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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 Survey2011 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-poorare 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, Dose 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 studywas 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. Bruntrupet 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

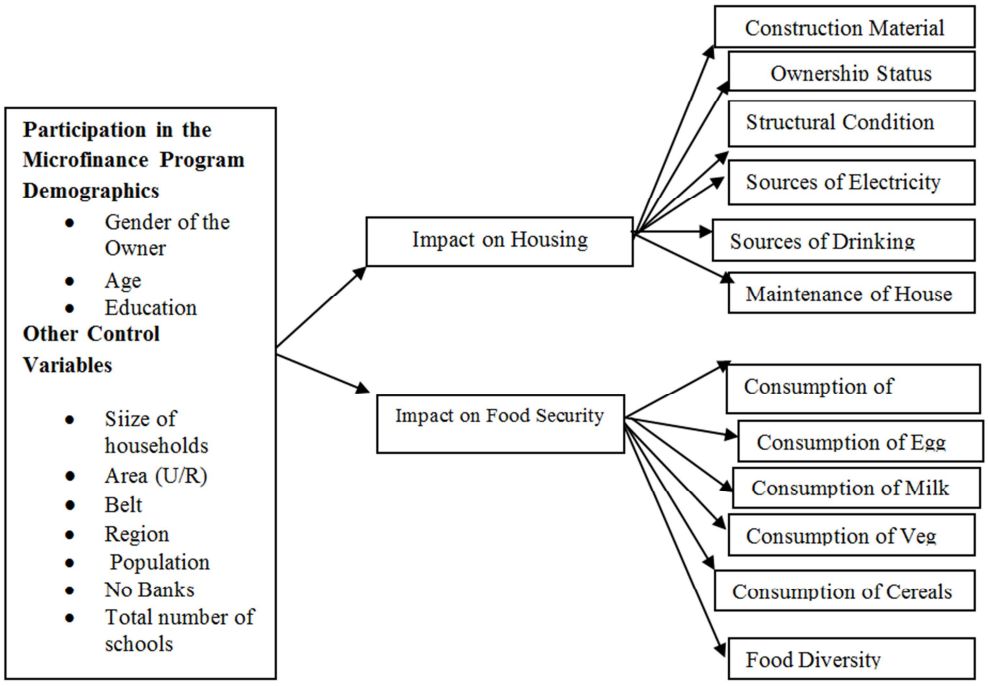
The data used in this research are taken from Nepal Living Standard Survey (NLSS). The original survey was carried out by the Central Bureau of Statistics (CBS), National Planning Commission, and Government of Nepal. The NLSS has been carrying out since first time in 1995/96. The second time the NLSS 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 collator 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

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

$$i = 1, \ldots n \qquad (1)$$

where,

Y_i is the dependent variable,

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

$X_{1i}, \ldots, X_k$ are k endogenous regressors, which are potentially correlated with u_i

$W_{1i}, \ldots, W_{ri}$ 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

$Z_{1i}, \ldots, Z_{mi}$ 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 ($Z_{1i}, \ldots, Z_{mi}$) and the induced exogenous variables ($W_{1i}, \ldots, W_{ri}$) using OLS. Compute the predicted values from this regression; call these X_{1ihat}. Repeat this for all the endogenous regressors $X_{2i}, \ldots, X_{ki}$ thereby computing the predicated values $X_{2ihat}, \ldots, X_{kihat}$

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

OLS. The TSLS estimators, B_{0hat}^{TSLS},..., B_{k+rhat}^{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},..., Z_{mi} must satisfy the following two conditions to be valid:

(1) Instrument Relevance

1. In general, let X_{1ihat} 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_{1ihat},..., X_{kihat}, W_{1i},..., 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:

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

The Instrument Variable Assumptions

The variables and error in the IV regression model satisfy.

1. $E(u_i/ W_{1i},..., W_{ri})=0$
2. (X_{2i},..., X_{ki}, W_{1i},..., W_{ri}, Z_{1i},..., 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},..., 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

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

Second Stage

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

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 ui or Control variables. Ui 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 is highly correlated with program or participation but that is not correlated with unobserved characteristics that affecting outcomes. β_1,..., β_{13} are the unknown regression coefficients.

4.10. Mandatory Diagnostic Tests of Models for IV

Two important tests, testing for endogenneity 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 3equations for the test of the strength of instruments and over identification restrictions. 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 3equations, 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	age, sex, edu (education) (size of household), type of area (rural and urban), Region (eastern, central, western Midwestern and far western), population, numbers of schools, numbers of bank and financial institutions	Micro	Distance of Bank, Distance of cooperative and size of land holding	13.92	1.93	41.55
amount_elect				5.83	2.39	17.45
Ownership				13.92	0.76	41.55
rep_main				13.92	0.25	41.55
Cstructure				18.02	13.92	41.55
Materialu				13.92	33.75	41.55
meat1				13.92	1.73	41.55
egg1				13.92	3.35	41.55
milk1				13.92	10.87	41.55
veg1				13.92	0.09	41.55
cereals1				13.92	0.42	41.55
diversity (meat1egg1milk1veg 1cereals1)				13.92	8.99	41.55

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): ≤10% of level

Chi-sq(2) P-val ≤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 leds to more consumption on electricity of participant household as compared tonon-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~l	-.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~l	39.31	-.00	.00**
micro	-107681.27***	.07	.80***
_cons	-7345.53	-1.77***	.25

legend: * p<0.05; ** p<0.01; *** p<0.00

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 mod 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~l	.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~l	-.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.

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 entrepreneurships 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.

Appendix: Output of IV Estimators

Impact on Housing

Table A1. *Cmp (sdwater = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_bank>dist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), indicators ($cmp_probit $cmp_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
hhsize	-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
hhsize	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

	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	-0.000000538	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 eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist _bank dist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), 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
hhsize	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
hhsize	-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	-0.000000152	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 eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_b>ankdist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), 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	-0.0557009	0.0488913	-1.14	0.255	-0.151526	0.0401242
edu	-0.0154333	0.0043135	-3.58	0	-0.0238876	-0.006979
hhsize	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	-.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	0.51	-0.0000562	0.0231935
hhsize	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
atanhrho_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 = -4314.6587Prob > chi2=0.0000.

Table A4. *Cmp (rep_main_hh = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_> bank dist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), 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
hhsize	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
hhsize	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
atanhrho_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 = -4314.6587Prob > chi2=0.0000.

Table A5. *Cmp (cstructure = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_b>ankdist_coopland_hec_tot age sex eduhhsize urban hill teraiedrcdrwdrmwdr population noofbanktotalnoofschool), 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
hhsize	-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	-.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
hhsize	.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
atanhrho_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 = -4472.0205Prob > chi2=0.0000.

Table A6. *Cmp (materialu = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_ba>nkdist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), 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
hhsize	. 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	0555041	.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
hhsize	.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
atanhrho_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 = -3889.4206Prob > chi2=0.0000.

Impact of Food Security

Table A7. *Cmp (meat1 = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_bank>dist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), 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
hhsize	.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	0262	-.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
hhsize	.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
atanhrho_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 eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_bank d>ist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), 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
hhsize	.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_hec_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
hhsize	.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
atanhrho_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 = 3889.4206Prob > chi2=0.0000.

Table A9. *Cmp (milk1 = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_bank>dist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), indicators ($c mp_probit $cmp_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
hhsize	.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_hec_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
hhsize	.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	-2.1 6	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

milk1	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 = 3889.4206Prob > chi2=0.0000.

Table A10. *Cmp (veg1 = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_bank d>ist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), 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
hhsize	.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	1.013828
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
hhsize	.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 = -1911.7656Prob > chi2=0.0000.

Table A11. *Cmp (cereals1 = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_ba>nkdist_coopland_hec_tot age sex eduhhsize urban hill teraiedrcdrwdrmwdr population noofbanktotalnoofschool), 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
hhsize	.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
hhsize	.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
atanhrho_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 = -9360.419Prob > chi2=0.0000.

Table A12. *Cmp (diversity = age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool micro) (micro =dist_bankdist_coopland_hec_tot age sex eduhhsize urban hill terai edr cdr wdr mwdr population noofbank totalnoofschool), 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
hhsize	.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
hhsize	.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
lnsig_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 = -9360.419Prob > chi2=0.0000.

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