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ORIGINAL ARTICLE

Covariate and Idiosyncratic Shocks and Coping Strategies for Poor and Non-poor Rural Households in India

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Abstract The objective of the paper is to track the association between different type of shocks experienced by rural households and corresponding coping strategies opted by them as they are, not only exposed to household-level and community level shocks, but also, lack effective risk management strategies which make them vulnerable to get into chronic poverty. A probit analysis has been used to articulate the comparative static distinction of risk management strategies between poor and non poor rural households using Additional Rural Incomes Survey/Rural Economic and Demographic Survey (ARIS/REDS) data surveyed by National Council of Applied Economic Research (NCAER) in rural India across 17 states to get a comparative static analysis. Households, generally, withdraw savings, seek remittances from migrant family members, take loan from formal and informal lenders and sell their existing assets and participate in Government sponsored welfare based programs to control after effect of shocks. Comparatively non-poor rural households could build up safety net (precautionary measure) to cope with price rise and other sudden shocks. But, extremely poor, generally, if don't get help from relatives or can't borrow from informal sources, ultimately

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starve at the time of sudden shocks. The welfare based government programs fail to arrest this extreme situation of grief during the idiosyncratic shocks.

Keywords Rural households · Shocks · Coping strategies · Poverty · Probit model

JEL Classification D10 · D81 · I30

1 Introduction

In developing countries, people experience a number of risks which brings sudden reduction in their regular income flows. This in turn brings irregularity in consumption and eventually causes significant sudden welfare loss. Specifically, rural households experience frequent income loss and high consumption volatility due to frequent experience of different type of shocks.[1] The perception of vulnerability has been traditionally used to describe exposure to different type of risks and corresponding risk management, including indemnify against shocks through diversifying assets and income[2]. Majority of rural population depends on agriculture, agro based activities and small scale industries which are exposed to adverse impact of climate change. Moreover, fluctuation in input prices and upward rigid output prices are usual incidents. Regular disruption in consumption due to climatic shocks clubbed with price changes brings repeated shortfall in their expected incomes which may cause chronic poverty.[3] According to Human Development Report (2014), between 2000 and 2012 more than 200 million people, most of them in developing countries were hit by natural disasters every year, especially by floods and droughts. India is not an exception, being one among the fastest-growing economies in the world. There is no second opinion that poverty is still persistent in India.[4] In spite of an emerging middle class population,

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[1] Despite the diversity of their financial situations, many American households share a surprising vulnerability. Families, even those with higher incomes, can be disrupted by just one financial setback." http://www.pewtrusts.org/~/media/assets/2015/10/emergency-savings-report-1_artfinal.pdf

b. Rural households in emerging market economies countries are vulnerable to poverty as a result of negative shocks and because of their limited capacity for effective ex-post coping. Tongruksawattana, Waibel and Schmidt (2010).

Dercon et al. (2005) and Calvo and Dercon (2005) defined shocks as "adverse events that lead to a loss of household income, a reduction in consumption and/or a loss of productive assets". Shocks can generate vulnerability and extreme poverty.

[2] Human Development Report 2014.

[3] Despite having huge policy level intervention for poverty reduction, more than 2.2 billion people are still living either near or below poverty line. That, essentially, signifies that more than 15 percent of the world's population is still vulnerable to multidimensional poverty (Human Development Report, 2014).

[4] a. The World Bank, in 2011 based on 2005's PPPs International Comparison Program, estimated 23.6% of Indian population, or about 276 million people, lived below $1.25 per day on purchasing power parity. For details refer to, 'A Measured Approach to Ending Poverty and Boosting Shared Prosperity—Concepts, Data, and the Twin Goals', The World Bank, Washington-DC , USA,ISBN (paper): 978-1-4648-0361-1;ISBN electronic): 978-1-4648-0362-8; doi:10.1596/978-1-4648-0361-1.

b. The incidence of poverty in India is a matter of key concern for policy analysts and academic researchers both because of its scope and intensity. National poverty line estimates1 indicated a poverty incidence of 27.5 percent in 2004–2005, implying that over one quarter of the population in India lives below the poverty line. Also, in absolute numbers, India still has 301.7 million poor persons with a significant percentage of

a significant chunk is still vulnerable, impoverished and prone to various risks. In the said context, literature classifies 'risk' into two broad categories-covariate risks and idiosyncratic risks (Krueger et al. 2016; Dercon et al. 2005; Calvo and Dercon 2005). Idiosyncratic risk refers to the particular experience where one household's experience is typically unrelated to neighboring households' (i.e. household-level shocks, such as death, injury or unemployment) and covariate risk refers to the experience where many households in the same geographical location suffer similar shocks (i.e. community shocks, such as natural disasters or epidemics). Coping strategies of idiosyncratic shocks can't be premeditated at the community level. It should be built up with risk pooling across larger areas and populations. Community-based shock management set up by households at individual level to mitigate the impact of covariate shocks (Bhattamishra 2008). Clarke and Dercon (2009) reclassified shocks into different categories based on nature of origin, viz., climatic, economic, political, crime and health. Climatic shocks comprise adverse event created by sudden change in climate such as flood, drought, erosion and pestilence affecting livestock and crops etc. Clarke and Dercon (2009) further defines economic shocks which include problems related to sudden change in country's economic situation and impact of that on individual's life. Sometimes rural households face severe difficulties due to change in input and output prices. Also, rural households face shocks due to theft, robbery, destruction of crops, damage of livestock and other assets. . Moreover, households face health shock in the form of both death and illness which has a binding impact on their economic conditions. The idiosyncratic shocks make these households vulnerable causing hardship or exacerbating the impact of shocks to income. Naturally, the degree of impact varies across households as shocks occur in different mode. Idiosyncratic shocks have a comparatively larger impact on poor households' vulnerability due to their sensitivity towards food price inflation, high borrowing, large family size, etc. (Amendah et al. 2014). Likewise, coping strategies can be separated into two broad categories, viz., ex-ante or planned strategies and ex-post strategies depending on time of action (Dercon 2002). Households set up risk management plans or depend on already planned strategies in the form of precautionary savings, different type of insurance and assets accumulation. On the other hand, ex-post strategies are treated as damage control strategies. In this, households face the shock first and thereafter take relevant measures according to their capacity to manage the aftershock effects. There are different types of ex-post strategies to cope up with these aftershocks, for example, by reducing consumption expenditures, increasing home production,etc. Different shocks affect households' livelihood from various interrelated dimensions. For example, it creates wage loss, dis-savings, adverse impact on health and nutrition, school drop outs etc. The effects of different shocks on rural households and their ability to cope with such crises have been a subject of discussion at policy level since it is considered as one of the main reasons for widespread rural and urban poverty as well as reason of existence of intra household disparity of resource allocation.

Footnote 4 continued

them being substantially or severely poor in terms of the norms identified as being necessary for survival. http://www.im4change.org/docs/understanding-poverty-india.pdf.

From the mid-1990s until 2012, the State and Central Governments have initiated a number of welfare schemes for a cross section of the society from time to time to focus on poverty alleviation from multi-dimensional aspects.[5] In recent times Government of India (GOI) initiated number of policy schemes stressing on rural development and poverty eradication. There are few schemes which target to enable better living focusing on urban planning and development. It has been planned to capture urban poor households by enabling them to access gainful self-employment and skilled wage employment opportunities.[6] There are miscellaneous programs set up by the policy planners time to time with the objective of developing self employment, asset creation for the vulnerable section to make natural safe guard of income shocks. It has been observed that these welfare programs which could have given massive positive outcome, however, failed to generate the degree of strength to get a sweeping effect. Few observed reasons are improper policy implementation, effective governance, lack of information and demand side and supply side constraints to access these welfare programs. Added to the above are social norms and institutional shortcomings which exacerbate this vulnerability and therefore, community and state support is needed to boost households' coping capacities for covariate shocks.[7]

Households, at individual level, regularly make use of a variety of strategies to control risk and cope with shocks, depending on their wealth and abilities. Even comparatively rich households are unable to be fully insured against such shocks and eventually, they suffer welfare losses. If coping strategies are ineffective to control their income shocks, even non poor households can face severe shortfalls in income and thus can be vulnerable due to lack of proper control 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 at individual level. As the mode of shock determines the degree of consequences, the ability of an individual to cope with its consequences determines the degree of loss. This loss is the outcome of covariate shock and varies across households. Moreover, the ability to adopt active coping strategy to mitigate the effect of shocks of a poor and a non-poor household is different. Therefore, it is a dire need to determine the choice functions of poor and nonpoor households differently to get a comparative static analysis of current status of coping strategy portfolios and also to get a clear understanding of demand sided constraints of opting the correct coping strategies against various covariate shocks and idiosyncratic shocks. In order to get rid of chronic poverty caused by failure to manage different shocks at individual level as well as at community level

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[5] Various Ministries in the Government of India have come up with various social sector schemes for social and economic welfare development of the nation. The programs are classified into different groups. These are named as, wage employment programs, self-employment programs, food security programs, social security programs and poverty alleviation programs. http://www.gktoday.in/government-schemes-in-india/http://www.gktoday.in/government-schemes-in-india/.

[6] Deen Dayal Upadhyaya Grameen Kaushalya Yojna, National Urban Livelihood Mission, National Food Security Mission, Pradhan Mantri Kaushal Vikas Yojana are few policy programs taken up by GOI for wellbeing of the poor population.

[7] Human Development Report, 2014. http://hdr.undp.org/sites/default/files/hdr14-report-en-1.pdf.

it is important to examine the type of shocks and their consequences on households' income and consumption behavior.

Poverty alleviation has been one of the major policy initiatives in India since last two decades. Welfare based programs are inclusive part of it. In order to promote poverty alleviation programs through enhancing socio economic wellbeing of poor population and get rid of a high incidence of poverty, Centre and State Governments in India enhanced allocations for the provision of employment, health, education, disaster management, other scopes of having grief management tools. With effective implementation of welfare programs, it is also possible to bring out best outcome with existing coping measures. Although there are number of theoretical literature on vulnerability dimension, yet largely due to data limitations relevant empirical studies on coping strategy, vulnerability, program assessment are still rare.

Therefore, the present study makes use of a detailed national level household survey to examine the impact of common shocks on households' income and assets. The study, also attempts to assess households' behaviour towards their choices of coping action with respect to the impact of shocks. This study primarily tries to examine the influence of shocks on Indian rural households associated with their adopted strategies to cope with such shocks.

In developing countries, issues related to different types of income risks and respective coping strategies of a rural household have started receiving attention in recent times. It has also been seen that households' choices differ in opting coping strategies for similar type of shocks across income groups. Coping strategies that give out smooth consumption during time of distress to compensate shortfalls in income across income levels are diverse and further differ depending on the geographical area. However, it is shown in studies that household's choices of coping strategy are mostly determined by their economic and social status. Rural households mostly try to increase labor supply after certain shocks in order to avoid sudden disorder in consumption level. Households often send their children to work to balance out welfare shocks as they have limited access to formal financial markets (Kochar 1999). Moreover, as they fail to build up asset stocks in good times, they can't withdraw the same to smoothen consumption during income shocks in bad times (Carter and Lybbert 2012). Townsend (1994) pointed that 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. Berloffa and Francesca (2013) examined income shocks and corresponding coping strategies for Indonesian farmers. The study specified that asset ownership has significant role in the behavior of choosing a coping strategy for the farmers. In order to smooth consumption during income shortfall a poor farmer uses labor supply and they save half of this extra income and accumulate productive assets for future use. Cameron and Worswick (2003) have proved empirically with Indonesian households' survey data that households cope with different shocks through adjusting their supply of labor to smooth consumption as aftershock adjustment process. Here, crop loss is seen as a transitory shock, where there is no scope to change labor supply and thus households face transitory welfare losses. However, it didn't consider asset accumulation and interlinkage between production and consumption decisions, measures of welfare loss and the household's ability to cope with the shock. Moreover, understanding of differences in the coping or risk management

behavior between poor and non-poor households is necessary to judge whether permanent income is an appropriate welfare indicator for both groups. Few other studies have shown that households seek for remittances from distant family members and relatives, borrow loans from different lenders, participate in welfare based programs, reallocate household assets, withdraw savings and sell assets at the time of distress as shock management mechanism. Tongruksawattana et al. (2010) specified that rural households in Myanmar consider own savings or physical assets as ex-ante shock management. They purchase physical assets at their good times as precautionary measure. During the time of shocks, they sell these assets to smooth their regular expenditure. They seek monetary assistance from others if they can't control the loss with the amount they could accrue through dis-savings. Households sometimes get interest-free loans from relatives (Okamoto 2011). Using different quantitative techniques, Castellanos and Rahut (2006) have provided country wise depiction on household's bahaviour in choosing different coping strategies. Around 48% of sample households in Indonesia try augment their labour supply at the time of harvest failures to make it up; 38% sample households in Bolivia consider savings as ex-ante coping strategy to protect their consumption and income and around 42.12% households increase their labour supply. Dercon (2002) focused on the type of shocks and capacity to deal with their adverse consequences. It have been stressing that the coping strategies of rural households differ across types of shocks. Covariate shocks have a much broader coverage than idiosyncratic shocks. Rashid et al. (2006) tried to put it forward through connecting it with households' behavior towards adopting coping strategies. They have specified that household's attitude varies with income level. There are other important determinants, such as, access to stable income sources, household ownership of assets, and education level of household head which make households' decisions divergent. Without having proper information about the individuality of different coping strategies it is not easy to examine households' ability to mitigate the vulnerability or severity of the welfare loss for poor rural households. Although specific categories of coping strategies, like self-insurance via savings and asset accumulation in terms of gold and other physical assets (Kazianga and Udry 2006) or some community based mutual insurance (Udry 1994; Fafchamps and Lund 2003; Fafchamps and Gubert 2007) are thoroughly examined in the light of their effectiveness. However, the decision of opting correct alternatives or viewing household's portfolio of coping strategies has received little attention in the empirical literature so far. A few studies have considered multiple incidences of shocks households are exposed to, corresponding coping strategies and welfare consequences (Heltberg and Lund 2009; Wagstaff, Lindelow, 2014). Nevertheless, most of the existing studies view the shocks, aggregate or idiosyncratic, in isolation- as discrete events. Mazumdar et al. (2014) provided an empirical evidence of the fact that households suffer from multiple shocks from natural calamity like cyclonic storm. It has nicely articulated from the data distribution that some households experience repeated welfare loss because of simultaneous occurrence of interrelated shocks and their mutually reinforcing nature. These households experienced the impact of a large climatic shock induced by a pre-monsoon cyclonic storm followed by idiosyncratic health shocks as after effect. Naturally, it becomes more challenging to those households who suffer repeatedly for one event to another and trying to make it up through typical coping mechanisms as opposed to their counterparts facing single shock at a time. They face

only health shock or only asset loss from climatic shock. To mention, poor and non poor households behave differently in choosing the alternative coping options. Some uninsured shocks like sudden adverse events affect severely to poor rural households as ex-ante risk management become extremely costly to them. Comparatively non poor rural households can afford to bear the grief for time being. Surprisingly, there are not many studies to look after these issues to help policy practitioners to understand in better way as how the extremely poor (and others) deal with different shocks. However, we need to know in depth about all sorts of income risks, their origins, triggers and associated degree of vulnerability. Estimation of impact of different kind of shocks with degree of vulnerability in perpetuating poverty is extremely essential for inclusive growth and development of a country like India. The present study not only estimates the number of poor and non-poor households experiencing the effects of different covariate and idiosyncratic shocks and their choice of coping strategies corresponding to different shocks across India but also it sheds light on the efficiency of welfare programs governed by the state 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 Sect. 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 Sect. 5 concludes the paper and offers policy suggestions.

2 Data Distribution

The data for this paper are based on the 'Additional Rural Incomes Survey/Rural Economic & 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 across17 states[8] and, collected over six rounds encompassing the period 1969 to 2006.[9] 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. along with community level data. The data covers both 1999 and 2006 round household survey. The current round of 2006 has surveyed 8659 households out of which 5885 represents the panel covering the 2006 and the 1999 round.[10]

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[8] 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. The state reorganization that influenced Bihar, Madhya Pradesh and Uttar Pradesh, did not affect the selection of villages that have remained intact since 1969.

[9] 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 (both incidents affected by the local law and order situation prevailing in these states at that time). The current round excludes both these states.

[10] The household sample has compensated for attrition through a random addition to the original sample since 1982. 10 households were randomly selected from the process of listing in each of the survey rounds. Thus, the sample remains representative.

The data are in three parts viz., listing, community, and the household schedule. In the rounds prior to 2006[11] 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,[12] 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, the reason why the study uses the 2006 round survey of REDS data for the current 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 declined by slightly more than 14% and the average number of children has declined by 23%. 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%, which is expected as household incomes have increased about 69 percent. This implies, rural households have propensity to save more, as thus, income increases for future to manage the sudden risks. Now looking at village level statistics, we can identify that poverty has declined from 31 to 25%. However, inequality has increased significantly and has in fact gone up from 19 to 23 percent according to 'Gini[13]' measurement of inequality of household incomes. 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. Therefore, it can be said that agricultural income growth primarily generated by positive change in productivity. Households' welfare, measured in terms of physical asset creation and monetary growth such as number of brick houses, multi-storied houses and agricultural wage rates, have improved over this time period.

From a total of 8659 households, around 25% (2163 households) came under poor category. The distribution of poor and non-poor households who experience the effects of six different shocks has been provided in Table 2 below. The shocks are categorized into two broad heads; viz., covariate shocks and idiosyncratic shocks following the literature. . The distribution articulates that on an average, 52% of sample households experience both the shocks. Majority of households irrespective of their income status reported experience of welfare loss due to sudden crop loss, water borne diseases, loss

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[11] The listing component of the survey was completed in 2006 while the household survey was administered between 2007 and 2008.

[12] 'Jati' is synonymous to 'Caste' in Hindu society. The word has its origin from Sanskrit and indicates towards a form of existence determined by birth.

[13] The Gini coefficient is a measure of statistical dispersion projected to represent the income distribution of a nation's inhabitants, and is the most commonly used measure of inequality.

Table 1 Village and household characteristics: REDS 1999 Vs. REDS 2006

Variables village characteristics	2006	1999	**Percentage change**
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
Welfare indicators			
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

Table 1 continued

Variables village characteristics	2006	1999	**Percentage change**
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: $pce < 1/2\,(pl)$	3.41	1.5	127.33
Poor: $1/2\,(pl) < pce < pl$	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

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						
Shocks 1: Crop loss, Water borne diseases, loss of property, cyclone/floods/hailstorm	811	2,388	3,199	37.49	36.76	36.94
Shocks 2: 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						
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	39	132	171	1.80	2.03	1.97
Shocks 4: Sudden health problems/accidents	112	528	640	5.18	8.13	7.39
Shocks 5: Crop failure, bore well/open wells for irrigation purposes dried up	130	645	775	6.01	9.93	8.95
Shocks 6: Price increase	395	796	1,191	18.26	12.25	13.75
Total number of households	2163	6496	8659	-	-	-

Source: Authors' calculation

of property during natural calamities. 22% poor households have experienced shocks due to mal functioning of water supply sources. Comparatively non-poor households, generally, experience more covariate shocks mostly in the form of sudden health

shocks. Sudden price increase is the main concern for poor people. More than 18 percent poor people have faced grief of regular price increase.

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. The estimated loss of the impact is analysed by decomposing the time frame into two categories, viz., the impact of current shocks happened in the year 2008 and cumulative impact of shocks happened for the period 1999–2007. Amongst six defined idiosyncratic shocks, rising prices has been affecting most to the sample 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 of shocks in the form of price rise as along with limited capacity at individual level as well as institutional level for effective ex-post coping. The price rise may indirectly affect sudden health problem and crop failure of rural poor and non-poor households. The result shows that loss of crop production, sudden health shocks were the major concern for relatively non-poor households during 1999–2007. In 2008, the health shocks affected more to the poor households. Whereas, unavailability of water, mal functioning of agricultural tools and price rise are the sources of risk for non-poor households in recent time.

We have analysed the relationship between household shocks and their coping strategies separately for poor, non-poor and total sample households to see the difference in their priority in terms of selecting the strategy from the available alternatives in their choice functions. It is shown by three different tables numbered as 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. Dissaving, welfare support from States, 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 up the welfare loss. There are number of welfare based program governed by States (centre, state, urban local bodies and rural local bodies) in India as for example, job guarantee schemes, public employment programs, social security programs, poverty reduction schemes, consumption smoothing programs financial support through subsidised lending, micro finance (self insurance program) which aim at the mitigation of risks faced by poor households when they experience income shocks (World Bank 2013). In order to bring down poverty level, most of these programs are to help poor rural households to cope with various forms of risk (Lal et al. 2010) and are considered as safety nets to the vulnerable population.[14] 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. Interestingly, the study finds that poor people, despite having lesser amount of savings, depend on savings

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[14] As for example the NREGA, enacted in 2005 by the United Progressive Alliance government, was envisioned as a safety net for rural households. http://nrega.nic.in/nrega_guidelineseng.pdf

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									
Shocks 1: 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
Shocks 2: 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									
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	4.44	1.38	2.01	3867.17	5807.58	4981.11	2685.71	9367.04	7085.61
Shocks 4: Sudden health problems/accidents	1.33	1.32	1.32	6323.48	9074.90	8591.82	6445.24	4794.61	5047.63
Shocks 5: 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
Shocks 6: 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: Authors' calculation

mainly to cope up with covariate shocks as well as idiosyncratic shocks. The reason could be the unavailability of alternatives or might be non-exposure to the alternatives due to information asymmetry. On the other hand, non-poor households follow same kind of trend for covariate shocks but around 9.4% households got help from the local government during shocks, the same for the poor households is just 7%. It has been 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 typically fail to create sufficient safety net for idiosyncratic shocks neither at individual level nor at community level. Government has also failed to make provisions for sufficient welfare management programs even for extremely poor people.

3 Methodology

This paper estimates the impact of coping strategies on poor and non-poor 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 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 poor and non-poor rural households is estimated as follows.

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

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

Basically, the coefficients from the output of a probit model are not interpreted like linear regression model. The marginal effect in the probit regression model measures the *ceteris paribus* effects of changes in the regressors affecting the features of the outcome variable.

Where, i is ith households and t is the time period. S_{kit} is a vector of kth 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 lth 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 (in acres), household splits, social network[15]; the governance variables such as dummy for voted to local

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[15] Household ties based on kinship.

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	Selling of assets	Starvation	Formal and informal borrowing	Total
General/covariate Shocks									
Shocks 1: 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
Shocks 2: 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									
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	0.24	0	0.18	0.06	0	0.06	0.12	0.66	1.32
Shocks 4: Sudden health problems/accidents	3.42	0.18	0.12	1.26	0	0.12	0.06	0.9	6.06
Shocks 5: 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
Shocks 6: 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

Source: Authors' Calculation

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	Selling of assets	Starvation	Formal and informal borrowing	Total
General/covariate Shocks									
Shocks 1: 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
Shocks 2: 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									
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	0.15	0.02	0.15	0.22	0.02	0	0.05	1.56	2.16
Shocks 4: Sudden health problems/accidents	6.47	0.09	0.09	1.41	0	0.22	0.15	0.73	9.17
Shocks 5: 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
Shocks 6: 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

Source: Authors' Calculation

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	Selling of assets	Starvation	Formal and informal borrowing	Total
General/covariate Shocks									
Shocks 1: 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
Shocks 2: 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									
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	0.17	0.01	0.15	0.18	0.01	0.01	0.07	1.35	1.97
Shocks 4: Sudden health problems/accidents	5.76	0.11	0.1	1.38	0	0.2	0.13	0.77	8.44
Shocks 5: 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
Shocks 6: 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

Source: Authors' Calculation

representative, dummy for participated in Gram Sabha[16] meetings, regime change (female to male Pradhan[17]); village characteristics such as: infrastructure index[18], service index[19], technology index[20] revenue and expenditure programs by the governments on public goods, untied resources and welfare programs.[21].

DH_{it} is dummy for households where 1= poor household, 0=non-poor households. $\hat{S}_{kit}$ is kth predicted coping strategies of ith 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) $E(Z'\varepsilon) = 0$, $E(Z'\upsilon) = 0$, and $E(Z'u) = 0$ (i.e., the explanatory variables are uncorrelated with error terms).

4 Empirical Analysis

In this section, we analyse the determinants of coping strategies and how the coping mechanism influence the welfare of the rural poor and non-poor households. The results of determinants of coping strategies are presented by Tables 7 and 8. We have

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[16] Gram Sabha has been envisaged as the foundation of the Panchayati Raj system after the enactment of the 73rd Constitutional Amendment Act, 1992. A Gram Sabha consists of members that include every adult (age 18 +) of the village and is generally formed in villages with population at least exceeding 1500 people.Usually in every 5 years the members of the Gram Sabha elects the members of the Gram Panchayat.

[17] Pradhan or Gram Pradhan or Sarpanch, as it is called in India, is the elected head of the Gram Panchayat.

[18] 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
Accessibility of proper public transport, road quality, concentration of whole sale markets etc are the major indicators of infrastructure.

[19] 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
Availability of public taps, trained health workers, schools, electricity connection signify strong access to public services.

[20] Technology index =[(Percentage of high yielding verities 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
Technology Index in rural areas refers to technology for farm sector. Availability of tractors, high yielding verities of inputs, pump sets etc signify improvement of technology.
Each index is the simple average of scores obtained from the information given by the respondents for related indicators.

[21] Details on the revenue and expenditure programs as defined in survey questionnaire are following.

- Revenue from higher source (state government, state finance commission, central government certified programs and employment guarantee schemes).
- Revenue from local government (collect land tax, water usage tax, issues stamp papers, other taxes).
- Expenditures (drinking water, sanitation and sewages, roads and transformations, irrigations, electrifications, street lighting, credit & input subsidies, communications, school and education, health facilities, natural resource management, employment programs, social issues and ceremonies and etc).

Table 7 Determinants of coping strategies (Marginal effects in Probit regression model)

Variables	Saving	Help from government	Wage employment	Transfer: borrowing from friends/relatives
Shocks variables				
Ln(Number of covariate shocks)	−0.0216* (0.0127)	0.0069 (0.00177)***	−0.0144*** (0.003)	0.0041 (0.004)
Ln(Number of idiosyncratic shocks)	0.133*** (0.012)	−0.0072*** (0.0019)	0.002 (0.003)	−0.0118*** (0.0036)
Ln(Lagged losses from covariate shocks)	0.0574*** (0.002)	0.0041*** (0.0004)	0.0054*** (0.0005)	0.0048*** (0.0006)
Ln(Lagged losses from idiosyncratic shocks)	0.0247*** (0.003)	0.0009** (0.0004)	0.0037*** (0.0006)	0.0062*** (0.0007)
Household characteristics				
Ln(Age of household)	0.0290 (0.021)	0.0015 (0.004)	−0.0099* (0.0057)	0.0007 (0.0068)
Gender (male = 1, female = 0)	0.0495** (0.0217)	−0.0059 (0.0054)	0.0011 (0.0067)	−0.0041 (0.0083)
Marital status	0.0149 (0.0206)	0.0013 (0.0034)	0.0051 (0.0054)	0.0089 (0.0058)
Ln(No of children (<15 years))	0.0322*** (0.0105)	−0.0035* (0.0019)	−0.0068** (0.003)	−0.0089** (0.0035)
Ln(Mean education of household)	0.0298*** (0.0071)	−0.0003 (0.0012)	−0.0059*** (0.0019)	−0.0044* (0.0023)
Ln(land holdings)	0.0097* (0.0057)	−0.0021** (0.0009)	−0.0081*** (0.0015)	−0.0011 (0.0018)
Household split	0.267*** (0.0539)	−0.0337*** (0.0098)	0.0187 (0.0146)	−0.0335* (0.0176)
Social network	−0.0035* (0.0021)	−0.0001 (0.0003)	0.0002 (0.0005)	0.0002 (0.0007)
Governance variables				
Voted to local representatives	−0.0324* (0.0195)	0.0064*** (0.0023)	0.0039 (0.0042)	0.0347*** (0.0029)
Participated in Gram Sabha meetings	−0.0368*** (0.0120)	0.0207*** (0.003)	0.0057 (0.0036)	−0.0006 (0.0038)
Regime change (male to female Pradhan)	−0.0275** (0.0115)	0.0319*** (0.0036)	0.0015 (0.0032)	0.0173*** (0.0039)
Village characteristics				
Technology index	−0.201*** (0.0543)	−0.0277*** (0.0095)	0.0511*** (0.0145)	0.0310* (0.0176)
Infrastructure index	0.178*** (0.0321)	0.0236*** (0.0059)	−0.0115 (0.0088)	0.0541*** (0.0106)

Table 7 continued

Variables	Saving	Help from government	Wage employment	Transfer: borrowing from friends/relatives
Service index	−0.0701** (0.0279)	0.0180*** (0.0052)	−0.0197*** (0.0077)	0.0181* (0.0093)
Revenue and expenditure programs by government				
Ln(Per capita exp. in public goods)	−0.0016 (0.001)	−0.0003 (0.0003)	0.0002 (0.0003)	−0.0006 (0.0004)
Ln(Per capita exp. in untied resources)	−0.0007 (0.0009)	0.0006** (0.0003)	−0.0001 (0.0003)	0.0001 (0.0003)
Ln(Per capita exp. in welfare programs)	−0.0101*** (0.0027)	0.0026*** (0.0005)	−0.0004 (0.0007)	0.0012 (0.0009)
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

Standard errors are in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source: Authors' Calculation

Table 8 Determinants of coping strategies (Marginal effects in Probit regression model)

Variables	Technology	Selling assets	Starvation	Borrowing from formal and informal sources
Shocks Variables				
Ln(Number of covariate shocks)	0.0079***	0.0086***	0.0027	0.0063*
	(0.003)	(0.002)	(0.0031)	(0.0037)
Ln(Number of idiosyncratic shocks)	−0.0276***	−0.0103***	0.0033	−0.0033
	(0.003)	(0.0022)	(0.0028)	(0.0029)
Ln(Lagged losses from covariate shocks)	0.0032***	0.0021***	0.0067***	0.0014**
	(0.0005)	(0.0004)	(0.0006)	(0.0007)
Ln(Lagged losses from idiosyncratic shocks)	0.0059***	0.0007	0.0018**	0.0064***
	(0.0006)	(0.0004)	(0.0007)	(0.0007)
Household characteristics				
Ln(Age of household)	0.0065	−0.0029	−0.0101*	−0.008
	(0.0049)	(0.0038)	(0.0061)	(0.0063)
Gender (male = 1, female = 0)	0.0043	−0.0015	0.0033	0.0131**
	(0.005)	(0.0048)	(0.0066)	(0.0052)
Marital Status	0.0043	0.0014	−0.0006	−0.0016
	(0.0046)	(0.0037)	(0.0065)	(0.0068)
Ln(No of children (<15 years))	0.0041	−0.0012	0.0079***	0.0054*
	(0.0023)	(0.0019)	(0.0031)	(0.0032)
Ln(Mean education of household)	0.0033*	0.0002	−0.0059***	−0.0026
	(0.0018)	(0.0013)	(0.002)	(0.0021)
Ln(land holdings)	−0.0047***	−0.0013	−0.0057***	0.0008
	(0.0012)	(0.001)	(0.002)	(0.0018)

Table 8 continued

Variables	Technology	Selling assets	Starvation	Borrowing from formal and informal sources
Household split	0.0153	−0.0322***	0.0359**	0.0653***
	(0.0126)	(0.0104)	(0.0158)	(0.0161)
Social network	−0.0007	0.0005	0.0009*	0.0015**
	(0.0005)	(0.0004)	(0.0006)	(0.0006)
Governance variables				
Voted to local representatives	0.0099***	−0.0033	0.0146***	0.0237***
	(0.0034)	(0.0037)	(0.0036)	(0.0031)
Participated in Gram Sabha meetings	0.0170*** (0.003)	0.0013 (0.0023)	0.0152*** (0.0041)	−0.0171*** (0.0034)
Regime change (male to female Pradhan)	0.0012 (0.0028)	0.0051** (0.0023)	−0.0034 (0.0034)	−0.0041 (0.0035)
Village characteristics				
Technology index	0.0425*** (0.0132)	0.0112 (0.0096)	0.0125 (0.0165)	0.0051 (0.0172)
Infrastructure index	0.0246*** (0.0076)	0.0001 (0.0056)	−0.0600*** (0.0099)	−0.0061 (0.0099)
Service index	0.0219*** (0.0068)	−0.0104** (0.0049)	−0.0106 (0.0085)	0.0191** (0.009)
Revenue and expenditure programs by government				
Ln(Per capita exp. in public goods)	−0.0003(0.0003)	−0.0004** (0.0002)	−0.0007** (0.0003)	0.0004 (0.0004)
Ln(Per capita exp. in untied resources)	0.0006** (0.0003)	0.0001 (0.0002)	0.0005* (0.0003)	0.0013*** (0.0003)
Ln(Per capita exp. in welfare programs)	−0.0002 (0.0006)	−0.0016*** (0.0005)	0.0051*** (0.0009)	−0.0019** (0.0008)
Constant	−4.529*** (0.512)	−1.756*** (0.567)	−1.569*** (0.431)	−2.392*** (0.447)
LR Chi^2	620.77***	194.69***	606.09***	348.36***
Observations	8,659	8,659	8,659	8,659

Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source: Authors' Calculation

controlled the analysis with type of shocks, number of occurrence of the shocks, household factors, village factors and indicators of governance. Probit regressions find that households get help from government during the covariate shocks and 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 leads to complete deficiency of public services. The impact of accumulated welfare loss (in monetary terms) from covariate and idiosyncratic shocks from 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 first priority 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.

The number of years of schooling of the household is positively related to saving and negatively related to alternative wage employment.[22] It has theoretical significance in the economy. If households have exposure to education, prefer to dis-save, rather than withdrawing their children from school to get alternative wage employment for the minor members of the family. The probability of starvation has declined for educated households. In the starvation equation, the results show that splited households starve more. These results suggest that the joint family fight better than splited households in the periods of shocks. The splited households starve, and that's why they borrow from formal and informal sources. The lower land holding classes do not have savings. They use wage employment to control damages from shocks. The social networks help the rural households to get borrowings from the relatives. 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 village facilities such as infrastructure index, service index and technology index play an important role on households coping strategies during shocks periods. The results show that technology index has greater chance to increase alternative wage employment and this ensures the households to adopt the technological change to manage shocks. We find that the infrastructure index is positively related to the saving strategy of rural households. The increased village infrastructure and service indices are positively related to the coping strategy of getting help from local government. This result ensures that through improved infrastructure and service

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[22] Alternative wage employment of rural households is the wage employment excludes the employment programs by the government i.e. household engages themselves in the private sectors.

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

Authors' Calculation

Table 10 Effects of coping strategies on Poor Households (Marginal effects in Probit regression model)

VARIABLES	Poor Households (Poor = 1,Non-poor = 0)
Pr(use saving)	0.0071** (0.0037)
Pr(govt. employment program)	0.0075*** (0.0029)
Pr(wage employment)	0.0114*** (0.0006)
Pr(transfers from friends and relatives)	−0.0144*** (0.0007)
Pr(Technology)	−0.0117** (0.0063)
Pr(selling assets)	0.0171*** (0.0052)
Pr(starvation)	0.0054* (0.0032)
Pr(borrowings from formal and informal sources)	0.0016 (0.007)
Constant	−0.692*** (0.0246)
LR chi2	145.82***
Observations	8659

Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

sectors in the rural areas, the scope and accessibility for a healthy environment to reap employment opportunities for rural households may be enhanced.

High income risk, health related shocks and consumption risk are the normal problems for poor households in rural areas. Households do not just undergo the consequences of high risk, but parallelly, 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, therefore, distinguish risk-management from risk-coping strategies. The former affects 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.

From the estimation of effect of coping strategies on poor households shows that Government's 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 welfare by participating in welfare programs provided by government. One cannot ignore the fact that, 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 adversely affects the poor.

5 Conclusion

The incidence of poverty in India is an issue of key concern for both policy practitioners and academic researchers because of its extent and intensity. Vulnerability always threatens the economic development of rural household. Although a constant growth has taken place in developing countries, progress is neither equitable nor sustainable because of growing simultaneous uncertainty due to deeper and more-frequent shocks. More and more financial instability clubbed with high and volatile commodity prices as an impact of recurrent natural disasters to widespread social and political discontent, human development achievements are more exposed to adverse events. As a result, millions of poor, marginalized or socially disadvantaged people remain significantly vulnerable to several risks as they can't cope up with regular economic shocks, health shocks, natural disasters, social conflict and environmental hazards. Unless and until these risks are systematically identified and eliminated through proper risk management techniques, these chronic vulnerabilities could jeopardize the sustainability of human development progress for decades to come. This study tries to bring out the underlying coherence among different shocks and households' choices of opting coping strategies. It also tracks sequence of coping strategies opted by the poor and non-poor households in order to clarify the inconsistency in choice pattern in terms of 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 quite clear that withdrawal of savings is the most frequently chosen coping strategy during idiosyncratic shocks by the households who have used savings as precautionary measures. Inflation is one of the major reasons of idiosyncratic shocks to the rural households. Rural households regularly face it. Lack of information about the market phenomenon in terms of ambiguity between expected demand and aggregate production force uninformed rural farmers to experience the grief. . Sometimes households experience simultaneous shocks from multiple causes which are often unpredictable. Poor households struggle to save at their good time so that in an event of a sudden shock, they can start dis-saving these assets and use them to absorb the shock and get better off for a particular shock. However, people with insufficient core capabilities in terms of, income, education and health, are obviously, less able to exercise their precautionary management. Whereas, relatively non-poor households give priority to dis-saving in response to both, covariate shocks and idiosyncratic shocks as they are able to do so. Non-poor households are more likely to have relatives' and support from other informal sources during the time of distress as they are more creditworthy than

a poor. There is no second opinion that local government have major role in helping the poor households during the periods of shocks. Extremely poor households find no other way but to starve as their choices are restricted or held back by economic and social barriers and other exclusionary practices. Thus, persistent vulnerability reflects deep deficiencies in the provision of public services and inefficiency of existing public policies, institutional norms and governance accountability of welfare programs. Although the empirical results claim that people access welfare programs significantly, percentage of starving poor population during the time of distress signifies that these policies miserably failed to capture targeted population and failed to get responses to vulnerability in order to prevent sudden threats, promote capabilities and protect people from regular and multiple shocks. Other results show that, other available coping strategies are negatively correlated with government programs. Therefore, it also refers that the households participating in the welfare programs are not willing to build their own precautionary techniques for future period. It is state and societal inability which make them unwilling to anticipate and protect themselves against severe external shocks through building their own capabilities. It requires boosting the capacity of individuals, societies and countries to respond to setbacks.

It posits that the government should take up alternative savings or insurance based programs for rural households to reduce adverse outcomes like starving, selling physical assets like houses. Some shocks have been found to be significant causes of substantial reduction in welfare and eventually indirect reason for chronic poverty. There should be policy level interference 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 an efficient public risk control management could make poor households better off without crowding out the informal insurance arrangement. Designing better saving instruments can act as natural safety net.

References

Amendah, Buigut, Mohamed. 2014. Coping Strategies among Urban Poor: Evidence from Nairobi, Kenya. PLOS One 9(1): e83428. Published: January 10, 2014. doi:10.1371/journal.pone.0083428

Basu, K. 1991. The Elimination of Endemic Poverty in South Asia: Some Policy Options. In *The Political Economy of Hunger*, vol. 3, ed. Endemic Hunger. Jean Dreze & Amartya Sen. Oxford: Clarendon Press.

Berloffa, G., and Francesca. 2013. 'Income shocks, coping strategies, and consumption smoothing: An application to Indonesian data'. Journal of Asian Economics, Elsevier, vol. 24(C), pages 158–171.

Bhattamishra, B. 2008. Community-based Risk Management Arrangements: An Overview and Implications for Social Fund Programs. Social Protection Discussion Paper No. 0830. The World Bank, Washington D.C.

Calvo, C., and Dercon, S. 2005. Measuring Individual Vulnerability. Economics Series Working Papers 229. University of Oxford. Department of Economics.

Cameron, Lisa A., and Worswick. 2003. The labor market as a smoothing device: labor supply responses to crop loss. *Review of Development Economics* 7 (2): 327–341.

Carter, and Lybbert. 2012. Consumption versus asset smoothing: testing the implications of poverty trap theory in Burkina Faso. *Journal of Development Economics* 99 (2): 255–264.

Castellanos, and Rahut. 2006. Coping Strategies adopted by rural extreme poor households in Bolivia.mineo. 1–28.

Clarke, D., and Dercon. 2009. Insurance, Credit and Safety Nets for the Poor in a World of Risk. United Nations. DESA. Working Paper No. 81. http://www.un.org/esa/desa/papers/2009/wp81_2009.pdf. Accessed on 20th November 2015.

Dercon, S. 2002. Income risk, coping strategies, and safety nets. *The World Bank Research Observer* 17 (2): 141–166.

Dercon, S. 2005. Risk, poverty and vulnerability in Africa. *Journal of African Economics* 14 (4): 483–488.

Dercon, S., J. Hoddinott, and T. Woldehanna. 2005. 'Shocks and Consumption in 15 Ethiopian Villages', 1999–2004. *Journal of African Economies* 14 (4): 559–585.

Fafchamps, M., and Gubert. 2007. The formation of risk sharing networks. *Journal of Development Economics* 83 (2): 326–350.

Fafchamps, M., and Lund. 2003. Risk-sharing networks in rural Philippines. *Journal of Development Economics* 71 (2): 261–287.

Gaiha, R. 2000. Do Anti-Poverty Programmes Reach The Rural Poor in India? *Oxford Development Studies* 28 (1): 71–95.

Government of India. 2008. The National Rural Employment Guarantee Act 2005 (NREGA), Operational Guidelines 2008; Ministry of Rural Development Department of Rural Development, Government of India. http://nrega.nic.in/nrega_guidelineseng.pdf.

Heltberg, and Lund. 2009. Shocks, Coping, and Outcomes for Pakistan's Poor: Health Risks Predominate. *Journal of Development Studies* 45 (6): 889–910.

http://www.gktoday.in/government-schemes-in-india/http://www.gktoday.in/government-schemes-in-india/. Accessed on 27 December 2015.

http://www.pewtrusts.org/~/media/assets/2015/10/emergency-savings-report-1_artfinal.pdf. Accessed on 03 May 2016.

http://hdr.undp.org/sites/default/files/hdr14-report-en-1.pdf. Accessed on 03 May 2016.

Jha, R., Nagarajan, and Pradhan. 2012. 'Household Coping Strategies and Welfare: Does Governance Matter?'. NCAER. Working Papers on Decentralization and Rural Governance in India, Number 14.National Council of Applied Economic Research, New Delhi.

Kazianga, H., and C. Udry. 2006. Consumption smoothing? Livestock, insurance and drought in rural Burkina Faso. *Journal of Development Economics* 79 (2): 413–446.

Klonner, S., and Oldiges. 2014. 'Safety Net for India's Poor or Waste of Public Funds? Poverty and Welfare in the Wake of the World's Largest Job Guarantee Program'. Discussion Paper Series No. 564, Department of Economics, University of Heidelberg.

Kochar, A. 1999. 'Smoothing Consumption by Smoothing Income: Hours-Of-Work Responses to Idiosyncratic Agricultural Shocks in Rural India'. The Review of Economics and Statistics, February 1999, 81(1): 50–61.

Kozel, V., Fallavier, P., and Reena Badani. 2009. 'Risk & Vulnerability Analysis in World Bank Analytic Work, 2000-07'. Social Protection Discussion Paper No. 0812. The World Bank, Washington D.C.

http://siteresources.worldbank.org/SOCIALPROTECTION/Resources/SP-Discussion-papers/Social-Risk-Management-DP/0812.pdf. Accessed on 31 January 2016.

Krueger, Mitman, and Perri. 2016. 'On the Distribution of the Welfare Losses of Large Recessions'. Staff Report 532, July 2016, Federal Reserve Bank of Minneapolis, Minneapolis. https://www.minneapolisfed.org/research/sr/sr532.pdf. Accessed on 08 August 2016.

Lal, R., Miller, S., Lieuw-Kie-Song, M., and Kostzer, D. 2010. 'Public Works and Employment Programmes: Towards a Long-Term Development Approach'. International Policy Centre for Inclusive Growth Working Paper No.66.

Mazumdar, Sumit. et.al. 2014. 'Multiple Shocks, Coping and Welfare Consequences: Natural Disasters and Health Shocks in the Indian Sundarbans'. PLOS One, Open Access Journal.Published: August 29, 2014. doi:10.1371/journal.pone.0105427. Accessed on 5 July 2015.

Okamoto, I. 2011. How do poor rural households in Myanmar cope with shocks? Coping strategies in fishing and farming village in Rakhine state. *The Developing Economies* 49 (1): 89–112.

Rashid, D. A., Langworthy, M., and Aradhyula, S. V. 2006. 'Livelihood Shocks and Coping Strategies: An Empirical Study of Bangladesh Households', 2006 Annual meeting, July 23-26, Long Beach, CA 21231, American Agricultural Economics Association (New Name 2008: Agricultural and Applied Economics Association).

Tongruksawattana, S., Hermann Waibel, and Erich Schmidt .2010. 'How do Rural Households Cope with Shocks? Evidence from Northeast Thailand'. Paper prepared for the CPRC International Conference 2010: Ten Years of War Against Poverty hosted by the Brooks World Poverty Institute at the University

of Manchester 8-10 September 2010 1-20. http://www.chronicpoverty.org/uploads/publication_files/tongruksawattana_waibel_schmidt_thailand.pdf. Accessed on 7 September 2014.

Townsend, R. 1994. Risk and Insurance in Village India. *Econometrica* 62: 539–592.

Udry, C. 1994. Risk and insurance in a rural credit market: An empirical investigation of Northern Nigeria. *Review of Economic Studies* 61 (3): 495–526.

"Understanding Poverty in India", ADB, 2011. http://www.im4change.org/docs/understanding-poverty-india.pdf

World Bank. (2013). World Development Report 2014: Risk and Opportunity. Managing Risk for Development. Washington, DC. http://www.pewtrusts.org/~/media/assets/2015/10/emergency-savings-report-1_artfinal.pdf. Accessed on 2 September 2015.