The Effect of the Microcredit Policy of the Government of Benin in Improving Nutrition

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Bringing Rigour and Evidence to Economic Policy Making in Africa

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Abstract

Many African countries are suffering from food insecurity and undernourishment of the population in a context of imperfect credit markets. Microcredit-related policies have been initiated to address these issues, but the interventions have had mixed effects. In this paper, we assess the extent to which the microcredit to the poorest (MCPG), a microcredit policy of the Government of Benin, has an influence on the nutrition. We estimate the household-level and individual-level nutritional impacts using national household survey and demographic, and health survey databases and a modelling framework that accounts for the endogeneity of accessing the MCPG. We find positive linkages between the MCPG and household and individual nutrition outcomes. The largest positive effects are observed among households using microcredit to buy food, and among female-headed households. The MCPG would thus benefit not only individual beneficiaries within the household, but also the other members through an "insurance" or "investment" channel.

Key Words: *Microcredit, Government policy, Nutrition, Poorest, Benin*

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1. Introduction

Sub-Saharan Africa (SSA) is characterized by low economic development and high levels of poverty (Bezu et al., 2014). The undernourished population has increased in this region over the years (OECD and FAO, 2016). It is acknowledged that food security is of paramount importance to maximize economic capacity, as a poorly nourished population is a less economically productive one (Dones et al., 2013). The importance of food insecurity and nutrition-related issues for development globally has necessitated the study and reflections on policies and strategies to address these issues. Making finance accessible to individuals is one of the advocated interventions, among many others.

Microcredit-related policies are highlighted as a means to address poverty, food insecurity and undernutrition (Islam et al., 2016; Van Rooyen et al., 2012). Van Rooyen et al. (2012) argue that microfinance is considered a key, and growing, development tool in SSA, which positively affects food security and nutrition. Microcredit participation is also found to be gender-sensitive, as reported in the case of Peru (Hamad and Fernald, 2012). Although the importance of microfinance is increasingly recognized (Senanayake and Premaratne, 2006), some studies report mixed effects on the anthropometric measures for children and females of reproductive age in the long and the short term (Islam et al., 2016).

In this study, we assess the extent to which the government's microcredit policy intended for the poorest affects household and individual nutrition outcomes in Benin. Like other SSA countries, Benin is subject to poverty, food insecurity and malnutrition. For example, 34% and 11%, respectively, of the population in Benin were food insecure and severely food insecure in 2013 (République du Benin, 2014). The situation improved in 2017 with only 10% of the population food insecure (République du Benin, 2017). Regarding children, 32% of those aged 6–59 months were affected by chronic malnutrition in 2011 (WFP, 2018). The prevalence of stunting has evolved over time and in 2017, 32% of children were subject to stunting (INSAE, 2018).

In 2013, the New Alliance for Food Security and Nutrition (NAFSN) was launched in Benin as a joint initiative between major stakeholders (government, private companies and development partners) in order to improve food and nutrition security and to develop 13 agricultural sectors according to the National Agricultural Investment Plan (NAIP). A recent report assessing the performance of the NAFSN in achieving its goals, specifically regarding policy actions, has shown that policy actions aimed at

improving the nutritional status of the population and putting in place appropriate and accessible funding have only partially been met (Badiane et al., 2018). This shows that more effort is needed with regard to nutrition and access to finance.

The microfinance sector in Benin is heterogeneous and composed of banks, and formal and informal microfinance institutions. Yet, a huge part of the population, specifically the poor, has limited access to microfinance services (PNUD, 2007). To help the poorest in general, and women in particular, the Government of Benin launched the *Programme de Microcrédit aux Plus Pauvres* (Microcredit Policy for the Poorest – MCPG) in 2007. The government's aim with this microcredit policy is to reduce the prevalence of extreme poverty and hunger, improve maternal health, and promote gender equality and women's empowerment, among other things (Dahoun et al., 2013).

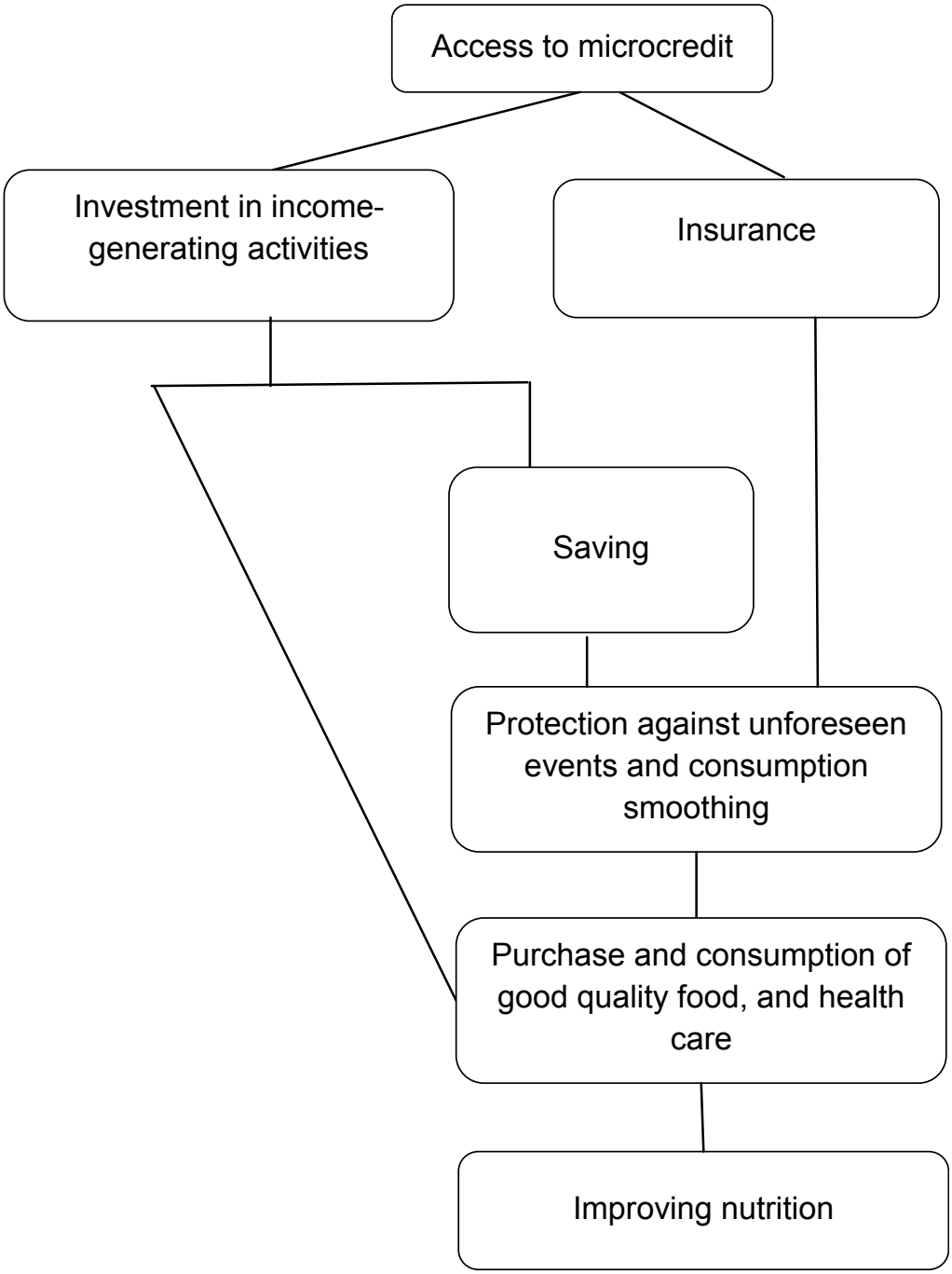
Although this policy is still being implemented, to our knowledge little is known about its effect on improving nutrition in Benin (Observatoire du Changement Social, 2010). Few empirical studies in Benin have analyzed the impact of the credit granted by microfinance institutions on women's empowerment and on the living standards of the beneficiaries such as their food expenditures (Houngan, 2008; Dahoun et al., 2013). However, these studies only focussed on microfinance institutions in general and not on specific government microfinance-related policies and programmes or their impact on nutrition. In this paper, we estimate the nutritional impact of accessing the microcredit offered by the government and compare that to not accessing credit or accessing credit from a bank or a mutual financial institution.

2. Conceptual framework and literature review

Removing the barriers of access to financial markets is identified in the literature as an important tool for poverty alleviation and improving living standards (Quibria, 2012; Churchill et al., 2016; Islam, 2016). For example, the development of microcredit provides capital for the landless and rural households without assets, who would normally be excluded from conventional financial institutions. It mainly supports informal activities with low returns by providing small loans to individuals (generally women). Microcredit allows households to start and run businesses that increase their income and satisfy their basic consumption needs (Islam et al., 2016; Van Rooyen et al., 2012). Butler et al. (2012) argue that microcredit provision supports and strengthens women's income-generating activities and their ability to purchase more food for family meals.

Microfinance is expected to influence nutritional outcomes through two main channels[1] (Figure 1). First, microcredit allows poor households to access financial capital to invest and diversify into income-generating activities that increase their available resources and relax the budget constraints faced by households – the generation of "investment-led" benefits. As such, households can increase and diversify their demand for calories. Second, access to microcredit can protect households against unforeseen events and seasonality. Thus, the "insurance-led" benefits protect households against unforeseen risk and seasonality. Access to microcredit is seen as providing a safety net that prevents income from falling to a level where households are unable to satisfy their basic consumption needs (Islam et al., 2016). It involves investment in activities that can generate revenue that would allow households to save and insure themselves against unforeseen events (Fletschner and Kenney, 2014).

Figure 1: Channels through which microcredit influences nutrition



There is a growing number of studies that assess the impact of microcredit on different dimensions of wellbeing such as poverty, education, health, food security and nutrition. Microcredit participation is generally shown to have positive effects on nutrition (Doocy et al., 2005; Hamad and Fernald, 2012). For example, according to Doocy et al. (2005), microfinance programmes positively affect the nutritional status and wellbeing of female clients and their families. Guha-Khasnobis and Hazarika (2008) use financial markets and food security data in Malawi to show that women's access to microcredit improves the long-term nutrition of girls measured by anthropometric nutritional z-scores. However, men's access to microcredit does not have any effect on either girls' or boys' nutritional status. The authors explain the difference in the effects by the fact that women have relatively more control over household resources and girls' food security.

Deloach and Lamanna (2011) show that the presence of microfinance institutions in communities in Indonesia had a large and positive influence on relative changes in child anthropometric measures. Similarly, Hamad and Fernald (2012) show that in Peru, women's extended participation in microcredit programmes is associated with higher body mass index (BMI) and haemoglobin levels, as well as lower food insecurity. Using panel data from rural Gansu, northwest China, You (2013) shows that formal borrowing of microcredit improves parent-reported health status and weight, and alleviates anaemia and zinc deficiency. Also, participating in microcredit borrowing positively affects both anthropometric and micronutrient measures of child nutrition. Marquis et al. (2014) find that participation in an entrepreneurial and nutrition education intervention that includes microcredit lending increases the weight-for-age and height-for-age scores of children living in poor rural communities in Ghana.

While its positive effect on nutrition is acknowledged in the literature, microfinance is also shown to have mixed effects on nutrition. For example, Malapit and Quisumbing (2015) show that women's participation in credit decisions improves their dietary diversity, but does not reduce their likelihood of being underweight. In rural Bangladesh, microcredit is reported to increase calorie availability but not improve dietary diversity, and has mixed effects on anthropometric measures (Islam et al., 2016). It is worth mentioning that there is no comparable research in the context of Benin. The extent to which the government's microcredit policy contributes to an improvement in nutrition to guide policies related to access to microcredit remains to be investigated in Benin.

3. Data and descriptive statistics

We used two data sets in this paper. The first set of data is from the 2013 Comprehensive Food Security and Vulnerability Analysis (CFSVA) survey. The data were collected in February and March 2013 by the National Institute of Statistics, in collaboration with the World Food Program (WFP), and is a representative sample at the national, departmental and communal levels. The second set of data is from a merger of the Integrated Modular Survey on the Living Conditions of Households[2] (EMICoV-2) database and the Demographic and Health Survey (DHS-IV) database. These two surveys are nationally representative and have been undertaken by the National Institute of Statistics over the same period, in 2011–2012, and on the same households.

The use of the two data sets is justified by the fact that the 2013 CFSVA contains information on nutrition-related variables only at the household level. The 2011 EMICoV-2/DHS-IV fills this gap as the DHS data include modules on anthropometric information for children aged 0 to 5 years and women aged 15 to 49. In order to have a broader view of the relationship between access to government microcredit to the poorest (henceforth MCPG) and nutrition, we use indicators of nutritional outcomes both at the household and individual levels. At the household level, we use the Food Consumption Score (FCS). The FCS is a composite score based on dietary diversity, food frequency, and the relative nutritional importance of different food groups (Maxwell et al., 2013). At the individual level, we use anthropometric measures such as a weight-for-height standard deviation (WH-SD), height-for-age standard deviation (HA-SD), weight-for-age standard deviation (WA-SD) and body mass index (BMI).

The two databases contain information on credit accessibility, specifically whether the household had borrowed in the 12 months prior to the survey. The main sources of credit include whether the source was MCPG. To avoid potential spillover or confounding effects stemming from several sources of credit, we restricted the sample in each data set to households that had only one member that received credit from one source, or had several members that accessed credit from only one (identical) source of credit. Observations of households that accessed credit from non-formal sources, such as family members and relatives, and other non-formal lenders such as tontines, were removed. We also removed all observations with missing values regarding the variables used in the econometric analysis.

Table 1 summarizes the samples used for the two databases. For the 2013 CFSVA database, we retained a sample of 13,004 households comprising three groups of households. The first group of 256 households accessed only the MCPG. The second group of 12,281 households did not obtain any credit during the year prior to the survey. The third group of 467 households accessed credit only from other formal sources of credit (FC) such as mutual credit institutions or banks. Different samples of households were used for the 2011 EMICoV-2/DHS-IV database, according to the availability of information on the anthropometric measures.

Table 1: Samples of households used for each database according to different nutrition outcomes

Outcome variables	2013 CFSVA database	2011 EMICoV-2/DHS-IV database			
	Household	Women	Children		
	FCS	BMI	WH-SD	HA-SD	WA-SD
# of households with MCPG	256	274	145	118	118
# of households with no credit	12,281	11,674	6,917	5,591	5,591
# of households with FC	467	206	104	89	89
Total	13,004	12,154	7,166	5,798	5,798

Source: Calculations based on the 2013 CFSVA and the 2011 EMICoV-2/DHS-IV data.

Table 2 presents the descriptive statistics on variables used in both CFSVA and EMICoV-2/DHS-IV data. In terms of nutrition outcomes, households with MCPG have significantly higher FCS than households that did not access credit. For other nutrition outcomes, overall, there is no significant difference between the three groups of households. Regarding household characteristics, relatively significant differences are noted. The number of members is significantly higher in households with MCPG compared to households that did not obtain any credit. More female-headed households are found in households that accessed the MCPG. There is no significant difference in age of the household head across the three groups of households.

Regarding the formal education level of the household head, the statistics point out relative significant differences between households with MCGP and those without. The heads of the households are more educated in households that accessed formal credit other than the MCPG. In the CFSVA, the proportion of household heads without any formal education or with a primary education is significantly higher in households with MCPG than in households that accessed other formal credit or households that did not obtain any credit. However, the proportion of household heads with at least a secondary education level is lower in households with MCPG than the two other groups of households. The highest proportion is found among those that accessed formal credit, which is almost double that of households with MCPG.

Table 2: Descriptive statistics

	All	MCPG	No credit	Formal credit		
	Mean	Mean	Mean	T- test	Mean	T-test
# of households in 2013 CFSVA database	13,004	256	12,281		467	
Nutrition outcome						
Food consumption score (FCS)	48.337	51.622	48.090	***	53.107	
Household characteristics						
Household (HH) size	4.814	5.585	4.767	***	5.654	
Age of HH head	45.088	44.473	45.142		43.993	
HH head is male	0.781	0.658	0.785	***	0.728	*
HH Head has no schooling	0.538	0.557	0.545		0.337	***
HH Head has primary education	0.222	0.275	0.218	*	0.310	
HH Head has at least secondary education	0.240	0.169	0.237	**	0.353	***
Tropical livestock units	0.939	0.439	0.964	***	0.536	
HH wealth index	0.015	-0.027	-0.002		0.456	***
HH experienced shock previous 12 months	0.438	0.640	0.431	***	0.509	***
# of households in 2011 EMICoV-2/DHS-IV database	13328	293	12817		218	
Nutrition outcome						
Body mass index (BMI)	2360.071	2400.359	2357.91		2417.603	
Weight for height (WH-SD)	-1.791	-0.797	-1.920		5.214	
Height for age (HA-SD)	-149.483	-151.020	-149.546		-143.399	
Weight-for-age (WA-SD)	-102.784	-98.316	-103.127		-86.375	
Household characteristics						
Household (HH) size	5.721	6.062	5.721	**	5.726	
Age of the HH head	42.517	42.796	42.509		43.857	
HH head is male	0.790	0.729	0.793	**	0.743	
Years of education of the head	3.509	3.182	3.474		5.323	***
Tropical livestock units	0.871	0.410	0.888	***	0.380	**
HH wealth index	14,300.416	4,432.394	13,602.013		67,405.892	***
HH experienced shock previous 12 months	0.661	0.642	0.661		0.613	

Significant mean differences are indicated by *** p<0.01, ** p<0.05, * p<0.10.
Source: Calculations based on 2013 CFSVA data and on 2011 EMICoV-2/DHS-IV data.

The figures in Table 2 also indicate that the group of households that did not obtain any credit is more endowed with livestock than households with MCPG. The difference in the wealth index is only significant between participants of the MCPG and the group of households that accessed formal credit, the highest wealth index found among this group. This suggests that only relatively richer households obtain formal credit. The statistics indicate significant differences in experiencing shocks between participants of MCPG and the other two groups. The proportion of households that experienced shocks during the 12 months prior to the survey is highest among MCPG participant households, and the lowest is found among those that did not obtain any credit. However, this significant difference is only observable in the CFSVA data.

4. Models and methods

In this study, we assess the impact of accessing MCPG on households' FCS and on individuals' anthropometric measures. However, potential endogeneity bias can arise in estimating the nutritional impact of accessing the government's microcredit. As is common in the literature for assessing the impact of microfinance, non-random programme placement and self-selection issues need to be accounted for. The microcredit policy of the government is intended to be available to the poorest. As such, programme placement bias may result from the government or the microfinance institutions' selection behaviours that are related to eligibility conditions or unobserved factors. Moreover, the individual's choice of applying for the government's microcredit may be based on observable characteristics and unobserved factors such as the inclination for microentrepreneurship, motivation or self-confidence.

We assess the effect of accessing the government's microcredit and dealing with its endogeneity by estimating the following endogenous treatment-regression model (Cameron and Trivedi, 2005; Wooldridge, 2010):[3]

$$Y_i = X_i\beta + \delta t_i + \varepsilon_i \qquad (outcome\ equation: Eq1) \tag{1}$$

$$t_i = \begin{cases} 1, if\ Z_i\alpha + u_i > 0 \\ 0, \quad otherwise \end{cases} \qquad (endogenous\ treatment\ equation: Eq2) \tag{2}$$

where Y is an indicator of the nutrition outcome (household's FCS and individuals' anthropometric measures), X and Z are vectors of explanatory variables, α and β are the parameters to be estimated, and u and ε are the error terms not related to X or Z. The unobserved error terms are bivariate normal with mean zero and have the following correlation structure: corr $(\varepsilon,u)=\rho$. t is the treatment variable – that is household accessing the MCPG – and is endogenous if the estimated $\rho \neq 0$. The estimated parameter δ is interpreted in the framework of the counterfactual model as the average treatment effect on the treated (ATET):

$$ATET = E(Y_{1i} - Y_{0i} | \ t = 1) \tag{3}$$

$$Y_i = t_i Y_{1i} + (1 - t_i) Y_{0i} \tag{4}$$

where Y_{1i} and Y_{0i} are the observed nutrition outcomes, respectively, where the household obtained the MCPG, and the potential nutrition outcome (counterfactual) where the same household did not. We considered two control groups in the analysis. The first control group comprises households that did not obtain any credit in the year prior to the survey, and the second control group comprises households that obtained credit from other formal sources of credit, such as a mutual credit institution or a bank.

The ATET is the average of the difference of these nutrition outcomes among households that actually made use of the MCPG (Rubin, 1974; Heckman and Navarro-Lozano, 2004). The above endogenous treatment-regression model (Equations 1 and 2) may be extended to allow complete interaction between the treatment variable and all control variables included in the outcome equation.

The vectors X and Z are used to estimate the endogenous treatment-regression model include common (same) and non-common observable covariates that might affect the nutrition outcome and factors that might determine the likelihood of households accessing the MCPG. These variables control for human capital endowments, households' access to other resources and environmental conditions. Two exclusion restrictions are included in the vector Z, depending on the type of nutrition outcome we use. For the household nutrition outcome (2013 CFSVA database), we used instrumental variables related to the awareness of the availability of main sources of credit for households. These external instruments denote whether parents or relatives are the main source of credit available to households, and whether tontine is the main source of credit. The awareness of the availability of these nearest (informal) sources of credit may increase the likelihood of them being accessed, and will therefore decrease the probability of obtaining credit from relatively formal sources such as microfinance institutions and banks. Campero and Kaiser (2013) studied the awareness and use of formal and informal credit sources in Mexico and reported significant correlation between being aware of a specific source of credit and its use. The orthogonality condition is satisfied with our two external instruments as only knowing about a source of credit does not directly affect the nutrition of households unless it is used.[4]

For the individual nutrition outcome (2011 EMICoV-2/DHS-IV database), we use two instrumental variables: whether the household has a bank account and whether the household has participated in tontine in the 12 months prior to the survey. These two instruments are likely to be correlated to the likelihood of obtaining credit from formal sources such as microfinance institutions and banks, but not directly to the anthropometric measures.

5. Results and discussion

Impact of MCPG on households' nutrition outcomes

Table 3 reports the results of the effect of accessing the MCPG on households' FCS. We present the results for two different control groups: households without any credit (control group 1) and those with formal sources of credit (control group 2). This allows us to assess the relative effectiveness of the MCPG in improving nutrition compared to other formal sources of credit.

In each case, we considered two different specifications. In the first specification we assume that the effect of the explanatory variables in the outcome equation (Equation 1) does not differ between the treated group and the control group. In the second specification we allow for complete interaction between the treatment variable and the control variables included in the outcome equation. Separate coefficients of these covariates are thus estimated for the treated and control groups.

Table 3 shows that the excluded instruments – awareness of the availability of sources of credit from parents/relatives and from tontine – are significantly correlated with the likelihood of obtaining microcredit from the government. The awareness of the availability of these types of credit sources either decrease or increase significantly the likelihood of obtaining microcredit from the government. The estimated correlations between the error terms of the endogenous treatment equation (Equation 2) and of the FCS equation (Equation 1) are negatively significant at the 5% level, indicating that unobserved factors that increase the likelihood of accessing the MCPG also tend to decrease FCS.

Table 3 also shows that the average treatment effects of accessing the MCPG are positively significant for all estimations. For Example, when considering the first control group in the model without interaction, there is evidence that the expected FCS of the households that accessed the MCPG is higher and amounts 29 scores more than that would be if they did not obtain any credit. When considering the control group 2 in the model with interaction, the estimated average treatment effect of accessing the MCPG on FCS is 21 scores . This result implies that the poorest households that accessed MCPG would have decreased their FCS by about 21 scores more if they did obtain formal credit. They would

have decreased their FCS even more by 31 scores had they not obtained credit at all. These findings suggest the relative effectiveness of the MCPG in improving nutrition at the household level.

Table 3: Effects of MCPG on household food consumption score (FCS)

	Control group 1: No credit		Control group 2: Other formal credit	
	Model without interaction	**Model with interaction**	**Model without interaction**	**Model with interaction**
Average treatment effect on the treated	28.926***	30.993***	19.891***	21.294***
Instrumental variables				
Awareness of availability of parents or relatives as main source of credit	-0.198***	-0.193***	-0.188**	-0.199**
Awareness of availability of tontine as main source of credit	-0.099*	-0.095*	0.197**	0.193**
corr(e.Eq2, e.Eq1)	-0.701***	-0.759***	-0.684***	-0.732***
Observations	12,537	12,537	723	723
Treated Obs.	256	256	256	256

Note: The model with interaction allows for complete interaction between the treatment variable and all the control variables included in the outcome equation. Full results not reported but available on request.
Significant levels are indicated by *** p<0.01, ** p<0.05, * p<0.10.
Source: Calculations based on 2013 CFSVA data.

Impact of the MCPG on individuals' nutrition outcomes

Table 4 presents the estimated treatment effects of accessing the MCPG on individuals' nutrition outcomes. Due to inconsistencies and lack of convergence, we do not report estimation results for control group 2, which consists of households that accessed other formal credit. As in Table , we also present the results in Table 4 with and without interaction between the treatment variable and all control variables included in the outcome equation.

The results show that the instrumental variables are significantly correlated with the treatment variable – accessing MCPG – and that the estimated error correlations between the error terms of the outcome and the treatment equations are negatively significant at the 5% level. The estimation results provide evidence that the average nutrition outcomes of women and children belonging to households that accessed the MCPG are estimated to be higher than the nutrition outcomes would have been if the same households had obtained any credit. Accessing the MCPG would therefore be favourable for individual nutrition in households.

Table 4: Effects of accessing government microcredit on women's and children's nutrition (control group 1: no credit)

	Women				Children			
	Body mass index		Weight-for-height SD		Height -for-age SD		Weight -for-age SD	
	Model without interaction	Model with interaction	Model without interaction	Model with interaction	Model without interaction	Model with interaction	Model without interaction	Model with interaction
Average treatment effect on the treated	686.178***	724.7184***	288.575***	348.118***	364.754***	393.875***	238.845***	270.066***
Instrumental variables								
HH has a bank account	0.346***	0.343***	0.209*	0.152	0.327***	0.339***	0.321***	0.334***
HH has participated in tontine	0.319***	0.305***	0.154**	0.163***	0 .026	0.007	0.089	0 .063
corr(e.Eq2, e.Eq1)	-0.667***	-0.710***	-0.638***	-0.764***	-0.702***	-0.757***	-0.624***	-0.710***
Observations	15,874	15,874	10,272	10,272	8260	8260	8260	8260
# of treated HH	383	383	205	205	168	168	168	168
# of treated HH	274	274	145	145	117	117	117	117
# of control HH	11673	11673	6953	6953	5582	5582	5582	5582

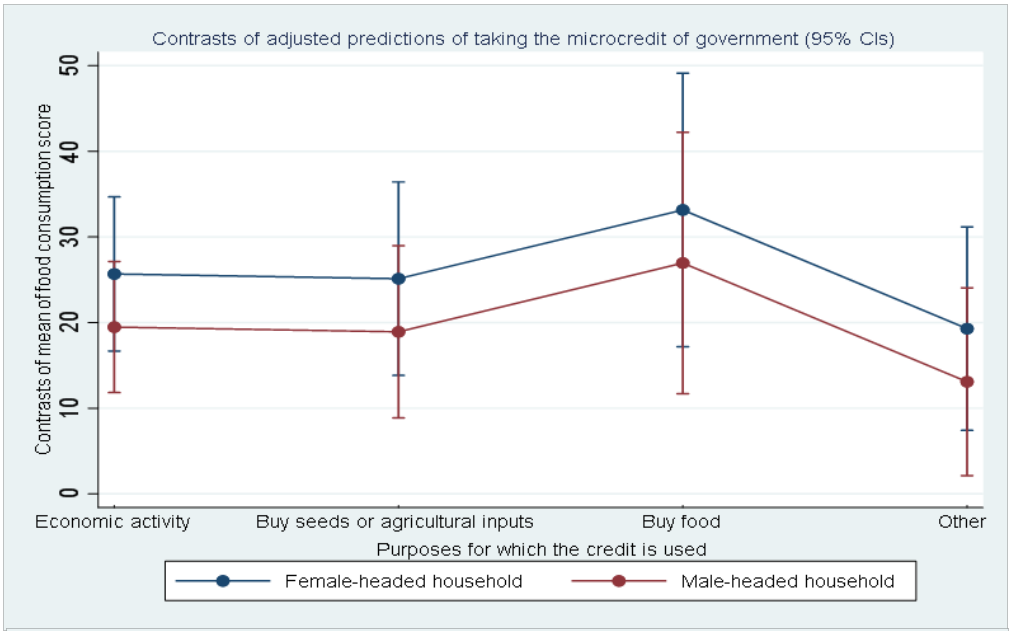
Note: The model with interaction allows for complete interaction between the treatment variable and all the control variables included in the outcome equation. Full results not reported but available on request.
Significant levels are indicated by *** p<0.01, ** p<0.05, * p<0.10.
Source: Calculations based on 2011 EMICoV-2/DHS-IV data.

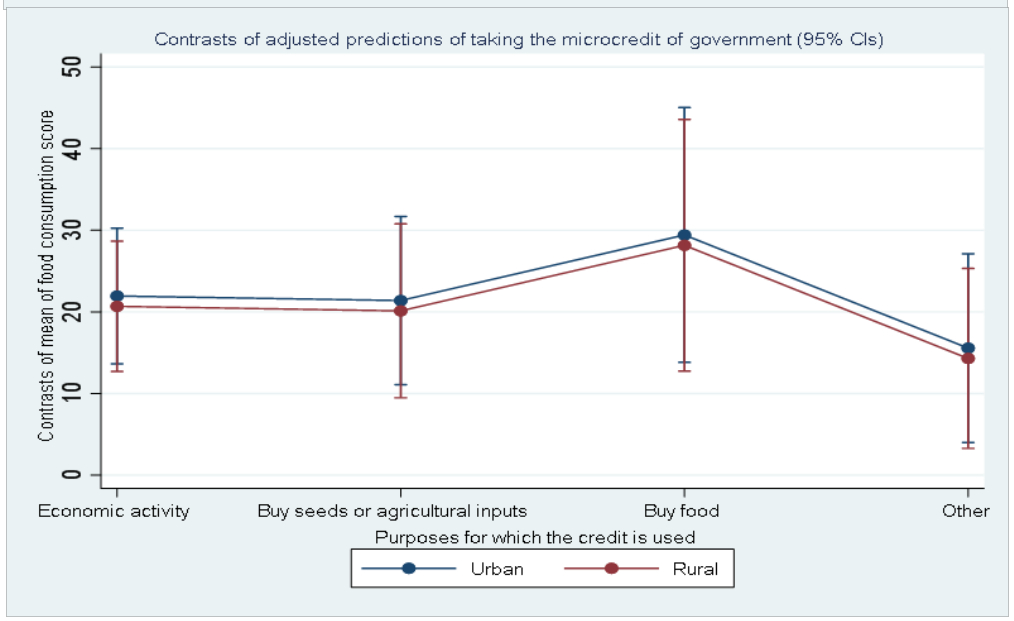
The findings are in line with that of Hamad and Fernald (2012) that show that participation in microcredit is associated with higher BMI for women in Peru. Note that while our treatment variable is at the household level, the nutrition outcome variable refers to one or more eligible women and children in the same household. The treatment effects remain robust when we restrict the sample to households with only one eligible woman or one eligible child. As such, in relation to the study of Hamad and Fernald (2012), who only use a sample of female clients from a microcredit organization in Peru, our results suggest that the nutritional effect of accessing the MCPG can be transmitted to other household members and does not necessarily only affect the one who accessed the credit. Accessing the MCPG has a "household" effect, indicating that when women obtained the MCPG it was beneficial for the whole household. This is corroborated by a sample of MCPG beneficiaries surveyed in 2011, which showed that the MCPG favoured the management of health needs, the improvement of nutritional status and the state of housing (floor covering), and access to drinking water (FNM, 2011). The findings are also in line with that of Guha-Khasnobis and Hazarika (2008), who show that women's access to microcredit improves children's nutrition. However, contrary to Guha-Khasnobis and Hazarika (2008), our results show that the MCPG is not only confined to the improvement of girls' nutrition, but also for the nutrition of boys (Table A1 in the Appendix).

Heterogeneous effects

In order to better understand the heterogenous impact of accessing the MCPG on household nutrition, we extended our analysis by analysing the effects across household groups. Considering control group 2, we explored whether the estimated effect of obtaining the MCPG differs between different household groups. Figure 2 presents the profiles of the average treatment effect among households that accessed the MCPG for representative values of some covariates. Each data point in Figure 2 represents the expected increase in FCS from accessing the MCPG among those who accessed this type of credit. Figure 2 shows that the MCPG affects FCS the least when it is used for purposes other than economic activity, buying seed and agricultural inputs, or buying food. The largest positive effect in terms of FCS is observed when households used the MCPG for buying food, even more so in female-headed households. There is not much difference in the effect of the government's microcredit on rural and urban areas.

Figure 2: Heterogeneous effect of accessing government microcredit





Source: Calculations based on CFSVA-2013 data.

The results suggest that the MCPG, which is mostly intended for women, may increase women's empowerment through its use in income-generating activities (economic activity, or buying seed and agricultural inputs) and reinforce women's empowerment in female-headed households. Dahoun et al. (2013) show that microcredit has a positive effect on the empowerment of female-headed households in Benin, and specifically on the dimensions of "social responsibilities and living conditions". These results also suggest that the MCPG has an impact on household nutrition through both the "investment in income generating activities" and the "insurance" channels. Although the majority of households accessed the MCPG for income-generating activities, it is the "insurance" channel, through the purchase of food, that has a larger nutrition impact.

6. Conclusion

Like many SSA countries, Benin is characterized by low economic development, high levels of poverty, food insecurity and an imperfect credit market. Consequently, policy makers struggle to address the challenge of food insecurity. In this study, we assessed the extent to which the government's microcredit extension to the poorest affects nutrition in Benin. We assessed the effect of the microcredit of the government on nutrition in Benin, considering household-level as well as individual-level nutritional outcomes, such as the FCS for households, the height-for-age standard deviation, the weight-for-age standard deviation, and the weight-for-height standard deviation for children aged 0 to 5, and the BMI for women aged 15 to 49. This paper makes use of a modelling framework that takes into account the endogeneity of accessing the government's microcredit.

The results show that access to the government's microcredit helps to increase the FCS relative to no access to credit, and households that accessed the government's microcredit would have a decrease in FCS if they accessed mutual credit or credit from a bank. The findings also indicate that accessing the government's microcredit has a positive effect on the nutrition of children and women. Furthermore, the results suggest that the largest positive effect of the government's microcredit on FCS is when it serves to purchase food, even to a greater extent among female-headed households. These findings therefore show positive linkages between the microcredit policies of the Government of Benin and household-level as well as individual-level nutritional outcomes. The findings highlight the importance of the microcredit policy in improving households' and household members' nutrition, most likely through women's empowerment as the microcredit policy of the government is largely aimed at women for income-generating activities.

Notes

1. A third channel identified in the literature is through education or information. Islam et al. (2016) describe a framework to understand the channels through which microfinance influences food security.

2. Enquête Modulaire Intégrée sur les Conditions de Vie des Ménages.

3. We do not use treatment-effects estimators (such as the propensity score matching method) that rely only on the conditional independence assumption (CIA).

4. In addition, in the outcome equation we control for whether a microcredit institution and a mutual credit institution exists in the community.

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Appendix

Table A1: Effects of accessing government microcredit on children's nutrition by sex (control group 1: no credit)

	Girls		Boys	
	Weight-for-height SD	**Weight -for-age SD**	**Weight-for-height SD**	**Weight -for-age SD**
	Model with interaction	**Model with interaction**	**Model without interaction**	**Model without interaction**
Average treatment effect on the treated	357.285***	272.217***	318.217***	241.534***
Instrumental variables				
HH has bank account	0.360***	0.382***	-0.013	0.232
HH has participated in tontine	0.154***	0.0339	0.164*	0.087
corr(e.Eq2, e.Eq1)	-0.710***	-0.710***	-0.745***	-0.658***
Observations	4,979	4,037	5,293	4,223

Significant levels are indicated by *** p<0.01, ** p<0.05, * p<0.10.
Source: Calculations based on 2011 EMICoV-2/DHS-IV data.

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