
Impact of Microcredit on Housing and Food Security in Nepal

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Abstract: This paper intends to assess the impact of microcredit on housing and food security in Nepal. The multivariate techniques used to achieve the objectives of the study. The study uses Nepal Living Standard Survey 2011 data, which covers 5,988 households. Considering the endogeneity in the microcredit participation of household, the study uses instrumental variable technique (IV method) for assessing the impact of microcredit on housing and food security. After the adjustment of the endogeneity, distance of bank, distance of cooperative from household and holding of land size of household as the instruments, eligible household reduced 475 household from 779 total households of intervention group and similarly 2,953 households from 5,209 total households of control group. CMP (conditional mixed process) estimator used to give flexibility in terms of combining continuous and binary variables together in the same model. Multivariate analysis indicates that it has positive and significant relationship on housing and food security (construction material, ownership status, sources of electricity, structural condition, sources of drinking, maintenance of house, consumption of cereals, consumption of veg, consumption of milk, consumption of egg, consumption of meat, food diversity) on intervention group than the control group. The results and findings of this study and review of the literatures in the paper provided a wide range of evidence that microcredit programs can increase incomes and lift families out of poverty. Microcredit would be a viable and potentially sustainable tool to reduce poverty level in Nepal.

Keywords: Microcredit, Impact, Expenditure, Nepal

1. Introduction

A loan for the poor is generally used as an absurd concept. Millions of unbanked households, poor and vulnerable non-poor are wanted banking and financial services for their financial need. They seek a varied of services such as loans, facilities for sending and receiving remittances, savings and insurance. They want to use their financial services to build income generating activities, mitigate risk, and want to protect against vulnerability. It is often when the economy is in crises, when they are suffering from illness, and natural disaster. This kind of loan usually, they invest in their micro and small businesses, they purchase basic assets, improve their quality of homes, and right to use their health and education services [30]. It is argued that the financial services in developing countries often have failed to serve the low income, marginalized and poor people. With regard to the formal and the regulated sector, like banks and other

financial institutions generally they need significant collateral, favor to invest only more income and high amount of loan clients, and have lengthy and bureaucratic application procedures. In informal sector and money-lenders usually they charge very high interest rates because of without collateral, and often allow chauvinistic manner to guide lending decisions. The failure of such financial services provider formal and informal sectors to provide affordable financial services to the poor, needy and marginalized people is often caused as one of the main reasons that add force to the vicious circle of economic, social and demographic structures that ultimately cause illiteracy and poverty [30].

As the partial response of the failure of this formal and informal financial sector, over the last past three and half decades, there has been significant growth in what can be termed "micro-credit". Microcredit is fundamentally the dispersion of without collateral loans with jointly group's responsibility to repay and in order to foster employment and

income generation which helps to overall poverty reduction through enhancing self-entrepreneurship [30].

Perhaps the well-known micro-credit institution is the 5 regional "*Grameen Bikas Bank*" in the period of its establishment in Nepal which was the copy model of "*Grameen Bank*" of Bangladesh. However, this model is not only in developing countries, it has been also replicated in many developed countries as well (such as the United States and in many European countries), and it is estimated that over 10 million households world-wide are serviced by microcredit [17].

Time to time, International financial institutions such as the World Bank, USAID and other international donor agencies have arranged an international summit on microcredit in different part of the world. Representative of international donor agencies and microcredit organizations have set a target to achieve at that summit. Under these circumstances, it is important to evaluate that what is the real impact on housing and food security of poor through poverty alleviation capacity of microcredit? It is also very important know that whether microcredit alleviates poverty and improves their poverty related indicators such as education, income, shelter, sanitation and assets for policy perspective. It is time and need to know that whether claims, made by the international microcredit summit and the microfinance institutions in Nepal to eradicate poverty and improve people's poverty related indicators through microcredit, are rhetoric or reality. For that some studies have carried out and found that access to this type of credit by the poor has a positive significant, large and permanent effect on living standard of such people and they enhance their education, their housing quality and food nutrition. While other related studies have also found that through micro-credit, the poor households simply become poorer through the additional burden of further debt and high interest rate [2].

We therefore need to know and answer to all of this type of unclear and crucial questions before making any statement on the microcredit summit's and microfinance institutions' target. Does microcredit increase the construction material their house? Does microcredit increase the ownership status of their assets? Does microcredit improve their sources of electricity? Does microcredit improve their housing structural condition? Does microcredit improve their sources of drinking? Are they making maintenance of their house? And some more questions that, Does microcredit improve consumption of cereals, consumption of veg, consumption of milk, consumption of egg, consumption of meat, food diversity of borrowing households? Is it true that microcredit programs are sustainable tool to reduce overall poverty in Nepal?

Keeping with these questions in mind, this study is intended to examine empirically the impact of microcredit on housing and food security in Nepal. The cross-sectional data from Nepal Living Standard Survey III (2011) has used in this study which covers 5,988 households. Among them 5,209 households are control and 779 households are intervention group. The drawback associated with impact

assessment studies using one period cross sectional data is that the result of such studies do get biased due to the problem of self-selection and endogeneity. The presence of such an endogeneity problem, the study uses instrumental variable technique (IV method) for assessing the impact of microcredit on children education.

2. Hypotheses of Research

The main hypothesis of this study is that microcredit is a sustainable tool to increase the living standard of people of borrowing households from microfinance institutions. The unbanked households, poor and vulnerable non-poor households in rural and remote areas fail to obtain the minimum amount of capital that is required for financial services due to lack of collateral. Microfinance institutions provide minimum capital to unbanked, poor and vulnerable non-poor households to improve their employment status. Through improving employment status such households increase their income and thus, improve the fulfillment of their basic needs. Gradually these households graduate to increase in on housing and food security i.e. microcredit is a sustainable tool to reduce poverty.

On the basis of this main hypothesis, two sub hypotheses can be defined:

1. Being a membership in a any microcredit institutions access the financial services which help to improves the employment opportunity and ultimately increases income of the borrowing households;
2. Being a membership in a any microcredit institution improves the fulfillment of basic needs of the borrowing households; i.e. membership of the microcredit institutions increases the access to the financial services for the self-employment which ultimately increase in income which makes positive impact on housing and food security (construction material, ownership status, sources of electricity, structural condition, sources of drinking, maintenance of house, consumption of cereals, consumption of veg, consumption of milk, consumption of egg, consumption of meat, food diversity).

3. Literature Review

In spite of the existence of microfinance industries all over the world and concentrated in developing countries for over three decades, it is surprised that there is no sufficient quantity of literature in this field, which provides a clear evidence of alleviation of poverty indicators capacity of microcredit. Only a few impact related studies have been conducted with carefully chosen treatment and control groups and these studies provides a mixed picture of the impact [19].

The results of the empirical evidence on impact of microcredit on poverty's indicators such as employment, income, assets, formal education health access, sanitation etc. havefound very mixed results [11, 31, 23, 33, 15, 28, 1, 4, 17, 32].

Glewwe and Jacoby [8], tested the effect of child health and nutrition outcomes in Ghana, including the age of enrollment and years of completed schooling. They used the cross-sectional data to identify effects. One of the approaches in that study was to seek instruments that affect child health characteristic (such as height for age anthropometric outcome) but were not correlated with unobserved family characteristic affecting child education. They proposed as instruments for child health (a) Distance to the closest medical facility and (b) Maternal height. Both justifiably correlate with child health, but they also pointed out the mother's height could affect her labor productivity and hence household income and the resulting time she has to spend on her children's education. Distance to nearby medical facilities could also correlate with other community characteristic, such as presence of school. Both of the caveats weaken the assumption that $cov(Z, e) = 0$. From the IV estimate, as well as alternative estimate specifying fixed effect for families. They found strong negative effects of child health on delayed enrollment but no statistically significant effect on completed years of schooling.

Ghalib [6] explained that "social impact on lives of the poor by means of a standard model". Which consider a sort of an experimental and design two different groups, one is a control and other is a treatment group. Treatment group is exposed to participation in the microfinance intervention whereas control group is not, assuming that both the groups are living in the identical economic and social conditions. The difference in the quality of lives, in terms of social indicators is considered the impact of microfinance. Since social impact is a complex process and a number of other factors will contribute to the model.

Some impact evaluation studies have found that access to credit by the poor has a positive, large and permanent effect on poverty's indicators such as employment, income, assets, formal education health access, and sanitation. However, other studies have found that poverty is not reduced through micro-credit; poor households simply become poorer through the additional burden of further debt. Since more money for micro-credit essentially means less money for other programs with similar aims. Bruntrup et al.; [1], have only used descriptive statistics for impact analysis. They have not used any multivariate technique to determine the impact of microcredit on poverty related aspects of borrowing households. Mustafa et al.; [23], and Hossain [11], completed their study without solving endogeneity problems. It means they were biased in selecting the sample households. Among the studies reviewed, Khandker and Chowdhury [15], and Pitt and Khandker [28], were found sound in methodological perspective. Hossain [12], have conducted the study using cross sectional data and only one impact assessment study, Khandker [14], has conducted using a panel data set. Instrumental variable technique (IV) method Stock & Watson [35], allows for endogeneity in the individual participation, program placement, or both and it also can

allow for time-varying selection bias. Measurement error that results in attenuation bias can also be resolved through this procedure. This approach involves finding a variable (or instrument) that is highly correlated with program or participation but that is not correlated with unobserved characteristics that affecting outcomes.

4. Methodology

4.1. Source of Data

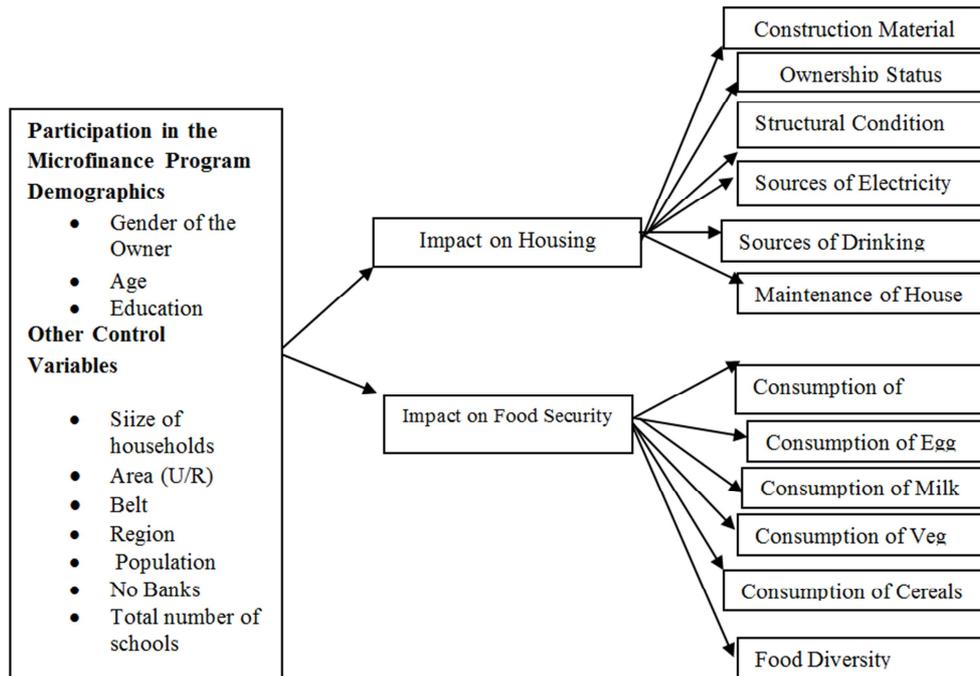
The data used in this research are taken from Nepal Living Standard Survey (NLSS). The original survey was carried out by the Central Bureau of Statistics (CBS), National Planning Commission, and Government of Nepal. The NLSS has been carrying out since first time in 1995/96. The second time the NLSS was carried out in 2003/04. And the NLSS 2010/11 was the third round of a survey conducted by the CBS. NLSS followed the globally adopted framework and methodology developed by the World Bank. All the three surveys followed the Living Standard Measurement Survey Methodology, which was developed by the World Bank. While the panel data could be desirable to inter temporal changes and specially studying on impact. This study had been used the cross-section data of NLSS III in view of unavailability of panel data. This cross-section survey NLSS III enumerated 7,020 households, of which 5,988 households have been for the cross-section sample and remaining 1,032 were for the panel sample [24].

4.2. Research Framework

On the basis of discussion made so far and theoretical underpinnings explained in the review of literature, the model has been developed like as shown in the figure below which is a unified framework that sheds light on the impact of microcredit on education at household level. In addition to this demographic and other independent variable has been added in the model.

4.3. Dependent and Independent Variables

Treatment (independent) variables and the outcome (dependent) variables have been considered in the study. Several outcome variables taken into consideration, namely: children education (number of schools going children, highest educational level and school expenditure). There are three possible treatment variables that can be used to assess the impact of microfinance. These are: (1) number of years the clients spent as an access of the microfinance, (2) amount/value of loans availed, (3) number of loan cycles. Treatment variable 1 and 2 are deemed better in representing program availability [3], Present study has taken (2) as the treatment variable to assess the impact of microfinance. Outstanding loan without collateral from agricultural development bank or from commercial bank or from rural development bank or from other financial institution or from NGO or from relief agency or from co-operative has been considered the proxy of microcredit.



Source: Developed by the researcher.

Figure 1. Research Framework.

4.4. Other Control Variables

Other control variables have been included in the control function such as sex, age, education, household size, type of area (rural, urban), ecological belts (mountain, hills, terai), development region (eastern, central, western and mid and far western), population, number of banks and total number of schools.

4.5. Theoretical Statement of IV Model and Assumptions

Sometimes, problems occur in the regression model. This is often due to omitted variables, or due to errors in variables or due to simultaneous causality which make the error term correlated with the regressor. Omitted variable can be addressed directly by including the variable in a multiple regression, but there is feasible if data is available on the omitted variable. And sometimes, when causality runs both from X to Y and from Y to X, there is simultaneous causality bias, multiple regression cannot eliminate the bias. If a direct solution to these problems is either infeasible or unavailable, then a new method is required. In such situation Instrumental Variables (IV) regression is a general way to obtain a consistent estimator of the unknown coefficients of the population regression function when the regressor, X is correlated with the error term u. The variation in X as having two parts: one part that, for whatever reason, is correlated with u, and the other part that is uncorrelated with u. If we had the information that allowed us to isolate the part second, then we could focus on those variation in X that are uncorrelated with u and disregard the variation in X that bias the OLS estimates. The information about the movements in

X that are uncorrelated with u is gleaned from one or more additional variables, is an instrumental variables or instrument.

4.6. General Instrumental Variables Regression Model

$$Y_i = B_0 + B_1 X_{1i} + \dots + B_k X_{ki} + B_{k+1} W_{1i} + \dots + B_{k+r} W_{ri} + u_i \quad (1)$$

$i = 1, \dots, n$

where,

Y_i is the dependent variable,

B_0, B_1, \dots, B_{k+r} are the unknown regression coefficients,

X_{1i}, \dots, X_{ki} are k endogenous regressors, which are potentially correlated with u_i

W_{1i}, \dots, W_{ri} are r included exogenous regressors, which are uncorrelated with u_i or are control variables,

u_i is the error term which represents measurement of error and/or omitted factors, and

Z_{1i}, \dots, Z_{mi} are the m instrumental variables.

Two Stage Least Squares

The TSLS estimator in the general IV regression model in Equation (1) with multiple instrumental variables is computed in two stages:

(1) First-stage regression (s): Regress X_{1i} on the instrumental variables (Z_{1i}, \dots, Z_{mi}) and the induced exogenous variables (W_{1i}, \dots, W_{ri}) using OLS. Compute the predicted values from this regression; call these X_{1ihat} . Repeat this for all the endogenous regressors X_{2i}, \dots, X_{ki} thereby computing the predicted values $X_{2ihat}, \dots, X_{kihat}$

(2) Second-stage regression: Regress Y_i on predicted values of the endogenous variables ($X_{1ihat}, \dots, X_{kihat}$) and the included exogenous variables (W_{1i}, \dots, W_{ri}) using

OLS. The TSLS estimators, $B_{0\text{hat}}^{\text{TSLS}}, \dots, B_{k+\text{rhat}}^{\text{TSLS}}$ are the estimators of the second-stage regression.

In this study two stages are done automatically within TSLS estimation commands in STATA software.

4.7. Two Conditions for Valid Instrument

A set of m instruments Z_{1i}, \dots, Z_{mi} must satisfy the following two conditions to be valid:

(1) Instrument Relevance

1. In general, let $X_{1\text{ihat}}$ is the predicted value of X_{1i} from the population regression of X_{1i} the instruments (z 's) and the included exogenous regressor (W 's) and let "1" denote a regressor that takes on the value "1" for all observations (its coefficient is the intercept), then $(X_{1\text{ihat}}, \dots, X_{k\text{ihat}}, W_{1i}, \dots, W_{ri}, 1)$ are not perfect by multicollinear.

2. If there is only one X , then at least one Z must enter the population regression of X on Z 's and the W 's.

(2) Instrument Exogeneity

The instruments are uncorrelated with the error term, that is:

$$\text{Corr}(Z_{1i}, u_i) = 0, \dots, (Z_{mi}, u_i) = 0.$$

The Instrument Variable Assumptions

$$\text{Micro} = \alpha + \beta_1 \text{sex} + \beta_2 \text{age} + \beta_3 \text{education} + \beta_4 \text{size of households} + \beta_5 \text{area} + \beta_6 \text{belts} + \beta_7 \text{development regions} + \beta_8 \text{population} + \beta_9 \text{no of banks} + \beta_{10} \text{total number of school} + \beta_{11} \text{distance of bank} + \beta_{12} \text{distance of cooperative} + \beta_{13} \text{holding of land} + u_i \quad (2)$$

Second Stage

$$Y = \alpha + \lambda_1 \text{sex} + \lambda_2 \text{age} + \lambda_3 \text{education} + \lambda_4 \text{size of households} + \lambda_5 \text{area} + \lambda_6 \text{belts} + \lambda_7 \text{development regions} + \lambda_8 \text{population} + \lambda_9 \text{no of banks} + \lambda_{10} \text{total number of school} + \lambda_{11} \text{micro}^{\text{hat}} + v_i \quad (3)$$

Y is the dependent or outcome (Housing and food Security)

Micro is the endogenous regressor, which is potentially correlated with u_i whose characteristic is the participation of microfinance which is measuring the household status (a binary variable having a value 1 if there is participating in the credit and 0 otherwise).

Sex, age, education, household size, type of area (rural, urban) belts (mountain, hills, terai) development region (eastern, central, western and mid and far western), population, no of Banks and total number of schools are included exogenous regressor, which are uncorrelated with u_i or Control variables. u_i is the error term which represents measurement of error and/or omitted factors. Distance of bank, distance of cooperative and holding of land size are the instrumental variables which are highly correlated with program or participation but that is not correlated with unobserved characteristics that affecting outcomes. $\beta_1, \dots, \beta_{13}$ are the unknown regression coefficients.

4.10. Mandatory Diagnostic Tests of Models for IV

Two important tests, testing for endogeneity and testing of over identifying restrictions have been carrying out for searching the plausible instruments for a potentially endogenous explanatory variable. As a diagnostic test conducted on all given 3 equations for the test of the strength of instruments and over identification restrictions.

The variables and error in the IV regression model satisfy.

1. $E(u_i / W_{1i}, \dots, W_{ri}) = 0$
2. $(X_{2i}, \dots, X_{ki}, W_{1i}, \dots, W_{ri}, Z_{1i}, \dots, Z_{mi}, Y_i)$ are i.i.d. draws from their joint distribution.
3. The X 's, W 's, Z 's and u all have nonzero, finite fourth moments
4. The W 's are not perfectly multicollinear and
5. The two conditions for the valid instrument hold.

4.8. A Rule of Thumb for Checking for Weak Instruments for Relevancy

The first stage F-statistics is the F-statistics testing the hypothesis that the coefficients on the instruments, Z_{1i}, \dots, Z_{mi} equal to zero in the first stage of the two stage least squares. When there is single endogenous regressor, first-stage F less than 10 indicates that the instruments are weak. In which case, the TSLS estimator is biased (even large sample), and TSLS t-statistics and confidence interval are unreliable [35].

4.9. Empirical Instrumental Variables Regression Model

First Stage

Cragg-Donald Wald F statistic, Sargan statistic (over-identification test of all instruments), and under identification test (Anderson canon. corr. LM statistic), have been tested and results of all 3 models are verified (Table 1).

When the distance of the cooperative is used as IV for outcome variables in all 3 equations, the criteria of testing the over identifying restriction. Distance of cooperative from the household, over identification test is satisfied. When distance of bank and land holding (eligibility restriction criteria to the participant of households for microcredit) are added to the IVs list, nR^2 is higher than the 10 percent level which is statistically verified. Therefore, it is valid to add these two variables as instruments to the IV list.

Testing for endogeneity, OLS and 2SLS estimator have been estimated in the study. As it is seen, there is statistically significant difference between OLS and 2SLS. As Hausman [9] suggested directly comparing the OLS and 2SLS estimates and determining whether the difference is statistically significant or not for all 3 equations, both OLS and 2SLS are found consistent because all variables are exogenous. If OLS and 2SLS statistically significant, it concludes that dependent (outcome) variable must be endogenous. For details, (Number of observations, Result of F-test, Probability > F, R-Squared and Adjusted R-squared) see in Appendix.

Table 1. Diagnostic test Results.

| Dependent Variable (outcome variable) | Exogenous variables | Endogenous variables | Instruments | Weak identification test (Cragg-Donald Wald F statistic) | Sargan statistic (over identification test of all instruments) | Under identification test (Anderson canon. corr. LM statistic): |
|---------------------------------------|--|----------------------|----------------|--|--|---|
| Sdwater | | | | 13.92 | 1.93 | 41.55 |
| amount_elect | age, sex, edu | | | 5.83 | 2.39 | 17.45 |
| Ownership | (education) (size of household), type of | | | 13.92 | 0.76 | 41.55 |
| rep_main | area (rural and | | | 13.92 | 0.25 | 41.55 |
| Cstructure | urban), Region | | Distance of | 18.02 | 13.92 | 41.55 |
| Materialu | (eastern, central, | Micro | Bank, Distance | 13.92 | 33.75 | 41.55 |
| meat1 | western Midwestern | | of cooperative | 13.92 | 1.73 | 41.55 |
| egg1 | and far western), | | and size of | 13.92 | 3.35 | 41.55 |
| milk1 | population, numbers | | land holding | 13.92 | 10.87 | 41.55 |
| veg1 | of schools, numbers | | | 13.92 | 0.09 | 41.55 |
| cereals1 | of bank and | | | 13.92 | 0.42 | 41.55 |
| diversity | financial institutions | | | 13.92 | 8.99 | 41.55 |
| (meat1egg1milk1veg1cereals1) | | | | | | |

Table 1 shows the all individual results of tests on all dependent variables.

Weak identification test (Cragg-Donald Wald F statistic): 10

Sargan statistic (over identification test of all instruments): $\leq 10\%$ of level

Chi-sq(2) P-val $\leq 10\%$ of level

For the results of OLS and IV estimator of all 3 models (Appendix)

5. Empirical Results and Discussion

5.1. Impact on Housing

To assess the impact of microcredit of participants, controlling for selected demographic and other variables, an instrumental variable technique with cmp estimator was run to determine the effect of microcredit on housing. The key coefficients of the estimated model of IV regression estimator are summarized i.e., Sources of drinking water (sdwater), consumption of electricity (amount_elect), ownership status (Ownership) are in the table 2 and repair and maintenance of house (rep_main_hh), condition of structure of house (cstructure) and materials used in roofing (materialu) are in Table 3.

The results show that there is positive but not significant with improved source of drinking water. There is no significant different among the participants and non-participants to move from tube well, open well, spring water, river to piped water, covered well, hand pump. Similarly, the amount of monetary value of the consumption of electricity is positive; it leads to more consumption on electricity of participant household as compared to non-participant of microcredit. It seems the huge impact of microcredit on the consumption of electricity So, there is no evidence to reject that our hypothesis.

The ownership of dwelling is positively associated with the participation of microcredit. There is more likely to have ownership of dwelling as compared to non-participant of microcredit. Theoretically, it can be said that participant household might have earn more their new kind of business after taking microcredit. This theoretical concept is supported with this result.

Table 2. IV results of Housing indicators (sdwater, selectricity and Ownership).

| Variable | sdwater | amount_elect | Ownership |
|--------------|---------|--------------|-----------|
| Age | .00 | 71.50*** | .00*** |
| Sex | .00 | -779.00*** | -.05 |
| Edu | .03*** | 180.86*** | -.02*** |
| Hhsize | -.00 | 246.90*** | .09*** |
| Urban | .31*** | 1594.87*** | -.67*** |
| Hill | .09 | 648.09* | .42*** |
| Terai | .70*** | 907.84* | .37** |
| Edr | .32*** | -492.74 | .27** |
| Cdr | .40*** | 203.32 | .04 |
| Wdr | .69*** | 595.16* | -.09 |
| Mwdr | -.03 | -416.27 | .17 |
| Population | -.00*** | -.00 | 2.30 |
| Noof bank | -.00 | 36.63*** | -.01*** |
| totalnoofs~1 | -.00*** | -2.46*** | .00 |
| micro | .00 | 5095.15*** | .06 |
| _cons | .23 | -2791.01*** | -.06 |

legend: * p<0.05; ** p<0.01; *** p<0.001.

Table 3. IV results of Housing indicators (b)(rep_main_hh, cstructureand materialu).

| Variable | rep_main_hh | cstructure | materialu |
|--------------|---------------|------------|-----------|
| Age | -218.60 | .00 | .01*** |
| Sex | 4171.07 | -.21*** | -.19*** |
| Edu | 3378.60*** | .06*** | .06*** |
| Hhsize | 2033.81 | -.00 | .00 |
| Urban | 11843.54 | .89*** | .74*** |
| Hill | -18015.00 | .15 | .28*** |
| Terai | -5869.50 | .72*** | .69*** |
| Edr | 12782.72 | .03 | -1.3*** |
| Cdr | 23481.42* | .50*** | -.57*** |
| Wdr | 20491.95 | .60*** | -.53*** |
| Mwdr | 19250.05 | .00 | -1.43*** |
| Population | -.01 | 1.08 | -3.89 |
| Noofbank | -287.64 | .01** | -.00 |
| totalnoofs~1 | 39.31 | -.00 | .00** |
| micro | -107681.27*** | .07 | .80*** |
| _cons | -7345.53 | -1.77*** | .25 |

legend: * p<0.05; ** p<0.01; *** p<0.001

Source: Author's calculation based on instrumental variable technique estimator.

The participant of the microcredit is negatively associated with house repair or improvements (rep_main_h) Table 3. This means that participant household is less likely to repair or improve their houses as compared to who is not participated in the microcredit. Based on the interpretation there is no evidence of acceptance of the hypothesis that participation in the microcredit leads to improve house repair and improvement condition.

There is positive relationship with condition of structure of housing; it means condition of housing (cstructure) is more likelihood with the participant of household. As it is defined that, pillar bonded and cement bonded is good condition and mud bonded or wooden pillar or other is not good condition. Based on the interpretation of all result there is no evidence of rejection of the hypothesis that participation in the microcredit leads to improve the structural condition of housing.

There is positive and significant with materials used in the housed with microcredit. The variables cstructure and materialu are inter related both are found positive associated with the participation. As it is defined that of weak and strong material,(straw/thatch or earth/mud or wood/planks or other = weak material and galvanized iron or concrete/cement or tiles/slate = strong material). So, there is more likelihood to use concrete/cement or tiles/slate or galvanized iron for constructing house as compared to straw/thatch or earth/mud or wood/planks or other by the participant of microcredit. Based on the interpretation of all result there is no evidence of rejection of the hypothesis that participation in the microfinance leads to improve the construction material.

These results are supported by [5, 10, 13, 34, 7] and contradict with some of the studies like [3, 19].

5.2. Impact on Food Security

Table 4. IV results of Food Security Indicators (meat1, egg1 and milk1).

| Variable | meat1 | egg1 | milk1 |
|--------------|------------|---------|---------|
| Age | -.01*** | -.00* | .01*** |
| Sex | .09* | -.05 | -.20*** |
| Edu | -.01 | .02*** | .07*** |
| Hhsize | .03*** | .01 | .04*** |
| Urban | .20*** | .38*** | .21*** |
| Hill | .02 | .09 | .38*** |
| Terai | .20 | .22 | .03 |
| Edr | .74*** | .58*** | -.33*** |
| Cdr | .59*** | .68*** | -.16* |
| Wdr | .58*** | .59*** | -.16* |
| Mwdr | .54*** | .34*** | -.43*** |
| Population | -4.52 | -6.02* | 8.97*** |
| Noofbank | .00* | .01*** | .00** |
| totalnoofs~1 | .00 | -.00 | -.00*** |
| micro | .073 | -.06 | .20 |
| _cons | -.14012292 | -.93*** | -.11 |

legend: * p<0.05; ** p<0.01; *** p<0.001

Source: Author's calculation based on instrumental variable technique estimator.

To assess the impact of microcredit on food security of participants, controlling for selected demographic and other

variables, similarly as the impact of housing, an instrumental variable regression with cmp estimator was run to determine the effect of microcredit on food security. The key coefficients of the variables i.e., consumption of meat, egg and milk (meat1, egg1, milk1) of iv estimator are in Table 4 and consumption of vegetable, cereals and food diversity (veg1, cereals1 and food diversity) of iv estimator are in Table 5.

The results show that the participation of microcredit is positive with consumption of meat. Based on the interpretation of result there is no evidence of rejection of the hypothesis that participation in the microcredit leads to increase the consumption of meat as a nutritious food item. The participant of the microcredit is negatively associated with consumption of egg. This means that participant household is less likely to consume egg as compared to who is not participated in the microcredit. Based on the interpretation of the result there is no evidence of acceptance of the hypothesis that participation in the microcredit.

The results show that the participant of the microcredit is positively associated with increased of consumption of milk as a nutritious food item. There is positively relationship between the microcredit participation and percentage of consumption of milk. Based on the interpretation of the result there is no evidence of rejection of the hypothesis that participation in the microfinance leads to increase the consumption of milk as a nutritious food item.

The results show that there is positive and significant relationship with consumption of green vegetables as a nutritious food item. So, there is no evidence of rejection of the hypothesis that participation in the microcredit which leads to increase the consumption of vegetables as a nutritious food item.

Table 5. IV results of Food Security Indicators (veg1, cereals1 and diversity).

| Variable | veg1 | cereals1 | diversity |
|--------------|---------|----------|-----------|
| Age | .01* | .01 | -2.87 |
| Sex | -.31* | -.22 | -.05 |
| Edu | -.00 | -.01 | .02*** |
| Hhsize | .14*** | .37*** | .03*** |
| Urban | .09 | -.29 | .27*** |
| Hill | -.05 | -.14 | .16*** |
| Terai | .02 | .34 | .17* |
| Edr | -.39 | -3.86 | .34*** |
| Cdr | -.14 | -3.92 | .38*** |
| Wdr | .15 | -3.73 | .35*** |
| Mwdr | -.43 | omitted | .16** |
| Population | 2.09 | -5.10 | -7.38 |
| Noofbank | -.00 | .01 | .01*** |
| totalnoofs~1 | -.00 | -.00 | -.00*** |
| micro | .68* | .48 | .08 |
| _cons | 1.69*** | 5.43 | 3.13*** |

legend: * p<0.05; ** p<0.01; *** p<0.001

The results show that being the participant of the

microcredit is positively associated with increased with consumption of cereal. There is positively relationship between the microcredit participation and percentage of consumption of cereal. So, there is no evidence of rejection of the hypothesis that participation in the microfinance leads to increase the consumption of cereal as a nutritious food item.

The results also show that over all food diversity of that being the participant of the microcredit with consumption of different food item as a nutritious food. There is positively relationship between the microfinance participation and percentage of consumption of different food item as a nutritious food. So, there is no evidence of rejection of the hypothesis that participation in the microcredit leads to increase the consumption of different food item as a nutritious food.

It can be said that microfinance has influenced the choice of nutritious food items except the egg. Reason for acceptance of these hypotheses is that participants prefer to spend in food items except the egg and they were sensitive with their health and they have given priorities of food items than the other household expenses.

These results are supported by some previous studies like [16, 18, 20, 34]. However, [29, 22, 25] are found contradict with this result.

Appendix: Output of IV Estimators

Impact on Housing

Table A1. *Cmp (sdwater = age sex eduhhsiz urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo micro) (micro =dist_bank>dist_coopl and_hec_tot age sex eduhhsiz urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo), indicators (\$cmp_probit \$scmp_probit).*

| | Coef | Std. Err | Z | P> z | [95% Conf. Interval] | |
|--------------|------------|-------------|-------|-------|----------------------|------------|
| sdwater | | | | | | |
| age | 0.002143 | 15473 | 1.38 | 0.166 | -0.0008897 | 0.0051756 |
| sex | 0.0097317 | 0.0509435 | 0.19 | 0.849 | -0.0901157 | 0.1095792 |
| edu | 0.029594 | 0.0049897 | 5.93 | 0 | 0.0198144 | 0.0393736 |
| hhsiz | -0.0012329 | 0.0100067 | -0.12 | 0.902 | -0.0208456 | 0.0183799 |
| urban | 0.3100482 | 0.0555078 | 5.59 | 0 | 0.201255 | 0.4188415 |
| hill | 0.095886 | 0.0773752 | 1.24 | 0.215 | -0.0557666 | 0.2475385 |
| terai | 0.7005761 | 0.1502116 | 4.66 | 0 | 0.4061668 | 0.9949853 |
| edr | 0.3183625 | 0.0802782 | 3.97 | 0 | 0.1610201 | 0.4757049 |
| cdr | 0.3988752 | 0.0783751 | 5.09 | 0 | 0.2452628 | 0.5524876 |
| wdr | 0.6862515 | 0.086708 | 7.91 | 0 | 0.516307 | 0.8561961 |
| mwdr | -0.0273915 | 0.082686 | -0.33 | 0.74 | -0.189453 | 0.13467 |
| population | 0.00000114 | 0.000000355 | 3.21 | 0.001 | 0.000000445 | 0.00000184 |
| noofbank | -0.0002959 | 0.001864 | -0.16 | 0.874 | -0.0039492 | 0.0033575 |
| totalnoof | -0.000825 | 0.0001876 | -4.4 | 0 | -0.0011926 | -0.0004573 |
| micro | 0.003072 | 0.1195362 | 0.03 | 0.979 | -0.2312146 | 0.2373586 |
| _cons | 0.2324049 | 0.1438949 | 1.62 | 0.106 | -0.049624 | 0.5144338 |
| micro | | | | | | |
| dist_bank | -0.0070043 | 0.002113 | -3.31 | 0.001 | -0.0111457 | -0.002863 |
| dist_coop | -0.0114539 | 0.0030465 | -3.76 | 0 | -0.017425 | -0.0054828 |
| land_hec_tot | -0.1414175 | 0.0410223 | -3.45 | 0.001 | -0.2218198 | -0.0610153 |
| age | -0.0058405 | 0.0019657 | -2.97 | 0.003 | -0.0096931 | -0.0019878 |
| sex | -0.0007573 | 0.0606825 | -0.01 | 0.99 | -0.1196927 | 0.1181782 |
| edu | 0.0115554 | 0.0059288 | 1.95 | 0.051 | -0.0000648 | 0.0231756 |
| hhsiz | 0.0223838 | 0.01128 | 1.98 | 0.047 | 0.0002754 | 0.0444922 |
| urban | -0.1245376 | 0.0636485 | -1.96 | 0.05 | -0.2492864 | 0.0002111 |

6. Conclusion

Does microcredit work? This study and review of the literature in this paper provided a wide range of evidence that microcredit programs can increase incomes and lift families out of poverty. Access to microcredit can improve the household's employment and increase their household assets and consumption among many other outcomes.

In conclusion to this study it is argued that there is a role for microcredit as a poverty reduction policy tool. However, it is emphasized that if microcredit is chosen as an intervention policy to enhance the living standard of people, there is need to set clear objectives for the indicators of economic empowerment for the people. More importantly the ability of households to begin informal sole micro entrepreneurs should not be assumed to be adequate for the improvement of household income. There is need to create a policy framework to spur growth in the enterprises as well as the rural economy as a whole through the creation of employment opportunities and an increment in the agricultural output to achieve such poverty reduction objective policy intervention may be required. In essence this calls for both private (microcredit) and public partnerships to create the environment where such a quality education objective could be realized.

| | Coef | Std. Err | Z | P> z | [95% Conf. Interval] | |
|-------------|-------------|------------|-------|-------|----------------------|-------------|
| hill | -0.3564387 | 0.0986424 | -3.61 | 0 | -0.5497742 | -0.1631032 |
| terai | -0.1495627 | 0.1562172 | -0.96 | 0.338 | -0.4557427 | 0.1566174 |
| edr | 0.0846157 | 0.0913508 | 0.93 | 0.354 | -0.0944285 | 0.26366 |
| cdr | -0.0111961 | 0.0912784 | -0.12 | 0.902 | -0.1900985 | 0.1677063 |
| wdr | -0.2116612 | 0.0974545 | -2.17 | 0.03 | -0.4026685 | -0.020654 |
| mwdr | 0.3843425 | 0.0940153 | 4.09 | 0 | 0.2000759 | 0.5686091 |
| population | -0.00000538 | 0.00000032 | -1.68 | 0.092 | -0.00000116 | 0.000000088 |
| noofbank | -0.005646 | 0.0019994 | -2.82 | 0.005 | -0.0095648 | -0.0017271 |
| totalnoofs | 0.0009643 | 0.0001894 | 5.09 | 0 | 0.0005931 | 0.0013354 |
| _cons | -0.9337752 | 0.181858 | -5.13 | 0 | -1.29021 | -0.5773401 |
| atanhrho_12 | 0.0456331 | 0.0720285 | 0.63 | 0.526 | -0.0955401 | 0.1868063 |
| rho_12 | 0.0456014 | 0.0718787 | | | -0.0952505 | 0.1846632 |

Mixed-process regression

Mixed-process regression Number of obs=5988

LR chi2(32)=857.79

Log likelihood =-4091.77Prob > chi2=0.0000.

Table A2. *Cmp (amount_elect = age sex eduhsz urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school micro) (micro = dist_bank dist_coopl and hec_tot age sex eduhsz urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school), indicators (\$cmp_cont \$cmp_probit).*

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|--------------|-------------|-------------|--------|-------|----------------------|-------------|
| amount_elect | | | | | | |
| age | 71.50089 | 4.86221 | 14.71 | 0 | 61.97113 | 81.03064 |
| sex | -779.0031 | 158.8143 | -4.91 | 0 | -1090.273 | -467.7329 |
| edu | 180.8725 | 14.10905 | 12.82 | 0 | 153.2193 | 208.5258 |
| hhsz | 246.9061 | 29.43553 | 8.39 | 0 | 189.2135 | 304.5986 |
| urban | 1594.874 | 150.6735 | 10.58 | 0 | 1299.56 | 1890.189 |
| hill | 648.0942 | 295.7229 | 2.19 | 0.028 | 68.48789 | 1227.7 |
| terai | 907.8489 | 445.468 | 2.04 | 0.042 | 34.74766 | 1780.95 |
| edr | -492.7458 | 284.5473 | -1.73 | 0.083 | -1050.448 | 4.86221 |
| cdr | 203.3254 | 274.6897 | 0.74 | 0.459 | -335.0566 | 741.7074 |
| wdr | 595.1594 | 288.6827 | 2.06 | 0.039 | 29.35175 | 1160.967 |
| mwdr | 1160.967 | 317.7405 | -1.31 | 0.19 | -1039.039 | 206.4806 |
| population | -0.0007422 | 0.0008889 | 0.83 | 0.404 | -0.0024845 | 0.0010001 |
| noofbank | 36.63552 | 5.425955 | 6.75 | 0 | 26.00085 | 47.2702 |
| totalnoof | -2.463103 | 0.5095548 | -4.83 | 0 | -3.461812 | -1.464394 |
| micro | 5095.153 | 125.0088 | 40.76 | 0 | 4850.14 | 5340.165 |
| _cons | 71.50089 | 4.86221 | 14.71 | 0 | 61.97113 | 81.03064 |
| micro | | | | | | |
| dist_bank | -0.0104345 | 0.0016614 | -6.28 | 0 | -0.0136908 | -0.0071783 |
| dist_coop | -0.0139532 | 0.0024853 | -5.61 | 0 | -0.0188243 | -0.009082 |
| land_hec_tot | -0.0539775 | 0.0242384 | -2.23 | 0.026 | -0.1014839 | -0.0064712 |
| age | -0.011632 | 0.0015094 | -7.71 | 0 | -0.0145905 | -0.0086736 |
| sex | 0.0544805 | 0.0471668 | 1.16 | 0.248 | -0.0379647 | 0.1469258 |
| edu | -0.008071 | 0.0044651 | -1.81 | 0.071 | -0.0168224 | 0.0006804 |
| hhsz | -0.0119435 | 0.0086169 | -1.39 | 0.166 | -0.0288324 | 0.0049454 |
| urban | -0.2279087 | 0.0469707 | -4.85 | 0 | -0.3199697 | -0.1358478 |
| hill | -0.254054 | 0.0822538 | -3.09 | 0.002 | -0.4152686 | -0.0928395 |
| terai | -0.1159288 | 0.1256039 | -0.92 | 0.356 | 0.3621078 | 0.1302503 |
| edr | 0.0808817 | 0.0774737 | 1.04 | 0.296 | -0.070964 | 0.2327273 |
| cdr | 0.0396197 | 0.0755619 | 0.52 | 0.6 | -0.1084788 | 0.1877183 |
| wdr | -0.0630669 | 0.080249 | -0.79 | 0.432 | -0.220352 | 0.0942183 |
| mwdr | 0.2085402 | 0.0818816 | 2.55 | 0.011 | 0.0480552 | 0.3690252 |
| population | -0.00000152 | 0.000000252 | -0.6 | 0.546 | -0.000000645 | 0.000000342 |
| noofbank | -0.006132 | 0.0015491 | -3.96 | 0 | -0.0091681 | -0.0030958 |
| totalnoofs | 0.0006107 | 0.000147 | 4.16 | 0 | 0.0003226 | 0.0008987 |
| _cons | 0.0947958 | 0.146981 | -0.64 | 0.519 | -0.3828731 | 0.1932816 |
| atanhrho_12 | 8.400795 | 0.0111204 | 755.44 | 0 | 8.379 | 8.422591 |
| rho_12 | -1.922445 | 0.0395691 | -48.58 | 0 | -1.999999 | -1.844891 |

Mixed-process regression

Number of obs=5905

LR chi2(32)=2196.30

Log likelihood = -44122.956Prob > chi2=0.0000.

Table A3. *Cmp* (Ownership = age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo micro) (micro =dist_b>ankdist_coopland_hec_tot age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo), indicators (\$cmp_probit \$cmp_probit).

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|--------------|------------|-----------|-------|-------|----------------------|------------|
| amount_elect | | | | | | |
| age | 0.009016 | 0.0014915 | 6.04 | 0 | 0.0060927 | 0.0119392 |
| sex | -0.057009 | 0.0488913 | -1.14 | 0.255 | -0.151526 | 0.0401242 |
| edu | -0.0154333 | 0.0043135 | -3.58 | 0 | -0.0238876 | -0.006979 |
| hhszise | 0.0907074 | 0.0100748 | 9 | 0 | 0.0709611 | 0.1104538 |
| urban | -0.6725887 | 0.045126 | -14.9 | 0 | -0.7610341 | -0.5841433 |
| hill | 0.4275378 | 0.082594 | 5.18 | 0 | 0.2656565 | 0.5894191 |
| terai | 0.3723948 | 0.1330295 | 2.8 | 0.005 | 0.1116618 | 0.6331277 |
| edr | 0.2693941 | 0.0822943 | 3.27 | 0.001 | 0.1081002 | 0.430688 |
| cdr | 0.0435958 | 0.0771029 | 0.57 | 0.572 | -0.107523 | 0.1947146 |
| wdr | -0.0995483 | 0.082089 | -1.21 | 0.225 | -0.2604397 | 0.0613432 |
| mwdr | 0.1714319 | 0.09053 | 1.89 | 0.058 | 0.0060036 | 0.3488674 |
| population | 2.30E-07 | 2.81E-07 | 0.82 | 0.412 | -3.20E-07 | 7.81E-07 |
| noofbank | -0.006851 | 0.0016849 | -4.07 | 0 | -0.0101532 | -0.0035487 |
| totalnoof | 0.000543 | 0.0001628 | 0.33 | 0.739 | -0.0002647 | 0.0003733 |
| micro | 0.058386 | 0.1197193 | 0.49 | 0 | -0.1762596 | 0.2930316 |
| _cons | -0.0610783 | 0.1428334 | -0.43 | 0.669 | -0.3410267 | 0.21887 |
| micro | | | | | | |
| dist_bank | -0.0070542 | 0.0021237 | -3.32 | 0.001 | -0.0112167 | -0.0028918 |
| dist_coop | -0.0115687 | 0.0030448 | -3.8 | 0 | -0.0175364 | -0.0056009 |
| land_hec_tot | -0.1396345 | 0.0411512 | -3.39 | 0.001 | -0.2202894 | -0.0589795 |
| age | -0.0059006 | 0.0019726 | -2.99 | 0.003 | -0.0097667 | -0.0020344 |
| sex | -0.0007306 | 0.0606913 | 0.01 | 0.99 | -0.1196833 | 0.1182222 |
| edu | 0.0115687 | 0.0059311 | 1.95 | 0.051 | -0.0000562 | 0.0231935 |
| hhszise | 0.0224121 | 0.0112861 | 1.99 | 0.047 | 0.0002918 | 0.0445324 |
| urban | -0.1260542 | 0.0640346 | -1.97 | 0.049 | -0.2515598 | -0.0005487 |
| hill | -0.3552624 | 0.0987627 | -3.6 | 0 | -0.5488337 | -0.1616911 |
| terai | -0.1472808 | 0.1561764 | -0.94 | 0.346 | -0.4533809 | 0.1588194 |
| edr | 0.084466 | 0.0913596 | 0.92 | 0.355 | -0.0945954 | 0.2635275 |
| cdr | -0.0109665 | 0.0912964 | -0.12 | 0.904 | -0.1899041 | 0.1679711 |
| wdr | -0.2135179 | 0.0975625 | -2.19 | 0.029 | -0.4047368 | -0.022299 |
| mwdr | 0.3831403 | 0.0940172 | 4.08 | 0 | 0.19887 | 0.5674106 |
| population | -5.40e-07 | 3.19E-07 | -1.69 | 0.091 | -1.17E-06 | 8.58E-08 |
| noofbank | -0.0056422 | 0.0019999 | -2.82 | 0.005 | -0.0095619 | -0.0017225 |
| totalnoofs | 0.0009641 | 0.0001894 | 5.09 | 0 | 0.0005929 | 0.0013354 |
| _cons | -0.9309705 | 0.1820085 | -5.11 | 0 | -1.287701 | -0.5742404 |
| atanrho_12 | -0.0096041 | 0.0784785 | -0.12 | 0.903 | -0.1634191 | 0.144211 |
| rho_12 | -0.0096038 | 0.0784713 | | | -0.1619797 | 0.1432195 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=1738.04

Log likelihood = -4314.6587 Prob > chi2=0.0000.

Table A4. *Cmp* (rep_main_hh = age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo micro) (micro =dist_> bank dist_coopland_hec_tot age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo), indicators (\$cmp_cont \$cmp_probit).

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|----------------|------------|-----------|-------|-------|----------------------|-----------|
| repair main hh | | | | | | |
| age | -218.6013 | 194.7578 | -1.12 | 0.262 | -600.3196 | 163.117 |
| sex | 4171.066 | 6423.931 | 0.65 | 0 | -8419.608 | 16761.74 |
| edu | 2033.81 | 1173.662 | 1.73 | 0.083 | -266.5251 | 4334.145 |
| hhszise | 11843.54 | 6352.219 | 1.86 | 0.062 | -606.5789 | 24293.66 |
| urban | -18015 | 11190.06 | -1.61 | 0.107 | -39947.11 | 3917.104 |
| hill | -5869.501 | 17710.22 | -0.33 | 0.74 | -40580.89 | 28841.88 |
| terai | 12782.72 | 10523.91 | 1.21 | 0.005 | -7843.754 | 33409.2 |
| edr | 23481.42 | 10208.53 | 2.3 | 0.021 | 3473.066 | 43489.78 |
| cdr | 20491.95 | 10861.33 | 1.89 | 0.059 | -795.8607 | 41779.77 |
| wdr | 19250.05 | 11412.67 | 1.69 | 0.092 | -3118.362 | 41618.47 |
| mwdr | -0.0133399 | 0.0361913 | -0.37 | 0.712 | -0.0842735 | 0.0575937 |
| population | -287.6453 | 219.4865 | -1.31 | 0.19 | -717.831 | 142.5404 |
| noofbank | 39.31604 | 21.02389 | 1.87 | 0.061 | -1.890031 | 80.52211 |
| totalnoof | -107681.3 | 13844.97 | -7.78 | 0 | -134816.9 | -80545.63 |
| micro | -7345.535 | 18942.54 | -0.39 | 0.698 | -44472.22 | 29781.15 |

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|--------------|------------|-----------|---------|-------|----------------------|------------|
| _cons | -218.6013 | 194.7578 | -1.12 | 0.262 | -600.3196 | 163.117 |
| micro | | | | | | |
| dist_bank | -0.0056125 | 0.0020041 | -2.8 | 0.005 | -0.0095405 | -0.0016845 |
| dist_coop | -0.0096235 | 0.0028835 | -3.34 | 0.001 | -0.015275 | -0.003972 |
| land_hec_tot | -0.1269703 | 0.039499 | -3.21 | 0.001 | -0.2043868 | -0.0495538 |
| age | -0.0059504 | 0.0019128 | -3.11 | 0.002 | -0.0096995 | -0.0022014 |
| sex | 0.0067447 | 0.0590333 | 0.11 | 0.909 | -0.1089584 | 0.1224478 |
| edu | 0.0091869 | 0.0058111 | 1.58 | 0.114 | 0.0058111 | 0.0205764 |
| hhsz | 0.0230067 | 0.0110481 | 2.08 | 0.037 | 0.0013528 | 0.0446606 |
| urban | -0.0849415 | 0.0620198 | -1.37 | 0.171 | -0.206498 | 0.036615 |
| hill | -0.3306592 | 0.0961791 | -3.44 | 0.001 | -0.5191667 | -0.1421516 |
| terai | -0.1079654 | 0.1525703 | -0.71 | 0.479 | -0.4069978 | 0.191067 |
| edr | 0.0738715 | 0.0891138 | 0.83 | 0.407 | -0.1007884 | 0.2485314 |
| cdr | -0.0033992 | 0.0889494 | -0.04 | 0.97 | -0.1777368 | 0.1709384 |
| wdr | -0.1994116 | 0.0949271 | -2.14 | 0.036 | -0.3854654 | -0.0133578 |
| mwdr | 0.3569873 | 0.0918402 | 3.89 | 0 | 0.1769839 | 0.5369907 |
| population | -6.10E-07 | 3.13E-07 | -1.95 | 0.051 | -1.22E-06 | 3.53E-09 |
| noofbank | -0.0055738 | 0.001955 | -2.85 | 0.004 | -0.0094056 | -0.0017421 |
| totalnoofs | 0.0009935 | 0.0001852 | 5.36 | 0 | 0.0006305 | 0.0013564 |
| _cons | -0.9470172 | 0.1766176 | -5.36 | 0 | -1.293181 | -0.600853 |
| atanrho_12 | 12.19414 | 0.0100334 | 1215.35 | 0 | 12.17447 | 12.2138 |
| rho_12 | 0.3957542 | 0.0463754 | 8.53 | 0 | 0.3048601 | 0.4866483 |
| sig_1 | 197627.3 | 1982.873 | | | 193778.9 | 201552.1 |
| rho_12 | 0.3763103 | 0.0398082 | | | 0.295754 | 0.4515522 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=1738.04

Log likelihood = -4314.6587 Prob > chi2=0.0000.

Table A5. *Cmp* (*cstructure* = *age sex eduhsz urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school micro*) (*micro* = *dist_b>ankdist_coopl and_hec_tot age sex eduhsz urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school*), indicators (*\$cmp_probit \$cmp_probit*).

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|--------------|------------|-----------|--------|-------|----------------------|------------|
| csstructure | | | | | | |
| age | 0.0012426 | 0.0014661 | 0.85 | 0.397 | -0.0016309 | 0.0041161 |
| sex | -0.2083316 | 0.0480184 | -4.34 | 0 | -0.3024458 | -0.1142173 |
| edu | 636477 | 0.0042216 | 15.8 | 0 | 0.0553735 | 0.0719219 |
| hhsz | -0.0049735 | 0.0087653 | -0.057 | 0.57 | -0.0221532 | 0.0122062 |
| urban | 0.8907974 | 0.0437109 | 20.38 | 0 | 0.8051257 | 0.9764691 |
| hill | 0.1577974 | 0.1008103 | 1.57 | 0.118 | -0.0397872 | 0.355382 |
| terai | 0.7218186 | 0.1410937 | 5.12 | 0 | 0.44528 | 0.9983571 |
| edr | 0.0368532 | 0.087209 | 0.42 | 0.673 | -0.1340732 | 0.2077796 |
| cdr | 0.5014919 | 0.0828369 | 6.05 | 0 | 0.3391345 | 0.6638492 |
| wdr | 0.6057018 | 0.0866256 | 6.99 | 0 | 0.4359187 | 0.775485 |
| mwdr | 0.0001978 | 0.0959332 | 0 | 0.998 | -0.1878277 | 0.1882234 |
| population | 1.08E-07 | 2.64E-07 | 0.41 | 0.683 | -4.09E-07 | 6.25E-07 |
| noofbank | 0.0052709 | 0.0016417 | 3.21 | 0.001 | 0.0020533 | 0.0084885 |
| totalnoof | -.000274 | 0.000156 | -1.76 | 0.079 | -0.0005798 | 0.0000318 |
| micro | 0.0681149 | 0.1166947 | 0.58 | 0.559 | -0.1606026 | 0.2968323 |
| _cons | -1.775722 | 0.1567115 | -11.33 | 0 | -2.082871 | -1.468573 |
| micro | | | | | | |
| dist_bank | -0.0077596 | 0.0021401 | -3.63 | 0 | -0.0119542 | -0.003565 |
| dist_coop | -0.0119918 | 0.003062 | 3.92 | 0 | -0.0179931 | -0.0059904 |
| land_hec_tot | -0.1375246 | 0.0411691 | -3.34 | 0.01 | -0.2182144 | -0.0568347 |
| age | -.0056875 | 0.001967 | -2.89 | 0.004 | -0.0095427 | -0.0018323 |
| sex | -0.0013044 | 0.0606821 | -0.02 | 0.983 | -0.1202391 | 0.1176304 |
| edu | 0.0116521 | 0.005937 | 1.96 | 0.05 | 0.0000159 | 0.0232884 |
| hhsz | .0236258 | 0.0112838 | 2.09 | 0.036 | 0.0015099 | 0.0457418 |
| urban | -0.1506442 | 0.0646724 | -2.33 | 0.2 | -0.2773997 | -0.0238886 |
| hill | -0.3477759 | 0.098689 | -3.52 | 0 | -0.5412028 | -0.1543489 |
| terai | -0.1550616 | 0.1562856 | -0.99 | 0.321 | -0.4613758 | 0.1512525 |
| edr | 0.0850685 | 0.0913668 | 0.93 | 0.352 | -0.0940071 | 0.2641441 |
| cdr | -0.0157714 | 0.0913037 | -0.17 | 0.863 | -0.1947234 | 0.1631805 |

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] |
|------------|------------|-----------|-------|-------|-----------------------|
| wdr | -0.2184171 | 0.0973613 | -2.24 | 0.025 | -0.4092417 -0.0275924 |
| mwdr | .385625 | 0.0941497 | 4.1 | 0 | 0.201095 0.570155 |
| population | -5.14E-07 | 3.20E-07 | -1.61 | 0.108 | -1.14E-06 1.12E-07 |
| noofbank | -0.0055914 | 0.0019986 | -2.8 | 0.005 | -0.0095085 -0.0016742 |
| totalnoofs | 0.000948 | 0.0001892 | 5.01 | 0 | 0.0005773 0.0013188 |
| _cons | -.9339736 | 0.1819413 | -5.13 | 0 | 1.290572 -0.5773753 |
| atanrho_12 | -.1526119 | 0.0758236 | -2.01 | 0.044 | -0.3012234 -0.0040003 |
| rho_12 | -0.151438 | 0.0740847 | | | -0.2924318 -0.0040003 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=2212.67

Log likelihood = -4472.0205 Prob > chi2=0.0000.

Table A6. *Cmp (materialu = age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school micro) (micro = dist_ba > nkdist_coopland_hec_tot age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school), indicators > (\$cmp_probit \$cmp_probit).*

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] |
|--------------|-----------|----------|--------|-------|----------------------|
| materialu | | | | | |
| age | 0066936 | .0016461 | 4.07 | 0 | .0034674 .0099198 |
| sex | -.1985757 | .0540462 | -3.67 | 0 | -.3045042 -.0926472 |
| edu | .0619691 | .0057385 | -10.08 | 0 | .0507218 -.0926472 |
| hhsz | .0007029 | .009768 | 0.07 | 0.943 | -.0184419 .0732164 |
| urban | .7432934 | .0625383 | 11.89 | 0 | .6207206 .0198478 |
| hill | .2878445 | .0823543 | 3.50 | .407 | .1264331 .8658662 |
| terai | .6890365 | .1445879 | 4.77 | 0 | .4056494 .4492558 |
| edr | -1.372498 | .0988525 | -13.88 | 0 | -1.566246 .9724236 |
| cdr | -.5742669 | .0997426 | -5.67 | 0 | -.7697587 -1.178751 |
| wdr | -.5742669 | .1073708 | -5.01 | 0 | -.7484855 -.378775 |
| mwdr | -1.430497 | .1019726 | -14.03 | 0.637 | -1.63036 -.378775 |
| population | -3.89e-08 | 3.02e-07 | 0.897 | 0.897 | -6.31e-07 5.53e-07 |
| noofbank | -.0014214 | .001876 | -0.67 | 0.449 | -.0050983 .0022556 |
| totalnoof | .0005713 | .0001867 | 3.06 | 0.002 | .0002054 .0009371 |
| micro | .8022523 | .1760164 | 4.56 | 0 | .4572664 1.147238 |
| _cons | .8022523 | .158024 | 1.61 | 0.108 | 0.555041 .5639385 |
| micro | | | | | |
| dist_bank | -.0088403 | .0021585 | 4.10 | 0 | -.0130709 -.0046097 |
| dist_coop | -.0137094 | .0030663 | -4.47 | 0 | -.0197192 -.0076996 |
| land_hec_tot | -.1070782 | .0416179 | -2.57 | 0.010 | -.1886478 -.0255086 |
| age | -.006301 | .0019637 | -3.21 | 0.001 | -.0101498 -.0024523 |
| sex | -.0065854 | .0603284 | -0.11 | 0.913 | -.1248268 .1116561 |
| edu | .0101208 | .0059568 | 1.70 | 0.089 | -.0015543 .0217959 |
| hhsz | .0220109 | .0112289 | 1.96 | 0.050 | 2.59e-06 .0440191 |
| urban | -.1553477 | .0641091 | -2.42 | 0.015 | -.2809992 -.0296962 |
| hill | -.3375627 | .0987921 | -3.42 | 0.001 | -.5311917 -.1439337 |
| terai | -.1674369 | .1554372 | -1.08 | 0.281 | -.4720882 .1372144 |
| edr | .0802513 | .0912022 | 0.88 | 0.379 | -.0985017 .2590043 |
| cdr | -.0063337 | .0913113 | 0.07 | 0.945 | -.1853005 .1726332 |
| wdr | -.2240451 | .0976354 | -2.29 | 0.022 | -.415407 -.0326832 |
| mwdr | .4004817 | .0943128 | 4.25 | 0.000 | .2156321 .5853313 |
| population | -4.88e-07 | 3.18e-07 | -1.53 | 0.125 | -1.11e-06 1.35e-07 |
| noofbank | -.005616 | .0019941 | -2.82 | 0.005 | -.0095243 -.0017077 |
| totalnoofs | .0009159 | .0001893 | 4.84 | 0 | .0005448 .001287 |
| _cons | -.8640063 | .1816163 | -4.76 | 0 | -1.219968 -.5080448 |
| atanrho_12 | -.3624603 | .1233151 | 2.93 | 0.003 | -.6041535 -.1207672 |
| rho_12 | -.3473793 | .1084344 | | | -.5399985 -.1201834 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=1581.84

Log likelihood = -3889.4206 Prob > chi2=0.0000.

Impact of Food Security

Table A7. *Cmp* (*meat1* = *age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo micro*) (*micro =dist_bank>dist_cooplant_hec_tot age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo*), indicators (*\$c>mp_probit \$cmp_probit*).

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|--------------|-----------|----------|-------|-------|----------------------|-----------|
| meat1 | | | | | | |
| age | -.0079648 | .0013065 | -6.10 | 0 | -.0105255 | -.0054042 |
| sex | .0980979 | .0428875 | 2.29 | 0.022 | .0140399 | .0140399 |
| edu | -.0073842 | .0039425 | -1.87 | 0.061 | -.0151114 | .0003431 |
| hhsiz | .0380673 | .0079298 | 4.80 | 0 | .0225252 | .0536094 |
| urban | .2046907 | .2046907 | 4.77 | 0 | .1205931 | .2887883 |
| hill | .0278163 | .0737597 | 0.38 | 0.706 | -.1167501 | .1723827 |
| terai | .2080567 | .1175027 | 1.77 | 0.077 | -.0222444 | .4383578 |
| edr | .74993 | .0686634 | 10.92 | 0 | .6153523 | .8845078 |
| cdr | .599561 | .0660872 | 9.07 | 0 | .4700325 | .7290896 |
| wdr | .5815501 | .0702681 | 8.28 | 0 | .4438272 | .719273 |
| mwdr | .5415501 | .0740483 | 7.31 | 0 | .3964182 | .6866821 |
| population | -4.53e-07 | 2.41e-07 | -1.88 | 0.060 | -9.25e-07 | 1.94e-08 |
| noofbank | .003308 | .0014619 | 2.26 | 0.024 | .0004426 | .0061733 |
| totalnoof | 0001219 | .0001401 | 0.87 | 0.384 | -.0001527 | .0003966 |
| micro | 0728077 | .1097103 | 0.66 | 0.507 | -.1422206 | .2878359 |
| _cons | -.1401229 | .125007 | -1.12 | 0.262 | -.3851321 | .1048863 |
| micro | | | | | | |
| dist_bank | -.0073186 | .0021221 | -3.45 | 0.001 | -.0114779 | -.0031594 |
| dist_coop | -.0115895 | .0030422 | -3.81 | 0 | -.0175521 | -.005627 |
| land_hec_tot | -.1439833 | .0412555 | -3.49 | 0.002 | -.2248426 | -.0631239 |
| age | -.0059301 | .0019654 | -3.02 | 0.003 | -.0097823 | -.0020779 |
| sex | .0003421 | .0607022 | -0.01 | 0.996 | -.1186319 | .1193162 |
| edu | .0115149 | .0059255 | 1.94 | 0.052 | -.0000989 | .0231287 |
| hhsiz | .0226317 | .0112653 | 2.01 | 0.045 | .000552 | .0447114 |
| urban | -.1330423 | .0638518 | -2.13 | 0.037 | -.2581895 | -.007895 |
| hill | -.3526825 | .0986881 | -3.57 | 0 | -.5461077 | -.1592574 |
| terai | -.1492835 | .1561744 | -0.96 | 0.339 | -.4553797 | .1568127 |
| edr | .0825045 | .091368 | 0.90 | 0.367 | -.0965735 | .2615825 |
| cdr | -.014522 | .091307 | -0.16 | 0.874 | -.1934804 | .1644363 |
| wdr | -.2167655 | .0974179 | -2.23 | 0.026 | -.4077011 | -.02583 |
| mwdr | .381248 | .0940167 | 4.06 | 0.000 | .1969787 | .5655173 |
| population | -5.32e-07 | 3.20e-07 | -1.67 | 0.096 | -1.16e-06 | 9.38e-08 |
| noofbank | -.0056036 | .0020009 | -2.80 | 0.005 | -.0095253 | -.0016819 |
| totalnoofs | .000955 | .0001896 | 5.04 | 0 | .0005834 | .0013266 |
| _cons | -.9200699 | .182107 | -5.05 | 0 | -1.276993 | -.5631467 |
| atanrho_12 | -.0657877 | .0675148 | -0.97 | 0.330 | -.1981143 | .0665388 |
| rho_12 | -.065693 | .0672234 | | | -.1955624 | .0664408 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=463.33

Log likelihood = -5358.828Prob > chi2=0.0000.

Table A8. *Cmp* (*egg1* = *age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo micro*) (*micro =dist_bank d>ist_cooplant_hec_tot age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo*), indicators (*\$cm>p_probit \$cmp_probit*).

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|--------------|-----------|----------|-------|-------|----------------------|-----------|
| amount_elect | | | | | | |
| age | -.0032323 | .0013203 | -2.45 | 0.014 | -.00582 | -.0006446 |
| sex | -.0508673 | .0432889 | -1.18 | 0.340 | -.135712 | .0339775 |
| edu | .02166 | .0039084 | 5.54 | 0 | .0139996 | .0293203 |
| hhsiz | .0068654 | .0079458 | 0.86 | 0.388 | -.008708 | .0224389 |
| urban | .3789136 | .0414292 | 9.15 | 0 | .2977138 | .4601134 |
| hill | .0894567 | .0772025 | 1.16 | .247 | .2407708 | .2407708 |
| terai | .225351 | .1203276 | 1.87 | 0.061 | -.0104869 | .4611888 |
| edr | .5818695 | .0772835 | 7.53 | 0 | .4303966 | .7333425 |
| cdr | .6879677 | .0753009 | 9.14 | 0 | .5403805 | .8355548 |
| wdr | .5992037 | .0792102 | 7.56 | 0 | .4439546 | .7544529 |
| mwdr | .3490659 | .0840901 | 4.15 | 0 | .1842524 | .5138795 |
| population | -6.02e-07 | 2.41e-07 | -2.50 | 0.012 | -1.07e-06 | -1.31e-07 |
| noofbank | .0071626 | 2.41e-07 | 4.91 | 0 | .0043019 | .0100233 |
| totalnoof | -.0000868 | .0014596 | -0.62 | 0.538 | -.0003626 | .0001891 |
| micro | -.0572938 | .1051513 | 0.54 | 0.586 | -.2633866 | .148799 |

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|---------------|-----------|----------|--------|-------|----------------------|-----------|
| _cons | -.9306571 | .1332974 | -6.98 | 0 | -1.191915 | -.669399 |
| micro | | | | | | |
| dist_bank | -.0070963 | .002114 | -3.36 | 0.001 | -.0112397 | -.0029529 |
| dist_coop | -.0115797 | .0030516 | -3.79 | 0 | -.2204983 | -.0055987 |
| land_hect_tot | -.1402494 | .0409441 | -3.43 | 0.001 | -.1886478 | -.0600006 |
| age | -.0058834 | .001966 | -2.99 | 0.001 | -.0101498 | -.0024523 |
| sex | -.0005607 | .0606966 | -0.01 | 0.993 | -.1195239 | .1184024 |
| edu | .0115801 | .0059313 | 1.95 | 0.051 | -.0000451 | .0232053 |
| hhsz | .0224626 | .0112774 | 1.99 | 0.046 | .0003593 | .0445659 |
| urban | -.1275433 | .0638899 | -2.00 | 0.046 | -.2527651 | -.0023214 |
| hill | -.3545135 | .0987087 | -3.59 | 0.000 | -.547979 | -.1610481 |
| terai | -.1474569 | .1562309 | -0.94 | 0.345 | -.4536638 | .1587499 |
| edr | .0841869 | .0913848 | 0.92 | 0.357 | -.094924 | .2632978 |
| cdr | -.0116056 | .0914153 | -0.13 | 0.899 | -.1907762 | .1675651 |
| wdr | -.2145476 | .0975146 | -2.20 | 0.028 | -.4056728 | -.0234225 |
| mwdr | .38332 | .0940309 | 4.08 | 0.000 | .1990229 | .5676172 |
| population | -5.38e-07 | 3.20e-07 | -1.680 | .093 | -1.17e-06 | 8.89e-08 |
| noofbank | -.0056491 | .0020017 | -2.82 | 0.005 | -.0095722 | -.0017259 |
| totalnoofs | .0009635 | .0001894 | 5.09 | 0 | .0005922 | .0013347 |
| _cons | -.9314869 | .1819357 | -5.12 | 0.005 | -1.288074 | -.5748994 |
| atanrho_12 | -.0056549 | .0652079 | -0.09 | 0.931 | -.13346 | .1221501 |
| rho_12 | -.0056549 | .0652058 | | | -.1326732 | .1215462 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=1581.84

Log likelihood = 3889.4206 Prob > chi2=0.0000.

Table A9. *Cmp (milk1 = age sex eduhsz urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school micro) (micro = dist_bank > dist_coop | land_hect_tot age sex eduhsz urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school), indicators (\$c mp probit \$c mp probit).*

| milk1 | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|---------------|-----------|----------|-------|-------|----------------------|-----------|
| age | .0131849 | .001389 | 9.49 | 0 | .0104626 | .0159072 |
| sex | -.2074094 | .0447236 | -4.64 | 0 | -.2950659 | -.1197528 |
| edu | .0670234 | .0044516 | 15.06 | 0 | .0582985 | .0757484 |
| hhsz | .0446585 | .0086303 | 5.17 | 0 | .0277435 | .0615736 |
| urban | .2127678 | .0455896 | 4.67 | 0 | .1234138 | .3021218 |
| hill | .3817615 | .0743082 | 5.14 | 0 | .2361201 | .527403 |
| terai | .0318204 | .1214146 | 0.26 | 0.793 | -.2061479 | .2697887 |
| edr | -.3320726 | .0734569 | -4.52 | 0 | -.4760454 | -.1880998 |
| cdr | -.1622034 | .0720673 | -2.25 | 0.024 | -.3034527 | -.0209541 |
| wdr | -.1691613 | .0764353 | -2.21 | 0.027 | -.3189718 | -.0193508 |
| mwdr | -.4257947 | .0788515 | -5.40 | 0 | -.5803409 | -.2712485 |
| population | 8.96e-07 | 2.54e-07 | 3.53 | 0 | 3.98e-07 | 1.39e-06 |
| noofbank | .0047623 | .0015385 | 3.10 | 0.002 | .0017469 | .0077777 |
| totalnoof | -.001041 | .0001458 | -7.14 | 0 | -.0013268 | -.0007552 |
| micro | .201481 | .1168912 | 1.72 | 0.085 | -.0276216 | .4305837 |
| _cons | -.1159334 | .1308919 | -0.89 | 0.376 | -.3724769 | .1406101 |
| micro | | | | | | |
| dist_bank | -.0068984 | .002108 | -3.27 | 0.001 | -.0110301 | -.0027668 |
| dist_coop | -.0119247 | .0030501 | -4.47 | 0 | -.0179028 | -.0059466 |
| land_hect_tot | -.1248633 | .0412454 | -3.03 | 0.002 | -.2057028 | -.0440238 |
| age | -.0059854 | .0019628 | -3.05 | 0.002 | -.0098324 | -.0021385 |
| sex | -.002652 | .0606043 | -0.04 | 0.965 | -.1214341 | .1161302 |
| edu | .0112267 | .0059382 | 1.89 | 0.059 | -.0011292 | .0228654 |
| hhsz | .021001 | .0112911 | 1.86 | 0.063 | -.2543143 | .0431312 |
| urban | -.1297652 | .0635467 | -2.04 | 0.041 | -.2543143 | -.005216 |
| hill | -.3378461 | .0991762 | -3.41 | 0.001 | -.5322279 | -.1434643 |
| terai | -.1367871 | .1563638 | -0.87 | 0.382 | -.4432545 | .1696802 |
| edr | .0891643 | .0913747 | 0.98 | 0.329 | -.0899269 | .2682555 |
| cdr | -.0082733 | .0913437 | -0.09 | 0.928 | -.1873036 | .170757 |
| wdr | -.2108751 | .0974586 | -2.16 | 0.030 | -.4018905 | -.0198597 |
| mwdr | .385577 | .0941769 | 4.09 | 0.000 | .2009938 | .5701603 |
| population | -5.28e-07 | 3.19e-07 | -1.65 | 0.098 | -1.15e-06 | 9.75e-08 |
| noofbank | -.0057365 | .0019981 | -2.87 | 0.004 | -.0096526 | -.0018203 |
| totalnoofs | .0009584 | .0001894 | 5.06 | 0 | .0005872 | .0013296 |
| _cons | -.9434527 | .1821302 | -5.18 | 0 | -1.300421 | -.586484 |

| milkl | Coef | Std. Err | z | P> z | [95% Conf. Interval] |
|-------------|-----------|----------|-------|-------|----------------------|
| atanhrho_12 | -.1376301 | .0710442 | -1.94 | 0.053 | .2768743 .001614 |
| rho_12 | -.1367677 | .0697153 | | | -.2700097 .001614 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=1581.84

Log likelihood = 3889.4206 Prob > chi2=0.0000.

Table A10. *Cmp (veg1 = age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo1 micro) (micro =dist_bank d>ist_cooplant_hec_tot age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo1), indicators (\$cmp_probit \$cmp_probit).*

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] |
|--------------|-----------|----------|-------|-------|----------------------|
| veg1 | | | | | |
| age | .0096515 | .004515 | 2.14 | 0.033 | .0008022 .0185008 |
| sex | -.306508 | .1562456 | -1.96 | 0.050 | -.6127436 -.0002723 |
| edu | -.0014624 | .0135798 | -0.11 | 0.914 | -.0280782 .0251534 |
| hhszise | .1358869 | .0388031 | 3.50 | 0.000 | .0598343 .2119395 |
| urban | .0871314 | .1639099 | 0.53 | 0.595 | -.2341261 .408389 |
| hill | -.0468365 | .2127569 | -0.22 | 0.826 | -.4638323 .3701592 |
| terai | .0255052 | .5042556 | 0.05 | 0.960 | -.9628176 .1013828 |
| edr | -.3876124 | .2766594 | -1.40 | 0.161 | -.9298549 .1546301 |
| cdr | -.1438796 | .2848144 | -0.51 | 0.613 | -.7021056 .4143465 |
| wdr | .1513778 | .3143276 | 0.48 | 0.630 | -.4646929 .7674486 |
| mwdr | -.43224 | .292968 | -1.48 | 0.140 | -1.006447 .1419667 |
| population | 2.10e-06 | 1.38e-06 | 1.52 | 0.129 | -6.13e-07 4.81e-06 |
| noofbank | -.0033786 | .0060392 | -0.56 | 0.576 | -.0152152 .0084579 |
| totalnoof | -.000906 | .0006436 | -1.41 | 0.159 | -.0021674 .0003555 |
| micro | .6823605 | .3336885 | 2.04 | 0.041 | .028343 1.336378 |
| _cons | 1.696599 | .4628119 | 3.67 | 0.000 | .7895038 2.603693 |
| micro | | | | | |
| dist_bank | -.0068642 | .0020958 | -3.28 | 0.001 | -.0109719 -.0027565 |
| dist_coop | -.0117604 | .0030247 | -3.89 | 0 | -.0176886 -.0058321 |
| land_hec_tot | -.1370011 | .0408373 | -3.35 | 0.001 | -.2170408 -.0569615 |
| age | -.0058612 | .0019634 | -2.99 | 0.003 | -.0097094 -.002013 |
| sex | -.0026404 | .0606312 | -0.04 | 0.965 | -.1214753 .1161944 |
| edu | .0119145 | .0059279 | 2.01 | 0.044 | .000296 .023533 |
| hhszise | .0216818 | .011276 | 1.92 | 0.055 | -.0004189 .0437824 |
| urban | -.1223577 | .0635007 | -1.93 | 0.054 | -.2468168 .0021013 |
| hill | -.3520126 | .0986178 | -3.57 | 0 | -.5452999 -.1587252 |
| terai | -.1404319 | .1561653 | -0.90 | 0.369 | -.4465102 .1656465 |
| edr | .0838869 | .0912678 | 0.92 | 0.358 | -.0949947 .2627685 |
| cdr | -.0095279 | .0911453 | -0.10 | 0.917 | -.1881695 .1691137 |
| wdr | -.2143156 | .0973076 | -2.20 | 0.028 | -.405035 -.0235961 |
| mwdr | .3818092 | .0940137 | 4.06 | 0 | .1975458 .5660726 |
| population | -5.41e-07 | 3.19e-07 | -1.69 | 0.090 | -1.17e-06 8.49e-08 |
| noofbank | -.0057294 | .001999 | -2.87 | 0.004 | -.0096475 -.0018114 |
| totalnoofs | .0009737 | .0001893 | 5.14 | 0 | .0006026 .0013447 |
| _cons | -.9425946 | .1818415 | -5.18 | 0 | -1.298997 -.5861918 |
| atanhrho_12 | -.472017 | .2550088 | -1.85 | 0.064 | -.971825 .027791 |
| rho_12 | -.4398276 | .2056778 | | | -.7495052 .0277839 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=204.61

Log likelihood = -1911.7656 Prob > chi2=0.0000.

Table A11. *Cmp (cereals1 = age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschoo1 micro) (micro =dist_ba>nkdist_cooplant_hec_tot age sex eduhsize urban hill terai edr cdr wdr mwdr population noofbanktotalnoofschoo1), indicators (\$cmp_probit \$cmp_probit).*

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] |
|-----------|-----------|----------|-------|-------|----------------------|
| diversity | | | | | |
| age | .0094958 | .0068103 | 1.39 | 0.163 | -.0038521 .0228437 |
| sex | -.2226826 | .2230294 | -1.00 | 0.318 | -.6598121 .2144469 |
| edu | -.0181199 | .0196094 | -0.92 | 0.355 | -.0565535 .0203138 |
| hhszise | .3720053 | .0866917 | 4.29 | 0.000 | .2020927 .5419178 |
| urban | -.2921023 | .2308587 | -1.27 | 0.206 | -.7445771 .1603725 |
| hill | -.1460582 | .4294551 | -0.34 | 0.734 | -.9877747 .6956584 |

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|--------------|-----------|-----------|-----------|-----------|----------------------|-----------|
| terai | .3395427 | .8155348 | 0.42 | 0.677 | -1.258876 | 1.937961 |
| edr | -3.861006 | 708.0209 | -0.01 | 0.996 | -1391.556 | 1383.834 |
| cdr | -3.929023 | 708.0209 | -0.01 | 0.996 | -1391.624 | 1383.766 |
| wdr | -3.738952 | 708.0209 | -0.01 | 0.996 | -1391.434 | 1383.956 |
| mwdr | (omitted) | (omitted) | (omitted) | (omitted) | (omitted) | (omitted) |
| population | -5.10e-07 | 1.61e-06 | -0.32 | 0.751 | -3.66e-06 | 2.64e-06 |
| noofbank | .0075085 | .0086483 | 0.87 | 0.385 | -.0094419 | .024459 |
| totalnoof | -.0001999 | .0007871 | -0.25 | 0.799 | -.0017426 | .0013428 |
| micro | .4885801 | .5576457 | 0.88 | 0.381 | -.6043855 | 1.581546 |
| _cons | 5.43335 | 708.0211 | 0.01 | 0.994 | -1382.263 | 1393.129 |
| micro | | | | | | |
| dist_bank | -.0070007 | .0021117 | -3.32 | 0.001 | -.0111396 | -.0028618 |
| dist_coop | -.0115415 | .0030434 | -3.79 | 0.000 | -.0175064 | -.0055766 |
| land_hec_tot | -.1392029 | .0409101 | -3.40 | 0.001 | -.2193852 | -.0590206 |
| age | -.0058586 | .0019648 | -2.98 | 0.003 | -.0097095 | -.0020076 |
| sex | -.0007682 | .0606638 | -0.01 | 0.990 | -.119667 | .1181307 |
| edu | .0118027 | .0059403 | 1.99 | 0.047 | .0001598 | .0234455 |
| hhsz | .022336 | .0112804 | 1.98 | 0.048 | .0002268 | .0444452 |
| urban | -.1246783 | .0636215 | -1.96 | 0.050 | -.2493742 | .0000175 |
| hill | -.3570365 | .0986988 | -3.62 | 0.000 | -.5504826 | -.1635903 |
| terai | -.1457935 | .1561977 | -0.93 | 0.351 | -.4519354 | .1603484 |
| edr | .0845799 | .0913659 | 0.93 | 0.355 | -.094494 | .2636538 |
| cdr | -.0107615 | .0912655 | -0.12 | 0.906 | -.1896386 | .1681157 |
| wdr | -.2130961 | .0974256 | -2.19 | 0.029 | -.4040468 | -.0221455 |
| mwdr | .3835767 | .0940172 | 4.08 | 0.000 | .1993063 | .5678471 |
| population | -5.45e-07 | 3.20e-07 | -1.70 | 0.088- | -1.17e-06 | 8.15e-08 |
| noofbank | -.0056642 | .002 | -2.83 | 0.005 | -.0095841 | -.0017443 |
| totalnoofs | .000969 | .0001895 | 5.11 | 0.000 | .0005975 | .0013404 |
| _cons | -.9364078 | .1820124 | -5.14 | 0.000 | -1.293145 | -.5796701 |
| atanrho_12 | -.2895828 | .3623237 | -0.80 | 0.424 | -.9997242 | .4205587 |
| rho_12 | -.2817507 | .3335612 | | | -.7614783 | .397401 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=1049.59

Log likelihood = -9360.419 Prob > chi2=0.0000.

Table A12. *Cmp (diversity = age sex eduhsz urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school micro) (micro = dist_bank dist_coop land_hec_tot age sex eduhsz urban hill terai edr cdr wdr mwdr population noofbank totalnoofs school), indicators (\$cmp_cont \$cmp_probit).*

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|--------------|-----------|----------|-------|-------|----------------------|-----------|
| diversity | | | | | | |
| age | -2.87e-06 | .0008582 | -0.00 | 0.997 | -.0016849 | .0016792 |
| sex | -.0497726 | .0282638 | -1.76 | 0.078 | -.1051687 | .0056235 |
| edu | .0239276 | .0025774 | 9.28 | 0 | .0188759 | .0289792 |
| hhsz | .0308866 | .0051652 | 5.98 | 0 | .0207631 | .0410101 |
| urban | .2702307 | .0279476 | 9.67 | 0 | .2154543 | .325007 |
| hill | .1665391 | .0492597 | 3.38 | 0.001 | .0699919 | .2630862 |
| terai | .1718274 | .0779255 | 2.21 | 0.027 | .0190961 | .3245586 |
| edr | .347965 | .0463203 | 7.51 | 0 | .2571787 | .4387512 |
| cdr | .383806 | .0449233 | 8.54 | 0 | .295758 | .471854 |
| wdr | .3539981 | .0477935 | 7.41 | 0 | .2603247 | .4476716 |
| mwdr | .1630962 | .0502947 | 3.24 | .001 | .0645204 | .261672 |
| population | -7.39e-08 | 1.59e-07 | -0.46 | 0.643 | -3.86e-07 | 2.38e-07 |
| noofbank | .0051761 | .0009665 | 5.36 | 0 | .0032818 | .0070703 |
| totalnoof | -.0003335 | .0000928 | -3.59 | 0 | -.0005155 | -.0001516 |
| micro | .0767892 | .0687758 | 1.12 | 0.264 | -.0580088 | .2115872 |
| _cons | 3.130246 | .0833817 | 37.54 | 0.000 | 2.966821 | 3.293671 |
| micro | | | | | | |
| dist_bank | -.0073175 | .0021099 | -3.47 | 0.001 | -.0114528 | -.0031823 |
| dist_coop | -.0119523 | .0030506 | -3.92 | 0.000 | -.0179314 | -.0059732 |
| land_hec_tot | -.1375972 | .0409777 | -3.36 | 0.001 | -.2179121 | -.0572824 |
| age | -.0059547 | .0019633 | -3.03 | 0.002 | -.0098026 | -.0021067 |
| sex | -.0006322 | .0606551 | -0.01 | 0.992 | -.1195141 | .1182496 |
| edu | .011689 | .0059237 | 1.97 | 0.048 | .0000789 | .0232992 |
| hhsz | .0221164 | .0112481 | 1.97 | 0.049 | .0000705 | .0441623 |
| urban | -.1388507 | .0638927 | -2.17 | 0.030 | -.264078 | -.0136234 |

| | Coef | Std. Err | z | P> z | [95% Conf. Interval] | |
|-------------|-----------|----------|--------|-------|----------------------|-----------|
| hill | -.3435532 | .0989529 | -3.47 | 0.001 | -.5374974 | -.149609 |
| terai | -.1482922 | .1561779 | -0.95 | 0.342 | -.4543952 | .1578108 |
| edr | .0818932 | .0913278 | 0.90 | 0.370 | -.0971061 | .2608924 |
| cdr | -.0180207 | .0913341 | -0.20 | 0.844 | -.1970323 | .1609908 |
| wdr | -.2199237 | .0974316 | -2.26 | 0.024 | -.410886 | -.0289613 |
| mwdr | .3829855 | .0940088 | 4.07 | .000 | .1987317 | .5672393 |
| population | -5.10e-07 | 3.20e-07 | -1.59 | .111 | -1.14e-06 | 1.17e-07 |
| noofbank | -.0057246 | .0020008 | -2.86 | 0.004 | -.0096462 | -.001803 |
| totalnoofs | .0009512 | .0001894 | 5.02 | 0 | .00058 | .0013224 |
| _cons | -.9270175 | .1818163 | -5.10 | 0.000 | -1.283371 | -.5706641 |
| _insig_1 | -.1398436 | .0091978 | -15.20 | 0 | -.1578709 | -.1218164 |
| atanhrho_12 | -.0849242 | .049058 | -1.73 | 0.083 | -.1810761 | .0112276 |
| sig_1 | .8694942 | .0079974 | | | .85396 | .8853109 |
| rho_12 | -.0847207 | .0487058 | | | -.1791226 | .0112271 |

Mixed-process regression

Number of obs=5988

LR chi2(32)=1049.59

Log likelihood = -9360.419 Prob > chi2=0.0000.

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