Implication of Microfinance Debt Burden for Household Welfare: Lessons from Ghana

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Abstract

This paper draws on the quantitative and qualitative evidence from a dataset generated from a survey of 499 households in Ghana to explore the implication of household debt burden from access to microfinance for household financial distress and overall welfare. The findings suggest that while access to microfinance is generally good for the household, being highly indebted compromises household welfare through a reduction in expenditures, in particular food expenditures, while increasing the probability of credit constraint. The evidence suggests that debt service above 30 percent of total household expenditures creates financial distress and the observed distress is stronger for female-headed households relative to male-headed households. The analysis further shows that, a household's level of indebtedness is influenced by the type of microfinance, the interest rate, when the household is below the poverty line, and when the household holds more loans. The share of the loan allocated to investment and when the loan user is female, however, have a negative effect on the probability of a household being highly indebted. Contrary to expectations, neither financial literacy programs offered by microfinance institutions nor the education of the household head had any significant effect on a household's level of indebtedness.

Keywords: Microfinance, indebtedness, intra-household allocation, welfare.

JEL Classification: G21, D91, D120, D140, I31.

1. Introduction

> *"The short period given to repay the loan generates anxiety for my husband and I. We now have to spend so much on our health because we both have high blood pressure. Madam, they (MFIs) are killing us slowly."* **Elizabeth, microfinance client in Ghana.**

> *"I took the loan to restock my drug store. However, the location of my shop makes it difficult to increase sales. But the MFI loan officers are here every month to collect repayment and I don't have the amount because all the things I bought with the loan are on the shelf. I have BP (meaning high blood pressure) now. I wish I could have applied for*

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a bank loan instead but the banks require collateral and I don't have one." **Augustine (Elizabeth's husband), also a microfinance client in Ghana.**

Narratives such as quoted above resonated strongly during the survey of selected microfinance clients in Ghana interviewed individually for this study. In the development literature, significant evidence have been provided on the importance of finance for poverty reduction and welfare improvement at the aggregate level (Beck, Demirgüç-Kunt, & Levine, 2007; Clarke, Xu, & Zou, 2006; King & Levine, 1993). Most of the evidence however, allude to access to finance from the formal financial sector. However, in most developing countries, access to finance for the poor is mainly through the informal or the semi-formal sector, including microfinance institutions (MFIs). Indisputably, the poor's subjection to discrimination in terms of access to financial services from the formal financial sector in most developing countries, due to their lack of marketable collateral, and a contributory factor in the explosive growth of MFIs, is a consequence of financial market failure.

Indeed, microfinance is taking the center-stage in most developing countries as a major source of finance for the poor. The question is whether there is a risk that the conditions of the poor could be worsened through increased debt burden from access to credit from MFIs. This question is legitimate on account of the following reasons; cost channel: the interest rates charged by microfinance institutions tend to be relatively higher than those charged by banks, partly a result of the lack of competition in the sector, and thus poor households are in a sense caught up in a captive market; balance sheet effect: higher interest rates imply higher debt obligations for low income households with low returns to investment and therefore weaker balance sheet; and the lack of institutional mechanisms for households in developing countries to deal with debt distress. This situation may make it harder to obtain more external financing or even to increase or sustain expenditures thereby leading to worsening households' conditions.

No doubt, under the right conditions, access to microfinance often may be associated with positive outcomes at the micro-level (Imai, Arun, & Annim, 2010; Khandker, 1998; Mosley, 2001; Swain & Wallentin, 2009). On the flip side, however, doubts have been raised about the welfare impact of microfinance at both the individual and household levels. This is in view of the severe exposure of many poor people to MFIs in a number of developing countries including India, Nigeria, Bosnia and Pakistan. This means that for the poor who access credit from MFIs not to be caught in the debt trap, it is essential that they apply the credit obtained from MFIs to investments that generate high returns so that the profit rate is greater than the interest rate.

Unlike most developed countries, where households are able to acquire debt relief toward smooth spending without large penalties under bankruptcy systems in the event that their loans become delinquent, for most households in developing countries, and especially in Sub-Saharan Africa (SSA) countries, there are no institutional mechanisms to enable households to deal with financial distress should they go delinquent on their loans. This means that often there would be a reduction in household spending, and in some severe cases, a distress sale of their limited assets. The severe exposure of many poor people to MFIs especially in India, Nigeria, Bosnia and Pakistan, have led to calls for further scrutiny of the use of microfinance as a tool for poverty reduction (Bateman, 2010; Hulme, 2000). Bateman (2010) argues that microfinance, while it may offer some minimal benefits, is a 'poverty trap' and an 'anti-development policy' which may harm local communities economically and socially undermine their drive for escaping poverty. Fundamental to this argument is the belief that the 'new wave' model of microfinance

was based on a neo-liberal agenda that was being pushed in earnest during the 1980s (Bateman, 2010; Bateman & Chang, 2009).

This paper seeks to explore the implications of indebtedness from microfinance for household financial distress and overall welfare. The following two hypotheses are tested: (i) microfinance market characteristics are important determinants of a household's debt service burden; and (ii) high debt burden compromises household welfare.

The study draws on the qualitative and quantitative evidence from a unique dataset generated from a survey of 499 households in Ghana, undertaken in May to June 2013. The empirical analysis uses ordinary least squares in conjunction with two-stage least squares and maximum likelihood estimation methods to test the above hypotheses. The evidence shows that while access to microfinance is generally good, being highly indebted compromises household welfare through reduction in expenditures, in particular food expenditures, and by increasing the probability of being credit-constrained.

The rest of the paper is organized as follows. Following this introduction, the next section presents a review of the relevant literature. Section 3 presents the empirical analysis including the econometric specifications, the data and the empirical results. Section 4 concludes.

2. Literature Review

The advent of research work related to borrowers' over-indebtedness began to gain traction, following the chronic credit delinquency crises which emerged in Bosnia and Herzegovina, Pakistan, Morocco and Nicaragua from the mid to late 2000s (Chen, Rasmussen, & Reille, 2010).

While debt in itself may not necessarily be a bad thing, excessive debt burden is problematic. Debt may be viewed as a two-edged sword, welfare-improving but also potentially leading to disaster (Cecchetti, Mohanty, & Zampolli, 2011). It is welfare-improving as long as it is moderate and put to wise use. However, it can have negative effects when it is used imprudently and excessively.

Cecchetti et al (2011) argue that for individual households and firms, over-borrowing leads to bankruptcy and financial ruin and for a country, excessive debt blights the government's ability to deliver essential services to its citizens. A large build-up of household debt is therefore seen as facilitating economic contraction (Mishkin, 1978) and a threat to financial sector stability (Hull, 2003).

The debt burden for a household may be measured using the ratio of total monthly installment on household debt to monthly net income (Kappel, Krauss, & Lontzek, 2010). Another measure used in the literature and identified as having higher explanatory potential relative to debt to income ratio measures is debt to household wealth ratio (Dynan & Kohn, 2007). Recently, the issue of "over-indebtedness" of microfinance borrowers in most developing countries has also received immense attention in the microfinance literature. However, measuring over-indebtedness empirically has proved elusive. In fact, no clear definition of what really constitutes over-indebtedness has been agreed upon in the literature.

A common set of measures of over-indebtedness usually employed in the empirical literature involve the use of quantitative (in monetary terms) and/or qualitative (mostly subjective) measures. Quantitative measures of over-indebtedness include making high payments

relative to income, being in arrears, multiple borrowing around and in excess of four loan commitments (D'Alessio & Iezzi, 2013) and when a borrower's net resources, including income and realizable assets, make it persistently difficult to meet essential living expenses (see Stamp (2009)). Qualitative and mostly subjective measures identified in the literature include a borrower finding debt repayment as a burden (see (D'Alessio & Iezzi, 2013) or when a borrower struggles to meet repayment deadlines and requires repeatedly high sacrifices to meet loan obligations (see Schicks (2010)).

In one such studies, employing a quantitative measure of indebtedness, commissioned by the European Funds for Southeast Europe (EFSE), for three countries, Bosnia Herzegovina, Kosovo, and Azerbaijan in 2009, 2010 and 2011, respectively, the authors find that, 28 percent of microcredit clients are over-indebted in Bosnia Herzegovina, 25 percent are over-indebted in Kosovo and 30 percent are over-indebted in Azerbaijan (Maurer & Pytkowska, 2010; Pytkowska & Spannuth, 2011, 2012).

Using a subjective measure, based on the borrowers' own perceived struggles with the loan repayment, Schicks (2014), also finds that 30 percent of sampled micro-borrowers in Ghana are over-indebted. In the case of Southern India, the debt-driven suicide of more than 30 micro-borrowers which occurred mostly in the state of Andhra Pradesh in 2010 preceded critical attention to an elusive assessment of the extent of over-indebtedness among micro-borrowers, mostly rural farmers (Dobusch, Mader, & Quack, 2013; Schicks, 2013a, p. 168). Using both qualitative and quantitative analysis, Guérin et al (2013) also report that 20 percent of the households from four villages in Tamil Nadu were over-indebted between 2005 and 2009.

Among the factors identified as being the main causes of over-indebtedness are socio-demographic characteristics, economic-related factors, business and loan-related factors, sociological influences and cognitive influences (Schicks, 2013b, p. 15)[2]. On the basis of these factors, Schicks (2014) finds that micro-borrowers in Ghana, in particular male borrowers, are more likely to be over-indebted. In addition, borrowers with adverse economic shocks, low return on investments, and engagement in non-productive use of loans are more prone to being over-indebted. The impact of adverse shocks to economic activities was also found to be a contributory factor to the over-indebtedness of 85 percent of microfinance borrowers in Bolivia (see Gonzalez (2008, p. 159)).

One other study specifically identifies loan demand- and supply-related factors as contributing to over-indebtedness in Bosnia Herzegovina (see Maurer and Pytkowska (2010)). The loan demand-related factors identified include the deterioration of economic conditions and the evolution of an easy credit culture while the loan supply-related factors, including fierce competition, riskier lending, fast growth and lack of industry code of conduct, as well as high capital inflow into the financial sector (Maurer & Pytkowska, 2010, pp. 7-8). It is in view of the loan supply-related factors that some authors have argued that microfinance reinforces the possibility of financial juggling of institutions, products, and between formal and informal credit by households (Wampfler, Bouquet, & Ralison, 2014). The increased juggling options, which potentially influences the 'trajectories towards greater empowerment, diversification and accumulation' also imply greater risk of over-indebtedness mostly for the poorest households whose juggling practices are more frequently observed to be a reactive, rather than a proactive response (Wampfler et al., 2014, p. 229).

[2] See Schicks (2013b) for a comprehensive review of the drivers of over-indebtedness.

While research on borrowers' indebtedness from microfinance and its consequences is a burgeoning field, there is a well-documented literature on borrower in advanced economies that sheds some light on the consequences of a high debt burden. Over-indebtedness may have far-reaching consequences at the individual and household levels with potential spill-over effect to the macro-economy at large, particularly when it results in contagion. The empirical literature identifies economic (Burton, 2012; Gonzalez, 2008; Maki, 2002; Schicks, 2013a; Turunen & Hiilamo, 2014), sociological, and psychological consequences (Guérin, Roesch, Venkatasubramanian, & Kumar, 2013; Schicks, 2013a) among the most critical of the impact of over-indebtedness.

Even though Maki (2002) identifies increased household delinquencies and bankruptcies to be the direct consequences of high levels of household indebtedness, the empirical evidence provided on the US economy suggests no direct and consistent short-term impact of high levels of household indebtedness on their consumption pattern (Maki, 2002, p. 6). Evidence provided for the UK economy from 1997 to 2004 also shows that in general, higher debt levels do not raise the sensitivity of spending to shocks (Benito, Waldron, Young, & Zampotli, 2007, p. 74). Possibly explaining this weak link is that under the US bankruptcy system, households often acquire debt relief without incurring huge penalties and this usually results in household consumption even rising after the completion of bankruptcy cases (see Maki (2002)).

The adverse consequences of over-indebtedness on household consumption and welfare as well as the overall macroeconomic implications may be even more severe for developing countries compared to advanced countries for obvious reasons. In particular, for most developing countries the absence of institutional mechanisms in the event of borrowers' financial distress, either from over-indebtedness and/or high debt service burden, aggravates the livelihood conditions of borrowers, especially poorer ones. Debt with high constraints, such as high interest rates and short maturity, accompanied with high frequency repayments, characteristic features of microfinance loans, are by themselves enough to trigger significant concerns over financial distress. Added to the problem of debt with constraints is the volatility which characterizes the macroeconomic environment in most developing countries.

Schicks (2013a) provides evidence which shows that over-indebtedness from microfinance has implications for human capital investment leading to lower income-generating capacity. Similarly, high indebtedness which affects repayment capacity is identified to be associated with lower education levels and adverse health outcomes (Gonzalez, 2008; Schicks, 2013a; Turunen & Hiilamo, 2014). Further, (Burton, 2012) has also argued that high household indebtedness may lower households' buffer against shocks, which also creates dependency on close circle for daily survival (Guérin et al., 2013).

In terms of the sociological consequences of over-indebtedness, Guérin et al (2013), argue that over-indebtedness results in social stigma, domination in the household, and the loss of social networks for the borrower. Using Sen's concept of development as freedom, Guérin et al (2013), further argue that the consequences, should they occur, imply a reduction in the borrower's personal freedom of choice and ability to determine their lives. Specifically, Guérin et al (2013) found for micro-borrowers from four villages in Southern India that were over-indebted, that debt can be a source of impoverishment (i.e. for families with monthly debt service being about a third of monthly income), pauperization (i.e. where monthly debt service is 100 of

monthly income), and dependency (where families are unable to repay and find themselves in cycles of debt and dependency on relatives).

The direct psychological consequences of high indebtedness identified in the literature include depression, low self-control, feelings of self-efficacy, insufficiency, alienation and guilt pushing defaulters into crime and suicide (Hatcher, 1994; Maciejewski, Prigerson, & Mazure, 2000; Schicks, 2013a). Empirical evidence in Canada, Britain, and the US suggest that high household debt is indeed correlated with lower psychological well-being (see Brown (1952); Bridges and Disney (2010) and Drentea and Lavrakas (2000)). The aggressive tactics of close-marking, abusive languages and threats, which are usually employed by lenders to enforce repayments by delinquent borrowers, may also have adverse psychological impacts (also see Schicks (2013a).

High household indebtedness may also trigger high rates of defaults and delinquency crises. Among the main factors, identified as being at the heart of the 2004-2008 delinquency crisis in the microfinance markets in Nicaragua, Morocco, Pakistan and Bosnia and Herzegovina, are lending concentration and multiple borrowing, overstretched MFI capacity and a loss of MFI credit discipline (Chen et al., 2010). Other secondary factors identified as also influencing the speed and spread of delinquency crisis included external forces operating through macroeconomic conditions, local politics and events, and contagion (Chen et al., 2010, p. 14). The factors likely to have worked through borrowers' over-indebtedness, creating a vicious cycle of over-indebtedness and delinquencies, would include multiple borrowing and macroeconomic conditions.

Indeed, as a result of the increasing over-indebtedness and repayment crises experienced by majority of borrowers in some microfinance markets, an attempt has been made to develop an early warning index using a sample of 13 countries (Kappel et al., 2010). On the borrower side, multiple borrowing, often associated with 'debt juggling' in the literature, is among the leading variables identified as preceding and predicting most of delinquency crises in some microfinance markets (see Maurer and Pytkowska (2010); Pytkowska and Spannuth (2011) and Kappel et al. (2010)). Average loan balances per borrower as well as loan requirements placed on borrowers are other leading indicators from the demand side which were found to be critical in the construction of the over-indebtedness index (Kappel et al., 2010, p. 6).

This paper is not an attempt to quantify the percentage of households who are over-indebted to MFIs. However, the paper is an attempt to examine the thresholds of indebtedness that contribute to financial distress in a typical household with access to microfinance. To the best of our knowledge, this study is the first study, which examines for Ghana, the thresholds of MFI debt beyond which a household is at a high risk of being financially distressed and which potentially compromises household welfare. Specifically, the paper tests the following hypotheses; (i) microfinance market characteristics are important determinants of a household's debt service burden; (ii) A high debt burden compromises household welfare by increasing the probability of financial distress and credit constraint; and reducing expenditures, in particular, food expenditures.

3. Empirical Analysis

3.1 The data and key variables

The study draws on the quantitative and qualitative evidence from a unique dataset generated from a survey of 499 households, with and without access to microfinance, from a field research work undertaken in Ghana from May to July 2013[3]. The survey collected household-level data on access to credit from MFIs, overall balance sheet, and demographic characteristics. The survey covered two regions, Central and Greater Accra which have a significant concentration of microfinance institutions. To reduce selection bias, households with microfinance were randomly selected from the clientele list of randomly selected MFIs and households without microcredit were randomly sampled within the same communities. Out of the sample of 499 households used in the analysis, 252 households had received MFI loans while 247 had never taken loans from microfinance institutions.

The analysis proceeds by first testing whether access to microfinance, and therefore financial inclusion, is good for household welfare. To do this, the study uses a household's participation in MFI programs as a measure of financial inclusion. Two measures of household welfare are used in this study. The first measure is a qualitative measure and is based on a household's perceived welfare. Specifically, households were asked to assess their relative welfare, that is, in comparison to their contemporaries over the last 12 months. The responses allow us to derive a measure of a households' perceived welfare with or without access to microfinance. This qualitative measure takes the value "1" if a household perceives its current welfare to be above or equal to average, and "0" otherwise. The second measure is household expenditures, defined at two levels, food expenditures and total essential household expenditures.

Following conventions in the literature on indebtedness, this study measures a household's debt burden as the ratio of its monthly debt service to its monthly income. However, given the problems associated with reported income in developing countries, other measures of indebtedness will be explored to ascertain the impact of microfinance debt holding on the welfare of households. In particular, the monthly debt service to essential household expenditures ratio, and debt to asset ratio seem to be the most objective measures of indebtedness for developing countries as these measures tend to be less prone to reporting errors.

This paper defines household financial distress as "the persistent difficulty encountered by households in the servicing of their debt." To implement this in the empirical analysis, we employ a dummy variable for financial distress. Specifically, a dummy of "1", representing financially distressed households (includes households having persistent difficulties in servicing their loans, some of whom frequently had to forego basic needs in order to service loans) and "0", otherwise. Using the measures of indebtedness above, the study further examines the level of household indebtedness that result in financial distress. This paper shares the belief that while microfinance customers have good reasons to take loans, over-indebtedness has detrimental effects on household welfare.

To ascertain the extent to which households are credit constrained the study examines both the qualitative and quantitative evidence. In terms of the qualitative evidence, an individual is said to be credit constrained when s/he was discouraged from borrowing or made the attempt to

[3] The Socio-economic Characteristics of Households are reported in the Appendix on Table A1.

borrow but was rejected. In terms of the quantitative credit constraints facing a household, two measures are employed. For the first measure, the data used is based on responses obtained from households who were asked to indicate the loan amount they would like to borrow (DD_{credit})[4] and the loan amount that was granted (SS_{credit}). The difference between DD_{credit} and SS_{credit} provides us with the first measure of credit constraint. A positive value implies the household is credit constrained. A negative value implies the household faces no credit constraint. In the second measure of credit constraint, we examine the difference between DD_{credit} and the borrowers' reported credit limit.[5] As noted by Diagne (2000), this measure of access to credit depends on both lender and borrower characteristics and actions as well as on random events that affect the fortune of lenders and other potential borrowers. Specifically, one has access to a certain type of credit when the maximum credit limit, b_{max}, for that type is strictly positive. In the same vein, a positive value implies the household is credit-constrained and a negative value implies the household faces no credit constraints. On the basis of the second measure of credit constraint, we derive a dummy variable for credit constraint which takes the value "1" if a household is credit constrained and "0" otherwise.

3.2 Stylized Facts from the data

The aggregate debt holding from all sources for households with access to microfinance in our sample stands at GH¢503,598.4 (equivalent to US $251,799.2)[6], with microfinance debt accounting for approximately 90 percent of this total debt holdings (see Table 1). Most microfinance loans are granted on a short-term basis, ranging from 3 to 6-month period. A few of these loans, about 10 percent, have maturity ranging from 7 to 24 months. In general, microfinance loan repayments are made on a daily, weekly, biweekly or monthly basis with the objective to minimize defaults.

The cost of the loans sourced from MFIs is generally high. The survey data shows that, on average, the monthly interest rates charged on these loans is about 5 percent. This average translates into an annual percentage rate of 79.6 percent for MFI loans. What is troubling is that roughly 77 percent of respondents who have accessed credit from MFIs do not know the interest rate being charged on these loans. It is worthwhile to note that loans with longer maturity tend to have lower interest rates. On average, the amount of credit received was GH¢1,410 (US$705).

Generally, microfinance loans are offered mostly to those who are involved in small and medium scale business activities and rarely to those who require loans to supplement income used for household expenditures. From our data analysis, about 63 percent of loan recipients applied the credit received fully to their business enterprises (Table 2). Eleven percent of loan recipients applied the credit to household expenditures (specifically to consumption, education, and health expenditures). The remaining 26 percent applied varying percentages to either home enterprise or to household expenditures. This evidence shows that the strict rule by the MFIs, which requires recipients to apply the credit to their business enterprises, are difficult to enforce in practice.

[4] Module C1 and C2 of the household survey questionnaire provide the details of the data used here.

[5] This follows Diagne (2000) who quantifies the extent of household access to credit using the credit limit concept.

[6] The exchange rate at the time of the survey, June 2013, was $1 to GH ¢2.

3.3 Econometric analysis

This section applies econometric analysis to examine the implication of MFI debt burden for household welfare. Specifically, the following two hypotheses are tested; (1) Microfinance market characteristics are important determinants of a household's debt service burden; (2) A high debt burden compromises household welfare by increasing the probability of financial distress and credit constraint; and reducing expenditures, in particular, food expenditures.

3.3.1 Empirical Models

Welfare implications of access to microfinance

Before proceeding with the analysis, it is first important to examine whether the mere access to microfinance, and therefore financial inclusion, is welfare-enhancing for households. To do this, we apply logistic regressions and two-stage least squares. The analysis will involve the use of both qualitative and quantitative measures of welfare. To avoid obtaining inconsistent and bias estimators, the two-stage least squares methodology is applied to the quantitative measure given potential endogeneity of some of the regressors used to predict household welfare.

The impact of access to microfinance on the household subjective welfare will be investigated by estimating the following logistic regression model:

$$Pr(W_i = 1) = \varphi(\delta + \boldsymbol{X}_i'\gamma_2 + \beta AC_i) \quad (1)$$

Where φ is the cumulative density function of a normal distribution; *i* refers to the *i*th households; W_i takes the value "1" if household perceives its welfare to be average or above average, and "0" if it perceives welfare to be below average; AC_i is a dummy that indicates access to microfinance; it takes the value "1" when the household has access to microfinance and "0" otherwise. The use of the dummy is appropriate in view of the fact that we want to examine the impact of the mere access to microfinance on welfare for all households in our sample, including those with and without access to credit. We hypothesize that $\beta > 0$. $\boldsymbol{X}_i$ is a set of control variables.

Following the literature, we control for household-specific characteristics, which also influence household welfare. The household-specific variables include demographic characteristics and current levels of wealth. The demographic characteristics of households included are the level of education and marital status of the household head, and whether the household head is self-employed; the household size; age dependency; and a household's access to utilities, which we proxy with access to clean water. We control for the wealth of the household by including a dummy for land ownership, which takes the value "1" when the household owns land and "0" otherwise as well as a dummy for the ownership status of the dwelling, which also takes the value of "1" when the dwelling is owner occupied and "0" otherwise. In addition, assets and income measures are controlled for by running two separate equations that interchanges the asset and income measures. In addition, we control for the share of health and education expenditures in total household expenditures. Equation (1) is estimated using the maximum likelihood estimation method.

The following model, which uses food expenditures as an objective measure of household welfare will also be estimated using the two-stage least squares methodology. This is due to the possible endogeneity of some of the regressors explaining household welfare.

$$FEpp_i = a_0 + \boldsymbol{X}_i'\gamma + \alpha AC_i + \epsilon_i \quad (2)$$

Where *i* refers to the *i*th households; $FEpp_i$ is the dependent variable and refers to the quantitative measure of household welfare being food expenditure per person; AC_i and $\boldsymbol{X}_i$ are as defined in equation (1) above. We hypothesize here that $\alpha > 0$.

Determinants of household debt service burden

To test hypothesis (1), we postulate the following relationship between the debt service burden and the characteristics related to the microfinance market, the borrower, the household and geographical location of the dwelling:

> Debt Service Burden = f (MFI market characteristics, borrower characteristics, household characteristics, and locality characteristics).

The dependent variable, debt service burden, is defined as the monthly debt service to essential expenditures ratio[7]. However, due to the fact that the debt service ratio is not normally distributed[8], an alternative technique is to derive thresholds of the debt service burden and modeled to arise sequentially as a latent variable, y*, which crosses progressively higher thresholds. Specifically, three thresholds[9] of the debt burden are derived. The thresholds are based on the increasing levels of severity of the ratio of debt service to essential expenditures (monthly). This approach seems more appropriate given that we are interested in understanding factors that influence being in a higher debt burden category relative to a lower category. The three categories, arbitrarily derived, are low debt burden, moderate debt burden and high debt burden. Low debt burden takes the value "1" for debt service ratios less than 25 percent, moderate debt burden takes the value "2" for debt service ratios between 25 percent and 40 percent, and high debt burden takes the value "3" for debt service ratios above 40 percent.

The following ordered logit model is estimated:

$$P(DB_i = j) = \Psi[\eta_j - \boldsymbol{X}_j\gamma] - \Psi[\eta_{j-1} - \boldsymbol{X}_j\gamma] \quad (3)$$

Where j=1, 2, 3 (1: Low debt burden; 2: Moderate debt burden; and 3: High debt burden); *i* refers to the *i*th households and $\boldsymbol{X}$ is a set of control variables. To estimate this model, a log-likelihood is required, thus we define an indicator variable, Z_{ij}, which equals 1 if $y_i = j$ and 0 otherwise. The log-likelihood is given by:

$$In\ L = \sum_{i=1}^{N}\sum_{j=0}^{3} Z_{ij}\, In[\Psi_{ij} - \Psi_{ij-1}]$$

[7] Results using the debt service to income ratio can be provided upon request.
[8] See Appendix: Figures A1.
[9] Similar thresholds are used for the debt service to income ratio measure.

Where $\Psi_{ij} = \Psi[\eta_j - \boldsymbol{X}_j\gamma]$ and $\Psi_{ij-1} = \Psi[\eta_{j-1} - \boldsymbol{X}_j\gamma]$

The independent variables are chosen based on the theoretical and empirical literature on household finance. The independent variables of interest are the microfinance market/loan characteristics. The characteristics of the microfinance market that the data allows us to analyze include the following; the type of microfinance institution from which the loan was accessed, (i.e. whether the loan was accessed from a formal or informal microfinance institution), whether the loan was granted on an individual basis or on group basis, whether the MFI program provided some form of financial literacy, whether the loan term was above 6 months, and finally, the interest rate charged on the loan. The household-specific characteristics include the age, education level and employment status of the household head; the household size and the poverty status. Other characteristics which are borrower-specific are the number of loans, and the use of the loan, specifically, whether more than 50 percent of the loan was used for home enterprise or not and the gender of the loan user. The ordered outcome model from equation (1) above is estimated using the maximum likelihood estimation method.

Financial Distress and Credit Constraint Analysis

We test our second hypothesis using different econometric approaches involving the use of logistic regression and ordinary least squares analysis. First, we are interested in understanding the relationship between indebtedness and household financial distress on one hand, and credit constraint on the other. Second, we analyze the impact of actual debt burden on food expenditures.

To examine the impact of household indebtedness on the probability of a household being financially distressed and credit constrained the following logistic regression models are estimated:

$$Pr(FD_i = 1) = \varphi(\alpha + \boldsymbol{X}_i'\gamma_1 + \beta_1 DB_i + \beta_2 DB_i^2) \quad (4)$$

$$Pr(CC_i = 1) = \varphi(\delta + \boldsymbol{X}_i'\mu_1 + \tau_2 DB_i) \quad (5)$$

Where φ is the cumulative density function of a normal distribution; *i* refers to the *i*th households; FD_i in equation (4) takes the value "1" if household is financially distressed, and "0" otherwise; CC_i in equation (5) takes the value "1" if a household is credit constrained and "0" if otherwise; DB_i is a measure of the household's indebtedness; for equation (4) we use the debt service ratio and for equation (5) we use the thresholds of debt derived for equation (1). $\boldsymbol{X}_i$ is a set of control variables. The control variables include household-specific characteristics and MFI-specific variables. The household-specific variables include demographic statistics: the age of the household head, the level of education; wealth indicators: ownership of land, number of rooms within the household, access to utilities and infrastructure, proxied by the location of the household in urban area MFI-specific variables to be included the type of microfinance finance institution, that is, whether the MFI from which the loan was accessed is a formal or an informal institution and whether the loan contracted on an individual or group loan. Equations (4) and (5) are also estimated using the maximum likelihood estimation method. For equation (4), we

hypothesize that $\beta_1 > 0$; and $\beta_1 < 0$. For equation (5) we hypothesize that $\tau_2 < 0$ at low levels of debt and $\tau_2 > 0$ at higher levels of debt.

Debt burden and food expenditures analysis

The implications of the debt burden for food expenditures will further be examined using the following model:

$$E_i = a_0 + \boldsymbol{X}_i'\gamma + \alpha DB_i + \epsilon_i \qquad (6)$$

Where *i* refers to the *i*th households; E_i is the dependent variable and refers to a household's annual food expenditures. As a robustness check, the model is re-estimated using total household expenditures as the dependent variable; DB_i is a measure the debt burden, which in this case will be the debt to asset ratio. $\boldsymbol{X}_i$ is as defined in equations (4) and (5) above. We estimate the model using OLS.

3.3.2 Discussion of the Results

Welfare implications of Access to Microfinance – All Households

First, we discuss the results of the impact of access to microfinance on household welfare which are estimated by including all the households in our sample. The descriptive statistics are reported on table A2 in the appendix. The results[10] are reported on tables 3 and 4 for equations (1) and (2) respectively. The results show that access to microfinance is positively associated with household welfare.

Specifically, the results show that the odds of a household being well-off are 77 percent higher for households with access to microfinance than their counterparts without and this is statistically significant at the 1 percent level (see column 4 of table 3). Having a 1-standard-deviation-higher percentage of households with access to microfinance increases the odds of household being well off by 33 percent (see column 5 of table 3). Control variables found to be statistically significant include the years of schooling of the household head, asset per person, the share of human capital expenditures in total household expenditures, and the employment status of the household head.

The results from the two-stage least squares regression are reported on table 4. The results also confirm that access to microfinance increases household welfare as measured by food expenditures per capita, between 95 to 135 percent (see columns 2 & 3 on table 4). Control variables found to be statistically significant include assets per person, access to clean water, the years of schooling of the household head, age dependency, household size, dwelling ownership, and the share of health and education expenditures in total household expenditures (see table 4).

[10] See tables A3 in the Appendix for detailed results including the base and full regression results for the logit model estimation of household welfare.

Hypothesis 1: Microfinance market characteristics are important determinants of a household's debt service burden

Determinants of debt service burden

The descriptive statistics for the variables used in the analysis are presented on table A4. The results are reported on table 5. The results show the importance of microfinance market characteristics as well as borrower and household characteristics for indebtedness. We test the relationship also using the debt service to income ratio and the results are similar.

Microfinance characteristics that have statistically significant influence on indebtedness are, the interest rate, the type of microfinance, and the loan maturity. In particular, holding all variables at their means, a 100 percent increase in the interest rate increases the probability of being in the high debt burden category by 16 percent (see column 6, table 5), while contracting the loan from a formal MFI increases the probability of being in the high debt burden category by 18 percent (see column 6, table 5). The finding that formal MFIs, relative to informal MFIs, increases the probability of being highly indebted is plausible, in that, formal MFIs on average offer larger loan amounts compared to the informal MFIs. Loan maturity above 6 months decreases the probability of being in the high debt burden category by 12.5 percent (see column 6, table 5). Holding an individual loan and receiving financial literacy decreases the probability of being in the low debt burden category, however, they are statistically insignificant.

Borrower characteristics that are also statistically significant for household indebtedness are the number of loans, share of investment credit in total MFI credit and the gender of the user of the credit. Holding all variables at their means, contracting more than one loan increases the probability of being in the high debt burden category by 31.7 percent (see column 6, table 5). A unit increase in the share of investment credit in total MFI credit decreases the probability of being in the high debt burden category by 28 percent (see column 6, table 5). Similarly, the probability of being in the high debt burden category decreases by 20.2 percent when the user is female.

Household characteristics are critical for the debt service burden as indicated by the statistically significant coefficients on the poverty status, the owner occupier status of the dwelling, the household size and the number of rooms in the household. Specifically, the probability of being in the high debt burden category increases when the household is below the poverty line, owns the dwelling and has relatively more rooms. Further, the results suggest that household size greater than 4 decreases the probability of being in the high debt burden category, which is counter-intuitive. *A priori*, one would expect that a larger household size positively influences indebtedness. The negative relationship between household size and indebtedness, however, imply that household size alone is not a sufficient condition for indebtedness and that the composition of the family in a household and as well as their occupation are important for household indebtedness.

Hypothesis 2: High debt burden compromises household welfare.

Impact of debt burden on financial distress

The descriptive statistics for the financial distress analysis are reported on table A5 in the appendix. The results for equations (4) showing their marginal effect estimates are reported on

tables 6. The results confirm the hypothesis that, on average, when we control for microfinance market, household, and borrower characteristics, the probability of reporting financial distress is positively associated with the debt service burden. The results show that a unit increase in the debt service ratio increases the probability of reporting financial distress by about 76 percent, and this is statistically significant (see columns 3 and 5, table 6). The squared term of the debt service ratio entered significantly suggesting a non-linear relationship between financial distress and the debt service ratio.

We find that being a female loan user is negatively associated with the probability of financial distress, and its effect is significant. While receiving financial literacy from MFIs is negatively associated with the probability of financial distress, its effect is insignificant. Similarly, accessing the loan from a formal MFI relative to an informal MFI is positively associated with the probability financial distress, though, its effect is insignificant. This result was however, contrary to expectation given that loans from formal MFIs have longer maturity and lower interest rates compared to informal MFIs, which can potentially reduce financial distress. We interacted the dummy variable for formal MFI with the interest rate and find a negative coefficient for the interaction term, but its effect was insignificant. Including the interaction term, however, renders a positive and significant effect of formal MFIs on the probability of financial distress.

Borrower characteristics which is positively associated with the probability of financial distress is when more than 50 percent of the loan is applied to home enterprise and this is statistically significant (see column 3, table 6). Applying more than 50 percent of loan to home enterprise increases the probability of reporting financial distress by 18 percent and this is also statistically significant. Theoretically, the relationship between loan use and the probability of financial distress could be negative or positive. The relationship could be positive if applying more credit to investment constrains the household in terms of the ability to afford basic household needs initially. Overtime, one would expect that if the investment is profitable, the financial constraint experienced initially will ease and possibly result in a negative relationship.

Other household characteristics that are negatively associated with the probability of financial distress are the years of schooling of household head, annual income and a self-employed household head, and their effects are also significant (see table 6). Household characteristics that are positively associated with the probability of financial distress are when the household is located in the regional capital, the household size, health problems and number of rooms, and their effects are statistically significant (see table 6).

The prediction plots of financial distress as a function of the debt service ratio, ranging from 0.01 to 1, are also shown on figures 2, 3, and 4. On average, predicted probability of financial distress is lower for debt service ratios below 0.3 (30 percent) and begins to rise afterwards (see figure 2). We examine the predicted probability of financial distress by the gender of the household head as well as the poverty status of the household and the plots suggest that on average, the probability of reporting financial distress as a function of the debt service ratio differ by the gender of the household head and the poverty status of the household (see figures 3 and 4).

We note that on average, though the probability of financial distress begins at a threshold of about 0.35 to 0.40 of the debt service to essential expenditures ratio for female-headed households compared to about 0.20 for male-headed households, the rate of increase in the probability of financial distress of debt service ratio from 0.40 is higher for female-headed households compared to male-headed households (see figures 3 and 4). We include a dummy for if the household head is female in our model used to estimate financial distress and find a positive but insignificant coefficient. While the probability of reporting financial distress begins at a threshold of about 0.40 of the debt service to essential expenditures ratio for households on or below the upper poverty line[11], the probability of financial distress begins at about 0.30 of the debt service to essential expenditures ratio for households above the upper poverty line.

The computed average predicted probabilities based on the estimated model for debt service ratios from 0.01 to 1 for equation (4) are also shown on figure 5. We note that, after controlling for MFI market, borrower and household characteristics, the average predicted household financial distress is higher at higher levels of the debt service burden (see figure 5). We also test the relationship using the debt service to income ratio measure and the results are confirmed.

Impact of debt burden on being credit constrained

The descriptive statistics for the analysis of the implication of indebtedness for a household reporting to be credit constrained are reported on table A6 in the appendix. The results for equations (5) including the marginal effects are reported on table 7. Here also, the hypothesis that a high debt service burden is positively associated with being credit constrained, after controlling for selected household characteristics, is confirmed. We also test the relationship using the debt service to income ratio measure and the results are similar.

The results show that the probability of being credit constrained increases with the increasing severity of the debt service burden (for debt service to essential household expenditures ratios above 25 percent). In particular, after controlling for household characteristics, a change from the low burden to moderate burden category increases the probability of being credit constrained by 25.8 percent while a change from the low burden category to the high burden category increases the probability of being credit constrained by 34.2 percent (see column 3, table 7). Some household characteristics enter significantly and are positively associated with the probability of being credit constrained. These include the years of schooling of the household head, the regional location of the household, household size greater than four, and when the household report health problems (see table 7).

The prediction plots of credit constraint as a function of the debt service ratio, ranging from 0.01 to 1, is also shown on figure 6. On average, the plots show that the probability of reporting credit constraint increases from about 0.45 (i.e. 45 percent) of the debt service to essential expenditures (see figure 6).

[11] Upper poverty line is at GHS 1314 per adult (equivalent to $657.00).

Impact of MFI debt burden on food expenditures

We further examine the impact of microfinance debt holdings only for households with access to microfinance by re-estimating equation (6) above using ordinary least squares (OLS). Quadratic terms for the debt to asset ratio (per person) and the age of the household head are also introduced to allow for non-linear effects of these variables on welfare measures.[12] We carry out the estimation by also controlling for the share of investment credit in total MFI credit. The summary statistics are reported on table A7 in the appendix.

The results from the OLS estimation of equation (6) is reported on table 8. The results confirm a negative relationship between expenditures and debt holdings indicating that higher levels of debt reduces expenditures, in particular, food expenditures. We test the robustness of these results using other measures of microfinance debt holdings, all of which confirm the results.[13] The results from table 8 suggest that a unit increase in debt to assets (per person) ratio will result in over 100 percent reduction in expenditures and this is statistically significant. Similarly, a 100 percent increase in the share of investment credit to total microfinance credit will lead to roughly 14.8 percent to 22 percent decrease in expenditures.

The plot of the average predicted probabilities of the log of annual food expenditures and all household essential expenditures over the debt to asset ratio (per person), ranging from 0.01 to 1, suggests that debt distress is a real problem for households in our sample (see figure 7). In particular, we note that at low levels of debt, household expenditures are relatively higher when compared to household expenditures at high levels of debt. At higher debt burden expenditures are lower, probably due to the fact that households must necessarily spend more to service their loans hence the lower expenditures. However, as debt crosses a certain threshold, households are able to increase their expenditures, probably allocating some of the debt to expenditures. The results, shown on table 9, indicate that the debt to asset (per person) ratio at which food expenditures begin to increase is about 0.66 (also see figure 7). The estimated log of household food and total essential expenditures is 5.16 and 4.82, respectively, which is lower than their respective mean of 7.8 and 8.5.

We also compute and plot the average predicted log of food expenditures for debt to asset ratios ranging from 0.01 to 1, based on the estimated results for equation (6). The plots reveal that after controlling for MFI market, borrower and household characteristics, the predicted probability of the log of food expenditures declines until a debt to asset threshold of about 65 percent and then begins to rise thereafter (see figure 8).

4. Conclusion

The study set out to test the following two hypotheses: (1) microfinance market characteristics are important determinants of a household's debt service burden; and (2) a high debt burden compromises household welfare.

[12] Welfare measures used are the annual food expenditures and the annual total household essential expenditures.

[13] Other measures employed are MFI debt to income, total debt to total assets, and MFI debt service to income. These results will be provided upon request.

The results from the econometric analysis confirm both of the hypotheses. Three key findings are worth mentioning. First, while access to microfinance is generally good for household welfare, being highly indebted compromises household welfare as this result in a reduction of household expenditures, in particular, food expenditures, and by increasing the probability of financial distress and credit constraint. Second, the evidence suggests that debt service to essential expenditures ratio above 30 percent creates significant financial distress and the observed distress is worse for female-headed households relative to male-headed household. This is disturbing given the absence of institutional mechanisms in Ghana to deal with such distress. Finally, microfinance market characteristics as well as, borrower-specific and household-specific characteristics are important factors explaining household indebtedness. Indebtedness is primarily determined by the type of microfinance (formal MFI relative to informal MFI), the interest rate, whether the household is below the poverty line and the number of loans contracted by the household holds. The share of credit allocated to investment and when the loan user is female, however, have a negative effect on the probability of a household being highly indebted. Contrary to expectations, neither the financial literacy offered by MFIs nor the education of the household head had any significant effects on household indebtedness.

This paper contributes to the growing body of empirical literature focused on the household-level welfare impact of access to microfinance. The paper also contributes to a relatively new area of research focused on borrower debt distress from access to microfinance. Further research is required to understand the effects of household composition and the occupational status of adult members of a household on indebtedness. More research is also required to examine the specific ways through which the dynamics of the different microfinance models affect borrowers. Future research could also shed light on the extent to which social cohesion interact with indebtedness from microfinance as well as the welfare impact of other aspects of access to microfinance, including savings deposits.

REFERENCES

Bateman, M. (2010). *Why doesn't microfinance work?: the destructive rise of local neoliberalism*: Zed Books.

Bateman, M., & Chang, H.-J. (2009). The microfinance illusion. *Available at SSRN 2385174*.

Benito, A., Waldron, M., Young, G., & Zampotli, F. (2007). The role of household debt and balance sheets in the monetary transmission mechanism. *Bank of England Quarterly Bulletin, 47*(1).

Bridges, S., & Disney, R. (2010). Debt and depression. *Journal of Health Economics, 29*(3), 388-403. doi:http://dx.doi.org/10.1016/j.jhealeco.2010.02.003

Brown, T. M. (1952). Habit persistence and lags in consumer behaviour. *Econometrica: Journal of the Econometric Society*, 355-371.

Burton, D. (2012). *Credit and consumer society*: Routledge.

Cecchetti, S. G., Mohanty, M. S., & Zampolli, F. (2011). The real effects of debt. *BIS Working Paper, No. 352.* . Retrieved from

Chen, G., Rasmussen, S., & Reille, X. (2010). Growth and vulnerabilities in microfinance. *Focus Note, 61*.

D'Alessio, G., & Iezzi, S. (2013). Household over-indebtedness: definition and measurement with Italian data. *Bank of Italy Occasional Paper*(149).

Diagne, A. (2000). Towards a New Measure of Access to Credit. *Rural Financial Policies for Food Security of the Poor, IFPRI Policy Brief*(No. 13).

Dobusch, L., Mader, P., & Quack, S. (2013). *Governance across borders: Transnational fields and transversal themes*: epubli GmbH.

Drentea, P., & Lavrakas, P. J. (2000). Over the limit: the association among health, race and debt. *Social science & medicine, 50*(4), 517-529.

Dynan, K. E., & Kohn, D. L. (2007). The Rise in US Household Indebtedness: Causes and Consequences. *THE STRUCTURE AND RESILIENCE OF THE FINANCIAL SYSTEM*, 84.

Gonzalez, A. (2008). *Microfinance, incentives to repay, and overindebtedness: Evidence from a household survey in Bolivia.* The Ohio State University.

Guérin, I., Roesch, M., Venkatasubramanian, G., & Kumar, S. (2013). The social meaning of over-indebtedness and creditworthiness in the context of poor rural South Indian households (Tamil Nadu). In I. Guérin, S. Morvant, & M. Villarreal (Eds.), *Microfinance, Debt and Over-Indebtedness. Juggling with Money, Routledge, Londres* (pp. 125-150): Routledge.

Hatcher, S. (1994). Debt and deliberate self-poisoning. *The British Journal of Psychiatry, 164*(1), 111-114.

Hull, L. (2003). Financial deregulation and household indebtedness. *Reserve Bank of New Zealand Discussion Paper No. DP2003/01*.

Hulme, D. (2000). Is microdebt good for poor people? A note on the dark side of microfinance. *Small Enterprise Development, 11*(1), 26-28.

Kappel, V., Krauss, A., & Lontzek, L. (2010). *Over-Indebtedness and Microfinance-Constructing an Early Warning Index.* Paper presented at the UMM workshop report.

Maciejewski, P. K., Prigerson, H. G., & Mazure, C. M. (2000). Self-efficacy as a mediator between stressful life events and depressive symptoms Differences based on history of prior depression. *The British Journal of Psychiatry, 176*(4), 373-378.

Maki, D. (2002). The Growth of Consumer Credit and the Household Debt Service Burden. In T. Durkin & M. Staten (Eds.), *The Impact of Public Policy on Consumer Credit* (pp. 43-68): Springer US.

Maurer, K., & Pytkowska, J. (2010). Indebtedness of Microcredit Clients in Bosnia and Herzegovina, Results from a comprehensive field study. *European Fund for Southeast Europe (EFSE)*.

Mishkin, F. S. (1978). The household balance sheet and the Great Depression. *The Journal of Economic History, 38*(04), 918-937.

Pytkowska, J., & Spannuth, S. (2011). Indebtedness of Microcredit Clients in Kosovo. *EFSE. Stamp, Stuart.(2009).“A Policy Framework for Addressing Over-indebtedness”. Combat Poverty Agency, Dublin, Ireland*.

Pytkowska, J., & Spannuth, S. (2012). The Risk of Over-indebtedness of Microcredit Clients in Azerbaijan. Results from a comprehensive field study. *European Fund for Southeast Europe (EFSE)*.

Schicks, J. (2010). Microfinance Over-Indebtedness: Understanding its drivers and challenging the common myths. *Bruxelles: Centre Emilee Bergheim, Solvay School of Business, CEB Working Paper, 10*, 048.

Schicks, J. (2013a). From a supply gap to a demand gap? The risk and consequences of over-indebting the underbanked. In J. Gueyie, R. Manos, & J. Yaron (Eds.), *Microfinance in Developing Countries: Issues, Policies and Performance Evaluation* (pp. 244): PALGRAVE MACMILLAN.

Schicks, J. (2013b). Microfinance Over-Indebtedness: Understanding its drivers and challenging the common myths *Oxford Development Studies* (Vol. 41(sup1), pp. 95–116).

Schicks, J. (2014). Over-indebtedness in Microfinance–an empirical analysis of related factors on the borrower level. *World Development, 54*, 301-324.

Stamp, S. (2009). *A policy framework for addressing over-indebtedness*: Combat Poverty Agency.

Turunen, E., & Hiilamo, H. (2014). Health effects of indebtedness: a systematic review. *BMC public health, 14*(1), 489.

Wampfler, B., Bouquet, E., & Ralison, E. (2014). *Does juggling mean struggling? Insights into the financial practices of rural households in Madagascar.* (I. Guérin, S. Morvant, & M. Villarreal Eds.). London, UK: Routledge.

Table 1: Total debt holdings (GHS), Households with MFIs

Description	MFI	Others	**Total**	**% share of MFI**
Male	129,687.7	25,060.0	154,747.7	83.8
Female	305,171.7	25,929.0	331,100.7	92.2
Joint	17,250.0	500.0	17,750.0	97.2
Total	452,109.4	51,489.0	503,598.4	89.8

Source: Author's calculations based on survey data

Table 2: Household Credit Allocation

Borrowers (In Percent)	Home Enterprise (% of Credit)	Household Expenditures (% of Credit)
63	100	0
7	100<=>75	0>=<25
13	75<=> 50	29>=< 50
5	45<=> 15	55>=< 85
11	0	100

Source: Author's calculations based on survey data

Table 3: Welfare Implication of Access to Credit – All Sampled Households

Variables	**Logit Coef.**	**Odds Ratio**	**percent**	**%StdX**	**SDofX**
Access to Microfinance	0.572*** (0.009)	1.772*** (0.009)	77.2	33.1	0.499
Log of household head years of schooling	1.494*** (0.006)	4.455*** (0.006)	345.5	38.4	0.218
Number of rooms	0.106 (0.355)	1.112 (0.355)	11.2	12.7	1.124
Self-Employed Household head	-0.469* (0.050)	0.626* (0.050)	-37.4	-20.4	0.485
Log assets per person	0.219** (0.016)	1.245** (0.016)	24.5	35.6	1.387
Log of household size	-0.342 (0.349)	0.710 (0.349)	-29	-17.2	0.552
Dwelling Owned	0.280 (0.265)	1.323 (0.265)	32.3	14	0.468
Log of share of human capital expenditures in total household expenditures	0.361** (0.012)	1.435** (0.012)	43.5	43.4	0.998
Access to clean water	0.175 (0.458)	1.191 (0.458)	19.1	8.8	0.481
Age dependency ratio	-0.587 (0.357)	0.556 (0.357)	-44.4	-13.7	0.252
Household Head is Married	0.115 (0.709)	1.122 (0.709)	12.2	5.2	0.441

Notes: *** p<0.01, ** p<0.05, * p<0.1. pval in parentheses. The dependent variable is Households Perceived Welfare which takes the value of "1" if HH welfare>=average and "0" if below average. Percent=percent change in odds for unit increase in X; %StdX=percent change in odds for SD increase in X; SDofX=standard deviation of X. Where X refers to the explanatory/independent variables.

Table 4: Welfare Implications of Access to Microfinance – All Households

	Two-stage least squares	
Variables	**Model 1**	**Model 2**
Microfinance Dummy	1.351**	0.956*
	(0.034)	(0.068)
Household Size	-0.221*	-0.134
	(0.065)	(0.272)
Dwelling is owned	-0.321***	-0.310***
	(0.004)	(0.002)
Number of rooms in household	0.080*	0.056
	(0.087)	(0.124)
Assets per person	0.161***	0.139***
	(0.000)	(0.000)
Access to water		0.586***
		(0.000)
Age Dependency ratio		1.409***
		(0.000)
Log of Share of health and education expenditures in total household expenditures		-0.243***
		(0.000)
Household head Years of Schooling		0.404**
		(0.041)
Household Head is Married		-0.182*
		(0.087)
Income per person		
Household owns land		
Constant	5.536***	3.656***
	(0.000)	(0.000)
Observations	488	424
R-squared	-0.504	0.099

Notes: *** p<0.01, ** p<0.05, * p<0.1. pval in parentheses. The dependent variable is Food expenditures per capita – Adults.

Table 5: Determinants of the Debt Burden Thresholds – Expenditure Measure

Variables	Logit Coef	Odds Ratio	Marginal Effect - Overall Model	Marginal Effect - Low	Marginal Effect - High
Number of loans greater>1	1.509***	4.520***	-0.245***	-0.295***	0.317***
	(0.007)	(0.007)	(0.005)	(0.007)	(0.007)
Share of Investment Credit in Total MFI Credit (%)	-1.330**	0.265**	0.216**	0.260**	-0.280**
	(0.039)	(0.039)	(0.036)	(0.039)	(0.041)
Log of monthly interest rate	0.766**	2.150**	-0.124**	-0.150**	0.161**
	(0.044)	(0.044)	(0.039)	(0.045)	(0.043)
Loan user is female	-0.963**	0.382**	0.156***	0.189**	-0.202**
	(0.012)	(0.012)	(0.010)	(0.012)	(0.013)
Financial literacy received	0.319	1.375	-0.052	-0.062	0.067
	(0.295)	(0.295)	(0.291)	(0.295)	(0.295)
Formal MFI	0.850**	2.339**	-0.138**	-0.166**	0.179**
	(0.028)	(0.028)	(0.025)	(0.029)	(0.029)
Loan maturity >=6 months	-0.593*	0.552*	0.096*	0.116*	-0.125*
	(0.082)	(0.082)	(0.078)	(0.084)	(0.081)
Individual loan	0.170	1.185	-0.028	-0.033	0.036
	(0.569)	(0.569)	(0.568)	(0.569)	(0.569)
Urban	-0.600	0.549	0.098	0.118	-0.126
	(0.223)	(0.223)	(0.220)	(0.223)	(0.224)
Below Upper Poverty Line	1.235***	3.437***	-0.200***	-0.242***	0.260***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Owner occupied house	0.578**	1.783**	-0.094**	-0.113**	0.122**
	(0.044)	(0.044)	(0.040)	(0.045)	(0.044)
Household size>4	-1.290***	0.275***	0.210***	0.253***	-0.271***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of rooms=>household size	1.310***	3.708***	-0.213***	-0.257***	0.275***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Age of household head	-0.013	0.987	0.002	0.002	-0.003
	(0.367)	(0.367)	(0.365)	(0.366)	(0.368)
Household head has post primary Education	0.184	1.202	-0.030	-0.036	0.039
	(0.599)	(0.599)	(0.599)	(0.600)	(0.600)
Self-Employed Household Head	0.264	1.303	-0.043	-0.052	0.056
	(0.377)	(0.377)	(0.375)	(0.377)	(0.377)
cut1	-5.420***	0.004***			
	(0.002)	(0.002)			
cut2	-3.566**	0.028**			
	(0.036)	(0.036)			
Log likelihood	*-218.96*				
Prob > chi2	*0.000*				
LR chi2(16)	*106.49*				
McFadden pseudo-R2	*0.196*				
Observations	*248*				

Notes: *** p<0.01, ** p<0.05, * p<0.1. pval in parentheses. Dependent variable is defined at 3 levels; Low burden = "1" if debt service to essential expenditures ratio<25%; Moderate burden ="2" if 25% >=essential expenditures ratio< 40%; High burden ="3" if essential expenditures ratio>=40%.

Table 6: Impact of debt burden on household financial distress – Expenditure Measure

VARIABLES	Model 1		Model 2	
	Logit Coef	Marginal Effects	Logit Coef	Marginal Effects
Debt service to essential expenditures ratio	5.502***	0.759***	5.559**	0.760***
	(0.009)	(0.005)	(0.011)	(0.007)
Debt service to essential expenditures ratio squared	-3.555***	-0.491***	-3.682***	-0.503***
	(0.009)	(0.005)	(0.006)	(0.004)
More than 50% of Credit Used for home enterprise	1.324**	0.183**	1.362**	0.186**
	(0.017)	(0.011)	(0.019)	(0.012)
Financial literacy received	-0.377	-0.052	-0.364	-0.050
	(0.342)	(0.344)	(0.364)	(0.366)
Loan user is female	-0.947*	-0.131*	-1.104**	-0.151**
	(0.062)	(0.053)	(0.030)	(0.022)
Formal MFI	0.429	0.059	0.986*	0.135*
	(0.291)	(0.281)	(0.071)	(0.058)
Household head years of schooling	-0.393***	-0.054***	-0.386***	-0.053***
	(0.001)	(0.000)	(0.002)	(0.001)
Household head years of schooling squared	0.024***	0.003***	0.023***	0.003***
	(0.002)	(0.001)	(0.004)	(0.002)
Greater Accra Region	2.129***	0.294***	2.102***	0.287***
	(0.000)	(0.000)	(0.000)	(0.000)
Urban	-1.003*	-0.138*	-0.965	-0.132
	(0.097)	(0.096)	(0.114)	(0.113)
Household head is female	0.674	0.093	0.692	0.095
	(0.173)	(0.169)	(0.166)	(0.160)
Total annual income	-0.791***	-0.109***	-0.826***	-0.113***
	(0.004)	(0.002)	(0.002)	(0.001)
Household Size	1.042**	0.144**	1.015**	0.139**
	(0.017)	(0.015)	(0.018)	(0.017)
Household head is self-employed	-0.919**	-0.127**	-0.937**	-0.128**
	(0.028)	(0.024)	(0.031)	(0.026)
Number of rooms=>household size	1.223**	0.169**	1.173*	0.160*
	(0.044)	(0.041)	(0.054)	(0.051)
Health problems	0.935*	0.129*	0.887*	0.121*
	(0.060)	(0.059)	(0.075)	(0.075)
Formal MFI*Interest Rate			-15.679	-2.142
			(0.182)	(0.172)
Constant	2.724		3.166	
	(0.251)		(0.173)	
Log pseudolikelihood	*-106.84*		*-105.55*	
Prob > chi2	*0.001*		*0.001*	
Wald chi2	*40.4*		*42.2*	
McFadden pseudo-R2	*0.20*		*0.20*	
Observations	*249*		*248*	

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust pvalue in parentheses. Dependent variable= financial distress: takes value "1" if financially distressed and "0" otherwise.

Table 7: Impact of debt burden on being credit constrained – Expenditure measure

VARIABLES	Logit Coefficient	Marginal Effects
Debt service burden		
Moderate	1.767***	0.258***
	(0.000)	(0.000)
High	2.221***	0.342***
	(0.000)	(0.000)
Household head years of schooling	0.277***	0.035***
	(0.009)	(0.008)
Household head years of schooling squared	-0.015**	-0.002**
	(0.015)	-0.014
Greater Accra Region	0.586*	0.073*
	(0.087)	(0.087)
Urban	1.927**	0.240**
	(0.027)	(0.022)
Below the upper poverty line	-0.643	-0.080
	(0.122)	(0.122)
Total physical assets	-0.059	-0.007
	(0.523)	(0.521)
Household size>4	1.075***	0.134***
	(0.001)	(0.001)
Household head is self-employed	0.274	0.034
	(0.343)	(0.341)
Number of rooms=>household size	0.351	0.044
	(0.277)	(0.273)
Health problems	1.485***	0.185***
	(0.001)	(0.001)
Constant	-6.503***	
	(0.000)	
Log pseudolikelihood	*-193.03*	
Prob > chi2	*0.000*	
Wald chi2(15)	*78.57*	
McFadden pseudo-R2	*0.239*	
Observations	*491*	

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust pvalue in parentheses. Dependent variable: Credit Constrained: takes the value "1" if household is credit constrained and "0" otherwise.

Table 8: Welfare Impact of MFI Debt – Households with Access to Microfinance

	Dep. Var1: Log of Annual Food Expenditures		Dep. Var2: Log of Annual Essential Household Expenditures	
Variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**
MFI Debt to Asset (Per Person)	-1.184***	-1.197***	-1.044***	-1.452***
	(0.000)	(0.000)	(0.000)	(0.000)
MFI Debt to Asset (Per Person) Squared	0.877***	0.901***	0.419***	0.920***
	(0.000)	(0.000)	(0.001)	(0.000)
Log of Investment Credit Share of Total MFI Credit	-0.193**	-0.165*	-0.221**	-0.148*
	(0.025)	(0.060)	(0.017)	(0.097)
Log of Annual Household Income	0.206***	0.188***	0.265***	0.201***
	(0.000)	(0.000)	(0.000)	(0.000)
Female years of schooling	0.016*	0.015	0.022**	0.021**
	(0.098)	(0.136)	(0.034)	(0.035)
Access to clean water	0.540***	0.544***	0.480***	0.526***
	(0.000)	(0.000)	(0.000)	(0.000)
Urban Dwelling	0.474***	0.501***	0.235**	0.301***
	(0.000)	(0.000)	(0.045)	(0.006)
Age Dependency Ratio		0.313**		0.873***
		(0.048)		(0.000)
Age of Household Head		-0.015		0.019
		(0.527)		(0.428)
Age of Household Head Squared		0.000		-0.000
		(0.403)		(0.528)
Self Employed Household Head		-0.022		-0.118
		(0.767)		(0.123)
Constant	5.297***	5.553***	5.682***	5.393***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	230	230	232	231
R-squared	0.528	0.533	0.475	0.552

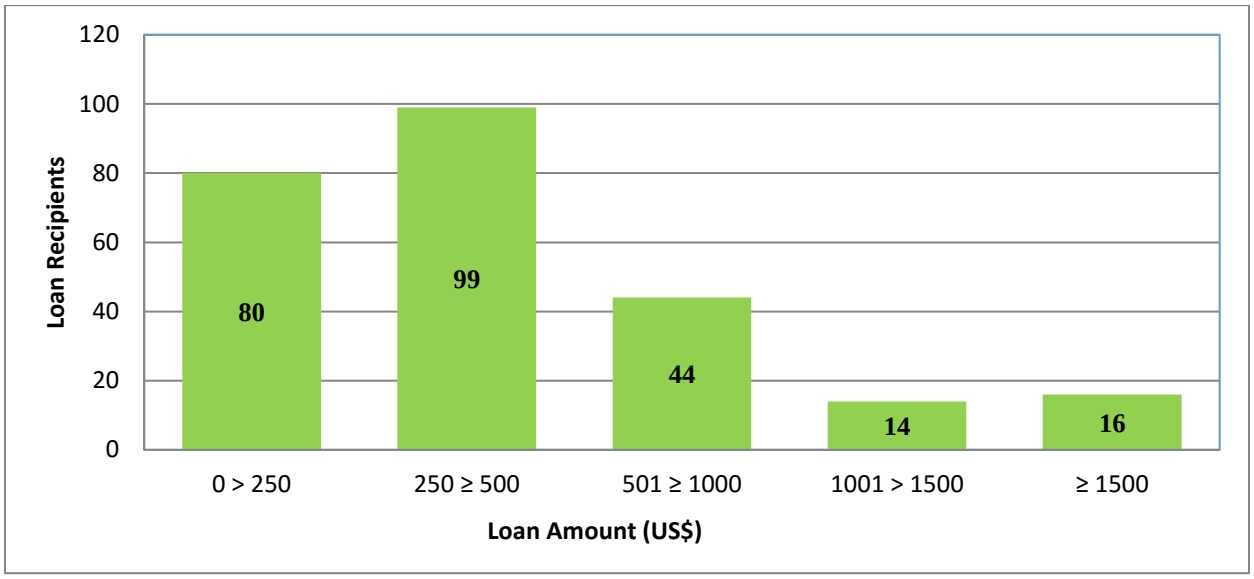
Notes: *** p<0.01, ** p<0.05, * p<0.1. pvalue in parentheses. Essential household expenditures is the sum of annual household expenditures on rent, education, health, water, electricity, and food.

Table 9: Threshold for Debt to asset ratio (per person)

	Food Expenditures	Total Household Expenditures
Estimated threshold debt to asset ratio (per person)	0.66	0.79
Estimated log household expenditures	5.16	4.82
Estimated volume of Household expenditure	173.37	123.98

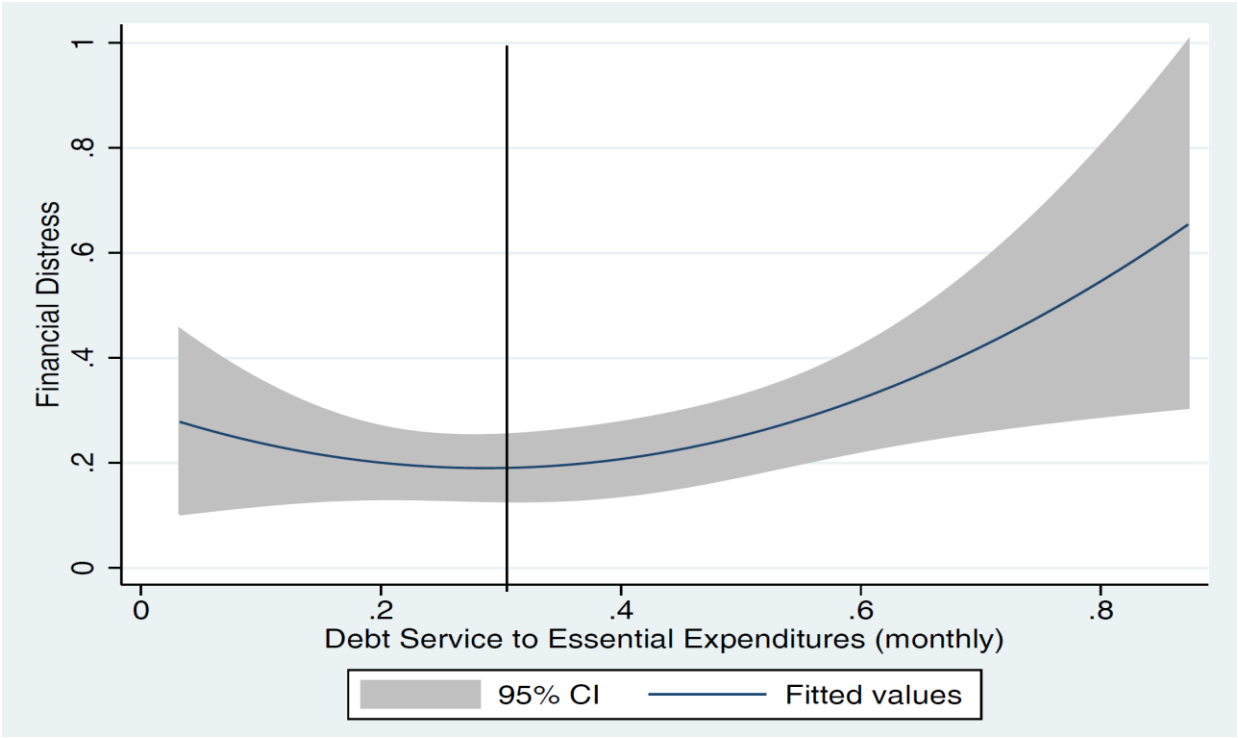
Source: Authors calculations based on results from Table 8.

Figure 1: Loan Amount (US Dollars)



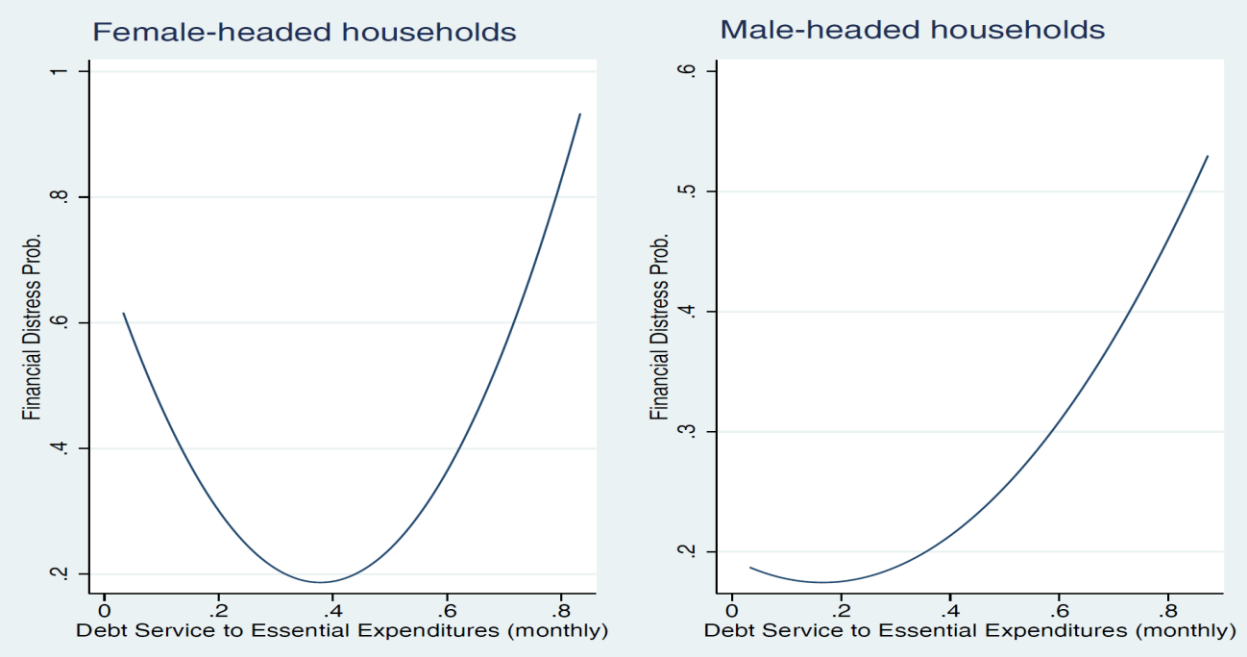
Source: Author's calculations based on survey data

Figure 2: Predicted Probabilities of Financial Distress as function of Debt Service Ratio



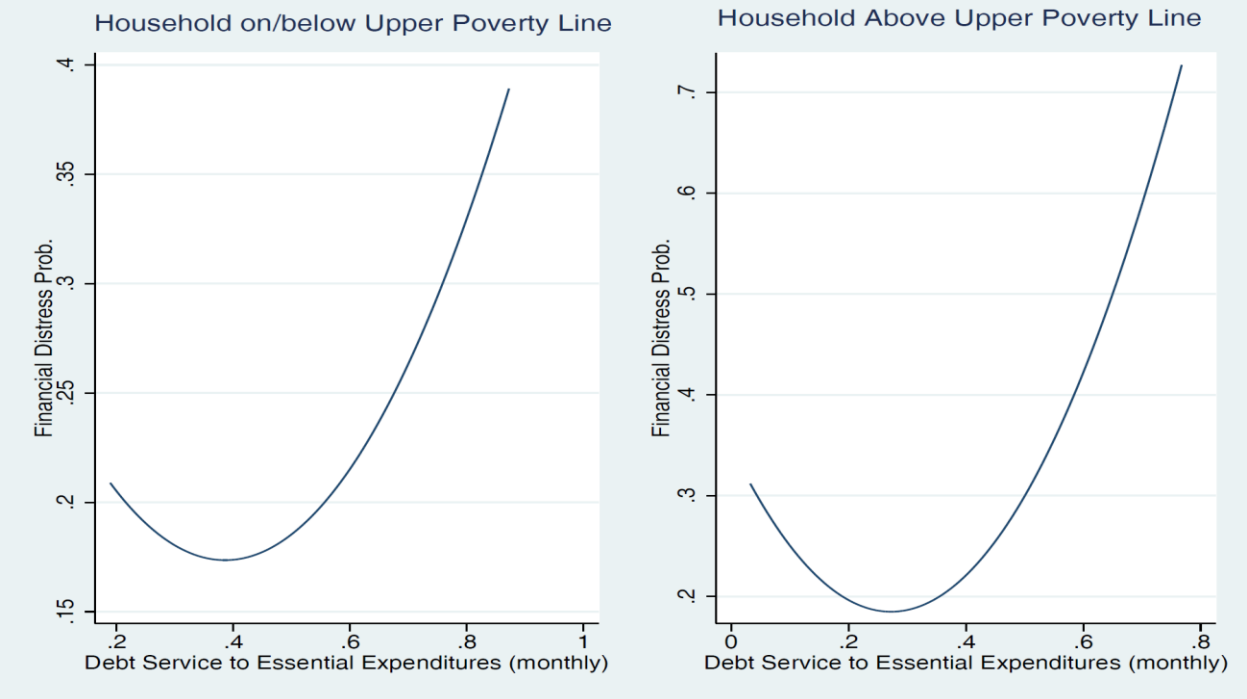
Note: Average predicted plots of financial distress based on debt service ratio ranging from 0.01 to 1**.**

Figure 3: Predicted plots of financial distress as function of debt service ratio by gender of household head



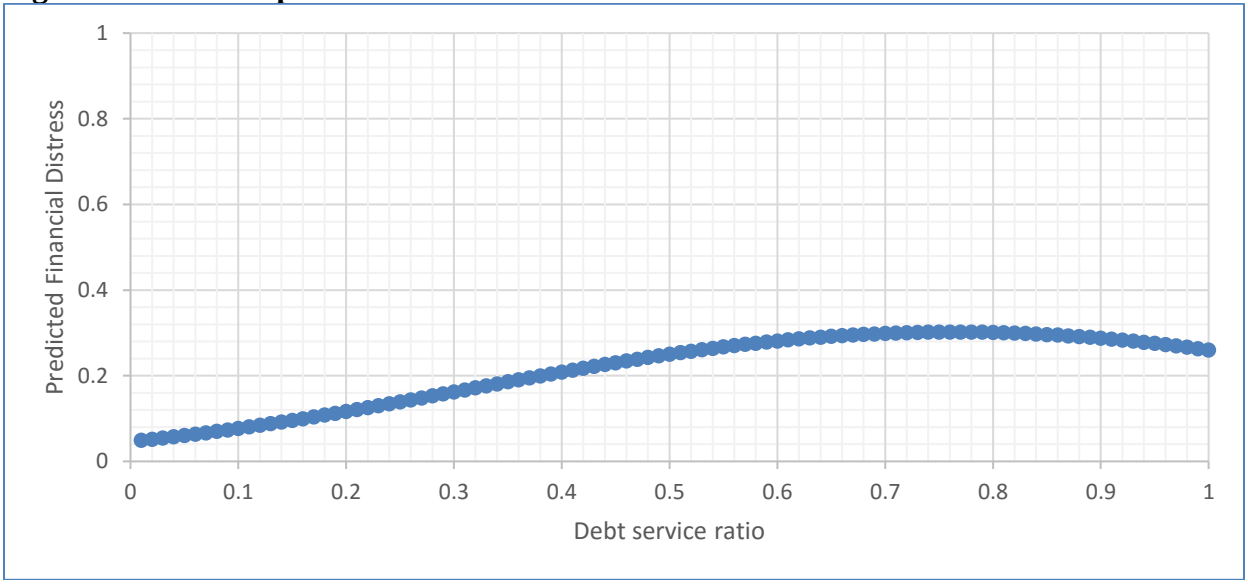
Note: Average predicted plots of financial distress based on debt service ratio ranging from 0.01 to 1**.**

Figure 4: Predicted plots of financial distress as function of debt service ratio by household poverty status



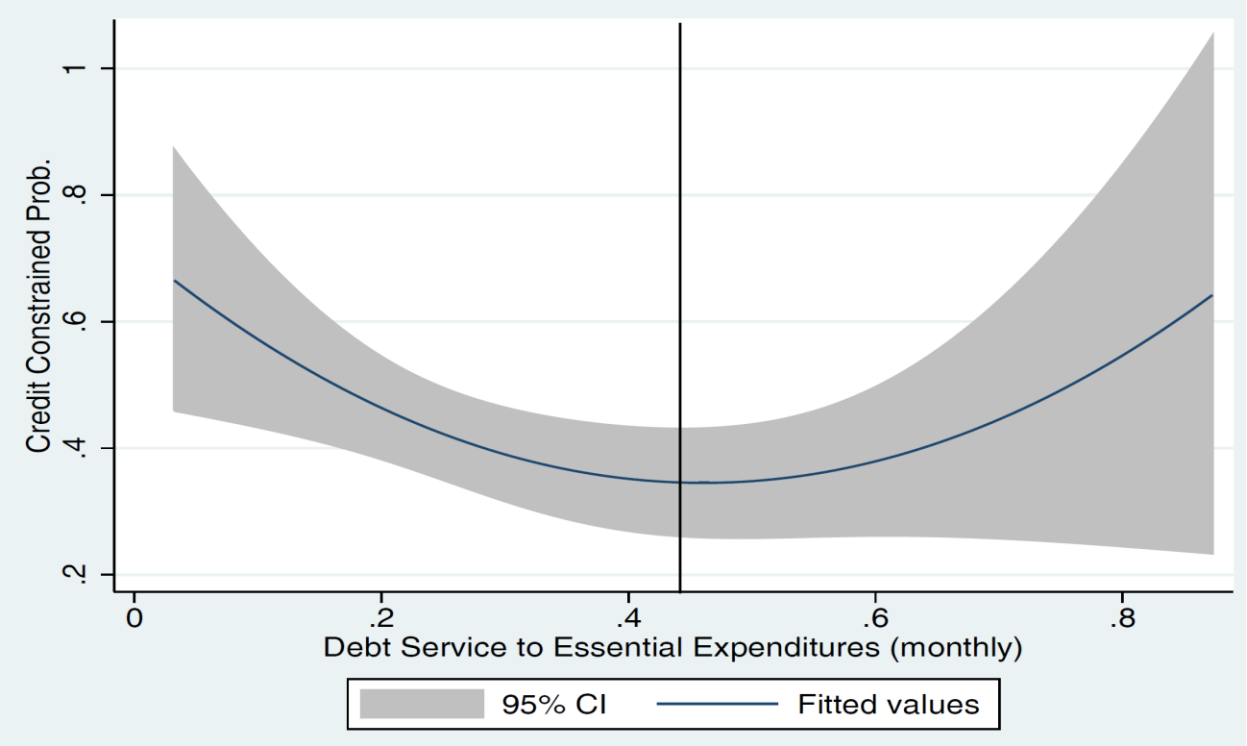
Note: Average predicted plots of financial distress based on debt service ratio ranging from 0.01 to 1**.**

Figure 5: Predicted probabilities of financial distress as a function of debt service ratio



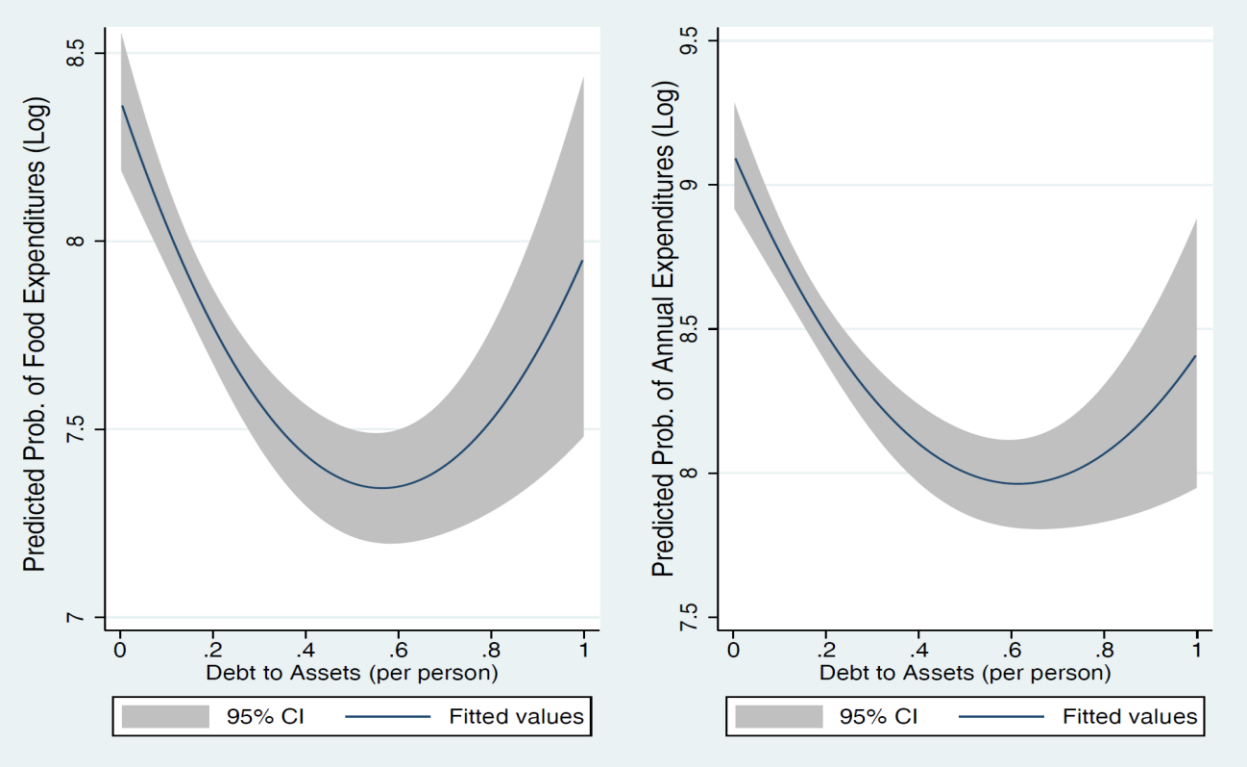
Note: Average predicted probabilities of financial distress examined at values of the debt service ratios, ranging from 0.01 to 1, computed based on the estimated results reported on table 20.

Figure 6: Predicted plots of credit constraint as function of debt service Ratio



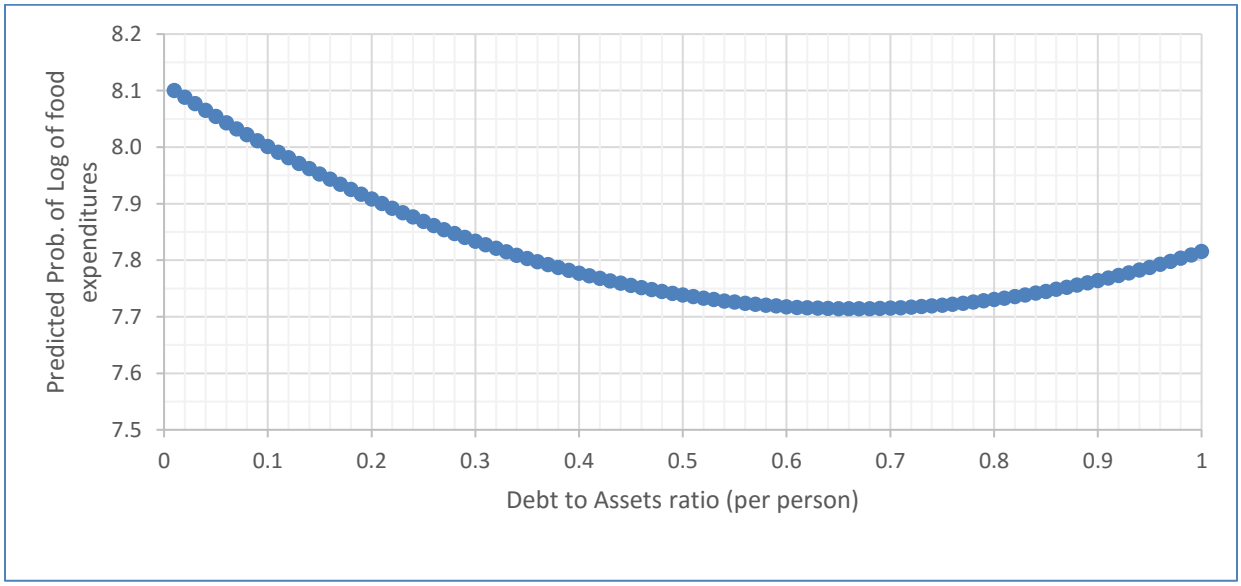
Note: Average predicted plots of being credit constrained based on debt service ratio ranging from 0.01 to 1.

Figure 7: Predicted plots of log of annual expenditures as a function of the debt to asset (per person) ratio



Note: Average predicted plots of log of annual food expenditures based on debt to asset ratio ranging from 0.01 to 1**.**

Figure 8: Predicted probabilities of log of food expenditures as a function of the debt to asset ratio



Note: Average predicted probabilities of the log of food expenditures examined at values of the debt to asset ratios, ranging from 0.01 to 1. The computation is derived using the estimated results reported on column 3 of table 21.

Appendix

Figure A1: Histogram of Debt Service to Income Ratio

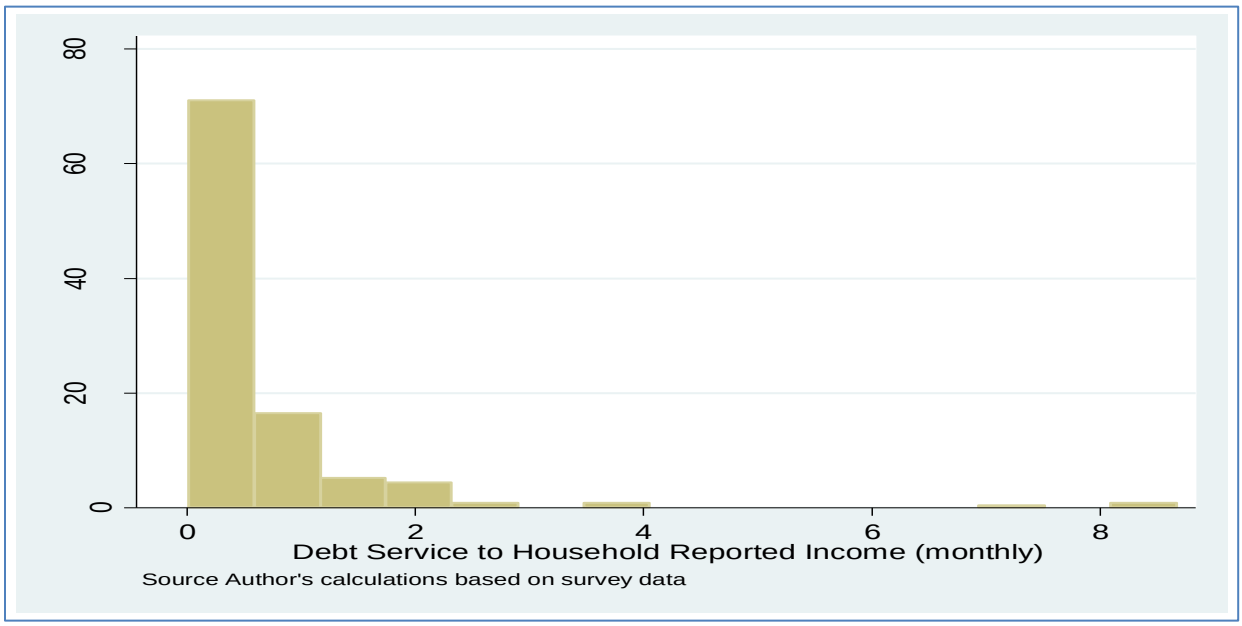


Figure A2: Histogram of Debt Service to Essential Expenditures Ratio

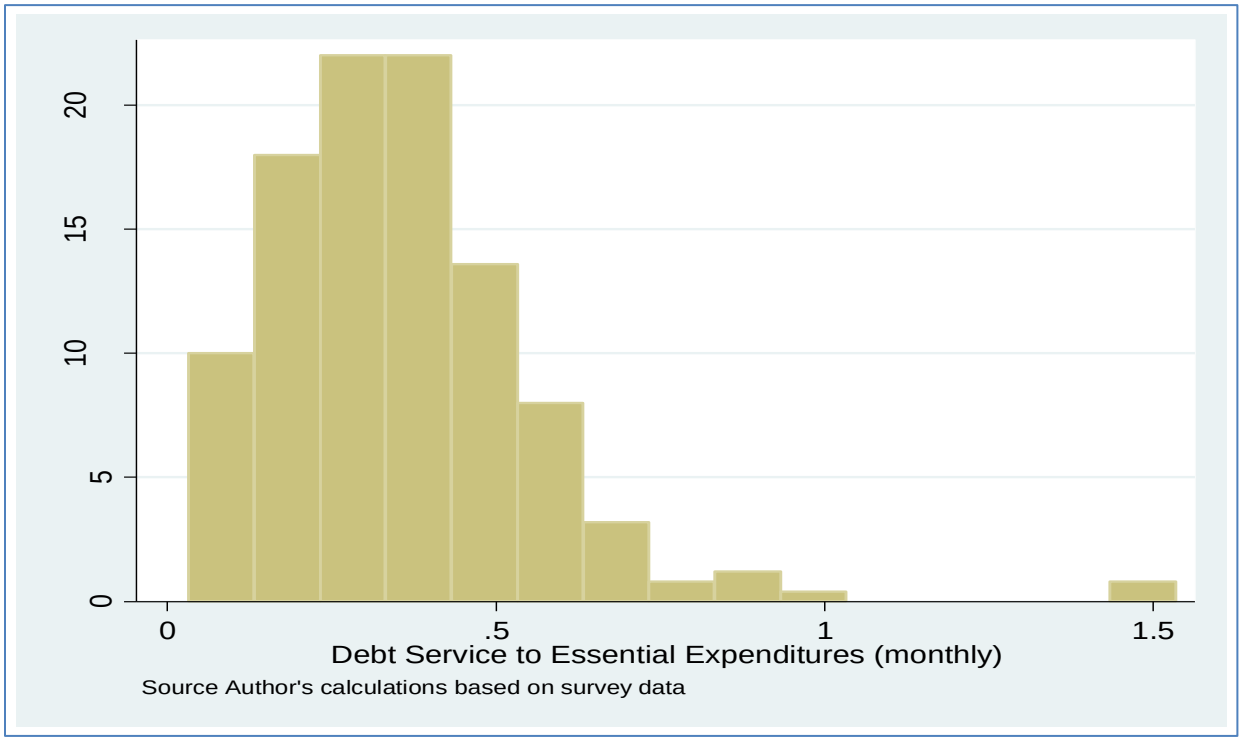


Table A1: Socio-economic Characteristics of Households

Description	Households with MFI Credit	Households w/o MFI Credit
Mean Household Size	4.2	3.6
Mean Age of Household Head	42.1	39.1
Female Headed Household (% of Total)	35.2	34.4
Mean number of years of schooling - Household Head	10.2	9.5
Mean number of years of schooling - Male Children	5.8	4.6
Mean number of years of schooling - Female Children	5.4	4.6
Marital Status of Household Head (% of Group Sample)		
Never married	12.3	17.5
Married	70.2	63.8
Divorced / separated	10.3	11.8
Widow / widower	7.1	6.9
Primary Employment of Household Head (% of Group Sample)		
Self-employed	70.8	61.5
Government Employee	8.7	6.1
Other Employee	18.6	29.1
Retired	1.2	1.6
Unemployed	0.8	1.6

Source: Author's calculations based on survey data

Table A2: Descriptive Statistics: Welfare implications of access to microfinance

Variables	Variable Definition	Obs.	Mean	Median	Std. Dev	Min	Max
Food Expenditure per capita - Adults (GH¢)	Log of Annual Food Expenditure per adult	493	7.143	7.174	0.760	3.766	9.537
Household Perceived Welfare	"1" if HH welfare>=average and "0" if below average.	495	0.558	1	0.497	0	1
Microfinance Dummy	"1" if Household has access to microfinance and "0" if otherwise	495	0.505	1	0.500	0	1
Number of rooms in household	Number of rooms in household	493	1.550	1	1.071	1	10
Income per capita (GH¢)	Log of Annual Household Income per person	495	7.423	7.438	0.841	4.787	9.674
Age dependency ratio (In percent)	Dependency ratio	495	0.406	0.500	0.257	0	0.857
Assets per person (GH¢)	Log of Total Assets per person	494	7.284	7.198	1.476	2.730	11.95
Share of human capital expenditures in total household expenditures (In percent)	Share of human capital expenditures in total household expenditures (In percent)	488	-1.545	-1.240	0.991	-5.014	-0.175
Household size	Log of number of household members	495	1.218	1.386	0.567	0	2.398
Household head Years of Schooling	Log of years of schooling for household head	433	2.390	2.303	0.220	1.946	2.773
Self-employed	"1" if Household head is Self-employed and "0" if otherwise	495	0.651	1	0.477	0	1
Household Head is Married	"1" if household head is married and "0" if single	495	0.673	1	0.470	0	1
Female	"1" if is household head is female and "0" if otherwise	495	0.364	0	0.482	0	1
Household Owns Land	"1" if Household own land and "0" if otherwise	497	0.274	0	0.446	0	1
Owner Occupier Accommodation	"1" if dwelling is owned and "0" if otherwise	497	0.326	0	0.469	0	1
Household has access to Tap Water	"1" if household has access to clean water and "0" if otherwise	497	0.626	1	0.484	0	1

Author's calculations based on survey data

Table A3: Welfare Implication of Access to Credit – All Sampled Households

VARIABLES	Model 1		Model 2		Model 3	
	Logit Coef	Odds Ratio	Logit Coef	Odds Ratio	Logit Coef	Odds Ratio
Microfinance Dummy	0.565***	1.759***	0.551**	1.735**	0.572***	1.772***
	(0.007)	(0.007)	(0.012)	(0.012)	(0.009)	(0.009)
Household head Years of Schooling	1.716***	5.561***	1.433***	4.191***	1.494***	4.455***
	(0.001)	(0.001)	(0.008)	(0.008)	(0.006)	(0.006)
Number of rooms in household	0.179*	1.196*	0.133	1.143	0.106	1.112
	(0.086)	(0.086)	(0.251)	(0.251)	(0.355)	(0.355)
Self-employed Household Head	-0.380*	0.684*	-0.356	0.700	-0.469*	0.626*
	(0.087)	(0.087)	(0.132)	(0.132)	(0.050)	(0.050)
Income per person	0.438***	1.550***	0.466***	1.594***		
	(0.001)	(0.001)	(0.003)	(0.003)		
Household Size			-0.324	0.723	-0.342	0.710
			(0.380)	(0.380)	(0.349)	(0.349)
Dwelling is owned			0.273	1.315	0.280	1.323
			(0.278)	(0.278)	(0.265)	(0.265)
Log of share of health and education expenditures in total household expenditures			0.401***	1.493***	0.361**	1.435**
			(0.006)	(0.006)	(0.012)	(0.012)
Access to water			0.232	1.262	0.175	1.191
			(0.314)	(0.314)	(0.458)	(0.458)
Age Dependency ratio			-0.446	0.640	-0.587	0.556
			(0.490)	(0.490)	(0.357)	(0.357)
Household Head is Married			0.084	1.088	0.115	1.122
			(0.786)	(0.786)	(0.709)	(0.709)
Household owns land			0.193	1.212		
			(0.443)	(0.443)		
Assets per person					0.219**	1.245**
					(0.016)	(0.016)
Constant	-7.321***	0.001***	-5.935***	0.003***	-4.036***	0.018***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.005)
Log Likelihood	*-268.6*		*-259.5*		*-261.6*	
Prob > chi2	*0.000*		*0.000*		*0.000*	
McFadden pseudo-R2	*0.082*		*0.099*		*0.091*	
Observations	*432*		*425*		*425*	

Notes: *** p<0.01, ** p<0.05, * p<0.1. pval in parentheses. The dependent variable is Households Perceived Welfare which takes the value of "1" if HH welfare>=average and "0" if below average.

Table A4: Descriptive Statistics: Debt Service Burden Thresholds – Expenditure measure

Variable names	Variable Definition	Low debt burden Obs.=84	Moderate debt burden Obs.=78	High debt burden Obs. = 88
		Mean	Mean	Mean
Debt service ratio	Monthly debt service to total essential household expenditures (%)	16.71	32.56	55.30
Number of loans greater than 1	"1" if number of loans held in household is greater than 1, "0" otherwise	0.05	0.05	0.15
Share of Investment Credit in Total MFI Credit (%)	Share of Investment Credit in Total MFI Credit	91.2	90.2	80.9
Monthly Interest rate (%)	Monthly Interest Rate (%)	4.6	5.1	5.0
Log of monthly interest rate	Log of monthly interest rate	-3.18	-3.05	-3.05
Loan user is female	"1" if loan user is female and "0" otherwise	0.86	0.92	0.73
Financial literacy received	"1" if household received financial literacy from MFI and "0" otherwise	0.69	0.69	0.72
Formal MFI	"1" if formal MFI institution and "0" informal	0.20	0.15	0.16
Loan maturity >=6 months	"1" if repayment is >= 6 months and 0 otherwise	0.74	0.53	0.48
Individual loan	"1" if it is an individual loan and "0" if group loan	0.57	0.58	0.74
Urban	"1" if household is located in urban area and "0" otherwise	0.94	0.90	0.74
Below Upper Poverty Line	"1" if below upper poverty line and "0" otherwise	0.06	0.23	0.48
Owner occupied house	"1" if household owns dwelling and "0" otherwise	0.31	0.40	0.41
Household size>4	"1" if household size is greater than 4 and "0" otherwise	0.42	0.26	0.08
Number of rooms=>household size	"1" if number of rooms is equivalent or greater than household size and "0" otherwise	0.06	0.12	0.23
Age of household head	Age of household head	43.08	42.31	40.70
Household head has Post Primary Education	"1" if Household head has Post Primary Education and "0" otherwise	0.85	0.81	0.78
Self-Employed Household Head	"1" if Household head is self-employed and "0" if salaried worker	0.64	0.64	0.75

Source: Author's calculation based on survey data

Table A5: Descriptive Statistics of Financial Distress Analysis

Variable Name	Variable Definition	Obs.	Mean	Median	SD	Min	Max
Financial distress	"1" if household is frequently having difficulty servicing loans and foregoing basic needs to service loans and "0" otherwise	249	0.23	0	0.42	0	1
Debt service ratio1	Monthly debt service to total essential household expenditures (%)	250	0.35	0.33	0.20	0.03	1.53
Debt service ratio1 squared	Monthly debt service to total essential household expenditures (%) squared	249	0.16	0.11	0.24	0.00	2.35
Debt service ratio2	Monthly debt service to total household income (%)	249	0.64	0.40	0.99	0.02	8.66
Household head years of schooling	Years of schooling for household head	250	10.20	10	3.80	0	16
Household head years of schooling squared	Years of schooling for household head squared	250	118.37	100	66.43	0	256
Greater Accra Region	"1" if household dwells in the Greater Accra Region and "0" otherwise	250	0.59	1	0.49	0	1
Urban	"1" if dwelling is located in an urban area and "0" otherwise	252	0.86	1	0.35	0	1
Total annual income	Log of annual total income	250	8.76	8.79	0.83	6.61	11.04
Household Size	Log of household size	250	1.30	1.39	0.55	0	2.4
Household head is self-employed	"1" if household head is self-employed and "0" otherwise	250	0.68	1	0.47	0	1
Female-headed household	"1" if household head is female and "0" otherwise	250	0.37	0	0.48	0	1
Number of rooms=>household size	"1" if number of rooms is equivalent or greater than household size and "0" otherwise	249	0.14	0	0.34	0	1
Health problems	"1" if significant health problems reported and "0" otherwise	249	0.78	1	0.42	0	1
More than 50% of Credit Used for home enterprise	"1" if greater than 50% of credit applied to home enterprise and "0" otherwise	250	0.83	1	0.37	0	1
Financial literacy received	"1" if household received financial literacy from MFI and "0" otherwise	250	0.70	1	0.46	0	1
Loan user is female	"1" if loan user is female and "0" otherwise	250	0.83	1	0.37	0	1
Formal MFI	"1" if formal MFI institution and "0" informal	250	0.20	0	0.40	0	1
Formal MFI*Interest rate	Interaction between the dummy variable for Formal MFI and the monthly interest rate	249	0.01	0	0.02	0	0.16

Author's calculations based on survey data

Table A6: Descriptive Statistics-Impact of Debt Service Burden on being Credit Constrained

Variable Name	Variable Definition	Obs.	Mean	Median	SD	Min	Max
Credit Constrained	"1" if household is credit constrained and "0" otherwise	496	0.210	0	0.407	0	1
Debt Service Burden							
Low	if debt service to essential expenditures<25%	499	0.667	1	0.472	0	1
Moderate	if 25% >=essential expenditures ratio< 40%	499	0.156	0	0.364	0	1
High	if debt service to essential expenditures>40%	499	0.176	0	0.382	0	1
Household head years of schooling	Household head years of schooling	495	9.782	10	4.373	0	16
Household head years of schooling squared	Household head years of schooling squared	495	114.772	100	70.646	0	256
Greater Accra Region	"1" if household dwells in the Greater Accra Region and "0" otherwise	497	0.571	1	0.495	0	1
Urban	"1" if dwelling is located in an urban area and "0" otherwise	499	0.848	1	0.360	0	1
Below the upper poverty line	"1" if Below upper poverty line and "0" otherwise	495	0.265	0	0.442	0	1
Total physical assets	Log of total physical assets	492	8.357	8.26	1.549	3.83	12.42
Household size>4	"1" if household size is greater than 4 and "0" otherwise	496	0.192	0	0.394	0	1
Household head is self-employed	"1" if household head is self-employed and "0" otherwise	495	0.651	1	0.477	0	1
Number of rooms=>household size	"1" if number of rooms is equivalent or greater than household size and "0" otherwise	496	0.167	0	0.374	0	1
Health problems	"1" if significant health problems reported and "0" otherwise	496	0.800	1	0.400	0	1

Author's calculations based on survey data

Table A7: Descriptive Statistics of Welfare implications of Microfinance – Only Households with Access to Credit

Variable Name	Variable Definitions	Obs.	mean	median	SD	min	max
Food Expenditures	Log of Annual Food Expenditures	243	7.77	7.80	0.72	5.78	9.35
Total Essential Expenditures	Log of Annual Essential Expenditures	244	8.45	8.40	0.74	6.13	10.13
MFI Debt to Asset Ratio	MFI Debt to Asset (Per Person)	244	0.32	0.22	0.34	0.00	2.73
MFI Debt to Asset Ratio Squared	MFI Debt to Asset (Per Person) Squared	244	0.22	0.05	0.63	0.00	7.44
Total MFI Debt to Total Assets Ratio	Total MFI Debt to Total Assets	244	0.41	0.24	0.61	0.00	6.27
Total MFI Debt to Total Assets Squared	Total MFI Debt to Total Assets Squared	244	0.54	0.06	2.78	0.00	39.35
Debt Service to Income Ratio	Debt Service to Income Ratio (Monthly)	243	0.64	0.40	1.00	0.02	8.67
Debt Service to Income Ratio Squared	Debt Service to Income Ratio Squared	243	1.41	0.16	7.36	0.00	75.11
Total MFI Debt to Annual Income	Total MFI Debt to Annual Income	244	0.31	0.16	0.49	0.02	4.33
Total MFI Debt to Annual Income Squared	Total MFI Debt to Annual Income Squared	244	0.33	0.03	1.64	0.00	18.78
Investment Credit Share of Total MFI Credit	Log of Investment Credit Share of Total MFI Credit	244	-0.20	0.00	0.41	-2.39	0.00
Annual Household Income	Log of Annual Household Income	244	8.75	8.79	0.82	6.61	11.04
Wealth Per Person	Log of Physical Wealth Per Person	244	7.38	7.29	1.36	4.34	11.11
Female years of schooling	Female years of schooling (Adults)	232	9.00	10	3.69	0	16
Age Dependency Ratio	Age Dependency Ratio	244	0.45	0.5	0.24	0	0.86
Age of Household Head	Age of Household Head	244	41.8	42	9.78	22	83
Age of Household Head Squared	Age of Household Head Squared	244	1839.9	1764.0	874.5	484.0	6889.0
Water	Access to clean water	244	0.60	1	0.49	0	1
Urban	Household has urban Location	244	0.85	1	0.36	0	1
Self-Employed	Household head is Self-employed	244	0.68	1	0.47	0	1

Source: Author's calculations based on survey data