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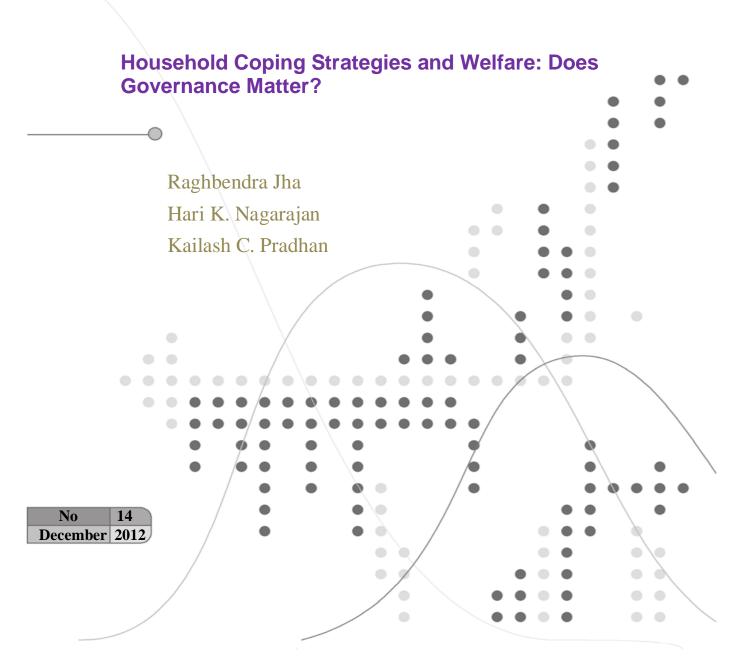
Household Coping Strategies and Welfare: Does Governance Matter?

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Household Coping Strategies and Welfare: Does Governance Matter?[1]

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Abstract

Rural households in India are often confronted by various types of risks — covariate (e.g. natural disasters, economic or political crisis) and idiosyncratic (e.g. illness or job-los) shocks. When faced with such risks even non-poor members of the society can be vulnerable if it has ineffective or constrained coping instruments. This study analyses the relationship between shock types and coping decisions of rural households, and the impact of these coping strategies on consumption using the ARIS/REDS panel survey data. We find that rural households will be more vulnerable in time of covariate shocks. Social networks help to get borrowings from friends and relatives during shocks periods. The results indicate that rural government programs contribute significantly to manage distress shocks. We find that the coping strategies such as savings, getting help from government, technological up-gradation and selling assets increase the chance of consumption growth of households. Other coping strategies such as getting alternative wage employment, getting help from relatives, and starvation are risky coping strategies and, these decline the chance of consumption growth of households.

Overall, the results suggest that shocks experienced by rural households are likely to negatively affect their future welfare and more effective social risk management strategies are needed. An important policy implication of our analysis is that the government should provide readily accessible and well targeted public safety nets. The existing informal strategy is not very effective as a consumption insurance mechanism. Although the government coping program is found to reduce vulnerability access to such program is constrained. Expansion of government sponsored coping program is likely to protect households effectively from negative shocks.

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1. Introduction

The policy of inclusive growth adopted by India as part of the 11th five year plan puts a lot of emphasis on reducing poverty and vulnerability and significantly increased government expenditures on programs, many of which involve implementation via Panchayats or in association with them. Unequal access to services, mis-targeting of programs, programs capture, bribes, and inefficiencies in program delivery, are all manifestations of poor governance. All of these can have significant adverse economic impacts on households' poverty and vulnerability, which can be reduced or removed with improved quality of local governance[2].

In India poverty is typically defined as a state in which consumption expenditure is less than some acceptable norm. The head count ratio of poverty thus measures the proportion of the population that is in this state, i.e., is poor. Hence, poverty is an *ex post* concept. Local institutions like the Panchayats can play a significant role in poverty reduction if policy were to instead focus on an ex ante concept which can actually be influenced, i.e., vulnerability**.** In rural areas where households face high risk of falling into poverty in the future due to external adverse shocks. It is essential to understand shocks and their consequences on household consumption to develop effective poverty alleviation strategies that strengthen existing coping measures. This will then allow us to examine not only the dynamics of poverty but also important determinants of coping strategies. Therefore, this study makes use of a large scale panel household survey to analyse the effects of common shocks on consumption of rural households and to assess their behaviour regarding decisions to take coping action and the choice of coping measures.

Households in villages are often confronted by two types of risks – covariate (e.g. natural disasters, pest attacks on crops in the village, etc) and, idiosyncratic (e.g. illness, job-loss etc) shocks. Both types of risk could render even non-poor members of the villages vulnerable if any of these risk events occur when the household level coping mechanisms are either ineffective and (or) constrained. For example, if a preferred coping strategy of households is

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[2] In Binswanger, H. and et al (2012a,b,c) political reservations improved quality of governance which can have positive effects on a range of services such as water, education and health — all of which, in turn, lead to improvements in economic welfare of the households.

accessing welfare programs and, if participation is restricted or prevented either due to improper targeting or because of program capture, then we can say that the coping mechanisms have been constrained by inefficiencies associated with the Panchayati Raj institutions or other institutions involved in the program. If household income (consumption) is significantly covariate then the informal sources of insurance such as family networks are likely to become ineffective and if these are the only sources of insurance, then such households are prone to become vulnerable due to covariant shocks. This paper is therefore concerned with identifying the magnitude of exposure to risks (and its components), and the instruments that households use for ex ante risk management and ex post risk coping.

We wish to examine whether in response to covariate shocks households are tending to sell assets, or with draw children from school? Do they attempt access the centrally sponsored welfare programs? Answers to such questions are important in the context of the Panchayati Raj framework for such institutions have been designed to improve access by households to welfare programs and hence not resort to second best coping mechanisms that could have long term adverse consequences. Similarly with respect to idiosyncratic risks it is pertinent to ask whether households are unable to access credit, health facilities, or apply for a scheme like the MGNREGS. The Panchayats have a strong role in administering the employment guarantee schemes and if they are properly administered then household level impact of a sudden job loss will be minimized.

To address these research objectives the plan of this paper is as follows: Section 2 describes the literatures on determinates of various coping strategies and the impact of these coping strategies on consumption. We briefly describe the data sets used in the section 3, followed by the discussion of the econometric methodology in section 4. Section 5 presents and discusses the results of our estimation. Section 6 offers policy conclusion.

2. Literature
Literature on determinates of coping strategies and its impact on household consumption, is abundant. Gabriella and Francesca (2009) found that in Indonesian data, 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 confirm 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 (2006) 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, I (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.

In this paper we shall examine the coping strategies adopted by households of different types in Indian villages. We do not differentiate between whether such strategies were adopted as a reaction to idiosyncratic risks or covariate risks. Instead the average probability of any one of the coping strategies adopted in response to an average shock is examined. We predict the probability of such coping strategies after controlling for various household, village and governance variables. Since coping strategies could be endogenous to consumption, we use these predicted values to explain consumption.

We expect that with the progress in the reforms associated with the Panchayati Raj institutions, households have to resort less to strategies such as reducing consumption, not sending children to schools, or selling of assets and land. These strategies can have long term adverse consequences for the households. But, more importantly, if households are more likely to adopt such strategies then that reflects on quality of local governance.

3. Data and descriptive statistics

The data for this paper are based on the ARIS/REDS surveys of 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[3]and, collected over six rounds encompassing the period 1969 to 2006.[4] 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

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[3] 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.

[4] 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.

and the 1999 round.[5]

The data are in three parts viz., listing, community, and the household schedule. In the rounds prior to 2006[6] 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 descriptive statistics for the 1999 and the 2006 rounds are reported in table 1. The household size has been declined by slightly more than 14% and the average number of children is less that 2 per household (a decline of 23%). The average years of schooling at the household level remains low. To the extent that literacy can affect adjustment of coping mechanism during the distress periods. Consumption expenditures have increased about 22 percent and household incomes have increased about 69 percent. It suggests that rural households save more for future to manage the uncertain distress events. The poverty has declined from 31 percent to 25 percent. However, the Gini index suggests that inequality has increased significantly and has in fact gone up from 19 to 23 percent.

On an average, villages have become better connected to urban centers, and the per capita availability of infrastructure and public goods has improved. The provision of public goods like public tap, drinking water, street lighting and sanitation has improved. The proportion of cultivated area has remained stagnant, suggesting that agricultural income growth has to come primarily from productivity growth. Welfare indicators such as number of brick houses, multi-

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[5] 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. This way the sample remains representative.
[6] The listing component of the survey was completed in 2006 while the household survey was administered between 2007 and 2008.

storied houses and agricultural wage rates, have improved over this time period.

The summary table for covariate shocks and idiosyncratic shocks has given in the table 2. Most percentage of households was affected by covariate shocks than idiosyncratic shocks. On an average, 52 percentage of households were experienced both the covariate and idiosyncratic shocks. The households were faced most of 8 times shocks due to increases of prices. The average monetary loss by households is higher in covariate shocks than the idiosyncratic shocks. This is important to note that the intervention of local governance is needed to endorse rural employments programs, food subsidies and facilitate rural credit. In order to cope-up with covariate shocks, there is an urgent need for better management of water to become more water sensitive to reduce risks and to share water for the life and security of all through capacity building of community by sensitising them on flood and drought disasters for taking preparedness and mitigation measures.

In the table 3.1, 3.2 and 3.3, we discussed the 8 important coping strategies to overcome the shocks periods by the household. This shows that 60 percentages of households are using saving strategy than other coping strategies during the shocks periods. About 9 percentage households are getting help from the local government during the shocks periods. This finding suggests that the rural household do not depend on local government. They manage the distress periods using the coping strategies such as: saving, finding alternative wage employment and increasing productivity. Nevertheless the household has to borrow money from relatives, formal/informal sources, selling of assets and reduce consumption. If the distress shocks occur again in a year, then 19 percentages of households sell their assets, 15 percentages households reduce their consumption and 23 percentages of households borrow money from formal and informal sources. It seems that households did not have saving to manage shocks again in a year and only 8 percentage of households could get help from the government. If the distress events take place again after 5 years, then 52 percentages of households predict to use savings as a coping strategy and in fact 12 percentages of households hope to get help from the local government.

Rural households are so vulnerable that's why when they would not get any sources to cope during the distress periods they have to reduce consumption or starve. Here the question arises

who does starve within the households? Here we stress the starvation by the male and female household between 1999 and 2006. During the periods of covariate shocks the percentages of male households starve more than female households in both the periods 1999 and 2006. The starvation has been declined for female households. On the other hand, the percentage of female starving has been increased in the period of idiosyncratic shocks. This may be the cause for malnutrition and under-nutrition of female households in the rural India.

4. Methodology

We estimate the effects of various coping strategies on growth of household consumption expenditure. We also examined the household behaviors and role of rural governance during the shocks. We first estimated the determinants of coping strategies by the Probit model. The growth of consumption equation is estimated using the predicted coping strategies since the variables associated with coping strategies during shocks are endogenous to growth of consumption expenditure. These regressions will enable us to link the results to policy. The relationship between consumption and various coping strategies are written as follows.

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

$$\Delta C_{it} = \alpha_0 + \alpha_1 \bar{I}_{jt} + \beta_k \hat{S}_{kit} + \varepsilon_{it} \tag{2}$$

Where, i is ith households, t is the time period and j is jth villages. S_{kit} is a vector of kth qualitative dependent variables that includes various coping strategies such as use saving, help provided from local government, alternative wage employment, borrowings or received financial help from relatives/friends, technological changes to improve productivity, selling of 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 from 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 index[7], service index[8] and technology index[9], and revenue and expenditure programs by the governments on public goods, untied resources and welfare programs.

$\ln C_{it} - \ln C_{it-1}$ or ΔC_{it} is the growth of consumption expenditure of the household between 1999 and 2006. $\Delta \bar{I}_{jt}$ is the village average net of own income[10], $\hat{S}_{kit}$ is kth predicted coping strategies of ith households.

The coping strategies in the vector S_{kit} could be potentially endogenous to household consumption expenditure. Therefore we predicted the coping strategies. These are chosen to reflect the stated hypotheses. 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) $E(Z'\varepsilon) = 0$ (i.e., the explanatory variables are uncorrelated with error terms).

5. Results

The results discuss the determinants of coping strategies and impact of coping strategies on household welfare. The estimated Probit regression results of determinants of coping strategies are presented in the table 5. Basically the households adopt different coping strategies in periods of distress shocks. Here the results find that households get help from government during the covariate shocks and use saving during the idiosyncratic shocks. Rural households utilize more

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[7] 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

[8] 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

[9] 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

[10] The average net of own income growth at the village level compares the own income with other households at the village. It estimated the average income growth at the village level excluding his/her income.

savings compare to other coping strategies during the idiosyncratic shocks. The results show that 15 percentage chance of starvation during the covariate shock. This leads that the rural governance is ineffective to control the starving. The households also sell assets, get help from relatives, borrow from formal and informal sources, and adopt new technology to increase production to manage distress shocks.

The results have shown that the households are having more number of children will cope with using savings, upgrading technology and starving in the shocks periods. Education of the household has positively related to saving and negatively related to alternative wage employment. The probability of starvation has declined for educated households. The richer land holding classes use savings and upgrade the technology to manage distress shocks. The splited households starve, and borrow from formal and informal sources. It is interesting to look that social networks helps to get borrowings from friends and relatives to manage during shocks periods.

The governance variables are positively related to coping strategy. 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. These results suggest that they get help from the local government and the coefficients are very lager and positively significant. Here we conclude that local government have major role to help the rural household during the shocks periods conditioned if the household voted to them. The results also show that if the Pradhan changes from male to female then households participated in government programs during shocks periods. Still households starve and rural governance is not insuring starving completely.

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 households and this ensures the rural households to adopt the technological change to manage shocks. The infrastructure index has increased saving strategy of households. The increased village infrastructure and service indices ensure positively to get help from local government.

The results find that rural government programs contribute significantly to manage distress shocks. The results reveal that the household participation in wage employment has increased by the government programs. Other coping strategies are negatively related with government programs. It posits that the government should provide more revenue and expenditure programs for rural households.

In table 6, we find that average net of own income growth at the village level has increased the consumption growth of households. This result suggests that the consumption of households has directly related with income growth of the village. This is due to the mutual insurance in villages. Also we find that the coping strategies such as savings, getting help from government, technological up-gradation and selling assets increase the chance of consumption growth of households. Other coping strategies such as getting alternative wage employment, getting help from relatives, and starvation decline the chance of consumption growth of households.

6. Conclusion and policy implications

Rural households in India are vulnerable to shocks and hence are at risk of falling into poverty in the future. The results find that saving is the most important coping strategy during idiosyncratic shocks and in the periods of covariate shocks, households get help from government. Rural households face around 15 percentage chance of starvation during the covariate shock. These results reveal that rural households will be more vulnerable in time of covariate shocks. The educated households starve less. The richer land holding classes use savings and upgrade the technology to manage distress shocks. The splited households are vulnerable and they starve, and borrow from formal and informal sources. We find that social networks help to get borrowings from friends and relatives during shocks periods. The evidence from village facilities has positive impact on households coping strategies during shocks periods. The results find that rural government programs contribute significantly to manage distress shocks. The consumption of households has directly related with income growth of the village. This is attributable to mutual insurance in the villages. We find that the coping strategies such as savings, getting help from government, technological up-gradation and selling assets increase the chance of consumption growth of households.

Overall, the results suggest that shocks experienced by rural households lead to losses in income and assets. Hence, more effective social risk impact instruments are needed to enhance the capacity of rural households to cope with the negative effects of shocks. The local governance should give more attention for public safety nets to assist poor households in rural areas as they are mostly affected by covariate and idiosyncratic shocks. The local government should undertake immediate action to deal with covariate shocks. In addition, healthcare and social insurance systems should be improved to ease the expense burden due to medical and hospital treatment. The education system should be improved and this may aware the rural households to handle shocks wisely. Conversely, precautionary measures should be provided for households with higher income and wealth level to prevent them from shocks.

References

1. Binswanger, H., H. Nagarajan, and S. Nag. (2012a). Political Economy of Water Security in India, NCAER-IDRC working paper.
2. Binswanger, H. H. Nagarajan, and S. Singh. (2012b). Public Spending and Private Outcomes: The Case of Rural Schooling in India. NCAER-IDRC working paper.
3. Binswanger, H., H. Nagarajan, and K.C Pradhan. (2012c). Managing Health Outcomes through Local Governance, NCAER-IDRC working paper.
4. Cameron, Lisa A. and Christopher Worswick. (2003), "The Labor Market as a Smoothing Device: Labor Supply Responses to Crop Loss", *Review of Development Economics* 7, no. 2: 327-341.
5. Castellanos Iván Velásquez and Rahut D.B. (2006), "Coping Strategies adopted by rural extreme poor households in Bolivia", 1-28.
6. Dercon, Stefan. (2002), "Income Risk, Coping Strategies and Safety Nets." WIDER Discussion Paper no. 2002/22, 1-44.
7. Gabriella, B. and Francesca M. (2009), "Income Shocks, Coping Strategies, and Consumption Smoothing. An Application to Indonesian Data", Università degli Studi di Trento, Discussion Paper No. 1-30.
8. 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, no. 1: 89–112.
9. Rashid, Dewan Arif, Langworthy, Mark and Aradhyula, Satheesh 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).
10. Tongruksawattana, S., Hermann Waibel and Erich Schmidt (2010), "How Do Rural Households Cope With Shocks? Evidence from Northeast Thailand", 1-20.

Table 1: Village and household characteristics: 1999-2006

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
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
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**	**-**

Table 2: Descriptive of covariate and idiosyncratic shocks

Variables	Household experience the effects of such distress events	Percentage of households affected such distress events	Average number of impacts per year (1999-2008)	Average cumulative losses (1999-2008)	Average losses in the latest episode
General/covariate Shocks					
Shocks 1: Crop loss, water borne diseases, loss of property, cyclone/floods/hailstorm	3,199	36.94	2.22	13136.08	7857.74
Shocks 2: Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	2,077	23.99	1.61	13683.53	7457.83
Idiosyncratic Shocks					
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	171	1.97	2.01	4981.11	7085.61
Shocks 4: Sudden health problems/accidents	640	7.39	1.32	8591.82	5047.63
Shocks 5: Crop failure, bore well/open wells for irrigation purposes dried up	775	8.95	1.77	12130.19	7502.71
Shocks 6: Price increase	1,191	13.75	8.40	5194.82	1537.30
Not experienced the effects of shocks	4,156	48.00	-	-	-
Total number of households			8659		

Table 3.1: Relationship between household shocks and their coping strategies

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									
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	1.92	39.08
Shocks 2: Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	15.55	3.35	1.47	1.17	1	0.67	2.05	0.81	26.08
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	9.22	0.21	0.87	2.11	0.01	0.07	2.06	0.18	14.74
Total	**59.45**	**9.01**	**4.67**	**6.71**	**6.06**	**2.4**	**6.36**	**5.33**	**100**

Table 3.2: Relationship between household shocks and their coping strategies (If distress events occur again in year)

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									
Shocks 1: Crop loss, water borne diseases, loss of property, cyclone/floods/hailstorm	1.76	3.26	7.08	2.44	0.47	6.65	4.37	7.46	33.49
Shocks 2: Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	1.63	3.9	2.06	2.02	2.36	4.29	1.2	4.55	22
Idiosyncratic Shocks									
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	0.04	0.13	0.17	0.26	0.04	0	0.21	4.25	5.1
Shocks 4: Sudden health problems/accidents	0	0.04	7.46	0.21	0.04	0.17	1.42	2.36	11.71
Shocks 5: Crop failure, bore well/open wells for irrigation purposes dried up	0.26	0.69	0.34	0.39	1.2	7.46	0.17	1.72	12.22
Shocks 6: Price increase	0.43	0.17	1.89	1.93	0	0.51	7.68	2.87	15.48
Total	**4.12**	**8.19**	**19**	**7.25**	**4.12**	**19.08**	**15.05**	**23.2**	**100**

Table 3.3: Relationship between household shocks and their coping strategies (If distress events occur again after 5 years)

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									
Shocks 1: Crop loss, water borne diseases, loss of property, cyclone/floods/hailstorm	19.16	5.98	1.08	3.89	3	1	1.58	2.56	38.24
Shocks 2: Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	14.39	4.45	0.96	3.61	1.77	0.49	0.83	1.41	27.91
Idiosyncratic Shocks									
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	1.44	0.44	0.13	0.21	0.04	0.15	0.07	0.2	2.68
Shocks 4: Sudden health problems/accidents	4.29	0.24	0.11	0.83	0.03	0.27	0.09	0.64	6.48
Shocks 5: Crop failure, bore well/open wells for irrigation purposes dried up	4.57	0.47	0.24	0.6	2.89	0.25	0.13	0.97	10.12
Shocks 6: Price increase	7.71	0.39	1	2.4	0.05	0.16	2	0.88	14.58
Total	**51.55**	**11.96**	**3.51**	**11.53**	**7.78**	**2.32**	**4.7**	**6.66**	**100**

Table 4: Descriptive of starvation

Variables	2006				1999			
	Percentage of members of households without two square meals due to shocks		Average number of days starvation		Percentage of members of households without two square meals due to shocks		Average number of days starvation	
	Male	Female	Male	Female	Male	Female	Male	Female
General/covariate Shocks								
Shocks 1: Crop loss, water borne diseases, loss of property, cyclone/floods/hailstorm	60.84	39.16	6.01	5.30	57.14	42.86	2.70	2.79
Shocks 2: Bore wells dried up, pucca/kuchha wells dried up, public-taps non-usable, drought	53.70	46.30	4.59	2.52	51.22	48.78	3.86	4.05
Idiosyncratic Shocks								
Shocks 3: Mounting debt associated with education/health/cultivation, starvation & suicide	20.00	80.00	1.00	1.75	0.00	100.00	0.00	2.00
Shocks 4: Sudden health problems/accidents	41.67	58.33	3.60	3.00	0.00	0.00	0.00	0.00
Shocks 5: Crop failure, bore well/open wells for irrigation purposes dried up	33.33	66.67	2.00	4.00	0.00	0.00	0.00	0.00
Shocks 6: Price increase	40	60	2.50	2.33	50.00	50.00	3.00	3.00
Total	**56.36**	**43.64**	**5.46**	**4.16**	**20.00**	**80.00**	**3.29**	**3.47**

Table 5: Determinants of coping strategies

VARIABLES	Saving	Help from government	Wage employment	Coping strategies Transfer: borrowing from friends/relatives	Technology	Selling assets	Starvation	Borrowing from formal and informal sources
Shocks Variables								
Ln(Number of covariate shocks)	-0.0560	0.161**	-0.213***	0.0224	0.199***	0.285***	0.152***	0.0911
	(0.0454)	(0.0659)	(0.0661)	(0.0616)	(0.0657)	(0.0807)	(0.0585)	(0.0685)
Ln(Number of idiosyncratic shocks)	0.434***	-0.140**	0.0285	-0.225***	-0.564***	-0.267***	-0.0443	-0.0190
	(0.0429)	(0.0659)	(0.0537)	(0.0593)	(0.0644)	(0.0851)	(0.0545)	(0.0553)
Ln(Lagged losses from covariate shocks)	0.160***	0.131***	0.0850***	0.0788***	0.0674***	0.0666***	0.0962***	0.0122
	(0.00707)	(0.0126)	(0.0118)	(0.0107)	(0.0118)	(0.0159)	(0.0114)	(0.0121)
Ln(Lagged losses from idiosyncratic shocks)	0.0764***	0.0271*	0.0749***	0.0799***	0.114***	0.0336*	0.0238*	0.0998***
	(0.00861)	(0.0145)	(0.0126)	(0.0113)	(0.0111)	(0.0175)	(0.0130)	(0.0115)
Household characteristics								
Ln(Age of household)	0.0238	0.154	-0.160	0.132	0.189	0.157	-0.122	-0.160
	(0.0759)	(0.140)	(0.128)	(0.118)	(0.134)	(0.169)	(0.123)	(0.121)
Gender (male=1, female=0)	0.103	-0.132	0.0937	-0.0473	0.0429	-0.0352	0.0351	0.242
	(0.0840)	(0.160)	(0.157)	(0.131)	(0.166)	(0.195)	(0.147)	(0.150)
Marital Status	0.0429	0.0383	0.0308	0.0783	0.123	0.142	0.0698	0.0646
	(0.0741)	(0.140)	(0.133)	(0.119)	(0.141)	(0.177)	(0.125)	(0.126)
Ln(No of children (<15 years))	0.0737**	-0.0568	-0.103	-0.175***	0.108*	0.00528	0.178***	0.00783
	(0.0369)	(0.0703)	(0.0661)	(0.0615)	(0.0648)	(0.0799)	(0.0584)	(0.0605)
Ln(Mean education of household)	0.0675***	-0.00786	-0.109**	-0.0739*	-0.00303	-0.00302	-0.0701*	-0.0618
	(0.0259)	(0.0480)	(0.0424)	(0.0384)	(0.0465)	(0.0561)	(0.0421)	(0.0413)
Ln(land holdings)	0.0229***	-0.0133***	0.00106	-0.0154***	0.0272***	-0.00551	0.00339	0.0156***
	(0.00289)	(0.00511)	(0.00510)	(0.00430)	(0.00599)	(0.00642)	(0.00505)	(0.00509)
Household split	-0.118	-0.705*	0.327	-0.513	-0.543	-1.220**	1.251***	0.834**
	(0.223)	(0.401)	(0.380)	(0.340)	(0.404)	(0.492)	(0.366)	(0.371)
Social network	-0.0215***	4.48e-05	0.00357	0.0187*	-0.00535	0.0164	0.0232**	0.0169
	(0.00751)	(0.0126)	(0.0120)	(0.0111)	(0.0126)	(0.0158)	(0.0115)	(0.0121)
Governance variables								
Voted to local representatives	-0.0173	0.994***	-0.0391	0.659***	0.518***	0.0352	0.346***	0.610***
	(0.0693)	(0.185)	(0.101)	(0.150)	(0.156)	(0.142)	(0.111)	(0.138)
Participated in Gram Sabha meetings	-0.107**	0.578***	0.119	0.0354	0.386***	-0.0149	0.203***	-0.312***
	(0.0439)	(0.0778)	(0.0757)	(0.0656)	(0.0718)	(0.0966)	(0.0712)	(0.0725)
Regime change (male to	-0.0821**	0.844***	0.0954	0.282***	-0.0134	0.0799	-0.0628	-0.00210

female Pradhan)	(0.0413)	(0.0846)	(0.0691)	(0.0630)	(0.0727)	(0.0906)	(0.0658)	(0.0660)

Village characteristics

Technology index[11]	-0.390*	-1.486***	0.650*	0.0432	1.481***	-0.0970	0.354	0.353
	(0.203)	(0.366)	(0.339)	(0.313)	(0.366)	(0.432)	(0.327)	(0.340)
Infrastructure index[12]	0.547***	0.967***	0.0648	0.607***	0.826***	0.169	-0.934***	-0.0493
	(0.115)	(0.213)	(0.190)	(0.179)	(0.206)	(0.243)	(0.190)	(0.188)
Service index[13]	-0.129	0.580***	-0.484***	0.222	0.607***	-0.382*	-0.0754	0.266
	(0.101)	(0.201)	(0.176)	(0.162)	(0.184)	(0.215)	(0.167)	(0.176)

Revenue and expenditure programs by government

Ln(Per capita exp. in public goods)	-0.00719**	0.00611	0.00429	-0.00202	-0.00442	-0.0157**	-0.00525	0.00588
	(0.00350)	(0.0102)	(0.00634)	(0.00603)	(0.00686)	(0.00691)	(0.00604)	(0.00671)
Ln(Per capita exp. in untied resources)	-0.00310	0.0154*	-0.00400	0.00203	0.0134**	-0.00289	0.00273	0.0223***
	(0.00304)	(0.00937)	(0.00530)	(0.00555)	(0.00669)	(0.00650)	(0.00525)	(0.00635)
Ln(Per capita exp. in welfare programs)	-0.0136	0.0403**	0.00270	-0.00562	-0.00821	-0.0436**	-0.0675***	-0.0346**
	(0.00978)	(0.0177)	(0.0162)	(0.0147)	(0.0159)	(0.0216)	(0.0167)	(0.0149)
Constant	-1.419***	-5.512***	-1.540***	-3.778***	-4.882***	-2.931***	-1.994***	-2.279***
	(0.333)	(0.663)	(0.564)	(0.537)	(0.627)	(0.738)	(0.543)	(0.549)
Predicted coping strategies	0.335	0.052	0.038	0.051	0.045	0.018	0.050	0.045
LR Chi2	1970.67***	758.19***	210.80***	309.01***	465.55***	122.90***	412.54***	272.22***
Observations	**5,885**	**5,885**	**5,885**	**5,885**	**5,885**	**5,885**	**5,885**	**5,885**

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[11] 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

[12] 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

[13] 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

Table 6: Effects of coping strategies on consumption growth

VARIABLES	P.C. Consumption growth
Village average net of own income	0.0469***
	(0.0112)
Pr(use saving)	0.191*
	(0.101)
Pr(govt. employment program)	1.470***
	(0.254)
Pr(wage employment)	-3.660***
	(0.615)
Pr(transfers from friends and relatives)	-2.873***
	(0.556)
Pr(Technology)	1.604***
	(0.277)
Pr(selling assets)	1.674**
	(0.825)
Pr(starvation)	-0.0402
	(0.310)
Pr(borrowings from formal and informal sources)	-0.549
	(0.377)
Constant	-0.304**
	(0.127)
F-test	20.42
Observations	5,885

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