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**COVARIATE AND IDIOSYNCRATIC
SHOCKS AND COPING STRATEGIES FOR
POOR AND NON-POOR RURAL
HOUSEHOLDS IN INDIA**

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Abstract

A probit analysis estimates the relationship between different shocks and their corresponding choices of coping actions for poor and non-poor rural households using data set from Additional Rural Incomes Survey/Rural Economic and Demographic Survey (ARIS/REDS) surveys of National Council of Applied Economic Research (NCAER) from rural India across 17 states. Both poor and non-poor households experience the covariate and idiosyncratic shocks and they adopt coping strategies differently. Remittance from relatives, public support programs, reallocating households' resources, borrowing from formal and informal sources, withdrawing savings and selling assets are the dominant strategies. Extremely poor starve to manage distress of sudden shocks. Welfare programs organized by local Govt. fail to control poor from starve during idiosyncratic shocks. Households' education plays significant role in opting appropriate coping strategies depending on the nature of shocks. Repeated sequence of same kind of shocks brings out the scope of chronic poverty and vulnerability.

Keywords: *Rural Households, Shocks, Coping Strategies, Poverty, Probit Model*

JEL Codes: *D10, D81, I30*

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INTRODUCTION

Households in developing countries often fight against a number of risks which upsets their income flows and consumption flows and eventually causes significant sudden welfare loss. Specifically, rural households are more vulnerable to diverse risks and shocks and their income fluctuate widely since the majority makes living from agriculture and small scale industries which get affected by climate change as well as by frequent fluctuations of prices. Regular disruptions in consumption or high income risk may cause chronic poverty. The failure to cope with such frequent income risk and thus consumption fluctuations affect them from different dimensions like it harms nutrition, health and education etc. The effects of different shocks on rural households and their ability to cope with such crises have been a subject of discussion and research always since it is considered as the cause as well as outcome of intra household disparity of resource allocation. Clarke and Dercon (2009) defined shocks as adverse events leading to a loss of household income, a reduction in consumption and/or loss of productive assets. Shocks can be decomposed into different categories depending on nature of origin, viz., climatic, economic, political, crime and health. Climatic shocks comprise drought and flood, erosion, frosts and pestilence affecting crops or livestock etc. Economic shocks include problems in terms of access to inputs, decreases in output prices and difficulties in selling agricultural and nonagricultural products. Crime shocks take account of theft and/or armed robbery, destruction of crops, livestock, housing, tools or household durables as well as crimes against persons. Health shocks include both death and illness. Apart from climatic risks and economic fluctuations, a large number of idiosyncratic shocks make these households vulnerable causing hardship or exacerbating the impact of shocks to income. Rural households in India are often confronted by various types of risks, as foe example, covariate (e.g. natural disasters, economic or political crisis) and idiosyncratic (e.g. illness or job-loss) shocks. Households regularly make use of a variety

of strategies to control risk and cope with shocks, depending on their wealth and abilities. Rural population in India is not different. When faced with such risks even non-poor members of the rural India can be vulnerable if it has ineffective or constrained coping instruments (Jha, *et. al.*, 2012). When market-provided instruments such as savings accounts, credit, pensions, insurance, etc. are not sufficient to look after, governments interfere and provide various welfare programs, unemployment benefits, health insurance or social security. The mode of shock determines the degree of consequences and the ability of an individual to cope with its consequences determines the degree of loss. The outcome of covariate shock is different from individual shocks: the former affects everybody in a particular community or region whether the latter only affects a particular individual in this community. Since the ability of a poor and a non-poor household to adopt active coping strategy to mitigate the effect of shocks are different and depends on certain determinants we need to examine minutely to get rid of poverty formed by failure to manage different shocks at individual level as well as community level. Despite high rates of economic growth in emerging market economies in India poor households face high risk of falling into poverty in the near future due to idiosyncratic shocks. Understanding shocks and their consequences is essential for effective poverty alleviation strategies that strengthen existing coping measures. At present a better understanding of this linkage is lacking because comprehensive empirical data are rare. Therefore, this study makes use of a large- scale household survey to analyse the effects of common shocks on income and assets of rural households and to assess their behaviour regarding decisions to take coping action and the choice of coping measures. This study tries to examine the influence of shocks on Indian rural households associated with their adopted strategies to cope with such shocks.

We have reviewed some of the important studies on household coping strategies during shocks periods and its impacts on rural households. Different types of shocks and risk coping strategies of the rural households in developing countries have received extensive attention in the literature since last two decades. The different patterns of choice in coping strategies, even with the same type of shocks or in similar geographical areas, are well documented in various empirical studies. The coping strategies, that give out a smooth consumption after income shocks adopted by the rural households, are very diverse and differ depending on the area, but are mostly determined by the economic and social structure of the specific rural community. For example, some rural households may attempt to increase labor supply after certain shocks in order to maintain their income level (Kochar, 1999). A typical coping strategy in the context of limited access to financial markets involve building up asset stocks in good times and drawing them down to shield consumption from income fluctuations in bad times (Carter and Lybbert, 2012). Despite the fact that poor households by theory are expected to behave more prudently in their consumption and saving choices, empirical studies often find limited consumption smoothing, Townsend (1994). Gabriella and Francesca (2009) found that in Indonesian, while non-poor farmers smooth consumption relative to income, poor households use labor supply to compensate the income loss and, on average, they save half of this extra income. These results confirmed the importance of savings for poor households, and highlight a crucial role for policies that support savings or, more precisely, the accumulation of productive assets. Cameron and Worswick (2003) have shown that labor supply responses facilitate Indonesian households to smooth consumption during the crop loss. Tongruksawattana and *et. al.* (2010) have shown that households adopted the coping strategies such as asking for remittances from migrant household members and relatives, taking on public support programs, reallocating household resources, borrowing from formal and informal sources, using savings and selling assets are dominant during time of shocks in northeast

Thailand. They suggested that shocks experienced by rural households are likely to negatively affect their future welfare and more effective social risk management strategies are needed. Castellanos and Rahut (2012) found that around 48 per cent of indigenous households work more or increase their working days as a coping mechanism against harvest failures; 38 per cent spend savings and pay with goods in order to protect their consumption and sharp declines in income in Bolivia. They also found that 42.12 per cent answered that they work more, migrate and increase the working days. 60.98 per cent of respondents from the first three poorest quintiles of expenditure distribution indicated that they spend savings during crises. Dercon (2002) stressed the role of the type of shocks on the ability of households to cope with their consequences. The coping strategies of rural households in Ethiopia are likely to differ between idiosyncratic and covariate shocks. Covariate shocks that have a much broader coverage in terms of incidence will be more difficult to insure using informal risk-sharing measures. Okamoto (2011) have shown that the rural households in Myanmar strive to save in kind (by purchasing gold or bullocks) whenever they can afford it. Once some shock occurs, they dissave these assets and use them, together with cash held at home. If the value of dissaving is insufficient to meet the total cost (including those who may have no money or assets), they seek help from others. If the household was fortunate in having someone (mainly relatives) to resort to, they had the option of requesting an interest-free loan. Rashid and *et. al.* (2006) have found that an adoption of coping strategies reveal important patterns of how households respond to different types of shocks according to household characteristics, most importantly the number of income sources and access to stable income sources, household ownership of assets, and education level of household head in northeastern Bangladesh. There are many classifications and typologies of coping strategies in the literature on the subject. Without clear understanding of the background of coping strategies, effective measures to mitigate the vulnerability of rural households in the target area cannot be properly identified. Even though

specific categories of coping strategies, such as self-insurance via saving and asset accumulation (Kazianga and Udry, 2006) or mutual insurance in rural communities or villages (Udry 1994, Fafchamps and Lund 2003, Fafchamps and Gubert, 2007) are thoroughly examined in the light of their effectiveness, the choice and sequence of these strategies have been given little attention in the literature thus far. A few studies have considered multiple incidences of shocks households are exposed to, corresponding coping strategies and welfare consequences (Heltberg, Lund, 2009, Wagstaff, Lindelow, 2014). Nevertheless, most of the existing studies view the shocks, aggregate or idiosyncratic, in isolation as discrete events. A recent study (Mazumdar and etall, 2014) examined the welfare consequences arising out of mutually reinforcing nature of shocks and the impact of idiosyncratic health shocks experienced by households during the year following a large climatic shock induced by a pre-monsoon cyclonic storm, cyclone Aila in Sundarbans delta in Bay of Bengal region of India. The study argues that health and climatic shocks are essentially linked forming a continuum and with exposure to a marginal one, coping mechanisms and welfare outcomes triggered in the response is significantly affected. Surprisingly, there is very little systematic analysis to help policy practitioners in their efforts to understand how the extremely poor (and others) deal with negative shocks. However, we need to have better understanding of risk and vulnerability tracking the points to the role the income and consumption risks, different kind of shocks, degree of vulnerability in perpetuating poverty are utmost essential. Specifically, uninsured shocks like adverse events that are costly to poor rural households in terms of lost income, reduced consumption, or the sale or destruction of assets eventually turns into a cause of poverty. Present study, not only estimates the number of poor and non-poor households experience the effects of different covariate and idiosyncratic shocks with appropriate coping strategies come under different shocks across India but also sheds light on the efficiency of welfare programs to act as safe guard of such shocks for vulnerable rural population in rural India.

After the brief introduction and identifying the objective of the paper in section 1, the remaining structure of the paper is as follows. Section 2 provides data description for the analysis. Section 3 deals with the methodology of estimating determinants of coping strategies and its impact on rural households. Section 4 covers the empirical finding of the study and Section 5 concludes the paper and offers policy suggestions.

DATA DISTRIBUTION

The data for this paper are based on the Additional Rural Incomes Survey/Rural Economic and Demographic Survey (ARIS/REDS) surveys of National Council of Applied Economic Research (NCAER). These data provide us with a combination of community, household and member level information base on a nationally representative sample of 241 villages from rural India across 17 states¹ and, collected over six rounds encompassing the period 1969 to 2006.² There is detailed demographic information on households, food security and coping mechanism, participation in welfare schemes, governance, evaluation of governance by households, composite pattern of cultivation, infrastructure, availability of public goods etc. with community data. The data cover a period of considerable change in the rural economy of India, both in terms of structure as well as the policy regime and in addition allows tracing of the impact of changes in policy on to the households and fixes these households within a policy space. The current round of 2006 has surveyed 8659 households out of which 5885 represents the panel covering the 2006 and the 1999 round.

¹ The states include Tamil Nadu, Kerala, Karnataka, Maharashtra, Gujarat, Rajasthan, Punjab, Haryana, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Orissa, Chhattisgarh, Madhya Pradesh, and, Andhra Pradesh.

² The first three rounds included Assam and Jammu and Kashmir. However, the 1982 round did not include Assam, while the 1999 round excluded Jammu and Kashmir. The current round excludes both these states.

The data are in three parts viz., listing, community, and the household schedule. In the rounds prior to 2006 the listing data was confined to identifying households for the detailed survey. However in the current (2006) round listing represents a census of the village and forms the basis for detailed information on incomes, occupations, voting, land holdings and network formation. The community data set contains information on the structure of governance in these villages incidence, village wide shocks, composite pattern of cultivation, infrastructure, availability of public goods etc. The household survey provides detailed information on participation in governance, welfare programs, assessment of quality of welfare programs, information on networks, voting behavior, Jati, apart from usual details of cost of cultivation, household characteristics etc. The data for household shocks and their coping strategies is only collected in the 2006 round survey of REDS. That's why the study uses the 2006 round of survey of REDS data for the analysis.

The descriptive statistics of the data distribution identifying village characteristics and household characteristics for year the 1999 and the 2006 rounds are presented in Table 1. The household size has been declined by slightly more than 14 percent and the average number of children has declined by 23 percent. The average years of schooling has marginally increased but remains low at the household level. Level of education may have positive impact on adjustment of coping mechanism during the distress periods. Average consumption expenditures have improved about 22 percent which is expected as household incomes have increased about 69 percent. That means rural households have propensity to save more as income increases for future to manage the sudden risks. Now looking at village level statistics, we can identify that poverty has declined from 31 percent to 25 percent. However, inequality has increased significantly and has in fact gone up from 19 to 23 percent in according to Gini measurement. On an average, villages have better facilities now as the per capita availability of infrastructure and provision

of public goods like public tap, drinking water, street lighting and sanitation has improved. The proportion of cultivated area has remained stagnant. This result suggests that agricultural income growth come primarily from productivity growth. Welfare indicators such as number of brick houses, multi-storied houses and agricultural wage rates, have improved over this time period.

Table 1: Village And Household Characteristics: REDS 1999 Vs. REDS 2006

Variables	2006	1999	Percentage change
Village Characteristics			
Indicators of Infrastructure (km.)			
Average distance from bus stand (km.)	2.64	3.23	-18.27
Average distance from pucca road (km.)	1.11	2.48	-55.24
Average distance from post office (km.)	1.61	1.79	-10.06
Average distance from railway station (km.)	25.14	27.02	-6.96
<i>Welfare indicators</i>			
Average number of public taps in a village	3.44	3.1	10.97
Average number of drinking wells in a village	2.51	2.55	-1.57
Average number of street lights in a village	3.6	3.03	18.81
Average number of public toilets in a village	0.67	0.39	71.79
Development Indicators			
Average number of households with brick houses	277.55	240.97	15.18
Average number of households with huts	44.92	56.55	-20.57
Average number of households with mud houses	126.41	129.13	-2.11
Average number of households with multi storey houses	52.36	34.36	52.39
Proportion of houses with electricity connection	0.49	0.43	13.95
Proportion of cultivated area irrigated	0.49	0.46	6.52
Proportion of area irrigated by govt. canal	0.17	0.16	6.25
Village harvest wage (Rs.)	52.24	49.25	6.07
Land gini	0.55	0.56	-1.79
Consumption gini	0.23	0.19	21.05
Number of observation	238	238	
Household Characteristics			
Household size	5.16	6.02	-14.29
Number of children per household	1.51	1.98	-23.74
Age of head	51.16	49.42	3.52
Year of schooling	5.11	4.46	14.57
Land owned (in acres)	2.80	3.97	-29.47
Average consumption expenditure (Rs)	39822.13	32747.49	21.60
Average income	86675.28	51297.69	68.97
Poverty (Head Count)	24.98	30.6	-18.37
Ultra-poor: $pce < \frac{1}{2}(pl)$	3.41	1.5	127.33
Poor: $\frac{1}{2}(pl) < pce < pl$	21.57	29.1	-25.88
Non-poor: $pl < pce < 2(pl)$	52.45	50.9	3.05
Affluent: $pce > 2(pl)$	22.57	18.5	22.00
Number of observation	8659	7474	-

Source: Author's calculation.

In total sample there are 8659 number of households, out of that, 2163 households are poor. The number of poor and non-poor households experiences the effects of six different shocks which are categorized into two broad heads; viz., covariate shocks and idiosyncratic shocks, has given in Table 2 below.

Table 2: Descriptive of Covariate and Idiosyncratic Shocks

Variables	Household experience the effects of such distress events			Percentage of households affected such distress events		
	Poor	Non-Poor	All	Poor	Non-Poor	All
General/covariate Shocks						
<i>Shocks 1:</i> Crop loss, Water borne diseases, loss of property, cyclone/floods/hailstorm	811	2,388	3,199	37.49	36.76	36.94
<i>Shocks 2:</i> Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	476	1,601	2,077	22.01	24.65	23.99
Idiosyncratic Shocks						
<i>Shocks 3:</i> Mounting debt associated with education/health/cultivation, starvation and suicide	39	132	171	1.80	2.03	1.97
<i>Shocks 4:</i> Sudden health problems/accidents	112	528	640	5.18	8.13	7.39
<i>Shocks 5:</i> Crop failure, bore well/open wells for irrigation purposes dried up	130	645	775	6.01	9.93	8.95
<i>Shocks 6:</i> Price increase	395	796	1191	18.26	12.25	13.75
<i>Total number of households</i>	2163	6496	8659	-	-	-

Source: Author's calculation.

It has seen that on an average, 52 percentage of households were experienced both the covariate and idiosyncratic shocks. Majority of households irrespective of their income status reported experience of welfare loss due to sudden crop loss, water borne diseases, loss of

property for natural calamities. 22 per cent poor households have experienced shocks due to mal functioning of water supply sources. Comparatively non-poor households, generally, experience more covariate shocks. They face comparatively more sudden health shocks than poor households. These are general or covariate shocks. However, idiosyncratic shocks are not also ignorable. Sudden price increase is the main concern for poor people. More than 18 percent poor people have faced grief of price increase. Therefore, structural change in the economy or increasing growth with initial inflationary trend in market prices affects poorly to the extreme poor people which is definitely counterproductive for an emerging economy like India, which is growing with high inequality.

Now if we observe average number of impacts of different shocks per year from 1999 to 2008, we can see that idiosyncratic shocks are affecting more than the covariate shocks as shown in Table 3. Amongst six idiosyncratic shocks price rise has been affecting most to the households. Poor households received much higher negative impact from price rise. Therefore, it can be claimed that poor households in emerging market economies are often vulnerable to poverty due to repeated occurrence shocks of price rise and as well as limited capacity at individual level as well as institutional level for effective ex-post coping. Huge debt associated with health, cultivation and previous debt payment have also significant contribution in this context. The estimated loss of the impact is analysed by decomposing the time frame into two categories, viz., cumulative impact of shocks happened from 1999-2007 and impact of current shocks happened in the year 2008 as shown in Table 3. Trend shows that loss of crop production, sudden health shocks were the major concern for relatively non-poor households. Whereas, unavailability of water, mal functioning of agricultural tools and price rise are the sources of risk for poor households in recent time.

Table 3: Descriptive of Covariate and Idiosyncratic Shocks

Variables	Average number of impacts per year (1999-2008)			Average cumulative losses (1999-2007)			Average losses in the latest episode (2008)		
	Poor	Non-Poor	All	Poor	Non-Poor	All	Poor	Non-Poor	All
General/covariate Shocks									
<i>Shocks 1:</i> Crop loss, Water borne diseases, loss of property, cyclone/floods/hailstorm	2.72	2.05	2.22	7732.78	15107.17	13136.08	4912.81	8761.89	7857.74
<i>Shocks 2:</i> Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	1.63	1.61	1.61	6781.60	15682.48	13683.53	3225.30	8868.68	7457.83
Idiosyncratic Shocks									
<i>Shocks 3:</i> Mounting debt associated with education/health/cultivation, starvation and suicide	4.44	1.38	2.01	3867.17	5807.58	4981.11	2685.71	9367.04	7085.61
<i>Shocks 4:</i> Sudden health problems/accidents	1.33	1.32	1.32	6323.48	9074.90	8591.82	6445.24	4794.61	5047.63
<i>Shocks 5:</i> Crop failure, bore well/open wells for irrigation purposes dried up	2.04	1.72	1.77	8560.08	12910.01	12130.19	4367.11	7995.07	7502.71
<i>Shocks 6:</i> Price increase	11.6	6.71	8.40	5725.80	4833.46	5194.82	1306.85	1662.34	1537.30
Total	4.23	2.41	5.89	7068.23	13602.10	7626.85	3005.93	5951.73	2557.47

Source: Author's calculation.

We have analysed the relationship between household shocks and their coping strategies separately for specifically poor, non-poor and all households to see the difference in priority and choice function by three different tables, viz., Table 4, 5 and 6. Our intention is to understand the difference in available options and the households' efficiency in availing the correct choice as coping strategy during the time of distress. In order to get a crisp knowledge about the priority of the different households in selecting the coping strategies we have classified the available coping strategies into 8 different categories. Dis-saving, welfare support from rural local bodies, increase in wage employment earned by sending wards for wage income after withdrawing children from school, loan from formal and informal sources, changing technology (change in crop choices to avoid bad weather or pest attack and improve risk proof technology), selling of assets and starvation are the available choices for the households to make the welfare loss up.

This shows that more than 23 percentages and 15 percent of poor households are using saving strategy than other coping strategies during first and second covariate shocks respectively. One interesting finding is, although poor people have low amount of savings they primarily depend on savings to cope up with both covariate shocks as well as idiosyncratic shocks. It is mainly because of the unavailability of other options or might be non-exposure to the alternatives due to information asymmetry. Whereas, non-poor households follow same kind of trend for covariate shocks. However, about 9.4 percentage households got help from the local government during shocks. Whereas, only 7 percent poor households get less help from welfare programs provided from local and village government. It has seen that basically, households get welfare support from Government at the time of covariate shocks. Poor, generally, manage the distress of idiosyncratic shocks using the coping strategies such as: saving, finding alternative wage employment. Nevertheless the household has to borrow money from relatives, informal sources, selling of assets and reducing necessary consumption. Households couldn't create sufficient safety net for idiosyncratic shocks neither at individual level nor at community level. Government has failed to provide sufficient welfare management programs even for extremely poor people.

Table 4: Relationship Between Household Shocks and Their Coping Strategies (Poor Households)

Variables	Use saving	Help provided from local/village government, depend upon work for food	More wage employment, withdraw children from school and send them for wage employment	Transfers: Borrowings from relatives/friends, received financial help from relative	Technology: Change crop choices to avoid bad weather or pest attack, improve technology	Sell of assets	Starvation	Formal and informal borrowing	Total
General/covariate Shocks									
<i>Shocks 1:</i> Crop loss, water borne diseases, loss of property, cyclone/floods/hailstorm	23.44	4.68	3.24	1.62	2.16	2.82	2.64	2.04	42.63
<i>Shocks 2:</i> Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	14.27	2.4	2.82	1.44	0.72	1.02	1.32	1.02	25
Idiosyncratic Shocks									
<i>Shocks 3:</i> Mounting debt associated with education/health/cultivation, starvation and suicide	0.24	0	0.18	0.06	0	0.06	0.12	0.66	1.32
<i>Shocks 4:</i> Sudden health problems/accidents	3.42	0.18	0.12	1.26	0	0.12	0.06	0.9	6.06
<i>Shocks 5:</i> Crop failure, bore well/open wells for irrigation purposes dried up	3.9	0.06	0.72	0.18	0.9	0.06	0.06	0.18	6.06
<i>Shocks 6:</i> Price increase	14.09	0.42	1.38	0.48	0	0.06	2.28	0.24	18.94
Total	59.35	7.73	8.45	5.04	3.78	4.14	6.47	5.04	100

Table 5: Relationship between Household Shocks and Their Coping Strategies (Non-Poor Households)

Variables	Use saving	Help provided from local/village government, depend upon work for food	More wage employment, withdraw children from school and send them for wage employment	Transfers: Borrowings from relatives/friends, received financial help from relative	Technology: Change crop choices to avoid bad weather or pest attack, improve technology	Sell of assets	Starvation	Formal and informal borrowing	Total
General/covariate Shocks									
<i>Shocks 1:</i> Crop loss, water borne diseases, loss of property, cyclone/floods/hailstorm	22.53	5.33	1.04	1.5	2.97	0.95	1.78	1.87	37.98
<i>Shocks 2:</i> Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	15.97	3.65	1.06	1.08	1.08	0.57	2.27	0.75	26.43
Idiosyncratic Shocks									
<i>Shocks 3:</i> Mounting debt associated with education/health/cultivation, starvation and suicide	0.15	0.02	0.15	0.22	0.02	0	0.05	1.56	2.16
<i>Shocks 4:</i> Sudden health problems/accidents	6.47	0.09	0.09	1.41	0	0.22	0.15	0.73	9.17
<i>Shocks 5:</i> Crop failure, bore well/open wells for irrigation purposes dried up	6.65	0.16	0.46	0.4	2.68	0.05	0.07	0.33	10.82
<i>Shocks 6:</i> Price increase	7.72	0.15	0.71	2.6	0.02	0.07	2	0.16	13.44
Total	59.49	9.4	3.52	7.22	6.76	1.87	6.32	5.41	100

Table 6: Relationship between household shocks and their coping strategies (All households)

Variables	Use saving	Help provided from local/village government, depend upon work for food	More wage employment, withdraw children from school and send them for wage employment	Transfers: Borrowings from relatives/friends, received financial help from relative	Technology : Change crop choices to avoid bad weather or pest attack, improve technology	Sell of assets	Starvation	Formal and informal borrowing	Total
General/covariate Shocks									
<i>Shocks 1:</i> Crop loss, water borne diseases, loss of property, cyclone/floods/hailstorm	22.74	5.18	1.56	1.53	2.78	1.39	1.98	1.91	39.07
<i>Shocks 2:</i> Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	15.57	3.36	1.47	1.17	1	0.67	2.05	0.81	26.1
Idiosyncratic Shocks									
<i>Shocks 3:</i> Mounting debt associated with education/health/cultivation, starvation and suicide	0.17	0.01	0.15	0.18	0.01	0.01	0.07	1.35	1.97
<i>Shocks 4:</i> Sudden health problems/accidents	5.76	0.11	0.1	1.38	0	0.2	0.13	0.77	8.44
<i>Shocks 5:</i> Crop failure, bore well/open wells for irrigation purposes dried up	6.01	0.14	0.52	0.35	2.26	0.06	0.07	0.29	9.7
<i>Shocks 6:</i> Price increase	9.21	0.21	0.87	2.11	0.01	0.07	2.06	0.18	14.73
Total	59.46	9.01	4.67	6.71	6.06	2.4	6.36	5.32	100

METHODOLOGY

This paper estimates the impact of coping strategies on rural households. First, we used Probit regression model to estimate the determinants of coping strategies of rural households in India using REDS 2006 data. Then the predicted coping strategies from the model 1 are used to determine the impact of these coping strategies on rural poor households. The determinant of coping strategy and its impact on rural households is estimated as follows.

$$\Pr(S_{kit} = 1 | Z_{lit}) = \eta_0 + \delta_l Z_{lit} + \psi_{it} \quad (1)$$

$$DH_{it} = \beta_0 + \beta_k \hat{S}_{kit} + \varepsilon_{it} \quad (2)$$

Where, i is k th households and t is the time period. S_{kit} is a vector of k th qualitative dependent coping strategies variables such as saving used by rural households, help provided from local government, alternative wage employment, borrowings or received financial help from relatives/friends, technological changes to improve productivity, sell of household assets, reduce consumption or starvation and borrowing from formal or informal sources. Z_{lit} is l th explanatory variables used in the probit regressions include: shocks variables such as: number of covariate shocks, number of idiosyncratic shocks, previous period losses due to covariate and idiosyncratic shocks, household characteristics that includes age of the household head, dummy for gender of the head, dummy for marital status of the household head, number of children less than 15 years, mean education of households, land holdings, household splits, social network, the governance variables such as dummy for voted to local representative, dummy for participated in gram sabha meetings, regime change (female to male Pradhan), village

characteristics such as: infrastructure index³, service index⁴ and technology index⁵, and revenue and expenditure programs by the governments on public goods, untied resources and welfare programs.

DH_{it} is dummy for households where 1= poor household, 0=non-poor households. \hat{S}_{kit} is k th predicted coping strategies of l th households. The coping strategies in the vector S_{kit} could be potentially endogenous to poor households. Therefore we predicted the coping strategies. We assume that (i) $E(Z'S) \neq 0$ (i.e., all explanatory variables are relevant to the vector S_{kit} and, Z_{lit} affects S_{kit}) and, (ii) $E(Z'\varepsilon) = 0$, $E(Z'\nu) = 0$, and $E(Z'u) = 0$ (i.e., the explanatory variables are uncorrelated with error terms).

EMPIRICAL ANALYSIS

We analyse the determinants of coping strategies and the coping mechanism which influence the welfare of the rural poor and non-poor households. The projected determinants of coping strategies are presented in flowing tables, viz., Table 7 and 8. We have controlled the analysis with type of shocks, number of shocks occur, household factors, village factors and indicators of governance. Probit regressions find that households get help from government during the covariate shocks and

³ Infrastructure index = [(1-(Distance to wholesale market /Maximum distance to wholesale market)) + (1-(Distance to pucca road /Maximum distance to pucca road)) + (Dummy for villages having motorized bus stand) + (Dummy for villages having milk cooperative societies)]/4

⁴ Service index = [(Dummy for villages having public tap) + (Dummy for villages having trained health workers) + (Dummy for villages having schools) + (Number of electricity connections / Maximum number of electricity connections)]/4

⁵ Technology index = [(Percentage of high yielding varieties area per 1000 acres /1000) + (Percentage of pump sets per 1000 acres/Maximum percentage of pump sets) + (Percentage of harvesters and sprinklers per 1000 acres/Maximum percentage of harvesters and sprinklers) + (Percentage of tractors per 1000 acres/Maximum percentage of tractors) + (Percentage of improved buffaloes and cows per 1000 acres/Maximum percentage of buffaloes and cows)]/5

use saving during the idiosyncratic shocks. Rural households utilize more savings compare to other coping strategies during the idiosyncratic shocks. It is observed that technological switching (costly to poor technology) for production process and selling of physical assets are significant determinant of covariate shocks for rural households. It is more likely to adopt dis-savings and informal borrowing as coping strategies if number of idiosyncratic shocks is increasing. Getting support from government welfare programs is negatively significant with the number of idiosyncratic shocks for these households. If rural households are more likely to get more number of idiosyncratic shocks probability of getting help from government welfare programs will decrease. This is unexpected and complete deficient of public services. The impact of accumulated welfare loss (in monetary terms) from covariate and idiosyncratic shocks for previous period gets controlled with savings, increase in wage employment, help from government managed programs and borrowings from relatives and friends (informal loans). Savings get priority first in this context. In household's characteristics, average level of education of households, dependence ratio (measured in terms of number of children with age below 15 years) is the major determinants of coping strategies.

Education of the household is positively significant with coping strategy is dissaving and negatively significant to the coping strategy of adopting alternative wage employment. It means that educated households prefer to dis-save during distress whereas, comparatively less educated or illiterate tries to withdraw their children (minors) from school to earn wages from temporary employment which is basically considered as earning from child labour. The probability that people starve is low for educated households. The splited households starve and borrow from formal and informal sources. The lower land holding classes do not have savings. Therefore, they use wage employment to control damages from shocks. The governance variables are positively related to some coping strategies like savings

and get help from local government, but negatively related to few strategies like opportunity to get loan from informal sources. If the household voted to local representatives (i.e. Pradhan or Ward member) and participated in the gram sabha meetings then the household saves less for shocks periods. The evidence from village facilities has greater impact on households coping strategies during shocks periods. Technology index has greater chance to induce the productivity of rural households and this ensures the households to adopt the technological change to manage shocks. The infrastructure index has increased saving strategy of rural households. The increased village infrastructure and service indices ensure positively to get help from local government.

High income risk, health related shocks and consumption risk are the normal problems for poor households in rural area. Households do not just undergo the consequences of high risk. Different coping strategies get developed by the poor and non-poor households on the basis of their choices and opportunities that focus on long-term survival and well-being. We can distinguish risk-management from risk-coping strategies. The former tool attempts to affect the ex-ante riskiness of the income process. From the predictive effects from different strategies on poor and non-poor households we can estimate the impacts of 8 different strategies for poor and non-poor households as shown in Table 9. Rural households give more priority to use savings as a coping strategy. Poor households adopt coping strategies as try to get help from relatives and friends, starvation, and borrowing from formal and informal sources.

Table 7: Determinants of Coping Strategies (Probit Regression Model)

Variables	Saving	Help from government	Wage employment	Transfer: borrowing from friends/relatives
<i>Shocks Variables</i>				
Ln(Number of covariate shocks)	-0.0642* (0.0379)	0.212*** (0.0516)	-0.271*** (0.0576)	0.0583 (0.0523)
Ln(Number of idiosyncratic shocks)	0.395*** (0.0346)	-0.223*** (0.0552)	0.0387 (0.0466)	-0.169*** (0.0503)
Ln(Lagged losses from covariate shocks)	0.171*** (0.00586)	0.126*** (0.00995)	0.101*** (0.00982)	0.0695*** (0.00882)
Ln(Lagged losses from idiosyncratic shocks)	0.0734*** (0.00728)	0.0308** (0.0121)	0.0701*** (0.0108)	0.0893*** (0.00951)
<i>Household characteristics</i>				
Ln(Age of household)	0.0862 (0.0617)	0.0462 (0.110)	-0.186* (0.107)	0.0101 (0.0971)
Gender (male=1, female=0)	0.153** (0.0696)	-0.159 (0.126)	0.0206 (0.130)	-0.0558 (0.109)
Marital Status	0.0446 (0.0625)	0.0429 (0.112)	0.104 (0.117)	0.142 (0.102)
Ln(No of children (<15 years))	0.0956*** (0.0312)	-0.111* (0.0573)	-0.128** (0.0565)	-0.128** (0.0508)
Ln(Mean education of household)	0.0886*** (0.0212)	-0.00819 (0.0378)	-0.111*** (0.0358)	-0.0633* (0.0323)
Ln(land holdings)	0.0289* (0.0168)	-0.0662** (0.0293)	-0.152*** (0.0280)	-0.0161 (0.0264)
Household split	0.794*** (0.160)	-1.041*** (0.290)	0.350 (0.274)	-0.482* (0.252)
Social network	-0.0103* (0.00618)	-0.00233 (0.0101)	0.00314 (0.0101)	0.00526 (0.00936)

(Contd... Table 7)

Variables	Saving	Help from government	Wage employment	Transfer: borrowing from friends/relatives
<i>Governance variables</i>				
Voted to local representatives	-0.0944* (0.0557)	0.240** (0.107)	0.0777 (0.0891)	0.872*** (0.137)
Participated in Gram Sabha meetings	-0.110*** (0.0363)	0.533*** (0.0622)	0.104 (0.0638)	-0.00882 (0.0546)
Regime change (male to female Pradhan)	-0.0820** (0.0344)	0.824*** (0.0693)	0.0285 (0.0591)	0.243*** (0.0533)
<i>Village characteristics</i>				
Technology index	-0.598*** (0.161)	-0.856*** (0.291)	0.958*** (0.272)	0.445* (0.252)
Infrastructure index	0.530*** (0.0953)	0.730*** (0.171)	-0.215 (0.165)	0.777*** (0.154)
Service index	-0.208** (0.0828)	0.555*** (0.157)	-0.369** (0.144)	0.260* (0.133)
<i>Revenue and expenditure programs by government</i>				
Ln(Per capita exp. in public goods)	-0.00469 (0.00308)	-0.00775 (0.00844)	0.00438 (0.00582)	-0.00814 (0.00538)
Ln(Per capita exp. in untied resources)	-0.00218 (0.00260)	0.0181** (0.00773)	-0.00254 (0.00460)	0.00140 (0.00475)
Ln(Per capita exp. in welfare programs)	-0.0299*** (0.00800)	0.0816*** (0.0141)	-0.00831 (0.0135)	0.0174 (0.0123)
Constant	-1.794*** (0.266)	-4.292*** (0.499)	-1.512*** (0.465)	-3.808*** (0.446)
LR Chi2	2761.57***	1106.53***	325.37***	472.30***
Observations	8,659	8,659	8,659	8,659

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Determinants of Coping Strategies (Probit Regression Model)

Variables	Technology	Selling Assets	Starvation	Borrowing from Formal and Informal Sources
<i>Shocks Variables</i>				
Ln(Number of covariate shocks)	0.177*** (0.0574)	0.297*** (0.0669)	0.0429 (0.0498)	0.102* (0.0584)
Ln(Number of idiosyncratic shocks)	-0.624*** (0.0585)	-0.355*** (0.0748)	0.0531 (0.0457)	-0.0521 (0.0475)
Ln(Lagged losses from covariate shocks)	0.0726*** (0.0102)	0.0718*** (0.0125)	0.108*** (0.00930)	0.0227** (0.0103)
Ln(Lagged losses from idiosyncratic shocks)	0.133*** (0.00939)	0.0235 (0.0149)	0.0282** (0.0110)	0.102*** (0.00984)
<i>Household characteristics</i>				
Ln(Age of household)	0.145 (0.113)	-0.101 (0.132)	-0.163* (0.0989)	-0.129 (0.101)
Gender (male=1, female=0)	0.105 (0.141)	-0.0498 (0.152)	0.0556 (0.120)	0.254** (0.124)
Marital Status	0.105 (0.122)	0.0500 (0.140)	-0.00877 (0.104)	-0.0245 (0.105)
Ln(No of children (<15 years))	0.0914 (0.0557)	-0.0405 (0.0669)	0.128*** (0.0494)	0.0871* (0.0514)
Ln(Mean education of household)	0.0736* (0.0396)	0.00838 (0.0458)	-0.0960*** (0.0337)	-0.0410 (0.0344)
Ln(land holdings)	-0.106*** (0.0276)	-0.0454 (0.0353)	-0.0919*** (0.0268)	0.0114 (0.0287)
Household split	0.346 (0.283)	-1.116*** (0.360)	0.579** (0.254)	1.047*** (0.258)

(Contd ... Table 8)

(Contd ... Table 8)

Social network	-0.0146 (0.0108)	0.0174 (0.0128)	0.0160* (0.00946)	0.0247** (0.0101)
<i>Governance variables</i>				
Voted to local representatives	0.276** (0.120)	-0.103 (0.108)	0.291*** (0.0885)	0.558*** (0.111)
Participated in Gram Sabha meetings	0.348*** (0.0603)	0.0429 (0.0771)	0.231*** (0.0592)	-0.290*** (0.0609)
Regime change (male to female Pradhan)	0.0258 (0.0623)	0.173** (0.0749)	-0.0546 (0.0546)	-0.0662 (0.0559)
<i>Village characteristics</i>				
Technology index	0.958*** (0.299)	0.388 (0.334)	0.202 (0.266)	0.0823 (0.276)
Infrastructure index	0.555*** (0.173)	0.00396 (0.194)	-0.967*** (0.159)	-0.0970 (0.160)
Service index	0.495*** (0.153)	-0.360** (0.171)	-0.171 (0.137)	0.307** (0.146)
<i>Revenue and expenditure programs by government</i>				
Ln(Per capita exp. in public goods)	-0.00572 (0.00641)	-0.0153** (0.00619)	-0.0116** (0.00543)	0.00708 (0.00612)
Ln(Per capita exp. in untied resources)	0.0144** (0.00597)	0.00447 (0.00569)	0.00789* (0.00463)	0.0210*** (0.00538)
Ln(Per capita exp. in welfare programs)	-0.00504 (0.0134)	-0.0542*** (0.0166)	0.0823*** (0.0139)	-0.0299** (0.0125)
Constant	-4.529*** (0.512)	-1.756*** (0.567)	-1.569*** (0.431)	-2.392*** (0.447)
LR Chi2	620.77***	194.69***	606.09***	348.36***
Observations	8,659	8,659	8,659	8,659

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 9: Predicted Coping Strategies (Poor Vs. Non-Poor)

Variables	Poor	Noon-Poor	Total
Pr(use saving)	0.3076	0.3205	0.3109
Pr(govt. employment program)	0.0445	0.0566	0.0536
Pr(wage employment)	0.0356	0.0362	0.0357
Pr(transfers from friends and relatives)	0.0526	0.0429	0.0502
Pr(Technology)	0.0334	0.043	0.0406
Pr(selling assets)	0.0189	0.02	0.0192
Pr(starvation)	0.0501	0.049	0.0498
Pr(borrowings from formal and informal sources)	0.0415	0.0379	0.0406

The estimation of effect of coping strategies on poor households shows that government support through welfare programs and alternative wage employment have positive significant impact on poor households. If we look at only the extreme poor households' choices and impact of coping strategies we can say that they cope with sudden shocks more through selling of their assets as shown in Table 10. The poor household can increase his welfare by participating in welfare programs provided by government. We can't ignore the reality of starvation acts as occurrence of negative driving force for poor households during the shocks. Households become vulnerable when they are not able to smooth consumption, despite various formal and informal coping mechanisms. However, transfer of money from friends and relatives and technological change for production negatively affect towards poor.

Table 10: Effects of Coping Strategies on Poor Households

Variables	Poor Households (Poor=1, Non-poor=0)
Pr(use saving)	0.201** (0.101)
Pr(govt. employment program)	0.228*** 0.046
Pr(wage employment)	2.997*** (0.673)
Pr(transfers from friends and relatives)	-3.418*** (0.631)
Pr(Technology)	-0.924** (0.404)
Pr(selling assets)	4.346*** (0.790)
Pr(starvation)	0.678* (0.399)
Pr(borrowings from formal and informal sources)	0.184 (0.536)
Constant	-0.692*** (0.0246)
LR chi2	145.82***
Observations	8,659

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

CONCLUSION

The study tries to bring out the underlying dynamics among different shocks and households' choices of opting coping strategies. It tracks the sequence of coping strategies for poor and non-poor households separately in order to identify all possible measures for enhancing the shock-coping capabilities of vulnerable rural poor households. The determinants of coping strategies and impact of coping strategies on households' welfare

are estimated here through probit regressions. From the entire analysis it is clear that withdrawing savings is the most chosen coping strategy during idiosyncratic shocks by all kind of households. As price rise is major reason of idiosyncratic shocks to the rural households, it can be said that policy change and structural change in economy adversely affect rural poor households which should not be unnoticed during policy planning. In the periods of covariate shocks, generally, comparatively poor households get help through local government. Poor households struggle to save at their good time so that if any shock occurs they can start utilising these assets to get better off. The relatively non-poor households always give priority to disaving in response to both, covariate shocks and idiosyncratic shocks. They are mainly dependent on their own savings. Non-poor households are more likely to have relatives' support during the time of distress. They also borrow from formal as well as informal loans depending on their accessibility. Extremely poor households find no other way but to starve. The empirical results claim that they get help from the local government and the coefficients are very large and positively significant. Education is positively related to savings opted as coping strategy and negatively related to alternative wage employment. Educated poor comparatively starve less during distress as they manage to make safety net with other alternatives. The richer land holding classes use savings and upgrade the technology to manage distress shocks. There is no second opinion that local government should have taken major role in helping the poor households during the periods of shocks. One interesting fact is that although the results find that rural government programs contribute significantly to manage distress shocks for poor households, they still starve. However, inefficiency in selecting the targeted population and delivery mechanism coupled with asymmetric information acts as the significant barriers. That means despite mass participation in welfare programs it is quite certain that rural governance can't insure starving completely. We found

that rural government programs contribute significantly to manage distress shocks. These results also show that other coping strategies are negatively related with government programs. It posits that the government should take up alternative savings or insurance based programs for rural households to reduce the starving, selling assets and borrowings to manage the impact of sudden shocks. As some shocks have been found to be important causes of chronic poverty and substantial reduction in welfare, there is policy level priority to find better ways of providing protection against the adverse effects of shocks. The viable policy measures in the form of safety nets might help poor households to adopt active coping strategies to withstand general and individual sudden shocks. The scope of better savings and a efficient public risk control management could make poor households better off without crowding out the informal insurance arrangement. Providing better savings instruments can act as natural safety net.

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