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Impact of MGNREGA on Rural Credit Structure in Andhra Pradesh state of India: Household Level Panel Data Analysis from 2006-2012

M Bhattarai, P Padmaja, C Bantilan
ICRISAT, Patancheru, India, b.madhu@cgiar.org

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Abstract

With expenditure of USD8 billion per annum, the Mahatma Gandhi National Rural Employment Guarantee Schemes (MGNREGS) of India is one of the largest Social Safety Nets (SSN) programs in the developing world. The program aims to improve rural livelihood in India by reducing overall vulnerability and distress of rural poor. The nature and degree of implementation of the program vary across the Indian states (provinces); Andhra Pradesh is one of the states which has received/spent largest national level MGNREGS funding. Using panel data sets out of ICRISAT targeted four villages (and 227 households) in Andhra Pradesh state for the last 5 years (2007-11), we quantified the impact on the program on credit and debt structure the rural households, using quasi- experimental design such as difference-in-difference method of impact assessment. Extending the regression model, we evaluated factors determinant of the level of debt and its structure by using 5 years of panel household data by the Tobit model with random effects. The debt of the program participant households in the selected four villages of Andhra Pradesh, over the last 5 years, has declined by Rs. 8,000 (USD200) per annum, while the debt of non-participants of NREGS increased. About 90% of this reduction was on credit from non-institutional sources with high interest charge of over 40% per annum. The results also suggest that, over the 5 years period, the rural debt has been reduced significantly for lower caste households, with education, and small-holdings than their counterpart rural households. Likewise, overall debt to asset ratio (debt burden) has significantly reduced among the NREGS participating household (often poor households). Considering the high interest rate (often 40% per annum) for informal sector credits, the 50% reduction on debt-to-asset ratio of the program participant households is shown to provide significant social safety net benefits to the rural poor in the study area. The paper concludes with policy recommendations for effective targeting of the program and particularly the social safety net benefits to the poor households in the study area of Andhra Pradesh, India.

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1. Introduction

1.1 Background

Improving equitable access Rural Credit to mass population of rural sector is a powerful policy instrument for alleviation of poverty and insuring rural population against risk and vulnerability in developing world. However, improving access to formal credit and particularly among the large number of landless and smallholding farmers of developing countries, including in the middle income countries is a formidable challenge. For example, in India with a huge investment of around Rs. 700,000 crore[i] (Rs. 7000,000 million) credit flow per year in the country through formal institutions, still a large proportionate of rural population- about 40 percent of rural population- are depended upon the informal sources for their credit needs. In this context, we analyze the rural credit structures and smallholding farm households behavior on rural credit, and evaluate impact of national employment guarantee schemes (i.e., MGNREGS) on rural households taking households data sets across 220 households from four different villages in Andhra Pradesh state (old state) of India.

With annual funding allocation of US 8 billion per annum in 2012/12, Mahatma Gandhi National Rural Employment Guarantee Schemes (MGNREGS or MGNREGA[ii]) is the flagship programme of Government of India. This act provides every rural household employment guarantee of up to 100 days of wage employment in a year within 15 days of demand for such employment. Thus, it ensures a direct employment opportunity to unemployed rural population community within the locality at lean period of agricultural season, when farm employment opportunities in many part of the rural India are at scarce. In this context, in this study, we identify impact of MGNREGS on credit structures by analyzing general credit pattern of MGNREGA participants and evaluating factors affecting MGNREGA participation.

By ensuring at least a minimum of 100 days guarantee employment per annum to all households who demand for manual work, and who cannot get employment in the local markets (even seasonal and informal markets). The MGNREGS scheme aims to reduce food insecurity and vulnerability in rural India. Due to seasonality on agriculture production as well as highly seasonality of agricultural employment structures in rural India, and high dependence of rural population in agricultural activities for their employment and livelihoods securities, the MGNREGS program has also provided to Social Safety Nets to many millions of households in dry land regions with frequent droughts, and with highly seasonality in agricultural employment. In these regions, where local farm activities cannot generate the number of employment demanded by all households in a community, this program has been seen a more useful and with greater dent in addressing the vulnerability problems of rural India, particularly of dry region with uncertain agricultural practices and production activities. Recent studies have shown that the implementation of the MGNREGS has also helped in combatting drought, reducing distress out seasonal migration from rural to urban, particularly in the lean agricultural seasons.

MGNREGA program activities have been implemented more vigorously in Andhra Pradesh, and also with active involvement of state government machineries and local administration bodies, than compared to many other states of India. Likewise, the MGNREGS related

activities are also more widespread and as per local context in the state of Andhra Pradesh compared to several other states of India. Lots of innovations and use of ICT have also been made to address challenges on widespread implementation of the Program.

This study analyses impact of MGNREGS debt of the households in the selected four sample villages of Andhra where ICRISAT has been compiling panel farm households data sets and comparing the changes going in the village economy for the long period of time. ICRISAT compiles the panel household data and information from these selected villages by keeping a resident field investigator in each of the village, who compiled data and information from each of the stratified random sample households in monthly basis on household consumption and various transactions that took place. This includes also the household credit and debt payment related transaction.

For the analyses, we have used the panel household data from The ICRISAT four sample villages in old Andhra Pradesh state, they are Aurepalle and Dokur located in Mahabubnagar district (now in Telanagana state after bifurcation of the state in June 2014); and the other two villages are J C Agraharam and Pamidipadu located in Prakasam district of Andhra Pradesh. Among the four villages, ICRISAT has been compiling consistent and high frequency data in Aurepalle and Dokur villages since 1975. As per the scope of study, this study however includes data sets largely from the year 2006, as the MGNREGA program first started in Andhra Pradesh in 2006. From the two villages in Prakasam district (J.C.Agraharam and Pamidipadu), ICRISAT has been compiling the panel household data sets only from 2009, we have used the same data for the analyses in this study.

1.2 Objectives

The purpose of this study is to evaluate impacts of the MGNREGS program on debt structure of rural households in India. For this purpose, we have evaluated impact of MGNREGS on changes on debt level of rural households, and factors determinants of the farm credit level of these households in rural India.

The specific objectives of this study are as listed below.

1. To analyze impacts of MGNREGA on borrowings behavior of households participating in the public work program in the selected villages in Andhra Pradesh, using method of counterfactual based impact assessment.

2. To evaluate marginal impacts of factors determinant of farm borrowing of the rural households across the selected studied households in Andhra Pradesh.

3. Based on empirical analyses, assess policy implications in better access of rural credit in India.

2. Literature Review

The literature on impacts of MGNREGS and likewise factors determinant of credit is very fast. Therefore, we do not claim that we would be summarizing al of the literature on the topic, but we summarize only the selected literature on the topic. We have divided this section into two separate sub-heading, as given below. First, we have summarized key findings of selected literature on "impact of MGNREGS" and recent trend on the literature and studies on the topic. Then, we have summarized key finding of factors determinant of farm credit level of rural credit in India.

2.1 Impact of MGNREGS and other EGSs program in general

The literature on impact of impact of MGNREGA is in growing trend. The available studies on MGNREGA focused largely on process adopted for program implementation, and performances. Very limited studies are available that deals on MGNREGA implication of farm credit behaviors credit. Some of the findings of recent impact studies of MGNREGA on household's food security, income and credit needs are discussed below.

A government evaluation of MGNREGS program in five districts of Uttar Pradesh noted that around 85 per cent of the MGNREGS beneficiaries belong to Below Poverty Line (BPL), 50 per cent belong to Schedule Castes (SCs), and other 45 per cent of them belong to the other backward classes (OBCs) (MRD, 2013). National Sample Survey Offices (NSSO) surveys in 2006 to 2012 (MRD, 2013) on MGNREGA observed that in Andhra Pradesh 42 per cent of the beneficiaries were SCs/STs class, and 50 per cent were OBCs. These proportions in Madhya Pradesh were 67 per cent and 29 percent, and in Rajasthan 50 per cent and 42 per cent, respectively. Thus, largely lower income and lower social strata of population have participated more on the work activities of MGNREGA. This is logical due to need to work for manual work largely done by the unskilled labor forces in rural sector.

Women who participated in MGNREGA were highly satisfied with MGNREGA work; in of the study by CRRID (2009), 80 percent sample respondents of district Sirsa (Himachal Pradesh), and more than 57 percent of Hoshiarpur (Punjab) reported that economic conditions of women improved substantially. In fact, women were getting job at their doorstep. Likewise, Hirway (2006) reported that farmers with less than 2.5 acres of land (i.e. marginal farmers) of landless households (land less agricultural labor) followed the highest participation in MGNREGA in their study sites in Gujarat. The participation for MGNREGA from medium and large farmers was very small. The highest participation is from the income groups Rs. 10,000 to 25,000 and Rs. 25,000-50,000, i.e., they are also the groups just below the poverty line and just above the poverty line. The village level multiplier analysis carried out by Hirway et.al. (2006) has demonstrated positive impact of MGNREGA on incomes, production and employment. In this study, the increase on output was more than double than the increase in the expenditure from MGNREGS, because of increased income of labor households and increased transaction and inflow of fund in the village economy.

Likewise, in a study in Burdwan district of West Bengal (Prattoy Sarkar et al, 2011) reported that the per capita savings of MGNREGS beneficiaries had almost doubled (97% increase) in 2008-09 over that of 2007-08, and it again increased by 40 per cent in 2009-10. The

corresponding changes for non-beneficiaries were increased just by nominally (2.3% and 0.5% in those two years, respectively). The amount of outstanding debt for beneficiaries had decreased by 20 per cent in 2008-09 over 2007-08, and again decreased by 13 per cent in 2009-10. In fact, it increased for non-beneficiaries by 10.6 per cent in 2008-09 over 2007-08, and decreased in 2009-10 by 59 per cent, which is the only significant change in the case of non-beneficiaries. This micro-level study in West Bengal suggests that the program participants used the wage money from MGNREGS for repayment of their existing debt. In fact, during our field studies in several villages in AP and MP, the community members, especially the lower income households did mention using MGNREGA wage payments in repaying their old debt from informal sources. The wage earning from MGNREGA in lean agricultural season, has helped many smallholding farmers for getting access to critical finances and liquidity for the households particularly in the slack seasons of agricultural activities in the SAT India villages.

2.2 Factors determinant of farm credit in India

Earlier studies imply that the main factor that affects farmers credit demand or total assets of HH is the income of the household supported by other factors such as education of the head of the HH, Age of head of the HH, farm-size, social category of HH etc. If income levels of households increase, either the assets of the HH improve or debts of HH decline.

According to the study by Tang et.al.(2010) "Credit demand is significantly affected by household's production capacity as supported by the fact that household size, land size, head's education all significantly increase household's probability to borrow, but the impact of these factors varies considerably by credit market. Transaction costs have a significant, negative effect on formal credit demand. The credit constraints analysis suggests that off-farm employment, land size and the cost of the credit are the three most important factors that increase the probability of being constrained."

The quantum of institutional credit availed by the farming households is affected by a number of socio-demographic factors, which includes education, farm size, family size, caste, gender, occupation of household, etc. (Kumar, et al. (2010)). "The proportion of borrowing households in the total households in India has increased during 2006-07, but giving maximum gains for large farmers" (Satyasai, (2012)).

Among important factors demands of rural credit, the role of education in farm credit is another unresolved issue. The available literature has provided mixed results on effect of education on farm credit. Therefore, this is also subject of study in this study. A recent study has shown that higher education level of farmers in fact helps as capacity building of borrowing farmers, specially ease in understanding of complexities of banking procedures, and imparting training to borrowers regarding procedural formalities of financial institutions; thus education is helpful in increasing their access to institutional credit (Kumar et. al., 2010). The same study also points out that the weaker sections of the society like scheduled castes, scheduled tribes and other backward castes and smallholders are more exposed to non-institutional sources for their borrowings and thus end up paying higher rates of interest. Therefore, in this study, we also assess this issue more in depth and analyze the differential access of farm credit (and level of farm credit) by social group, and economic classes.

Likewise, Reddy (2012) study reported that as agriculture and rural areas are being exposed to more commercialization, the financial transactions of the rural households are also increasing over the years. More rural households are borrowing now than in earlier years. 80 per cent of rural households have borrowed from either formal or informal sources and about 46 per cent of households have taken multiple loans. Cropping system has been found to play an important role in the sources of borrowings. According to Gandhimathi (2011), the size of land holding was a significant factor in determining the borrowing behavior of farmers.

Reddy (2012) and several other studies (Sharangi, 2014) have reported that large proportionate of rural households borrow from the informal sources compared to formal sources more so in dry land and Semi-Arid Tropics of India. Due to risky and uncertain crop yield, even the formal sources of financial institutions tighten their belt in SAT India. In a longitudinal survey of 1,064 rural households in a Medak district of Andhra Pradesh, the MRD (2013) study reported that around 12 per cent of the households' income had increased, as more members of the same household were being able to work under MGNREGS.

By surveying over 1,500 households in three states, the study reported that the share of MGNREGA in the total annual income of the poor households was the highest in Andhra Pradesh (17%),followed by Rajasthan (10%), and by Maharashtra (7%)" (MRD, 2013). The households utilized the extra income obtained from MGNREGS to meet family expenses, or to clear off their old debts, or use for education expenses for their children, buying small items to be used in the daily household uses. We have not found any of the participant members of household buying any of the major durable assets (equipment) out of the wage income that he/she has earned from working in MGNREGS program.

In case of AP, microfinance institutions are also the important sources of rural financing for smallholding farmers, but they are also charging extremely high interest rates on smallholding farm borrowers, and many times, they followed forced loan recovery practices that lead to farmer suicides (Shylendra 2006; Sharangi, 2014). The excessive coercing mechanisms adopted by these Microfinance institutions, alternative and effective media, all helped to highlight the plight of debt crises in AP , and roles of finance institutions on the micro-credit crises, all of these lead to micro—finances crises in AP, with closer of several MFFIs, and government interventions on this sector. All of these activities also hit badly on rural financing and credit flow in rural Andhra Pradesh in 2010.

The share of marginal and small farmers in the use of total credit (both disbursed and outstanding) has been shrinking at all India level; hence it is suggested to augment the credit flow to the lower strata of the farming community, which has more shares in the total operational land holdings, as well. Many scholars have argued that there is an urgent needs to supplementing the land inputs of marginal and small farmers with the non-land inputs such as credit, with a view to enhancing the productivity and thereby the production performance of Indian agriculture (Sharangi, 2014). In this context, the need for linking credit supply to input use also assumes very importance (Golait, 2007). Likewise, some studies have also reported high interest rate and prices of inputs are the two major factors affecting delay in repayments of agricultural credit in Punjab state in India (Mehmood, et al., 2012).

The high dependency of informal sources of funding for agricultural operation is another endemic problem in rural credit market in Andhra Pradesh. This brings into focus the public lacunae in the rural credit system, which has added to the woes of the farmers. Most of the rural credit in the state is supplied from non-institutional sources. Several recent studies have reported that the formal credit in Andhra Pradesh meets hardly less than 30 per cent of the total annual credit requirements of an average farmer. Therefore, many scholars have also suggested reducing farmers' dependence upon private moneylenders and informal source of credit (www.macroscan.org/pol/apr05/pdf/Chapter4.pdf).

The government subsidy on rural credit is to lower cost of capital for farm investment also comes as a part of the government overall rural development strategy and commitment to support and expand formal sources of institutions of credits in rural areas. In addition to providing direct support to rural credit, government of India is supporting use of agro-inputs at subsidized prices, particularly fertilizers, irrigation water, and agro-implements. In India, the prices of fertilizers and irrigation water have historically kept far below than the market prices by various direct and indirect subsidies. The direct and indirect supports from the government for the rural credit needs to be examined within the framework of rural development strategy, and other area development strategies.

However, recently many studies have reported that subsidized credit programs from government have failed to achieve an increase of agricultural output and farm profit effectively, or even to have any dent on improvement of rural income distribution and alleviate poverty. They have mentioned that the financial institutions that were created to channel rural credit are incompetent and lacking accountability (Braveman and Guasch, 1986; Sharangi, 2014). Thereby, we can say that financial institutions, or subsidized credit programs, in India have not been able to help the farmers to come out of debt, or serve needs of those who need the credit most.

The recent farm debt crises in Andhra Pradesh (or newly formed states of AP) are another example of failure of governmental failure of rural credit policy in India. During the state election, all major political parties have announced farm credit waiver of 100,000 to 200,000 if a certain party wins the election, the loan waiving commitment amount varied across the political parties. After winning the state level election, the government in each of the state of Telengana and AP has in fact announced farm credit waiving, and are implementing this political commitment done earlier at the time of election period in May 2014. However, implementation of this policy has created several distortions in rural credit markets of both the Telangana and AP. For example, identifying the authentic client and minimize the misused of the fund. However, the state has also faced budgetary constraints in waiving all of the farm credit up to Rs. 100,000 per farm households within a year. Due to all of these political interventions, on the ground, many of the local financial institutions have not provided additional formal source credit to farmers in this year unless paid by the previous due amount, and also faced several uncertainties of farm credit waiving program, complicated rural credit waiving procedures in several installments[iii]. At the end, majority of smallholding farmers have become more depended upon informal sources of credit for their regular farm operation (authors communication with several money lenders in Dokur villages, of Telangana state on 24- 25 October 2014; talk with Dr. D N Reddy, Hyderabad).

In this context, examining the farm credit issues in old state of AP (Telangana and new AP state), and particularly impact of MGNREGA on debt structures, and factors determinant of farm credits, as done in this study, will carry very high public policy implications.

3. Methodology

3.1 Methods

First method of the study is counter factual based impact assessment (Fig 1) which helps to estimate the average treatment effect by calculating the difference in difference of base line and follow-up of treated and non-treated variables. MGNREGA treatment effect on MGNREGA participant households is clearly understood with counterfactual based assessment. A comparative approach between treated and control groups is involved in such kind of analysis.
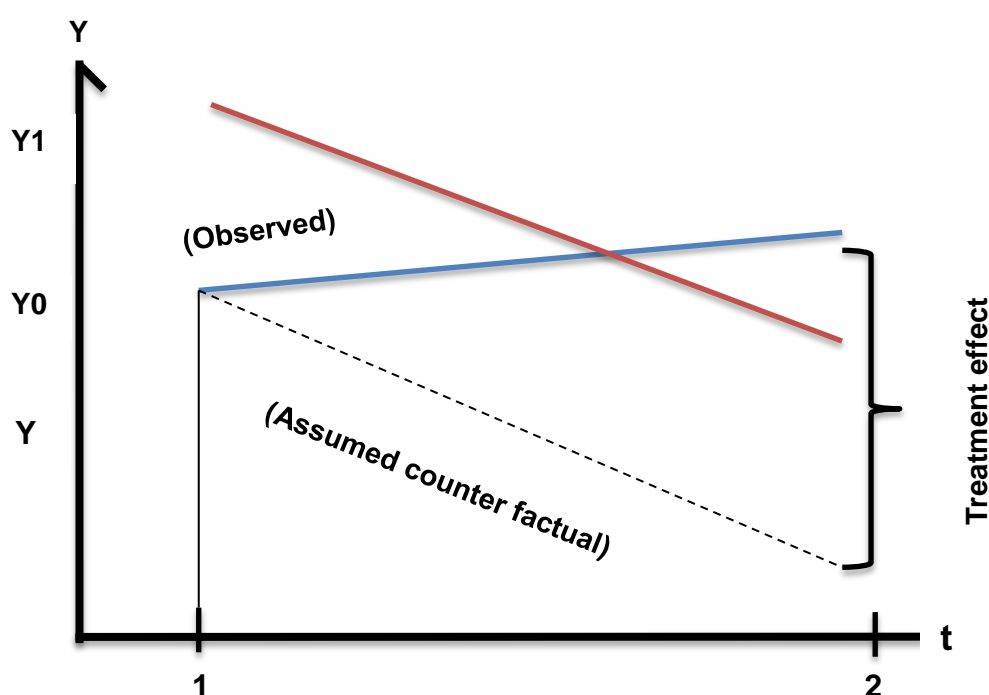
Source: http://en.wikipedia.org/wiki/Difference_in_differences

Figure 1: Counter factual based impact assessment of a program intervention on debt

Second method of the study is to estimate the marginal effects of factors contributing to farm borrowings through censoring in regression. Censoring in regression framework helps in estimating the latent effect of independent variables on dependent variable (Fig 2). Theerefore, considering the nature of field data, we have used tobit random efefct model to estiate the equations (1 and 2) that have been mentioned in the earlier ection.

Marginal effect captures the change in dependent variable with respect to change in independent variables. In the current research study, Tobit censored regression model is used to estimate the marginal effect of age of head of household, education level of head of household, main occupation of head of household, social category of head of household,

land holding size of the household, female as head of household and importantly MGNREGA participation on the ratio of amount of debt to total assets.
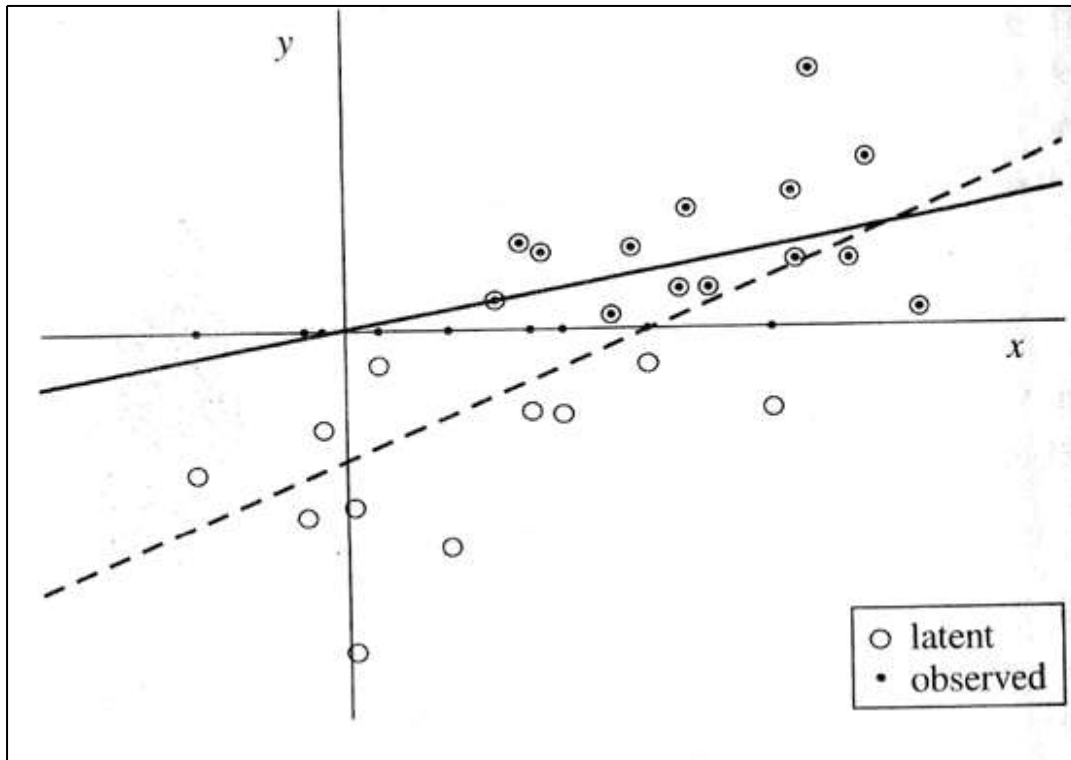
Source: Wooldridge (2003), Introductory Econometrics, 2nd edition, Chap.17.2

Figure 2: Censoring in a regression framework

3.2 Analytical Tools and Techniques

3.2.1 Difference in Difference method of impact assessment

The general equation of Difference in Difference model is:

$$\hat{\delta} \, DD = \bar{y}_1^T - \bar{y}_0^T - (\bar{y}_1^C - \bar{y}_0^C)$$

$$\hat{\delta} \, DD = [\bar{y}_1^T] - E [\bar{y}_0^T] - (E [\bar{y}_1^C] - E [\bar{y}_0^C])$$

$$= \alpha + \beta + \gamma + \delta - (\alpha + \beta) - (\alpha + \gamma - \gamma)$$

$$= (\gamma + \delta) - \gamma$$

$$= \delta$$

$\delta = \bar{y}_1^T - \bar{y}_0^T - (\bar{y}_1^C - \bar{y}_0^C)$, where δ is the difference between differences in 2009 and 2011 on control and treated observations. Table 1 shows the difference in difference method implemented in the current study.

Table 1: Difference in Difference method adopted in the study

y_{st}	S=participants (treated)	S=Non-Participants (control)	Difference in Difference
T_1=*2011*	$\bar{y}_1^T$	$\bar{y}_1^C$	$\bar{y}_1^T - \bar{y}_0^T - (\bar{y}_1^C - \bar{y}_0^C)$
T_0=*2009*	$\bar{y}_0^T$	$\bar{y}_0^C$	
Difference	$\bar{y}_1^T - \bar{y}_0^T$	$\bar{y}_1^C - \bar{y}_0^C$	
Note: y = Debt Ratio (in %)			

In this case, $\bar{y}_1^C$ is debt ratio (%) of MGNREGA non-participants in 2011, $\bar{y}_1^T$ is equal to debt ratio (%) of MGNREGA participants in 2011, $\bar{y}_0^C$ stands for debt ratio (%) of MGNREGA non-participants in 2009 and $\bar{y}_0^T$ applies to debt ratio (%) of MGNREGA participants in 2009.

3.2.2. Tobit Censored Regression Model

A Tobit model best fit for modeling credit behavior since, in reality, the debit variable is censored due to constraints in credit availability and credit rationing. The general equation of tobit model is: $y_{it}^* = bx_{it} + u_{it}$ where $u_{it} \sim N(0, s^2)$, In practice, y_{it}^* is not observed. $y_{it} = y_{it}^*$ if $y_{it}^* > y_0$, and $y_{it} = y_0$ otherwise, where y_{it} is observed. y_0 is known. s^2 is often treated as known. x_i's are observed for all i. In the present study, the dependent variable for Tobit model is the percentage ratio of borrowings to total assets. The lower limit for percentage ratio is zero and the upper limit is 100. When there are no borrowings ratio becomes zero. So the lower limit is zero. When borrowings are higher than assets, ratio will be greater than 1 and percentage would be greater than 100. So, the upper limit for the model is 100.

The general equation of Tobit model is:

$$Y_{it}^* = \beta_1 + \beta_2 X_{1it} + \ldots + \beta_k X_{kit} + u_{it}$$

Y_{it}^* is unobservable but $Y_{it} = \begin{cases} 0 \text{ if } Y_{it}^* < 0 \\ Y_{it}^* \text{ if } Y_{it}^* \geq 0 \end{cases}$

Here, *Y* = Debt Ratio (%) = Ratio borrowings (Rs.) to total assets (Rs.) (in %)

$\beta 1$ = constant

X_1 = Benefits from MGNREGA = Amount in Rs. obtained from MGNREGA work (real values)

X_2 = Education = Level of education of head of the household: Illiterate, Primary, Middle, High school, Inter, Diploma, Graduation, Post-graduation, Technical degree, Double degree, PhD, Others

X_3 = Farm Size = Size of operational holdings in acres

X_4 = Age = Age of head of household in years

X_5 = Female HH = Female headed households

X_6 = Occupation = Main occupation of head of household taken as dummy variable: Farm labour; Non-Farm labour; Regular farm servant; Caste Occupation=1, Otherwise (Farming, Livestock, Business, Salaried job, Education, domestic work, no work (i.e. child/old age/physically or mentally handicapped) = 0)

X_7 = BC = Backward and other backward castes

X_8 = SC/ST = Schedule castes or Schedule tribes

u_{it} = Standard error

Where a is the lower limit for left censoring and b is the upper limit for right censoring dependent variable.

Interpreting Coefficients.

The confidents of coefficient estimates of a Tobit model can be explained as below./

1. Expected value of the underlying latent variable (γ^*)

$$E(Y * |xi) = x!\,i\beta$$

2. Estimated probability of exceeding C

$$\mathrm{pr}(yi > C) = \Phi\left(\frac{x!i\beta}{\sigma}\right)$$

3. Expected, unconditional value of the realized variable (γ)

$$E(yi\,|xi) = \Phi i\left(x!\,i\beta + \sigma\frac{\phi i}{\Phi i}\right) + (1 - \Phi i)$$

4. Expected γ, conditional on exceeding C

$$E(yi\,|y > C, xi) = x!\,i\beta + \sigma\frac{\phi i}{\Phi i} + C$$

3.3 Study Sites

The study used household level panel data from 4 villages of Andhra Pradesh namely Aurepalle and Dokur of Mahabubnagar district and JC Agraharam and Pamidipadu of Prakasam district where MGNREGA is implemented. HH participating in MGNREGA are compared with HH not participating in MGNREGA in terms of outcome variable i.e. percentage of borrowings to total assets. Difference in difference and Tobit random effects model (Panel form of regression analysis) is used to factor out impacts of MGNREGA taking into account other major factor determinants of the welfare indicators.

ICRISAT VDSA (Village dynamics in South Asia) household level data is the main source of data for the current study. The general characteristics of the head of the household and landholding details of the household are obtained from general endowment data and landholding data of the VDSA database. Financial liabilities of the household are obtained

from financial transactions data of the VDSA database. MGNREGA participant's data is obtained from resurvey of VDSA (Village dynamics in South Asia) panel households for their actual participation in MGNREGA program activities in each of the village. (With a short checklist for participation member households and their annual income from MGNREGA)

3.4 Data Description and Data Limitations

Primary data was collected from the beneficiaries as well as non-beneficiaries selected in the sample villages, using well-structured pretested schedule by personal interview and direct observations. Information related to different socio-economic parameters of the beneficiaries and non-beneficiaries in general characteristics were ICRISAT data sources.

Research data is obtained from 4 SAT (Semi-Arid Tropics) villages of Andhra Pradesh. The 4 villages are Aurepalle, Dokur, JC Agraharam and Pamidipadu. Aurepalle and Dokur belong to Mahabubnagar district in AP while JC Agraharam and Pamidipadu belong to Prakasam district in Andhra Pradesh.

Data Limitations Data for the years 2006, 2007 and 2008 is only available for 2 villages (Aurepalle and Dokur) of AP. In case of other villages data is available from the year 2009. So, the analysis includes 2009, 2010 and 2011 round of survey of panel households data.

Table 2: General description and summary statistics of the variables used in the study

Variables	Description	Unit	Sample Mean	Std. Dev.	Min	Max
Debt ratio (in %)	% of ratio of borrowings (Rs.) to total assets (Rs.)	%	14.65	19.87	0	197
Benefits from MGNREGA	Amount in Rs. obtained from MGNREGA work	Rupees	4009.9	5602.2	0	31488
Education	Level of education of head of the HH	Code [a]	1.17	1.58	0	11
Farm Size	Operational holding of the farmer in acres	Acres	4.35	4.7	0	35.25
Age	Age of head of the household in years	Years	48.96	12.1	25	78
Female HH	Female as head of the household=1; otherwise =0	1= Female HH; 0= Male HH	0.12	0.32	0	1
Occupation	Main occupation of head of the household	Code [b]	0.33	0.47	0	1
BC	BC or OBC households=1; otherwise=0	BC = 1 Others = 0	0.60	0.49	0	1
SC/ST	SC or ST households=1; otherwise=0	SC / ST = 1 Others = 0	0.18	0.38	0	1

[a] 0=Illiterate, 1=Primary, 2=Middle, 3=High school, 4=Inter, 5=Diploma, 6=Graduation, 7=Post-graduation, 8=Technical degree, 9=Double degree, 10=PhD, 11=Others, [b]Farm labour/Non-Farm labour/ Regular farm servant/Caste Occupation=1, Otherwise=0

4. Results and Discussions

Difference in Difference and Tobit regression are the two analysis tools used to estimate the impact of MGNREGA on participant households taking debt ratio as outcome variable. Difference in difference mainly explains the difference in baseline (2009) and follow-up (2011) of treated (participant) and control (non-participant) groups. Tobit regression model captures the marginal effect of treatment (MGNREGA Participation) and other factors determining the HH borrowings.

4.1 Tabular and Graphical Analysis

Table 3: Percentage of borrowings of HH from each source out of total borrowings (all sources) in four villages of Andhra Pradesh (2010-11)

Source	Number of HH borrowed (N)	Mean amount borrowed	Min	Max	Percentage of total borrowings
Formal	**185**	**40419.05**	**0**	**429000**	**45.32**
Commercial Banks	96	43869.79	0	405000	25.53
Co-operatives	48	29541.67	0	123000	8.59
Financial Companies	22	31435.23	675	210000	4.19
Insurance	125	0	0	0	0.00
Post offices	26	0	0	0	0.00
Self-help groups	150	7709.667	0	58000	7.01
Informal	**183**	**49296.45**	**0**	**400000**	**54.68**
Commission Agent/Traders	1	1000	1000	1000	0.01
Employer/Land lord	5	18200	7000	46000	0.55
Friends/Relatives	148	31409.46	0	375000	28.18
Input dealer/Shopkeeper	22	7193.182	150	25000	0.96
Money lenders	65	50623.08	2000	300000	19.94
Others	74	11241.89	0	86600	5.04
Tenants	4	0	0	0	0.00
All Sources	**196**	**84177.42**	**0**	**454000**	**100.00**

Source: VDSA (2014).

Informal sources are dominant sources of borrowings in AP in the year 2010-11 (Table 3) with high percentage of borrowings from money lenders and/or friends/relatives. In case of formal sources, commercial banks are prominent. Figure 3 shows that in Mahabubnagar, AP, informal sources of borrowings have been dominant from 2001 to 2009 which has gradually reduced in 2010 and 2011.

Impact of MGNREGA on Rural Credit Structure in Andhra Pradesh state of India: Household Level Panel Data Analysis from 2006-2012
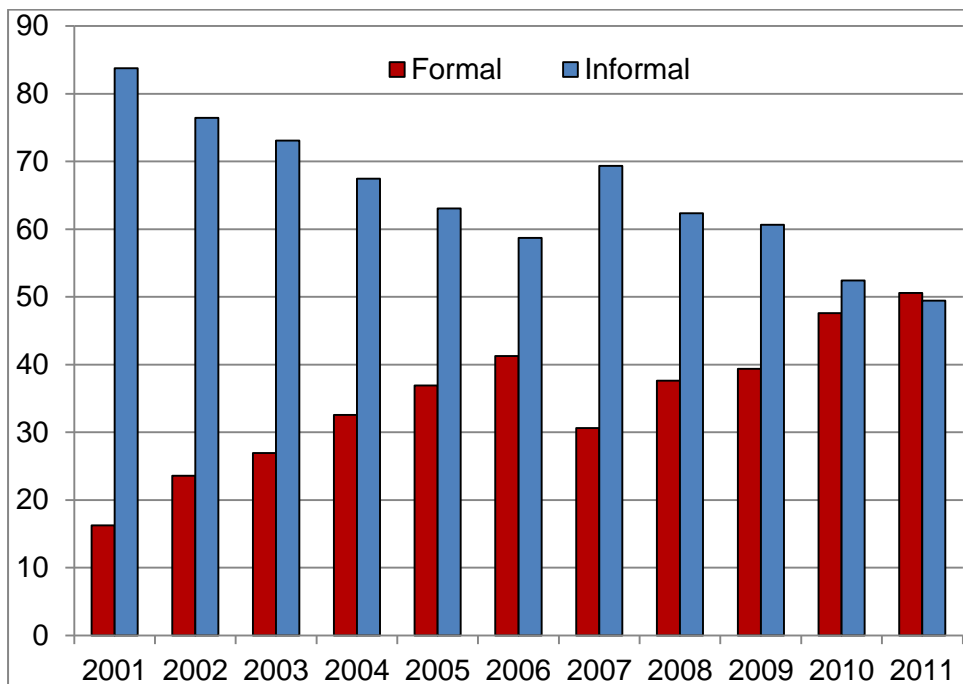
Source: VDSA (2014).

Figure 3: Trend on HH borrowed money from formal and informal sources in Mahabubnagar, AP by Year (in percentage)
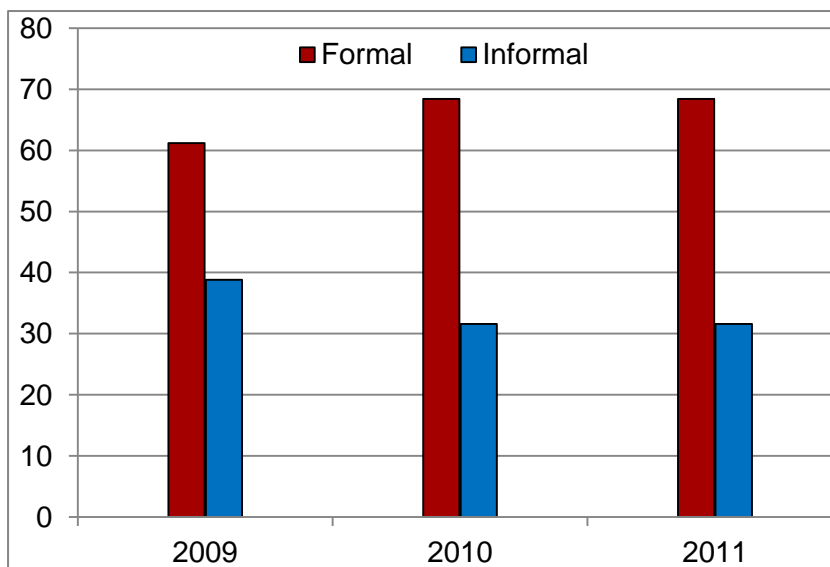
Source: VDSA (2014).

Figure 4: Trend on HH borrowed money from formal and informal sources of credit in Prakasam, Andhra Pradesh in 2009-12 (%)

In Prakasam district of Andhra Pradesh (Fig 4), households borrowed money mostly from formal sources like commercial banks, cooperatives, financial companies or SHGs in the years 2009, 2010 and 2011.
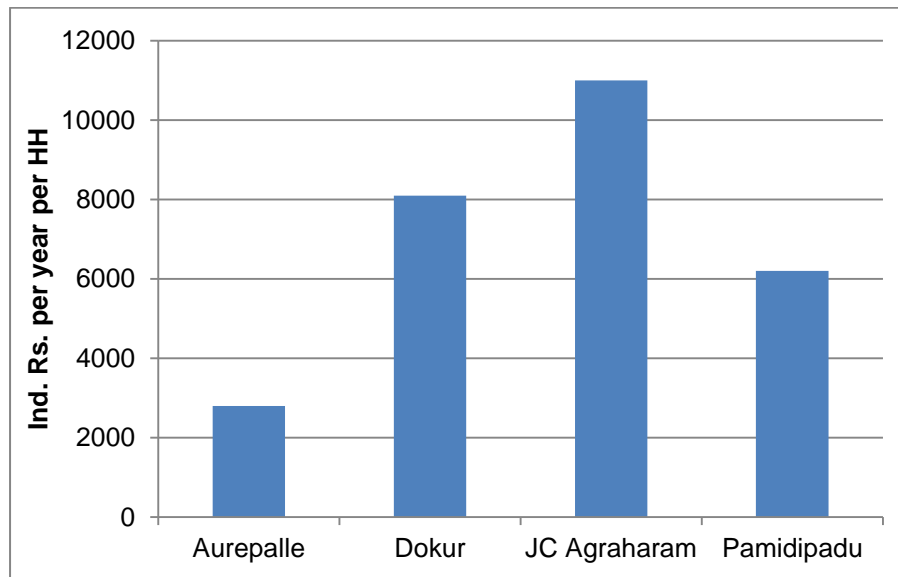
Source: VDSA (2014).

Figure 5: Average income earned by farm labor working from MGNREGA across four selected villages in Andhra Pradesh, India, 2010

In Andhra Pradesh, each household earned between Rs. 3000 – 12000 (approx.) (Fig 5) in the lean season (summer months) of the year 2010. The MGNREGA income earned per household can be used in different ways like for household expenses or clearing debts or for children's education etc.

4.2 Statistical Analysis

Changes in borrowing behavior or debt ratio of the program participants are taken as outcome of interest as per findings from the field and literature review. The percentage decrease in average percentage ratio of borrowings to total assets in case of participants from 2009 to 2011 is 46.7 while the percentage decrease in case of non-participants from 2009 to 2011 is 18.92. Even though the proportion of participants out of non-participants is almost half, the decrease in average percentage ratio of borrowings to total assets in case of participants is much higher compared to non-participants (Table 4).

Table 4: Average of Debt Ratio (in %) and number of participants and non-participants

Year of Survey	Debt Ratio		Number of	
	Non Participants	Participants	Non Participants	Participants
2009	10.5	21.8	76	99
2010	9.6	17.9	78	110
2011	13.0	12.1	81	101
Source: VDSA (2014).				

The percentage ratio of debt-to- total assets (Fig 6) in case of MGNREGA participant households declined from 21.8 in 2009 to 12 in 2011. This decrease on debt burden to these households could be attributed to impact of MGNREGA, since there was no other major changes within the short time between the two group of participants selected in this study.
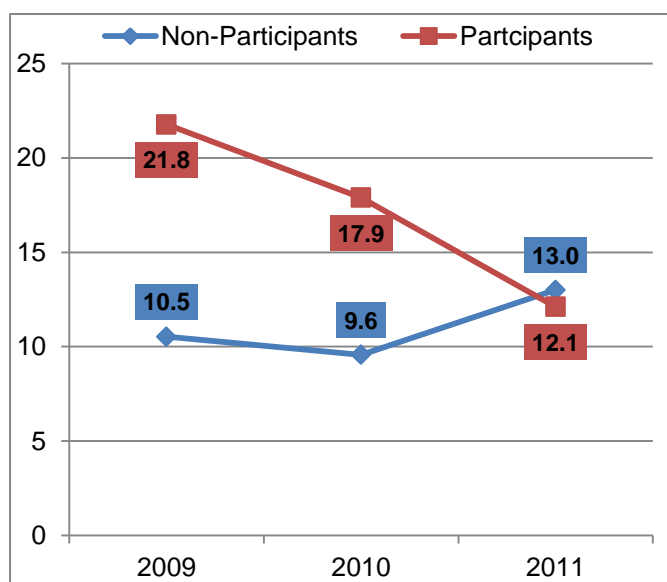
Source: VDSA (2014).

Figure 6: Average of Percentage Ratio between borrowings and total assets participants and non-participants.

Sample group mean t-test with unequal variances for percentage ratio of borrowings to total assets between participants and non-participants (All Sources of Credit) were done (Table 5). The results show that the mean percentage ratio of borrowings to total assets combinedly for all three years is higher in case of participants compared to non-participants. The participants are mostly labour, marginal farmers and small farmers with relatively higher operaoinal debts and and also possening with less asset capitals than non-participants, who are comprising of medium and large farmers, with large land holding and asset capitals.

Table 5: Number of MGNREGA Participants and Non-Participants in 2009 and 2011 taken in Difference-in-Differences analysis method (All Sources of Credit)

	Baseline (2009)	Follow-up (2011)	Total
Non Participants (Control)	76	81	157
Participants (Treated)	99	101	200
Total	175	182	357

Source: VDSA (2014).

Using difference-in-difference analyses, we have analysed impact of the MGNREGS particiation on changes on the debt- to- Asset position of the sample households, who belong to both pprogram participants and non-participants. on changes on debpon method. The difference between follow up period and baseline is -11.19 reductoin on debt-to asset reducton, that too within three year, which is statistiacally significantly 1% level (p=0.008).

This higly signifant value of debt variable has very high socieeconomic and public policy significant. The results here imply that the program participants used their wage income from participation in MGNREGA to repay their old debpt with the informal sources, money lenders, or even pay their debt to their fellow farmers in the village. This reduction on debpt has much wider impliaction in terms of improving their wellbeing in the community as well. Our field consultation with the farmers, field laborers and with the money lenders in the vilages also confirm such patterns that they have obserevd in the village, after the government initiated the MGNREGA work activities in these villages at large scale.

Table 6: Difference-in-Differences with Covariates (All Sources of Credit)

Outcome Variable	Baseline (2009)			Follow-up (2011)			
	Control (N-P)	Treated (P)	Diff (BL)	Control (N-P)	Treated (P)	Diff (FU)	Diff-in-Diff
Debt Ratio (%)	16.35	25.34	8.98	18.28	16.07	-2.208	**-11.19**
Standard Error	7.63	7.36	3.11	7.65	7.55	3.011	4.16
t-value	2.14	17.58	2.89	16.61	25.78	5.27	-2.69
p-value	0.03	0.001	0.004***	0.018	0.034	0.464	**0.008***

Note: Diff = Difference ; The Diff in Diff means
N-P = Non-Participants P = Participants BL = Baseline FU = Follow-up
*** = significant at 99 % confidence level, ** = significant at 95 % confidence level, * = significant at 90 % confidence level
Source: VDSA (2014).

Similar analysis has been carried out separately for institutional and non-institutional source of credit. Most of the MGNREGA participants comprising labour groups, marginal farmers and small farmers borrowed highly from non-institutions like money lenders, friends, relatives etc (Table 7). In addition, participants borrowing only from institutional credit are very less compared to non-participants. Consequently, the impact of MGNREGA is mostly seen more in case of Non-institutional sources of credit than the case of institutional credit.

Thereby, the discussion in this paper is mainly concentrated on factors affecting non-institutional souurces of credit. Also due to space constraint, details about analysis on

instituional credit is not included in this paper. Detailed results and information on analysis of formal credit sources can be obtained from the authors, seperately.

Table 7: Average of Percentage Ratio of borrowings to total assets (Non Institutional Credit)

Year of Survey	Average of Debt Ratio (Non-Institutional Credit)	
	Non Participants	**Participants**
2009	8.8	21.5
2010	8.7	16.0
2011	11.6	10.6
Source: VDSA (2014).		

Table 7 indicates that the percentage decrease in average percentage ratio of debt-to-total assets in case of participants from 2009 to 2011 is 56.2 while there was only a 20% decrease in case of non-participants from 2009 to 2011. Even though the proportion of participants out of non-participants is less, the decrease in average percentage ratio of debt-to- assets in case of participant is much higher compared to that of non-participant.
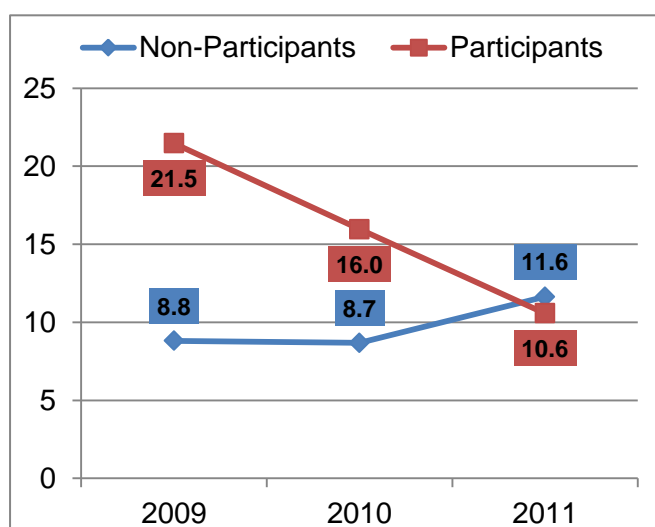
Source: VDSA (2014).

Figure 7: Percentage Ratio of Borrowings to Total Assets in case of Participants and Non-Participants (Non-Institutional Credit)

The percentage ratio of borrowings to total assets in case of participants declined from 21.5 in 2009 to 10.6 in 2011 (Table 9). If participants had not participate in MGNREGA, their percentage ratio of debt - to - total assets would have been more than 21.5 in 2011 instead of 10.6. Using DID analysis, this decrease may be attributed to the impact of MGNREGA.

Table 8: Number of MGNREGA Participants and Non-Participants in 2009 and 2011 taken in Difference-in-Differences analysis method (Non-Institutional Sources of Credit)

	Baseline (2009)	Follow-up (2011)	Total
Non Participants (Control)	57	60	117
Participants (Treated)	82	72	154
Total	139	132	271

Source: VDSA (2014).

Table 9 shows the results obtained from difference in difference method. The difference between follow up and baseline is -13.22 which is significantly high with p-value of 0.011. This implies that those households who participated in MGNREGA during the slack period of year, they were able to reduced thier ratio of debt- to assets ratio significantly by lowing non-institutional sources of burrowing.

Table 9: Difference-in-Differences with Covariates (Non-Institutional Sources of Credit)

Outcome Variable	Baseline (2009)			Follow-up (2011)			
	Control (N-P)	Treated (P)	Diff (BL)	Control(N-P)	Treated(P)	Diff(FU)	Diff in Diff
Debt Ratio (%)	13.22	24	10.77	15.78	13.33	-2.45	-13.22
Standard Error	9.97	9.65	3.79	9.89	9.82	3.75	5.13
t-value	1.33	14.34	2.84	13.49	25.2	7.25	-2.58
p-value	0.186	0.014	0.005***	0.11	0.18	0.51	0.011**

Note: N-P = Non-Participants; P = Participants ; BL = Baseline FU=Follow-up
*** = significant at 99 % confidence level, ** = significant at 95 % confidence level, * = significant at 90 % confidence level
Source: VDSA (2014).

4.3 Factors determinant of farm credit of rural households

Using the panel data, random effects form of Tobit regression model is used to capture the impact of MGNREGA on the program participants along with individual and household characteristics. Tobit is a censored regression model which estimates the impact of unobserved characteristics (Wooldridge 2003). For this model Debt ratio is taken as dependent variable and following as independent variables: benefits from MGNREGA, age, number of years of education, total operated area, percentage of leased in area, percentage of irrigated area, main occupation, percentage of non-cereal area, percentage of children below 20 years out of total members of the household, female headed households, family size and social caste along with one year lag and two year lag of debt ratio.

Table 10: Basic statistics of the variables used in household model in two villages of Mahabubnagar, AP (2001 to 2011)

Variables	Unit	Sample Mean	Std. Dev.
Debt Ratio	%	86.1	230.2
Amount Borrowed (Real)	Rupees	58074	77455
% of Non-Cereal Area out of Total Operated Area	%	40.0	44.7
% of children below 20 years out of Total members	%	32.5	22.1
Benefits from MGNREGA (Real)	Rs. in 100s	626	2193
% of Leased-in Area out of Total Operated Area	%	18.9	45.0
% of Irrigated Area out of Total Operated Area	%	32.0	40.3
Total Operated Area	Acres	4.2	4.7
% of Non-Farm Income out of Total Income	%	485	5404
Number of years of education	Years	2.5	3.8
Age	Years	48.9	12.8
Age Square	Years	2558	1307
Family size	Number	4.7	2.2
Dummy Variables			
i. Occupational dummy			
a. Farming		0.4	0.5
b. Farm Labor		0.2	0.4
c. Non-Farm Labor		0.0	0.2
d. Regular Farm Servant		1.0	0.0
e. Caste Occupation		0.0	0.2
ii. Female headed households		0.1	0.3
iii. Social Category Dummy			
a. Forward Caste		0.1	0.4
b. Backward caste		0.6	0.5

Source: VDSA (2014).

We have summarized the results of factors impact in elasticity form, so that the marginal impacts of factors can be compared across the factors. The results are reported in Table 11 below. The impact of MGNREGA participation (in terms of benefits per households per year) was statistically significant among the sample households selected during the period selected.

Table 11: Elasticity estimation out of the standard Tobit model

<u>Dependent Variable</u>: Debt-to-Asset Ratio (in %)

Factors\Variables	Marginal effects (dy/dx)	Z Values (marginal effects)	Elasticity value	Z Values of (elasticity)
Benefits from MGNREGA	-0.95	-4.76[a]	-0.09	-4.61[a]
Education[1]	-7.64	2.17[a]	-0.29	-3.72[a]
Total Operated Area	-1.92	-1.01[ns]	-0.12	-1.00[ns]
Leased in area (%)	-0.46	-4.65[a]	-0.13	-5.01[a]
Irrigated area (%)	-0.03	-0.19[ns]	-0.02	-0.19[ns]
Non-cereal area (%)	-0.0002	-0.54[ns]	0.06	0.56[ns]
Children below 20 years (%)	0.934	2.04[b]	0.46	1.98[b]
Age	4.29	0.9[ns]	3.21	0.89[ns]
Age_Square	-0.06	-1.33[ns]	-2.56	-1.33[ns]
Family Size	14.58	3.43[a]	1.05	3.42[a]
Dummy Variables				
i. Female headed households (Dummy , female = 1)	24.82	0.96[ns]	0.05	0.96[ns]
ii. Occupational Dummy				
a. Farming	-41.58	-1.46[ns]	-0.28	-1.49[ns]
b. Farm labour	-82.59	-2.6[a]	-0.29	-2.67[a]
c. Non-farm labour	-51.78	-1.48[ns]	-0.03	-1.52
d. Regular farm servant	21.57	0.19[ns]	0.32	0.19[ns]
e. Caste occupation	-37.43	-0.97[ns]	-0.02	-0.97
iii. Social Category Dummy				
a. Forward castes	-27.42	-0.89[ns]	-0.06	-0.89[ns]
b. Backward castes	-27.4	-1.13[ns]	-0.27	-1.13[ns]

Note: In recent version of Stata software (version 12), the Z statistics value of elasticity can be measured at different point intervals of observations of the variables Unlike, the elasticity measured at a sample mean value of the variables, the elasticity measured reported here is at whole range of sample intervals (Stata manual).

[a] = significant at less than 1 % level, [b] = significant at less than 5 % level, [c] = significant at less than 10 % level, [ns] = not significant .up to 10% level.
Source: VDSA (2014).

Likewise, we have found that the impact of education was negative in debt, which means the household heads with low education were more under debt burden than their counter parts. The owner cultivated farmers in AP had more debt burden than the tenant cultivators; this may be counter effect of asset possession, since the own cultivated farmers would usually have more asset than the tenant farmers would.

Interestingly, when we combined sociocultural and other economic variables, for household credit behavior, economic and market related factors were more obvious than the effect of MGNREGA and other Government programme.

5. Conclusions and Implications

Using counterfactual based impact analysis (Difference-in-Difference (DiD) method), impacts of MGNREGA on debt- to- asset ratio have been quantified in sample households taken from Andhra Pradesh of India. This was done taking the panel household approach of analyses. The debt ratio (total debt to asset ratio) of the households participating in MGNREGA has substantially reduced than that of their counter parts; this was established by average treatment effects (ATE) and using DID method of analysis.

MGNREGA participant households have been able to reduce their dependency on non-institutional sources of credit as reflected by their reduced Debt Ratio over the year. The informal sector charges higher interest charge (36-40% per annum), thus reduction on debt to asset ratio from non-institutional source is a substantial gain to the participants; also leading to their less dependency on the local landlord (i.e., social empowerment).

MGNREGA participation has led not only in reduction on short term debt and vulnerability but also contributed substantially in long term asset accumulation and human capital formation of the households. The study findings contribute on the national debates and discourse on impacts of MGNREGA on welfare of the participants. More disaggregated analysis (by households/members) on other welfare indicators may also provide better clarity on the differential impacts and implication of the program on improvement on household level wellbeing and the welfare.

MGNREGA has significantly contributed in reducing vulnerability caused by excessive farm borrowings, and thus improving welfare of the program participant households, who are usually less better off section of the rural communities.

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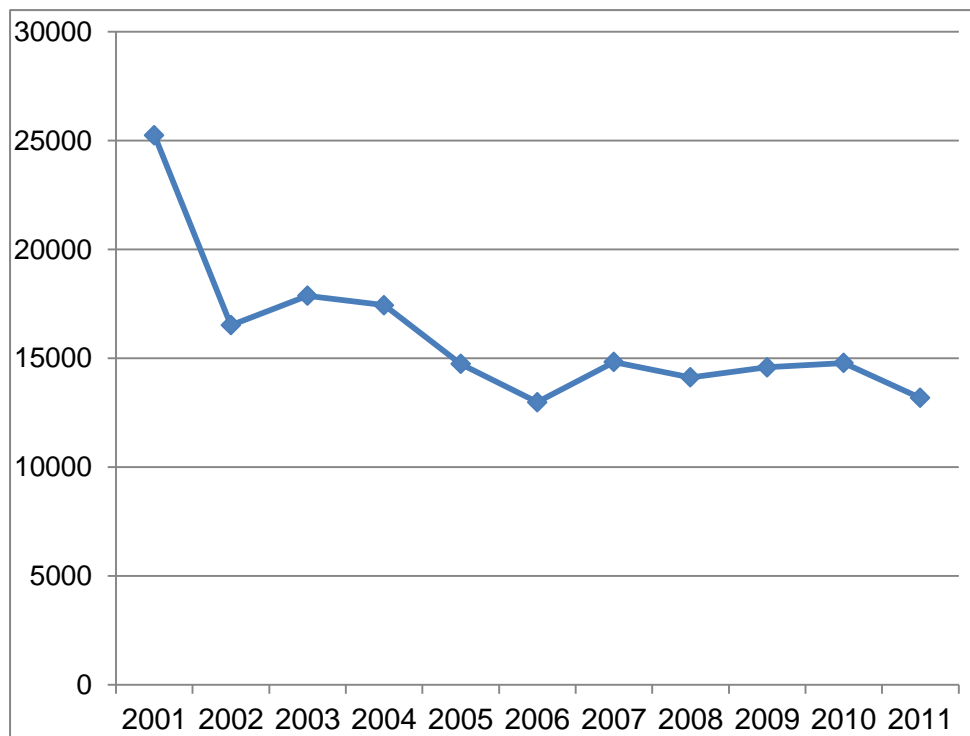
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7. Appendix

Table 12: Percentage of Borrowings

State	Group	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	All Years
Andhra Pradesh	**Formal**	**13.59**	**16.29**	**20.9**	**27.41**	**27.92**	**29.2**	**24.78**	**24.84**	**36.64**	**43.51**	**45.32**	**31.64**
	Commercial Banks	6.67	6.01	9.07	17.37	10.48	10.85	8.54	13.27	23.42	24.98	25.53	16.46
	Commission Agent/Traders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.52	0.13	0.01	0.11
	Co-operatives	3.42	3.63	8.27	5.45	14.67	11.14	9.71	3.16	6.09	6.50	8.59	7.46
	Financial Companies	3.50	5.87	3.25	4.52	2.77	3.63	2.36	2.50	0.83	3.60	4.19	3.18
	Self-help groups	0.00	0.78	0.31	0.07	0.00	3.58	4.17	5.91	6.30	8.43	7.01	4.43
	Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Post offices	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Informal	**86.42**	**83.7**	**79.09**	**72.59**	**72.09**	**70.81**	**75.23**	**75.16**	**63.36**	**56.49**	**54.68**	**68.34**
	Friends/Relatives	4.67	1.20	2.82	19.34	17.01	20.39	16.08	21.53	27.35	34.00	28.18	20.97
	Employer/Land lord	0.61	0.79	0.00	14.12	1.79	1.15	0.33	2.06	6.43	1.26	0.55	2.57
	Input dealer/Shopkeeper	0.00	0.00	0.00	0.18	0.36	0.09	0.38	3.06	3.05	2.03	0.96	1.23
	Money lenders	80.95	72.05	75.96	37.43	48.81	45.48	53.00	43.86	22.76	16.28	19.94	39.76
	Others	0.19	9.66	0.31	1.52	4.12	3.70	5.44	4.40	3.25	2.79	5.04	3.81
	Tenants	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Andhra Pradesh Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: VDSA (2014).

Impact of MGNREGA on Rural Credit Structure in Andhra Pradesh state of India: Household Level Panel Data Analysis from 2006-2012

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Figure 8: Average Amount Borrowed from 2001 to 2011 from different Sources of Credit in Andhra Pradesh

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[i] Rs. 1 crore of Indian system of counting is equivalent of 10 million Rs. Thus, India Rs. 700,000 crore is equivalent of USD 117 billion (with exchange rate of 1 USD = Rs. 60).

[ii] The short form of MGNREGS and MGNREGA has been interchangeably used in this paper. Both are to be interpreted as same meaning.

[iii] In the face uncertainty of full payment back from government, there is almost no new farming sector loan has been provided by the local bank for the last one year, to all those who has got date expired unpaid farm credit with the bank from the previous year of lending. Only 15% of the principal amount that came as credit waiving from the government, was released by the bank to the farmers with outstanding farm loan in the bank.