IOSR Journal of Economics and Finance (IOSR-JEF)
e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 10, Issue 5 Ser. IV (Sep. – Oct 2019), PP 01-16
www.iosrjournals.org

Econometric Analysis of Microcredit Access and Rural Household Welfare in Cameroon[1]

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Abstract:*The poverty profile shows that Cameroon's poverty is primarily rural, although this sector has the greatest potential to take Cameroon out of poverty. Unfortunately, this is also the sector where financial intermediation and penetration is very shallow. This paper is interested in empirically determining if microfinance access contributes to poverty reduction and if the effect of microfinance access on wellbeing depends on the econometric problems internalised. It employed a control function approach to estimate the direct effects of borrowing on welfare in Cameroon, acrossresidence and gender. Findings showed that the effect of borrowing on household welfare depends on the estimation approach used.Guided by the presence of potential endogeneity, results revealed that household welfare may not only be generated from borrowing per se, but also from unobserved variables that affect borrowing – a household with greater dedication or effort is more willing to borrow and more likely to generate higher welfare benefits than others. Another econometric problem that can echo signals to policy makers is the possibility that lenders use their characteristics to include or exclude households from the credit market (that is, selectivity bias). Policy makers should understand and internalize these informed econometric problems in their policy agenda to better tap the effects of policy actions geared towards promoting access to microcredit.*

Key words:*Microfinance access, borrowing, household welfare, and econometric problems*

Date of Submission:07-10-2019 Date of Acceptance: 22-10-2019

I. Background

Microfinance is a key source of finance for the poor and lower income earners in developing countries. It allows these people to obtain funding that can enable them run their micro-businesses and smoothen their household's consumption. Poor and lower income earners have difficulties in obtaining finance from formal financial institutions such as commercial banks, due to barriers such as high collateral requirements and complicated application procedures (Yunus, 2001). Providing access to finance to the poor or microfinance has been considered as a tool for economic development and poverty reduction (ADB, 2000; Khandker, 2003; Hao, 2005). Evidence suggest the transformative effect of microfinance on individual borrowers, but until recently there has been surprisingly little rigorous research that attempts to isolate the impact of microfinance from other factors, or to identify how different approaches to microfinance change outcomes (Roodman and Morduch, 2009).In the last thirty years, microfinance has emerged from a grassroots movement to a global industry with about 70 million clients in 40 countries (Harris, 2005). The crucial issue in microfinance has been centred around the question of how to provide financial services to the poor and low-income households.

[1]*We wish to express our deep appreciation to African Economic Research Consortium (AERC) for the financial support to carry out this research. We are also grateful to the resource persons and members of AERC's thematic group C for various comments and suggestions that helped the evolution of this study from its inception to completion. We are indebted to the anonymous referees who reviewed the paper and provided comments and suggestions that helped in shaping and improving the overall quality of the paper. The findings made and opinions expressed in this paper are exclusively those of the authors. The authors are also solely responsible for content and any errors.*

[(2)][of blessed memory]

The rapid expansion of microfinance institutions (MFIs) in the past two plus decades has been due to the economic crisis Cameroon has been going through since 1986. Cameroon has been described as a country of striking diversity, unfulfilled promise and tantalizing potential, with regions that abound in variety – geography, climate, people, education, economic structure, etc. (World Bank, 1994). In spite of all these endowments, Cameroon has been steeped in deep poverty and political discord since the 1980s. The economy collapsed in the mid-1980s because of the fall in commodity prices in the world market, and poor management.In 1988, the country adopted an IMF/World Bank structural adjustment programme. From 1985 to 1993, GDP per capita declined by 6.3% per year and this translated into a 6.0% rate of decline in private consumption per capita. Cumulatively, this represented a drop in average per capita consumption of over 40% in eight years – a collapse that continues to be painful, particularly coming after the extended period of growth over the decades before 1985 (Tchoungui, et al., 1996).

The economic collapse led to the country not being able to pay its foreign debts, and to the poverty level mounting dramatically. A 1996 household survey found that over 50% of Cameroonians were living below the income poverty line. A second household survey conducted in 2001, and a third in 2007 showed an improvement to around 40%, which is still very high. Between 2007 and 2014, we observed a slight decrease in headcount poverty (by 2.4 points) but this reduction failed to meet the target of the current government's policy document (Growth and Employment Strategy Paper) to reduce poverty to 35% in 2015. This is indication that poverty is still a hard node to crack in Cameroon. The rural sector has been hardest hit by this poverty phenomenon, because of the loss of earnings from cash crops whose prices had collapsed in the world market, and also because of the lack of industries to transform especially rural produce. We fear that this situation may grow worse with the ongoing socio-political crises that are robbing economies in the country.

The financial sector was not spared of the 1980 crisis;the banking sector was particularly hit hardandin the late 1980s this sector collapsed with the rest of the economy. The restructuring of this sector led to the liquidation of many banks, the closure of almost all banks in the rural areas and small towns, and the laying off of many bank workers. This meant that financial intermediation in the rural areas, which was already quite limited, became almost inexistent.

Cameroon's economy continues to be dominated by the rural sector through its contribution to growth and employment, as well as its large poverty reduction potential. More than half the population lives in the rural areas, sourcingout their living from agriculture, pastoral, or forestry activities. The poverty profile shows that Cameroon's poverty is primarily rural. In 2007, overall poverty in Cameroon stood at 40%: 55% in the rural areas and just over 12 % in the urban areas (Government of Cameroon,2007).Unfortunately, rural poverty between 2007 and 2014 instead witnessed an increase. In 2014, 56.8% of those in rural areas were poor compared to 55.0% in 2007 (Government of Cameroon, 2014).A rural sector study by the World Bank in 2003 showed that this sector had the greatest potential to take Cameroon out of poverty. It is expected that access to microcredit in the rural areas among other welfare enhancing factors - such as community and household characteristics - may help reduce rural poverty, and consequently, overall poverty. This paper also intends to demonstrate to policy makers that the effect of microcredit access on poverty is contingent on individual behaviour and characteristics.

According to the NIS (2008), the ability to access credit and own savings can permit Cameroonian households to come out of poverty. However in 2007, only about 9.5% of household heads applied for credits. Some55% of those who applied obtained credit, while 45% were refused credit at the national level. This is clear indication that very few Cameroonian households apply for credits and that very few credit applications are granted. Out of the few credit recipients in 2007, 41% are rural households as opposed to 59% in urban areas.Out of the few households who applied and were refused credit (because of lack of collateral, support or good projects), about 37% live in rural areas and close to 63% are urban households (Government of Cameroon, 2007). This shows a gap between urban and rural dwellers in terms of credit access, in spite of the fact that this rural sector remains the bearer of growth and employment in Cameroon. Moreover, thought the effect of credit access on poverty is clear as posited by the NIS (2008), it is vital for policy makers to understand how this effect mutates with the internalisation of potential econometric problems that have important policy signals.

In addition, out of a limited number of householdheadswho received microcredit in 2007, 41% are rural dwellers as opposed to 59% who live in urban areas; and by gender, only about 25% were female household-heads.In the rural areas, the situation of female householdheads as concern access to microcredit deserves particular attention. Only 5.9% of female household heads in rural areas have access to credit and out of all credit recipients in the rural areas, about 28.8% are female household heads (Government of Cameroon, 2007).The main reasons of credit refusal evoked by households in both urban and rural areas are: first, the lack of sufficient guaranties (54.9%) and second, the lack of support (22.9%).

Although microfinance has been the focus of development and poverty reduction activities for some time now (Khandker, 2005), the findings have not yet established a convincing link. This implies that analysts and policymakers still know relatively little about the extent of poverty reduction possible through microfinance

credit because of the conflicting evidence from empirical studies (Gonzalez, 2003). Paramount among the limitations of the existing studies is the absence of a consistent methodology that would make empirical findings more robust and valid for policy purposes. In particular, potential endogeneity, sample selection and heterogeneity due to unobservables is generally not investigated in econometric studies that attempt to assess the impact of credit on poverty status of households. This lack of empirical rigour reduces the relevance of findings for policy purposes.

To fill this gap, this paper is geared at assessing whether access to microcredit has any effect on poverty reduction and, if so, evaluate the magnitudes using a range of econometric approaches. To contribute in determining this link, we want to examine whether individual, household and/or community level characteristics influence a household`s demand for credit and also to evaluate the effect of microfinance on household well-being in rural Cameroon. In particular, the paper proposes to address the following research questions: (1) What effect does microfinance have on household economic welfare across residence and gender? (2) Are microcrediteffects on well-being approach sensitive?

On the basis of the forgoing research questions, the main objective of this study is to evaluate the effect microcredit has on poverty outcomes in rural Cameroon. The specific objectives are:

(1) To evaluate the effect of microcredit on household welfare in rural Cameroon by location and gender;
(2) To internalise major econometric problems in the structural equation and discuss their policy relevance.

II. Literature Review

Microfinance links finance to development by offering financial services – micro-credit, savings facilities, micro-insurance, health care financing, and pension funds – to vulnerable groups of people who do not have access to the modern financial sector. Increasing incomes of the rural poor through microfinance intervention is an appropriate means of ensuring the poor can access services like education, health and other social services. At the macro-level, the proposition that capital investment, akin to provision of microfinance, and other financial services constitute important determinants of economic growth and income improvement (Hulme and Mosley, 1996).

On the micro-scale, since microfinance is generally perceived as labour-intensive, facilitating access to microfinance should in all likelihood result in the acquisition of new skills and the upgrading of existing ones and thus improve on the capacity of the poor to generate income to improve their livelihood (El-Solh, 1999). Access to microfinance is expected to enable the poor invest on education, health, overcome vulnerability and meet a variety of other cash requirements. This may translate into better nutrition, improved health outcomes, reduced illiteracy rates and lead to greater empowerment (Littlefield, et al., 2003).

Some literature shows that access to credit has ambiguous impact on poverty reduction (Gonzalez, 2003). However, many empirical studies show that access to credit has a positive impact on household economic welfare (Khandker, 1998; Panjaitan et al., 1999; Remenyi and Benjamin, 2000; Wright, 2000; Khandker, 2001; Khandker and Faraque, 2001; Coleman, 2002; Pitt and Khandker, 2002; Khandker, 2003). The literature also shows that most microfinance programs do not serve the poorest, but when they do so, the poorest can benefit from microfinance through increased income and reduced vulnerability (Morduch and Haley, 2002). There is also some evidence that the degree of poverty may affect the response. Better-off poor households have a larger positive response than the very poor (Remenyi and Benjamin, 2000; Coleman, 2002).

In particular, a study in Vietnam (Hao, 2005) finds that household credit contributes positively and significantly to the economic welfare of households in terms of per capita expenditure, per capita food expenditure and per capita non-food expenditure. The study also finds that credit has a greater positive effect on the economic welfare of poorer households and that the age of the household head, the household size, land ownership; savings and the availability of credit at village level are key factors that affect household borrowing.

Many researchers have postulated that the provision of financial services to the poor, through microfinance, is a powerful means of providing low income households with the chance to escape from poverty and to transform their lives. It is also evident that there is a strong demand for small-scale commercial financial services – both credit and savings – by low income households (Robinson, 2001). The strong demand for financial services by low income households, together with the evidence that access to credit reduces household poverty, provides clear incentives for policymakers to develop a framework for providing financial services to low-income households. This paper goes beyond to show policy makers that access to credit per se is not enough, other behavioural variables matter.

Evidence from the Asian Development Bank evaluation of five microfinance projects supports the importance of considering gender in all aspects of microfinance projects (SadeghBakhtiari, 2006). Most of gender literature focuses on intra-household gender disparities. The literature on credit disparity between male and female headed households is quasi-inexistent. Women headed households generally lack credible collateral to enable them access credit, especially from the banking sector. For instance, Baye and Khan (2008) present

village level evidence which shows that although land inheritance in most villages in Cameroon is no longer gender bias, land inherited by female next-of-kin is frequently undermined and encroached upon by their male neighbours. This state of affairs weakens the likelihood of microfinance institutions accepting land owned by female heads as credible collateral for credit access. Thus, this paper also intends to investigate possible dissimilarities in welfare responses to credit access as more rigour is employed in the econometric analyses.

III. Methodology of the Study

To determine the effect of borrowing on household welfare and hence poverty using household survey data, we start by assuming that relevant credit contracted by Cameroonian households from microfinance institutions is for investment purposes and that microfinance participants maximize both utility and profit.

To assess how much household credit access contributes to household economic welfare and poverty, we consider a framework in which two sets of actors - households and lenders, interact in the credit market. Households finance their economic activities, at least in part, by borrowing from the lenders. Household demand for credit is constrained by the supply of credit. While demand for credit depends on household characteristics, the supply of credit depends on the availability of funds and the lender's characteristics.

The difficulty is that the factors which are likely to affect household demand for credit, are also likely to affect supply of credit. For example, ownership of farmland may positively affect household demand for credit, while it may also positively affect the supply of credit if lenders consider it as collateral in the credit market. This implies that credit supply and demand curves cannot be easily identified. Thus, we consider household borrowing, rather than separately considering demand and supply. The household borrowing function, B, is therefore jointly determined by supply and demand functions for credit. In this process, the typical household that borrows is expected to generate or enhance household welfare, which we denote by W.

In order to assess the impact of credit on household economic well-being, we employ a production function in which credit is introduced as a separate explanatory variable. Household welfare is typically reflected in indicators of income/expenditure. At the household level, economic welfare is also likely to be affected by household characteristics such as the age of household head, the education of household head, health status, etc. At community and regional levels, household well-being is possibly affected by community and regional characteristics. For example, the prices of selected goods and services in the community and region may affect household expenditure or income. These characteristics may be recognised as local market characteristics. Household economic well-being is also affected by household and local market characteristics that we cannot observe or measure. For instance, households exerting more effort may generate higher income. Control variables may therefore include household characteristics, local market characteristics and unobservable characteristics. The household welfare generating function may take the structural form:

$$W_i = a_0 + \sum_{k=1}^{m} a_k Z_{ik} + \eta B_i + \varepsilon_{i1} \qquad 1$$

where, W_i and B_i, are household welfare generating function and access to borrowing by household i; $Z_k$is a set of m exogenous covariates such as individual, household, community and regional characteristics, participation in production activities etc.; a_k is a set of m parameters of the exogenous explanatory variables that correlate with the income generating function to be estimated; η is the parameter of the potential endogenous explanatory variable (borrowing) in the economic well-being function; and ε_1 is the error term that captures both random effects and unobservables such as household effort at work.

The estimation of the parameter η would show the effect of credit/borrowing on household economic welfare. Notice that we consider neither the demand nor the supply of household credit, but the function of household borrowing or access to credit for a representative household. The understanding and interpretation of determinants of household borrowing should therefore reflect both the demand and the supply side.

The reduced form of household borrowing function therefore takes the form:

$$B_i = b_0 + \sum_{k=1}^{m} b_k Z_{ik} \sum_{k=m+1}^{n} b_k Z_{ik} + \varepsilon_{i2} \qquad 2$$

where, B is access to credit/borrowing by the household head; Z_k is a set of exogenous variables, comprising of m covariates that belong to the economic welfare production function (outcome equation) and a set of (n-m) instrumental variables, that affect household head's credit access or borrowing status, B, but have no direct influence on household economic welfare, W; b_k is a set of n parameters of exogenous explanatory variables in the reduced form borrowing equation to be estimated and ε_2 is the error term that captures both the

random effects and other relevant but unobservable characteristics which may include valuation of the lender of the average effort and dedication at work by households in a specific market and other complementary inputs.

Even if the problem of endogeneity of credit access is solved, our next concern is about the selection of the sample because it is possible that the lenders may systematically exclude the less well-off from the credit market. In theory, the demand and supply of credit would determine the amount and price of credit granted to a representative household (Hao, 2005**)**. However, the credit market is special. The existence of asymmetric information may lead lenders into the problems of adverse selection and moral hazard (Akerlof, 1970). One solution to these problems is for the lenders to tailor their loan contract covenants, which may act as a screening device to differentiate borrowers (Bester, 1985; Bester, 1987). Another solution is for lenders to ration credit (Stiglitz, 1981). Rationing may be understood in terms of the amounts given by lenders to borrowers or the complete exclusion of a potential borrower from the credit market by the lender. For these reasons, the function of household borrowing may result not only from pure demand and supply functions but also from variables controlling for asymmetric information problems, such as collateral, high interest rates, availability of funds and competition amongst borrowers (Khandker, 2001, 2003).

From a household survey, we can observe that there are a number of households who borrow and other households who do not. For a number of reasons, including credit rationing by the lenders, some non-borrowing households cannot get loans even if they wish to do so. The allocation of credit therefore is not a random process because lenders may screen households using their characteristics. If we select only households who borrowed or fail to borrow by choice and estimate the effect of credit on household economic welfare, the estimate may be biased. For example, lenders select households because they are more creditworthy, but credit-worthy households may achieve higher welfare outcomes. Hence, the effect of credit on household welfare is not consistent. To control for potential sample selection bias, the whole sample, which includes borrowing, non-borrowing by choice and excluded householdsshould be used. To handle the selection problem, we introduce Equation 3.

$$S_i = 1(c_0 + \sum_{k=1}^{m} c_k Z_{ik} \sum_{k=m+1}^{p} c_k Z_{ik} + \varepsilon_{i3} > 0) \qquad 3$$

where, S is an indicator function for selection of observations into the sample–it takes the value zero when a household is excluded from the credit market by the lender and 1 when the household is included in the outcome equation of interest; $Z_k$hereis a set of p exogenous variables comprising of the m covariates that belong to the economic welfare production function (outcome equation) and a set of (p-m) instrumental variables that account for sample selection, but have no direct influence on household economic welfare; c_k is a set of p parameters of all exogenous explanatory variables of the sample selection equation to be estimated, and ε_3 is the error term that captures both the random effects and unobservable characteristics of selection.

Equation 1 is the structural equation of interest, that is, the household economic welfare function whose parameters are to be estimated. Equation 2 is the linear projection of the potential endogenous variable, B, on n exogenous variables, that is, a reduced form model of borrowing status of the household.

Equation 3 is the probit for sample selection. It is the probability of a household being included in (or excluded from) the estimation sample. Since household without borrowing potentials are excluded from Equation 1, Equation 3 helps correct for sample selection bias in the estimated parameters. The correction factor derived from Equation 3 is the inverse of the Mills ratio.

To take care of potential endogeneity bias and sample selection biassimultaneously, Equation 1 can be augmented into Equation 4. This control function specification takes the form (see, Garen, 1984; Mwabu, 2009; Baye and Fambon, 2010):

$$W_i = \alpha_0 + \sum_{k=1}^{m} \alpha_k Z_{ik} + \eta B_i + \gamma_1 \hat{\varepsilon}_{i2} + \lambda IMR_i + u_i \qquad 4$$

where, $\hat{\varepsilon}_2$ is fitted residual of B, derived from the reduced form linear probability model of borrowing (Equation 2); IMR is the hazard rate, what Heckman (1979) calls the inverse of the Mills ratio obtained after estimating the selection (Equation 3) by a probit model; *u* is a composite error term comprising ε_1 and the unpredicted part of ε_2, under the assumption that $E(u) = 0;$ and $\alpha, \eta, \lambda, and\ \gamma$ are parameters to be estimated.

Exclusion restrictions are imposed on Equation 4 because the set of (n-m)instruments, (for borrowing status, B), is absent from the equation. The terms IMR and $\hat{\varepsilon}_2$ in Equation 4 are the control function variables

because they control for the effects of unobserved factors that would otherwise contaminate the estimates of structural parameters. The reduced form borrowing residual, $\hat{\varepsilon}_2$, serves as the control for unobservable variables that correlate with B.

As noted in Wooldridge (1997), the IV estimates of Equation 4 are unbiased and consistent only when there is no sample selection problem. In this study,twocontrol function variables (fitted residual of borrowing and IMR) are generated via the reduced form linear probability model of demand for credit, which corresponds to the first-stage estimates of the IV, and the Heckman procedure that jointly estimates the probit for sample selection and the structural parameters by the ML estimation procedure to purge the structural estimates of potential simultaneity biasandsample selection.

IV. Data Sources and the Measure Of Welfare

Data source

The main source of data for this study is the 2007 Cameroon Household Consumption Survey (ECAM III), by the National Institute of Statistics. The ECAM III survey covered all 10 regions of Cameroon, and was conducted in both urban and rural areas. In all, data were collected for 22 strata – 10 rural and 12 urban. Yaoundé and Douala, the two largest cities in the country with about one quarter of the total population, were considered as separate strata. Each of the ten provinces was divided into two strata – one rural and one urban. The ECAM III survey, made up of 11391 households was carried out between May and July 2007. Its main goal is to update knowledge on poverty and welfare status in Cameroon and to provide indicators that track the living standards of the local population. It stands as a follow up of efforts made towards the implementation of the former PRSP document and the MDG objectives. The ECAM III data can be used to (1) study all aspects of poverty at national and regional levels (monetary poverty, household poverty, poverty in terms of potentials and subjective poverty), as well as establish correlations between these different types of poverty; (2) study the dynamics of poverty since 1996, notably between 2001 and 2007, with the aim of evaluating the effects of macro-economic policies of the last five years on household wellbeing; (3) evaluate the households' demand for credit and access to savings and other financial assets by regions or poverty status; (4) evaluate household land ownership status etc.

Measure of welfare and its relation to poverty

The choice of household expenditure as a measure of welfare is supported theoretically and empirically. The theory of permanent income developed by Milton Friedman supports the view that expenditures are a better proxy of long-term income, hence long-term living standard than current income. This shows that expenditures better reflect the welfare of a household than current income. In addition, the life-cycle hypothesis developed by Modigliani, Ando and Brumberg holds that permanent income is the maximum amount a household can spend on consumption each year without supporting debts that are passed on to future generations. These theories also consolidate the basic Keynesian theory of consumption; where consumption is associated to some long-term concept of income. Moreover, Anand and Harris (1994) in an attempt to consider a welfare indicator posited that income is a noisy indicator of permanent income, while total household expenditure per capita is less noisy. Thus, household expenditure or consumption is a relevant measure of household welfare.

For Sahn and Stiffel (2003), the difficulty faced by developing countries in carrying out household surveys that enclose all facets of welfare or wellbeing indicates the value added of using household expenditure which is most viable in these surveys. For instance, only about 10% of households interviewed in the Cameroon household consumption survey 2007 provided information on their incomes; leaving us with missing values. Moreover, Jenkins and Micklewright (2007) observed that even in cases where some monetary measures of resources are used to measure welfare, the debate on whether resources should be measured in terms of consumption expenditure or income remains. Consumption expenditure is less inclined to variations than income (Ravallion, 1994). Consolidating this view, Deaton (2009) underlined that expenditure data is better measured than income in developing countries and agrarian economies; as income for rural households may fluctuate within the year in line with the harvest cycle, in urban economies with large informal sector as well; income flows may be inconsistent.

Besides methodological downsides, a purely income based poverty assessment also suffers from measurement issues in cognizance with survey data collected, the household is the lowest possible layer where income information is available. Though, it is easy to get information about the income of the bread-earner in a household, it is difficult to know how this income is later on distributed within the family (Thorbecke, 2005; Klasen, 2008). Generally, this problem is solved by assuming a unitary distribution of income within the household. Thus, justifying our use of expenditure per capita as a proxy of household welfare; given by household total expenditure divided by household size. Thus, total household expenditure per capita is favoured

as a basic indicator for measuring household standard of living. Essentially, poverty/poverty line in Cameroon is evaluated on the basis of household expenditure and not on income. The poverty line in 2007 is constituted using the minimal basket of basic food and non-food items; including health, education and housing expenditures; this shows how expenditure is related to poverty in Cameroon. The poverty line is used to assess the incidence, depth and severity of poverty in the country.

1. Empirical analysis

1.1. Result of descriptive statistics

Table 1 hosts the summary statistics describing the variables used in the empirical analysis. Close to 79% of the households in our sample of study are headed by men with only about 21% of households headed by women. On the average, 35% of the households are urban dwellers with 65% living in the rural areas. Averagely, 7% of households who applied for credit got credit and about 4.6% of households applied and were refused credit. Only about 1% of household heads own financial assets and close to 61% of household heads in a cluster are married. On the average, each region has 25% of the total coverage of microfinance institutions. The average age of household heads at cluster level is 42 years and the number of household heads in each cluster is 111.

Table 1: Descriptive statistics

Variables	Number of observations	Mean	Standard Deviation
Outcome variables			
Log of total expenditure per capita	11391	12.30	0.67
Gender parity index (GPI)	4638	0.19	0.44
Potential endogenous variable			
Borrowing status of household (borrowing =1)	11006	0.07	0.25
Exogenous included Variables			
Household size	11391	6.48	3.99
Household size squared	11391	57.84	107.23
Labour experience	11391	33.40	14.28
Labour experience squared	11391	1319.11	1105.86
Primary education (dummy)	11391	0.34	0.48
Secondary education (dummy)	11391	0.29	0.45
Tertiary education (dummy)	11391	0.06	0.24
Bilingual (english and French	11391	0.24	0.43
Access to electricity (electricity=1)	11391	0.90	0.30
Access to potable water (cluster level)	11391	0.95	0.09
Ownership of farmland (farmland =1)	11391	0.61	0.49
Regional price index	11391	0.88	0.08
Formal sector employment (formal=1)	11391	0.15	0.36
Density of microfinance institutions(per region)	11391	0.25	0.40
Experience of household heads (cluster level)	11391	31.71	6.04
Experience of household heads squared (cluster level)	11391	1244.99	446.14
Primary education (cluster level)	11391	0.33	0.19
Secondary education (cluster level)	11391	0.30	0.24
Tertiary education (cluster level)	11391	0.06	0.11
Proportion of revenue (cluster level)	11391	341480.50	206702.20
Average number of households (cluster level)	11391	110.78	59.53
Proportion of farmland obtained by female heads (cluster level)	3041	0.52	0.38
Proportion of female heads that benefit from an allocation (cluster level)	3005	1.94	0.21
Proportion of female heads having savings (cluster level)	3041	0.26	0.27
Proportion of household heads in the formal sector (cluster level)	11391	0.14	0.17
Instruments for borrowing and sample selection			
Household credit refused (cluster level)	11391	0.042	0.064
Number of married household heads (cluster level)	11391	0.61	0.21
Access to radio (cluster level)	11391	0.67	0.25
Controls variables			
Predicted borrowing residual	11006	-0.008	0.24
Inverse of the Mills ratio	11391	0.138	0.05
Other variables			
Gender of household head (male =1)	11391	0.79	0.41
Location of household head (rural =1)	11391	0.65	0.48

Source: compiled by authors from the 2007 Cameroon Household survey (ECAM III)

At the cluster level, 51.7% of farmland is obtained by the female household heads and only about 2% of these female household heads benefit from an allocation. On the average, 27% of female household heads have savings. About 13% of household heads in each cluster are in formal employment.

Table 2: Reduced-form Estimates of Borrowingand selection equation

Explanatory Variables	**Dependent variable (t-values)**	
	Borrowing =(=1 if household applied and obtained credit; =0 if household did not apply and missing if household was not observed	Selection indicator = (= 1 if household applied and was given or refused credit; 0= if household was not observed
Excluded variables (from the structural equation)	(1)	(2)
Household credit refused (cluster level)	0.403*** (10.18)	-
Average number of married household heads (cluster level)	0.049*** (3.68)	0.39*** (3.76)
Access to radio (cluster level)	-	0.219** (2.47)
Included variables		
Household size	-0.0053*** (-4.08)	-0.075*** (-6.50)
Household size squared	0.00047*** (10.21)	0.001*** (4.86)
Labour experience	0.00018 (0.25)	-0.026*** (-3.54)
Labour experience squared	-0.0000096 (-1.06)	0.0004*** (4.22)
Primary education (dummy)	0.03*** (4.65)	-0.131** (-2.37)
secondary education (dummy)	0.019** (2.23)	-0.037 (-0.50)
Tertiary education (dummy)	0.004 (0.29)	-0.086 (-0.78)
Bilingual (english and french)	0.04*** (5.33)	0.013 (0.20)
Access to electricity (electricity=1)	-0.033*** (-3.97)	0.014 (0.19)
Access to portable water (cluster level)	0.078*** (2.96)	-0.091 (-0.35)
Ownership of farmland (farmland =1)	-0.006 (-0.99)	-0.081* (-1.74)
Regional price index	-0.279*** (-7.81)	-0.019 (-0.06)
Formal sector employment (formal=1)	0.007 (0.89)	0.220*** (3.41)
Density of microfinance institutions	0.036** (2.45)	0.132 (1.44)
Constant	0.209*** (4.76)	2.55*** (6.35)
Uncentred R2	0.1088	-
Partial R2 (of excluded instruments)	0.0104	-
F-stats (df; p-value) (on excluded instruments)	57.95(2, 10989; 0.0000)	-
Log likelihood	-	-1646.06
LR chi2(16) – Chi2(df;p-value)	72.97 (0.0000)	-
Pseudo R2	-	0.022
Uncensored observations	11006	11006
Censored observations	-	385

Source: computed by authors using ECAM III

Note: ***, ** and * represent 1%, 5% and 10% levels of significance, respectively.

1.2. Reduced form estimates of borrowing and the selection equation

Instrumental variables and borrowing

Borrowing is a dichotomous variable: it equals 1 if households applied and had credit; it equals 0 if households did not apply and missing if household borrowing status is not observed. Table 2 column (1) presents the reduced-form estimates of the endogenous variable, borrowing. Credit-refusal which represents the rationing out of less creditworthy household heads by lenders is positively and significantly associated with borrowing. This implies that credit decision should also be viewed from the point of view of lenders, who may use their characteristics to include or exclude a household from the credit market. This falls in line with Khandker (2001, 2003), who found that the function of household borrowing may result not only from pure demand and supply functions but also from variables controlling for asymmetric information problems, such as collateral, availability of funds and competition amongst borrowers. Average number of married

householdheads in a cluster is significant in determining borrowing. This shows that the number of married household heads in a cluster is likely to influence the lending decision of microfinance institutions (MFIs). The number of married household heads in a cluster serves as a potential market for MFIs. In this regard, lenders may be encouraging lending in clusters with a higher number of married household heads.

Identification variables and selection

The selection indicator takes the value 1 if the household applied and was given or refused credit and the value 0 if the household's credit status was not observed at all. Column (2) of Table 2 submits the identification variables (cluster level access to radio and number of married heads at the cluster level) that affect selection. Access to radio is positively associated to the selection indicator. This is an indication that most households who lack access to information are most likely to be ignorant about the credit operations of MFIs. Such households are forcefully hard-up and often out-select themselves from the credit market, so their credit status is not observed. Nevertheless, if these households are informed or have information (through radio or any other means) on how MFIs operate, they may be motivated to apply for microcredit. This is a true problem of asymmetric information and one possible solution to this problem is for lenders to develop other means of informing even the most unenlightenedabout their activities. Equally, the number of married heads at the cluster level relates significantly and positively with the selection of households into the credit market. This is message that most unmarried household heads do not deal with MFIs in Cameroon. This is probable as most of these unmarried heads often have smaller family responsibilities (in terms of number of children, health and education) than their married counterparts.

Included variables and borrowing

Included variables in the outcome equation that are positively associated with borrowing are: household size squared, primary, secondary and tertiary education, bilingual status, cluster level access to potable water, density of microfinance institutions and working in the formal employment sector. Contrary to household size squared, the variable household size is negatively correlated with borrowing. This indicates that although lenders will continue to give out credit as households increase in size, this should be treated with caution, as there may be a critical size above which lenders become reticent. This depicts a non-linear relationship between household size and borrowing. Experience is positively related to borrowing and experience squared is negatively correlated to borrowing. This indicates that although lenders will continue to give out credit as households experience increases, there is a critical level of experience above which lenders become reticent; this may reflect experience at retirement.The regional price level and access to farmland do not positively influence the lenders decision to grant credit.

Included variables and selection

Most of the included variables are not significant in determining the selection of households into the credit market. The variables that correlate significantly with selection include household size and its square, labour experience and its square, primary education, ownership of farmland and formal employment. While household size relates negatively to selection, household size square correlates positively to it. Thus, we can predict that most households with large sizes are most likely to apply for credit. Since larger household size also implies larger responsibilities in terms of consumption, education and health. Labour experience affects selection negatively while labour experience square associates positively with selection. This is implies that most household heads with elaborate job tenure are more inclined to apply for credit than their counterparts with brief job tenure, mostly those in their first employment. Households who own farmland are more inclined to demand credit, as the latter may serve as ready collateral for their application. Equally, households in formal employment are more ready to apply for credit than their informal sector counterparts, as their employment contracts, payslips and other documents attesting their employment can serve as support for this purpose.

Relevance and strength of instruments

The first-stage F statistic on excluded instruments of 57.95(p-value 0.000) is evidence that the two instrumental variables are jointly significant (Table 2). As concerns the validity and strength of our instruments, the Sargan Chi2 test statistic of 2.095 (p-value 0.1477) casts no doubt on the validity of the instruments. While allowing for a 2SLS relative bias of ten per cent, the test statistics of 57.948is far more than the Stock-Yogo weak ID test critical value of 19.93, implying that our instruments are not weak (Table 3 column 2).

Table 3: Welfare production function: Dependent variable is log of total expenditures per capita (t-statistics in parentheses)

Variables	**Estimation**			
Potential endogenous variable	OLS(1)	2SLS (2) Correcting for endogeneity	Heckman/ control fuction (3)	Heckman Elasticities Overall (4)
Borrowing status of household head	0.133***	1.38***	1.33***	0.109***
	(6.88)	(6.23)	(7.23)	(7.23)
Household size	-0.097***	-0.091***	-0.091***	-0.007***
	(-37.3)	(-28.1)	(-31.8)	(-31.81)
Household size squared	0.002***	0.0016***	0.0015***	0.00012***
	(23.1)	(10.5)	(11.6)	(11.57)
Labour experience	0.008***	0.0074***	0.0057***	0.00005***
	(5.29)	(4.33)	(3.71)	(3.71)
Labour experience squared	-0.00005***	-0.00004*	-0.000014	-0.000001
	(-2.70)	(-1.65)	(-0.703)	(-0.70)
Primary education (dummy)	0.107***	0.07***	0.053***	0.004***
	(8.36)	(4.28)	(3.68)	(3.68)
Secondary education (dummy)	0.225***	0.206***	0.196***	0.016***
	(13.2)	(10.2)	(10.9)	(10.89)
Tertiary education (dummy)	0.587***	0.586***	0.545***	0.044***
	(20.9)	(17.8)	(18.6)	(18.55)
Bilingual (English and French)	0.128***	0.076***	0.077***	0.006***
	(8.41)	(3.79)	(4.37)	(4.37)
Access to electricity (electricity=1)	0.051***	0.09***	0.087***	0.007***
	(3.05)	(4.32)	(4.72)	(4.72)
Access to portable water (cluster level)	0.292***	0.194***	0.167***	0.014***
	(5.48)	(2.99)	(2.89)	(2.89)
Ownership of farmland (farmland =1)	-0.198***	-0.187***	-0.185***	-0.015***
	(-17.6)	(-14.0)	(-15.5)	(-15.52)
Regional price index	1.60***	2.01***	1.98***	0.162***
	(22.8)	(18.3)	(20.9)	(20.88)
Formal sector employment (formal=1)	0.274***	0.263***	0.28***	0.023***
	(17.7)	(14.4)	(17.2)	(17.21)
Density of microfinance institutions	0.291***	0.248***	0.229***	0.019***
	(9.96)	(7.05)	(7.32)	(7.32)
Predicted borrowing residual			-1.21***	-0.099***
			(-6.57)	(-6.57)
Inverse of the Mills ratio			0.475***	
			(65.77)	
Constant	10.70***	10.4***	10.4***	
	(134)	(90.6)	(104)	
R2/(log likelihood)	0.4637	0.9978	-9404.804	
F-stat (df;p-val)	633.37(15, 10990; 0.000)	459.04(15, 10990;0.0000)		
ρ (Correlation of welfare residual with sample selection residual)			0.907*** (88.8)	
σ (Sigma of welfare residual)			0.524*** (139.4)	
Wald test for independent equations – Chi2(df;p-value)			8600.48(16;0.0000)	
LR test of independent Equations – Chi2(df;p-value)			223.46(1;0.0000)	
Partial R-squared (on excluded instruments)		0.0104		
Weak identification test: Cragg-Donald F-stat (10% maximal IV relative bias)		57.948(19.93)		
Underidentification test (Anderson canon. Corr. LR statistic – Chi2(df;p-value)		115.467(2;0.0000)		
Sargan statistic (overidentification test of all instruments) – Chi2(df;p-value)		2.095(1;0.1477)		
Durbin-Wu-Hausman Chi2 test for exogeneity of the potential endogenous variables (df;p-value)		44.184(1;0.0000)		
Number of observations	11006	11006	11391	11391
Censored observations			385	

Source: computed by authors using the 2007 Cameroon Household Survey (ECAM III) and Stata 10
Notes: ***, ** and * and represent 1%, 5% and 10% levels of significance, respectively.
Note: t-statistics in parentheses, except otherwise specified

1.3. Correlates of household welfare under Alternative Assumptions/Approaches

1.3.1. The effect of borrowing on household welfare: Full sample

The main objective of this study is to ascertain the effect of borrowing on household welfare, while controlling for other correlates. Table 3 submits estimates of the welfare function for the whole sample under different assumptions or approaches. Column (1) hosts the OLS estimates of the structural parameters of equation 1.These estimates are exposed to the adverse effects of potential endogeneity, and sample selection biases. Column (2) presents the IV estimates of household welfare. These estimates correct for potential endogeneity bias and assume that credit allocation is a random process. Column (3) submits the control function estimates of the household welfare function (equation 4).Specifically column (3)purges the structural equation estimates of potential endogeneityand sample selection bias. In column (3), additional regressorsarise: the inverse of the Mills ratio (IMR) is generated in censored samples through the Heckman ML approach to account for selectivitybias (Card, 2001 and Mwabu, 2009) and the residual of borrowing is generated and included as additional regressor to check for potential endogeneity.

As shown in Table 3 borrowing is positively and significantly associated with household welfare irrespective of the approach. This result corroborates the findings of Coleman (2002); Pitt and Khandker (2002); Khandker (2003) and Hao (2005).The OLS estimate of the coefficient of borrowing is 0.133.It is probable that a household with greater dedication or effort is more willing to borrow than the others, and hence more likely to generate higher welfare than others.This way, an observed household welfare may not only be generated from borrowing, but also from unobserved variables that affect borrowing. The OLS estimation of the effect of borrowing on household welfare is therefore biased and inconsistent. Accounting only for this potential endogeneity, the coefficient of borrowing increases to 1.38(column 2). There is a possible econometric problem that may render these results not fit for policy implication: the possibility that lenders use their characteristics to include or exclude households from the credit market, that is, the inverse of the Mills ratio that accounts for sample selection, which is significant.This potential econometric issue, sample selection problem, may render our IV estimates bias. Accounting for potential econometric problems (that is, endogeneityand sample selection problems using the Heckman/control function approach), the estimate of borrowing normalisesat1.33(column 3) – which is about 10 times more than the OLS estimate of borrowing and 1.04 times less than that of the IV.This is indication that the size of the effect of borrowing on household welfare depends on the estimation approach used. This further highlights the need to use the estimation approach that internalises potential econometric problems,for appropriate policy implication.

The endogeneity test – the Durbin-Wu-Hausman Chi2 stats = 44.184, p-value =0.0000- forexogeneity of potential endogenousregressors rejects exogeneity of borrowing (Table 3 column 2). Moreover, the coefficients of the fitted borrowing residual is significant in the outcome equation (Table 3 column 3), confirming that this input into the outcome equation is indeed endogenous. The inverse of the Mills ratio is statistically significant, indicating that purging our estimates of sample selection problemsis necessary. The preferred estimation approach of the effect of borrowing on household welfare is the Heckman/control function. The direct effect of borrowing on household welfare of 1.33in our preferred approach clearly ascertains that borrowing enhances household welfare by about 1.3 times the welfare of non-borrowing households. To now provide more relative economic significance to our findings, we compute the elasticities of explanatory variables for our preferred estimation approachin column 4, Table 3. We observe that a change in household borrowing will cause household welfare to rise by 10.9% at the overall level (Table 3, column 4). Notwithstanding, this welfare generating effect of borrowing may only be felt among those who access credit. Many poor households, especially those residing in the rural areas, do not access microcredit. This is the case with the East, Far North and Adamawa regions in Cameroon. Moreover, women in rural areas hardly obtain microcredit compared to their male counterparts. These are issues to be grappled with by policy making.

In Table 3 column 3, household size correlates negatively with household welfare, whereas size squared is positively related with household welfare. This implies that as household size increases, household welfare tends to drop until a critical household size above which household welfare is affected positively. This is evidence of a U-shaped relationship and not evidence for careless child bearing, as knowledge on this critical household size is still an issue. This finding is controversial to the observation by Hao (2005) on Vietnam data.Experience associates positively with household welfare whereas, experience squared relates negatively with household welfare. This shows that labour experience tends to increase with household welfare until a threshold above which welfare is affected negatively. This is indication of an inverted U-shaped relationship. This critical labour experience may correspond to the experience at retirement; tantamount to low productivity.

The level of education increases with household welfare. This is probable as more educated household heads are more likely to access opportunities, especially in the labour market, that may help in enhancing their welfare. Importantly, a small change in the tertiary level of education is more welfare enhancing (an elasticity of 0.044) than a small change in the level of primary and secondary education, elasticities of 0.016 and 0.004 respectively (Table 3 column 4). In the same perspective, the ability to speak both English and French is an added advantage, as it helps enhance welfare by about 0.08 times the welfare of non-bilingual individuals.

The variablescluster level access to potable water and access to electricity associate positively and significantly to welfare outcomes. This is attributable to the use of electricity and water in household food preparation, transformation and preservation by local food industries and food vendors. The possession of farmland is adversely related to household welfare. This is so because most household heads involved in farming are poor and use rudimentary tools and methods that on the average generate very low productivity. Employment in the formal sector relates positively and significantly with household welfare. This is attributable to better payments and social coverage which are often rare in the informal sector. The density of microfinance institutions correlates positively and significantly with household welfare and specifically, a change in the density of microfinance institutions per region will boost household welfare by almost 2% (Table 3 column 4).However, it is important to note that this welfare enhancement resulting from MFIs does not level-up across regions in Cameroon. MFIs are unevenly distributed; regions like Adamawa, Far North, East, and South suffer great deficiency of MFIs, especially in villages therein. Thus, policy making should consider these disproportions in MFIs coverage.

Table 4: Welfare Production function: Dependent variable is log of total expenditures per capita
(Robust t-statistics in parentheses)

		Sub sample			
Potential endogenous variable	Overall(1)	Male (2)	Elasticity (ey/dx) (3)	Female (4)	Elasticity (ey/dx) (5)
Borrowing status of household head	1.33***	1.39***	0.113***	1.47***	0.119***
	(7.23)	(6.22)	(6.22)	(4.32)	(4.32)
Household size	-0.091***	-0.086***	-0.007***	-0.159***	-0.013***
	(-31.8)	(-26.3)	(-26.34)	(-17.4)	(-17.36)
Household size squared	0.0015***	0.0015***	0.0001***	0.006***	0.0005***
	(11.6)	(9.8)	(9.81)	(9.23)	(9.23)
Labour experience	0.0057***	0.0058***	0.0005***	0.016***	0.001***
	(3.71)	(3.31)	(3.31)	(6.32)	(6.32)
Labour experience squared	-0.000014	-0.000021	-0.000001	-0.00013***	0.00001***
	(-0.703)	(-0.96)	(-0.96)	(-3.82)	(-3.82)
Primary education (dummy)	0.053***	0.052***	0.0042***	0.169***	0.014***
	(3.68)	(3.12)	(3.12)	(6.37)	(6.37)
Secondary education (dummy)	0.196***	0.168***	0.0137***	0.382***	0.031***
	(10.9)	(8.35)	(8.35)	(11.0)	(10.95)
Tertiary education (dummy)	0.545***	0.541***	0.044***	0.83***	0.067***
	(18.6)	(16.8)	(16.78)	(13.5)	(13.54)
Bilingual (English and French)	0.077***	0.073***	0.006***	0.121***	0.010***
	(4.37)	(3.7)	(3.70)	(3.46)	(3.46)
Access to electricity (electricity=1)	0.087***	0.087***	0.007***	0.141***	0.011***
	(4.72)	(4.26)	(4.26)	(3.91)	(3.91)
Access to portable water (cluster level)	0.167***	0.214***	0.017***	0.091***	0.007***
	(2.89)	(3.35)	(3.35)	(0.82)	(0.82)
Ownership of farmland (farmland =1)	-0.185***	-0.191***	-0.016***	-0.162***	-0.013***
	(-15.5)	(-14.1)	(-14.07)	(-7.94)	(-7.95)
Regional price index	1.98***	1.94***	0.158***	2.27***	0.183***
	(20.9)	(17.7)	(17.65)	(12.8)	(12.76)
Formal sector employment (formal=1)	0.28***	0.284***	0.023***	0.145***	0.012***
	(17.2)	(16.3)	(16.28)	(3.84)	(3.84)
Density of microfinance institutions	0.229***	0.264***	0.022***	0.228***	0.018***
	(7.32)	(7.19)	(7.19)	(4.50)	(4.50)
Predicted borrowing residual	-1.21***	-1.27***	-0.104***	-1.33***	-0.107***
	(-6.57)	(-5.67)	(-5.67)	(-3.90)	(-3.90)

Inverse of the Mills ratio	0.475***	-0.060		-0.194***	
	(65.77)	(1.43)		(3.53)	
Constant	10.4***	10.4***		10.1***	
	(104)	(90.4)		(56.4)	
log likelihood	-9404.804	-7013.537		-2380.178	
Sigma of welfare residual	0.524*** (139.4)	0.494*** (126.67)		0.482*** (69.86)	
Correlation of welfare residual with sample selection residual	0.907*** (88.8)	-0.122 (-1.43)		-0.402*** (3.59)	
Wald chi2 test for independent equations (df; p-value)	8600.48(16;0.0000)	7099.08(16;0.0000)		2541.32(16; 0.0000)	
Censored observations	385	308		77	
Number of observations	11391	8350		3041	

Source: computed by authors using the 2007 Cameroon Household Survey (ECAM III) and Stata 10
Notes: ***, ** and * and represent 1%, 5% and 10% levels of significance, respectively.
Note: t-statistics in parentheses, except otherwise specified.

1.3.2. The effect of borrowing on household welfare: sub samples

Table 4 submits control function estimates of the structural parameters of household welfare by gender. For the male and female subgroups, the effect of borrowing on household welfare is positive and significant. This finding is consistent with the full sample. However, the female household head subgroup reports the effects of borrowing on household welfare that are in excess of those of the male subgroup and those reported by the pooled sample (Table 4columns 1, 2 &4).More essentially, a change in the borrowing habits of a female household head will cause household welfare to increase by about 12% compared to about 11% in the case of a male household head (Table 4, columns 3 & 5). This is clear indication that female household heads thathaveaccess to credit are more determined in generating vital welfare enhancing activities than their male counterparts. This finding supports the intuition held in the credit access – welfare economic literature.This result corroborates with Khandker (1998) and Khandker (2003) who with data from a 1991/1992 survey covering Grameen Bank and Bangladesh Rural Advancement Committee microfinance programs, found that a microfinance loan to a female borrower would result in a net consumption increase over and above that of their male counterparts. Generally, this may be because most female household heads invest these petit-credits in developing micro-activities that greatly complements household consumption.

For the urban and rural subgroups (Table 5), the effects of borrowing on household welfare are positive and significant, a finding that corroborates that of the full sample. But it is worthytonote that the rural subgroup tracks the effects of borrowing on household welfare that are significantly in excess of those reported by the urban subgroup (Table 5 columns 2 and 4). This result implies that rural dwellers that have access to credit are more determined in generating useful welfare enhancing activities, as a small increase in borrowing for rural dwellers will cause them to secure higher welfare outputs (an elasticity of 0.09) than those in the urban areas (an elasticity of 0.08)(Table 5 columns 3 and 5).This finding agrees with the existing economic literature on this issue. This finding ties with Morduch (1998) who argues that the effect of microfinance programs on consumption levels is more for households living in villages. The institutional coverage of microfinance structures appears to generate rural household welfare effects in excess of urban household welfare. The other correlates (for instance household size and its square, experience and its square and secondary/tertiary education) in the two sub samples say the same story as those in the full sample;their interpretations are done in the same way as under the full sample. Most striking, primary education appears more important, in terms of welfare generation, for female heads and rural dwellers.

Table 5: Welfare Production function: Dependent variable is log of total expenditures per capita
(Robust t-statistics in parentheses)

		Sub sample			
Potential endogenous variable	Overall (1)	Urban (2)	Elasticity (ey/dx) (3)	Rural (4)	Elasticity (ey/dx) (5)
Borrowing status of household head	1.33***	0.953***	0.075***	1.06***	0.088***
	(7.23)	(3.98)	(3.98)	(3.80)	(3.80)
Household size	-0.091***	-0.115***	-0.009***	-0.087***	-0.007***
	(-31.8)	(-27.1)	(-26.96)	(-23.05)	(-23.05)
Household size squared	0.0015***	0.0026***	0.0002***	0.0015***	0.0001***
	(11.6)	(13.2)	(13.16)	(8.39)	(8.39)
Labour experience	0.0057***	0.010***	0.001***	0.005***	0.0004**
	(3.71)	(4.10)	(4.10)	(2.55)	(2.55)

Labour experience squared	-0.000014	-0.00005	-0.000004	-0.00002	-0.000002
	(-0.703)	(-1.71)	(-1.71)	(-0.73)	(-0.73)
Primary education (dummy)	0.053***	0.033	0.003	0.082***	0.007***
	(3.68)	(1.30)	(1.30)	(4.38)	(4.38)
Secondary education (dummy)	0.196***	0.15***	0.012***	0.203***	0.017***
	(10.9)	(5.51)	(5.51)	(8.07)	(8.07)
Tertiary education (dummy)	0.545***	0.554***	0.043***	0.437***	0.036***
	(18.6)	(16.5)	(16.52)	(8.04)	(8.04)
Bilingual (english and french)	0.077***	0.105***	0.008***	0.056**	0.005**
	(4.37)	(5.39)	(5.39)	(2.02)	(2.02)
Access to electricity (electricity=1)	0.087***	0.107***	0.008***	0.084***	0.007***
	(4.72)	(3.42)	(3.42)	(3.7)	(3.70)
Access to portable water (cluster level)	0.167***	-0.109	-0.009	0.182**	0.015**
	(2.89)	(-1.04)	(-1.04)	(2.61)	(2.61)
Ownership of farmland (farmland =1)	-0.185***	-0.003	-0.0003	-0.107***	-0.009***
	(-15.5)	(-0.188)	(-0.19)	(-6.05)	(-6.05)
Regional price index	1.98***	0.903***	0.071***	1.68***	0.140***
	(20.9)	(7.85)	(7.85)	(10.6)	(10.64)
Formal sector employment (formal=1)	0.28***	0.258***	0.020***	0.219***	0.018***
	(17.2)	(15.1)	(15.1)	(7.86)	(7.85)
Density of microfinance institutions	0.229***	-0.238***	-0.019***	0.309***	0.026***
	(7.32)	(-7.53)	(-7.53)	(4.53)	(4.53)
Predicted borrowing residual	-1.21***	-0.814***	-0.064***	-0.932***	-0.077***
	(-6.57)	(-3.38)	(-3.38)	(-3.34)	(-3.34)
Inverse of the Mills ratio	0.475***	-0.015		-0.098**	
	(65.77)	(-0.119)		(2.19)	
Constant	10.4***	12.0***		10.6***	
	(104)	(85.4)		(68.8)	
log likelihood	-9404.804	-5560.274		-3757.579	
Sigma of welfare residual	0.524*** (139.4)	0.502*** (109.13)		0.458*** (95.6)	
Correlation of welfare residual with sample selection residual	0.907*** (88.8)	-0.029 (-0.119)		-0.215** (-2.19)	
Wald chi2 test for independent equ	8600.48(16;0.0000)	3369.42 (16; 0.0000)		2247.47 (16; 0.0000)	
censored observations	385	245		140	
number of observations	11391	6365		5026	

Source: computed by authors using the 2007 Cameroon Household Survey (ECAM III) and Stata 10
Notes: ***, ** and * and represent 1%, 5% and 10% levels of significance, respectively.
Note: t-statistics in parentheses, except otherwise specified

2. Conclusion remarks and policy recommendations

The study attempted to empirically link household credit access and welfare. Specifically, the study estimated the effects of credit access on household welfare; and assessed disparities by gender and location. A range of econometric approaches were employed and the control function approach proved to be the most appropriate estimation strategy as it purged the structural parameter estimates of potential endogeneity and selectivity bias simultaneously. In the case ofthe gender parity index function, the Tobit model of estimation was retained since it cleanse our parameter estimates of the adverse effects of cluster-wise heteroscedasticity and is also recommended for estimations with a large proportion of zeros on the dependent the variable.

Our findings showeda strong positive and significant influence of credit access on household welfare.The degree of the influence was found to depend on the econometric model employed and was also found to vary across gender and location, as female household heads and rural household heads were more determined in generating welfare enhancing activities than their male and urban counterparts. Essentially, rural credit is used for the purchase of seed and fertilizer to increase agricultural output and productivity. The institutional coverage of microfinance structures has crucial implications on rural household welfare and hence rural poverty.

These findings indicatethat:(1) improve access to credit for female heads would reduce their vulnerability to poverty. This could be made possible in Cameroon through an increase in the coverage of more specialised microfinance institutions like CEC Prom and SOS Women, especially in the rural areas of theEast, Far North and Adamawa regions, where they are relatively absent and where women are still less empowered; (2)MFIs in Cameroon should scale-up their outreach to large numbers of rural poor households; this especially in the Adamawa, Far North, East and South regions. More resources should be provided to specialized institutions like CVECA, by external or internal financing, so they can expand to enclave villages in these

regions where people are desperately poor. Today, this is easier than ever before because of the pioneering work of service providers in the industry, like CGAP[3] World Bank, the Microfinance Network, Women's World Banking, the Grameen Trust, etc. These structures provide the training needed and more cost-effective management tools to assist MFIs build their capacities. Theycanalsofind support, *inter alia*, fromNGO ADAF; NGO Microfinance and Development; le Centre International pour le Développement et la Recherche (CIDR) and l'Agence Française de Développement (AFD). (3) improve credit access if accompanied byrural-agricultural training programmes to enhance agricultural productivity in rural areas mayfurtherenhance rural household welfare and reduce poverty. Thus, region-based agricultural development programmes like SOWEDA in the South Western region may be replicated in other regions of Cameroon. (4) Access to primary education is particularly important for female heads and rural dwellers in their struggle to generate welfare benefits of small credits. Though efforts to ensure access to primary education for all are already ongoing in Cameroon under the ambit of the MDGs (MDG2) and the SDGs, there is still need for more specific training and capacity building that can rural dwellers manage petit cash flows.

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Ndamsa Dickson Thomas. "Econometric Analysis of Microcredit Access and Rural Household Welfare in Cameroon." IOSR Journal of Economics and Finance (IOSR-JEF) , vol. 10, no. 5, 2019, pp. 01-16.