

Vulnerability of the Rural Poor: By Choice or By Default?

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Rural agrarian households are generally prone to frequent income shortfalls emanating from natural and man-made calamities. These income shortfalls very often lead to consumption shortfalls pushing them below subsistence levels. In their attempt to survive under extreme conditions, households tend to dispose productive assets often at levels below the market prices. This makes them more vulnerable for calamities of even at low magnitude. Numerous newspaper headlines attest to these conditions. The literature on the vulnerability of rural economies is extensive, and can be divided broadly into two groups. The life cycle model or variants of it suggest that individuals and households can smooth out their consumption. Some economists, in particular those in developing countries resist the idea that households do achieve smooth consumption paths over time. More interestingly, several case studies seem to suggest that rural households do not even make a concerted effort to smooth our consumption over income fluctuations.

This paper attempts to address the question whether rural households insure themselves against possible farm failures or other disasters. If not, why they do not insure?

Consumption Smoothing Among Rural Agrarian Households

The idea that individuals or households can smooth out consumption intertemporally received its prominence with the advent of the permanent income hypothesis and life cycle models (Modigliani and Brumberg, 1954; and Friedman, 1967). These models led to the emergence of a consensus among the economists on the ability of individuals or households to smooth out con-

sumption under income fluctuations. Studies based on the life cycle model or variants of it suggest that households achieve a substantial amount of consumption smoothing in the sense that consumption is not equal to income. For example, Paxon (1992) finds that positive transitory gains in income from rainfall have negligible impact on consumption. Although she maintains that transitory income is saved rather than consumed she rejects a strong version of a permanent income model which posits that marginal propensity to consume (mpc) out of permanent income is exactly one (i.e. she rejects the hypothesis that $mpc=1$).

There is a significant body of research that suggests agrarian households neither do achieve nor do they necessarily attempt to smooth out consumption over time. Some economists, particularly those in developing countries, resisted this idea on several grounds. First, it was hard to imagine the existence of formal markets that can effectively insure consumption against various fluctuations. As in models based life cycle models, it is necessary to have well-developed markets for explicit contingent claims for households to be able to smooth out consumption, which are sparse to find in developing countries. Even if we allow for the possibility of using various forms of informal buffering mechanisms to smooth out consumption, the amount of smoothing that rural households achieve seem to be small.¹ The ability of households to smooth out consumption in rural economies has been extensively debated since the 1970s (Popkin, 1979; Scott, 1976; Platteau, 1991; Abel and Kotlikoff, 1988; Altonji, Hayashi; and Kotlikoff, 1989). The literature is not conclusive, however, on the level of consumption smoothing among agrarian households. In developing countries, rich households achieve smooth

consumption paths compared to poorer households. Using a three-year panel from India, Bhalla (1979, 1980) finds that households smooth out consumption over time, but the consumption of poorer households tracks income more closely than does the consumption of wealthier households. In a study conducted in Pakistan, Alderman (1992) reports a substantial amount of consumption smoothing among agrarian households. He also finds that saving propensities to the substantially different between rich and poor households. Another basis for the resistance is that everyday experience seems to suggest that individual consumption does respond to individual shocks affirming that large fractions of temporary income shocks are typically consumed (Jodha, 1975, 1978).

Seasonality of production and consumption is a common way of live for rural agrarian households. Expenditures of agrarian households have been found to rise around harvest time and subsistence level of consumption is maintained during the rest of the year. Moreover, farmers sell their major crop to meet rising expenditure even though prices are lowest during this time of the year. Garine (1991) provides a vivid account for lack of consumption smoothing among rural agrarian households in Africa. In his words,

"Money from the cash crop is available around November-December at a time when food stores are still plentiful and when the feeling of wealth creates a festive atmosphere. During this time period debts are repaid and traditional obligations are fulfilled. Everyone reasserts, through gifts and entertainment, their network of social and economic relationships. It is by so doing and by allowing their money to circulate (rather than being invested in savings) that individuals maintain their status and will be able to draw on their

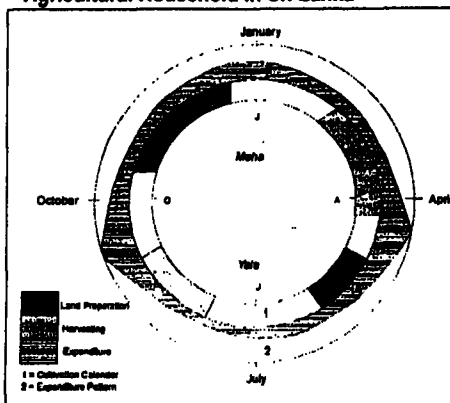
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partners' solidarity later on in terms of food as well as other services. This is the time when the cows which constitute the brides' wealth are brought to the family of the bride, visits made to in-laws or to one's mother's family. This is also the time for funeral feasts which have been postponed since the rainy season. Prestige is a must, and status-enhancing articles such as beautiful clothes, radios and bicycles are purchased. Money supplies are rapidly exhausted. Then, in December, comes the time for compulsory payment of taxes. In many cases the farmers have to sell some of their cereals, which are purchased at the lowest possible price by the local merchants, who have been waiting for this opportunity. The food stores progressively dwindle and by March farmers attempt to reconstitute the missing grain. They try to reach neighbouring markets in well-provisioned areas such as the Tupuri country, but prices will have already increased by 50%, to which bought by the same merchants at a still lower price, to obtain the grain which is sold to them at rising cost" (Gariné, 1991, p.86-87).

In case of Tanzania, Ali and Pitkin (1991) report that farmers sell up to 50 percent of their main crops just after collection of harvest even when they know what remains will not meet their annual food needs and that prices are often lowest at harvest time. The same situation has been reported in a case study conducted in East Kenya in 1984 (Downing, 1991). Data gathered during the period of 1984-1985 suggest that the average household food consumption has declined from over 12,000 kcal/day to under 9,500 kcal/day during the lean period which, according to the study, runs from June to October². The pattern of household incomes and expenditures of agrarian households in the case of irrigation settlement in Sri Lanka show a similar pat-

tern (Siriwardhana, 1981). This situation is illustrated in Figure 1.

Figure 1 Annual Expenditure Cycle of a Typical Agricultural Household in Sri Lanka



According to this, household expenditures vary considerably along the cropping cycle. After each harvest time, *yala* and *maha*³, farmers sell their crop to local merchants and receive cash which, according to some government officials, they spend rather lavishly, on clothing, food and other "luxurious" items such as bicycles, radios, sewing machines, etc. During the harvest time, the proportion of expenditure out of current income rises substantially. In the months following this, consumption expenditure declines to almost subsistence levels, which they maintain until the next harvest.

An important question is why households do not make an effort to smooth out consumption if it is beneficial to them. Jodha points out that consumption smoothing is not an objective itself in case of rural agrarian households (1975, 1978). Using Indian data, he shows that households adjust consumption downward to protect productive assets. They do so by curtailing expenditures on consumption as well as other activities related to consumption such as ceremonies, clothing, protective foods,⁴ etc. The quantity of cereals consumed per adult unit has declined by 12 to 22 percent in different areas in India. The decline of per capita consumption has been found to be higher among small farms compared to large farms. It is obvious that even a smaller decline of consumption has severe consequences in the case of half-starved people than with those who are rela-

tively well fed. In the case of protective foods such as milk, meat, sugar, vegetables, fruits, etc. the decline has been found to be even higher, 28 to 42 percent in Indian case (Jodha, 1978). I depart from other studies to show that low amount of consumption smoothing is a result of high transaction costs in rural economies. This will be examined in the next section.

Theoretical Model

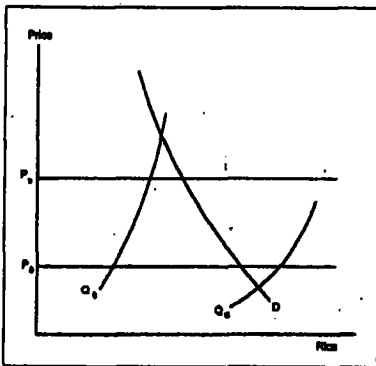
As it was in Section II, there is a body of research suggesting that agrarian households do not achieve a high level of consumption smoothing. A pervasive pattern among agrarian households is to consume at maximum⁵ during the time of harvesting and at minimum levels during other times.

Transaction cost wedges can be defined as the price differential between buying and selling prices (Roumasset, 1982; Evenson, 1993). 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 capital market imperfections, lack of transportation facilities, inappropriate institutions, and other costs. The general expectation among transaction cost economists is that as transaction costs decline markets become more integrated and, hence, improve the efficiency of the market. According to the above 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.

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 Q_s . In a bad year, yield drops to Q_b , and the demand exceeds its 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 shortfalls, 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 extremely difficult to cope. Jodha (1978) estimates that during the Rajasthan 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. This can be illustrated by using the following figure:

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



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 $Q^a_{(t)}$, followed by a bad yield in crop season $t + 1$, denoted by $Q^b_{(t+1)}$. As before, selling price at period t with good yield is p_a . One can write buying price when bad yield occurs at time $t + 1$ is $p^R_{b(t+1)}$. Since $p^R_{b(t+1)} > p^R_{a(t)}$, one can write buying price as selling price plus transaction cost premium, j , e.g., $p^R_{b(t+1)} = p^R_{a(t)} + j$. By definition, transaction cost wedge is a function of distance to the market centre, t , e.g., $j = j(t)$.

I assume that households save whatever the amount not consumed within that period. The saving can be taken to include various types of savings (e.g. grain storage, assets, etc).⁶

Thus, the current consumption out of farm output and any bequest is $C_t = X^j_t - S$ where s is saving out of current farm income. In period $t + 1$, household receives the yield given by X^{t+1}_j where j is the weather-induced uncertainty parameter such that $0 < \theta < 1$, where $j = 1$ incomes at both time periods are equal while $j = 0$ implies complete destruction of the farm in period $t + 1$. The consumption of period $t + 1$ is $C_{t+1} = X^{t+1}_0 + (1 + r)s$.

The consumption function of the household is specified as $u = u(c_t) + Bu(c_{t+1}) + Ybv(w_t)$

Where c_t and c_{t+1} are consumption in periods t and $t + 1$ respectively, B 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 $t + 1$ 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 premises is that the household is altruistic. The term y is the weighting factor. Fisher (1973) points out that higher Y 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.⁷ In that line of thinking, y is the *interpersonal discount factor*.

The farm output at period t is assumed to be known before the household solves its consumption-saving problem.

Income at period $t + 1$ depends on the state of the world. The motive for consumption smoothing becomes critical when households expect their future income to be smaller than the current income. The model captures this aspect with the above assumption.

The household maximisation problem with bequests under these conditions can be written as:

$$\text{Max } u(c_t) + Bu(c_{t+1}) + Ybv(w_t)_{s, w_t}$$

subject to the budget constraints

$$P^R_s C_t + S = P^R_s X^j_t + P^R_s w_t$$

$$(P^R_s + \theta(t))c_{t+1} + w_{t+1} = (P^R_s + \theta(t))c_t + (1 + r)S$$

Langrangian for this problem can be written as:

$$\begin{aligned} \mathcal{G} = & u(c_t) + \beta u(c_{t+1}) + \beta \gamma v(w_t) \\ & \lambda_t [P^R_s c_t + P^R_s w_t - P^R_s X^j_t - P^R_s w_t] \\ & \gamma_t [(P^R_s + \theta(t))c_{t+1} + w_{t+1} - (P^R_s + \theta(t))c_t - (1 + r)S] \end{aligned}$$

Kuhn-Tucker conditions for the optimisation problem can be written as

$$\begin{aligned} G'_c &= u'(c_t) - \lambda_t P^R_s \geq 0, \quad c_t \geq 0, \quad c_t \cdot G'_c = 0 \\ G'_{c_{t+1}} &= \beta u'(c_{t+1}) - \lambda_t (P^R_s + \theta(t)) \geq 0, \quad c_{t+1} \geq 0, \quad c_{t+1} \cdot G'_{c_{t+1}} = 0 \\ G'_S &= \gamma_t (1 + r) - \lambda_t \geq 0, \quad S \geq 0, \quad G'_S \cdot S = 0 \\ G'_{w_t} &= \beta \gamma v'(w_t) - \lambda_t \geq 0, \quad w_t \geq 0, \quad G'_{w_t} \cdot w_t = 0 \end{aligned}$$

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

$$\begin{aligned} S : & \frac{u'(c_t)}{P^R_s} = \beta \frac{u'(c_{t+1})}{(P^R_s + \theta(t))} \frac{(1 + r)}{(P^R_s + \theta(t))} \\ w_t : & \frac{u'(c_{t+1})}{P^R_s + \theta(t)} = \gamma v'(w_t) \end{aligned}$$

Considering equation (9a), household saving under transaction cost wedges is determined at the point where the marginal rate of substitution between periods t and $t + 1$ equals the price ratio between buying and selling prices adjusted for the interest rate and the personal discount rate. b Assuming $r = 0$ and $b = 1$, one can see that saving is completely determined by the transaction cost

wedge. When it is high, current consumption is desirable than saving because saving will not allow the household to buy the same amount of food in the future. In order for the household to save for the future, the rate of return should exceed the loss due to transaction cost wedges. The amount of bequest is determined at the point where marginal rate of substitution between bequests and the period $t + 1$ consumption equals the inverse of the buying price. As such, when transaction costs are high the utility derived from bequests become high.

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. $q = 1$, the motive for consumption smoothing may not be that large. However, if farm yield at period $t + 1$ is zero, i.e. $q = 0$, the motive for consumption smoothing may become much higher. Thus, despite 'conversion losses'⁸ households may still want to save in order to maintain a level of consumption sufficiently high in period $t + 1$. In summary, holding household saving depends on three factors: (a) gains from saving; (b) transaction cost edges; and (c) the extent of consumption smoothing motive.

Simulation Results

To further illustrate the impact of transaction costs on consumption smoothing the above model is numerically simulated. For this purpose, the utility of the consumptions represented by an Isoelastic Utility Function (IUF) which is additive and separable.⁹ The utility of bequests is also represented by an IUF adjusted by the weighting factor.

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

$$u(w_T) = b_T \frac{w_T^{1-\rho}}{1-\rho}$$

The system of equations given in (8) 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.¹⁰ The

model was simulated allowing transaction cost wedges and income in period $t + 1$ to vary. This helps us to understand how the household would behave under the specified environment.

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 Y is taken to be equal to 0.5. This implies that there is an additional discount for bequest over normal discounts. The bank deposit rate, r , is assumed to be 10 percent. The income at period t is taken to be one, i.e. $x = 1$ Income in period $t + 1$ where $o = 0$ represents the complete destruction of the farm while $o = 1$ 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, $w = 1$. The wedge between the buying and selling price of rice is considered to vary between 0 and 1 i.e. $0 < \phi < 1$. The $\phi = 0$ implies that there is no wedge between buying and selling prices and $\phi = 1$ implies that the buying price is twice that of the selling price.

Figure 3 provides consumption levels for three different levels farm failures (i.e. o takes three values 1, 0.5 or 0). At the same time various levels of transaction cost wedges are considered. When $o = 1$, incomes in periods t and $t=1$ are equal. When transaction cost wedges are high, households can increase their utility by increasing current consumption. As transaction costs decline, households can increase its utility by reducing current consumption and increasing saving. When farm failure stands at 50 percent at period $t + 1$ (i.e. $o = 0.5$) households attempt to smooth out consumption. This is indicated by flat consumption in the current period.

The simulation results have a close correspondence with our hypothesis that households do not benefit from a high level of consumption smoothing when the rural environment is characterised by high transaction costs. The choices

made by households depend on two factors: transaction costs and possibility for farm failure. Due to conversion losses emanating from high transaction costs, disutility of saving may outweigh utility gains from consuming later. Thus, households may view saving as a suboptimal choice. At the time of harvesting, commodity prices are generally low. The converse is true in lean periods. When households attempt to sell the farm produce now and purchase when farm failures occur, the prices they have to pay are high. In this process selling and buying, a substantial portion of income is lost. Thus, saving is not an attractive option. As transaction costs decline, households reduce current consumption and increase savings. As transaction costs further decline, income effect starts to dominate pushing current consumption levels higher. Therefore, one could see a U-shaped consumption curve in periods t . Households with $o = 0$ consume as much in the current period while saving for the future. The consumption at period t rises as long as transaction costs decline. This result is due to the strong need for consumption smoothing. In this case, any decline in transaction cost is not automatically converted into saving. Instead households redirect gains arose from low

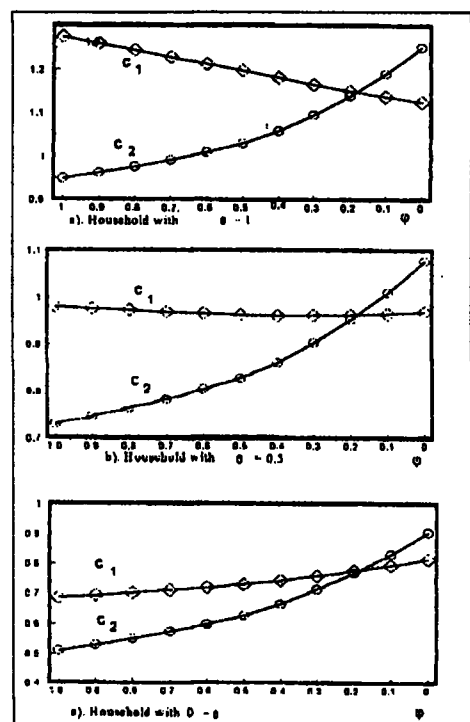


Figure 3: Consumption Smoothing Under Transaction Costs and Farm Failure
 a: Various Levels of Farm Income, $0 < o < 1$ (Only Three Levels Specified Above)
 b: Various Levels of Transaction Costs, $0 < \phi < 1$



transaction costs to consumption. The consumption in period $t + 1$ rises in all three cases considered above ($\alpha = 1, 0.5, 0$) and outweighs consumption at period t where $\alpha > 2$. Households with 0.2 save in period t and consume more in period $t + 1$ taking advantage of the positive rate of return. When transaction costs are low, saving in terms of assets and lending generate more income after adjusting for smaller amount of transaction costs that prevail in the economy.

As long as the conversion loss, defined as the consumption loss from converting output to assets and back into consumption goods, is positive, households will find it advantageous to consume more out of current income rather than saving for the future. However, households without insurance save as much out of current income in order to smooth out consumption. In other words, households with high-income ex-



pectations, due to wealth or insurance, consume a large proportion out of current income. Since there is no consumption smoothing motive, it is optimal to consume now, which avoids the need to convert output to other types of saving and back to consumption goods. Households with bad yield expectations, however, save in order to smooth out consumption despite apparent conversion losses.

Conclusion

A major objective of this paper was to provide an explanation for the observed lack of consumption smoothing among rural agrarian households.

Before proceeding into the theoretical model, I have reviewed some literature relevant for developing countries. Though there is no consensus among economists on the question of consumption smoothing among rural agrarian households, there is a substantial body of literature supporting the view that households do not indeed achieve smooth consumption paths. More interestingly, households do not seem to make a concerted effort to smooth out consumption even when they are in a position to do so. The theory of transaction cost seems to provide a better explanation for this behaviour. To explore this possibility, a two-period household model was developed incorporating transaction costs. Due to the difficulty in deriving closed-form solutions, some numerical simulations were carried out. The numerical results suggest that when transaction costs are high, house-

holds do not engage in precautionary saving even when they expect their farm to fail completely in the next season. In other words, insuring against disasters by way of foregone consumption in this period is not a preferred choice of rural agrarian households. These results reject the simple notion that farmers are irrational in their behaviour. As an implication, this suggests that attempts to uplift the living standards of the rural poor must address the question of high transaction costs. A long term solution to poverty and vulnerability of rural communities to various calamities rests on the ability to bring about a reduction in transaction costs of using the market mechanism.

Footnotes

¹ See, for example, Platteau (1991), Wickramasinghe (1995, 1997)

² The figure on average monthly household food consumption in the middle zones of Embu District of Kenya is particularly compelling (Bohle, et., op.cit, p.51). It shows how consumption varies during this period.

³ The word "yala" literally means wet, this is the season that runs from late April or early May to middle of September. The "maha" literally means great, runs from September to early April. This season is generally better in terms of yield.

⁴ Protective foods are the ones that provide more nutritional value such as milk and fish

⁵ This maximum may not be too far from the subsistence level

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⁷ See Altig and Davis (1992) for such an interpretation.

⁸ Conversion loss is defined as the amount of consumption loss due to transaction 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 output 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).

⁹ See Appendix A

¹⁰ The model is solved by using the KTMx package developed by Kaplan and Mukherji (1993)