Impact of Income Shocks on Asset Portfolio of Rural Indian Households: an Empirical Analysis

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Abstract

People who live in low income economies often have to cope, not only with severe poverty, but also with extremely variable income. The high prevalence of risk in low economies implies that people's ability to manage uncertainty is critical for both productivity and their mere survival. This paper examines the effects of income shocks on the saving decision of rural households i.e. how an unpredictable peculiar income shock affects the composition of asset portfolio of rural households. A sincere attempt is made to gauge the effects of unanticipated health and weather related income shocks on the saving decision of a rural household. This study uses an "Ordinary Least Squares Regression" to analyze the saving behavior of households in response to health and weather shocks. The significant finding of this study is that the volatility of income adds to poverty of rural households by forcing them to reduce stocks of productive assets in order to accumulate liquid assets. Results show that income shocks related to health are more significant to lead them to this than weather related income shocks. In view of the diversity of the structure of rural Indian households (like joint, nuclear and stem house holds.); impact of income shocks has been studied for all categories of rural households. It reveals significant differences in savings behavior between nuclear and joint households. Since, the study has found very strong link between health and income (for low income level), poor are more susceptible to an unpredictable health shock. Hence, the policy implication of the present paper is that the income of rural households can be raised considerably if government tends to design and introduce the appropriate micro health insurance schemes keeping in view the different behavior of joint and nuclear households.

Keywords: *asset portfolio; rural households; income volatility; health and weather shocks; household structure; India*

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Introduction

The rural poor tend to save for a variety of reasons. Most of which are aimed at ex ante protection against risk and ex post management of risk. Individuals and households in rural India are vulnerable to substantial risks. Among the most severe is the risk that drought or excessive rain can cause crop failure, leading to substantial hardship. Most of the economic activities in rural areas are very sensitive to the quality of the monsoon. Savings are seen as one way of mitigating risk, especially of income variability in poor households. The risk of crop failure or of unemployment means households either build up savings or attempt to gain access to loans. Saving is therefore a type of self-insurance. Poor households are unlikely to save much, already finding hard to gain sufficient income to satisfy minimum consumption needs.

Ramaswami and Ravi (2003) provides a comprehensive overview of types of risks that rural Indian households face and outline different management techniques employed by households and communities to mitigate such risks. Risks interact to form a complex risk environment and gives rise to a complex range of risk management strategies. These strategies can be broadly grouped into precautionary strategies and response or loss management strategies.

Deaton (1991) shows that in the absence of complete financial markets, prudent households may accumulate and draw stocks of physical or financial assets to maintain consumption levels that vary slightly from time to time. The more variable the future income, the higher would be the incentives to save for a rainy (dry) day. It is thus expected that households who face greater uncertainties due to poor health and weather variability across season would have more precautionary saving and their asset portfolio would be more liquid.

The implication of income variability on consumption has been central theme of much research in developing economies (Deaton, 1991; Paxson, 1992; Urdy, 1994). However, income variability implies consumption variability only if households do not use mechanism to insulate consumption from income fluctuations across periods. The bulk of studies; providing most of the insights on consumption smoothing use weather as the major source of income variability (Czukas et al., 1998;

Dercon and Krishnan, 2000; Kinsey et al., 1998). While weather is an important source of risk in rain-fed agriculture, health uncertainties have increasingly become important (Lundberg et al., 2003).

There is a stream in developing economies that argues that anticipated and unanticipated income volatility contribute significantly to chronic poverty of rural households. The main line of argument is that the lack of insurance markets in such economies, in conjunction with imperfectly functioning credit markets, forces households to accumulate assets primarily to smooth consumption. Such behavior, it is claimed, leads to portfolios that favor comparatively low yielding liquid assets over high yielding illiquid assets such as physical capital is required to increase crop incomes. This way, households experience lower wealth and hence higher poverty.

There have also been a number of studies which show that households in developing economies are forward looking and savings decisions reflect expectations of future income. However, very few studies have looked at the effects of such expectations on asset portfolios. This study is able to do so by exploiting detailed savings portfolio data and household level income shocks data.

Objective of the Study

Keeping in view the research motivation, the main objective of the study is as:

To study the behavior of rural households ex post to an unanticipated income shock and examine whether their asset portfolio is affected by the nature of income shock which they have faced and the household structure.

It is important to mention that unanticipated income shocks such as illness or premature death of a bread earner, fire and accidents are sudden and unexpected that demand emergency interventions. Such shocks are moderately different from lifecycle risks which are related to events such as birth and marriage, education, widowhood, old age and death. These are risks that are predictable to some degree and make planning and managing them more feasible. We will separately study the effects of unanticipated health related income shocks and weather related income shocks on the

saving decision of rural households keeping in view the household structure. This leads to a better understanding of the nature of insurance that is required within these environments.

Results of the study reveal that income volatility contributes to poverty of rural households by leading them to reduce stocks of productive assets in order to accumulate liquid assets. Health related income shocks are significantly likely to do so, in addition to the weather related income shocks. The study also reveals the important difference in determinants of savings of nuclear and joint households. Where as both types of households react similarly to weather related income shocks, in that they increase their stock of liquid and illiquid assets, joint families tackle income shocks due to poor health by reducing liquid assets, nuclear households reduce their stock of productive assets.

This suggests that policy interventions in health infrastructure might have a substantial impact on rural income and well being.

The next section reviews the existing literature on the effects of income uncertainty on rural household savings. The section after that describes the research methodology used for the empirical analysis in this study and discusses the demographic and economic characteristics of the sample households that are relevant for the analysis of savings. The section after that presents the result discussions concerning with the effects of unanticipated weather and health shocks on the asset portfolio of various types of households. The last section contains the concluding remarks.

Review of Literature

Current literature on idiosyncratic income uncertainty and its effects on rural households in developing economies assume that such households are particularly vulnerable to crop or agriculture income shocks. It is asserted that crop income shocks reduce household wealth not only directly, but also as the consequences of the costly measures used by households to protect consumption from such shocks. These include choosing less risky but also the less profitable agricultural investment, and either the ex ante diversion of productive capital towards more liquid assets or the ex post sale of such assets for consumption smoothing (Eswaran and Kotwal, 1989).

High frequency consumption smoothing against uncertain income shocks in the short run is the basic motive for saving in poor economies. According to Deaton and Paxson (2000), this includes both anticipated shocks like seasonal changes in income as well as unanticipated shocks. This basis of saving coupled with the imperfect insurance and credit markets can explain the low levels of productive investments in poor rural economies. High frequency consumption smoothing requires liquid assets and therefore households choose them over productive assets that are more illiquid. These illiquid assets, however, directly impact household income, particularly when households lack access to credit markets (Eswaran and Kotwal, 1989; Rosenzweig and Wolpin, 1993; Morduch, 1995).

There have been some influential studies that have established that households in poor economies save in response to anticipated income shocks (Deaton, 1991; Paxson, 1992). However, there is little evidence in the effect of these income shocks on asset portfolios. Development literature have exclusively concentrated on the crop income uncertainty, particularly that caused by fluctuating weather conditions. This underlies the premise that incomes in rural economies critically depend on agriculture and which in turn is dependent on the vagaries of weather. However, our data reveals that there are several other sources of risk which are equally important in terms of incidence. There are significant risks attached to health such as illness, accidents, disability or death of household members, particularly bread earners. As per an estimate, more than one-third of all loans borrowed in Haryana were for medical reasons. Moreover, the amount borrowed in proportion to total outstanding loan is significant. As Kochar (2002) outlines, the effects of illness on savings can be very different from those of other income shocks, as it affects the income process differently. It is more likely to be persistent over time.

From the policy perspective, identification of those factors which lead to low investment becomes imperative. *The common belief that low investments are primarily due to crop income uncertainty has become the basis for interventions in rural credit markets, specially since instituting effective crop insurance programs have proven too costly. On the other hand, if medical reasons are a primary cause of low investments then this will become yet another reason to push for health insurance and programs that improve health and sanitation in rural areas.*

Many empirical studies have assumed rainfall variability (Dercon and Krishnan, 2000; Kisney et al., 1998; Udry, 1994) as an instrument to identify income variability in order to test for consumption smoothing, the idea being that if transitory changes in income did not affect consumption, then households were consumption smoothing and therefore saving and dissaving. The empirical literature in this area, some of which uses the International Crops Research Institute for the Semi- Arid Tropics (ICRISAT) data for India, suggests that consumption smoothing does go on with an implication that the lack of credit markets may not be as important as theory suggests. However, there are problems with this empirical work because it is important to take into account the question of family labour. If the family supplies less labour and hires more, when there is an output increase because of good weather, then this will distort real net income unless the implicit cost of family labour is taken into account.

According to Rosenzweig (2001), when the harvest is good because of favourable weather, family labour input is lower because leisure is more highly valued as income rises. Weather therefore ceases to be an adequate instrument for income fluctuations because the shadow wage is endogenously determined (i.e. the opportunity cost of leisure is determined by the weather). This appears to contradict earlier work by Wolpin (1982), who used historical weather data and more recent household income and consumption data to test for the permanent income hypothesis. Knowledge about weather history gives households information about income fluctuations. Thus weather is considered to be an important variable in determining whether harvests are successful and therefore determining how much dissaving has to occur to smooth consumption or how far credit is sought to do the same. A study made by Rosenzweig and Binswanger (1993) discovers that the timing of the monsoon is an important determinant of output. Using data from the ICRISAT village surveys, they find that a delay in the onset of the monsoon by 16 days reduces crop profits by 6%. Once again it is likely that the poorest households will be in the greatest need of some form of insurance, but they would be least likely to find an insurer. This finding is supported by the study made by Jacoby and Skoufias (1998); it suggests that rural households tend to smooth the consumption over seasons.

Rosenzweig (2001) points to the highly volatile incomes around a

low mean which adds to the belief of lack of well-established insurance and credit markets. This leads to limited possibilities for increasing savings rates, highly correlated as they are with income and investment.

A growing literature asks whether low-wealth households can accumulate assets over time or whether they are trapped in poverty. Zimmerman and Carter (2003) explore savings and portfolio decisions in a resource-poor environment characterized by risk and subsistence constraints. They find that optimal portfolio strategies are found to bifurcate, despite divisible assets and fully rational households. In particular, wealthier people acquire a higher-yielding portfolio and pursue conventional consumption smoothing where as poorer households acquire a less remunerative portfolio and pursue asset smoothing, rather than consumption smoothing.

Rogaly and Johnson (1997) show an interesting finding that households tend to discover other ways than saving to affect the smoothing process such as marital ties, or changing family size. Deaton and Paxson (2000) consider that the existence of multigenerational households hides the differences between individuals within households. They develop a method of deriving individual behavior from household data and then apply this to Thailand and Taiwan household survey data. They find that there is some support for the life-cycle hypothesis that savings increase with growth as the younger age groups save more as their incomes rise.

Browning and Lusardi (1996) in an article whose principal objective is to review the literature on why households save, coincidentally take note of studies which look at behavior in the light of announcements about changes in government policy such as an increase in social security payments (Wilcox, 1989), or changes in credit restrictions (Alessie and, Devereux, 1993).

In the developed country literature, analysis of savings behavior has been dominated by life-cycle theory (Attanasio and Banks, 2001). Consumption smoothing over the life-cycle is dependent on the existence of well-behaved financial markets for savings and loans. In contrast, developing country literature reveals that the possibility for consumption smoothing through participation in financial markets (e.g. credit for housing and durables, insurance policies for crop failure, health and old

age) is limited because these markets are either incomplete or missing (Morduch, 1995).

Conclusively, a wide-ranging review of empirical literature on savings and consumption in low-income countries sheds new light on the behavior of agricultural households that make up the majority of the population in such countries. A number of conclusions have emerged: (a) the degree of consumption smoothing over seasons within the year and across years, in response to very large income fluctuations, is very high; (b) the lack of complete insurance and credit markets, however, is manifested in asset stocks and asset compositions among farmers, especially small farmers, that are inefficient; (c) the combination of low and volatile incomes is an important cause of inefficiency and income inequality; (d) the proximity of formal financial institutions increases financial savings and crowds out informal insurance arrangements, thus, in principle, better facilitating financial intermediation; and (e) simple life-cycle models of savings do not appear to explain long-term savings in low-income settings.

Based on above, it is easy to understand that while measuring the impact of peculiar income shocks specifically related to weather and health shocks on the saving behavior of the rural households, there are many demographic and economic parameters which need to be included in the study. The factors such as family size, family structure, occupation, age of family members, access to financial or credit markets and intensity of shocks etc. appear to be very significant influencing the behavior of households. It also provides the knowledge of tools to be incorporated in this study to accomplish the set objectives.

Research Methodology

Instrument Development

To accomplish the objectives of research, a questionnaire has been constructed comprising of –

- Questions concerned with respondent demographics- Gender, Age, Occupation, Education, Family size and Monthly Household Income (MHI), Access to formal and informal credit facilities;

- Questions related to respondent income and consumption data, as well as data on the stocks of assets and transactions in the credit

market;

-        Asset data include for both agriculture and household assets.

The questions related to respondent income, consumption, saving behavior and asset data have been drawn from an extensive review of widely cited studies on the same. In order to identify and incorporate the parameters in the Indian context, much emphasis has been given on two studies made by Kochar (2002) and Basu (1997).

One senior researcher from the relevant field was consulted to establish the validity of the instrument. Besides, six senior faculty members belonging to three leading management institutions / university departments were also requested to compare and evaluate the items/ parameters incorporated in the questionnaire with the research objectives.

Construct validity was improved by using parameters/ items included in previous research.

Sampling and Data Collection

The data used in this study was collected from an extensive household survey conducted between July 2009 and November 2009 in the 26 villages of four districts namely Rewari, Rohtak, Hisar and Sirsa of Haryana state. The main reason to select this specific region was that the people in this region largely depended upon the agriculture and allied activities, therefore, appeared to be suitable to accomplish the objectives of the study. Furthermore, it was convenient for the researchers to collect the reliable information from this region as they had a team of well trained management students who belonged to the selected districts.

This survey included 746 households out of which 691 households were finally considered in the study. The respondents with monthly income less than Rs.3500 were dropped as they hardly had the potential to save (Nair, 2000). Only those respondents were included who volunteered or agreed to fill or respond to the questionnaire. The data set, apart from demographic information, contained information on household expenditure, income, saving, value of assets, economic activities of all family members, live stocks and working days lost due illness. As some respondents were reluctant to disclose their income, saving, assets etc.,

survey team preferred to take the assistance of some influential people of the region.

Data Analysis

The collected data have been analyzed in two ways. Firstly, keeping in the mind the significance of family structure (Kochar, 2002; Attanasio and Banks 2001) on the saving decision of a rural household; sources of income and types of wealth and saving have been identified and then analyzed by household type. Secondly, to gauge the effects of unanticipated health and weather related income shocks on the saving decision of a rural household; an Ordinary Least Square regression has been considered.

Type of Family Structure

Rural Indian households are very diverse in their structure. According to Kochar (1997a), they can broadly be classified into two types, joint and nuclear. In joint households, two or more adult generations reside with the dependent children of the younger generation, while in nuclear households; there is one young adult male of the younger generation. There is also a third type known as stem households where one or both parents belonging to the older generation reside with one adult male of the younger generation and his family. For simplification, we will break this category into joint and nuclear depending on the age of the older generation. If the older generation is of more than sixty years, we will consider these families as nuclear as the decision making process in such families are similar to the nuclear households. If older generation is less than sixty and within the working age, we consider them joint households. *From our data* (Table 1) *we see that there are total 422 joint households and 269 nuclear households. Joint households account for 61.2 percent of our sample. Who, on an average, have 9.6 members while nuclear households have 4.7 members (not shown in table). These include more adults (3.6) and children (3.3) compared to nuclear households (1.5 and 1.8 respectively).*

Table 1. Sources of Income for the Sample Households

Source of Income	Total Households	Joint Households	Nuclear Households	With Lands	Land Less
Number of Households with main sources of income	691	422	269	463	228
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Crop income	218	154	123	206	12
	(31.5)	(36.5)	(45.7)	(44.5)	(5.3)
Wage income	297	172	85	126	170
	(43)	(40.7)	(31.6)	(27.2)	(74.5)
Salary income	144	59	33	112	32
	(20.8)	(13.9)	(12.3)	(24.2)	(14.0)
Miscellaneous income	32	37	228	19	14
	(4.6)	(8.7)	(10.4)	(4.1)	(6.1)
Mean income by source Total	40,676	35,074	64,275	44,693	32,831
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Crop income	11,242	6,887	23,547	16,907	180.5
	(27.64)	(19.63)	(36.63)	(37.83)	(0.55)
Wage income	12,914	13,053	14,575	10,704	17,233
	(31.75)	(37.21)	(22.68)	(24.01)	(52.50)
Salary income	12,855	11,087	21,314	13,327	11,902
	(31.6)	(31.61)	(33.16)	(29.81)	(35.25)
Miscellaneous income	3,665	4,047	4,839	3,775	3,516
	(9.01)	(11.53)	(7.7)	(8.4)	(10.7)

Source: Self computed and compiled from the survey data. Figure in brackets are percentages

Source of Income by Household Type

Based on the assumption that access to credit and insurance are dependent on income level and land ownership; empirical studies have generally separated households by income levels, like in (Alderman, 1996) or land ownership, as in (Morduch, 1990). However, there is a strand of theoretical literature which argues that the most relevant source of credit and insurance in economies with imperfect or missing markets is the family

itself (Kotlikoff and Spivak, 1981). This finding is supported by various empirical studies particularly made by Ligon and Thomos (1989) and Cox and Jimenez (1992). Monetary and non-monetary assistance from relatives and neighbors are the two most significant responses reported. Even as a source of credit, family and friends account for nearly half the outstanding loans in rural Haryana. (Table 1) *outlines difference in the sources of income across these two types of households as well as between landed and landless types; Crop is the major source of income for nuclear households (45.7 percent) while wage labor is the major source for joint households (40.7 percent). However, a significant proportion (36.5 percent) of joint households also depends upon crop income. Amongst landed households, the major source of income is crop while for the landless it is wage labor. About 74.5 percent landless derive their earnings as wages.*

Wealth and Savings by Household Type

Saving decision of a household is strongly affected by its type. Survey team collected detailed information on different forms of assets including landholding, value of house, agricultural assets, household assets, bank deposits, cash holdings and jewelry; which have been arranged in Table 2 by asset type for different household structures. *The data reveals that on an average, joint families are likely to hold slightly more savings than nuclear households. Of their savings, joint households hold 39.5 percent in productive assets, 29.9 percent in durable & live stocks and 19.8 percent in jewelry. But the composition indicates that nuclear families are twice as likely to hold their savings in the form of bank deposits as joint families which are more likely to hold wealth in the form of productive assets and jewelry. Nuclear households hold 19 percent of their savings in the form of bank deposits compared to 10.67 percent for the joint households. Landed households are most likely to hold wealth in the form of productive agricultural and household assets (45.93 percent) while Landless households prefer to hold wealth in the form of durables and livestock (43 percent). Their savings in the jewelry and bank deposits are almost the same.*

Table 2. Household Wealth by Asset Type

	Nonland wealth*	Productive Assets*	Durables & Live Stock	Jewelry	Deposits***
Mean Value (Rs.)	92,337	35,300	27,200	16,960	12,877
	(100.00)	(38.30)	(29.46)	(18.37)	(13.90)
Joint Households	95,805	37,850	28,661	19,054	10,240
	(100.00)	(39.51)	(29.90)	(19.88)	(10.67)
Nuclear	88,501	32,258	25,515	13,954	16,774
	(100.00)	(36)	(29)	(16)	(19)
With Land	126,882	57,644	34,488	15,218	19,532
	(100.00)	(45.43)	(27.20)	(12.0)	(15.40)
Landless	42,316	13,122	18,373	5715	5106
	(100.00)	(31)	(43)	(14)	(12)

Source: Self computed and compiled. Figures in brackets are percentage. * Nonland wealth refers to the sum of wealth in all four categories, it excludes value of house. ** Productive wealth is the sum of the value of all tools and machinery used in farm and non farm enterprise, *** Deposits include accounts in bank, post office, cooperative societies and LIC policies.

Survey conducted reveals that the rural households in Haryana have convenient access to widespread informal as well as formal credit. It depicts that nearly 62 percent of Haryana households have reported borrowing from formal sources while remaining have reported borrowing from informal sources. This widespread access to credit undermines the premise of some saving models wherein households are required to maintain stocks of assets to smooth consumption because of lack of access to credit.

Weather and Health Related Income Shocks

In a sample of 691 households, 523 have reported some form of income shocks in the last 3 years. Sources of these shocks are broadly classified into health related and weather related shocks.

While 28 percent of female members from sample households reported illness resulting in lost days of work, nearly 46 percent reported illness among male members in the last 1 year of the survey. Survey reveals that there are relatively high levels of adult morbidity. The higher incidence

of male illness probably reflects an underestimate of female illness as respondents tend to only report illness of working members within the household which in turn can potentially lead to fluctuations in household income. Weather related shocks reported by households are primarily due to lack of sufficient rainfall or excessive rainfall.

Regression Specifications

To gauge the effects of unanticipated health and weather related income related shocks on the saving decision of a rural household, researchers have decided to run an Ordinary Least Squares regression using the following regression specification:

$$L_i = \alpha + \beta_1 D_i^w + \beta_2 D_i^h + \beta_3 H_i + \euro_i \quad \dots\dots\dots\dots\dots\dots\dots \text{ (1)}$$

where L_i is the stock of liquid assets held by household I, D_i^w is the dummy variable that equals one if household i has reported suffering from a weather related income shock in the last 2 years and 0 otherwise, D_i^h is the dummy variable that equals one if household i has reported suffering from any health related income shocks in the last 2 years and H_i is a vector of household characteristics.

We will separately run an OLS regression to study the impact of shocks on stock of illiquid asset held by a household, using the following specification:

$$I_i = \alpha + \beta_1 D_i^w + \beta_2 D_i^h + \beta_3 H_i + \euro_i \quad \dots\dots\dots\dots\dots\dots \dots \text{(2)}$$

where I_i is the stock of liquid assets held by household i, D_i^w is the dummy variable that equals one if household i has reported suffering from a weather related income shock in the last 2 years and 0 otherwise, D_i^h is the dummy variable that equals one if household i has reported suffering from any health related income shocks in the last 2 years and H_i is a vector of household characteristics.

As a robustness measure and to check the consistency of our results, we will also do a maximum likelihood probit estimation with the following specification:

$$Ds_i = \alpha + \beta_1 D_i^w + \beta_2 D_i^h + \beta_3 H_i + \euro_i \dots\dots\dots\dots\dots\dots\dots \text{ (3)}$$

Where DS_i is a dummy variable which equals one when a household reports dis-saving in response to an income shock and 0 otherwise. The remaining variables are the same as described in the earlier specifications.

Result Discussions

Table 3 reports the results for joint households and table 4 reports the results for nuclear households. ***We have run each of the three regressions specified in the last section, separately for joint and nuclear households.*** Liquid assets include the sum of deposits, cash in hand and jewelry. Illiquid asset stock is the sum of productive agricultural assets, durables and livestock. *The general results show that shortfalls in income for joint as well as nuclear households affects savings in both productive (illiquid) assets as well as liquid assets.*

Table 3. Saving Regression for Joint Households

Joint Households	Liquid Asset Stock	Illiquid Asset Stock
Weather related income shock	633.92	920.80**
	(387.1)	(211.13)
Health related income shock	-573.10**	280.70
	(129.73)	(321.2)
Annual Income	-0.635	0.921
	(0.378)	(0.417)
Number of adult male members	863.78	1301.04**
	(404.2)	(388.19)
Number of marriageable age	352	1028.82**
	(274.31)	(271.1)
Female headed households	349.81	156.74*
	(211.50)	(42.3)
Total land holding	812.7	5011.63*
	(408.4)	(1726.63)
Number of Observations	**422**	**422**
F (19,2270)	**9.76**	**12.23**
	(p=0.0007)	**(p=0.0089)**
R- Square	**0.59**	**0.64**

Standard errors are in brackets, ** Significant at 5% level, *significant at 10 % level

The regression results support the hypothesis that even in very poor economies; a household's asset portfolio is affected by the nature of income shocks they face. Households increase their savings in liquid assets as well as illiquid assets which are the productive assets, durables and livestock, when they are faced with weather related income shocks. Since productive assets directly affect income, this result also indicates that shocks in income may cause households to modify their income problems through changes in assets that contribute directly to the income process. *Between the two types of income shocks, we note that health related shocks affects the liquid and illiquid asset stocks very differently. While a reduction in income due to ill health leads to an increase in illiquid asset stock of joint households, it has a significant negative effect (-573.1**, S.E.=129.73) on liquid assets. Joint families reduce their stock of liquid assets such as deposits and cash in hand when faced with health related shocks. Weather related shocks on the other hand lead to a significant increase (922.8**, S.E.=211.13) in illiquid assets held by joint households, but does not affect the stock of liquid assets significantly.* Most surprising finding is that annual income of the family does not have any significant effect either on liquid assets or illiquid assets of joint households. One may also note here that for joint households, the number of members in the marriageable age significantly increases (1028.82**, S.E.=271.10) the stock of productive/ illiquid assets. This is similar to the finding that number of adult male members in a joint family tends to enhance the productive assets significantly (1301.04**, S.E.=388.19). Also, female headed joint households are more likely to hold illiquid assets (156.74*, S.E.=42.3).

Table 4 reports the results from similar regression for nuclear household. Here too the hypothesis that adverse effects of income uncertainty affect the asset portfolios is upheld. In general, *the results for weather related income uncertainty are similar to those of joint households, that is, both forms of savings increase in response to income shocks. However, increase in productive assets is found to be significant (929.23**, S.E.=173.2). Health related income fluctuations, however, lead to a significant increase in liquid assets (283.7**, S.E.=58.5) but lead to a reduction in illiquid assets (-134.73, S.E.=91.2), though not significant.* For nuclear households, number of marriageable aged members significantly increases (984.1**, S.E.=108.11) the stock of illiquid assets

but unlike joint households, number of adult male members does not have any significant effect on the asset portfolio of nuclear households. Unlike joint households, annual income of nuclear households has a significant (222.21*, S.E.=69.2) positive effect on the liquid assets. Also, female headed nuclear households are more likely to hold illiquid assets.

Table 4. Saving Regression for Nuclear Households

Nuclear Households	Liquid Asset Stock	Illiquid Asset Stock
Weather related income shock	480.7	929.23**
	(211.8)	(173.2)
Health related income shock	283.7**	-134.70
	(58.5)	(91.2)
Annual Income	222.21*	0.707
	(69.2)	(0.237)
Number of adult male members	864.8	1012.73
	(318.6)	(759.7)
Number of marriageable age	304.2	984.10**
	(113.1)	(108.11)
Female headed household	-148.20	134.8*
	(94.3)	(24.4)
Total land holding	512.7	2308
	(279.2)	(1411.4)
Number of observations	**269**	**269**
F (19,211)	**14.38**	**11.56**
	(p=0.00002)	**(p=0.0009)**
R- square	**0.67**	**0.61**

Standard errors are in brackets, **significant at 5% level, * significant at 10% level

The different effects that health related income fluctuations have on nuclear and joint households suggests that where as joint households are able to increase productive assets to safeguard against income shocks due to illness, nuclear households are not able to do so. They reduce their stock of productive assets when faced with income fluctuations due to poor health.

Limitations and Future Research

The major limitation of this study is the lack of information on the severity of the illnesses which could indicate the persistence of the resulting income shock. Due to ambiguity of data, weather shocks only related to inadequate rainfall or excessive rainfall have been considered. Other reported weather shocks such as fire, pests and destruction of crops by animals etc. have been sacrificed. Survey team while administering the questionnaire, experienced that some of the respondents showed much reluctance to answer to some questions specifically related to their income, savings, debts, and illness of family members etc. Though the survey team took the support of some influential people of the region to avoid this, however, it was difficult to ascertain the degree of accuracy of their responses. This research is confined to only 26 villages of four districts of Haryana state due to obvious time and financial constraints. Further studies with larger sample size could be carried out to investigate the influence of unanticipated health and weather related income shocks on the saving decisions of rural households for other parts of the country.

Conclusion

This is commonly believed that income volatility contributes to the poverty of rural households by leading household to reduce stocks of productive assets in order to accumulate illiquid assets. There are of course several potential factors that can cause incomes to fluctuate in rural economies. The statistical findings in the present work witness enough evidences that rural households (joint and nuclear) prefer to change their asset portfolio in response to the weather related and health related income shocks. The study also reveals the important difference in determinants of savings of nuclear and joint households. Where as both types of households react similarly to weather related income shocks, in that they increase their stock of liquid and illiquid assets, joint families tackle income shocks due to poor health by reducing liquid assets, nuclear households reduce their stock of productive assets, durables and livestock. Keeping in view the different type of behavior of joint and nuclear households towards health related income shocks, it is easy to suggest that different kinds of rural

health insurance schemes should be designed for their benefit. This also supports the recommendations made by Wadhawan (1987) and Ellis and Alam (2000) who strongly advocate the framing of appropriate health insurance schemes to elevate the income level of rural poor. Conclusively, this study suggests that policy interventions in health infrastructure might have a substantial impact on the income of rural Indian households.

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