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**Does access to
formal finance
matter for welfare
and inequality?
Micro level evidence
from Nigeria**

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Abstract

Using a treatment effects model, decomposition techniques and representative household data from Nigeria, this paper explores the living standard and inequality implications of access to formal finance. Formal access to finance is found to improve household welfare, but also increase inter-household inequalities, despite ameliorating the inequality enhancing effect of urban versus rural residence and enhancing the inequality ameliorating effect of greater educational attainment. The positive effect of access to formal finance on inequality is substantially smaller than the effect of unobserved household characteristics, indicating that welfare and equality enhancing strategies should follow a holistic approach.

Keywords

Access to finance, treatment effects, decomposition, Nigeria

JEL Codes

I30, O10, O20

1. Introduction

Since the early 1970s, when McKinnon (1973) and Shaw (1973) brought the limitations of repressed financial sectors and related benefits of financial liberalisation to the limelight of the global development agenda, efficient financial markets have been seen as key ingredients of successful economic development. Reviews of numerous cases of financial liberalisation around the world have highlighted high correlations between financial sector liberalisation and development of the financial market, proxied by measures of depth and efficiency (Caprio et al, 1994). Rigorous empirical analyses in turn find strong empirical links between these measures of financial sector development and not only growth (Levine, 1997; King and Levine, 1993; Levine and Zevros, 1998), but also poverty and inequality alleviation (Beck, Demirguc-Kunt and Levine, 2004). These empirical results grant support to theoretical postulates that a developed financial sector not only accelerates growth through increased efficiency of capital allocation, but also reduces poverty and inequality by relaxing credit constraints that disproportionately affect the poor (Aghion and Bolton, 1997; Galor and Zeira, 1993; Galor and Moav, 2004). At the same time, decades of rigorous research and a large doze of consensus have not alleviated controversies in both academic discourse and policy design. In particular, how formal financial systems affect the poor continues to be inadequately understood (Demirguc-Kunt and Levine, 2008).

One of the largest bones of contention is the ambiguity on whether financial sector policies aimed at poverty and inequality alleviation should place more emphasis on financial sector deepening or on increasing outreach. There are theoretical arguments that the welfare enhancing impact of the financial depth-growth nexus should eventually trickle down to the poor (Greenwood and Jovanovic, 1990; Beck, Levine and Lenkov, 2010). At the same time, others emphasize the role of asymmetric information in uncertainty ridden context, which leads to credit rationing and financial sector exclusion even in developed (and hence “deep”) financial markets (Stiglitz and Weiss, 1981; Besley, 1994). Empirical research on a number of economies in Africa, where the level of risk and uncertainty is among the highest, shows that despite contributing to the enhancement of certain indicators of financial depth, financial sector liberalisation resulted in: (i) expansion, rather than reduction, of the informal financial sector, the welfare implications of which are – at best – debatable (Ray, 1998; Fafchamps, 2004), (ii) constrained access to formal finance mostly in favour of the rather small public and large enterprise sector and (iii) a minimal share of private credit to GDP (Steel et al, 1997). More recent statistics corroborate this evidence by highlighting minimal access to formal finance for both households and firms in a range of developing countries (The World Bank, 2008). A large part of the response by policy organizations like the World Bank involves enhancing access to finance through actions such as improvement of financial infrastructure and servicing remote areas in developing countries.

On the alternative side of the analytical spectrum, authors emphasise the importance of financial deepening as opposed to inclusion on poverty and inequality alleviation. Using state-level data from India for 1983-2005, Ayaagari, Beck and Hoseini (2013) show that while by enhancing financial sector depth, liberalisation had significant negative impact on rural poverty – mostly through increased employment opportunities and migration from rural to urban areas - financial inclusion, measured by rural branches per capita did not have significant impact on the poor. A possible explanation of this controversy is the macro-micro

divide in conceptualisation and empirical evidence. To the best of our knowledge, most of the research on the role of financial sector development for poverty and inequality has been conducted at the macro or district level with negative correlations between measures of financial sector depth and measures of inequality and poverty quite plausibly capturing the structural transformation mechanism described by Ayaagari, Beck and Hoseini (2013). At the same time, measures of country or district level access to finance are arguably a rather rough proxy of access to finance by households and individuals. Yet, a disproportionately smaller number of studies – with the notable exception of papers such as that of Bruhn and Love (2009) – have looked at the impact of individual and household level access to formal finance on economic outcomes, after identifying the households and individuals who are the largest victims of exclusion. In particular, we are not aware of empirical research that explicitly links access to finance to poverty and inequality at the micro level.

The purpose of this paper is to bridge the gap in the literature by exploring the role of access to finance on household level welfare and intra-household inequality. We argue that while enhanced geographical access to finance is likely to be positively linked to enhanced access to finance for individuals and households within the same geographic zone and would in turn have positive impact on the welfare of its beneficiaries, it has ambiguous implications for intra-household inequalities. In particular, asymmetric information problems may preclude the access to finance by groups of the population within geographic areas that have enjoyed improvement in formal finance infrastructure. If geographic outreach benefits a privileged few, intra-household inequalities are likely to increase.

Moreover, while the literature on the economic implications of finance emphasizes its vital importance for economic outcomes, it is important to weigh the relative role played by access to finance against alternative determinants of poverty and inequality. From a policy perspective, this would provide an answer to the question of whether policy support should be given to including the poor in the formal financial system or whether instead priority should be given to alternative schemes, including among others, social security.

We use an empirical methodology that helps us deal with the above controversies and give answers to policy relevant questions. We start by estimating a treatment effects model of the determinants and welfare consequences of access to finance at the household level. The probit model estimates in the first stage of this model highlight household level and community (including those related to financial market infrastructure) determinants of access to finance for individual households. The second stage of the model provides unbiased estimates of the welfare implications of access to finance, after accounting for the fact that the sample of households with access to finance is not randomly selected. Next, we use a decomposition method, based on the treatment effects model, to highlight differential implications that (i) access to finance, enjoyed by beneficiary households, (ii) non-random selection into receiving access to finance, and (iii) factors that are not related to access to finance, have on intra-household welfare inequalities.

The rest of the paper is organised as follows. In Section 2 we highlight some background information on Nigeria as a context for our research. Section 3 explains the empirical methodology. In Section 4 we describe the data and highlight some descriptive statistics. Section 5 presents the empirical results and Section 6 concludes.

2. Nigeria: financial sector reforms, access to finance, poverty and inequality

Nigeria's economic history since independence in 1960 shares some key characteristics of resource rich sub-Saharan African economies, which opted for import substitution led development strategy and experienced a subsequent major economic crisis, followed by structural reforms and complex post-reform dilemmas. While at independence agriculture was Nigeria's main sector, providing food, employment and raw materials for nascent manufacturing, discovery of oil changed the equation with agriculture's role diminishing and the oil sector replacing it (Chete et al, 2014). The following two decades were marked by government led industrial policy, whereby the oil boom was particularly helpful in funding major industrial projects, especially in heavy industry; only to give way to the early 1980s crisis, triggered by a global recession and plummeting oil prices.

The structural reform program, introduced in 1986, involved stylized policy instruments, aimed at enhancing economic incentives. These included comprehensive foreign exchange reform, trade liberalisation and reform in business and agricultural regulations. The accompanying financial sector liberalisation involved eased restrictions on bank ownership, removal of interest rate ceilings, relaxation of credit allocation requirements and privatisation undertakings (Lewis and Stein, 1997). Initial reforms were implemented within a weak regulatory framework. While the number of banks tripled in six years, banking concentration remained high with many of the smaller banks taking on greater risk to attract new businesses and exploiting regulatory loopholes to enhance profits (Chibuike, 2000; Lewis and Stein, 1997). Together with rent seeking behaviour of military elites with influence within the banking sector, this contributed to the mid-1990s banking crisis. Between 1986 and 1996, bank deposits to GDP fell from 24% to 8% due to bank closures and capital flight (World Bank, 2014). Liquid liabilities fell from 35% to 13% (Federal Reserve Economic Data, 2014).

Since the early 2000s Nigeria has implemented series of reforms aimed at strengthening the regulatory environment. The immediate post-crisis risk management measures have included increasing bank capital requirements from 2 to 25 billion naira, improved regulatory reporting and formation of new monitoring organizations like the Economic and Financial Crimes Commission. Further reforms include introduction of microfinance policy – resulting in the transformation of existing community banks into microfinance banks – the establishment of Assets Management Company of Nigeria in 2010 and, more recently, the introduction of the National Financial Inclusion Strategy in 2012. These measures have had positive implications for key financial depth indicators. In particular, between 2005 and 2013 credit to the private sector increased from US\$11.49 billion to US\$98.61 billion, while M2/GDP went up from 18.1% in 2005 to 38% in 2009 before declining to 18.9% in 2013 (CBN, 2014).

At the same time, the reforms have had limited impact on stylized measures of financial inclusion. Statistics from as recently as 2014 show that only 48.6% (45.4 million) of the 93.5 million Nigerian adults have access to formal financial institutions. Among them, only 36.3% (33.9 million) have and/or use a bank account, while 61% (57.1 million) have never been banked (EFInA, 2014). One explanation for the low access to finance has been the large rural population (approximately 63.9% of total in 2014), the majority of whom are relatively

poor and rely on subsistence agriculture and informal finance. EFINA (2014) argues that the key constraint for enhanced access to finance in (rural) Nigeria comes from the supply side. Among the main supply side constraints are infrastructural bottlenecks, including roads, electricity and internet. Yet, aside from a few qualitative analyses and a handful of empirical studies, mostly conducted at the macro and state, regional and sectoral level (Aliero and Ibrahim, 2012; Ihugba et al, 2013; Taiwo et al, 2014; Yinusa, 2015) little rigorous and comprehensive effort has been made to explore the precise identity of excluded households and the determinants of their exclusion, as well as the welfare implications of exclusion from the formal financial sector.

Even short of financial sector related issues, the structural reforms and reforms that followed have had mixed implications on economic outcomes. On the positive side, the recent reassessment of national accounts data in the form of GDP rebasing revealed a much larger in size and much more diversified economy than that presented in earlier estimates (World Bank, 2014). The GDP estimate of US\$509 billion makes Nigeria the largest economy in Africa and the 26th largest in the world. Although it is largely dominated by oil and gas, as well as sectors that service the local market (agriculture, trade, food and various services), these are estimated to account for only 54% of the Nigerian output (compared to earlier estimates of 85%). Sectors that have received much higher new estimates are telecommunications, real estate, manufacturing, construction and entertainment.

At the same time, economic health continues to be dependent on the oil sector, as indicated by budgetary and growth difficulties experienced in the recent aftermath of the sharp decline in oil revenues due to fall in oil prices between June 2014 and January 2015 (Barungi et al, 2016). Moreover, one of the key problems faced by Nigeria is that of social cohesion and the related issues of poverty, inequality and productive job creation.

Growth over the past decade has been accompanied by increased inequality and vulnerability. Evidence suggests that growth and poverty reduction are predominantly an urban phenomenon, while slow progress in poverty reduction in rural areas is consistent with the decline of agricultural production, the growth of which fell to under 3% between 2011 and 2013 (World Bank, 2014). There is even stronger divide between North and South than between urban and rural areas more broadly speaking: although Southern areas experienced a decline in poverty and the South West experienced the lowest poverty rate of 16% in 2012-2013, approximately 66% of the poor reside in the North of the country. Creating productive employment continues to be a major issue. Although there is a debate within relevant institutions in Nigeria on the appropriate measurement of unemployment, international organizations like the ILO estimate unemployment to be on the rise and particularly acute among the youth (ILO, 2011). Most of the newly created jobs are in the informal sector (World Bank, 2014). In sum, despite progress in both the financial and real sector, Nigeria continues to face dilemmas related to appropriate strategies in addressing inequality and vulnerability. Given the strong theoretical foundation behind the role of access to finance on lifting constraints to entrepreneurship, human capital development and consumption, it is imperative to identify excluded households, find out to what extent finance is key determinant of intra-household welfare inequalities and weigh the role of access to finance against alternative sources of these inequalities.

3. Empirical methodology

3.1. Econometric model

3.1.1. Treatment effect model on the welfare implications of access to finance

Our focus is on the implications of access to finance for household welfare, which we proxy with the household level of per capita expenditures C (Glewwe and Hall, 1998; Dimova and Wolff, 2008). Access to finance itself is a function of a range of household and infrastructural characteristics. Hence, we estimate the following system of equations:

$$[1] \quad C = X_C \beta_C + \delta_C F + \varepsilon_C$$

$$[2] \quad F^* = Z_F \theta_F + \eta_F$$

In equation [1] C is the per capita expenditures of the i th household, X_C is a set of variables explaining C , β_C is the associated vector of coefficients and δ_C is the estimate of the exposure of the household to access to finance. ε_C follows normal distribution $\varepsilon_C \sim N(0, \sigma)$. In equation [2] F^* is a latent variable capturing the likelihood of the household to have access to finance, Z_F is a vector of explanatory variable and θ_F is a vector of related coefficients. While the latent variable is unobserved, we observe $F = 1$ when $F^* > 0$, $F = 0$ otherwise. Under the assumption that η_F is normally distributed ($\eta_F \sim N(0, \sigma)$), the corresponding specification is a probit model: $\Pr(F = 1) = \Phi(Z_F \theta_F)$ and $\Pr(F = 0) = \Phi(-Z_F \theta_F)$, where $\Phi(\cdot)$ is a normal distribution function.

Equations [1] and [2] are estimated simultaneously to address the possibility of non-random selection of households into the access to finance “treatment”, namely the possibility that $E(\varepsilon_C | F) \neq 0$. Specifically, if either households with genuinely better or households with genuinely worse unobserved characteristics are those who have access to finance, the impact of access to finance on welfare would be over-estimated/under-estimated. As a result, an OLS estimation of equation [1] would produce a biased coefficient of the access to finance variable. To account for the correlation between the two residuals, we estimate a treatment effects model of household welfare, which accounts for the non-random selection of households into the formal financial market (Barnow et al, 1981):

$$[3] \quad E(C | F = 1) = X_C \beta_C + \delta_C + \rho_{C,CF} \sigma_\varepsilon \left[\frac{\vartheta(Z_{CF} \theta_{CF})}{\Phi(Z_{CF} \theta_{CF})} \right],$$

$$[4] \quad E(C | F = 0) = X_C \beta_C + \delta_C + \rho_{C,CF} \sigma_\varepsilon \left[\frac{-\vartheta(Z_{CF} \theta_{CF})}{1 - \Phi(Z_{CF} \theta_{CF})} \right],$$

where ϑ is the normal density function. The difference in per capita expenditures between households with access to finance and those without access to finance is given by:

$$[5] \quad E(C | F = 1) - E(C | F = 0) = \delta_C + \rho_{C,CF} \sigma_\varepsilon \left[\frac{\vartheta(Z_{CF} \theta_{CF})}{(1 - \Phi(Z_{CF} \theta_{CF})) \Phi(Z_{CF} \theta_{CF})} \right]$$

Equation (5) is estimated using full maximum likelihood method, using the treatreg command in Stata. This produces unbiased estimates of β_C , δ_C , and θ_{CF} . Note that the term in brackets is the inverse Mills ratio, whose sign indicates the direction of selectivity bias. A negative value of this selectivity term gives evidence of overestimated welfare levels due to

non-random selection of households in the access to finance treatment, and the opposite is true for positive selection bias. The correct estimate of the effect of access to finance on welfare is computed net of the selectivity bias.

One of the attractive features of the treatreg model is its flexibility with respect to identification, given that normality condition of the probit model serves as an excluded condition. Hence, it is acceptable to have the same covariates in the X and Z vectors or different ones, depending on user's preferences (Guo and Frazer, 2014). We experimented with both an exactly identified model and alternatives until we were left with a specification that meets our theoretical requirements. Note that our results (available upon request) are robust to alternative specifications

3.1.2. Access to finance and disparity in living standards

As indicated earlier, one of our main objectives is to establish what implications access to finance has for inter-household inequalities, measured by the disparity or variance in per capita expenditures. Let us consider two groups of people: those with access to finance and those with no access to finance. To begin with, at the most aggregate level of the decomposition analysis we can establish the relative contribution of between group variance (namely between the groups of those with access to finance and those without access to finance) and within group variance (within each of these groups) to the disparity in overall living standards. If we find that the between group variance exceeds the within group variance this would indicate that access to finance plays larger role than alternative factors in explaining inter household differences in living standards.

Next, following Hachane and Silber (2005) and Dimova and Wolff (2008) it is also possible to calculate the relative contribution of different explanatory variables (exogenous covariates, access to finance, selectivity bias and the error term) to the between and within group variances of per capita expenditures. The methodology is an extension of decomposition analysis developed by Fields (2003) for OLS-based estimates to estimates based on a treatment effects model. Let $V_0(C)$ and $V_1(C)$ be the variances in per capita expenditures for households with no access to finance and households with access to finance. If p_F is the proportion of households with access to finance, the within group variance is:

$$[7] V^W(C) = (1 - p_F)V_0(C) + p_F V_1(C)$$

while the between group variance $V^B(C)$ is:

$$[8] V^B(C) = (1 - p_F)p_F(\bar{C}_1 - \bar{C}_0)^2$$

where \bar{C}_1 and \bar{C}_0 are the respective mean values of the levels of per capita expenditures in group 0 (no access to finance) and group 1 (access to finance). The individual contributions of exogenous covariates, access to finance, selectivity bias and unobserved factors, captured by the error term to these two contributors to the overall variance can be calculated as follows. In the case of the between variance $V^B(C)$, for each variable k other than access to finance, the residual and the Mills ratio, the contribution is:

$$[9] s_k^B = \beta_K \frac{\bar{X}_{1k} - \bar{X}_{0k}}{\bar{C}_1 - \bar{C}_0}$$

where $\overline{X_{1k}}$ and $\overline{X_{0k}}$ are the mean values of X_k in group 0 and 1, respectively. Similarly, the contribution of access to finance to the between group variance is:

$$[9] s_F^B = \frac{\delta}{\overline{C_1} - \overline{C_0}}$$

Note that by definition, the mean value of access to finance is equal to 1 in group 1 and 0 in group 0. If we denote the Mills ratios in the two groups by $\lambda_1 = \phi(Z_T \theta_T) / \Phi(Z_T \theta_T)$ and $\lambda_0 = -\phi \frac{Z_T \theta_T}{1 - \Phi(Z_T \theta_T)}$, the contribution of the selectivity bias to the between group variance is given by:

$$[10] s_\lambda^B = \rho \sigma_\varepsilon (\overline{\lambda_1} - \overline{\lambda_0}) / (\overline{C_1} - \overline{C_0}), \text{ where } \overline{\lambda_1} \text{ and } \overline{\lambda_0} \text{ are the mean values of the selectivity terms.}$$

The contribution of the residual is:

$$[11] s_\varepsilon^B = \rho \sigma_\varepsilon (\overline{\varepsilon_1} - \overline{\varepsilon_0}) / (\overline{C_1} - \overline{C_0}), \text{ where } \varepsilon_1 \text{ and } \varepsilon_0 \text{ are the means of the residuals in each group.}$$

In so far as the within group contribution to the variance is concerned, the contributions of each variable other than the residual, the inverse Mills ratio and access to finance is simply an extension of [6], adjusted for the probability of belonging to either of the two groups:

$$[12] s_k^W = (1 - p_F) \beta_k \frac{\text{cov}(X_{k0}, C_0)}{V(C_0)} + p_F \frac{\text{cov}(X_{k1}, C_{01})}{V(C_1)}, \text{ where } X_{k0} \text{ and } C_0 \text{ are the corresponding values of the variables and per capita consumption for individuals that do not have access to finance and } X_{k1} \text{ and } C_1 \text{ are the counterparts for those with access to finance. The contribution of the Mills ratio to the within group variance is given by:}$$

$$[13] s_\lambda^W = (1 - p_F) \rho \sigma_\varepsilon \text{cov}(\lambda_0, C_0) / V(C_0) + p_F \rho \sigma_\varepsilon \text{cov}(\lambda_1, C_1) / V(C_1), \text{ while the contribution of the residual is:}$$

$$[14] s_\varepsilon^W = (1 - p_F) \rho \sigma_\varepsilon \text{cov}(\varepsilon_0, C_0) / V(C_0) + p_F \rho \sigma_\varepsilon \text{cov}(\varepsilon_1, C_1) / V(C_1).$$

Clearly, access to finance only affects the between variance.

3.2. Empirical specification

As indicated in the preceding section, we use the logarithm of per capita expenditures as a stylised measure of living standards and the variance of per capita expenditures as a related measure of inequality in living standards (Glewwe and Hall, 1998; Dimova and Wolff, 2008). In addition, following relevant literature, we define access to finance as a dummy variable, taking the value of 1 if the household head either (i) has a bank account, or (ii) has used the credit facility of a formal financial institution within the preceding six months, irrespective of having or not having a bank account, or (iii) has used the savings facility of formal institution within the preceding six months irrespective of having or not having a bank account (United Nations, 2006; Johnson and Nino-Zarazua, 2011; Claessens, 2006).

Following relevant literature, we include in the specification of equation [1] variables that are linked to the ability of the household to generate earnings to be thereafter translated into expenditures. Education and age are key such variables. While both average measures of

education and age and the age and education of the head of household have been used in the literature, we give preference to the latter due to high correlation of these key human capital characteristics among family members (Rizov and Swinnen, 2004). We include both age and age squared of the head of household to account for possible non-linearities in the effect of age and potential experience on earnings and thereafter household living standards (Sen et al, 2002). Female headed households in less developed countries- especially when female headship is a result of divorce or death of a male head of household- are typically expected to have lower living standards. For the purpose, we include a variable indicating the gender of the head of household and a variable of marital status and expect the former to have a negative impact on per capita expenditures, after controlling for whether the head of household is married or not (Drèze and Srinivasan, 1997; Stanley and Jarrell, 1998; Buvinic and Gupta, 1997).

High dependency ratios are closely linked to household per capita expenditures as they produce a strain on time resources of working age people due to the need to take care of others (Pezzin and Schone, 1998). We include three different measures of dependency ratios: proportion of household members of less than 5 years, proportion of household members in the 6-14 age group and the proportion of elderly people of 60 years and above. Depending on the ability of the household to utilise the work resources of household members in the latter two groups, the impact of these dependency ratios on per capita expenditures would be either positive or negative. If individuals in dependent groups are a pure time and resource burden, we expect these groups to have negative impact on per capita expenditures, while the opposite would be true if these younger or older individuals contribute to the accumulation of household resources. By contrast, household size is likely to enhance the earning potential of the household, especially if the household happens to be labour constrained (Alwang and Siegel, 1999). Once again, to account for possible non-linearities we include both the level and the square of household size in the equation.

The labour market status of the head of household is also expected to have implications for the household's welfare. We include an indicator of whether the head of household works for the formal non-agricultural sector, the null hypothesis being that the formal sector provides stable earnings and therefore enhances the welfare of family members of those employed in that sector. We also control for the possibility that the household head does not have a non-agricultural job (is either unemployed or inactive). The excluded variable is thus the rather broad category of self-employed individuals either in agriculture or outside of agriculture. For a further distinction between agricultural and non-agricultural resources, we also control for the size of owned land. The implications of location (urban versus rural) and land ownership for welfare are also discussed a lot in the development literature (Moene, 1992; Sahn et al, 2002). We control for both urban location and distance from markets, as well as the size of land used by the household for agricultural production. The estimations also control for regional fixed effects.

As indicated earlier, the main focus of the paper is the welfare implication of access to finance, where access to finance itself is a function of a number of household and infrastructural characteristics, captured by equation [2]. We argue that not only per capita expenditures, but also the household's access to the formal financial sector are a function of the household head's age, education and employment status, as well as key productive

resources such as land ownership. In addition, for identification of the system over and above the normality condition of the probit model, we include in equation [2] variables that are not included in equation [1] and vice versa. We exclude from equation [2] dependency ratios based on the argument that while affecting per capita consumption these variables do not directly influence access to finance by the household. This argument was verified empirically. We include only in equation [2] the presence of a formal bank in the community, under the assumption that while community access to finance influences whether the household has an account in a formal bank, it affects household welfare only indirectly, conditional on the household itself holding an account in a bank. Given the spread of mobile and internet banking in Africa, we also include only in equation [2] a variable on whether the household has access to internet. Since more than 90% of the households – both those with access and those without access to formal finance – in the sample have a mobile phone, we opt for the slightly rarer proxy of access to internet. An additional infrastructural variable, capturing physical constraints to financial access is the distance to major roads. The precise definitions of the variables used in our econometric analysis are available in Table A1 in the Appendix.

4. Data and descriptive statistics

The empirical analysis is based on two consecutive cross-sections – for 2010/2011 and 2012/2013- from the General Household Surveys (GHS) panel data for Nigeria, which is part of the Living Standard Measurement Surveys (LSMS) project of the World Bank. The surveys, conducted by the Nigeria Bureau of Statistics (NBS) with technical support from the World Bank, contain information on household income, expenditures and demographic characteristics of about 5000 households. It also provides details on labour and agricultural activity of individual household members, as well as information on credit and savings, financial resources, household assets and welfare indicators.

The sampling procedures for the first wave are designed in a way that ensures national representativeness . The objective of the second wave was to re-interview households in the first wave. While households were tracked when they moved to a new dwelling, including when they moved to new communities, individual members were not tracked if they moved out due to splitting off of households. No household that re-located refused to participate, hence the total attrition of 200 households lost is due to inability to locate these households.

Basic descriptive statistics for variables of interest to us – both for the sample as a whole and separately for households with access to finance and households without access to finance- are presented in Table 1. After adjusting for missing data, we are left with 4627 observations for wave 1 and 4332 observations for wave 2. Comparison of the means in wave 1 and wave 2 indicates that there is no substantial difference between the types of households interviewed in the two waves. This is consistent with other work based on LSMS surveys. For instance, Falaris (2003) finds that attrition bias in regression analyses using LSMS datasets is not significant.

Table 1: Descriptive statistics

Variables of interest	Wave 1 (2010/2011)			Wave 2 (2012/2013)			Wave 2 - Wave 1	
	No financial access	With financial access	All	No financial access	With financial access	All	Difference in Mean	t-stat
Head: Age	50.388	47.878	49.617	52.514	50.037	51.730	2.114	-6.589 ***
Head: Female	0.177	0.081	0.147	0.167	0.105	0.147	0.000	-0.013
Head: Marital status	0.779	0.852	0.802	0.800	0.830	0.810	0.008	-0.951
Head: No education	0.421	0.089	0.319	0.441	0.077	0.326	0.007	-0.747
Head: Maximum of primary education	0.386	0.227	0.337	0.368	0.268	0.336	-0.001	0.082
Head: Minimum of secondary education	0.193	0.684	0.344	0.191	0.655	0.338	-0.007	0.655
Head: Not employed	0.073	0.072	0.073	0.082	0.077	0.081	0.008	-1.413
Head: Formally employed off-farm	0.060	0.392	0.162	0.048	0.380	0.153	-0.010	1.263
Head: Not formally employed off-farm (Default variable)	0.867	0.535	0.765	0.870	0.543	0.767	0.002	-0.197
Household size	5.616	5.554	5.597	6.495	6.467	6.486	0.889	-13.019 ***
% of members aged ≤ 5	0.165	0.143	0.158	0.161	0.141	0.154	-0.004	1.061
% of members aged 6-14	0.211	0.191	0.205	0.223	0.208	0.219	0.014	-3.462 ***
% of members aged 15-60 (Default variable)	0.513	0.602	0.541	0.501	0.581	0.526	-0.014	2.771 ***
% of members aged > 60	0.111	0.064	0.096	0.115	0.070	0.101	0.005	-1.033
Size of land owned (m2/1000)	7.442	4.241	6.458	6.993	3.268	5.815	-0.643	2.127 **
Access to finance index	0.000	1.000	0.307	0.000	1.000	0.316	0.009	-0.911
Log of expenditures per capita	11.243	11.808	11.416	11.193	11.781	11.379	-0.037	2.685 ***
Access to mobile phone	0.006	0.120	0.041	0.009	0.148	0.053	0.012	-2.784 ***
Community: Distance to markets	0.132	0.248	0.167	0.127	0.228	0.159	-0.008	1.081
Community: Distance to town/city	0.595	0.765	0.647	0.567	0.780	0.634	-0.013	1.275
Community: Distance to major roads	0.495	0.666	0.548	0.756	0.853	0.787	0.239	-24.883 ***
Bank present in community	0.156	0.333	0.211	0.125	0.305	0.182	-0.029	3.465 ***
Household: Urban area	0.222	0.530	0.317	0.210	0.501	0.302	-0.015	1.503
Household: North Central	0.163	0.177	0.167	0.161	0.186	0.169	0.001	-0.187
Household: North-East	0.171	0.105	0.151	0.196	0.093	0.164	0.013	-1.692 *
Household: North-West	0.237	0.089	0.191	0.252	0.072	0.195	0.004	-0.454
Household: South-East	0.172	0.156	0.167	0.152	0.182	0.162	-0.005	0.699
Household: South-South	0.130	0.214	0.156	0.127	0.227	0.158	0.002	-0.301
Household: South-West	0.127	0.259	0.167	0.112	0.240	0.152	-0.015	1.955 *
<i>N</i>	3205	1422	4627	2962	1370	4332		

Source: Author's computation from the Nigerian LSMS 2010/2011 and 2012/2013

* Significance at the 10% level, ** idem, 5%, *** idem, 1%

The statistics in Table 1 indicate that households with access to finance are characterised by larger per capita expenditures than households with no access to finance. Furthermore, households with access to finance generally have characteristics typically associated with higher living standards than households with no access to finance. In particular, female headed households and households with single household heads are more likely to not have access to finance, while higher levels of education and formal non-agricultural employment are positively associated with having access to finance. As expected, infrastructural variables such as distance to major roads, the presence of banks in the community and living in urban areas and in the south of the country have positive association with access to finance and the same is true for access to internet by the household. Interestingly, larger land sizes are negatively associated with access to finance: at first sight, this could be interpreted counter-intuitively as wealth effects in the form of agricultural assets playing a negative role in assuring access to formal finance. A more plausible explanation is market duality whereby households in the rural and informal sectors resort to informal finance, while those in the formal and urban sectors resort to formal finance. The next section will explore in greater rigour the determinants of access to finance, as well as the selectivity corrected implications of access to finance on welfare.

5. Empirical results

5.1. Determinants and welfare implications of access to finance

The results from the treatment effects model described by equations [1] and [2] are highlighted in Table 2. To reiterate, our main interest is in producing selectivity corrected estimates of the welfare implications of access to finance, after understanding key household and community level determinants of (formal) financial inclusion. The results indicate that access to finance has a strong positive impact on per capita household expenditures. This key estimate is consistent across the two survey years. To interpret the result correctly it is necessary to compute the impact of access to finance on welfare net of the selectivity effect, which is given by the difference between the absolute values of the access to finance coefficients and the corresponding inverse Mills ratios. The coefficient values are 0.587 and 0.581 in the respective 2010-2011 and 2012-2013 regressions, while the corresponding absolute values of the inverse Mills ratios are 0.183 and 0.234. This means that the corresponding net impact of access to finance on selectivity corrected per capita expenditures is 40.4% in 2010-2011 and 34.7% in 2012-2013. The results indicate that the estimated impact of access to finance would have been significantly higher if we had not corrected for this negative selection. This is consistent with arguments that access to finance has stronger poverty alleviation impact on households with genuinely lower living standards.

Table 2: Impact of household access to finance on household's expenditures per capita

	2010/2011					2012/2013				
	Log of per capita expenditure					Log of per capita expenditure				
	Expenditure	t-stat	Access to Finance	t-stat		Expenditure	t-stat	Access to Finance	t-stat	
Constant	12.409 ***	60.690	-3.627 ***	-14.670		12.809 ***	55.240	-4.129 ***	-13.400	
Head: Age	-0.004	-1.220	0.052 ***	5.420		-0.015 ***	-3.460	0.066 ***	5.830	
Head: Age squared	0.000	0.320	0.000 ***	-4.430		0.000 ***	2.720	-0.001 ***	-5.140	
Head: Female	0.024	0.670	-0.394 ***	-3.960		0.059 *	1.670	-0.294 ***	-2.920	
Head: Marital status	-0.099 ***	-3.350	0.149 *	1.700		-0.025	-0.790	-0.061	-0.670	
Head: Maximum of primary education	0.031	1.170	0.374 ***	5.690		-0.071 **	-2.130	0.592 ***	8.500	
Head: Minimum of secondary education	0.008	0.140	1.208 ***	17.520		-0.100 *	-1.700	1.272 ***	17.250	
Head: Not employed	-0.041	-1.380	-0.002	-0.030		-0.043	-1.430	0.049	0.520	
Head: Formally employed off-farm	-0.145 ***	-3.660	0.893 ***	14.060		-0.134 ***	-3.220	0.962 ***	13.770	
Household size	-0.142 ***	-17.620	0.005	0.550		-0.120 ***	-16.010	0.024 ***	2.900	
Household size squared	0.005 ***	10.880				0.003 ***	8.800			
% of members aged ≤ 5	-0.013	-0.260				-0.540 ***	-9.870			
% of members aged 6-14	-0.364 ***	-7.960				-0.451 ***	-9.490			
% of members aged > 60	-0.112 **	-2.330				-0.104 *	-1.950			
Size of land owned (m2/1000)	0.001	1.540	0.001	1.010		0.001 *	1.670	-0.003	-1.130	
Household: Access to internet			1.093 ***	7.420				1.026 ***	8.050	
Community: Distance to markets	0.117 ***	5.720				0.092 ***	4.230			
Community: Distance to town/city	0.002	0.130				0.089 ***	5.220			
Community: Distance to major roads			0.142 ***	2.880				-0.094	-1.460	
Bank present in community			0.234 ***	4.110				0.254 ***	3.970	
Household: Urban area	0.149 ***	5.710	0.327 ***	5.660		0.132 ***	5.400	0.271 ***	4.410	
Regional fixed effects		Yes***					Yes***			
Access to Finance Index	0.587 ***	8.690				0.581 ***	10.220			
Mills ratio	-0.183 ***	-3.090				-0.234 ***	-4.140			
Log likelihood	-4994.003					-4689.8871				
LR test of independent equations ($\rho = 0$)	Chi ² (1) = 9.04 Prob > Chi ² = 0.0026					Chi ² (1) = 16.34 Prob > Chi ² = 0.0001				

Source: Author's computation from the Nigerian LSMS 2010/2011 and 2012/2013

Treatment effect models. * Significance at the 10% level, ** idem, 5%, *** idem, 1%

The rest of our results are generally consistent with our expectations. All infrastructural variables, namely availability of bank in the community, distance to major roads and living in urban areas have the expected positive impact on access to finance. The same is true for access to internet, formal employment and higher levels of education. Moreover, female and single headed household have lower levels of access to finance. Relevant infrastructural variables are also positively linked to per capita expenditures. However, we see that unlike in the case of access to finance, there is negative association between formal off-farm employment and per capita expenditures. This is consistent with the highly heterogeneous structure of the informal labour market in West Africa, which is characterised by individuals with both lower than average and individuals with higher than average incomes (Benjamin and Mbaye, 2012; Olarewaju, 2015). The dependency ratios have negative implications for household welfare, which is consistent with our null hypothesis that these groups of individuals are a source of financial and time burden. Finally, the relationship between household size and per capita expenditures is convex. Close simulation-based scrutiny indicates that the minimum of the household size-per capita expenditures function is reached at substantial (outlier type) household sizes of 14 in 2010-2011 and 20 in 2012-2013, with per capita expenditures declining until that level. This indicates that the burden of larger household sizes seem to play a larger role on household living than the labour constraint based pressure.

5.2. The implications of access for finance for the variance in intra-household per capita expenditures

Following the discussion in section 3.2.1 we first highlight results from the aggregate decomposition of the variance in per capita expenditures, where the interest is on whether between (or access to finance driven) influences dominate the within (not related to access to finance) drivers of welfare disparities (Table 3). Next, we explore the impact of observed characteristics, unobserved characteristics, access to finance and selectivity into access to finance on the within group (Table 4) and between group (Table 5) variance in living standards.

Table 3: Decomposition of Variance

Variables	2010/2011		2012/2013	
	Value	%	Value	%
Between	0.0442	14.54%	0.0466	8.37%
Within	0.2599	85.46%	0.5106	91.63%
Overall	0.3041	100.00%	0.5572	100.00%

Source: Author's computation from Nigerian LSMS 2010/2011 and 2012/2013

The results from the aggregate decomposition, highlighted in Table 3 indicate that access to finance has only minor influence on intra-household welfare disparities. 85.46% in 2010-2011 and 91.63% in 2012-2013 of these disparities are explained by within group (or unrelated to access to finance) factors. The results highlighted in Table 4 further indicate that for both individuals belonging to the group with access to finance

and individuals belonging to the group with no access to finance, most of the intra-household variance in per capita expenditures is explained by unobserved characteristics, captured by the residual. Specifically, 67% of the variance in per capita expenditures among households with no access to finance in 2010-2011 and 64% of the variance in per capita expenditures of that group in 2012-2013 is explained by the residual. The corresponding contributions for households with access to finance are 62% in 2010-2011 and 59% in 2012-2013. This indicates that not only access to finance, but also other observed – and easier to address via clear policy instruments – characteristics play smaller role in reducing inter-household inequalities than unobserved characteristics such as cognitive skills or chance.

Table 4: Contribution of the explanatory variables to the within-group variance (in %)

Variables	2010/2011		2012/2013	
	Group with no financial access	Group with financial access	Group with no financial access	Group with financial access
Head: Age	0.7296	1.3183	-0.2729	0.4551
Head: Female	-0.6558	0.6044	0.3832	0.0572
Head: Marital status	2.2349	3.2865	0.7609	2.7116
Head: Maximum of primary education	0.1130	1.1468	-0.1163	2.2289
Head: Minimum of secondary education	2.7186	-2.8580	1.4198	-3.7624
Head: Not employed	-0.1512	-0.0120	-0.1984	-0.0475
Head: Formally employed off-farm	-0.1010	-1.6579	0.1627	-2.1410
Household size	13.8968	14.6853	13.9846	15.1925
% of members aged ≤ 5	0.4151	0.3521	3.8888	2.8017
% of members aged 6-14	5.5954	5.4611	4.7975	5.6431
% of members aged > 60	0.0231	-0.0343	0.2554	0.1393
Size of land owned (m ² /1000)	-0.3288	0.2079	-0.2586	-0.2140
Community: Distance to markets	1.0962	2.2190	0.7232	1.7014
Community: Distance to town/city	-0.1235	0.3781	1.8186	0.9287
Community: Distance to major roads	1.3607	-0.3687	-0.1601	-0.0771
Household: Urban area	4.8198	1.6918	5.1343	1.9599
Household: North Central	0.1792	1.2293	-0.1844	1.1793
Household: North-East	-0.0634	0.0300	-0.4225	-0.0461
Household: South-East	0.5809	-0.0370	0.1786	0.2727
Household: South-South	0.1372	0.3031	0.0986	-0.3185
Household: South-West	0.1898	-0.8094	2.9564	-2.0964
Mills ratio	0.1847	10.3681	0.5836	14.8107
Residual	67.1487	62.4954	64.4672	58.6210

Source: Authors' computation from Nigerian LSMS 2010/2011 and 2012/2013

Among observed characteristics, the household structure and composition plays the strongest role on enhancing within group variances. Between 13% and 15% of the within group variances across households with access or households with no access to finance is explained by household size, while between 4.8% and 5.6% of this variance is driven by the presence of household members in the 6-14% age group. The next

largest contributor to within group inequalities is urban residence, but interestingly urban residence matters much more for enhancing within group inequalities among households with no access to finance (4.8% in 2010-2011 and 5.1% in 2012-2013) than for households with access to finance (1.7% in 2010-2011 and 1.9% in 2012-2013). This is consistent with the low access to finance in rural areas in Nigeria (and sub-Saharan Africa more generally) and highlights the importance of improvement of the financial infrastructure outreach as an inequality reducing policy.

Interestingly, having secondary or higher education has a fairly strong inequality reducing influence on households with access to finance (-2.9% in 2010-2011 and -3.8% in 2012-2013), while it enhances inequalities among households with no access to finance (2.7% in 2010-2011 and 1.4% in 2012-2013). This provides a further rationale for inequality alleviation driven financial inclusion policies. The result on formal employment is analogical: for households with access to finance, formal employment reduces inequalities, while the effect of type of employment on within group inequalities is very marginal.

The results on the impact of different characteristics on between-groups inequalities are analogical (Table 5). The key contributor of interest to us in this case is the access to finance variable. We see that in 2010-2011 the contribution of the access to finance variable to between group inequalities is 10.16%, while in 2012-2013, it is 9.06%. In other words, access to finance enhances inter-household inequalities, with households with access to finance being between 9 and 10% better off than households not having access to formal finance. The effect of being selected into the formal financial sector also has strong positive effect on between group inequalities, as indicated by the positive and relatively large (8% in 2010-2011 and 9% in 2012-2013) effect of the Mills ratio. At the same time, once again, the residual accounts for the largest (positive) contribution to (between) group inequalities, much more than either the effect of access to finance or selectivity into the formal financial sector.

As in the case of within group inequalities, the strongest observed characteristics' effects are those of household size (12.2% in 2012-2011 and 12.5% in 2012-2013), presence of family members in the 6-14% age group (4.9% in 2010-2011 and 4.5% in 2012-2013) and urban residence (4.3% in 2010-2011 and 4.6% in 2012-2013), all of which enhance the inequalities between households with access to finance and those with no access to finance. In addition, in both waves, secondary or higher level of education enhances the inequality of those with access to finance compared to those without access to finance, while formal employment reduces that gap.

Table 5: Factor contribution to the *between-groups* variance (%)

Variables	2010/2011	2012/2013
Head: Age	1.2034	0.3278
Head: Female	-0.0279	0.0787
Head: Marital status	1.9613	1.1273
Head: Maximum of primary education	-0.2223	0.3107
Head: Minimum of secondary education	1.8362	0.1717
Head: Not employed	-0.0852	-0.0791
Head: Formally employed off-farm	-1.0778	-0.4287
Household size	12.1755	12.4737
% of members aged ≤ 5	0.3975	3.2841
% of members aged 6-14	4.9269	4.5124
% of members aged > 60	-0.0074	0.1553
Size of land owned (m ² /1000)	-0.2571	-0.4194
Community: Distance to markets	1.4902	1.1896
Community: Distance to town/city	-0.0254	1.8042
Community: Distance to major roads	0.6957	-0.1458
Household: Urban area	4.2572	4.5908
Household: North Central	0.5422	0.1265
Household: North-East	-0.2484	-0.6835
Household: South-East	0.1419	-0.2958
Household: South-South	-0.2799	-0.2423
Household: South-West	-1.3917	0.1003
Access to finance	10.1604	9.0583
Mills ratio	8.4083	10.2813
Residual	55.4267	52.7018

Source: Author's computation from Nigerian LSMS 2010/2011 and 2012/2013

6. Conclusion

Since the 1950s-1960s when waves of financial sector liberalisation swept emerging markets around the world and especially since the early 1970s when the benefits of financial sector deepening via transition from a repressed towards a liberalised financial sector were formally conceptualised, well - efficient financial sectors have been seen as a panacea to a number of developing countries' problems. When the shortcomings of financial liberalisation for the poor in the form of either financial crises that tend to disproportionately affect those with lower income levels or lack of inclusion on account of asymmetric information problems came to the fore, ensuring access to the formal financial sector became the buzzword in policy circles. With enthusiasm around the power of microcredit fading, most of the more recent policy focus has been on addressing geographical and other bottlenecks in more broadly defined access of households to formal financial institutions. While this policy approach may be appealing conceptually and from a policy perspective, few micro level studies have explored in detail the ability of access to finance to improve households' living standards and

alleviate intra-household inequalities over and above factors unrelated to formal financial access.

Our paper addresses these gaps in the literature by exploring the implications of access to formal finance for welfare enhancement and inequality alleviation in Nigeria, which since the mid-1980s underwent series of policy interventions, aimed at enhancing financial sector depth and formal financial sector inclusion. We find that, as expected, better financial sector infrastructure enhances the access to finance for individual households, which in turn improves their welfare vis-a-vis comparable households with no access to formal finance. The selectivity adjusted positive impact of access to finance on per capita expenditures is lower than that not adjusted for selectivity, indicating that the benefits of access to finance are greater for relatively worse off households than relatively better off households.

We also find that for households with access to finance the inequality enhancing effect of residing in an urban as opposed to a rural area is lower than that for households with no access to finance, while among households with access to finance, higher levels of education reduce inequalities to a much larger extent than for households, while for households with no access to finance education enhances inequalities. In other words, access to finance ameliorates the inequality enhancing effect of urban versus rural residence and enhances the inequality ameliorating effect of greater educational attainment. However, the overall effect of access to finance on inequality is positive.

At the same time, factors unrelated to access to finance, especially those linked to unobserved characteristics (typical proxies being initiative, cognitive skills or luck) have significantly stronger effect on inter-household inequalities than either access to finance or alternative observed household characteristics. Moreover, factors such as household structure, appear to have larger implications for both inter-household and intra-household inequalities than characteristics that are more prominently under the policy radar like education and labour formality.

Overall, the results are somewhat consistent with, though slightly more nuanced than other studies' findings that (i) General financial sector development that stimulates employment and geographic mobility may have stronger poverty and inequality alleviating effect than emphasis on enhancing finance for the poor (Ayaagari, Beck and Hoseini, 2013) and (ii) The effect of concrete inclusion policies like microfinance interventions on poverty alleviation is at best inconclusive, meaning that policy makers may need to think through alternative approaches to poverty like social security interventions (Karlan and Morduch, 2010). Consistent with that literature, we find that concrete measures to include relatively worse off households in the formal financial system has marginal effect on reducing inequalities compared to alternative socio-economic factors and potential related policy measures. Since we do find that relatively worse off households benefit disproportionately from formal financial sector inclusion, while improvement of geographic access stimulates not only individual household inclusion, but also the indirect positive implications of other factors like education and urban-rural residence, policies aimed at enhancing inclusion should continue to be a

priority. At the same time, the approach to poverty and inequality alleviation should be holistic, taking seriously into account broader institutional factors at both the macro and micro (for instance, related to household structure and behaviour) level.

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Appendix

Table A1: Definition of variables

Variable details	Definition and units
Outcome variables	
Per capita expenditure (log)	Natural logarithm of households' per capita expenditures
Access to formal finance index	Dummy = 1 if Household access formal financial services, otherwise=0 Access to formal financial services includes (i) having a bank account, (ii) having used the credit facility of a formal financial institutions irrespective of having or not a bank account in the preceding six months, (ii) having used the savings facility of a formal financial institution irrespective of having or not a bank account within the preceding six months.
Explanatory variables	
Head: Age	Age of household head (in years)
Head: Female	Dummy = 1 if gender of household head is female, otherwise = 0
Head: Marital status	Dummy = 1 if household head is married, otherwise = 0
Head: No education	Dummy = 1 if household head has no formal education, otherwise = 0
Head: Primary education as maximum education	Dummy = 1 if household head's highest education attainment is primary education, otherwise = 0
Head: Secondary education as minimum education	Dummy = 1 if household head's education is at the secondary or higher education level, otherwise = 0
Head: Not employed off-farm	Dummy = 1 if household head is not employed off-farm, otherwise = 0
Head: In formal employment off-farm	Dummy = 1 if household head is in formal off-farm employment, otherwise = 0
Household size	Number of members in household
% of members aged ≤ 5	Share of household members aged 5 years and below
% of members aged 6-14	Share of household members aged 6-14 years
% of members aged > 60	Share of household members aged above 60 years
Size of land owned (m ² /1000)	Size of land owned by household in metre square divided by 1000
Household: Access to internet	Dummy = 1 if a household member has access to internet, otherwise = 0
Community: Distance to markets	Dummy for household community located within 20km to markets = 1, otherwise = 0
Community: Distance to major town/city	Dummy for household community located within 20km to major town/city with population ≥ 20,000 = 1, otherwise = 0
Community: Distance to major roads	Dummy for household community located within 20km to major roads=1, otherwise = 0
Bank present in community	Dummy = 1 if a formal bank is present within the household community, otherwise = 0
Household: Urban area	Dummy = 1 if Household resides in Urban Area, otherwise = 0
Household: North Central	Dummy = 1 if Household is resident in North-Central Nigeria, otherwise = 0
Household: North-East	Dummy = 1 if Household is resident in North-East Nigeria, otherwise = 0
Household: South-East	Dummy = 1 if Household is resident in South-East Nigeria, otherwise = 0
Household: South-South	Dummy = 1 if Household is resident in South-South Nigeria, otherwise = 0
Household: South-West	Dummy = 1 if Household is resident in North-West Nigeria, otherwise = 0