Seasonality, precautionary savings and health uncertainty: Evidence from farm households in central Kenya

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The high prevalence of risks in low income economies makes managing uncertainty critical for productivity and survival. This paper analyzes seasonal changes in farm households' per capita consumption and saving in response to weather and health shocks. Using a sample of 196 households in central Kenya, it tests the notion that people save most of their transitory income, and examines their precautionary saving motives. The results show that the propensity to save out of transitory income is about a fifth of what the permanent income hypothesis postulates. The propensity to save differs by wealth, with the poor exhibiting stronger precautionary motives towards rainfall variability. But the wealth effect is weak, suggesting that the asset base is vulnerable even for the better-off. However, precautionary savings tend to increase with wealth among HIV/AIDS affected households. Since illness is associated with higher consumption, and therefore less investment, we find more volatile consumption for HIV/AIDS affected households.

Keywords: precautionary savings; HIV/AIDS; rainfall variability; farm households; Kenya

Il existe, dans les pays à faible revenu, une forte prédominance des risques. Lorsqu'il s'agit de productivité et de survie, il est, par conséquent, crucial de gérer l'incertitude. Cet article analyse, par habitant, les changements saisonniers que connaissent les petits fermiers en matière de consommation et d'épargne, en réponse aux chocs de climat et de santé. En se basant sur un échantillon de 196 ménages de la partie centrale du Kenya, l'article évalue l'hypothèse que les gens épargnent la plupart de leurs revenus transitoires, et examine les motifs de cette épargne de précaution. Les résultats révèlent que la propension à tirer une épargne des revenus transitoires représente un cinquième du chiffre présenté dans l'hypothèse des revenus fixes. La propension à épargner varie selon la richesse, avec, chez

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les pauvres, une motivation plus importante en matière d'épargne de précaution, en cas de pluviométrie variable. Le facteur richesse demeure cependant faible, suggérant ainsi l'existence d'une vulnérabilité des actifs même chez les plus riches. Malgré tout, l'épargne de précaution a tendance à augmenter selon le niveau de richesse dans les ménages touchés par le VIH/SIDA. Puisque maladie et augmentation de la consommation vont de pair, entrainant une diminution de l'investissement, on note une consommation plus instable dans les ménages touchées par le VIH/SIDA.

Mots-clés : *épargne de précaution ; VIH/SIDA ; pluviométrie variable ; petits fermiers ; Kenya*

1. Introduction

People who live in low income economies often have to cope not only with severe poverty but also with extremely variable income. The implication of this income variability on consumption has been a central theme of much research in developing countries (e.g. Deaton, 1991; Paxson, 1993; Udry, 1994, 1995). However, income variability implies consumption variability only if households do not use mechanisms to insulate consumption from income fluctuations across seasons. The bulk of the work providing most of the insights on consumption smoothing uses weather as the major source of income variability (Czukas et al., 1998; Paxson, 1993; Udry, 1994; Kinsey et al., 1998; Dercon & Krishnan, 2000). While weather is an important source of risk for rain-fed agriculture, health uncertainties have become increasingly important with the spread of HIV/AIDS (Lundberg et al., 2003).

Deaton (1992) shows that in the absence of complete financial markets, prudent households may accumulate and draw down 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 incentive to save for a rainy (dry) day. It is thus expected that households that face greater uncertainties due to poor health and weather variability across seasons would have more precautionary savings and their portfolio of assets would also be more liquid.

In this study the marginal propensity to save out of transitory income (MPS_T) is used as a measure for the saving response to shocks. The closer the MPS_T is to one, the more the household is able to use savings and the credit market to insulate consumption against shocks. The magnitude of MPS_T is also an indicator of the degree of completeness of credit and insurance markets (Morduch, 1991).

The study uses panel data generated from 196 households surveyed over 18 months covering three cropping seasons. Although it is difficult to differentiate between the continuum of ex ante and ex post behavior within the short period covered by the study, the study recognizes that household members are not passive to shocks and that people adapt to their new circumstances. The adaptation to current circumstances may entail reorganization of the assets and livelihoods, with an eye to the possibility of recurring episodes of negative events. The short-run seasonal effects may have long-term consequences for poverty (Dercon, 2005). Such effects also provide information on what kind of households are most sensitive to shocks.

The paper is organized as follows: Section 2 presents the data and empirical model of savings in the presence of fluctuations in income, Section 3 presents the results, and Section 4 concludes.

2. Data and the empirical approach

2.1 Data

The data used in this paper were collected from three household surveys carried out between May 2004 and April 2005 in Thika and Maragua Districts in central Kenya. The region has bimodal rainfall distribution and hence two planting seasons per year. The first survey captured information for the short cropping season (October 2003 to March 2004), the second for the main cropping season (April 2004 to September 2004), and the third for the next short cropping season (October 2004 to March 2005). The timing for each survey was after the harvest, to capture each season's income.

The average HIV prevalence in the two districts was 8.5%, which was above the national average of about 7% in 2003 (Government of Kenya, 2004). The quantitative survey data were complemented with qualitative information from community health workers, local health centers, people living with HIV/AIDS, and community leaders. This extra information was used to confirm HIV/AIDS status wherever there was doubt. It was important that the HIV status categorization was correct, both for ethical reasons and for correct impact analysis. Because of the prevailing HIV/AIDS stigma, a snowball sampling technique was used to locate HIV/AIDS-affected households in randomly pre-sampled household clusters in the national sampling frame. Hereafter, these are referred to as AIDS-affected. In total, 196 households were interviewed in the three surveys, comprising 101 AIDS-affected and 95 non-affected.

The data set contains information on household expenditure, income, savings, value of assets, economic activities of all household members, farm specific crop and livestock shocks, regional rainfall shock, types of illnesses suffered by household members and working days lost due to illness.

On crop loss, data were collected on events in the past cropping season that could have affected crop and livestock production. An index similar to that of Dercon & Krishnan (2000) was constructed from the responses. The indices ranged from 1 to 4 depending on farmers' perception of severity of loss (1 being least severe and 4 representing total loss). The regional rainfall shock was calculated as percent rainfall deviation from a 14-year average precipitation for 10 weather recording points in the study zone. Two critical periods in the crop cycle were considered: the planting and the weeding periods. The weeding period also captures the growth phase.

2.2 Empirical approach

Several methods have been used in the literature to investigate whether individuals make provision for the future. Deaton (1991), Udry (1995), Guiso et al. (1996) and Kochar (2004), all following Campbell (1987), test whether savings predict future changes in income. This paper adopts Paxson's approach (1992), which computes the marginal propensity to save out of transitory income. Savings is taken as a linear function of permanent income (Y_{it}^{P}), transitory income (Y_{it}^{T}), income variability (VAR_{it}), and a set of variables that measure the life-cycle stage of a household (LC_{it}). This is expressed as:

$$S_{it} = \mu_i^s + \alpha^P Y_{it}^P + \alpha^T T_{it}^T + \alpha_3 VAR_t + \alpha_4 LC_{it} + \varepsilon_{it} \quad (1)$$

where S_{it} is per capita saving for household *i* in period *t*, μ_i^S represents unobserved characteristics of household *i* that affect savings in a fixed manner over time, and ε_{it} is an error term. α^T is the estimate for the marginal propensity to save out of transitory income. Empirical tests of the effect of α_3 on savings would show whether people with uncertain income save more on average than those with more stable income streams.

For livelihoods that are largely dependent on agriculture, variable rainfall is likely to yield more variable incomes. We use the coefficient of variation for rainfall in each season to proxy for income variability (*VAR*). This is measured at the regional level. The *VAR* variables are also interacted with wealth as per Rosenzweig & Binswanger (1993), since wealth may influence precautionary behavior. Also included in *VAR* is a dummy for HIV/AIDS interacted with wealth in each period. The *HIV/AIDS* dummy alone is absorbed in the household fixed effects.

The life-cycle models suggest that households with greater numbers of young children and older members can be expected to save less, since their current labor income is less than the annuity value of their lifetime wealth. We include the dependency ratio to account for the life cycle effects. However, the presence of HIV/AIDS implies a shorter lifespan for parents. How this affects savings behavior is an empirical issue. For instance, while the need to meet immediate medical expenses may mean liquidation of assets, the need to leave stable income streams for children may increase the desire to maintain or acquire productive or more durable assets.

One thing needs to be noted: the analysis of precautionary savings as described in (Deaton, 1997:361) assumes that although future consumption becomes more uncertain, in that the spread around the mean becomes larger, its mean remains constant. With HIV and AIDS, this assumption may easily be violated since mean consumption can change with time as medical and food consumption needs change. However, given the short period covered by the study, we assume that household mean consumption is preserved.

Estimation of permanent and transitory incomes

Permanent income is defined over a short time horizon as expected income for period *t* conditional on the resources and information available at the beginning of the period. To estimate the permanent component of income, the following equation is specified:

$$Y_{it}^P = \mu_i^P + v_t^P + \beta^P X_{it}^P + u_{it}^P \quad (2)$$

where X_{it}^{P} represents a vector of household variables that are determinants of permanent income, μ_i^P captures the time invariant household variables that affect permanent income, v_t^P is the seasons effect common to all households and u_{it}^P is a random error term with zero mean.

The transitory income is expressed as:

$$Y_{it}^{T} = \mu_i^T + v_t^t + \beta^T X_{it}^T + u_{it}^T \qquad (3)$$

where X_{it}^{T} is a set of variables that affect transitory income. We include percent rainfall deviation in each period, the qualitative index of crop loss, the number of work days lost by male and female spouses due to ill health, and the latter interacted with the *HIV/AIDS* dummy. Interaction of sick days with the *HIV/AIDS* dummy helps differentiate effects of AIDS-related illnesses from other illnesses. Paxson (1992) did not have information on household-specific variables of transitory income. The effect of household-specific shocks on savings was therefore included in the error term.

Equations (2) and (3) are combined to form an equation for total income as:

$$Y_{it} = \mu_i + v_t + \beta^P X_{it}^P \ + \beta^T X_{it}^T + \mu_{it}. \qquad (4)$$

The parameter v_t measures the year effect. Equations (2) and (3) can also be substituted into the structural savings equation (1):

$$S_{it} = \mu_i^{sr} + v_t^{sr} + \rho^P X_{it}^P + \rho^P X_{it}^T + \alpha_3 VAR_{it} + \alpha_4 LC_{it} + \varepsilon_{it}. \qquad (5)$$

Noting that the variables in LC_{it} and VAR_{it} are collinear with X_{it}^P, a reduced form of the savings equation can be written as a function of the *X*s:

$$S_{it} = \gamma_{it} + v_t + \gamma^P X_{it}^P + \gamma^P X_{it}^T + \eta_{it}. \qquad (6)$$

The variable η_{it} in (6) is a vector of error terms, γ^P reflects the impact of X_{it}^P on savings through its effect on permanent income, and γ^T measures the impact of transitory variables on savings. v_t captures the village effects.

We estimate equation (4) and (6) and test for the key restriction derived from the permanent income hypothesis (PIH): $\gamma^T = \beta^T$ and $\gamma^P = 0$. The effects of the elements of X_{it}^T on savings are also expected to be identical to their effect on income. That is, transitory shocks should affect income and savings in an identical manner and X_{it}^T variables should have no effect on consumption. Positive and significant γ^T or a finding in favor of the PIH would indicate that households save in anticipation of future changes in income.

While equation (6) gives the reduced form estimates of the parameters in equation (1), we can estimate them directly using a two-stage estimation (Paxson, 1992; Ersado et al., 2003). Parameter estimates from equation (4) are used to decompose the total income into its estimated permanent (Y_{it}^P) and transitory (Y_{it}^T) incomes and a residual. The residual component is excluded from estimation of the structural equation below since it is correlated with the error term. Such exclusion does not lead to an omitted variable problem, since by design the residual component is orthogonal to the other two. We estimate the structural equation (1) as:

$$S_{it} = \mu_i^s + \alpha^P \hat{Y}_{it}^P + \alpha^T \hat{Y}_{it}^T + \alpha_3 VAR_t + \alpha_4 LC_{it} + \varepsilon_{it}. \quad (7)$$

Calculation of income, saving and consumption

Total household income was estimated as a sum of household earnings from farming activities, wages, business, transfers and rents. The savings measures are derived from the investment behavior. Savings was defined as reported purchases minus sales of assets and cash savings. We also included expenditure on consumer durables in each survey period. Consumer durables such as furniture or clothing provide services over several years or at least several periods and so allow current income to contribute to future utility. Paxson (1993) notes that computing savings in this manner may have serious problems if purchases and sales of farm animals and equipment are not explicitly measured. This problem was minimized in this survey as extra effort was made to record all the household purchases three months prior to each survey. In addition, the first survey included data on expenditure and savings for the previous 12 months. Computing savings as the observed savings has the advantage of being uncorrelated with errors in estimated income. Although the respondents were assured of the confidentiality of the information provided, cash savings may have been underestimated if the savings were unrecorded. Consumption consists of expenditure on food plus expenditure on non-food items, including health care. Expenditure on food was constructed from purchased foods and imputed values of home production and informal transfers or gifts.

3. Results

This section presents three sets of results. The descriptive statistics are presented first. Estimates for both the reduced form and structural equations are then discussed in Sections 3.2 and 3.3.

3.1 Descriptive statistics

Table 1 provides the means and variability of household per capita consumption. A differentiation was made for AIDS-affected and non-affected households. Mean consumption was estimated at about KSh1,961 (US$26.14) per adult equivalent per month. This mean was roughly consistent with the rural average expenditure of KSh1,836 per month (Government of Kenya, 2000) and KSh2,300 (KIHBS, 2005–06). Although affected households have higher food and non-food consumption than the non-affected, their consumption is more volatile. This volatility is significant, as Table 2 shows.

Table 1: Mean and variability of monthly per capita consumption, income and savings by season and HIV/AIDS status

	Season 1 (2003/04 short rains)		Season 2 (2004 long rains)		Season 3 (2003/04 short rains)	
	Affected	Non-affected	Affected	Non-affected	Affected	Non-affected
Food consumption[a]	1180 (0.75)[b]	1071 (0.62)	1188 (0.54)	1031 (0.51)	941 (0.67)	851 (0.52)
Non-food consumption	973 (1.52)	777 (1.09)	992 (1.21)	616 (1.46)	1291 (2.64)	806 (1.41)
Total consumption	2153 (0.85)	1849 (0.73)	2079 (0.70)	1647 (0.73)	2200 (1.18)	1656 (0.87)
Income	5085 (0.48)	5827 (0.55)	5124 (0.86)	5227 (0.58)	5877 (0.80)	5940 (0.54)
Savings	13034 (0.59)	13569 (0.61)	5101 (0.84)	5479 (0.80)	6903 (0.67)	6300 (0.71)
N	97	95	88	84	88	84

[a] Consumption in Kenya shillings (KSh): 1 US$ ≈ KSh. 75 in 2004/05.
[b] Coefficient of variation in parentheses

Table 2: Consumption mobility index for the three survey seasons

	Seasons 1–2			Seasons 2–3			Seasons 1–3		
Shorrocks index	Affected	Non-affected	All	Affected	Non-affected	All	Affected	Non-affected	All
	0.72	0.59	0.64	0.72	0.52	0.64	0.65	0.54	0.59
H_0:Random transition χ^2			109.90 **			69.65**			113**

** Significant at 1%

Table 2 presents transition probabilities across consumption quantiles, using the Shorrocks index as the measure of consumption mobility (Shorrocks, 1978). The table reveals substantial mobility across the three seasons. The Anderson & Goodman (1957) random transition χ^2 statistic rejects the hypothesis that the transition between quantiles is by chance. Close to 60% of the households move between consumption quantiles from season to season. Higher mobility is observed for AIDS-affected households, as would be expected for shocks affecting permanent income. For instance, between the first two seasons, only 28% of AIDS-affected households remained in their first season's quantile, compared to 41% of the non-affected households.

The above mobility in consumption can be linked to shocks experienced by the households. Information on shocks is presented in Table 3. The table shows the severity of crop and livestock losses reported by the households in the three seasons. The most reported loss is crop loss due to insufficient rainfall: this was reported by about 55% of the households. This loss was most severe in the long rains season, with 64% of households reporting such a loss. Very few households (about 10%) reported other losses. The table also shows the percent rainfall deviation. Since the survey period was generally drier than normal, the variable is regarded as percent rainfall shortfall. The weeding season, which also represents the plant growth phase, was much drier in all the survey rounds, with the long rains season being the driest. The magnitudes of the computed indices are better depicted in Figure 1. For most of the reported cases of loss, the AIDS-affected households reported on average higher severity than the non-affected in all the seasons, suggesting that they may be more sensitive to shocks. More male spouses reported more work days lost due to illness than female spouses in all seasons.

Table 3: Means and standard deviations of income and health shocks

	Season 1		Season 2		Season 3	
	Affected	Non-affected	Affected	Non-affected	Affected	Non-affected
Index of severity of crop and livestock losses						
Crop loss due to rain shortfall	1.60 (1.48)	1.4 (1.42)	1.94 (1.56)	2.09 (1.38)	0.98 (1.37)	0.76 (1.24)
Crop loss due to pests & diseases	0.46 (1.05)	0.33 (0.85)	0.05 (0.38)	0.04 (0.29)	0.26 (0.79)	0.23 (0.74)
Livestock death	0.50 (1.16)	0.62 (1.2)	0.18 (0.75)	0.19 (0.79)	0.10 (0.50)	0.14 (0.60)
Livestock illness	0.31 (0.91)	0.28 (0.75)	0.12 (0.65)	0.03 (0.31)	0.04 (0.29)	0.02 (0.21)
Health variables						
Work days lost by wife due to illness	2.55 (6.99)	1.65 (5.87)	2.37 (6.59)	1.62 (5.43)	2.82 (7.07)	1.10 (3.95)
Work days lost by husband due to illness	6.99 (11.78)	3.53 (7.92)	4.55 (8.54)	2.50 (6.13)	4.43 (9.21)	1.68 (5.10)
Rainfall shock						
% rainfall shortfall: planting season	0.25 (23.15)		-17.89 (25.72)		-9.55 (18.20)	

% rainfall shortfall: weeding season	36.67 (33.08)	53.18 (19.00)	6.11 (0.62)

Standard deviation in parenthesis

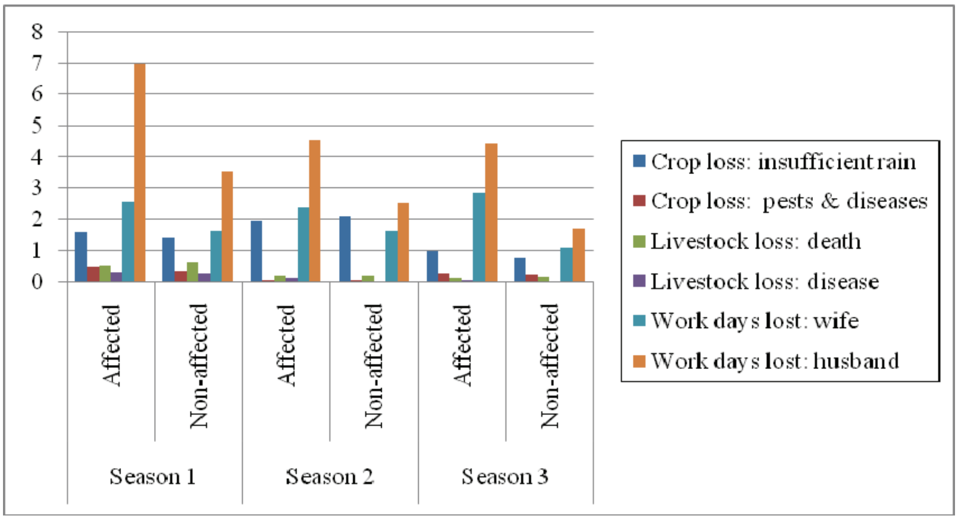

Figure 1: Computed indices for severity of shock

Although rainfall shock, and thus crop loss, was most severe during the long rains season, Figure 2 shows that, apart from households in the upper two deciles of consumption, welfare was generally higher during this season. This may be expected, given that this is the main harvest period. However, the effects of the poor harvest in this season are felt in the subsequent minor cropping season. The welfare level is lowest for all households during the third survey period. This large decline in consumption may be a signal that households are unable to insure consumption against seasonal shocks. We turn to the quantitative results to establish the extent to which this happens.

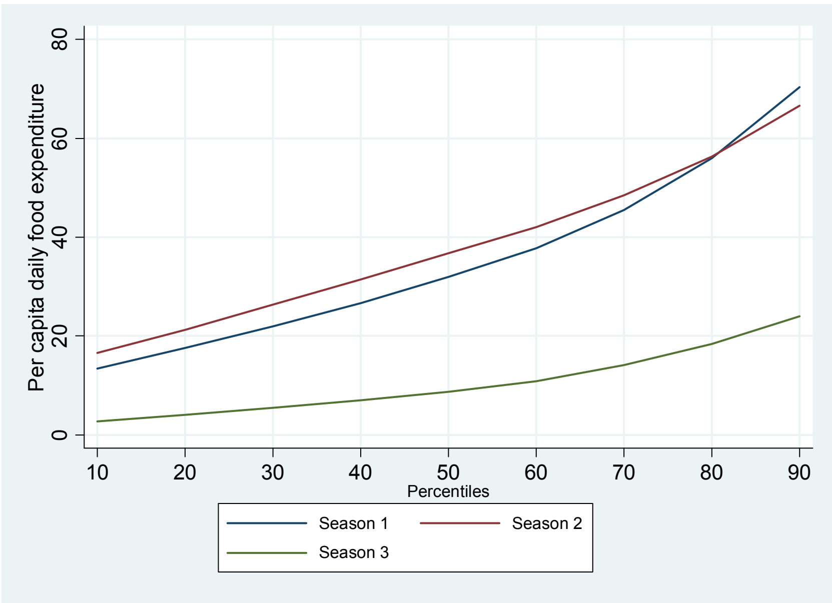

Figure 2: Welfare dominance using per capita daily food expenditure

3.2 Do households use savings to smooth consumption across seasons?

3.2.1 Reduced form income and savings estimates

The reduced form equations test the extent to which households use savings to insulate consumption against shocks across seasons. According to the PIH, if households use savings to smooth consumption, the effect of transitory variables on income should be equivalent to their effect on savings and there should be no significant effect on consumption.

The results are presented in Table 4. The rainfall variables have the expected signs in that they reduce both income and savings. In particular, rainfall shortage at planting time is significant – a 1% rainfall shortfall from its mean at planting time resulting in loss of income of about KSh31 and a dis-saving of about KSh67. This reduction in savings is substantial given that the daily wage for hired farm labor was about KSh90 (US$1.20). At a mean rainfall shortfall of 25%, this translates to a dis-saving of about KSh1,665, or close to 20 days' earnings.

Table 4: Reduced form estimates for per capita income and per capita savings equations (Fixed effects estimates)

	Income		Total savings		Consumption	
	Coefficient	**se**	**Coefficient**	**se**	**Coefficient**	**se**
Dependency ratio	-3,280.69***	1,220.50	-7,867.28***	2,807.66	-0.29*	0.160
Age	4,380.58**	1,868.42	9,005.01**	3,807.79	0.97***	0.228
Age squared	-42.10***	15.64	-73.86**	34.00	-0.00	0.002
Cropped area	8.18	432.62	-351.73	747.34	-0.09*	0.050
Livestock wealth	152.89	95.59	-34.02*	19.39	0.03*	0.016
Crop loss index	-217.30	210.50	-466.12	560.61	-0.09***	0.031
Sick days	26.31	32.59	-153.32**	73.52	0.01*	0.004
% rainfall shortfall, planting	-30.53***	9.08	-66.61**	24.42	-0.01***	0.001
% rainfall shortfall, weeding	-25.19	17.53	-31.63	32.60	-0.00	0.002
Constant	-98,74.88*	57,54.81	-230,16.83**	106,90.40	5.15***	6.501
N	533		537		533	
F test that all u_i=0	F(190, 334) = 3.74***		F(190 338) = 1.19***		F(190, 335) = 3.85***	
Hypothesis test[a]						
$\gamma_T = \beta_T$		25.37 (0.000)				

*significant at 10%, ** significant at 5%, ***significant at 1%

[a] Hypothesis test: The effect of the rainfall variables on income is the same as the effect on saving.

The hypothesis test on equality of the effect of transitory rainfall shock on income and savings is shown at the bottom of Table 4. The tests lead to rejection of the hypothesis that the effect of the transitory rainfall variables on income is identical to their effect on savings for the planting period. Indeed, low precipitation at planting time significantly reduces consumption. Households are unable to use savings to buffer consumption against rainfall shocks across the seasons.

Another implication of the PIH is that savings are unrelated to permanent income. This relationship implies that, after controlling for life-cycle effects, the permanent income variables such as assets should have zero impact on savings. The positive relationship between cattle ownership and total savings does not support such an assertion. Households with more assets save even more. The household fixed effects (u_i), which also include a time invariant determinant of permanent income (such as education, sex), are also significant. The parameter estimate for the dependency ratio has the expected sign – households with more elderly members and young children save less. Examining the health variable we see that days of ill health significantly reduce savings and raise consumption. This may be the result of a desire to smooth the asset stock (health).

3.3 Results of the structural equation: Propensity to save out of transitory income

The estimates for equation (7) also lead to a rejection of the PIH (Table 5). Households saved a small (0.22) but significant amount of their transitory income. These findings are similar to those of Ersado et al. (2003), who found a propensity to save out of transitory income of 0.38 in 1990/90 (before shocks) and 0.8 in 1995/96 (after shocks) in rural Zimbabwe. However, these findings differ substantially from those of Paxson (1992), who found that households save a large proportion of their transitory income (0.78–0.83). However, the Thai households examined by Paxson were much wealthier (middle-income category) than those examined here and in Zimbabwe. In much poorer households, budgeting of transitory income would be expected to deviate substantially from the theoretical prediction that all transitory income is saved.

Table 5: Estimates for the structural equation for savings (Two-stage estimation)
Dependent variable: Total savings

Variable	Coefficient	SE
Estimated permanent income	0.04	0.11
Estimated transitory income	0.22	0.07
Dependent ratio	-6,330.44**	2824.57
CV rainfall, planting season	13.63*	7.83
CV rainfall, planting season*Wealth	-1.10	1.31
Ill and AIDS affected	-231.80**	98.43
Ill and AIDS *Wealth	1,602.25**	818.67
Constant	2590.15	4979.35
N	533	
F test that all u_i=0	F(189, 336) = 2.02***	
F(7,336) = 2.95***		

*significant at 10%, ** significant at 5%, ***significant at 1%

Rainfall uncertainty is positively correlated with savings, as shown by the coefficients for rainfall variability (CV) for the planting period. When rainfall variation interacts with wealth, the negative sign suggests that farmers' precautionary balances may decline. These signs are in line with Rosenzweig and Binswanger's results in rural India (1993) that show wealthier farmers to be less risk-averse. However, the effect of CV interacting with wealth is insignificant in attenuating the effect of rainfall variability, which may point to a vulnerable asset base, even for the better-off.

Unlike rainfall variability, wealthier households with a head who is ill and AIDS affected may hold more precautionary balances. While being ill and AIDS affected depresses savings, when interacted with wealth the effect is positive and significant. This implies that such households may hold more of their wealth in liquid form. This has implications for investment and the ability to smooth future consumption.

4. Conclusions

This paper investigated the extent to which households build buffers to insulate consumption against seasonal shocks. It entailed examining seasonal changes in saving behavior and testing the idea that people save most of their transitory income, as postulated by the permanent income hypothesis. The results show that while households exhibit some level of prudence, the extent to which they save out of transitory income deviates from unity, as the theory postulates. Only 22% of the transitory income is saved in each period. This also shows the extent of incompleteness of financial markets in the study area. The implication is that households are unable to use savings and credit to smooth consumption across periods.

Consistent with theory, the results show that wealth reduces the need for precautionary balance with regard to weather variability. Nevertheless, the asset base may be weak, as wealth interacted with rainfall variability though negative is insignificant. With regard to health uncertainty, however, households may hold their wealth in more liquid form. This, coupled with the fact that being ill is associated with higher current consumption, may jeopardize future consumption. Although increased consumption during illness may lead to better health, the desire to smooth the asset (improve health) may outweigh the desire (or the ability) to smooth future consumption through increased savings. As a consequence, consumption across periods tends to be relatively more volatile.

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