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CHOICE OF COPING STRATEGIES AMONG LOW-INCOME RURAL HOUSEHOLDS UNDER TRANSACTION COSTS

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I. Introduction

Coping strategies, or buffering mechanisms, are the mechanisms that agrarian households have utilizcd for generations for buffering income and consumption variability over time and/or space. These mechanisms are aimed at minimizing or neutralizing the impact of an adverse outcome by combining it with a better outcome (s) over time or space. Some examples for these buffering mechanisms are: grain storage (Walker and Ryan, 1990), various borrowing and lending operations (Eswaran and Kotwal, 1989; Jodha, 1978 ; Bell and Srinivasan, (1989); holding various types of assets (Rosenzweig, and Wolpin, 1993), marriage relationships (Rosenzweig and Stark, 1989; Rosenzweig, 1988); reciprocity (Coate and Ravallion, 1993); migration (Stark, 1991); and plot and crop diversification (Walker, Singh and Jodha, 1983). As these papers amply demonstrate, coping strategies among low income reral households have been a source of several modeling attempts by economists among others. These studies are interesting in their own right; they illuminate the importance of each coping strategy rigorously. Nevertheless, all these studies concentrate on modeling a single coping strategy at a time leaving many important issues unexplained. First, while concentrating on a single mechanism the researcher may miss consumption smoothing possibilities rendered by another strategy (Townsend, 1994). Second, households may use a combination of strategies in order to cope with a wide variety of situations and problesms. Third, single or a combination of coping strategies that were chosen by the household may have some spillover effects on risk sharing institutions and factor markets. In order to circumvent this problem, Townsend proposes a general equilibrium model by which, as he puts it, researcher evaluates outcomes rather than coping mechanisms, so that all actual institutions of any kind are jointly evaluated. Unfortunately, this does not lead us to a better understanding of household responses under varying economic conditions, a task far more illuminating than simply evaluating patterns of consumption.

Our primary objective of this paper is to illustrate that the choice of coping strategies is governed by transaction costs and future income potential. Section two outlines the theoretical framework. Section three presents the simulation results, and section four concludes the paper.

2. Theoretical Framework

Roumasset (1982) defines transaction cost wedges as the price differential between buying selling prices. The price level facing a household at the time of buying an essential commodity may not necessarily be the one that the farmer is compelled to sell at the time of harvesting and selling. The divergence may emerge from various factors and costs such as transpotation, organization, and administrative costs. The general expectation among transaction cost economists is that as transaction costs decline markest become more integrated and, hence, improve the efficiency of the market. According to this view transaction cost wedge serves as a good indication of the level of market integration, or as a measure of economic development, of rural areas. In the context of coping strategies, as transaction costs decline households are expected to move from less to more market-oriented coping strategies.

Let that the buying price is P_b and selling price is P_s. In a good year, households are assumed to have a supply curve given by S_g. As this household experiences a surplus it sells the excess at price, P_s. In a bad year, yield drops to S_b and the demand exceeds its own supply. As a result, the household becomes a net buyer at which time it pays a higher price, given by P_b. In situations where the household does not have other reserves that can be used as a buffer against consumption shortfall, it tends to liquidate assets in order to maintain minimum consumption. If bad yields are correlated across farmers, everyone attempts to sell their assets at the same time, plummeting assets' prices. Thus, households face a higher buying price for rice and lower selling price for assets making it extremly difficult to cope. Jodha (1978) estimates that during the Rajastan drought in 1973-74, assets' prices were 25 to 80 percent lower than the purchase price while farm products became 2 to 3 times higher than during the normal year.

Good and bad yields do not coincide each other except under multi-cropping. Thus, it is quite legitimate to treat them as events that happened over time. Let us assume that the farmer receives a good yield in the first period, denoted by S_t^g, followed by a bad yield in crop season t+1, denoted S_{t+1}^b. As before, selling price at period t with good yield is $P_{S(t)}^R$. The buying price whien bad yield occurs at time t+1 is $P_{b(t+1)}^R$. Since $P_{b(t+1)}^R > P_{s(t)}^R$, one can write buying price as selling price plus transaction cost premium,

φ, e.g.,; $P_b^R = P_s^R + \varphi$. By definition, transaction cost wedge is a function of distance to the market,center, τ, e.g., $\varphi = (\tau)$.

To simplify further, I assume that the household uses four coping strategies, namely (a) grain storage, (b) assets as a buffering mechanism, (c) lending, and (d) saving in formal institutions. For each coping strategy a separate budget constraint is constructed. These are combined together to form the final model.

a) Grain Storage

When transaction costs are high, rural households have been observed to use coping strategies that avoid the use of market for consumption in the future. We concentrate on one such strategy, namely grain storage.[1]

By storing grain, rural households have been observed to avoid the use of the market for buying staple consumption goods where they are compelled to pay a high price for which they could receive only a fraction of the price at the time of harvesting. This is obviously a gain for the household. In a well functioning market, however, there is no need to store consumption goods. In that case they can sell output at the time of harvesting and accumulate saving that carries positive rates of return. Since the difference between selling and buying prices is negligible, they can purchase food items as needs arise without a loss. Grain storage is associated with many costs as well, for example, physical storage, interest and depreciation costs.

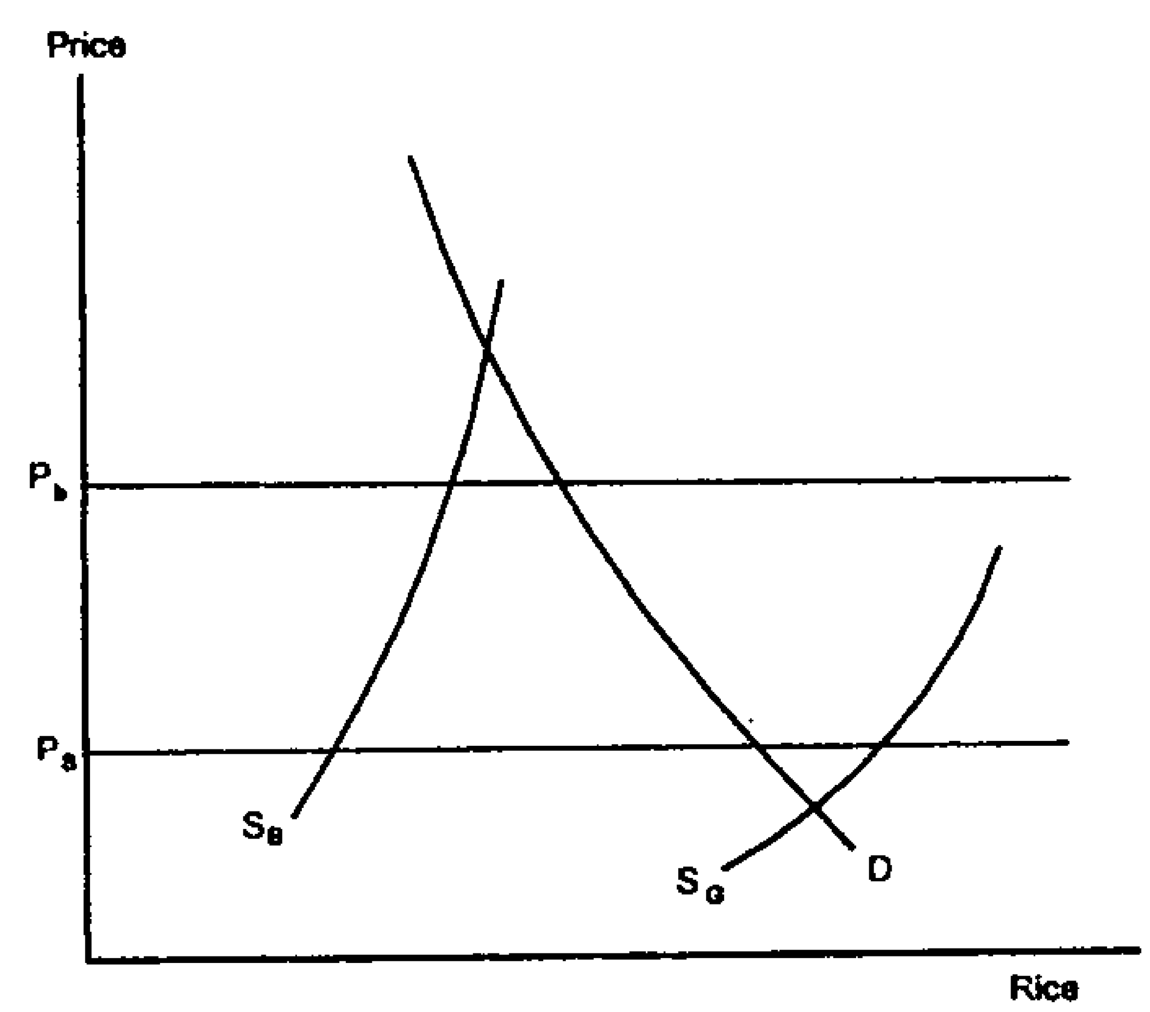


Figure 2: Typical Buying and Selling Prices in an Agrarian Economy

To simplify, let us assume that cost of storage per unit is cost of storage per unit is constant, given by k. The amount of grain storage of the household is given by g. Thus, the current consumption out of farm output is

$$C_t = x_g^t - g \tag{2}$$

In period t+1, household receives the yield given by $x_b^{t+1}\theta$ where θ is the weather induced uncertatnty parameter such that $O < \theta < 1$. When $\theta = 1$, period and peirod t+1 incomes are equal, while $\theta = 0$ implies a complete destruction of the farm in the t+1 incomes are equal, while $\theta = 0$ implies a complete destruction of the farm in the t+1 period, for example, by gale wind or elephant trampling. The consumption of period t+1 is

$$C_{t+1} = x_b^{t+1}\theta + g(1-k) - w_T \tag{3}$$

b) Assets as a Buffer

Households have found to accumulate assets when inccomes are better, and deaccumulate when incomes are bad (Jodha, 1979; Rosenzweig and Wolpin, 1992)

Let buying price of assets at time t be given by $P^A_{b(t)}$ and selling price at time t+1 be given by $P^A_{s(t)}$. Since $P^A_{b(t)} > P^A_{s(t)}$, one could write the buying price as $P^A_{s(t)}+\omega$ where ω, $0<\omega<\infty$, is the differential between buying and selling prices. The point where $\omega=0$, the price wedge is zero while $\omega>0$ indicates a higher assets price wedge. The assets price wedge is a function of the distance between the rual village and the market center., given by $\omega=\omega(\tau)$, $\omega(\tau) > 0$ where τ is the distance to the market center, At period t household acquires assets for the amount of A, at the cost of $P^A_{s(t)}+ \omega(\tau)$. Further assume that assets carry a positive rate of return,μ. It is also assumed that return is accrued at period t+1 even though asscts were acquired at period t. Thus, the contribution of asscts to period two income of the household is $(1+\mu)$ A. The amount of consumption at period t is lower by the amount of assets purchased and consumption period t+1 consumption is higher by the sale value of assets at period t+1 plus the gain from holding assets. In order to purchase assets, households have to sacrifice their consumption in period t. At period t+1, the amount of consumption is increased by the value of assets sold in the market.

c) Lending

Lending is a mechanism that allows households to transfer resources from present to the future. As Udry (1993) points out, rural households borrow when they suffer an adverse shock, and lend when favored with a positive shock. Lending in village economies is costly. First, lending involves screening of applicants for possible risk of default, administrative costs, cost of funds, and interest cost on delinquent loans. (Aleem, 1993) Hoff and Stiglitz (1993) attribute several features of rural credit market for the high cost of operating in rural areas, in particular, screening, incentives and enforcement costs. These problems are formidable in rural areas in developing countries due to asymmetries of information and limited scope for legal enforcement. Nonetheless, screening and default costs are expected to decline with economic development. As Hoff and Stiglitz (1993) explain:

> "as development proceeds and average income level increase, the imperfections of rural credit markets should diminish. This argument is supported by evidence from India that rural areas with higher-than-average incomes seem to face lower interest rates for money lenders," p.45.

In summary, lending in rural areas is costly. The transaction costs of credit market operations are expected to decline with the development of rural areas.

Let screening and default costs be specified by per unit of lending. For any amount of lending, the lender incurs a fixed cost, which is defined by Ω. The total cost of lending at period one can therefore be written as $(1+\Omega)$. As discussed earlier, the rate of interest in the village economy is related to the transaction cost wedges. Since transaction costs raise the cost of lending,, the interest rate that should be charged from borrowers in order to reach a positive rate is high. It has been observed that this rate of interest which is determined in the rural market floats in a band of maximum and minimum points. The minimum rate of this band may be equivalent to the rate of interest prevailing in the formal sector, $r_L^{min} = r$, while the maximum may depend on transaction cost wedges. Perhaps, a method can be devised to represent this relationship. In the ensuing numerical simulation, a simple lending rate is used, where $r_L > r$ where r is the rate that prevails in formal sector. At period t, the household is expected to lend L amount of funds, $(1+\Omega)\, L$, and at period t+1, it receives $(1+r_L)L$ amount of income. The consumption at period t is reduced by the amount of total lending plus cost of operating in a rural area. At period t+1, the household receives the total amount of lending plus interest payments.

d) Saving in the Formal Sector

How can the deposits in formal institutions be different from that of lending in the informal sector? A deposit in formal institutions like banks can be understood as a way of lending. This activity is distinguished from that of lending in the rural sector by the fact that the screening and default cost is either minimal or zero. A household can deposit and withdraw at any time without the risk of defaulting. Let the amount of deposit in a bank be denoted by S. At period two t+1 the household income rises by the amount given by $(1+r)$S.

The objective of the household is to maximize its lifetime utility which is given by,

$$u = u(c_t) + \beta u\,(c_{t+1}) + \gamma\beta v(w_T) \qquad (1)$$

Where c_t and c_{t+1} are consumption in periods t and t+1 respectively. β is the personal discount rate. The third term of this equation can have several interpretations. First, according to the terminology of discrete-perpetuity model of Hirshleifer (1970), it can be interpreted as the annual sequence of consumption which is a "permanent" level of future income. Under this, the representative household is assumed to exist for an infinite time period, and receives consumption equal to amount w_T for all the periods from period two onwards. Second, this term can be interpreted as utility arising from bequests (Hakansson, 1969; Fisher, 1973; and Richard, 1975). If we follow this interpretation, $v(w_T)$ is utility generated by the agent as a result of the bequest. The underlying premise is that the household is altruistic. The term γ is the weighting factor. Fisher (1973) points out that higher γ weights are applicable at times of family dependency. One could also interpret this as a weighting factor for family survival. At times when survival of current members is important, households may attach smaller weights to bequests. On the contrary, one could interpret $v(w_T)$ as the maximum utility attainable by a future generation as a function of transfer of wealth by the current generation[2]. In that line of thinking, γ is the *interpersonal discount factor.*

In formulating the model, we have assumed that the farm output at period t is higher than the output at peirod t+1. This may sound a very strong assumption. We lose some generality of the model due to this assumption. However, it becomes much easier to derive theoretical results and conduct simulation experiments. Further, the motive for consumption smoothing becomes critical when households expect their future income to be smaller than the current income. The model essentially captures this aspect with the above assumption.

The household maximization problem with all these coping strategies is

$$\max_{A,L,S,W_T} u(c_t) + \beta u(c_{t+1}) + \beta\gamma v(w_T) \tag{4}$$

s.t

$$P_S^R c_t + g_t + (P_S^A + \omega(\tau))A + (1+\Omega(\tau))L + S = P_S^R X_t^g + P_S^R w_0 \tag{5}$$

$$\begin{aligned}(P_S^R + \varphi(\tau))\, c_{t+1} + w_T &= \\ (P_S^R + \varphi(\tau))\, X_{t+1}^b \theta + g(1-k) &+ (1+\mu) P_S^A A + (1+r_L(\tau))L + (1+r)S\end{aligned} \tag{6}$$

Lagrangian for this problem can be written as:

$$\begin{aligned}G &= u(c_t) + bu(c_{t+1}) + bgv(w_T) \\ &+ \lambda_t[\, P_S^R X_t^g + P_S^R w_0 - P_S^R c_t - g_t - (P_S^A + \omega(t))A - (1+\Omega(t))L - S] \\ &+ \gamma_t[(P_S^R + \varphi(\tau))\, X_{t+1}^b \theta + g(1-k) + (1+\mu) P_S^A A + (1+r_L(\tau))L \\ &\qquad + (1+r)S - (P_S^R + \varphi(\tau))\, c_{t+1} - w_T]\end{aligned} \tag{7}$$

Kuhn-Tucker conditions for the optimization problem can be written as:

$$G'_{c_t} = u'(c_t) - \lambda_t P_S^R \geq 0,\ c_t \geq 0,\ c_t . G'_{c_t} = 0 \tag{8a}$$

$$G'_{c_{t+1}} = \beta u'(c_{t+1}) - \gamma_t (P_S^R + \varphi(\tau)) \geq 0,\ c_{t+1} \geq 0,\ c_{t+1} . G'_{c_{t+1}} = 0 \tag{8b}$$

$$G'_g = \gamma_t(1-\kappa) - \lambda_t,\ g \geq 0,\ G'_g . g = 0 \tag{8c}$$

$$G'_A = \gamma_t(1+\mu) P_S^A - \lambda_t (P_S^A + \omega(\tau)) \geq 0,\ A \geq 0,\ A . G'_A = 0 \tag{8d}$$

$$G'_L = \gamma_t(1+r_L(\tau)) - \lambda_t (1+\Omega(\tau)) \geq 0,\ L \geq 0,\ G'_L . L = 0 \tag{8e}$$

$$G'_S = \gamma_t(1+r) - \lambda_t \geq 0,\ S \geq 0,\ G'_S . S = 0 \tag{8f}$$

$$G'_{W_T} = \beta \gamma v'(w_T) - \gamma_t(1+n) \geq 0,\ W_T \geq 0,\ G'_{W_T} . W_T = 0 \tag{8g}$$

and two budget constraints for c_t and c_{t+1}.

Assuming that an interior solution exist, first order conditions can be written as,

$$A:\ u'(c_t) \frac{(P_S^A + \omega(\tau))}{P_S^R} = \beta u'(c_{t+1}) \frac{(1+\mu) P_S^A}{P_S^R + \varphi(\tau)} \tag{9a}$$

$$L:\ u'(c_t) \frac{(1+\Omega(\tau))}{P_S^R} = \beta u'(c_{t+1}) \frac{(1+r_L(\tau))}{(P_S^R + \varphi(\tau)} \tag{9b}$$

$$S:\ \frac{u'(c_t)}{P_S^R} = \beta u'(c_{t+1}) \frac{(1+r)}{P_S^R + \varphi(\tau)} \tag{9c}$$

$$W_T:\ u'(c_{t+1}) \frac{(1+n)}{P_S^R + \varphi(t)} = \gamma v'(w_T) \tag{9d}$$

These equations can be solved simultaneously for optimal level of assets, A^*, optimal lending, L^*, optimal saving, S^*, and transfer of wealth, W_T^* . Substituting the optimal values back into budget equations, one can solve for consumption in periods t and t+1.

The optimal asset holding is determined by the equality between marginal utility of consumption at period t adjusted by the terms of trade between assets and rice and the marginal utility of consumption at period t+1 adjusted by the terms of trade between assets and rice at period t+1 multiplied by gains from holding assets. Let us assume that the rate of return of holding assets is zero, μ=0. Let assets and rice price wedges are positive, i.e.,$\varphi(\tau)>0$, $\omega(\tau)>0$. Thus, holding assets for the purpose of smoothing consumption over time suffers at two levels of transaction costs; first, at assets price wedge and second at rice price wedge. As long as both $\varphi(\tau)$ and $\omega(\tau)$ are positive, the household will be better off by consuming more in the current period than holding assets and consuming more in the period t+1. If, however, $\mu>0$, and if gains from holding assets sufficiently outweigh transaction costs, then holding assets becomes desirable.

Optimun lending is determined by equating marginal utility of consumption at period t multiplied by cost of lending and the marginal utility of consumption at period t+1 adjsted by the price ratio of rice at periods t and t+1 multiplied by the rate of return on lending,$(1+r_L(\tau))$. Let us assume that the net rate of return to lending is zero, i.e., $r_L(\tau) - \Omega(\tau) = 0$. In other words, the ratio berween cost of lending and gains from lending is equal to one. As long as the price wedge is positve, i.e.,$\varphi(\tau)>0$, the relative price ratio of rice between periods t and t+1 is less than one, i.e., $\frac{P_S^A}{P_S^A + \omega(\tau)} < 1$.

Therefore, as long as there is a wedge between buying and selling prices, the household will be better off by reducing its lending in the current period. In other words, utility of consuming in this period is higher as long as there is a positive price wedge between buying and selling prices. However, if the net return to lending is positive, e.g. $r_L(\tau) - \Omega(\tau) > 0$, whether lending improves utility depends on relative magnitudes of net rate of return and relative price ratio of rice between periods t and t+l.

The optimal saving is determined at the point where marginal utility of consumption at period t equals marginal utility of consumption at period t+1 adjusted by the relative price between periods t and t+1 multiplied by the rate of return to saving, 1+r. As before, assume r = 0. Then, as long as transaction cost wedge is high, $\varphi(\tau)>>0$, current consumption is desirable than saving. If r is sufficiently high and that it outweighs cost of holding savings, then households will save. Thus, household savings can be increased either by raising r or by policies designed to reduce transaction cost wedges.

The optimal amount of bequests is determined by equating marginal utility of consumption in period t+1 adjusted by buying price of rice and marginal utility of bequests adjusted by the weighting factor. As long as $\varphi(\tau)>0$, households are better off by increasing bequests measured by lifetime utility.

Household income in period t+1 is an important variable that determines the extent of consumption smoothing. If income at period t+1 equals one, i.e., $\theta = 1$, the motive for consumption smoothing may not be large. However, if farm yield at period t+1 is zero, i.e., $\theta=0$, the motive for consumption smoothing may become much higher. Thus, despite 'conversion losses'[3] households may still want to save in order to maintain a level of consumption suffciently high in period t+1. In summary, holding assets, lending in the credit market, and savings in formal institutions will depend on three factors: (a) gains from the activity; (b) transaction cost wedges; and (c) the extent of consumption smoothing motive.

3. Simulation Results

In order to further illustrate the emergence of coping strategies from transaction costs, the above model is numerically simulated. For this purpose, the utility of the consumption is represented by an Isoelastic Utility Function (IUF) which is additive and separable[4]. The utility of bequests is also represented by an IUF adjusted by the weighting factor.

$$u(c_t) = \frac{C_t^{1-\rho}}{1-\rho} \tag{10}$$

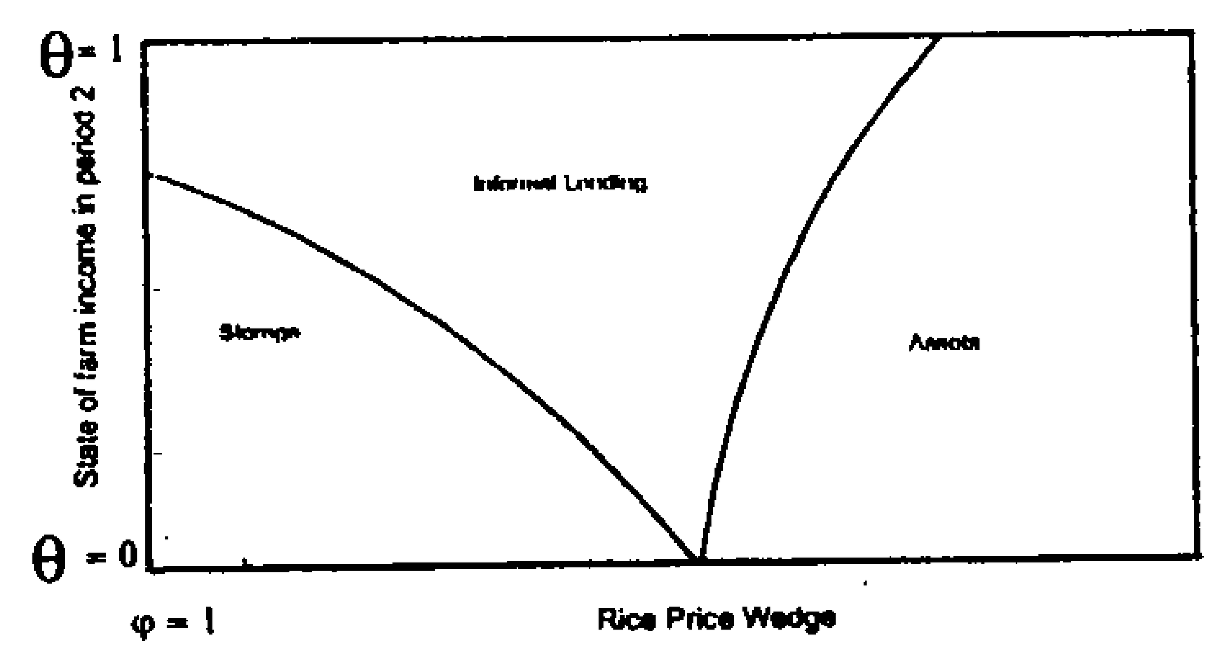
$$u(W_T) = b_t \frac{W_T^{(1-\rho)}}{1-\rho} \tag{11}$$

The system of equations given in (9) does not yield a closed-form solution. Therefore, a numerical solution for the system of equations is attempted. In the numerical solution, corner solutions are allowed[5]. The following exercises were carried out using the model: (a) effect of transaction cost wedges on (i) coping strategies, (ii) consumption in periods t and t+1, and (iii) bequests; (b) effect of period t+1 income on (i), (ii) and (iii) above.

The data used in the model are as follows. The degree of curvature of the utility function of consumption as well as of bequest are assumed to be 2, i.e.,$\rho=2$. The discount factor is taken to be 0.95. The bequest weighting factor, γ is taken to be equal to 0.5. This implies that there is an additional discount for bequests over normal discounts[6]. Rate of return on assets holding is taken to be 30 percent of purchase price,$\eta=0.3$. The bank deposit rete, r, is assumed to be 10 percent. The lending rate in the rural sector is assumed to be 20 percent, i.e., $r_L=0.2$, which may be questionable in some contexts due to extremely high rates of lending in village economis. Since the model is based on the cropping cycle, rather than a full calendar year, this may be a reasonable assumption[7]. Turning to storage, per unit cost of storage is assumed to be 6 percent of the total amount of grain stored, k=0.06. This relatively low coefficient is assumed to reflect the existence of indigenous technologies in developing countries plus low wage rate[8]. The income at period is taken to be one, i.e., $x^g = 1$. Income in period t+1 depends on the state of the world, θ. This was assumed to vary between 0 and 1, where θ=0 represents the complete destruction of the farm while θ=1 implies that the yields in periods t+1 and t are equal. The wealth inherited from the previous generation is assumed to be equal to 1, W_0=1. The total number of children, n, is assumed to be 1. The wedge between buying and selling price of rice is considered to vary between 0 and 1, i.e., $0<\varphi<1$. The φ=0 implies that there is no wedge between buying and selling prices and φ=1 implies that the buying price is twice that of the selling price.

a) Switching from Less to More Market Oricnted Coping Strategies

Indirect utilities of households under various insurance schemes with different crop failure rates, θ, are depicted in figure. 3. This provides a way of finding dominant coping strategies, measured by indirect utility. When households expect a complete farm farlure in the second period, the consumption smoothing motive becomes very high. If, in addition to farm failure, the price wedge is high, grain storage becomes the dominant choice since it guarantees future consumption at the lowest possible "conversion loss" As the price wedge declines, households switch from grain storage to assets. If the farm is expected to fail by 50 percent compared to period one income, the need for consumption smoothing becomes less strong. As a result, households abandon grain storage early at low price wedge and switch from storage to informal lending followed by the use of assets. When the household has information that the farm is not going to fail, the need for saving in order to achieve a smooth consumption path declines further. If the household is operating in an environment characterized by high transaction cost wedges, lending becomes the dominant choice. The household continues to engage in village level lending until the price wedge declines to a sufficiently low level such that gains from holding assets outweigh costs in terms of foregone losses by converting output to assets and back into consumption goods at period two.



θ=0: Complete Farm Failure — φ=1: High Transaction Costs

θ=1: No Farm Failure — φ=0: Zero Transaction Cost Wedges

Figure 3: Fragmentation of Price Wedge and Future Farm Failure posibillities According to Dominant Coping Strategies

First, household utility rises in two different ways: (a) due to higher income in t+1, indicated by θ, and (b) due to decline in transaction costs. A rise in period t+1 income, indicated by θ, $0<\theta<1$, implies a parallel shift in the level of household utility. Utility rises by 40.42 percent at the level where households do not anticipate a farm failure, compared to a level where the farm may fail completely. When households do not face a threat of failure, they become active participants of market activities; in this case, they become lenders instead of holding food granaries. Similarly, declining transaction costs increase households' indirect utility. The decline of φ from 1 to 0 increases utility by approximately 5 percent. More importantly, with declining transaction costs households switch form passive activities to more active market participation. In our simulation, this is reflected in the switch from storage, to lending, to asset holding. When transaction costs are high, it would be efficient for them to maintain grain storage, which is economically inefficient compared to investments that bring about positive economic gains. Futher, figure 3 also indicates that, when households are poor, a decline in transaction cost is much more utility enhancing than when the income is relatively high. This confirms the idea that it is the combined effect of low income and transaction cost wedges that hurts the most, rather than uncertainty or the transaction cost wedges alone.

As for coping strategies, there are two aspects that need further clarification: (a) the way in which households switch from one coping strategy to another along a given utility frontier (i.e. for a given θ); and (b) the way in which households respond to transaction cost differentials with varying levels of θ. First, let us consider a movement along the utility frontier. Let us also assume that $\theta=0.5$. The grain storage is dominant until φ reaches the point 0.7 ($\varphi\leq0.7$). Lending is dominant where $0.7<\varphi<0.4$ while assets become dominant afterwards. When transaction costs are high, it pays to avoid the market. If the household were to use lending or assets at this level, conversion cost of output to assets, and to consumption goods, in that order, are extremely high. Therefore, storage is preferable over other methods. As transaction costs decline, gains from lending outweigh costs of conversion between consumption goods and different types of assets. Thus, households may use lending at that stage. As transaction costs further decline, assets become preferable. Second, it is noticeable that there is a shift in coping strategies as θ rises from 0 to 1. For example, when $\theta=0$, households use grain storage in the range of $1<\varphi<0.5$; when $\theta=0.5$, storage is dominant in the range of $1\leq\varphi\leq0.7$. Finally, households avoid the use of grain storage completely when θ becomes 1,i.e., incomes in both periods are the same. Households do not use lending at low levels of of θ. But when $\theta=1$, it is the preferred choice until $\varphi\approx0.3$. This can be explained by referring to the income effect. As expected, when future income rises households can invest in assets, or lend in the money market, both of which have positive rates of return. This gain in income outweighs loss of income from transaction costs. Hence, it becomes more profitable to abandon storage that has a negative rate of return and switch to lending and asset holding as coping strategies. Further, when θ is at very low levels, household have a higher motive for consumption smoothing which declines as θ rises.

Why do households switch from storage to lending when transaction costs decline? The answer may lie in the level of economic integration. As markets become more integrated, transaction cost wedges measured by the difference between buying and selling prices start to decline. This decline affects lending activities in two ways. First, low transaction cost implies a higher market integration; hence, a higher level of competition: This puts a downward pressure on the lending rate in the rural sector. For lenders, rural markets become less attractive. Second, searching cost and other operational costs decline with economic development. This makes it more attractive to lend in the rural sector. The final outcome is determined by the interaction of these two opposing forces.

As transacton costs further decline, the use of assets become attractive. If a household attempts to use assets when transaction costs are high, it faces a "triple whammy". At the same time that households receive a bad yield, they have to pay a higher price for the consumption good and a lower price for assets sold in the market . Therefore, cost of wedges outweigh benefits of holding assets. In our model, the rate of return to assets is not correlated with transaction costs; it stays constant with declining transaction costs. As a result, benefits of holding assets start to outweigh costs at a sufficiently low price wedge. When this happens, households start using assets as a buffering mechanism.

Institutional lending is not shown to be attractive over the whole range of transaction cost wedges. This is due to two reasons. Institutional deposits normally carry lower rates of return and they do not cover transaction costs associated with rice prices. Thus, deposits in banks are not an attractive option for rural farmers.

4. Conclusions

The major objectives of this paper was to illustrate the role of transaction cost in the choice of buffering mechanisms. More broadly, choices made by farmers depend on many types of transaction costs in agrarian economies. To illustrate this, a two-period household model was constructed incorporating transaction costs. First order conditions show that transaction costs indeed play a significant role in the choice of coping strategies. Simulation results further suggest that households attempt to avoid the use of market mechanism when transaction costs are high. As transaction costs decline, households begin to use coping strategies that use the market mechanism at least partially, e.g., lending in the informal sector and holding assets. This result rejects the simple notion that farmers are backward and reluctant to adapt to changes. The choices made by farmers are governed to a significant degree by the transaction cost wedges and future uncertainty. As an implication, this suggests that a real attempt of the government or other agencies to uplift the living standard of farming communities must address the price differentials between buying and selling prices of farmers and stability of farm income over time.

Notes:

1. Another variant of storage is the use the body-livestock or the human body itself-as a storage that can carry them through lean periods (see, e.g., Bohle, et.al., 1991; Payne and Lipton, 1994).

2. See Altig and Davis (1992) for such an interpretation.

3. Conversion loss is defined as the amount of consumptio loss due to transation costs. In environments where capital market is underdeveloped, households rely on other methods for buffering their income, e.g.,,assets. When households attempt to convert out put into assets and back into consumption goods in the following period, some part of the income get lost due to wedges between buying and selling prices (both rice and assets.)

4. See Appendix A.

5. The model is solved by using the KTM ax package developed by Kaplan and Mukherji (1993).

6. See Fisher suggests that the weighting function to be a hump-shaped with the higher weights being applicable at times when the family dependency is important. As household members become older, the weight rises and subsequently declines. See Fisher for a table of weighting functions for bequests.

7. The annual rate of interest can vary from 25 percent to 100 percent, given the extent of operation cost and other admimistrative costs. Aleem (1989) estimatcs that the average cost of lending is 48 percent (p. 146).

8. Walker and Ryan (1990) indicates that there had been some large pits that stored food in India. This has for Sri Lanka according to historical witings and documents. One popular storage pit known as "bissa" is an example.

9. Conversion loss is the foregone income due to conversion between farm output and assets at period one and assets and consumption good in period two.

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