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Indebtedness in India- A Region Wise Analysis Leveraging Machine Learning

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Abstract:- The risk of indebtedness across region level is higher among the households having less human and physical assets and human resources. However, because of their better borrowing capacities, the extent of indebtedness among them is significantly higher than other segment of the rural society. The same is true about the households self-employed in various agricultural and non-agricultural activities in the rural areas. The region level analysis also rejects the contention that the higher consumptive expenditure of the rural people as a cause of their risk of indebtedness whereas the extent of indebtedness confirms that consumptive expenditure plays a major role in their indebtedness. Similarly, the hypothesis of agricultural prosperity and indebtedness going together lacks wider generalization for household located in all the regions except North-West states in Logistic regression and in North-Western, Eastern and Southern region in Tobit regression. Exposure of rural households to higher risk and uncertain situations like droughts, floods, crop failure due to pest attack pushes rural households deeper into debt.

I. INTRODUCTION

The problem of indebtedness continues to be serious and unrelenting amongst the farmers not only in developing countries but also in developed countries. The problem of indebtedness has also attracted the attention of researchers and policymakers and those who are concerned with the wellbeing of the people mainly because the mounting problem has led to unprecedented agrarian crisis compelling thousands of farmers to commit suicides in different parts of the country [GOI (2007)]. Further, the problem of debt is not sociological economic or political in isolation rather its roots are spread over all social, political or economic texture of the society. Darling (1925) quote that 'Indian peasant born in debt, lives in debt and dies in debt' in nineties. Inspite of huge development of agriculture, credit market, expansion of modernization and mechanization in agriculture, this quotation still holds true even after long decades. Since majority of farmers in India are living at the subsistence level with poor asset base, limited capacity to self-finance the process of modernization and development [Barry and Robinson (2001)]. They still rely heavily on borrowed capital to continue their processes. Besides modernization and mechanization of farming operations, farmers in India also rely heavily on debt capital to conduct marketing and production plans and even to smooth consumption during natural calamities and bad crop years. As a result, they have low agricultural income and poor repaying capacity which aggravates the debt problem.

India has a variety of states with different socio-economic and geographical backgrounds. For example, incidence of indebtedness (IOI)[2] during 2002 varies from 3.60 per cent in Jammu and Kashmir as compared with 42.30 per cent in Andhra Pradesh. Per household magnitude of indebtedness varies from Rs.600 in Assam to Rs. 23,580 in Punjab during 2002 at 1999-2000 constant prices [Singh (2008)]. Not only the incidence and magnitude of the problem differ considerably across states and regions, there are similar variations in term of household, demographic, economic and developmental factors that are identified as the determinants of indebtedness [Kaur (2012)]. For instance, the land productivity, which is found to be significantly associated with indebtedness, varies from as low as Rs.1,355 in Barmer district of Rajasthan to Rs.27,454, Kadagu district of Karnataka during 2003-06 at 1993 prices. Similarly, the level of literacy varies form 10 per cent in Khera district of Gujarat to 96 per cent in Kohlam district of Kerala. Therefore, it is an urgent need to study the nature and problem of indebtedness across various regions. Keeping in view, these wide inter-regional differences in the problem of indebtedness and the factors associated thereof, it will be interesting to examine the problem of indebtedness across different geographical region level in the country. For this purpose, we have grouped the states at the following five broad region levels:-

- **North-Western Region** – Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh, Delhi, Uttarakhand and Chandigarh
- **Eastern Region** – Bihar, Jharkhand, Orissa and West Bengal
- **Central Region** – Gujarat, Maharashtra, Madhya Pradesh, Chhattisgarh, Rajasthan, Daman & Dui and Dadra & Nagar Haveli
- **Southern Region** – Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Puducherry, Andaman & Nicobar Islands, Lakshwadeep and Goa
- **North-Eastern Region** – Assam, Manipur, Meghalaya, Sikkim, Mizoram, Nagaland, Tripura, and Arunachal Pradesh

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These regions are formed on the basis of geographical contiguity of the states. Infact, demarcation of regions on contiguity basis serves a useful purpose to control region wise idiocryanites like cropping pattern, agro-climatic conditions and socio-economic environment that happens to vary considerably across regions.

Therefore, the main aim of the present paper is to analyze the factors associated with debt in different regions.

The present paper has been divided into three different sections. Section I summarizes the review of literature, various factors affecting the household indebtedness are identified and their role in the problem of debt explained on the basis of theory and empirical evidence obtained from the previous studies. Section II describes the results of logistic and Tobit model and impact of various household and environmental factors on the risk of a household being indebted among the five broad region levels. Section III summarizes the main findings and conclusion of the present paper.

II. REVIEW OF LITERATURE

The problem of indebtedness has attracted the attention of various research scholars and policy-makers throughout the world. Research scholars from almost all the streams including Economics, Sociology, Political Science and Law, have extensively scanned the problem of indebtedness from their own perspective. Hence, a high rich and diverse literature has been generated which has covered the problem of indebtedness in a vast manner.

Many case studies have been conducted and analyze the issue of indebtedness into a limelight. **Darling (1925)** has estimated the problem of indebtedness and examined the various factors responsible for it. The author found that the debt and prosperity go walk and talk. Dealing with the factors of indebtedness, the author discovered that the problem of indebtedness had increased mainly due to the power of the moneylenders, the small size holdings, lack of irrigation facilities, litigation and fluctuations in the prices of farm products. **Moore (1953)** has examined the role of ceremonial expenditure as a main contributory cause to aggravate the problem of indebtedness among Indian peasants during 1927-1936. By conducting secondary survey and correlating data on actual cash expenditure and consumption of goods on ceremonial occasions, the author has concluded that the ceremonies play an important contributor to the problem of indebtedness among Indian peasants. The ceremonial expenditure plays major contributor of debt problem. **Mukerjee (1949)** has examined the nature and causes of indebtedness in the undivided state of West Bengal. Regarding the extent and burden of indebtedness, the author has concluded that although the volume of debt tends to rise with income but the debt per family bears heavy burden in case of small farm holders in contrast to the rich farmers. Comparing the 1943 and 1944 surveys, the author has concluded that the proportion of indebted families among the non-cultivating owners was lower than the cultivators in both the periods as cultivators owed both for productive as well as non-productive loans.

There are many other studies which examined and analyze the various determinants of indebtedness. **Singh (1993)** in his doctorate thesis (unpublished) has conducted primary survey of 450 weaker section households conducted by during the agricultural year 1990-91. The author has found that 67.56 per cent of the weaker sections in rural Punjab are under debt. There is a positive correlation between debt per household and productive regional level. However, the magnitude of indebtedness in absolute terms, the author has found that every weaker section of the rural society is indebted as the major part of debt is financed by the non-institutional sources, especially moneylenders. According to author, the main determinants of indebtedness are: - (1) The ratio of credit from non-institutional sources, (2) Income from subsidiary occupations and (3) Expenditure on unproductive purpose. **Hooda and Turan (1994)** have analyzed the pattern, magnitude and determinants of rural indebtedness among 2860 households in the state of Haryana. The authors have found that the magnitude of indebtedness (both in absolute and relative terms) is the highest among big farmers than the small farmers. The use of modern technology (mechanisation, irrigation, use of fertilizers) is the major dominant factor leading to the problem of rural indebtedness. The incidence of indebtedness is higher among the marginal farmers as compared to small farmers. The debt-asset ratio is also high in case of large farmers and the lowest in case of small farmers. **Singh and Mehrotra (1973)** have analyzed the magnitude and problem of indebtedness among the landless labourers and various different categories of farmers. By conducting survey in Ballia district of Uttar Pradesh, the author has discovered that as the size of holdings increases, the percentage of the households in debt is decreased and vice-versa. However, the size of debt per household increases with the increase in size of holdings. The author also found that marginal farmers and landless labourers were highly indebted households among the rural households. **Iyer and Manick (2000)** have examined the problem of indebtedness and suicides in rural Punjab. They disclose that the main reason for suicides was the extreme poverty and indebtedness. And the other main factors which the aggravated the problem of indebtedness were the crop loss, severe economic distress and the constant pressure by the lending agencies to pay off the loan. The ratio of committing suicides was higher among landless labourers and small and medium farmers than the cultivators with larger holdings**. Deshpande et. al (2001)** have analyzed the reasons for indebtedness among agricultural labourers from the depressed castes. The authors have observed that indebtedness among scheduled castes agricultural labourers is higher across all states in India even among West Bengal, Kerala, Haryana and Punjab in spite of using advanced technology and relatively better in implementing policy of land reforms. **Narayanamoorthy (2001)** has touched and examined the incidence and extent of indebtedness among the agricultural labour households. The author found that the incidence of indebtedness is high in agriculturally advanced states like Punjab and Haryana than the least developed

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states like Orissa, Assam, Maharashtra and Gujarat. By running regression analysis, the author has concluded that the incidence of indebtedness is higher in those states which are having high population of Scheduled caste labour households to agricultural labour households and gross irrigated area per agricultural labour household. **Sharma and Meher (2001)** have conducted a study to examine the problem of indebtedness among rural households in terms of major characteristics at an all India level in 1981 and 1991. By using and comparing the All-India Debt and Investment Survey 1981-82 and 1991-92 surveys, the authors have found that the average debt per household is higher in case of cultivator households in both the periods than the non-cultivator households. The authors have found that debt per household is inversely related with the incidence of poverty and positively associated with the agricultural labour productivity. Further, the proportion of households reporting cash loans has increased from 19.4 per cent to 23.4 per cent during 1981 to 1991. They have also concluded that the problem of indebtedness is higher among better-off states than backward ones. **Kumari (2005)** has examined the extent and identified the factors of rural indebtedness in the state of Andhra Pradesh. The author has found that there is a direct relationship between farm size and demand for credit. The author has found that the main reasons of non-repayment of loan were the crop failure, low yields, lack of irrigation facilities, low income, lack of technical knowledge and increasing biotic and aboitic constraints like pests and diseases, soil health problems and high input costs. **Narayanamoorthy and Kalamkar (2005)** have examined the trends and determinants of indebtedness of farmers' households across states by using NSSO report on Indebtedness of Farmer Households January-December, 2003 and All- India Debt and Investment Survey (AIDIS) 1991-92. By using regression analysis, the authors have concluded that the availability of credit per hectare of net sown area is the main determinant of problem of indebtedness. **Singh and Toor (2005)** have analyzed the socio-economic factors affecting the problem of indebtedness in the state of Punjab during the agricultural year 2002-03. The authors found that indebtedness is directly related with the family size, ratio of credit from non-institutional sources to institutional sources and expenditure on unproductive purposes and negatively related to farm size among the small, marginal and semi-medium farmers. Large unproductive expenditure on family maintenance and social ceremonies in the families is the main cause of the problem of indebtedness among the small and marginal farmers. However, the coefficients of income from subsidiary occupation, unproductive expenditure and farm size were statistically significant among the large farmers.

A few studies quoted that the problem of indebtedness arises due to the policies and programmes adopted in India in the event of liberalisation and globalisation in Indian economy [Mohanakumar and Sharma (2006), Mishra (2007), Jeromi (2007), GOI (2007)]. Mishra (2007) observed that profitability of the farmers has declined due to dumping in the global market by the U.S., low import tariff to India and failure of the Monopoly Cotton Procurement Scheme in Maharashtra. The other factors were – the declining public investment in agriculture, poor government agricultural extension service and declining role of formal institutions in the rural financial markets. Resultantly, farmers depended more on the input dealer for advice and supply of inputs and on non-institutional agencies for credit. In econometric analysis, the author found that the suicide risk was higher among households having higher outstanding debt, lower ownership of bullocks and liquid assets, access to basic amenities, large family size and lower value of produce. The author concluded that both micro and macro socio-economic factors are responsible for agrarian crisis in Maharashtra. Mohanakumar and Sharma (2006) have assessed the reasons of agrarian crisis and indebtedness, the authors have pointed out that the main reason of agrarian distress in Kerala is the neo liberal regime implemented in the country and concentration on input-oriented crops such as coffee and pepper. As a result, the worst affected are small farmers as they are more vulnerable to crop losses and price fall. Jeromi (2007) has identified various reasons and extent of farm indebtedness and farm crisis in the state of Kerala from 1970-71 to 2005-06. The author has found that the major reasons of agrarian crisis and indebtedness were trade liberalization, deficient rainfall, huge concentration on export oriented crops, fall in prices, decline in production and productivity.

➢ *Hypotheses*

- *Household Demographic Variables*

We assume that there is a strong relationship between demographic characteristics of the household and indebtedness. We hypothesize that the indebtedness is directly related with household size due to risings dependency burden. After certain stage, the dependency burden starts moving downwards, with increasing household size which involves the risk of indebtedness. But at later stage, dependency burden again increases with the household size in order to settle their arrange marriages/ (giving dowry to girl child) which further increases risk of indebtedness. In other words, we hypothesize that there is a U type relationship between household size and the risk of sinking into the debt. Females are at disadvantageous position in society as major of empirical literature reveals that the females have low earnings of females than the male ones [Jose (1988)]. Due to the imperfect information and low social networking of females of various economic opportunities and male dominated society are the major constraints which decreases the chances of grasping the emerging opportunities among women. As a result, females are more vulnerable to low earnings and high risk of indebtedness.

- *Physical Assets Variables*

We hypothesize that the there is a direct relationship between risk of indebtedness and the size of land ownership in the rural households. But this does not mean that large size of land owners is at more risk of indebtedness. However, the problem of severity may be other way round. So, the problem of indebtedness is more among the small land holders.

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The size of land measures the capacity of borrowings and therefore, we hypothesize that the risk of indebtedness increases with the increased area under assured irrigation.

- *Machine Ownership Variables*

Tractor and tube wells are good symbols to measure the level of mechanization in agriculture. The ownership of these machines pushes the people into risk of indebtedness but contrarily, these machines help them to generate good returns from land resources. So, we assume that risk of indebtedness is less likelihood among the large households having tractors and tube wells. Further, we also hypothesize that the number of livestock and draft animals is also important variables to determine the risk of indebtedness. Those having large number of livestock and draft animals are less likelihood to the chances of indebtedness.

- *Employment Status Variables*

A family having large workers (means having more working hands in a family) increases the chances of diversification of productive activities. Further, even in same and single profession, availability of more family labour increases the chances of division of labour. So, we hypothesize that as farmers having large workers reduces the chances of risk of indebtedness.

- *Education Variables*

Education plays a very important role in the risk of indebtedness. Higher education increases the productive capacity and help in getting highly paid jobs [Nguyen (2007)] in the labour market. But in labour market, it helps the chances of improving their knowledge and skills, assess the market knowledge and better financial management of household and business accounts and more knowledge how to sell the crops in mandis and new and existing government schemes. So we hypothesize that there is an inverse relationship between educated farmer households and the chances of indebtedness among the rural household.

- *Employment Status Variables*

We have created three dummy variables indicating the employment status of the households. The first dummy takes the value of 1 if the household is cultivator and 0 otherwise. The second dummy takes the value of 1 if the household is non-cultivator and 0 otherwise. And the third dummy takes the value of 1 it the household is agricultural labourer and 0 otherwise.

We hypothesize that the problem of indebtedness, other things being equal, is likely to be more among cultivators rather than among non-cultivators and labour households.

- *Access to Institutional Credit and Unproductive Purpose Variables*

We expect that the chances of getting involved in the risk of indebtedness is more households having less access to institutional credit and more on those who spent more on unproductive and litigation uses of fund.

- *Agricultural Productivity Variable*

We also assume that there is a direct relationship between extent of indebtedness and among the people living in prosperous agriculturally regions.

- *Risk Variable*

We hypothesize that the problem of indebtedness is more among who lives in ecologically fragile regions and facing high risks and uncertainties.

III. DATA AND METHODOLOGY

A. Data

To conduct our present study, we have used data pertaining to 91,192 rural households in All-India Rural Debt and Investment Survey (AIDIS) conducted by the National Sample Survey Organization (NSSO) during the 59th NSS round. We have covered both the visits covering Indebtedness and borrowing and repayment date to conduct the study in the present paper. Indebtedness for our present purpose is any amount outstanding due to any institutional or non-institutional agency as on 30.6.2003. We have substantiated the household level data with additional information on the environment factors which plays a crucial role to measure the indebtedness like level of agricultural development, institutional credit and risk and uncertainty in the districts where households are located. District wise information on these probable determinants of debt was taken from Singh (2007).

B. Methodology

To study the problem of indebtedness among rural households, we have chosen two different methods-

In the first method, we have identified various factors which forces many households to be indebted. To conduct the qualitative response mode, we have used the Linear Probability Model [Madalla (1983)]. Under it, the choice falls either on Logit or Probit Model. Though both these models provide the similar results, the Logit Model is generally preferred by the various research scholars. So, for the present paper, we have also used Bivariate Logit model. We have examined it by applying Logistic regression in PASW statistics 18.0 version.

In the second method, we have used Tobit Model to study the quantum of indebtedness by the rural household. The Quantum of indebtedness is defined as any amount outstanding as on 30.6.2003. We have examined the quantum of indebtedness by applying Tobit regression in STATA software.

The description of the Logit and Tobit Models are given in the below:

- Logit Model: In the Logit model[1], the probability of the i-th household being a borrower is given by:

$$P_i = P(Y_i = 1) = F(X_i\beta) = e^{(Xi\beta)} / 1 + e^{(Xi\beta)} = 1/1 + e^{-(Xi\beta)}$$

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On a little simplification, this specification leads to the following form of the Logit Model:-

$$\text{Log}\ [\ (P_i / 1 - P_i)] = X_i \beta$$

Where
P_i = Probability of the i-th household to borrow
X_i = Set of independent variables
β = Coefficient matrix

In our sample, we have assigned the two values of $P_i = 0$ for non-borrowers and = 1 for borrower households. The model is estimated by Maximum Likelihood Method using PASW statistics 18.0 version

[1]Although most of the properties of a logit model also hold for a probit model, the theoretical justification for employing the probit model is generally limited, while the logit specification is theoretically more appealing (Pindyck and Rubinfeld, pp. 245-47). Furthermore, the properties of the estimation procedure of the logistic function (which results in a logit model) are more desirable than those associated with the choice of a normal probability distribution, which results in a probit model (Rubinfield, p. 32). For further details, see Amemiya, Berkson, and Chambers and Cox.

- Tobit Model: The Tobit is one of the broad classes of models that have both discrete and continuous outcome. In this model, instead of observing merely the decision to borrow, one also deals with the actual amount of the borrowings. The Tobit model is given by the following:

$$yi = \begin{Bmatrix} yi^* \\ \\ 0 \end{Bmatrix} \ if\ yi^*>0$$

If yi<0*

Where
$y^*_i = X_i \beta + \epsilon_i$
$\epsilon_i \sim N(0, \sigma^2)$

This model is also called a Censored Regression Model because it is possible to view the problem, where observations of y^* at or below zero are censored [Johnston and Dinardo(1997)].

Since we are studying the determinants of two different aspects of indebtedness, that's why we have followed the two different methods. To examine the probability of indebtedness on our sampled households we are using Logit Model and to examine the quantum of indebtedness, we are using Tobit Model.

Table 1: List and Description of Variables Included in Logistic and Tobit Regression: Debt Analysis

Sr. No	Label	Description and definition	Units of Measurement	Data Source
(A) Demographic and Social Variables				
1	Household Size	Number of members in the household	Number	NSSO 2002
2	Household Size Square	Household size square	Number	NSSO 2002
3	Scheduled castes	Dummy for the scheduled caste households	Dummy	NSSO 2002
4	Scheduled tribes	Dummy for the scheduled tribe households	Dummy	NSSO 2002
5	Other Backward Classes	Dummy for other backward class households	Dummy	NSSO 2002
6	Sex	Dummy for the female headed households	Dummy	NSSO 2002
(B) Economic Variables				
I Physical Assets				
7	Land	Total area of land owned by the household	Hectares	NSSO 2002
8	Irrigation	Proportion of irrigated area	Hectares	NSSO 2002
	Machine Ownership			
10	Tractor	Number of tractors owned by the household	Number	NSSO 2002
11	Pump set	Number of pump sets owned by the household	Number	NSSO 2002
	Livestock Ownership			
12	Milch	Number of milch animals owned by the household	Number	NSSO 2002
13	Draft	Number of draft animals owned by the household	Number	NSSO 2002
II Human Capital				
14	Workers	Total number of workers in the household	Number	NSSO 2002
15	Secondary	Dummy for household having heads with Primary to secondary level of education	Dummy	NSSO 2002
16	Higher Education	Dummy for the households having head, above secondary level of education	Dummy	NSSO 2002
III Employment Status				
17	Cultivators	Dummy for the households Self-employed in agriculture	Dummy	NSSO 2002

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18	Self employed in non-agriculture	Dummy for the households Self-employed in non-agriculture	Dummy	NSSO 2002
19	Labourers	Dummy for the households working as labourers	Dummy	NSSO 2002
IV Access to and utilization of credit				
20	Rate of interest	Rate of interest paid by the household	Percentage/per annum	NSSO 2002
21	Institutional Credit	Outstanding institutional (Co-operatives, Commercial Bank and regional rural bank) credit per hectare net sown in the district	Rs./hectare	Singh (2008)
22	Consumptive expenditure	Dummy for households borrowing for durable and non-durable consumer goods and services, marriages and other social ceremonies	Dummy	NSSO 2002
(C) Development Variables				
23	Agricultural development	Value output per unit net sown area in the district where household is located	Rs./hectare	Singh (2008)
(D) Risk Variable				
24	Value loss	Value loss by natural calamities	Rupees	NSSO 2002

Table 2: Determinants of a Household Indebtedness among Various Regions: Logistic Regression.

Sr No.	Variable Description	North-Western	Eastern	Central	Southern	North-Eastern
(A) Demographic and Social Variables						
1	Household size	-0.199*	-0.158*	-0.182*	-0.317*	-0.207*
		(0.020)	(0.021)	(0.020)	(0.032)	(0.052)
2	Household size square	0.008*	0.006	0.009*	0.017*	0.007***
		(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
3	Age	-0.048*	-0.094*	-0.058*	-0.064*	-0.039**
		(0.008)	(0.009)	(0.009)	(0.011)	(0.017)
4	Age Square	$0.473x10^{-3}$*	$0.886x10^{-3}$*	$0.509x10^{-3}$*	$0.692x10^{-3}$*	$0.320x10^{-3}$***
		$(0.838x10^{-4})$	$(0.957x10^{-4})$	$(0.849x10^{-4})$	$(0.105x10^{-3})$	$(0.167x10^{-3})$
5	Scheduled castes	-0.148**	-0.095	0.016	0.050	-0.186
		(0.059)	(0.060)	(0.066)	(0.078)	(0.129)
6	Scheduled tribes	0.197	-0.032	0.001	0.313***	-0.021
		(0.173)	(0.082)	(0.063)	(0.116)	(0.117)
7	Other backward classes	0.194*	-0.056	0.074	0.001	0.091
		(0.053)	(0.059)	(0.049)	(0.062)	(0.104)
8	Islam	0.377*	-0.063	0.062	0.345*	-0.293*
		(0.071)	(0.063)	(0.095)	(0.100)	(0.113)
9	Christian	-0.596	-0.388**	0.657***	0.206***	-0.116
		(0.496)	(0.178)	(0.330)	(0.113)	(0.133)
10	Other Minor Religions	0.005	0.162	-0.025	-0.667	0.414**
		(0.119)	(28.316)	(0.114)	(0.799)	(0.193)
11	Sex	0.805*	0.709*	0.729*	0.550*	0.142
		(0.089)	(0.090)	(0.087)	(0.075)	(0.126)
(B) Economic Variables						
I Physical Assets						
12	Land	-0.052*	-0.073**	-0.074*	-0.093*	-0.178*
		(0.020)	(0.030)	(0.009)	(0.022)	(0.029)
13	Irrigation	-0.001**	$-0.830x10^{-3}$**	-0.003*	-0.003*	-0.006*
		$(0.480x10^{-3})$	$(0.418x10^{-3})$	$(0.490x10^{-3})$	$(0.610x10^{-3})$	$(0.100x10^{-2})$
	(i) Machine Ownership					
14	Tractor	-0.731*	-0.675*	-0.536*	-0.343	-1.600**
		(0.089)	(0.188)	(0.107)	(0.261)	(0.621)
15	Pump set	-0.285*	-0.500*	-0.195*	-0.422*	-0.463**
		(0.048)	(0.071)	(0.041)	(0.060)	(0.218)
	(ii) Livestock Ownership					
16	Milch animals	-0.024	-0.056***	-0.016	-0.156*	-0.063
		(0.023)	(0.034)	(0.021)	(0.034)	(0.050)
17	Draft animals	-0.005	0.001	-0.101*	0.010	-0.015

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		(0.027)	(0.025)	(0.021)	(0.036)	(0.034)
II Human Capital						
18	Workers	-0.059**	-0.037	-0.065*	-0.115*	0.025
		(0.023)	(0.024)	(0.018)	(0.027)	(0.037)
19	Secondary	-0.210*	-0.262*	-0.301*	-0.240*	-0.295*
		(0.048)	(0.047)	(0.044)	(0.056)	(0.075)
20	Higher Education	-0.020	-0.276*	-0.162**	-0.206*	-0.445*
		(0.059)	(0.065)	(0.063)	(0.076)	(0.114)
III Employment status						
21	Cultivators	-0.896*	-1.191*	-1.025*	-1.470*	0.962*
		(0.088)	(0.099)	(0.090)	(0.104)	(0.138)
22	Self-employed in non-agriculture	-0.887*	-1.164*	-1.075*	-1.352*	-1.493*
		(0.090)	(0.099)	(0.093)	(0.105)	(0.130)
23	Labourers	-0.315*	-0.539*	-0.493*	-0.440*	0.354**
		(0.093)	(0.099)	(0.089)	(0.102)	(0.145)
IV Access to and utilization of credit						
24	Rate of interest	0.064*	0.134*	0.157*	0.110*	0.165*
		(0.002)	(0.003)	(0.003)	(0.002)	(0.006)
24	Institutional credit	0.060*	0.040*	0.028*	0.01**	-0.001
		(0.009)	(0.011)	(0.010)	($0.43x10^{-2}$)	(0.028)
25	Consumptive Expenditure	32.660	22.593	22.257	22.703	10.314*
		(670.687)	(617.278)	(621.373)	(487.671)	(1.003)
26	Litigation	22.048	22.352	22.162	22.516	22.744
		(6756.840)	(6917.520)	(8389.411)	(12184.150)	(6523.766)
(C) Developmental Variable						
27	Agricultural development	$0.126x10^{-4}$*	$-0.120x10^{-4*}$	$0.364x10^{-5}$	$0.170x10^{-5}$	$0.977x10^{-6}$
		($0.298x10^{-5}$)	($0.270x10^{-5}$)	($0.295x10^{-5}$)	($0.230x10^{-5}$)	($0.487x10^{-5}$)
(D) Infrastructural Variables						
28	Market density	-0.221*	-0.409*	-0.307*	-0.234**	-0.610*
		(0.073)	(0.064)	(0.061)	(0.092)	(0.093)
29	Road density	16.730*	87.364*	26.833*	-2.460	1.898*
		(4.821)	(12.526)	(4.276)	(4.231)	(0.636)
30	Electrification	0.001	$0.60x10^{-3}$	-0.005*	0.006**	-0.014*
		(0.002)	(0.001)	(0.002)	(0.003)	(0.003)
(E) Risk Variables						
31	Risk	$0.300x10^{-4**}$	$-0.200x10^{-4}$	$0.402x10^{-4**}$	$0.160x10^{-4}$	$0.100X10^{-4**}$
		($0.130x10^{-4}$)	($0.194x10^{-4}$)	($0.161x10^{-4}$)	($0.205x10^{-4}$)	($0.418x10^{-4}$)
	Constant	-106.522	-85.231	-88.403	-93.196	-72.131
	Diagnostic Tests					
	-2 Log likelihood ratio	15596.000	16067.900	17548.263	12171.434	6412.951
	Nagelkerke R Square	0.611	0.582	0.504	0.710	0.751
	P.P.C.	80.7	79.2	75.0	84.2	89.8
	No. of Observations	20291	19791	19268	19696	12146
SourceNote:	Same as Table 1.					
	1. Asterisks *,**&*** indicate that the value are significant at 1, 5 and 10 per cent respectively.					
	2. State dummies are included but not reported because of taking too much space.					
	3. Figures in parenthesis are standard errors.					

IV. RESULTS AND DISCUSSION

Results of the region-wise estimate of the Logistic model are detailed in Table 2. It reveals that among the demographic factors, the U-type relationship of household size and age with the risk of indebtedness is validated by the region-wise estimates. Also, stands confirmed is the higher risk of indebtedness among the female-headed households by the region-wise estimate with an only exception of North-Eastern region where the risk of indebtedness is not significantly related with the gender of the household head. This seems to indicate that the gender of the household head does not matter much as determinant of household indebtedness in the North-Eastern region. Further, no definite conclusion can be drawn regarding the role of caste and religious background of the households. The sign, significance and magnitude of the caste and religion variables vary considerably across regions. For example, the result brings out significantly low risk of indebtedness among the Scheduled castes households for the households located in the North-Western region of the country. For rest of the four regions, the co-efficient of the scheduled castes

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dummy is turned out not to be statistically significant. The overall finding of the low caste status as determinant of household indebtedness is more rejected than being confirmed at the region level. Like the impact of caste background, the religious background of the household has no unique relationship with indebtedness of rural households across different geographical regions. For example, higher risk of indebtedness among Muslim households is valid only for North-West and Southern India whereas the co-efficient of Islam dummy turned out to be not significant statistically for the households in the Eastern and Central regions. On the other hand, the probability of indebtedness turned out to be significantly low among the Muslim households located in North-Eastern region. Compared with rest, the risk of indebtedness is high among Christian household located in Central and Southern regions, low among these located in Eastern region but not differ significantly among the households located in the Eastern and North-Western region. Therefore, region-wise results suggest that the role of caste and religious backgrounds of the household is not significantly associated with the risk of their indebtedness. At the most, caste and the religion have some impacted on the indebtedness of households located in North-Western and Southern region. Concentration of some social groups in some regions seems to be responsible for our results. Once regional impacts are controlled caste/religion ceased to play any significant role as determinant of indebtedness. With a few exceptions, the results show that the physical assets (land ownership, irrigation status of land owned), ownership of machinery (tractors and pump-sets), human capital resources (number of workers in the family and their education status) and occupation on the household indebtedness reduced the problem of indebtedness across various regions. However, no definite conclusion can be drawn regarding the impact of the livestock ownership of a household on its indebtedness. On the whole, with an exception of livestock, increasing level of physical assets and human resource endowments significantly reduced the risk of indebtedness among the rural households in India. Region-wise results also show that the high rate of interest aggravates the problem of indebtedness. However, the magnitude of the impact of interest rate on risk of indebtedness varies considerably across regions (from 0.064 for the North-Western to 0.165 for the North-Eastern region households). The region-wise analysis suggests that the increasing access to institutional credit increases the risk of indebtedness among the rural households. The only exception in this context, are the rural households in the North-Eastern region. The role of consumptive expenditure in aggravating the problem of rural indebtedness is not confirmed by the region-wise results presented in Table 2. The co-efficient of consumptive expenditure variable turned out to be insignificant statistically in four of the five regions with an only exception of households in North-Eastern region. The results seem to reject the wide perception of consumptive expenditure of the nature of rural households as an important factor for the problem of rural indebtedness in the country. Similarly, our hypothesis of higher expenditure on litigation as determinant of household indebtedness is also rejected by the region-wise analysis, as its coefficient is not significant statistically for households in all five regions.

Interestingly, no definite conclusion can be drawn from region level results regarding the role of agricultural development on household indebtedness. The validity of prosperity indebtedness hypothesis is valid only for the households in the North-Western states. The results for the household in Eastern region are other way round whereby the negative and significant coefficient of agricultural development indicate the lower risk of indebtedness among households located in agriculturally developed region. Unlike these two regions, agriculturally development is found to be playing no significant role in the risk of indebtedness as the coefficient of agricultural development turned out not significant statistically for the households in Central, Southern and North-Eastern regions. So about a century old finding by Darling that indebtedness and prosperity go together is valid only for the households in the North-Western states. Interestingly, the study of Darling is based on the field level evidence from the old Punjab that formed a significant part of the North-Western region in the study. For households in rest of the country, the prosperity-indebtedness association stands rejected than confirmed. The role of market, road density and electrification as determinant of household observed seems to be confirmed that these factors reduced the problem of indebtedness rather than rejected in the region-wise analysis reported in Table 2.

The impact of loss suffered by the households on its risk of being indebted is also confirmed by region level analysis. The only exception in this context is the result for household in Eastern region whereby the co-efficient turned out not significant statistically. Interestingly, the risk associated with adverse weather and climate conditions on indebtedness in the Eastern region is not significant statistically even though many districts in Bihar and Orissa are highly prone to floods every year. It seems that both formal and informal credit institutions may not be very active in such highly flood prone areas, resulting in low access and hence low indebtedness among such households. However, such an assertion needs to be confirmed with more field level information from the households located in such highly flood prone areas.

Further, to test our hypothesis regional level, we have repeated the exercise to verify the validity of results by taking quantum of indebtedness as dependent variable. Results of Tobit regression model in this context is given in Table 3. It may be mentioned that the polynomial variable of household size square is not included because of a serious problem of multicollinearity posed by inclusion in the Tobit regression. The region level results of the Tobit analysis provided in Table 3 brings out that extent of indebtedness, other things being same, is not same for a particular social group in all the regions. For example, the extent of indebtedness is significantly higher among the scheduled caste households in North-Western, Eastern and North-Eastern region whereas there is no significant difference in the extent of indebtedness in the scheduled caste and rest of the households in Central and Southern regions. Similarly,

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while the indebtedness is more among Muslim households at the country level whereas it is low among the Muslim households in the.

Table 3: Determinants of a Household Indebtedness among Various Regions: Tobit Regression

Sr. No.	Variables (in log form)	North-Western	Eastern	Central	Southern	North-Eastern
(A) Demographic and Social Variables						
1	Household size	2.061*	1.509*	1.492*	2.137*	2.239*
		(0.157)	(0.158)	(0.160)	(0.1360	(0.230)
2	Age	0.416***	1.384*	1.356*	-1.189*	1.725*
		(0.247)	(0.245)	(0.246)	(0.205)	(0.379)
3	Scheduled castes	0.261*	0.163***	0.017	-0.089	0.288***
		(0.093)	(0.094)	(0.105)	(0.084)	(0.171)
4	Scheduled tribes	-0.471***	-0.274**	-0.300*	-0.475*	-0.445*
		(0.264)	(0.130)	(0.104)	(0.132)	(0.144)
5	Other backward classes	-0.252*	0.127**	-0.143***	0.060	0.108
		(0.083)	(0.089)	(0.080)	(0.068)	(0.126)
6	Islam	-0.505*	0.044	0.013	-0.092	0.666*
		(0.108)	(0.096)	(0.153)	(0.099)	(0.142)
7	Christian	0.505	0.460	0.972***	-0.254**	0.122
		(0.628)	(0.310)	(0.512)	(0.112)	(0.146)
8	Other Minor Religions	-0.293**	1.765	0.287	1.300	-1.043*
		(0.131)	(2.616)	(0.190)	(1.108)	(0.214)
9	Sex	-0.683*	-0.705*	-0.957*	-0.451*	-0.078
		(0.117)	(0.120)	(0.129)	(0.074)	(0.145)
(B) Economic Variables						
I Physical Assets						
10	Land	1.107*	0.834*	1.077*	1.080*	1.036*
		(0.111)	(0.110)	(0.071)	(0.075)	(0.128)
11	Irrigation	0.006	0.112*	$-0.456x10^{-3}$	0.145*	0.130*
		(0.030)	(0.027)	(0.027)	(0.025)	(0.039)
	(i) Machine Ownership					
12	Tractor	1.579*	1.315*	1.070*	0.886*	2.542*
		(0.149)	(0.298)	(0.173)	(0.301)	(0.803)
13	Pump set	0.482*	0.646*	0.923*	0.652*	1.063*
		(0.095)	(0.123)	(0.087)	(0.083)	(0.356)
	(ii) Livestock Ownership					
14	Milch animals	-0.109***	0.069	-0.008	0.384*	-0.025
		(0.063)	(0.073)	(0.062)	(0.063)	(0.102)
15	Draft animals	-0.049	0.012	0.012	-0.124	0.053
		(0.075)	(0.070)	(0.060)	(0.075)	(0.091)
II Human Capital						
16	Workers	0.369*	0.378*	0.716*	0.868*	0.043
		(0.127)	(0.128)	(0.130)	(0.099)	(0.174)
17	Secondary	0.370*	0.370*	0.543*	0.301*	0.563*
		(0.077)	(0.075)	(0.072)	(0.061)	(0.096)
18	Higher Education	-0.094	0.313*	0.486*	0.341*	1.105*
		(0.097)	(0.104)	(0.101)	(0.085)	(0.139)
III Employment status						
19	Cultivators	0.857*	0.708*	0.651*	0.841*	0.071
		(0.123)	(0.137)	(0.133)	(0.109)	(0.145)
20	Self-employed in non-agriculture	1.118*	0.904*	1.302*	0.933*	1.208*
		(0.130)	(0.139)	(0.141)	(0.110)	(0.152)
21	Labourers	0.464*	0.233***	0.365*	0.046	0.123
		(0.127)	(0.135)	(0.129)	(0.099)	(0.155)
IV Access to and utilization of credit						
22	Rate of interest	1.911*	1.994*	2.246*	2.047*	2.010*
		(0.024)	(0.021)	(0.022)	(0.020)	(0.032)
23	Institutional credit	0.334***	-0.600*	-0.305*	-0.095	0.140
		(0.195)	(0.132)	(0.102)	(0.132)	(0.149)

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24	Consumptive Expenditure	5.803*	5.139*	5.219*	4.909*	6.245*
		0.075	0.074	0.074	0.056	(0.101)
25	Litigation	5.458*	5.031*	5.235*	4.809*	5.451*
		(0.657)	(0.666)	(0.810)	(0.991)	(0.625)
(C) Developmental Variable						
26	Agricultural development	1.152*	0.374***	0.142	0.630*	0.160
		(0.316)	(0.226)	(0.190)	(0.158)	(0.377)
(D) Infrastructural Variables						
27	Market density	0.112	0.256*	0.438*	0.332*	-0.298***
		(0.115)	0.095	0.087	0.116	0.174
28	Road density	-4.411*	-11.591*	0.190	-1.722*	-0.442***
		(1.323)	4.350	1.303	0.632	0.242
29	Electrification	0.134	0.556*	1.074*	-0.617**	-0.047
		(0.187)	(0.133)	(0.231)	(0.286)	(0.228)
(E) Risk and Uncertainty Variables						
30	Risk	0.178*	0.207*	0.193*	-0.048	-0.118
		(0.049)	(0.073)	(0.052)	(0.087)	(0.083)
	Constant	-2.320	-6.303	4.942	7.787	6.676
	Diagnostic Tests					
	Log likelihood	-31948.307	-32187.359	-33179.036	-33629.828	-16088.529
	LR chi2	8046.980	6079.280	6569.860	10318.450	5377.130
	Psuedo R2	0.112	0.086	0.090	0.133	0.143
	No. of Observations	20291	19791	19268	19696	12146
Source	Same as Table 5.2					
Note:	1. Asterisks *,**&*** indicate that the value are significant at 1, 5 and 10 per cent respectively.					
	2. Figures in parenthesis are standard errors.					

North-Western region, higher in North-Eastern region and no significant difference among the Muslim and other households located in Eastern, Central and Southern regions. Same is more or less true about other social groups with only an exception of a significant low quantum of indebtedness among the scheduled tribes living everywhere in the country. A significant deviation is the impact of social background is not unique to the problem of indebtedness but it is evident in almost the socio-economic phenomena. For example, extent of relative poverty among Muslims, Christians, tribals is not same everywhere. Somewhere, they are the most deprived section whereas in some other states, they are the least deprived sections [Bhattacharaya and Pal (1986)]. The findings suggest that caste and religious background for the households as criteria of all affirmative actions has no uniform validity for all the regions. Relative indebtedness among various social groups seems to be confounded by many other factors that are not included in our analysis. Probably a further probe is required to fully establish the role of social background of the people in explaining the comparative indebtedness among them. Our secondary data however, is inadequate to carry out this exercise.

The agricultural prosperity-indebtedness relationship positive relationship is true only for the households in North-Western, Eastern and Southern regions. The relationship is not significant for the households in the states of Central and North-Eastern regions. It may be pointed that Central and North-Eastern region are on bottom of the agricultural development ladder. This seems to indicate that the Darling's thesis indebtedness and prosperity go together is valid only for the regions/states that have already attained a particular threshold level of development. Besides agricultural development, infrastructural variable also shows minor variations across regions. It is quite possible that the quality of rural infrastructural services may vary considerably across regions that may be responsible for observed minor variations of their impact on household indebtedness.

The most interesting part is the consistency of the impact of various economic factors of the rural households living in different regions of the country. The risk of indebtedness across region level is comparatively higher among the households having low level of human and physical assets (land, machinery etc.) and human resources (workers and education). This higher risk and low extent of indebtedness across regions and vice versa among the resource poor households is further corroborated by the low risk and high extent of indebtedness among the households having self-employed in agricultural and non-agricultural occupations in the country. The observations seem to suggest that economic characteristics of the households play more decisive and consistent role in explaining variations in extent of indebtedness among the rural households in the country. The impact of demographic, social and infrastructural factors shows no consistent pattern across all the regions.

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V. SUMMARY

To recapitulate, the empirical analysis of household level indebtedness suggests that the indebtedness is a complicated problem as both household level and macro level factors contributes the problem of rural indebtedness at major. The regional level study conclude that the risk of indebtedness is more associated with the households having large assets and having more workers and education. across region. This higher risk and low extent of indebtedness across regions and vice versa among the resource poor households is further corroborated by the low risk and high extent of indebtedness among the households having self-employed in agricultural and non-agricultural occupations in the country. These two occupational groups are on top of the asset and income distribution ladders in rural India.

The region level incidence of indebtedness results rejects the wider relevance of the role of caste and religion background of the households as determinant of indebtedness. Contrarily, the extent of indebtedness is higher among the scheduled castes households and lower in the households belong to the scheduled tribes and other backward classes. The region level analysis also rejects the contention that the higher consumptive expenditure of the rural people as a cause of their risk of indebtedness whereas the extent of indebtedness confirms that consumptive expenditure plays a major role in their indebtedness. Similarly, the hypothesis of agricultural prosperity and indebtedness going together lacks wider generalization for household located in all the regions except North-West states in Logistic regression and in North-Western, Eastern and Southern region in Tobit regression.

Besides the physical and human resources, cost, source and purpose of borrowing also play a crucial role in aggravating the problem of indebtedness. Borrowing of credit at higher cost (rate of interest) increases the probability of household indebtedness and pushes them deeper into the debt. Since the rate of interest charged by the rural financial institutions is regulated and fixed by the Central Bank under priority sector lending scheme, the findings seem to validate the general impression of usurious lending practices of the moneylenders aggravating the problem of indebtedness in rural India. Contrary to the general belief, both the risk and extent of indebtedness, are more in the regions having better presence of rural financial institutions – co-operative, commercial as well as regional rural banks. Though both the probability and extent of borrowing and repayments are higher in the households living in better financial institution endowed regions, a higher indebtedness in such regions may be due to the fact that financial institutions extend both short and long term loans whereas moneylenders and other informal sources supply loans only on a short term basis. Exposure of rural households to higher risk and uncertain situations like droughts, floods, crop failure due to pest attack pushes rural households deeper into debt. Such adverse conditions augment the problem by seriously undermining the repaying capacities due to loss of earnings due to such adverse situations.

Besides economic factors, the impact of demographic, social and infrastructural factors show no consistent pattern across all the regions.

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