementation of this strategy, no study has examined the impact of financial inclusion in Nigeria. The FII survey is a unique dataset designed to measure national trends on key indicators of financial inclusion since 2013, the year after Nigeria launched the National Financial Inclusion Strategy, and is, thus, well-suited for this study.

Most of the existing literature on financial inclusion and poverty is at the macro-level (see, e.g., Beck, Demirgüç-Kunt, & Levine, 2007; Beck, Demirguc-Kunt, Laeven, & Levine, 2008; Chibba, 2009; Giné & Townsend, 2004; Levine, 1998). Related studies at the micro-level have typically used microfinance as a proxy for financial inclusion, and have examined the relationship between microfinance and outcomes such as poverty and income (e.g., Imai, Gaiha, Thapa, & Annim, 2012; Khandker, 2005; Zhang, 2017). We have very little evidence on the impact of specific financial inclusion interventions on development outcomes and what we do know is largely restricted to South Asia (see, e.g., Binswanger

[1] The Maya Declaration is a statement of common principles regarding the development of financial inclusion policy made by a group of developing nations during the Alliance for Financial Inclusion's 2011 Global Policy Forum held in Mexico.

& Khandker, 1995; Burgess & Pande, 2005). We contribute to the literature on financial inclusion and poverty by providing evidence on the efficacy of Africa's largest financial inclusion program on alleviating poverty in one of the poorest countries in the world.

We also contribute to a small related literature that has examined the implications of financial inclusion and access to microcredit in Nigeria. A few studies have examined the impact of access to finance or microfinance on consumption and expenditure (see, Aideyan, 2009; Dimova & Adebowale, 2018; Seck, Naiya, & Muhammad, 2017). In a related study, using cross-sectional data from the General Household Surveys for Nigeria, Dimova and Adebowale (2018) find evidence to suggest that access to finance improves household welfare, but increases income inequality. We extend this literature to examine the impact of financial inclusion on household poverty in Nigeria.

The rest of the chapter is set out as follows. The next section describes the data and variables used. Section 3 explains the empirical method. Section 4 presents the results and Sect. 5 concludes.

2 Data and Variables

We use data from the InterMedia Financial Inclusion Insights (FII) program. The FII program conducts nationally representative surveys in selected countries across Asia and Africa, including Nigeria. Commencing in 2013, the FII surveys have included modules that highlight trends in financial inclusion and the use of financial technologies and services with sections on the usage of mobile phones, mobile money, banks and non-bank financial institutions. Each module of the survey explores various dimensions of awareness, access and use of financial services. Our study draws on wave 4 of the survey for Nigeria conducted in 2016, which seeks to measure national trends in key indicators of financial inclusion since 2013, one year after Nigeria launched its National Financial Inclusion Strategy. The survey covers 6352 adults aged 15 years and above and includes information on household demographics, financial behavior, assets and poverty indicators among others.

Poverty

Based on information available in the FII survey, we employ three measures of poverty which enables us to examine the robustness of our results to alternative ways of measuring poverty. The first measure of poverty is the Poverty Probability Index (PPI). The PPI, commissioned by the Grameen Foundation, provides scores for households based on household characteristics to determine the likelihood of a household living below the national poverty line, which is set at $2.50 per day and takes into account current country conditions.[2] The scores on the PPI range between zero and 100, where a score of zero represents the household most likely to be poor and 100 represents the household least likely to be poor. Our second measure of poverty is a dummy variable set to equal one if the household lives below the poverty line of $2.50 per day.

Our third measure of poverty is a multi-dimensional poverty index (MPI) following the approach developed by the Oxford Poverty and Human Development Initiative (OPHI) (Alkire & Santos, 2010). We consider three equally-weighted dimensions in the poverty index; namely, education, health and living standards with multiple indicators under each dimension as shown in Appendix Table 2.6. Equal weights are assigned to each indicator under a dimension, and, thus, with two indicators each under the health and education dimensions, we assign a weight of 1/6 to each indicator, while for each of the six indicators under the living standard dimension we assign equal weights of 1/18. We use a poverty deprivation score derived from these indicators. The deprivation score per household is the weighted sum of the number of deprivations calculated as follows:

$$d_i = w_1 I_1 + w_2 I_2 + \ldots + w_n I_n, \tag{2.1}$$

where d_i is the household deprivation score, $I_i = 1$ if a household is deprived in indicator i and $I_i = 0$ otherwise. w_i is the weight attached to indicator i with $\sum_{i=1}^{d} w_i = 1$. Table 2.6 provides full details of how the household deprivation scores are assigned.

[2] See https://www.povertyindex.org/about-ppi for details on the construction of the PPI.

Financial Inclusion

Our measure of financial inclusion is a multi-dimensional financial inclusion index using an approach similar to that in Eq. (2.1). The index reflects a holistic view of financial inclusion based on various definitions of financial inclusion as proposed by the World Bank and the existing literature. According to the World Bank, a household or individual is financially included if they have access to affordable financial products that meet the needs associated with transactions and payment, savings, credit and insurance (World Bank, 2018a). Thus, the existing literature has often considered measures such as access to credit, access to savings, access to banking and access to insurance as the core pillars of financial inclusion (Mialou, Amidzic, & Massara, 2017; Park & Mercado, 2015).

In our multi-dimensional financial inclusion index, we consider three dimensions of financial inclusion; namely, access to banks, access to credit and access to insurance.[3] We assign each dimension an equal weight of 1/3 and develop a household financial deprivation score based on Eq. (2.1). Following Zhang & Posso (2019), we adopt a threshold of 0.5, where our measure of financial inclusion is a dummy variable set equal to one if the household financial deprivation score is less than 0.5, and zero otherwise. As a robustness test, we also use the individual indicators (access to bank, access to credit and access to insurance).

Covariates

Consistent with the household poverty literature, we control for household characteristics as well as the characteristics of a household reference person including household size, household asset ownership, age, gender, marital status, education, employment status, religion, household location (rural vs. urban) and number of children living in the household. Appendix Table 2.8 provides a description and summary statistics of variables included in our analysis.

[3] In the FII survey, access to banking services captures households that have either checking, savings or fixed deposit accounts, and thus our chosen indicators also reflect the savings dimension of financial inclusion. Table 2.7 presents details of the indicators used.

3 Empirical Specification and Methods

Our baseline estimates employ the following cross-section model for household poverty:

$$P_i = \beta F_i + \gamma X_i + \alpha_i + \varepsilon_i, \tag{2.2}$$

where P_i is poverty status or level of household i. F_i is the measure of financial inclusion and X_i is a vector of covariates correlated with household poverty. The variable α_i is a state-level dummy variable that controls for unobserved state-level fixed effects, while ε_i is a normally distributed error term. For our baseline results, we use ordinary least squares (OLS) for PPI and deprivation score regressions, while we use logit regressions for poverty line regressions.

We also employ 2SLS and PSM to address endogeneity arising from reverse causation and potential measurement error issues. In 2SLS regressions, we instrument for financial inclusion using the average time (in minutes) taken by a household member to get to the nearest financial institution providing financial inclusion services. Intuitively, time taken to reach the nearest financial institution should be correlated with financial inclusion, given the longer the time taken to reach the nearest financial institution, the less likely households will be able to avail financial services. This conjecture is consistent with the findings of studies that have examined the relationship between financial inclusion and distance to nearest banks (Brown, Guin, & Kirschenmann, 2016; Demirgüç-Kunt & Klapper, 2012). This time variable, however, only affects poverty through its effects on access to financial services, which are essentially measures of financial inclusion. One may be concerned about the validity of this instrument if the distribution of financial institutions across rural and urban areas in Nigeria were uneven. For instance, if the majority of financial institutions were in urban areas, and poverty was higher in rural areas than urban areas due to factors other than distance to financial institutions, distance to financial institutions might be correlated with poverty through other channels. We do not believe this is an issue in our case given that there has been an increase in the number, and distribution, of banks in rural areas since the introduction of Nigeria's Rural Banking Scheme (RBS) in 1977. However, to ensure that our choice of instrument is not sensitive to the geographic location of

respondents (i.e., urban vs. rural), in a robustness check, we also conduct 2SLS results in which we split our sample based on an urban/rural split.

We also follow a growing body of literature that has used PSM to address endogeneity in non-experimental data (see, e.g., Campello, Graham, & Harvey, 2010; Maertens & Swinnen, 2009; Zhang & Posso, 2019). We define the treatment as households that are financially included, and examine the average effect of this treatment on poverty by applying the PSM technique in Rosenbaum and Rubin (1983). In order to draw causal inferences about the effect of financial inclusion on poverty using PSM, we ask the question: What is the outcome (in terms of poverty) for a household that is treated (i.e., financially included), relative to the hypothetical outcome that would have prevailed if the same household was financially excluded? We estimate the average treatment effect as follows:

$$\tau = \begin{Bmatrix} E\left\{O_1 - O_0 \quad B=1\right\} \\ \left\{E\left\{E\left\{O_1 - O_0 \quad B=1, p\left(W\right)\right\}\right\}\right. \\ E\{E\left\{O_1 \quad B=1, p\left(W\right) - E\left\{O_0 \quad B=0, p\left(W\right)\right\} \quad B=1\right\} \end{Bmatrix},$$

where τ is the average effect of the treatment, B is a binary variable equal to one for a financially included household and zero otherwise, O represents poverty outcomes including household PPI scores, deprivation scores and poverty line, and W is a vector of pre-treatment characteristics represented by relevant covariates. The propensity score, $p\left(W\right)$, captures the probability of being poorer given pre-treatment characteristics (W). We use different matching methods, including nearest neighbour, radius, kernel and local linear regression matching methods.

4 Empirical Results

Table 2.1 presents the baseline results for the relationship between financial inclusion and household poverty. Column 1 presents results for household PPI scores, Column 2 presents results for household deprivation scores and Column 3 reports results for the poverty line.

Table 2.1 Financial inclusion and poverty (baseline results)

	(1)	(2)	(3)
Variables	PPI score	Deprivation	Poverty line
Financial inclusion	0.061***	−0.041***	−1.148***
	(0.008)	(0.011)	(0.246)
	[0.066]	[−0.031]	[−0.431]
Male	−0.007***	−0.004	0.085
	(0.003)	(0.005)	(0.077)
	[−0.022]	[−0.007]	[0.086]
Age	0.001***	0.000	−0.007**
	(0.000)	(0.000)	(0.003)
	[0.057]	[0.017]	[−0.226]
Rural	−0.076***	0.052***	1.367***
	(0.004)	(0.006)	(0.097)
	[−0.200]	[0.094]	[0.249]
Married	0.009***	−0.011**	−0.038
	(0.003)	(0.005)	(0.082)
	[0.027]	[−0.023]	[−0.039]
Children	−0.017***	0.012***	0.350***
	(0.001)	(0.002)	(0.037)
	[−0.185]	[0.091]	[0.316]
Household size	−0.014***	0.011***	0.157***
	(0.001)	(0.002)	(0.027)
	[−0.206]	[0.113]	[0.793]
Primary	0.038***	−0.282***	−0.681***
	(0.004)	(0.007)	(0.124)
	[0.087]	[−0.438]	[−0.534]
Secondary	0.088***	−0.335***	−1.630***
	(0.004)	(0.007)	(0.117)
	[0.252]	[−0.657]	[−1.615]
Tertiary	0.152***	−0.399***	−2.599***
	(0.006)	(0.009)	(0.152)
	[0.306]	[−0.549]	[−0.808]
Farm land	−0.037***	0.021***	0.701***
	(0.003)	(0.005)	(0.085)
	[−0.103]	[0.041]	[0.682]
Employed	0.017***	−0.026***	−0.492***
	(0.004)	(0.007)	(0.112)
	[0.036]	[−0.038]	[−0.366]
Self-employed	−0.003	−0.005	−0.161*
	(0.003)	(0.005)	(0.089)
	[−0.007]	[−0.011]	[−0.160]
Christian	0.019	−0.078***	−0.313
	(0.014)	(0.026)	(0.481)
	[0.055]	[−0.158]	[−0.318]

(*continued*)

Table 2.1 (continued)

	(1)	(2)	(3)
Variables	PPI score	Deprivation	Poverty line
Muslim	0.016	−0.086***	−0.112
	(0.015)	(0.027)	(0.488)
	[0.046]	[−0.173]	[−0.114]
Constant	0.677***	0.627***	−1.606***
	(0.019)	(0.033)	(0.573)
State fixed effect	Yes	Yes	Yes
Observations	6352	6352	6352
R-squared	0.645	0.528	–

Notes: Reference category for marital status is single/divorced/widowed, education status is no formal education, for employment, status is unemployed, for religion is other religions. Robust standard errors in parentheses. Standardized coefficients in brackets. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

In Column 1, a standard deviation increase in financial inclusion is associated with a 0.066 standard deviation increase in household PPI scores, while, in Column 2, a standard deviation increase in financial inclusion is associated with a 0.031 standard deviation decrease in household deprivation scores. In Column 3, a standard deviation increase in financial inclusion is associated with a decline of 0.431 standard deviations in the number of people below the poverty line. These results, viewed together, suggest that financial inclusion is associated with poverty alleviation. Further, compared to other covariates, the effects of financial inclusion on poverty is relatively stronger than factors such as gender, age, marital status and employment status of household reference persons.

Panel A of Table 2.2 presents 2SLS results for the association between financial inclusion and poverty using average time to the nearest bank as the instrument. From the first stage, consistent with expectations, we find that an increase in the time taken to reach the nearest bank is associated with a decline in financial inclusion. The F statistics, which are greater than 10, imply that our instruments are not weakly correlated with financial inclusion (Stock & Yogo, 2005). The 2SLS results suggest that endogeneity of financial inclusion causes a downward bias in our baseline estimates given that the 2SLS estimates are considerably higher than estimates from our baseline models. Specifically, a standard

Table 2.2 Financial inclusion and poverty (IV results)

	(1)	(2)	(3)
Variables	PPI score	Deprivation	Poverty line
Panel A: Full sample			
Financial inclusion	4.253*	−3.569*	−4.904***
	(2.229)	(1.923)	(0.053)
	[0.371]	[−0.277]	[−0.672]
State fixed effect	Yes	Yes	Yes
Observations	4555	4555	4555
First stage			
Time to bank	−0.007*		
	(0.004)		
Partial *R*-squared	0.1257		
F-statistic	18.11		
Panel B: Urban sample			
Financial inclusion	1.969**	−1.101*	−7.193*
	(0.994)	(0.661)	(4.018)
	[0.221]	[−0.212]	[−0.432]
State fixed effect	Yes	Yes	Yes
Observations	1533	1533	1533
First stage			
Time to bank	−0.020**		
	(0.009)		
Partial *R*-squared	0.1129		
F-statistic	8.97		
Panel C: Rural sample			
Financial inclusion	3.803**	−4.310**	−7.361**
	(1.806)	(2.094)	(3.578)
	[0.375]	[−0.365]	[−0.566]
State fixed effect	Yes	Yes	Yes
Observations	3022	3022	3022
First stage			
Time to bank	−0.009**		
	(0.004)		
Partial *R*-squared	0.1863		
F-statistic	14.30		

Notes: All regressions include the relevant control variables. Robust standard errors in parentheses. Standardized coefficients in brackets. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

deviation increase in financial inclusion is associated with an increase of 0.371 standard deviations in household PPI scores, and declines of 0.277 and 0.672 standard deviations in household deprivation scores and the number of households below the poverty line, respectively.

Panels B and C of Table 2.2 report 2SLS results for the urban and rural sub-samples, respectively. In Panel B, a standard deviation increase in financial inclusion is associated with an increase of 0.221 standard deviations in household PPI scores, and declines of 0.212 and 0.432 standard deviations in household deprivation scores and the number of households below the poverty line, respectively. In Panel C, a standard deviation increase in financial inclusion is associated with an increase of 0.375 standard deviations in household PPI scores and declines of 0.365 and 0.566 standard deviations in household deprivation scores and the number of households below the poverty line, respectively. These results are consistent with our baseline results and 2SLS results based on the full sample, although results for the urban sub-sample (Panel B) should be treated with caution given that the reported F-statistics are marginally below the Stock and Yogo (2005) critical value of 10.

Table 2.3 reports results for the effects of financial inclusion on poverty using PSM. Here, the treatment comprises households that are financially included, given that our baseline results suggest that financial inclusion is associated with better livelihoods. The PSM results suggest that, on average, poverty is lower for households that are financially included. This finding is consistent across all matching methods used and also consistent with our baselines and 2SLS results.

Table 2.3 PSM results with different matching methods

	ATT (average treatment effect on the treated)		
Matching method	PPI score	Deprivation	Poverty level
1—Nearest neighbor (one-to-one)	0.061***	−0.033***	−0.123***
	(0.003)	(0.006)	(0.026)
4—Nearest neighbor	0.063***	−0.037***	−0.118***
	(0.006)	(0.011)	(0.001)
Radius	0.070***	−0.044***	−0.148***
	(0.011)	(0.001)	(0.012)
Kernel	0.082***	−0.061***	−0.179***
	(0.013)	(0.001)	(0.007)
Local linear regression	0.073***	−0.048***	−0.156***
	(0.011)	(0.005)	(0.013)

Notes: ***represent significant at the 1% level. Bootstrapped standard errors in parentheses

Robustness Checks

In this section, we conduct a series of test to examine the sensitivity of our results. First, we examine the robustness of our 2SLS estimates using the Lewbel (2012) 2SLS approach in which we combine internally generated instruments with the time variable. Heteroskedasticity-based identification has a relatively long history as a complementary identification strategy to using external instruments (see, e.g., Klein & Vella, 2010). The Lewbel (2012) approach relies on heteroskedasticity of the error term. Because it relies on higher moments, it is less reliable than the standard IV approach, but it has still been widely used as a robustness check on 2SLS findings with external instruments (see, e.g., Brown, Martinez-Gutierrez, & Navab, 2014; Dang & Rogers, 2015; Denny & Oppedisano, 2013; Mallick, 2012; Mishra & Smyth, 2015; Sabia, 2007; Xue, 2018). In particular, several studies have combined Lewbel's method with an external instrument as a robustness check (see, e.g., Dang & Rogers, 2015; Denny & Oppedisano, 2013; Xue, 2018). The advantage of so doing is that it can enhance efficiency of estimation and create over-identification to test the validity of the instruments (Xue, 2018).

To employ the Lewbel (2012) approach, we estimate the following two equations:

$$Y_1 = X^I \beta_1 + Y_2 \Upsilon_1 + \xi_1, \quad \xi_1 = \alpha_1 U + V_1 \tag{2.3}$$

$$Y_2 = X^I \beta_2 + \xi_2, \quad \xi_2 = \alpha_2 U + V_2 \tag{2.4}$$

Y_1 is our measure of poverty, Y_2 is financial inclusion and U denotes unobserved characteristics, which affect both financial inclusion and poverty. V_1 and V_2 are idiosyncratic errors. Lewbel (2012) suggests that one can take a vector Z of observed exogenous variables and use $\left[Z - E\left(Z\right)\right]\xi_2$ as an instrument, provided that $E\left(X\,\xi_1\right) = 0$, $E\left(X\,\xi_2\right)$, $cov\left(Z, \xi_1, \xi_2\right) = 0$ and that there is at least some heteroskedasticity in ξ_j. The intuition is that $\left[Z - E\left(Z\right)\right]\xi_2$ is a valid instrument because identification depends on having regressors that are not correlated with the product of the heteroskedastic errors. Lewbel (2012) suggests that, where instruments (such as time taken to reach the nearest financial institution) exist, we can estimate

Eqs. (2.3) and (2.4) using 2SLS with both time taken to reach the nearest financial institution and an estimate of $\left[Z-E\left(Z\right)\right]\xi_2$ as instruments. As ξ_2 is a population parameter, and it cannot be directly observed, we use its sample estimate $\hat{e}_2$, obtained from the first stage regression and consequently use the vector $\left[Z-E\left(Z\right)\right]\hat{e}_2$ as instruments.

The main assumption of the Lewbel (2012) approach is that there is heteroskedasticity in ξ_j. The exact form of heteroskedasticity requirement as derived in Lewbel (2012) is $cov\left(Z,\xi_2{}^2\right)\neq 0$. As an approximation, Lewbel (2012) suggests using the estimate of the sample covariance between Z and squared residuals from the first stage regression linear regression on X to test for this requirement, using the Breusch and Pagan test for heteroskedasticity. As noted by Lewbel (2012, p. 71), "if $cov\left(Z,\xi_2{}^2\right)$ is close to or equal to zero, then $\left[Z-E\left(Z\right)\right]\xi_2$ will be a weak or useless instrument, and this problem will be evident in the form of imprecise estimates with large standard errors". The other assumptions that $E\left(X\,\xi_1\right)=0$, $E\left(X\,\xi_2\right)$, $cov\left(Z,\xi_1,\xi_2\right)=0$ are premised on population parameters and are non-testable. But, there is nothing unusual about these assumptions. As Lewbel (2012, p. 69) puts it: "These are all standard assumptions, except that one usually either imposes homoscedasticity or allows for heteroskedasticity, rather than requiring heteroskedasticity". This means, therefore, that the only non-standard required assumption by Lewbel (2012) is heteroskedasticity.

Table 2.4 reports findings from Lewbel 2SLS regressions. Panel A reports findings from regressions that use only internally generated instruments, while Panel B reports findings from regressions that combine time to the nearest bank with internally generated instruments. The Breusch and Pagan test for heteroskedasticity confirms that the heteroskedasticity assumption for the Lewbel (2012) approach is satisfied in our data. The first stage F statistics are consistently greater than 10 (Stock & Yogo, 2005). Further, we do not reject the null hypothesis for the over-identifying restriction test for regressions, suggesting that the instruments are not over-identified in the first stage.

In Panel A, we find that the effect of financial inclusion is significant across all columns. Specifically, a standard deviation increase in financial inclusion is associated with an increase of 0.059 standard deviations in household PPI scores, and decreases of 0.020 and 0.037 standard deviations in household deprivation scores and the number of households below

Table 2.4 Financial inclusion and poverty (Lewbel 2SLS results)

	(1)	(2)	(3)
Variables	PPI score	Deprivation	Poverty line
Panel A: Lewbel 2SLS with internal instruments			
Financial inclusion	0.054***	−0.028**	−0.100***
	(0.009)	(0.012)	(0.029)
	[0.059]	[−0.020]	[−0.037]
State fixed effect	Yes	Yes	Yes
Observations	6352	6352	6352
First stage			
Partial *R*-squared	0.8224	0.8224	0.8224
F-statistic	381.31	381.31	381.31
J *p*-value	0.1512	0.1415	0.2276
Panel B: Lewbel 2SLS with external & internal instruments			
Financial inclusion	0.053***	−0.019	−0.104***
	(0.009)	(0.012)	(0.030)
	[0.067]	[−0.017]	[−0.045]
State fixed effect	Yes	Yes	Yes
Observations	4555	4555	4555
First stage			
Time to bank	−0.007***		
	(0.002)		
Partial *R*-squared	0.7891		
F-statistic	282.09		

Notes: All regressions include the relevant control variables. Robust standard errors in parentheses. Standardized coefficients in brackets. ***$p < 0.01$, **$p < 0.05$

the poverty line, respectively. In Panel B, while the effect of financial inclusion on the household deprivation score is statistically insignificant, a standard deviation increase in financial inclusion is associated with an increase of 0.067 standard deviations in household PPI scores, and a decrease of 0.045 standard deviations in the number of households below the poverty line. These results are generally consistent with the baseline results in Table 2.1 and the instrumented results in Table 2.2. The coefficients in both Panels A and B are much closer to the baseline estimates than the estimates just using the external instrument and the coefficients in Panel B are slightly higher than those in Panel B, consistent with most previous studies that have employed the Lewbel method (see Mishra & Smyth, 2015).

We next examine the robustness of results to a sub-sample of our dataset. The common trend in the household poverty literature is to control

for characteristics of a household reference person. While the reference person is defined differently in the literature, in most cases, it corresponds with the household head or household member with the highest income. In the FII survey, not all household reference persons are household heads (or at least all household reference persons interviewed did not state that they were household heads). We examine the sensitivity of our results to a sub-sample which restricts our sample to household heads only, thus allowing us to control for the characteristics of household heads alone. Panel A of Table 2.4 reports results for the association between financial inclusion and poverty using this sub-sample. The results are consistent with our baseline estimates for financial inclusion reported in Table 2.1.

Next, we examine the robustness of our results to each component of financial inclusion that is used in our multi-dimensional financial inclusion index. Specifically, we examine the effects of access to banks, access to credit and access to insurance on poverty. Panel B of Table 2.5 reports results for the effects for access to banks, while Panel C reports results for access to credit. Panel D reports results for access to insurance. These results are generally consistent with our baseline results and thus the effects of financial inclusion are not sensitive to how financial inclusion is measured. We do, however, find that the association between access to banks and poverty is stronger than the association between either access to credit and insurance and poverty.

The stronger effect of access to banks could be because access to a bank account is considered the first and most important step toward financial inclusion (Sen & De, 2018). Nigeria has pursued a bank-led financial inclusion strategy (Wanga & Schueth, 2018). It is also worth noting that, in our dataset, access to banks also captures household savings, which is a very important aspect of financial inclusion that has been shown to help households finance productive investments in business and human capital, thus ensuring a lasting impact on wellbeing (Karlan, Ratan, & Zinman, 2014).

In our main results, the index of financial inclusion is based on equal weights (i.e., 1/3 each) for the three dimensions of financial inclusion. As a final check, we examine the sensitivity of our results to the use of different weights for the individual dimensions of financial inclusion. Specifically, we run alternating regressions, in which we assign higher weights to each of the three dimensions. Panel E of Table 2.5 reports

Table 2.5 Robustness checks

	(1)	(2)	(3)
Variables	PPI score	Deprivation	Poverty line
Panel A: Household head sample			
Financial inclusion	0.065***	−0.055***	−1.133***
	(0.012)	(0.015)	(0.338)
	[0.081]	[−0.046]	[−0.463]
Observations	2953	2953	2953
R-squared	0.643	0.540	–
Panel B: Effects of access to bank			
Financial inclusion	0.054***	−0.058***	−0.883***
	(0.004)	(0.006)	(0.100)
	[0.139]	[−0.102]	[−0.787]
Observations	6352	6352	6352
R-squared	0.653	0.534	–
Panel C: Effects of access to loan			
Financial inclusion	0.027***	−0.013	−0.532***
	(0.007)	(0.010)	(0.174)
	[0.032]	[−0.010]	[−0.218]
Observations	6352	6352	6352
R-squared	0.642	0.527	–
Panel D: Effects of access to insurance			
Financial inclusion	0.064***	−0.029**	−1.037***
	(0.010)	(0.014)	(0.317)
	[0.058]	[−0.018]	[−0.325]
Observations	6352	6352	6352
R-squared	0.645	0.528	–
Panel E: Weights—Bank (1/2), Loan (1/4), Insurance (1/4)			
Financial inclusion	0.061***	−0.041***	−1.153***
	(0.009)	(0.011)	(0.252)
	[0.066]	[−0.030]	[−0.429]
Observations	6352	6352	6352
R-squared	0.645	0.528	–
Panel F: Weights—Bank (1/4), Loan (1/2), Insurance (1/4)			
Financial inclusion	0.054***	−0.052***	−1.036***
	(0.011)	(0.014)	(0.277)
	[0.046]	[−0.031]	[−0.307]
Observations	6352	6352	6352
R-squared	0.644	0.528	–
Panel G: Weights—Bank (1/4), Loan (1/4), Insurance (1/2)			
Financial inclusion	0.069***	−0.024	−1.200***
	(0.012)	(0.015)	(0.413)
	[0.053]	[−0.013]	[−0.318]
Observations	6352	6352	6352
R-squared	0.644	0.527	–

Notes: All regressions include the relevant control variables. Robust standard errors in parentheses. Standardized coefficients in brackets. ***$p < 0.01$, **$p < 0.05$

results for financial inclusion, in which we assign the 'access to banks' dimension a weight of 1/2, and 1/4 each to the other two dimensions. In Panel F, we use a financial inclusion measure in which we assign the 'access to credit' dimension a weight of 1/2, and 1/4 each to the other two dimensions, while in Panel G, we use a financial inclusion measure in which we assign the 'access to insurance' dimension a weight of 1/2, and 1/4 each to the other two dimensions. We find that our results are robust to the assignment of different weight to each dimension.

5 Conclusion

The World Bank has declared universal financial inclusion by 2020 as a strategic priority. Hence, policymakers around the world have prioritized financial sector development and financial inclusion as ways to promote livelihoods and wellbeing. In Nigeria, the government has launched one of Africa's most extensive financial inclusion programs. These efforts have constituted one of the most important ways, through which Nigeria is seeking to meet its national priority of alleviating poverty. To this point, there is very little evidence on the effectiveness of specific financial inclusion programs on facilitating development around the world and no evidence on the relationship between financial inclusion and poverty in Nigeria, or Africa more broadly, despite its obvious policy significance.

Using data from a new nationally representative survey, we examine the effects of financial inclusion on poverty in Nigeria. We find that financial inclusion has contributed to lowering poverty levels. Our results, thus, confirm that well-functioning financial systems that promote access to credit, insurance and banking services, including savings, are likely to benefit poor people. This finding implies that increasing access to financial services and improving service provision and efficiency across poor and vulnerable populations is important to address poverty.

While Nigeria hosts the largest financial inclusion program in Africa, financial inclusion is still lagging behind, given the country's population. In Nigeria, only about 29% of the adult population have opened a bank account, or saved, in order to start a business (Demirguc-Kunt et al., 2018). The slow growth of financial inclusion, relative to Nigeria's

population, has been attributed to the choice of pursuing a bank-led model of financial inclusion, which has been based on a weak banking system amid a slow economic recovery from a prolonged recession, caused by low oil prices (Wanga & Schueth, 2018). According to the World Bank, the Nigerian economy contracted for five consecutive quarters between 2016 and 2017 with very high and persistent inflation as well as a highly devalued currency (World Bank, 2018b). High inflation rates, coupled with a devalued currency, suggest that borrowers have to pay high interest rates on loans, while savers are paid rates below inflation. Accordingly, people are inclined to turn away from banks for their financial needs.

Insights from the FII program also suggest that the enforcement of the Bank Verification Number (BVN) system by the Central Bank of Nigeria could be an important factor working against the bank-led financial inclusion model. The BVN requires that each customer links his or her bank account to a biometric system. However, customers, especially in rural areas, have been reluctant to submit to this process and, thus, many account holders no longer use their accounts, rendering several bank accounts inactive or underused. Indeed, statistics from the Nigeria Inter-Bank Settlement System indicate that over 2 million customers ceased to use their accounts with Nigerian banks between 2016 and 2017. Further, statistics from the FII survey shows that while there is a general awareness of the location of banks, there is a lack of awareness of financial point of service (POS) locations in Nigeria and this has impeded the growth of financial inclusion.

Despite these issues, our key finding that financial inclusion alleviates poverty implies that a strengthening of the financial sector, and further emphasis on financial inclusion, will assist with Nigeria's national agenda of poverty alleviation. Our results suggest that Nigeria should adopt strategies that will (1) help strengthen financial inclusion amidst existing economic challenges, (2) promote a multi-system financial inclusion program that goes beyond a bank-led program, (3) promote the knowledge, and usage, of non-bank financial services simultaneously with the usage of banks, and (4) review existing policies that influence the efficacy of the banking sector, such as the BVN, to ensure that such policies do not have undesirable consequences. The implementation, in March 2018, of the

new Shared Agent Network Expansion Facilities (SANEF) strategy, which licenses 500,000 mobile money and banking agents across Nigeria to promote financial literacy and provide digital financial services, is an important policy step, and can be developed further in the future to promote financial inclusion nationally. The SANEF program can also be adopted by African countries to expand financial inclusion and assist in fighting poverty across the continent as a whole.

Appendix

Table 2.6 Dimensions, indicators and weights for multi-dimensional poverty

Dimension (weight)	Deprived if… (weight)
Education (1/3)	Household head has less than 5 years of education (1/6)
	Any school age child is not going to school (1/6)
Health (1/3)	Household member needed a doctor but delayed or did not go because of funds in the last 6 months (1/6)
	Household has gone without enough food to eat because of funds in the last 6 months (1/6)
Standard of living (1/3)	The household does not have a refrigerator (1/18)
	The household does not have a stove/gas burner (1/18)
	The household does not have a television (1/18)
	The household does not have an electric fan (1/18)
	The household does not have a chair, stool, bench or table (1/18)
	The household does not have a motorcycle, scooter, motor car or jeep (1/18)

Table 2.7 Dimensions, indicators and weights for multi-dimensional financial inclusion

Dimension (weight)	Financially deprived if…
Bank (1/3)	Household does not have a bank account (bank account includes savings, current, fixed deposit or microfinance account)
Loan/Credit (1/3)	Household does not have access to loan/credit from bank, microfinance institution or other formal institution
Insurance (1/3)	Household does not have access to medical, life, property, unemployment/income or family insurance

Table 2.8 Description and summary statistics of variables

Variable	Description	Mean	SD
PPI score	Poverty Probability Index on a 0 to 1 scale	0.526	0.169
Deprivation	Deprivation score based on multi-dimensional poverty indicators	0.342	0.249
Poverty line	Dummy variable equals 1 if income lived on is less than $2.50 per day	0.589	0.492
Financial inclusion	Dummy variable equals 1 if household financial deprivation score is less than 0.5	0.040	0.184
Bank access	Dummy variable equals 1 if household has access to a bank	0.259	0.439
Loan access	Dummy variable equals 1 if household has access to loan/credit	0.042	0.201
Insurance access	Dummy variable equals 1 if household has access to insurance	0.024	0.154
Household size	Number of people in household	4.192	2.476
Male	Dummy variable equals 1 if household reference person is male	0.529	0.499
Age	Age of household reference person	35.606	15.613
Rural	Dummy variable equals 1 if household lives in rural area	0.719	0.449
Married	Dummy variable equals 1 if household reference person is married	0.586	0.492
Children	Number of children in household	1.775	1.851
Primary	Dummy variable equals 1 if highest level of education of household reference person is primary education	0.182	0.386
Secondary	Dummy variable equals 1 if highest level of education of household reference person is secondary education	0.389	0.487
Tertiary	Dummy variable equals 1 if highest level of education of household reference person is tertiary education	0.136	0.342
Farm land	Dummy variable equals 1 if household owns a farm land	0.343	0.479
Employed	Dummy variable equals 1 if household reference person is employed	0.160	0.367
Self-employed	Dummy variable equals 1 if household reference person is self-employed	0.392	0.488
Christian	Dummy variable equals 1 if household reference person is Christian	0.516	0.499
Muslim	Dummy variable equals 1 if household reference person is Muslim	0.476	0.499
Time to bank	Log of average time taken from residence to nearest financial institution	3.674	0.826

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