Impact of Access to Microcredit on the Well-being of Households and Poverty Change in Cameroon: 2001-2007

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Abstract

Using data from the second and third Cameroonian household surveys, this study analyzes the relationship between access to microcredit, household well-being, and poverty change in Cameroon. It uses a combination of two methods of analysis: the instrumental variable method for controlling the potential endogeneity of access to increased microcredit by correcting for selection bias; and a method for breaking down poverty change into intra-growth, intra-redistribution, and inter-sector mobility components based on Shapley's value. The latter is based on comparison of evidence-based and hypothetical/non-factual distributions. The key findings reveal that access to microcredit:

(i)   significantly and positively affects the level of well-being of households and financial inclusion, particularly through education;
(ii)   has an impact on poverty change and that this effect is brought about by the redistribution component and primary sector;
(iii)   positively and significantly influences the intra-sector redistribution component of poverty change through the intra-sector growth and mobility components.

Keywords: Microcredit, Well-being, Non-factual/hypothetical analysis, Shapley analysis, Household surveys, Cameroon

1. Introduction

Overview

In most cases, developing countries are faced with risks that can affect both economic activity and household behaviour. These risks can be climatic (natural disasters), social (conflicts) and economic (economic crises). In the face of such shocks, households may be exposed to situations of vulnerability or persistent poverty to the extent that loss of employment and interruption of income-generating activities are often inevitable (Dercon, 2002). In such situations, households' incomes and their asset portfolios will decline considerably. As a means of ensuring their socio-economic security, households will seek to maintain their income levels and sustain their consumption over time. They will then develop survival strategies based on, among other things, savings, child labour and credit or borrowing (Fafchamps, 2002). With consumption levels being stable, these strategies will then permit households to maintain their level of well-being.

Among these strategies, credit-based strategy, particularly microcredit, is increasingly being adopted by the poorest households. The Grameen bank model[1] and the various international summits on microcredit have made it possible to highlight the simplicity of their use and their effectiveness, especially regarding collateral issues. Indeed, the poorest segment of the population is very often faced with lack of collateral in their search for credit from conventional banks (Otéro, 1989). In this respect, several developed countries consider microcredits as an innovative and easy-to-implement instrument to combat poverty. These countries have consequently adopted microcredits as a privileged tool to help households cushion their consumption during periods of crisis.

Credit is one of the flagship strategies that can enable households to maintain or smoothen their level of consumption over time and thus protect themselves against poverty. To this end, the policy on credit lending and, more specifically, lending of small amounts of credit (microcredits) to poor households has spread throughout the world. Poverty is understood here as a complex phenomenon generally referring to a lack of resources and a deprivation of choices and opportunities that would offer individuals decent living conditions (UNDP, 1998).

The role played by microcredit in poverty reduction has been the subject of several controversies in the economic literature. Indeed, several studies have shown that microcredits can be effective tools for improving households' living conditions in both

developed and developing countries. In this context, microcredits are an important instrument for achieving the Millennium Development Goals by financing the projects of the poor (Littlefield *et al.*, 2003; International Monetary Fund, 2010). To this end, Roedenbeck (1998) points out that microcredit program are successful in the Middle East and Africa. Similarly, many studies have shown, in the case of Cameroon, the positive effect of microcredit on poverty reduction (Tchouassi and Tekam, 2003; Epo, 2013; Sikod and Baye, 2015).

Indeed, formal credit systems through microfinance enable households to engage in small businesses such as handicrafts and provide for the basic needs of their families (Gentil and Servet, 2002). Moreover, informal credit through tontines, for example, often permits women to finance their children's education through quasi-annual savings.

However, income generated from loans is not always used to finance income-generating projects, but rather for consumption (buying of goods, for example) and savings. For instance, Stiglitz and Weiss (1981) described the behaviour of bad borrowers in the credit market. Indeed, banks have incomplete information about the risks associated with the loans they provide. On the other hand, borrowers know perfectly well the probability of success of their projects. To reduce the likelihood of running into bad debt, lenders will offer high interest rates, but these rates may drive away good borrowers. Only the bad customers will stay on the market (anti-selection). In the same way, bad borrowers will take advantage of the information asymmetry of creditors to develop opportunistic behaviour (moral hazard). This can mean that borrowers use their loans for non-investment purposes.

Just like banks, microfinance institutions (MFIs) can also suffer the consequences of information asymmetry vis-à-vis borrowers. These consequences may include the non-use of MFI loans for investment purposes or the inability of the borrower to implement an income-generating project. Such a situation can lead to insolvency of households and, as a result, their resilience in a state of poverty (Falcucci, 2012). Similarly, the absence of securities in MFIs' credit lending policies can drive the poorest households into a situation of over-indebtedness (Morduch and Haley, 2002), as there seems to be a race for this type of credit on the part of these households.

To this day, many countries around the world continue to suffer the agony of poverty. Over the years, this plight has persisted and increased among most of these countries, leading to increased inequalities both within and between countries.

Africa is the hardest hit continent by the poverty pandemic. Like most African countries, Cameroon is suffering the consequences of poverty. Its economic activity has experienced a major slowdown with a decline in wages following the drop in international price of oil that occurred in the 1980s. These shocks were followed by introduction of the structural adjustment program, and devaluation of the currency in the mid-1990s. Most enterprises were liquidated or privatized. The Cameroonian state then cancelled subsidies as a matter of policy. The general price level rose and the economic situation in the country caused many households to become unemployed or to cease economic activities. This situation led to a drastic drop in the level of household consumption. However, as economic operators do not like fluctuations in

their consumption (Begg *et al.*, 2002), Cameroonian households then turned to the informal sector through small businesses to stabilize their consumption. Moreover, to finance these small businesses, households needed recourse to associations.

Cameroon then initiated fundamental measures such as joining the structural adjustment program. This was intended to rebuild its economic structure (Chauvin, 2012). Despite this and many other measures, the standard of living of the population continued to deteriorate. However, between 2001 and 2007, the country experienced a reduction in poverty rate from 40.1% to 39.9%.

In the light of this situation, the Cameroonian government, in its Growth and Employment Strategy Paper (GESP), developed a credit-based policy to finance its economy. However, the banking restrictions forced the government to embark on a process of liberalizing the financial sector, which led to a surge in the number of microfinance institutions in the early 1990s. This was followed by a national policy for the development of the financial sector.

The number of microfinance institutions increased from 192 in 2001 to 460 in 2007 (COBAC, 2008). In 2000, the total savings mobilized by microfinance institutions (MFIs) in Cameroon amounted to FCFA[2] 35.9 billion or 6% of the savings collected by the banking sector. During the same year, more than FCFA 25.4 billion was distributed by these institutions in the form of loans, representing 4.3% of the total amount of loans disbursed by the banking sector (COBAC, 2001). Furthermore, according to the Global Findex - Cameroon (2014), 12% of the population has an account in a formal MFI; 2% of the latter have benefited from credit and 8% hold savings in these institutions. At the end of 2010, there were nearly 509 MFIs and 1,500,000 clients. Over the same period, MFIs mobilized FCFA 454 billion in deposits and issued FCFA 240 billion in loans (CGAP-Cameroon, 2017).

Given the description of the situation of Cameroonian households, it emerges that households are faced with the problem of maintaining their level of consumption between two periods: growth period and post-crisis period (oil crises, devaluation of the CFA Franc and adoption of structural adjustment program). Similarly, at the theoretical level, the analysis of this type of consumption behavior is theoretically premised on the lifecycle and permanent income assumptions. Therefore, we pose the following research question: Does access to microcredit impact on household well-being and poverty change in Cameroon?

Objectives of the study

Our research question leads us to the following objectives:

(i) To analyze the role of access to microcredit on households' well-being;

(ii) To assess the contribution of the factors of sector growth, sector redistribution and mobility between sectors through access to microcredit on poverty change.

2. Literature review

Theoretical literature review

a) Credit and consumption

When households are in crisis, their income level decrease. This reduction in income can result in a drop in household consumption and thus put households in a precarious situation (Dercon, 2002). To maintain their consumption level, these households develop several strategies, including child labour, reduced consumption and demand for credit.

However, since poor populations in developing countries are excluded from the traditional banking system due to their lack of securities, they then turn to microfinance institutions where they find an opportunity to benefit from financing. Despite the lack of collateral, loans issued by MFIs are often taxed at very high interest rates. This situation leads to flaws in the lending market (asymmetry of information from the lender about the borrower and the selection of bad borrowers). This shortcoming in the loan market will translate into poor knowledge about the use of loan funds. This is because the borrower may decide to save this money for future consumption (lifecycle hypothesis) or to finance his consumption to maintain his spending at the same level as before the crisis (permanent income hypothesis). Thus, the issue of earnings from activities financed through household loans is not always known by microfinance institutions.

Given the above developments, we can say that the relationship between access to microcredit and household well-being is an important element of the problem relating to timeless consumption in economic theory. Consequently, the underlying theoretical basis for this issue comes from the Life-Cycle Permanent Income Hypothesis (LCPIH). These two hypotheses are extensions of the Keynesian consumption function. Indeed, Keynes (1936) seeks to explain overall household consumption using household income. He arrives at the conclusion that consumption is an increasing function of household income. In the short term, the validity of the Keynesian approach is verified, but in the long term the average propensity to consume is constant and close to 1. At the cyclical level, it has been found that when income declines, households tend to maintain steady consumption.

Milton Friedman's 1957 permanent income hypothesis states that household consumption is not only dependent on disposable income but also on permanent

income (Begg *et al.*, (2002). Permanent income is understood here as the income anticipated by individuals based on the income they earn from their work and the wealth they accumulate. This theory has one main limitation: the calculation of permanent household income is complex. Indeed, permanent income is approximated by an average of current and past earnings. These earnings have a lower weighting, on average, with respect to recent earnings.

Primarily developed by Ando-Modigliani (1963) and Modigliani-Brumber (1954)[3], life cycle theory states, through its underlying hypothesis, that households do not save during their inactive phase and that they accumulate wealth during their active period in the form of savings to maintain their level of spending during retirement (Begg *et al.*, 2002). This hypothesis thus assumes that the consumer's time horizon is his or her life time. Individuals wish to maintain a steady level of spending throughout their lives through saving and borrowing. Borrowing here suggests that, because of their needs, individuals will spend more than their income during their inactive phase. The gap between household spending and income is then financed through credit. The latter can only be repaid during their active period. During this period, households will also seek to accumulate wealth to finance their consumption in retirement. In this way, households make better guesses about the income they will earn throughout their lives and plan their consumption for the rest of their lives. This consumption plan also includes the inheritance that they will leave to their children. In this theory, individuals are not required to have the same level of spending throughout their lives. According to this theory, access to credit allows young people to finance their human capital accumulation and to acquire goods that their current level of consumption does not allow them to have. The main limitation of this approach lies in capital market flaws.

The convergence of these two hypotheses lies in the fact that the management of timeless household consumption is at the heart of their development. For both approaches, households determine their consumption not only by considering their current income but also by anticipating their future income over a long period. Moreover, both theories establish a correlation between consumption and credit.

b) Justification for microcredits

In the economic literature, Stiglitz and Weiss (1981) showed that the lending market suffers from several flaws. These include information asymmetries, management costs, transaction costs, and risks of adverse selection and moral hazard. To address these problems, banks generally apply a policy based on collateral requirements, credit rationing and financial penalties. In most cases, poor people are unable to bridge these barriers to access mainstream banking services. This explains why the poor are excluded from bank financing (Meyer and Nagarajan, 2000; Mpuga, 2010).

To address this exclusion, microcredit was introduced in the early 1970s through microfinance institutions by the 1998 Nobel Peace Prize winner, Mohammed Yunus. Indeed, the latter developed the principle of group lending, which makes it possible to solve the problems associated with asymmetric information through self-monitoring

by group members towards each other (Otero, 1989). Within this framework, several theoretical contributions have supported the idea that group lending was "effective in facilitating access to loans for large numbers of poor people" (Smashi, 2010). However, this principle of group lending has been subject to some criticism, as has Morduch (1999) who thought that the principle of group lending is not the only factor used by microfinance institutions to facilitate access to credit for the poor. Other factors such as macroeconomic context, demographic factors and socio-economic environment also affect access to credit for the poor people.

c)   Growth-poverty-inequality nexus

It is often accepted that growth also benefits the poor, although this conclusion is still debated. However, to better analyze this relationship, it would be useful to distinguish the effect of growth on relative and absolute poverty. Regarding the effect of growth on relative poverty, it can be said that growth can affect relative poverty through two drivers: productivity and employment. To this effect, when growth is explained by productivity, the income of the entire population increases. This is because increase in productivity leads to an increase in tax rates and consequently in income. This can lead to an improvement in redistribution of income and thus reducing poverty.

Regarding the effect of increased employment, it can be argued that growth has a positive and significant effect on poverty reduction if and only if the jobs created are taken up by the poor and if taxes remain unchanged; and if, as a result of these jobs, they are able to live a decent life. On the contrary, if increase in employment rates is associated with a decrease in taxes, the positive effect of redistribution can be negated. However, in the long term, the increase in growth is more attributable to increase in productivity than to increase in employment.

Regarding the effect of growth on absolute poverty, literature review on this linkage has revealed two distinct trends. According to the first trend, it is accepted that growth positively influences the reduction of absolute poverty without the effects of income distribution. The authors of this school of thought, Bhalla (2002), for example, believe that this is possible if the income elasticity of the poor with respect to GDP is greater than one. Other authors such as Dollar and Kraay (2002) consider that growth has a positive effect on absolute poverty if this elasticity is equal to one.

Contrary to previous authors, those of the second school of thought introduce the concept of income inequality in the analysis of the relationship between growth and poverty. This view is represented by the work of Bourguignon (2003) through the growth-poverty-inequality triangle. This author argues that growth influences poverty, although this effect can be reversed by inequality.

Regarding the relationship between growth and inequality, The latter has been illustrated through the studies of Kuznets and Lewis (Englert, 2008). According to these authors, economic development is accompanied by a simultaneous and systematic evolution of inequality. For them, the transition from an agricultural economy is first accompanied by an increase in inequality because the richest have accumulated

their wealth in the form of savings. After the increase in inequalities comes their decrease, which is due to social factors and characteristics related to dynamic growth. However, other authors such as Bourguignon (1990) have pointed out the limitations of Kuznets' analysis insofar as it does not consider foreign trade and the migration of populations from rural to urban areas. This is particularly so since such migration seems to perpetuate poverty.

Empirical literature review

The empirical literature regarding the existing relationship between well-being and microcredit has been nurtured by a number of authors following the successful experiments conducted by the Gramen Bank on the adoption of microcredit as a primary tool for poverty alleviation in Bangladesh. To this end, numerous studies on this subject have been developed, although their conclusions and validity are still subject to some reservations. Therefore, the effectiveness of microfinance on poverty reduction remains a major area of discussion (Chowdhury and Mosley, 2004). Consequently, some authors have demonstrated that microcredit has a positive impact on improving the well-being and reducing poverty (Khandker, 1998 ; Remenyi and Benjamin, 2000; Pitt and Khandker, 1992 ; Hao, 2005).

In this regard, Littlefield et al. (2003) and IMF (2010) argue that microcredit is an important instrument for achieving the Millennium Development Goals (MDGs) (Littlefield *et al.*, 2003). These goals take into account the needs of the poorest populations. In addition, Hulme and Mosley (1996) believe that a high level of lending to the poor enables them to have a wide range of investments and consequently to generate a high level of income after completing a project. For them, microcredit also allows households to build up their assets. These authors and others such as Johnson and Rogaly (1997) show that microcredit enables the poor to maintain their consumption during periods of shock or just before the harvest period. After the harvest period, this consumption-smoothing role of microcredit can increase future investments in education, health and other household production endowments. Montgomery *et al.* (1996) also argue that microcredit is necessary for improving the well-being of borrowers through consumption.

In addition, besides investment, microcredit also aims at improving household well-being through its main determinants, which are: children's health and education, household wealth or financial assets, women's empowerment, and housing (Microcredit Summit, 1997; Khandker, 1998; Sayed *et al.*, 2014). Indeed, Argwal (1994) and Kabeer (1995) have shown that through credits issued to women by their associations, women have been involved in decisions regarding the distribution of household income and can exert an influence on their children's education expenses. Similarly, Holvoet (1999) believes that credit has a particular influence on the factors that determine children's education, including the parents' individual budget, their degree of individual participation in household decisions, their perception of the importance of children's education and the time allocated to children's education.

In terms of the effect of microcredit on health, Sarwar (1998) showed that microcredit enables women not only to prevent diseases in children but also to be able to meet their health expenses. Metcalfe and al. (2012) concluded that a non-governmental organization (NGO) in India called 'Ekjut', through the provision of microcredits and sensitization of its clients, was able to reduce child and maternal mortality. Indeed, a 20% reduction in maternal mortality and a 57% reduction in post-natal depression were observed over the period 2005-2008. Long before, Tripathy and al. (2010) had argued that microfinance institutions in rural areas facilitated access to health products for their clients and provided them with health education, particularly in awareness raising and training sessions on family planning methods.

In the same logic, Teng *et al.* (2011) argue that microcredits enable households, through the income generated, to acquire certain durable assets such as immovable assets and thus improve their well-being. Moreover, microcredits contribute positively to the well-being of rural populations, particularly through informal MFIs (tontines and loan sharks). To this end, in the view of the FAO (2011), agricultural productivity can be impacted by access to financial services such as microcredit through acquisition of new arable land.

Tchouassi and Tekam (2003) exemplify how a savings and credit cooperative, Credit du Sahel, is improving the standard of living of small traders and small farmers in Cameroon. Indeed, this institution provides them with microcredits not only to finance their project but also to enable them to meet basic needs such as food and gradually move out of poverty. Despite the opportunities that microcredits offer to the populations in Cameroon, they remain limited by relatively high interest rates, which can have a negative impact on the well-being of the beneficiaries.

In the same vein, Epo (2012) argues that microcredits largely increase the probability of entrepreneurship for women in Cameroon. He also shows that there are other determinants of women's entrepreneurial activity, namely: literacy, health, work experience, asset endowment, access to electricity and household size. Furthermore, Baye (2013) indicates that microcredit has an impact on improving the living conditions of the poorest and most vulnerable segment of the population, especially women.

However, despite the potential of microcredits, some authors are not always convinced of the positive influence that microcredits could have on poverty reduction. In this respect, Hulme and Mosley (1996) for their part, although they recognize the role of microcredit in poverty reduction, show that it is not a panacea for this phenomenon. They find that poor people are often in some cases poorly served by microfinance. In the same spirit, Wright (1999) shows the limitations of income growth as a measure for evaluating the effects of microcredit on poverty reduction. Indeed, he argues that the poor can use income from microcredit for other purposes, for example, for alcohol consumption and not for project financing.

Wright (2000) justifies some authors' skepticism about the role that microcredit could play in poverty reduction by pointing out that microcredit still fails to reach the poor. The author explains this notion by the fact that income from women's business

ventures is often insufficient to meet the primary needs of their households, since they remain highly dependent on their husbands. The poorest people are usually most in need of food, shelter and schooling. Most development proponents find that microcredits are often diverted to other sectors at the expense of vital sectors such as entrepreneurship, education and health.

Parker and Pearce (2001) show the factors that can limit the impact of microcredits: a wide disparity between beneficiaries, and a focus of beneficiaries on a single business sector. This last factor can create competition in the market, leading to lower profit margins for sellers. Morduch and Haley (2002) also show that the absence of microcredit loan conditions attracts the poorest who are sometimes unable to effectively implement a business project. The beneficiaries who do not generate income find themselves in situations of bankruptcy, and therefore over-indebtedness. The prime effect of such a situation is deterioration of the standard of living, and the risk of committing suicide among peasants.

In addition, Maldonado *et al.* (2003), in a study conducted in Bolivia with a sample size of three households in India, found that access to microcredit increases the demand for child labour, especially for girls from households engaged in agriculture. Thus, instead of going to school, the girl helps her mother at home to carry out household chores. Guérin and Palier (2004) also highlight the negative effects of microfinance at both intra-family and global levels in a study conducted in Bangladesh. These effects include the following:

• Embezzlement of companies' funds when they become profitable.

• Increased intra-marital violence and patriarchal domination through the control exercised by loan agents.

• Exacerbation of intra-women inequalities.

• Increased specialization of women in low-productivity sectors. In Cameroon, for example, interest rates charged by microfinance institutions were very high, with a value of 18% in 2007 (COBAC, 2008). This level of interest rates adversely affects the well-being of the very poor. Thus, most microfinance institutions prioritize financial profitability at the expense of the fight against poverty.

Although the effectiveness of microcredits on poverty change is not unanimous among the authors, some of them recognize the positive role that microcredits would play on poverty reduction. However, the authors present some nuances to this relationship. For example, Morduch and Haley (2002) argue that microcredit has a positive impact on poverty reduction. Furthermore, Koloma (2007) studied the correlation between credit and income level in Mali by showing that for some time, household income levels increase if income from microcredit is allocated to finance income-generating activities. It illustrates the paradox of microfinance using

the "pseudo Kuznets curve". For him, the first phase of credit is accompanied by an increase in family income. After this phase comes the stagnation of profits from the household's business in which the income no longer varies due to the lack of innovation on the part of the entrepreneur.

Finally, after the second phase, a decline in income is experienced, which in turn leads to deterioration in the household's standard of living and plunges the household into a situation of over-indebtedness. However, the effectiveness of microcredit in reducing poverty depends on a number of conditions, including the redistribution of income in favour of the poor (Falcucci, 2012). Based on the above discussion, the effect of microcredit on well-being remains an empirical question warranting further analysis. Additionally, the analysis of the impact of access to microcredit on the evolution of poverty in terms of intra-sectoral growth and redistribution, and mobility between sectors will give a new dimension to the role of access to microcredit.

3. Methodology

In this section, we will present the econometric model, the disaggregation framework, the evidence-based and hypothetical simulations to elicit the impact of microcredit on poverty change and its components, and the data and strategy for identifying the structural model.

Econometric model

The theoretical model underpinning our approach is that of the timeless consumption function. Indeed, we hypothesize that households seek credit when faced with crises in order to maintain their level of consumption over time and ensure their security. The problem that these households must therefore solve is that of maintaining timeless consumption. The theoretical function considered in our model is the timeless consumption function. As noted above, our analysis is based on the assumption of lifecycle and permanent income. According to Romer (1997), the Hall (1978) model tests this hypothesis. In doing so, Hall (1978) concludes that the consumption function follows a random path. If income is accurate and consumers make rational predictions, it is not possible to predict consumption over time.

$$C_{t+1} = C_t + \varepsilon_{t+1} \qquad (1)$$

Where, C_{t+1} = level of consumption during the period t+1

C_t = level of consumption during the period t

ε_{t+1} = risk

In considering the approach in which household income determines consumption, the proxy for household well-being then becomes household expenditure or household income.

The well-being can be influenced at the household level by the characteristics of the household and the community. It can also be influenced by local market

factors. Among these characteristics, household access to microcredit is potentially endogenous in the well-being function. This endogeneity can be explained by several reasons. The first reason is that household entrepreneurial capacity is an unobserved variable. As a result, it is not considered in the model explicitly. The omission of this variable may lead to a correlation between access to credit and the error term.

The second source of endogeneity is justified by the heterogeneity of the amounts loaned to households. This also creates heterogeneity regarding the effect of access to microcredit on household's well-being.

Regarding the third potential source, there could be a two-way causality between access to microcredit and household well-being. For example, richer households might be more likely to have access to microcredit, all other things being equal, compared to poorer households, or they might be better able to use borrowed funds. If access to microcredit is targeted at the poor, the poor are more likely to obtain credit compared to rich households. However, poor households may be less able to demonstrate entrepreneurial capacity compared to non-poor households. This third source leads to the simultaneity bias. The different sources mentioned above lead to the use of instrumental variable method. The well-being function can therefore be expressed in the structural form as follows:

$$LnY = x_1 \delta_Y + \eta C + \varepsilon_1 \qquad (2)$$

Where Y and C represent, respectively, household consumption expenditure per adult equivalent and access to credit is considered endogenous. x_1 is the vector representing exogenous variables. This vector captures sub-variables such as household size, gender of the head of household, age, and other factors excluded from credit facilities. δ_Y, η and ε_1 are, respectively, the vector for exogenous variable parameters, the endogenous variable parameter (access to credit), and the error term. Since the availability of credit depends on a number of factors, the credit function is therefore expressed in the reduced form as follows:

$$C = X \delta_C + \varepsilon_2 \qquad (3)$$

Where δ_C is the vector that represents the exogenous variables' parameters, X is the vector that aggregates both the exogenous variables of the equation configuration and tools x_2 for accessing credit. ε_2 is the error term.

The credit function can trigger other functions such as the demand and supply function. The latter can lead to the occurrence of other control variables such as collateral, interest rates, availability of funds, and competition among borrowers. Moreover, the inclusion of only those households that benefited in the model limits our sample. For this purpose, it would be wise to consider households that did not receive credit. However, the allocation of credit is a non-random process because lenders choose the most financially solvent households. This situation can result in a selection problem in the model (Baye, 2006), which can be controlled by introducing the selectivity bias method.

In this regard, S takes the value 1 for households that have received credit and 0 if they have not.

Solving the selection bias problem takes us to equation (4), which assumes the following form:

$$S = 1(z\delta_S + \varepsilon_3 \succ 0) \quad \Leftrightarrow \quad S = 1 \text{ and } S = 0 \text{ if otherwise} \tag{4}$$

Where S is a function of the indicator for households that are excluded from the lending market, z is a vector of exogenous variables comprising of the other explanatory well-being variables, and (x_1) is a vector of exogenous variables (the instruments) explaining the observations from households excluded from the lending market. δ_S is a vector of parameters to be estimated and ε_3 is the error term. Equation (4) denotes the probit of equation selection. This equation gives the probability of a household being excluded from the lending market. The correction factor from equation (4) is the inverse of the Mills ratio introduced in equation (5) below.

Following this equation, the residual of the reduced form of access to credit and the Mills ratio calculated from the selection equation are introduced into equation (1) to give the following new equation configuration relating to the well-being:

$$LnY = x\delta + \eta C + \alpha\hat{\varepsilon}_2 + \lambda IRM + u \tag{5}$$

Where $\hat{\varepsilon}_2$ is the residual equation of the reduced form. IRM is the selection variable and corresponds to what Heckman (1979) calls the Mills ratio. This variable is determined from the probit selection indicator. u is the error term. δ, η, α and λ are the parameters to be estimated. However, this method of selection bias is criticized by many studies, to the extent that the Mills ratio used in this method distorts the regression of the endogenous variable.

Analysis of poverty change decomposition

Analysis of intra-inter sectoral components

It is often used to identify the factors FGT_α [4] that are behind the observed changes in overall poverty between two periods t and $t+n$. The factors studied here are the intra- and inter-sectoral contributions of observed changes in poverty. If f_k and $FGT_{\alpha k}$ represent, respectively, the share or frequency of the population and the poverty level of the subgroup $k \in K$, the properties of the disaggregated class measure FGT_α permits us to write the following formula: $FGT_{\alpha,t} = \sum_{k \in K} f_{k,t} FGT_{\alpha k,t}$. The overall change in poverty between the period t and $t+n$ and corresponds to:

$$\Delta FGT_\alpha = FGT_{\alpha,t+n} - FGT_{\alpha,t} = \sum \left[f_{k,t+n} FGT_{\alpha k,t+n} - f_{k,t} FGT_{\alpha k,t} \right] \tag{6}$$

The objective is to account for the overall change in poverty (ΔFGT_α), in terms of change in intra-subgroup poverty $\Delta FGT_{\alpha k} = FGT_{\alpha k,t+n} - FGT_{\alpha k,t}, k \in K$ and change in inter-subgroup poverty, $\Delta f_k = f_{k,t+n} - f_{k,t}, k \in K$.

Ravallion and Huppi (1991) use the aggregate class breakdown FGT_α of poverty measures to highlight the relative contribution of intra-group change compared to inter-group change.

According to the Shapley decomposition method proposed by Shorrocks (1999) and applied by Baye (2006), the exact intra $\phi_{\alpha W}^{sh}$ and inter $\phi_{\alpha B}^{sh}$ -sector effects of the change in global poverty are given by equations (7) and (8) below, respectively:

$$\phi_{\alpha W}^{sh} = 0.5 \sum_{k \in K} \left[f_{k,t} + f_{k,t+n} \right] \Delta FGT_{\alpha k} \tag{7}$$

$$\phi_{\alpha B}^{sh} = 0.5 \sum_{k \in K} \left[FGT_{\alpha k,t} + FGT_{\alpha k,t+n} \right] \Delta f_k \tag{8}$$

The equation explaining the overall change in poverty can now be rewritten based on two components:

$$\Delta FGT_\alpha = \phi_{\alpha W}^{sh} + \phi_{\alpha B}^{sh} \tag{9}$$

Unlike the initial sector disaggregation proposed by Ravallion and Hupi (1991), there is no interaction in the Shapley's decomposition in equation (9). In the empirical analysis, "k" corresponds to the primary sector, secondary sector and tertiary sector, and the overall K is:

$$\{\text{secteur primaire}, \qquad \text{secteur secondaire}, \qquad \text{secteur } \textit{tertiaire}\}$$

Growth and redistribution components' analysis {C}

Contributions with respect to growth and redistribution effects using Shapley method for each group   are shown in equations (10) and (11) (Shorrocks, 1999; Baye, 2004):

$$\phi_{\alpha G}^{k} = 0.5\left[FGT_{\alpha}(\mu_{t+n}, L_{t+n}) - FGT_{\alpha}(\mu_{t}, L_{t+n}) + FGT_{\alpha}(\mu_{t+n}, L_{t}) - FGT_{\alpha}(\mu_{t}, L_{T})\right] \quad (10)$$

$$\phi_{\alpha R}^{k} = 0.5\left[FGT_{\alpha}(\mu_{t+n}, L_{t+n}) - FGT_{\alpha}(\mu_{t}, L_{t+n}) + FGT_{\alpha}(\mu_{t}, L_{t+n}) - FGT_{\alpha}(\mu_{t}, L_{t})\right] \quad (11)$$

Where $\phi_{\alpha G}^{k}$ is the growth effect, $\phi_{\alpha R}^{k}$ the redistribution effect, μ average expenditures and L the Lorenz curve. It can easily be verified that the overall change in poverty in sector k is the sum of the growth and redistribution components provided by the Shapley method:

$$\Delta FGT_{\alpha k} = \phi_{\alpha G}^{k} + \phi_{\alpha R}^{k} \qquad (12)$$

This break down provides exact analysis. Unlike the disaggregation proposed by Datt and Ravallion (1992), it does not depend on the choice of baseline year.

Analysis by growth, redistribution and sectoral mobility components

Combining the sectoral decomposition and the growth redistribution decomposition provides an important link between changes in measured overall poverty, sectoral growth and redistribution, and population displacement. This exercise disaggregates changes in overall poverty into three components: intra-sector growth, intra-sector

redistribution and inter-sector mobility. The third component captures the effect of migration on poverty change. From equations (6), (7), (8) and (12), we can state:

$$\Delta FGT_\alpha = 0.5 \sum_{k \in K} \left[f_{k,t} + f_{k,t+n} \right] (\phi_{\alpha G}^k + \phi_{\alpha R}^k) + 0.5 \sum_{k \in K} \left[P_{\alpha k,t} + P_{\alpha k,t+n} \right] \Delta f_k$$

$$0.5 \sum_{k \in K} \left[f_{k,t} + f_{k,t+n} \right] (\phi_{\alpha G}^k) + 0.5 \sum_{k \in K} \left[f_{k,t} + f_{k,t+n} \right] (\phi_{\alpha R}^k) + 0.5 \sum_{k \in K} \left[FGT_{\alpha k,t} + FGT_{\alpha k,t+n} \right] \Delta f_k \qquad (13)$$

Equation (13) shows that the poverty measurement index FGT_α can be disaggregated into three components: intra-sector growth, intra-sector redistribution and inter-sector mobility.

Evidence-based and non-factual/hypothetical distributions

To assess the impact of access to microcredit on poverty reduction and on each of the three components of poverty change, we compare evidence-based and hypothetical distributions. The evidence-based distributions are obtained after econometric analysis and prediction of the dependent variables of the structural equation and residuals for years t and $t+n$. The sum of the predicted value of the dependent variable and the residual indicates the evidence-based distribution for each period: $DF = \exp(Ln\hat{Y} + \hat{u})$. The non-factual distributions are obtained by performing the simulations of the policy on access to microcredit using the evidence-based distributions. If we assume that policies ensure that all the poorest rural households have access to microcredit, the evidence-based distributions can be adjusted to obtain the non-factual distributions: $DCF = \exp(Ln\tilde{Y} + \hat{u})$.

The impact of access to microcredit on poverty reduction:

$$= \Delta FGT_{\alpha,DF} - \Delta FGT_{\alpha,DCF}$$

The impact of access to microcredit on the poverty change component A:
$$= A_{\alpha,DF} - A_{\alpha,DCF}.$$

- If the impact $\succ$ 0, this implies that the policy of universal access to microcredit reduces poverty compared to the status quo.

- If the impact $\prec$ 0, it implies that the policy of universal access to microcredit induces poverty with respect to the status quo.

- If the impact = 0, it implies that the universal access policy to microcredit is neutral with respect to the status quo.

4. Data and identification strategy

Data

The poverty analysis in this study is based on two household samples drawn from the Cameroon Household Surveys conducted in 2001 (ECAM II) and 2007 (ECAM III), respectively, by the Cameroonian government. The first sample comprises of 10,992 households and the second 11,391 households.

Identification strategy

To solve the problem of endogeneity, access to credit will be explained by other exogenous variables, including indicators. In our study, these tools are, among others, the status of credit denied and the average age of the head of household captured at the level of the enumerated areas. The choice of these instruments can be justified in several ways. First, regarding the first instrument, which is the credit declined to the household, it can be argued that the refusal of credit to a household is not a choice made by the household and does not directly influence its spending. It is the lender through the various mechanisms of the lending market such as credit rationing or the selection of creditors who decide to reject individuals/households applying for credit.

As for the average age of the household head captured at enumeration area level, this is exogenous to an individual. The average age of the household head in the survey area does not influence the expenditure of a given household. The fact that the age of the household head is considered at the enumeration area level gives it an exogenous aspect. Thus, the credit access instruments chosen in this analysis directly explain access to credit but are not correlated with the well-being/error term.

5. Empirical results

This section focuses on descriptive statistics, regression results, and the outcomes of intra- and inter-sector following Shapley analysis.

Descriptive statistics

Table 1 provides a summary of descriptive statistics for the variables used in the model from the ECAM II and ECAM III databases. Expenditure per unit of consumption is higher in 2007 compared to 2001. On average, about 6% of individuals obtained credit in both 2001 and 2007. It is noticeable that the population decreased in rural areas in the period 2001-2007 because the rate of population living in this environment reduced from 65% to 64%. However, the rural area remains inhabited by most of the country's population compared to the urban area. Moreover, the agricultural sector accounts for about half of the population; that is 50% of the population in 2001 and 51% of the population in 2007. Regarding the level of education, 34% of the population had primary education in 2001 and 2007, while only 6% of the population had a higher level of education. The percentage of the population with secondary education increased by 2% from 27% in 2001 to 29% in 2007.Life expectancy decreased between 2001 and 2007, and the average age in 2001 was 46 years compared to 44 years in 2007. In addition, as shown in the last two rows of this table, it appears that the expenditure per adult equivalent of households that did not benefit from credit is lower than that of households that benefited from it over the two years.

Table 1: Descriptive statistics of variables

	ECAM II (2001)				ECAM III (2007)			
	Averages	Standard deviations	Min.	Max.	Averages	Standard deviations	Min.	Max.
1. Dependent variables								
Logarithm of expenditure per adult equivalent	12.554	0.683	9.932	16.979	12.730	0.663	11.316	16.244
credit	0.061	0.239	0	1	0.064	0.245	0	1
2. Credit facilities								
Credit declined	0.095	0.293	0	1	0.046	0.209	0	1
Age (average age of enumeration)	44.027	5.839	27.111	59.778	42.784	4.015	20	69
3. Explanatory variables relating to the well-being function								
Proportion of adult	0.541	0.258	0.087	1	0.547	0.261	0.071	1
Age	45.689	14.122	13	99	44.395	14.279	11	99
Age squared	2286.936	1404.86	169	9801	2174.804	1412.618	121	9801
Household size	7.288	4.187	1	38	6.476	3.987	1	43
Urban area	0.348	0.476	0	1	0.353	0.478	0	1
Rural area	0.652	0.476	0					
	1	0.647	0.478	0	1			
Couple	0.803	0.398	0	1	0.776	0.417	0	1
Married	0.754	0.430	0	1	0.727	0.445	0	1
Married (in a polygamous household and a partnership household)	0.803	0.398	0	1	0.776	0.417	0	1
Employment	0.034	0.182	0	1	0.946	0.226	0	1
Without education level	0.315	0.465	0	1	0.300	0.458	0	1

Table 1 Continued

	ECAM II (2001)				ECAM III (2007)			
	Averages	Standard deviations	Min.	Max.	Averages	Standard deviations	Min.	Max.
3. Explanatory variables relating to the well-being function								
Primary education level	0.349	0.477	0	1	0.344	0.475	0	1
Secondary education level	0.274	0.446	0	1	0.292	0.455	0	1
Higher education level	0.060	0.237	0	1	0.060	0.238	0	1
Years of study	6.557	5.516	0	20	6.790	5.483	0	20
Agricultural sector	0.506	0.499	0	1	0.516	0.499	0	1
Industrial sector	0.087	0.282	0	1	0.099	0.299	0	1
Service sector	0.404	0.490	0	1	0.317	0.465	0	1
Formal sector	0.224	0.417	0	1	0.148	0.355	0	1
Informal sector	0.666	0.472	0	1	0.783	0.411	0	1
Exploited land	0.639	0.480	0	1	0.607	0.488	0	1
Non-exploited land	0.312	0.463	0	1	0.280	0.449	0	1
Land	0.697	0.459	0	1	0.667	0.249	0	1
No credit	0.939	0.239	0	1	0.930	0.255	0	1
S=1 for all households (whether or not they applied for credit) that did not receive credit and 0 otherwise	0.917	0.275	0	1	0.964	0.185	0	1
g	0.939	0.239	0	1	0.936	0.245	0	1
Logarithm of household expenditure with loan in (FCFA)	1.253	3.869	0	16.042	0.558	2.654	0	16.042
Logarithm of household expenditure without loan in (FCFA)	12.479	2.712	0	16.244	12.478	2.712	0	16.244

Source: Author based on ECAM II and ECAM III databases and Stata 10 software.

Regression results

Table 2 presents the effects of the explanatory variables on the interest variable, which is the well-being of households. The latter is captured by expenditures per adult equivalent. Columns 1 and 4 show the results of the parameter estimates of equation 1 for the years 2001 and 2007. These estimates are affected by a potential endogeneity of the credit variable and selection bias. Columns 2 and 5 show the results of the parameter estimates corrected for endogeneity, but which may be affected by selection bias for these two years. Columns 3 and 6 highlight the simultaneously controlled results of the endogeneity and selection bias of the sample estimation with respect to the well-being function for the same years.

Table 2 shows that credit has a positive and significant influence on household well-being. The values of the coefficient on the credit variable are 0.225 (column 1) in 2001 and 0.174 in 2007. It is likely that borrowers use the information available to them to include and exclude some households from the lending market. This may be the source of endogeneity bias in the model, which could bias the results of the well-being function estimation using ordinary least squares. By correcting only for the endogeneity problem, the coefficient on the credit variable increases by 1.652 (column 2) in 2001 and by 1.079 in 2007. When endogeneity and sample selection bias are adjusted simultaneously, the value of the coefficient of the credit variable rises to 1.876 and 1.253 in 2001 and 2007. These values are, respectively, 8 and 7 times those obtained by Ordinary Least Squares for the two years. These results show that the Double Least Squares' estimates are better in our study than the Double Least Squares estimates with selection bias correction.

Table 2 shows that well-being is also significantly and positively influenced by other variables such as the education level of the household head. Thus, household well-being improves with the level of education of the household heads.

The F-statistic and the R^2 give us important information on the validity and relevance of the indicators when there is only one variable in the model (Shea, 1997).

The values of the F statistic in columns 2 and 5 are 358.94 and 589.13, respectively, showing an overall significance of the model variables in both years. However, when there is a multitude of variables to be measured, the Cragg-Donald statistic is better suited to discuss the validity of the instruments (Stock and Yogo, 2004). The P-value of Anderson Canon's statistic Corr. LR is 0.000<5% for both years. This implies that the model is not being under-stated. The Chi-square statistic of the endogeneity test is 83.714 in 2001 and 57.907 in 2007 with a P-value of 0.000 < 5%, which shows that the credit variable is endogenous in the model for these two years.

Finally, for the year 2001, the Sargan's statistic test is 2.934 with a P-value of 0.087 greater than 5%, which implies that the model is overstated and valid; that is, the indicators are correctly excluded from the model.

Table 2: Estimation of the well-being function (ln dpea) using Ordinary Least Squares (OLS), Double Least Squares (DLS), and Double Least Squares with sample selection bias correction (DLS+SDS)

Variables	Years					
	2001			2007		
	OLS (1)	DLS (2)	DLS+SDS (3)	OLS (4)	DLS (5)	DLS+SDS (6)
Credit	0.225*** (0.021)	1.877*** (0.226)	1.876*** (0.235)	0.174*** (0.019)	1.259*** (0.164)	1.253*** (0.144)
Primary level education	0.043** (0.013)	0.085*** (0.017)	0.085*** (0.014)	0.150*** (0.012)	0.122*** (0.142)	0.096** (0.033)
Secondary level education	0.270*** (0.015)	0.347*** (0.022)	0.348*** (0.019)	0.322*** (0.014)	0.298*** (0.016)	0.275*** (0.031)
Higher education level	0.697*** (0.025)	0.746*** (0.032)	0.746*** (0.026)	0.760*** (0.022)	0.734*** (0.026)	0.710*** (0.036)
Age	0.016*** (0.002)	0.016*** (0.003)	0.016*** (0.002)	0.008*** (0.001)	0.010*** (0.002)	0.012*** (0.003)
Age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0000*** (0.000)
Household size	-0.042*** (0.001)	-0.045*** (0.002)	-0.045*** (0.001)	-0.035*** (0.001)	-0.041*** (0.002)	-0.045 (0.005)
Married	0.089*** (0.016)	0.088*** (0.019)	0.088*** (0.016)	0.059*** (0.013)	0.045** (0.015)	0.029 (0.024)
Household headed by a woman	0.074*** (0.016)	0.118*** (0.022)	0.117*** (0.018)	0.094*** (0.014)	0.081*** (0.015)	0.069** (0.020)
Rural area	-0.324*** (0.014)	-0.313*** (0.017)	-0.313*** (0.014)	-0.409*** (0.012)	-0.420*** (0.014)	-0.429*** (0.017)
Agricultural sector	-0.227*** (0.013)	-0.257*** (0.017)	-0.257*** (0.014)	-0.184*** (0.012)	-0.174*** (0.014)	-0.164*** (0.018)
Un-exploited land	0.046*** (0.011)	0.027* (0.014)	0.027* (0.012)	0.024* (0.010)	0.031*** (0.012)	0.038** (0.013)
Proportion of adult	0.453*** (0.023)	0.455*** (0.029)	0.454*** (0.023)	0.399*** (0.021)	0.421*** (0.024)	0.452*** (0.043)
Credit residual			-1.673*** (0.235)			-1.097*** (0.145)
Mills ration			0.001 (0.136)			0.444 (0.539)
Constancy	12.316*** (0.060)	12.140*** (0.078)	12.140*** (0.067)	12.629*** (0.050)	12.545*** (0.059)	12.423*** (0.158)
R-square	0.396		0.401	0.466		0.469
R-center square		0.067			0.307	
Fisher test	555.72	358.94	490.85	765.45	589.13	670.62

Table 2 Continued

Variables	Years					
	2001			2007		
	OLS (1)	DLS (2)	DLS+SDS (3)	OLS (4)	DLS (5)	DLS+SDS (6)
Joint test on the significance of the variables						
F-Stat(10% of the relative bias)		19.93			19.93	
Under identification test (Anderson Canon Corr.LR statistics)						
Chi-square (P-value)		151.952 (0.000)			192.750 (0.000)	
Variable endogeneity test						
Chi-square (P-value)		83.714 (0.000)			57.907 (0.000)	
Sargan's over-identification test of all instruments						
Chi-square (P-value)		2.934 (0.087)			12.159 (0.000)	
Number of observations		10 992			11 391	

Source: Author using ECAM II and ECAM III with the help of Stata 10 software.
Notes: (.) are standard deviations, imr= inverse of the Mills ratio and ***, **,* indicate the significance of the variables at 1%, 5%, 10%, respectively

Results of Shapley analysis within and across sectors

In this section, we present and explain the empirical results of Shapley's analysis of poverty change with respect to growth, redistribution and mobility components over the period 2001-2007.

The implementation of the Shapley disaggregation analysis requires two distributions: an evidence-based distribution in which the lenders' traditional credit lending policy is respected, and a non-factual distribution in which the poorest rural population benefits as much as the part of the population usually targeted by lenders in accessing credit. We have also considered 2007 as the baseline year. This permitted us to consider 269,443 CFA[5] francs as the reference poverty threshold, which indeed was the poverty threshold for the same year. To make our data comparable, we opted for a time-based standardization of our databases. For this purpose, we used the following method:

$$d = \frac{L_{2001}}{L_{2007}}$$

With d = deflator, L_{2001} = poverty line for the year 2001 and L_{2007} = poverty line for the year 2007. L_{2001} = 232,547 CFA francs. The standardization of data comprised

of comparing our interest variable, i.e. the expenditure per consumption unit of the evidence-based and non-factual distributions for the two years and the deflator.

Table 3.   Descriptive statistics for all variables and disaggregated interest variables obtained after standardization of the evidence-based and non-factual distributions for the two years

	ECAM II (2001)				ECAM III (2007)			
	Averages	Standard deviations	Min	Max	Averages	Standard deviations	Min	Max
Interest variables								
Expenditures per consumption unit in a situation where lenders are adhering to the traditional credit lending policy	2.11*10e11	2.75*10e7	781625	9.10*10e8	575523.9	552098.6	74351.28	1.1*10E7
Expenditure per consumption unit where lenders decide to extend credit, including to the poorest rural populations	2.07*10e7	2.96*10e7	136490	1.4*10e9	5955833	6186477.00	93979.41	1.22*10e8

Source: Author's calculations based on ECAM II and ECAM III databases and Stata 10 software.

Table 3 above shows the expenses per adult equivalent of the evidence-based and non-factual series once they have been standardized. From this table, we can see that in the evidence-based series, expenditures per adult equivalent (575 524) decreased in 2007 compared to 2001 in the same distribution. We can observe the same trend in the non-factual distribution. The decline in household expenditures observed between 2001 and 2007 in the evidence-based distribution reflects the increase in the poverty rate over this period. We can also note that the expenditure per adult equivalent of households in the non-factual series (595 583.3) is higher compared to the expenditure per adult equivalent of households in the evidence-based series (575 524.00) in 2007.

Disaggregated results regarding poverty change on growth and redistribution components based on sectors of activity

Table 4 presents the proportions of the populations in the different sectors of activity and different measures of poverty in the evidence-based and non-factual distributions for the years 2001 and 2007. We can see from this table that the proportion of workers in the primary sector (0.506 in 2001 and 0.516 in 2007), secondary sector (0.090 in 2001 and 0.099 in 2007) and tertiary sector (0.294 in 2001 and 0.317 in 2007) increased in the period 2001-2007. Both distributions are identical. This increase indicates that employment has grown more and that the proportion of the unemployed has

decreased in the period 2001-2007.This can be explained by the expansion of small enterprises, for example in the informal sector, such as call boxes in the mobile phone market, JIG[6] specializing in agricultural production and the processing of agro-food products. Similarly, the increase in the employed labour force reflects the mobility of individuals from the undefined sector to other sectors of activity. The undefined sector is made up of the unemployed persons and others.

We can also observe that the tertiary sector, followed by the primary sector, is the one that has had the greatest impact on the migration of the jobless people. The increased number of unemployed in the tertiary sector is certainly due to the increase in companies specializing in services, such as communication companies (radio, television) and microfinance institutions.

With respect to poverty measures, in Table 4, we have the values of the three poverty measures, namely incidence of poverty (FGT_0), level of poverty (FGT_1) and severity of poverty (FGT_2). From this table, it can be seen that the latter have declined both at the sector and national level, when we move from the evidence-based distributions to the non-factual distributions for the years 2001 and 2007.

For example, if we consider the incidence of poverty (FGT_0), Table 4 shows that it corresponds to 0.565 and 0.164, respectively, in the evidence-based distribution and non-factual distribution in 2001 in the primary sector. At the national level, it is 0.402in the evidence-based distribution and 0.161 in the non-factual distribution in the same year. Similarly, in 2007, the incidence of poverty is 0.588 in the evidence-based distribution and 0.066 in the non-factual distribution in the primary sector. Furthermore, on an aggregate basis over the same year, the poverty incidence is 0.399 in the first distribution and 0.087 in the second distribution.

These different figures show a clear decrease in poverty from evidence-based to non-factual distribution over the period 2001-2007. Consequently, from an economic point of view, policies targeting provision of credit to the poorest rural population should result in a significant reduction in poverty.

In addition, Table 5 presents the disaggregation results showing the change in the different measurements of poverty across the different sectors of economic activity (primary, secondary, tertiary), and the national level. In this table, two distributions are considered: the evidence-based distribution linked to the lenders' traditional policy[7] regarding access to credit, and the non-factual distribution, which corresponds to the situation in which lenders have decided to provide loans to the poorest rural population.

With regard to the evidence-based distribution, the results concerning disaggregation of the change in poverty over the period 2001-2007 show in the primary sector that:

(i)   the incidence of poverty has experienced an upward variation of 2.3 percentage points;
(ii) the level of poverty has increased by 2.2 points; however,
(iii) the severity of poverty has decreased by 0.4 percentage points.

These results show that the number of people living below the poverty threshold has increased, as did the gap between the average expenditure of the poor and the poverty line, even though the gap between the expenditure of poor households and their average has decreased. This can be explained by the decline in agricultural production. The downward trend can be caused either by an increase in the general price level, and thus in the prices of agricultural inputs such as fertilizers, seeds and pesticides, or by the occurrence of natural disasters.

Table 4:   Evolution of poverty indices by industry sectors for the years 2001 and 2007

Year 2001							
Industry Sectors	Population rate	Evidence-based distribution			Non-factual distribution		
		FGT0	FGT1	FGT2	FGT0	FGT1	FGT2
Primary	0.506	0,5649	0,18930	0,08470	0,1645	0,03593	0,01163
Secondary	0.090	0,2162	0,058963	0,02156	0,1814	0,03963	0,01273
Tertiary	0.294	0,2124	0,05626	0,02166	0,1455	0,03372	0,01189
Undefined	0.111	0,4018	0,09304	0,03969	0,1704	0,04284	0,01663
National	1	0,4018	0,12787	0,05554	0,1611	0,03638	0,01236
Year 2007							
Industry sectors	Population rate	Evidence-based distribution			Non-factual distribution		
		FGT0	FGT1	FGT2	FGT0	FGT1	FGT2
Primary	0.516	0.5883	0.19155	0.08014	0.0659	0.00904	0.00300
Secondary	0.099	0.2480	0.06236	0.02180	0.1211	0.01831	0.00482
Tertiary	0.317	0.1695	0.04211	0.01526	0.1011	0.01968	0.00657
Undefined	0.068	0.3988	0.07059	0.02826	0.1252	0.02708	0.01663
National	1	0.3988	0.12311	0.05025	0.0866	0.01456	0.0047

Source: Author based on ECAM II and ECAM III using Stata10 software and the DASP package developed by Araar and Duclos (2009)

Similarly, in the secondary sector, all three poverty measures have increased. Thus, the incidence, level and severity of poverty increased by 3.2, 0.3 and 0.02 percentage points, respectively. These figures show an increase in the number of poor people and a decline in average household expenditure compared to the poverty threshold in 2007. These elements reflect increase in poverty in this sector, which can be explained in general terms by the increasingly high consumption of imported manufactured goods compared to local products, thereby weakening domestic industries. This weakening may be due to a preference for imported products, which sometimes cost relatively less and are often of better quality than local products. The preference among the population for imported products over local products has led to a slowdown in business activities in the secondary sector. This reduction in economic activity can lead to liquidation of some companies or their total relocation, thus leading to loss of employment for a certain number of people.

Regarding the tertiary sector, there has been a decline in all three measures of poverty. Indeed, the incidence, level and severity of poverty fell by 4.3 points, 1.6 points and 0.6 percentage points, respectively. This suggests a decline in poverty. This decline can be explained by the growth of enterprises in the banking sector (creation and growth of microfinance institutions) and the telecommunications sector (development of Internet and mobile telephony, and opening of television and radio broadcasting stations) (Government of Cameroon, 2009). This growth has led to an improvement in the living conditions of populations through job creation. Moreover, the redistribution component (with a 4.3 percentage point decrease in the incidence of poverty, a 1.4 percentage point decrease in the level of poverty and a 0.6 percentage point decrease in the severity of poverty) contributes much more to poverty reduction in the tertiary sector than in the growth component (with an almost zero decrease in all measures of poverty).

Additionally, at the national level, the change values of the three poverty measures show that poverty in aggregate terms decreased over the period 2001-2007. These values are 0.3 percentage points for the incidence of poverty; 0.5 percentage points for the level of poverty and 0.5 percentage points for the severity of poverty. Thus, these figures show, respectively, that the number of persons living below the poverty threshold has decreased through out the country and that the expenditure of poor and non-poor households, and their income, has increased. However, it is important to point out that the reduction of poverty on the national territory is driven by the tertiary sector, which created many jobs over the period 2001-2007 (NIS, 2001; 2007).

In terms of non-factual distribution, results in Table 5 indicate generally that all poverty measures declined both at the sector level and across the country over the period 2001-2007. Indeed, when analyzed by sector, we find that for the primary sector, the incidence, level and severity of poverty declined by 9.9 percentage points, 2.7 percentage points and 0.9 percentage points, respectively. Similarly, in the secondary sector, these measures declined by 6 percentage points, 2.1 percentage points and 0.7 percentage points, respectively. Moreover, in the tertiary sector, the change in poverty indices declined by 4.4 percentage points for the incidence of poverty, by 1.4 percentage points for the level of poverty, and by 0.5 percentage points for the severity of poverty.

In aggregated terms, we can say that poverty has declined across all its indices. This reduction is 7.4 percentage points for the incidence of poverty, 2.2 percentage points for the level of poverty, and 0.8 percentage points for the severity of poverty.

It should also be noted from the figures shown above that it is the primary sector that has seen a significant reduction in poverty compared to the other sectors. Moreover, poverty reduction is much more sustained by the redistribution component compared to the growth component in all sectors of activity and at the national level. Furthermore, given that the difference between the change in a poverty measure in the evidence-based distribution and its change in the non-factual distribution is the impact of access to microcredit on that poverty measure, and when determining the

difference in changes in poverty indices between the evidence-based and non-factual distribution across the country, it can therefore be said that:

- Firstly, with respect to the incidence of poverty (FGT_0), the difference between its variation in the evidence-based distribution and its variation in the non-factual distribution is positive (0.07);

- Secondly, with respect to the level of poverty (FGT_1), the difference between its change in the evidence-based distribution and its change in the non-factual distribution is positive (0.02);

- Thirdly, with respect to the severity of poverty (FGT_2), the difference between its change in the evidence-based distribution and its change in the non-factual distribution is also positive (0.002). Consequently, the fact that all the differences calculated on the variations of the three poverty measures are positive shows that the impact of access to microcredit on poverty reduction is significant.

Furthermore, by calculating the difference in the contribution of each component on each measure of poverty between distributions, it can be said as follows:

- With regard to redistribution component:
   (i)   the difference between its contribution to the incidence of poverty in the evidence-based distribution and the non-factual distribution is positive (0.18);
   (ii) the difference between its contribution to the level of poverty in the evidence-based distribution and the non-factual distribution is positive (0.05);
   (iii) the difference between its contribution on poverty severity in the evidence-based distribution and the non-factual distribution is positive (0.02).

- As for the growth component:
   (i)   the difference between its contribution to the incidence of poverty in the evidence-based distribution and the non-factual distribution is negative(-0.12);
   (ii) the difference between its contribution to the level of poverty in the evidence-based distribution and the non-factual distribution is positive (0.03);
   (iii) the difference between its contribution on poverty severity in the evidence-based distribution and the non-factual distribution is negative (-0.01).

According to the figures presented above, access to microcredit has a positive and significant impact on the contribution of the redistribution component of poverty change, while this impact remains ambiguous on the growth component.

Table 5: Analysis of change in poverty indices (FGT[8]) according to growth and redistribution components based on sectors of activity

	Shapley approach					
	Primary sector					
FGTα	Evidence-based distribution			Non-factual distribution		
	Growth component	Redistribution component	Change	Growth component	Redistribution component	Change
FGT0[9]	-0.0005 (0.0093)	0.0239 (0.0112)	0.0235 (0.02167)	0.1146 (0.0056)	-0.2132 (0.0087)	-0.0985 (0.0108)
FGT1[10]	-0.0006 (0.0051)	0.0029 (0.0064)	0.0022 (0.0094)	0.0411 (0.0022)	-0.0679 (0.0035)	-0.02689 (0.0030)
FGT2[11]	-0.0003 (0.0028)	-0.0042 (0.0043)	-0.0045 (0.0061)	-0.0189 (0.0013)	-0.0275 (0.0019)	-0.0086 (0.0012)
	Secondary sector					
FGTα	Evidence-based distribution			Non-factual distribution		
	Growth component	Redistribution component	Change	Growth component	Redistribution component	Change
FGT0	0.0658 (0.0241)	-0.0339 (0.0300)	0.0318 (0.0298)	0.0981 (0.0214)	-0.1585 (0.0263)	-0.0603 (0.0213)
FGT1	0.0210 (0.0079)	-0.0177 (0.01078)	0.0034 (0.0098)	0.0254 (0.0068)	-0.0467 (0.0084)	-0.0213 (0.0050)
FGT2	0.0092 (0.0033)	-0.0089 (0.0050)	0.0002 (0.0044)	-0.0095 (0.0030)	-0.0174 (0.0037)	-0.0079 (0.0019)
	Tertiary sector					
FGTα	Evidence- based distribution			Non-factual distribution		
	Growth component	Redistribution component	Change	Growth component	Redistribution component	Change
FGT0	-0.0000 (0.0089)	-0.0429 (0.0149)	-0.0429 (0.0159)	0.0847 (0.0136)	-0.1290 (0.0159)	-0.0443 (0.0112)
FGT1	-0.0000 (0.0030)	-0.0140 (0.0055)	-0.0141 (0.0057)	0.0198 (0.0044)	-0.0338 (0.0053)	-0.0140 (0.0031)
FGT2	-0.0000 (0.0013)	-0.0064 (0.0028)	-0.0064 (0.0029)	0.0075 (0.0017)	-0.0128 (0.0017)	-0.0053 (0.0015)

	National level					
FGTα	Evidence-based distribution			Non-factual distribution		
	Growth component	Redistribution component	Change	Growth component	Redistribution component	Change
FGT0	-0.0013 (0.0073)	-0.0017 (0.0114)	-0.0029 (0.0176)	0.1054 (0.0055)	-0.1798 (0.0075)	-0.0745 (0.0075)
FGT1	-0.0067 (0.0034)	-0.0041 (0.0058)	-0.0047 (0.0076)	-0.0300 (0.0021)	-0.0518 (0.0029)	-0.0218 (0.0021)
FGT2	-0.0003 (0.0018)	-0.0049 (0.0034)	-0.0053 (0.0039)	0.0124 (0.0010)	-0.0200 (0.0014)	-0.0076 (0.0009)

Source: Author based on ECAM II and ECAM III with the help of Stata 10 software and the DASP package developed by Araar and Duclos (2009)

Results of the analysis of change in poverty according to growth, redistribution and mobility components broken down by sector of activity and on an aggregated basis

Table 6 shows the results of disaggregating the various poverty indices according to the three components of the evidence-based and non-factual distributions for the period 2001-2007.

Table 6a: Growth, redistribution and mobility components of changes in poverty incidence (FGT0): 2001-2007

Sector (k)	Evidence-based distribution				Non-factual distribution			
	Intra-sector growth	Intra-sector Redistri-bution	Inter-sector mobility	ACon theΔFGT0 =-0,0030	Intra-sector growth	Intra-sector redistribu-tion	Inter-sector mobility	AC on theΔFGT0 =-0,0745
Primary	-0,0002	0,0122	0,0057	0,0177	0,0586	-0,1089	0,0011	-0,0492
Secondary	0,0062	-0,0032	0,0022	0,0052	0,0093	-0,0150	0,0014	-0,0043
Tertiary	0,0000	-0,0131	0,0045	-0,0086	0,0259	-0,0394	0,0029	-0,0106
Undefined	-0,0060	0,0007	-0,0120	-0,0173	0,0052	-0,0093	-0,0063	-0,0104
Cameroun	0,0000	-0,0033	0,0003	-0,0030	0,0989	-0,1725	-0,0009	-0,0745

Source: Author using DASP and Excel software and ECAM II and ECAM III databases
Notes: AC is the absolute contribution.

Table 6a presents the analysis of changes in the incidence of poverty (per capita) between 2001 and 2007 for the intra-sector growth, intra-sector redistribution and inter-sector mobility components for both evidence-based and non-factual distributions. The non-factual distribution is the distribution with the policy, where all the rural poor are assumed to have access to credit during the period under review. The overall marginal incidence of poverty reduction of 0.3 percentage points is over-represented for the intra-sectoral redistribution component (0.33 percentage points). The intra-sector growth component is neutral and the inter-sector mobility component slightly dampens the reduction in poverty incidence. In terms of sector contributions, while the primary and secondary sectors are likely to increase poverty, the tertiary and undefined sectors are likely to reduce it.

Table 6a also presents the results by breaking down the change in the overall incidence of poverty into three components between 2001 and 2007 using a non-factual distribution. Providing access to credit for the rural poor over the period under review leads to a reduction in the overall proportion of the poor by about 7.5 percentage points. This simulated reduction in the incidence of poverty is over-represented by the intra-sector redistribution component, while the intra-sector growth component dampens the reduction in the incidence of poverty by 9.5 percentage points. In terms of sector contributions to the 7.5 percentage points reduction in overall poverty incidence due to the policy, all sectors contribute to the reduction in poverty incidence, with the primary sector (4.9 percentage points) contributing the most to the reduction in poverty incidence, as it is home to the largest number of the rural poor (4.9 percentage

points). Sector contributions to poverty incidence reduction are over-represented for the redistributive effect within the sector. At the same time, intra-sectoral growth and inter-sectoral mobility have contributed to mitigating the poverty reduction observed in the primary, secondary and tertiary sectors. These results indicate that the policy for providing access to credit to the rural poor contributes to poverty reduction and is likely to have a multiplier effect on other sectors in terms of poverty reduction.

A crucial issue is to assess the impact of providing access to credit for all the rural poor. This can be done by comparing aspects of poverty and the results of the analysis from the distributions with and without the policy. Distribution with policy registers more reduction in overall poverty incidence and between sectors than is the case with evidence-based distribution. This is an indication that the non-factual distribution is derived from the factual income-generating function by assuming that a policy that gives the rural poor access to credit is more likely to reduce the proportion of poor people than the status quo.

Table 6b: Growth, redistribution and mobility components of changes in poverty level (FGT1): 2001-2007

Sector (k)	Evidence-based distribution				Non-factual distribution			
	Intra-sector growth	Intra-sector redistri-bution	Inter-sector mobility	AC on theΔFGT1 =-0,0048	Intra-sector growth	Intra-sector redistri-bution	Inter-sector mobility	AC on theΔFGT1 =-0,0218
Primary	-0,0003	0,0015	0,0019	0,0030	0,0210	-0,0347	0,0002	-0,0135
Secondary	0,0020	-0,0017	0,0006	0,0009	0,0024	-0,0044	0,0003	-0,0017
Tertiary	0,0000	-0,0043	0,0012	-0,0032	0,0061	-0,0103	0,0006	-0,0037
Undefined	-0,0026	0,0006	-0,0035	-0,0055	0,0013	-0,0027	-0,0015	-0,0029
Cameroon	-0,0009	-0,0039	0,0001	-0,0048	0,0307	-0,0522	-0,0004	-0,0218

Source: Author based on DASP and Excel software and ECAM II and ECAM III databases
Notes: AC is the absolute contribution.

Tables 6b and 6c present the disaggregated changes in the poverty gap (ΔFGT_1 = -0, 5 percentage points for the evidence-based distribution, and ΔFGT_1 = -2, 2 percentage points for the non-factual distribution) and the poverty gap square (ΔFGT_2 = -0, 5 percentage points for the evidence-based distribution and ΔFGT_2 = -0, 8 percentage points for the non-factual distribution) over the period 2001 and 2007. In the evidence-based distribution, changes in the level and severity of poverty are explained by intra-sectoral effects in terms of growth and redistribution; mobility effects tend to mitigate the reduction in poverty level and severity; the tertiary and undefined sectors have contributed to reducing the level of poverty as is the case for the primary, tertiary and undefined sectors having contributed to reducing the severity of poverty. Primary and secondary sectors have inhibited reduction in level of poverty, and the secondary sector has inhibited reduction in the severity of poverty.

Changes in the level and severity of poverty in the non-factual distribution lead to the same conclusions as the disaggregation of changes in the overall incidence of poverty.

Table 6c: Growth, redistribution and mobility components with respect to changes in poverty severity (FGT2): 2001-2007

Sector (k)	Evidence-based distribution				Non-factual distribution			
	Intra-sector growth	Intra-sector redistri-bution	Inter-sector mobility	AC on the ΔFGT2 =-0,0053	Intra-sector growth	Intra-sector redistri-bution	Inter-sector mobility	AC on the ΔFGT2 =-0,0076
Primary	-0,0002	-0,0021	0,0008	-0,0015	0,0097	-0,0141	0,0001	-0,0043
Secondary	0,0009	-0,0008	0,0002	0,0002	0,0009	-0,0016	0,0001	-0,0007
Tertiary	0,0000	-0,0019	0,0004	-0,0015	0,0023	-0,0039	0,0002	-0,0014
Undefined	-0,0013	0,0002	-0,0015	-0,0025	0,0005	-0,0012	-0,0006	-0,0012
Cameroon	-0,0006	-0,0047	0,0000	-0,0053	0,0134	-0,0208	-0,0002	-0,0076

Source: Author based on DASP and Excel software and ECAM II and ECAM III databases
Notes: AC is the absolute contribution.

6. Conclusion and recommendations

Conclusion

In summary, the aim was to empirically assess the relationship between microcredit, household well-being and change in poverty in the case of a developing country such as Cameroon. The impact of microcredit on household well-being was determined using Ordinary Least Squares, Double Least Squares and Double Least Squares Sample Correction. The Double Least Squares method was found to be adequate for studying this relationship compared to the other methods used. The study on household access to microcredit regarding poverty level was carried out based on non-factual analysis using the Shapley analysis with respect to growth, redistribution and mobility components. Therefore, the results of the study show that microcredits have a positive and significant effect on poverty reduction both in aggregate, and at the level of various sectors of economic activity.

Recommendations

Based on results obtained from the econometric approach and the Shapley analysis conducted in our study, we recommend the following:

- Microcredit institutions in the country should be promoted for their growth and expansion. The existence of a large number of microcredits should make it easier for even the poorest segment of the population to have access to small loans.

- Given that the primary sector employs individuals who are predominantly from the rural areas, and despite the fact that this sector is much more affected by poverty, it contributes largely to poverty reduction and has a multiplier effect on the other sectors. To this end, a policy promoting the proximity of microfinance institutions should be encouraged in rural areas. Consequently, access to microcredit for rural actors will facilitate an increase in agricultural production through the acquisition of agricultural inputs and diversification of crops.

- Access to microcredit must also be directed towards the secondary sector to finance groups with common interests, small and medium-sized enterprises

specializing in the production and processing of local products. These micro-enterprises will be able to compete with foreign firms and absorb domestic demand.

- Policies aimed at providing access to microcredit must be geared towards the idea of redistributing credit to a large number of poor people by increasing the volume of credit to those who previously benefited from it.

- Support and training policies for the beneficiaries of credit should be promoted to improve their entrepreneurial capacity and enable them to implement projects.

- Policies providing easy access to education and health must also be implemented in rural areas, since these elements are the most favourable factors for the well-being of households.

Notes

1. This model was initiated by Mohammed Yunus in the 1970s in Bangladesh. Yunus' goal is to find cures for poverty in the village of Jobra. To this end, Yunus grants small amounts of credit to groups of borrowers who are mutually responsible for repayment. This helps to solve the problem of physical collateral which is a hindrance to the poor. These credits have made it possible to finance the projects of the people of this village and thus solve their basic needs.

2. Franc – currency of the West African Financial Community.

3. Ando-Modigliani (1963) and Brumber (1954) were cited by Begg and al. (2002).

4. FGT_α is a result of Foster et al. (1984).

5. CFA = Financial cooperation in Africa

6. JIG : Joint Initiative Group

7. The traditional policy on access to credit is the one usually applied by lenders (microfinance banks) and it involves giving loans to the target population of these financial actors.

8. FGT =Foster-Greer-Thorbecke. The different values presented in the paper are expressed in absolute values.

9. FGT0 =Incidence of poverty, which corresponds to the ratio of the number of individuals living below the poverty threshold compared to the population as a whole.

10. FGT1 =Level of poverty, which is the relative gap between the poverty threshold and average household expenditure.

11. FGT2 =Poverty severity measures the distribution of expenditures of the poor in reference to the average expenditures of poor households.

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