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# Do the Poor Insure?

# A Synthesis of the Literature on Risk and Consumption in Developing Countries

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Formal tests of perfect consumption-smoothing do not provide convincing evidence that such patterns are prevalent in village economies. Nevertheless, most individuals appear to have appreciable ability to mitigate income fluctuations.

How well do rural households in developing countries mitigate the income risk of the rural sector? There are several sensible reasons why households cannot fully insure consumption against income fluctuations. The well-known problems of moral hazard, information asymmetries, and deficient ability to enforce contracts may result in no or incomplete insurance markets — and certainly there is a dearth of formal insurance markets in developing countries.

Yet the literature indicates that these households do mitigate risk. Alderman and Paxson survey the literature on strategies for insuring consumption against fluctuating income and examine evidence on how effective these strategies are.

Strategies for *risk management* include crop and field diversification; a portfolio of occupations; and the strategic migration of family members. Strategies for *coping with risk* include those that smooth consumption *over time* (through *saving* behavior, including borrowing and lending in formal and informal markets, accumulating and selling assets, and storing goods for future consumption) and those that smooth consumption across households (through *risk sharing*).

Alderman and Paxson focus on, and discuss the relative effectiveness, of different risk-sharing arrangements.

Risk sharing arrangements may be through formal institutions (such as insurance and futures markets, and forward contracts for harvests) and informal mechanisms (including state-contingent transfers and remittances between friends and neighbors). A number of institutions may offer "disguised" insurance. For example, share tenancy, credit contracts with state-contingent repayments, and long-term labor contracts may each contain an insurance component, although none are explicitly insurance contracts. Alderman and Paxson examine the literature on these strategies.

The few pieces of evidence available suggest that the effect of risk on production and investment decisions depends on how well households can cope with income risk. Poorer households, in particular, appear to forgo potential earnings to reduce risk. As such, there is a convergence of efficiency and equity issues.

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Risk and Consumption in Developing Countries

Harold Alderman and Christina H. Paxson[*]

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## I. Introduction

Income risk is a central feature of rural areas of developing countries. A major topic in development economics is how well households are able to mitigate the adverse effects of income risk on their welfare. There are several sensible reasons why households will not be able to fully insure consumption against income fluctuations. The well-known problems of moral hazard, information asymmetries, and deficiencies in the ability to enforce contracts may result in incomplete or absent insurance markets. The dearth of formal insurance markets in developing countries is evidence that these problems are considerable. However, a large body of literature indicates that households in developing countries make use of a wide variety of mechanisms, often informal, to at least partially limit consumption risk. A key piece of information required to guide policy design is how and how well different households mitigate risk. This paper reviews various strategies for insuring consumption against income fluctuations, and examines existing evidence on how effectively these strategies work.

One can conceive of a wide range of possible strategies to mitigate risk, the efficacy of which often depend on transactions costs and contract enforcement, that is, on local institutions. We offer two broad classifications for consideration:

(1) Risk Management. In the absence of perfect insurance markets, households may undertake actions to reduce the variability of income. Within agriculture this might include crop and field diversification. Households might also limit income risk by choosing a diverse portfolio of occupations, or through the strategic migration of family members. The optimal amount of diversification will depend on the household's preferences towards risk, its ability to smooth consumption against income fluctuations, and the costs of diversification in the form of reduced average incomes.

(2) Risk Coping. Risk coping strategies can be classified as those that smooth consumption intertemporally, through saving behavior, and those that smooth consumption across households, through risk-sharing. The primary distinction between these two is that intertemporal smoothing enables a household to spread the effects of income shocks on consumption forward through time. Risk-sharing, by contrast, spreads the effects of income shocks across households at any one point in time. A wide variety of mechanisms may be used for both intertemporal consumption smoothing and risk-sharing. Intertemporal smoothing may be accomplished through borrowing and lending in formal or informal markets, accumulating and selling assets, and storing goods for future consumption. Risk-sharing arrangements may be accomplished through formal institutions (such as insurance and futures markets, and forward contracts for harvests) and informal mechanisms (including state-contingent transfers and remittances between friends and neighbors). There are also a number of institutions that may offer "disguised" insurance. For example, share tenancy, credit contracts with state-contingent repayments, and long-term labor contracts may each contain an insurance component, although none are explicitly insurance contracts.

Our primary focus in this paper is on risk-sharing arrangements. However, it would be misleading to consider this method of risk reduction in isolation from other strategies. Risk averse individuals may choose a general risk-reducing strategy that combines portfolio diversification, saving and borrowing, and risk-sharing, depending on the relative costs and benefits of each strategy. It follows that changes in the costs and benefits of one strategy will affect how other strategies are used, and these interactions may be important for policy

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design.[1] In what follows we review various mechanisms of consumption smoothing with particular reference to how they interact, and their implications for income distribution. Sections I and II provide brief overviews of income stabilization strategies and intertemporal consumption smoothing. Section III presents a simple model of risk-sharing, and reviews evidence on the use of risk-sharing.

## II. Management of Income Risk

In the absence of complete insurance markets, households may choose lower average incomes in exchange for lower income variability. In rural areas, the variability of income may be reduced through a variety of mechanisms, including choosing crops whose yields or prices display low correlations, planting crops on scattered plots that are subject to different weather shocks, using a variety of production techniques, or choosing a blend of farm and non-farm occupations. The extent to which household trade off average incomes for less variable incomes should depend, in theory, on available technology, preferences towards risk, and opportunities for smoothing consumption given income.

It is useful to first consider how much households might be willing to pay (in terms of foregone average income) to reduce income risk. A good starting point is Newbery and Stiglitz's (1981, p. 73) calculation that the money value of income stabilization as a proportion of average income, termed the relative risk premium, is approximately one half the product of the relative risk coefficient (defined relative to income) and the square of the

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[1] For example, it is often argued that share tenancy and tied labor arrangements evolved to reduce risk for households with few assets. If so, improvements in credit or insurance institutions could result in changes in the organization of tenancy arrangements and labor markets.

coefficient of variation of income. For example, if the coefficient of relative risk aversion is 1.5 (indicating moderate risk aversion) and the coefficient of variation of income is .30, a household would be willing to forego approximately 6.75% of its average income to totally eliminate income risk. It follows that the amount a household would be willing to pay to partially reduce income risk would be smaller. For example, Walker and Ryan (1990) calculate that the potential benefits of crop insurance to farmers in South India is worth only about 1% of mean household income. Simple calculations of this type cast doubt on the idea that risk considerations are a major factor in the determination of allocation decisions.

These calculations are based on the assumption that households cannot smooth consumption intertemporally, and so may overstate the gains from risk reduction. If households can smooth consumption through saving and borrowing, the amount of income they will be willing to forego to avoid income risk will be smaller. Newbery and Stiglitz (1981, p. 204) provide another simple calculation that shows how the potential to save and borrow affects the risk premium. If households can save and borrow at a certain interest rate of $r$, the relative risk premium falls to approximately $r$ times the relative risk premium in the case of no saving or borrowing. In other words, at an interest rate of 10%, a coefficient of relative risk aversion of 1.5, and a coefficient of variation of income of .3, a household would only be willing to give up .675 percent of its average income to totally eliminate income risk.

These examples imply that the use of portfolio diversification to limit income risk is likely to vary across households, even those that face common risks and have access to the same production technology. First, the degree of risk aversion may vary across households, and all else equal, more risk averse households will diversify more (and have lower average

incomes.)  An implication is that if risk aversion declines with wealth, uninsured income risk

may exacerbate income inequality.  Second, households may have differing abilities to

smooth consumption *ex post*, and this will also affect the attractiveness of using portfolio

diversification to reduce income variability.  For example, households that are more likely to

be credit-constrained in the future will be more willing to sacrifice income for less risk

(Eswaran and Kotwal, 1990, and Morduch, 1990.)  If credit constraints are related to wealth,

as seems likely, then poor households will be less willing to bear risk, even if they have risk

preferences identical to those of wealthier households.

Given that preferences towards risk may affect allocation decisions, it is useful to ask

how risk averse poor households in developing countries are, and whether risk aversion

varies by wealth level.  There are a number of studies that use information on the allocation

decisions of farmers in developing countries to measure risk preferences (see Moscardi and

de Janvry (1977), Antle (1987), and Hazell (1982)).  The basic approach is to estimate how

much observed allocation decisions diverge from what would be implied by profit

maximization, and attribute any divergence to risk aversion.  These studies generally support

the idea of moderate amounts of risk aversion, with coefficients of relative risk aversion

generally in the range of 1 to 2, although  evidence of risk neutrality in found in one Indian

village by Antle (1989.)  However, these studies are subject to several criticisms.  First,

there may be many reasons other than risk why farmers may choose less-than-efficient

production methods (including factor market imperfections, and imperfect information about

production techniques.)  Attributing all divergences from profit maximization to risk aversion

may result in measures of risk aversion that are too high.  Second, all of the studies cited

above implicitly assume that household consumption equals household income (i.e.

households do not smooth consumption). If households can smooth consumption, then measures of risk aversion are likely to be too low. As Morduch (1990) points out, a highly risk averse individual with very good consumption insurance may make production decisions "as if" he were risk neutral.

Measures of risk aversion have also been obtained from experimental studies, in which farmers choose among a set of gambles with non-trivial payoffs (see Binswanger 1980, Sillers (1980), Walker (1980), Binswanger and Sillers, 1983, and Grisley and Kellog (1987)). The results of these experiments have been used to compute measures of risk aversion, as well as to evaluate whether individual's choices are consistent with expected utility maximization versus alternative theories of decision-making under uncertainty. These experiments indicate that farmers are moderately risk averse, but that choices do not vary systematically across wealth levels. This latter result, taken in conjunction with the observation that risk aversion appears to increase as the size of the payoff increases, is interpreted as indicating that decision makers care only about the losses and gains in a choice rather than their final wealth position (Binswanger 1981, and Binswanger and Sillers 1983.)[2] This finding is strikingly at odds with the standard assumption underlying many economic models, that households maximize the expected utility of total consumption or wealth. Binswanger (1981) also finds that models of decision-making based on security or "safety first" principals are inconsistent with the experimental data.[3]

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[2] More formally, Binswanger rejects the "asset integration hypothesis."

[3] Safety first models are based on the assumption that low income households desire to minimize the probability of falling below some subsistence minimum. See Moscardi and de Janvry (1977) and Anderson (1979). A problem with implementing such models is that the definition of the subsistence minimum is essentially arbitrary (from the standpoint of a

The finding of moderate amounts of risk aversion indicate that there is scope for risk factors to affect production and investment decisions, especially if individuals have few opportunities to smooth consumption given income. However, there are several reasons why it may be quite difficult to quantify the importance of risk. First, many of the methods of reducing income variability cited above (such as diversifying crops or occupations) may actually serve to increase rather than reduce expected incomes. For example, Carter (1991) finds that in the Sahel region of Burkina Faso inter-cropping results in yields that are higher but more variable than does sole-cropping. Furthermore, given the seasonal nature of agriculture in many regions, one might expect household to undertake many different activities at different times. Simply documenting that households have a diverse set of income sources does not imply that households diversify to buffer themselves from income risk.

Second, a finding that allocation decisions are inefficient (in the sense they do not maximize expected income) does not necessarily imply that uninsured risk is the source of the inefficiency. For example, McClosky (1976) argues that field fragmentation in 14th century England, which reduced average incomes by as much as 10%, was primarily a response to uninsured risk. However, Heston and Kumar (1983) argue that field fragmentation in Southern Asia may be the result of imperfections in labor markets and other institutional factors. Likewise, the common finding that poorer households adopt new agricultural technology more slowly than richer households can be explained by several factors, not all of which involve risk. The poor would be less able to smooth consumption *ex*

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researcher). Safety first models imply that at sufficiently low expected incomes, households will be risk takers. However, there are no studies known to the authors that explore such a switching point in allocative decisions.

*post*, due to credit constraints (Eswaran and Kotwal, 1989). Alternatively, they may face higher costs of acquiring information (Feder et. al. 1985), or they may be less able to obtain credit to finance the up-front investments that new technology requires.[4]

A handful of studies attempt to distinguish the effects of risk on production from the effects of other factors. For example, Morduch (1990) examines whether Indian farm households that are likely to face binding credit constraints display more crop and plot diversification than do other households. He finds that farmers likely to face borrowing constraints do choose less risky portfolios of crops and plots. However, he does not provide information on the cost of risk reduction, in terms of forgone average profits. Using data from the same villages, Binswanger and Rosenzweig (1989) note that the tendency to shift to a less risky portfolio is greater among households with less inherited wealth. This study is careful to distinguish the effects of credit constraints from wealth related patterns in risk aversion. Given that risky portfolios are also shown to yield higher returns per unit of wealth, the study concludes that limitations on ex-post consumption smoothing decrease profits of the lowest wealth quintile by a third relative to the unit returns of the wealthiest farmers in the community. Indeed, the wealthiest farmers in the sample do not exhibit any behavior that can be interpreted as deviations from profit maximization due to risk aversion. A similar point is made by Carter (1992), who argues that differences in the capacity to cope with risk exacerbate income inequalities in Burkina Faso.

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[4] The issue of technological adoption may not hinge on risk as often new technologies may display first-order stochastic dominance over older technologies (Walker and Ryan, 1990.)

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In summary, the few pieces of evidence that are available suggest that the effect of risk on production and investment decisions depends critically on how well households can cope with income risk. Both Rosenzweig's and Morduch's results imply that poorer households do choose less risky production strategies. However, it should be kept in mind that these two papers are based on data from the same household survey. Similar research must be done using data sets from other countries before these findings can be accepted as general conclusions.

## III. Intertemporal Consumption Smoothing

Saving behavior is one possible mechanism which can reduce consumption fluctuations despite variable incomes. Saving and dissaving can potentially take on many forms including transactions in formal credit and financial markets, borrowing and lending in informal markets, and the accumulation and de-accumulation of productive assets as well as consumer goods. The desirability of policies designed to buffer households from income shocks depends critically on how households use such savings to smooth consumption.

The literature on saving in developing countries falls into two categories. First, there is a body of literature that investigates how well households smooth consumption *given* income, but abstracts from issues of production. Gersovitz (1988) and Deaton (1990) contain useful summaries of much of this literature. Second, there is a small but growing body of work that investigates the inter-linkages between saving, credit constraints, and production decisions (Rosenzweig and Wolpin, 1990, and Morduch, 1991).

How well do households in developing countries smooth consumption through time, given income? Although strict versions of permanent income models are rarely accepted, the data typically reveal substantial amounts of consumption smoothing. For example, Paxson (1992) finds that shocks to the incomes of Thai rice farmers that are produced by transitory rainfall are largely saved, and have little effect on consumption. However, she rejects a strong version of a permanent income model which posits that propensities to consume out of permanent income are exactly one. Bhalla (1979, 1980), using a three-year panel from India, finds evidence of consumption smoothing, but also finds that the consumption of poorer households tracks income more closely than does the consumption of wealthier households. This evidence suggests that credit constraints might be binding for poorer

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households. Alderman (1992), using a three year panel from Pakistan, also finds substantial evidence of consumption smoothing as well as differences in savings propensities between rich and poor households. Even poor households, however, use credit markets to maintain consumption in the presence of negative income shocks. Deaton (1992b) uses data from Cote d'Ivoire to test a permanent income model, with mixed results. He finds that household savings anticipates income declines in Cote d'Ivoire, implying that individuals are forward looking when choosing saving. However, the data are not consistent with either a strict version of the permanent income hypothesis, or with the presence of liquidity constraints.

Recent literature on saving (see, for example, Zeldes (1989a) and Kimball (1990)) has emphasized the possible importance of what has been termed precautionary savings, or prudence. Prudent consumers are defined as those with convex, rather than linear, marginal utilities of consumption. One major implication of convex marginal utility is that the *variance* of future consumption affects savings behavior. Specifically, consumers who face greater uncertainty in the future will consume less today and, on average, exhibit higher consumption growth. This is not an implication of the standard permanent income model, which assumes linear marginal utility. Furthermore, several articles have stressed the point that prudence may result in saving and consumption patterns that appear similar to those produced by borrowing constraints, even if no borrowing constraints exist. For example, Zeldes (1989a) shows that with a constant-relative-risk-aversion utility function, the marginal propensity to consume out of transitory income declines with wealth. In this case, prudent individuals with low wealth levels choose to dissave (or borrow) less in response to a transitory income decline. Consumption by these individuals will track income more closely than implied by the standard permanent income model.

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Several attempts have been made to distinguish, empirically, between prudent behavior and behavior produced by borrowing constraints. These studies include Zeldes (1989b), using U.S. data, and Morduch (1990) for India. The test for borrowing constraints relies on the idea that binding borrowing constraints result in a violation of the first order conditions for utility maximization, whereas prudence does not. Both Zeldes and Morduch argue that the first order conditions imply that the growth in consumption between two periods ($t$ and $t+1$) should be orthogonal to information known by the household at time $t$. A finding that income at $t$ predicts consumption growth between $t$ and $t+1$ is taken as evidence of borrowing constraints. Intuitively, households that want to borrow due to low current income, but cannot do so, will have low current consumption and (on average) high consumption growth between the current period and the next. Both papers report a negative relationship between lagged income and consumption growth, and conclude that borrowing constraints may be operative in the United States and India, respectively. Morduch, however, also notes the when the sample is dissaggregated by village and by land wealth, the permanent income model cannot be rejected for all groups. In particular, the hypothesis of borrowing constraints cannot be rejected for landless laborers and small farmers in most villages, but can be consistently rejected for medium and large farmers.

There is reason to be cautious when interpreting these results. Carroll (1991) points out that for prudent consumers, it may not be the case that consumption growth is orthogonal to income at time $t$. As noted above, prudence implies that consumers for whom future consumption is more uncertain will display higher consumption growth. If consumption uncertainty is negatively correlated with current income, then current income will be negatively correlated with consumption growth even in the absence of borrowing constraints.

Although the evidence indicates that poorer households have consumption that more closely tracks income, the empirical work done to date does not provide clear evidence of whether this is due to prudence or to borrowing constraints.

Assuming that borrowing constraints are operative for at least some households at some times, it is useful to consider how borrowing constraints will affect consumption patterns. First, as Deaton (1990) notes, even if households are precluded from doing any borrowing at all, households may still be able to do a substantial amount of consumption smoothing though the accumulation and de-accumulation of either financial or physical assets. Deaton's simulations indicate that households that can never be net borrowers may have consumption patterns that are generally smooth. However, when large negative shocks in income coincide with low levels of assets or stocks, consumption declines sharply. The implication is that the effects of negative shocks to income on consumption will depend critically on the initial asset position of households. For example, a negative shock to income may produce little effect on consumption, but two consecutive negative shocks may have a large effect (since assets were drawn down in response to the first shock.) This is consistent with Webb and Reardon's observation that famine conditions were observed in Burkino Faso and Ethiopia only after two successive droughts. The ability of credit-constrained households to buffer consumption may also depend on the degree of autocorrelation in incomes. Deaton (1991) shows that stocks will less effectively buffer consumption if income shocks display (positive) serial correlation. Conversely, households whose incomes are negatively autocorrelated will make be able to maintain consumption patterns that are quite smooth relative to income.[5]

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[5] Some tree crops have yields that are negatively correlated across successive years, which could produce incomes with negative serial correlation.

Second, as discussed in Section I, borrowing constraints have implications for production and investment decisions of farm households. If credit markets for consumption do not operate perfectly, then farmers may sell or buy productive assets to smooth consumption. This idea is explored by Rosenzweig and Wolpin (1990), who argue that bullock sales and purchases are a major source of consumption smoothing in rural India, with implications for the efficiency of agricultural production. Furthermore, as discussed by Morduch (1990), farm households with a positive probability of facing binding borrowing constraints may be less likely to undertake risky production activities at the cost of greater expected profits.

## IV. Risk-sharing

### i) General Framework

The presence of insurance markets, formal or informal, implies that random variation in a household's income need not result in consumption variation. It is well known, however, that the problems of moral hazard, asymmetric information, and high enforcement costs may produce inefficiencies in insurance markets. The dearth of formal insurance institutions in developing countries would seem to indicate that these problems are substantial. A relevant question is whether informal insurance markets, built around community or family relationships, are able to overcome the problems that hinder the development of formal insurance markets.

One perspective of social insurance in traditional economies is based on shared norms and moral values (Platteau, 1991 and Scott, 1976). Without denying this possibility, one can show that more narrow concepts of self interest can generate institutions which pool income

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risk. Arrow and Hahn (1971) present a general equilibrium framework with trade between risk averse individuals that produces perfect risk sharing. Although a set of strong assumptions support this particular model, a number of simpler markets can do so as well (Fafchamps, 1991). Similarly, risk sharing does not necessarily require an arbitrator or planner; if interactions are repeated than mutual assistance may be self-enforcing (Coate and Ravallion, 1992, and Posner, 1980). This implies that the short term gains of not cooperating when it is one's turn to remit rather than receive may not outweigh the expected costs of forgoing future cooperation.

There is a growing body of literature that tests whether households within villages, regions, and even countries fully share risk. The hypothesis of full risk sharing is extreme, requiring the absence of moral hazard, asymmetric information and enforcement costs. However, it is still useful to consider whether observed consumption patterns are broadly consistent with patterns predicted by insurance models.

In what follows, we sketch out a simple model of full risk-sharing, discuss the empirical implications of this model, and contrast the model's implications with alternative models of consumption smoothing. Our presentation follows Mace (1991) and Townsend (1991). We do not explicitly model production decisions, although these can be easily incorporated. For purposes of exposition, we also assume that the basic unit through which insurance operates is the village. However, the basic model can be (and has been) applied to many types of insurance "groups," ranging from families to countries.

To depict the basic model of risk sharing, let $Y_{ivt}^*$ be the true income of household $i$ in village $v$ at time $t$ (measured net of insurance premiums or receipts). Assume that $Y_{ivt}^*$ consists of several different orthogonal components: an individual-specific fixed effect $\mu_i$, a

time-varying village-specific shock $u_{vt}$ that is common to all villagers, and an idiosyncratic shock $e_{ivt}$:

$$Y_{ivt}^* = \mu_i + u_{vt} + e_{ivt}.\qquad(1)$$

The term $u_{vt}$ captures the effects of factors (such as weather or prices) that may affect the incomes of all people in the village. The actual effects of these common factors on incomes may, in reality, vary from household to household. The assumption of identical village effects in incomes is made here to simplify notation. The idiosyncratic component $e_{ivt}$ is not correlated across individuals within a village.

Full insurance within a village implies that total village resources in any time period are distributed across households so as to equate the weighted marginal utility of consumption across households:

$$\lambda_i U'(c_{ivt}^*, z_{ivt}) = \lambda_j U'(c_{jvt}^*, z_{jvt}) \quad \forall \quad i, j.\qquad(2)$$

where $c_{ivt}^*$ is the consumption of household $i$ in village $v$ at time $t$. The term $\lambda_i$ can be interpreted as the weight a social planner gives to household $i$. Alternatively, in a decentralized market system, $\lambda_i$ will reflect the initial endowment of household i, and would be a (nonlinear) function of $\mu_i$. The variable $z_{ivt}$ measures household $i$'s preferences for consumption at time $t$. $z_{ivt}$ reflects factors such as the number of people in a household and the health status of household members, which affect the marginal value of consumption and may change over time.

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An important property of equation (2) is that the household-specific weight, $\lambda_i$, is constant over time and does not depend on the households's income draw in time $t$. The portion of total village resources a household receives in any year depends only on its initial endowment relative to the initial endowments of other villagers, and its preferences for consumption relative to the preferences of other villagers in that year. For example, if all households had identical initial endowments and identical preferences, their consumption levels will be equated in each year, no matter what the distribution of realized incomes across households.

The exact relationship between an individual's consumption and village consumption depends on the form of the utility function. Mace and Townsend each develop a full insurance model using both constant-absolute-risk-aversion (CARA) and constant-relative-risk-aversion (CRRA) utility functions. In what follows, we use the CARA utility function, since it results in slightly more straightforward consumption equations.[6] The utility function is:

$$U(c_{ivt}^*) = -e^{-\alpha(c_{ivt}^* - z_{ivt})} , \qquad (3)$$

where $\alpha$ is the coefficient of absolute risk aversion. Equations (2) and (3) can be combined to yield the following consumption equation for household i at time t:

$$c_{ivt}^* = \bar{c}_{vt}^* + (z_{ivt} - \bar{z}_{vt}) + \theta_t , \qquad (4)$$

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[6] Although the CARA utility function is better for the purpose of exposition, the CRRA specification may be better for the purpose of estimation. The CRRA utility function is more attractive in that consumption cannot go negative. Furthermore, its use results in consumption equations that typically fit the data better.

where $\bar{c}_{vt}^*$ is average village consumption (total village consumption divided by the number of village members), $\bar{z}_{vt}$ is the village mean of $z_{jvt}$, and $\theta_i$ is an individual-specific consumption shifter that sums to zero across village members and is a nonlinear function of the $\lambda$'s of all village members.[7] The CRRA utility function results in a similar consumption function, with individual consumption replaced by its logarithm, and average village consumption replaced by the average of the logarithm of consumption.

There are several important implications of the full-insurance model. First, a household's consumption is determined solely by average village consumption and preferences. Household income affects consumption only insofar as it affects total village resources and village consumption. In fact, if preferences (i.e. $z_{ivt}$) did not vary over time, all households within a village would have identical consumption changes between any two periods. A related implication of the full insurance model is that an individual who receives an idiosyncratic shock that permanently increases his income will continue to receive only his pre-specified portion of total village income. Likewise, individuals who become permanently poor will have their consumption maintained by the community for life. Obviously, the incentives to renege on risk-sharing contracts in these instances may be high, and the assumption that contracts are fully enforceable is critical.

Another point is that full risk-sharing only protects individuals against idiosyncratic, rather than aggregate, risk. As the number of individuals in the insurance pool becomes large, the effect of idiosyncratic income shocks (the $e_{ivt}$'s in equation 1) on village consumption goes to zero. However, aggregate shocks (the $u_{vt}$'s) are left uninsured. This

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[7] Specifically, $\theta_i$ equals $\ln(\lambda_i)$ minus the village average of $\ln(\lambda)$, divided by $\alpha$.

does not imply that village consumption necessarily tracks village income. Villages may potentially borrow and lend from each other to smooth consumption against aggregate shocks, and the full insurance model can easily take this possibility into account. For example, a model of full insurance within villages can be nested together with a model of permanent income saving and borrowing between villages, implying a low response of village consumption to transitory movements in village income. Furthermore, stocking behavior may be used to smooth consumption over time within villages, even in the absence of inter-village credit markets.

Although intertemporal smoothing mechanisms may be used to mitigate the effects of aggregate risk on consumption, it is still true that the effectiveness of risk-sharing as a tool for consumption smoothing will be limited by the importance of aggregate risk relative to idiosyncratic risk within an insurance "group." The next section examines evidence on income covariation. The subsequent sections turn to evidence on risk-sharing.

## (ii) Income Covariation Within Communities

As described above, complete risk-sharing can only protect households from the effects of idiosyncratic shocks to income. Even if risk-sharing arrangements function efficiently within communities, they will produce little in the way of consumption smoothing if only a small part of total income risk is idiosyncratic. Covariate income risk may also limit the usefulness of credit markets as a tool for consumption smoothing, if credit markets are regionally segmented.

There are several problems associated with measuring the amount of aggregate risk a community faces. The first is conceptual; what is the appropriate community? To find out

how effective informal insurance can be, one should measure the covariance of incomes within groups of people for which the problems of moral hazard, asymmetric information, and enforcement of insurance contracts are small. Without knowing whether informal insurance markets work though villages, families, or even along ethnic or religious lines, it is not clear how income covariance should be measured.

This conceptual problem is compounded by data limitations. Household-level data are the natural data source to use for investigating issues of income covariance. The structure of many household surveys lends itself to investigating issues of covariance of incomes across households who live near each other. Most household surveys select villages (or small regions within urban areas) as sampling units, and then administer surveys to randomly selected households within those sampling units. With this type of survey structure, measuring income covariation within villages is straightforward. However, few household surveys collect comprehensive information on the locations or incomes of extended family members who do not reside with the household, making it difficult to test whether families members who do not live together could potentially insure each other. One exception is the ICRISAT data from India which asks households what ᵗⁱ· ᵤt daughter-in-laws within households lived prior to marriage, allowing Rosenzweig and Stark (1989) to test a family-based insurance model.

Walker (1990) lists three factors that will affect the degree of income risk for an agricultural household: 1) risk in input prices, 2) production risk, and 3) risk in output prices. This suggests several reasons why risk might co-vary within villages. First, households within villages are likely to face the same prices for inputs, outputs, and labor, and movements in these prices may produce correlated income shocks. Movements in the

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prices of consumer goods will also produce common movements in real incomes. Second, production risk may be correlated across households, especially for agriculture households. Weather fluctuations, in particular, may have similar effects on the incomes of agricultural households who live close to each other. Third, production risk may produce price risk which could simultaneously affect non-agricultural households as well as farmers. For example, poor rainfall could affect employment, wages and food prices as well as production.

One would expect a strong relationship between rainfall and agriculture output, either directly or indirectly by means of the catchment for an irrigation program. Thus, Paxson (1992) finds that the deviations of regional rainfall from average regional values have large and significant effect on the incomes of Thai rice farmers.[8] Similarly, Gersovitz (1987) uses time series data on rainfall and crop yields from Senegal to show not only that yields of groundnuts, millet and rice are highly responsive to rainfall, but that cross-crop correlations between rainfall-induced yield fluctuations is quite high (.82 or higher for each pair of crops). Webb, von Braun and Yohannes (1991) have similar results for Ethiopia. These two studies, then, support the view that there may be little scope for co-insurance at the village level.

For weather to induce strong correlations of income within a community, however, different households should face the same weather. Townsend's observation that rainfall measured at opposite ends of a single ICRISAT village are not highly correlated may imply

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[8] Rainfall, however, may not be the only, or the best, measure of weather induced variability. Binswanger and Rosenzweig (1989), for example, found that the monsoon onset date has large and significant effects both on crop profits and total profits of cultivating households, although rainfall levels did not.

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that weather can produce idiosyncratic changes in income even for neighboring farmers who produce the same crops. If individual farmers, however, all exploit this heterogeneity with plot diversification, then individual farm variability would be reduced while between farm correlations increased.

There may be substantial scope for co-insurance within villages even if within-crop risk is highly correlated across neighboring farms if households within villages are engaged in different activities, and if risk is not highly correlated across activities. Diversification within villages may also imply that movements in input or output prices need not result in large village-level movements in incomes. This possibility is supported by a fair amount of evidence from panel data. For example, Morduch (1991), finds that idiosyncratic risk (inclusive of measurement error) accounts for 75% to 96% of the total variance in household income in South India. Similar magnitudes of idiosyncratic risk have been implied for Burkina Faso (Carter, 1991) and Northern Nigeria (Udry, 1990).

Other studies use samples with numerous clusters (villages) to examine whether incomes co-vary more within than across villages. Deaton (1992a), for example, tests whether there are village-specific effects in household income changes within regions of Cote d'Ivoire. F-tests indicate that changes in household income do not co-vary significantly more within villages than across villages. These results imply either that the covariance of household incomes within villages is low, or that villages within regions experience common income shocks. Another possibility is that the two survey years over which income changes were computed happened to have no large village-level shocks. Longer time series of data might

reveal more within village covariance in incomes.[9]  Alderman and Garcia, using a similar methodology, provide evidence that village income covariance in Pakistan, although only around half of explained income fluctuations (less than a quarter of all observed interannual movement in incomes), is larger than provincial covariance.

One difficulty in interpreting evidence on the relative magnitudes of idiosyncratic versus village-level risk is that "idiosyncratic risk", as measured, captures both true idiosyncratic variation as well as measurement error in incomes.  There is no direct evidence on the size of measurement error in incomes in developing countries.  However, evidence from the U.S. indicates that measurement error may account for a substantial fraction of the total variance in reported income.  For example, Duncan and Hill (1984) compare employee's reports of incomes with records from their employer, and find that measurement error accounts for 16% of the variation in reported labor income.  One might expect that measurement error is a much more serious problem for self-employed agricultural households than for U.S. employees.[10]  Furthermore, in many data sets from developing countries the value of home-produced food (as well as in-kind payments of wages and rent) is included in both income and consumption, so measurement errors in consumption and income are likely to be positively correlated.  This positive correlation in measurement errors exaggerates co-movement of income and consumption; that is, it may appear that households buffer consumption from income risk less than they actually do.

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[9] As is discussed below, the lack of strong village effects in incomes makes it difficult to test for the presence of village insurance.

[10] Measurement of incomes is also difficult for non-agricultural self-employed, as has been observed in Ghana (Vijverberg, 1991).

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Two additional points must be stressed when interpreting evidence on the covariance of incomes across households within villages. First, a finding that incomes within villages do co-move does not necessarily imply that households cannot buffer consumption against village shocks to income. Income sharing between family members that live in different locations, for example, can ameliorate the effects of village movements in income on consumption. Furthermore, if villages are linked to a larger economy by credit markets then shocks to income that are correlated across village members need not produce large consumption changes.

Second, the degree of diversification of risk within and across households may be a *response* to the viability of insurance markets. If insurance markets work well within villages, then one might expect individual households to specialize in production, but the village as a whole to diversify risk. As Udry (1991, p. 14) states, perfect insurance markets within villages implies that "investment in agricultural production is directed to plots on which output is less correlated with overall community income and that this diversification is carried out at the community level, not the household level." Conversely, if insurance markets (and credit markets) do not work well within villages, because of problems of moral hazard, asymmetric information or a lack of effective enforcement mechanisms, then one might expect risk to be diversified within but not across households. In the extreme, each household might produce a similar diversified crop mix, resulting in co-movements in incomes across households. If this is the case, it would be a mistake to conclude that income co-variation hinders the effectiveness of village-level insurance markets. Rather, it is the inefficiency of insurance markets that produces income covariation.

## (iii) Tests of Complete Risk-Sharing

A strong empirical implication of the full risk-sharing model is that controlling for village changes in consumption and individual preferences, the consumption and income changes of a given individual will not be correlated.[11] This empirical implication of a full insurance model is not an obvious implication of other models of consumption determination. For example, one simple model would be that consumption tracks income: households neither insure each other, nor borrow and save so as to smooth consumption. If this simple model were correct, movements in an individual's consumption would be correlated with movements in village consumption only to the degree that the incomes of individuals within villages are correlated. The consumption-tracks-income model has empirical implications that are precisely the opposite of the full insurance model. Without controlling for individual income, individual and village consumption will be correlated. However, once individual income is controlled for, this correlation will vanish.

A permanent income model of saving and borrowing is another alternative to both the full insurance and the consumption-tracks-income model. Under a standard permanent income model, consumption responds to changes in the expected annuity value of current and future income. Like the consumption-tracks-income model, the permanent income model implies that changes in the consumption of individuals within a village will be correlated only because current and expected future incomes are correlated across village members.

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[11] Another testable implication of the Arrow-Debreu model of risk sharing is that there will only be two sources of wealth variation across members of a community, initial endowments and preferences (Banerjee and Newman, 1991). Since initial endowments are fixed over time, by definition, all changes in the distribution of wealth over time should be attributable to changes in the distribution of preferences (measured by $z_{iv}$ in equation (2)) across households.

However, unlike the consumption-tracks-income model, the effect of a change in an individual's income on consumption may in theory be quite small. For example, a shock to income that is not expected to persist (for example, an increase in income due to good weather) would increase consumption only by the annuity value of the shock.

The empirical implications of full risk-sharing and other models of consumption determination differ sharply. However, in practice, distinguishing between these models may be difficult for several reasons. First, both the permanent income and complete risk sharing models are consistent with small effects of household income on consumption. A finding that household income has little effect on consumption does not distinguish between the two models. Second, household income is likely to be measured with a great deal of error, especially for farm households. If there are strong village effects in income, village consumption may serve as a better measure of true household income than does measured household income. It is demonstrated below that if this is the case, permanent income and full risk-sharing models of consumption can yield extremely similar empirical results. Third, if credit markets are regionally segmented, household consumption may co-move with aggregate village consumption even in the absence of risk-sharing. Region-wide shocks to incomes may produce movements in regional interest rates, which could result in consumption changes even for households who have not experienced a change in income. The result would be the appearance of risk-sharing when none actually exists.

A spate of recent papers test the full insurance model. Mace (1991) as well as Cochrane (1991) do so using U.S. data. Tests using data from developing countries include Townsend (1991) and Morduch (1991), for India, Rashid (1990) and Alderman and Garcia (1992) for Pakistan, Deaton (1992a) for Cote d'Ivoire, and Udry (1990) for Nigeria. Other

relevant papers are Altonji, Hayashi and Kotlikoff (1989) and Hayashi, Altonji and Kotlikoff (1991), which use U.S. data to test models of altruism within extended families.

Most of these papers test for full insurance by estimating consumption equations, and testing whether household income affects household consumption, given "community" consumption. The community is defined either as the village (Deaton, Townsend, Morduch and Udry), the extended family (Altonji et. al.) or the whole United States (Mace.) The basic form of the consumption equation is:

$$c_{ivt} = \beta_0^i + \beta_1 \bar{c}_{vt} + \beta_2 Y_{ivt} + \varepsilon_{ivt} .$$ (5)

$c_{ivt}$, $\bar{c}_{vt}$, and $Y_{ivt}$ represent *measured* values of $c_{ivt}^*$, $\bar{c}_{vt}^*$, and $Y_{ivt}^*$. Variables meant to control for household preferences (i.e. the $z_{ivt}$ in equation 4) are typically included as well. The household-specific intercept $\beta_0^i$ represents $\theta_i$. A minimum data requirement for estimating (5) is that each household is observed for at least two time periods. The household-specific fixed effect $\beta_0^i$ cannot be properly accounted for without panel data. The null hypothesis of full insurance implies that $\beta_1$ equals 1 and $\beta_2$ equals 0: controlling for village consumption, individual incomes will not affect consumption. Some studies yield additional information on the full insurance model by examining whether the coefficients on the preference-shifters $z_{ivt}$ are significant. For example, Cochrane tests whether illness adversely affects consumption growth, which should not happen if illness if fully insured.[12]

There are several general methods of estimating equation (5), and the choice of method depends on the nature of the data available. One approach is to estimate equation (5), for

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[12] Cochrane's measure of consumption does not include medical costs. If it did, one might expect that fully insurance for illness would result in an *increase* in consumption.

each village, in first differences. The change in community consumption can then be proxied by the change in the sample mean of consumption or, if the data span a number of years, by a set of time-varying intercepts.[13] Another approach, which is useful with long panels of data, is to estimate equation (5) for each household, thereby letting the parameters $\beta_1$ and $\beta_2$ vary across households. Townsend, who uses 10-year panels of information on the incomes and consumption of 102 households spread over three Indian villages, adopts this approach (among others). Deaton as well as Alderman and Garcia exploit cross-village rather than cross-time variation in consumption to test the insurance model. These tests rely on the idea that under full risk-sharing within (but not across) villages, year-to-year changes in household consumption should be fully explained by a set of village-specific intercepts.

Despite the variety in methodology and data sources, each of these papers provides some evidence against the full insurance model. However, their results do differ. Townsend and Mace are the most supportive of risk-sharing. Both of these papers find that: 1) movements in individual consumption are strongly correlated with movements in average community consumption, and 2) household incomes appear to exert only small, although sometimes significant, effects on consumption, once community consumption is controlled for. For example, Townsend first estimates variants of equation (5), for each household, that do not include household income. The hypothesis that $\beta_1$ equals 1 can be rejected for only three households per village.[14] He then includes individual income measures, and finds that

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[13] If village consumption is not measured accurately (which is likely because not all people in the community are sampled), $\beta_1$ will be subject to measurement error bias. The use of time-varying intercepts, as an alternative, obviates this problem.

[14] The fact that estimates of $\beta_1$ are distributed around 1 (within a village) does not provide conclusive evidence of risk-pooling. For example, if there is no risk-pooling but there are common shocks to income, individual and village consumption will co-move. It is

incomes are statistically significant for only a few households per village. Townsend also estimates variants of equation (5) in which $\beta_2$ is constrained to be identical for all households within villages. These results are somewhat less supportive of full insurance; some income measures affect consumption but the effects of different types of income differ across villages. Furthermore, lagged income values tend to have more consistently significant effects on consumption, although these effects are still small (i.e. estimates of $\beta_2$ range from .06 to .10). Similarly, Mace finds that individual income changes have extremely small, although in some specifications significant, effects on consumption changes.

The results of the other studies cited are less supportive of full risk-sharing. Cochrane, for example, finds that long illnesses and involuntary job loss are associated with consumption declines, thus rejecting the full insurance model. Altonji, et al. find that household consumption changes respond to household income changes, even controlling for changes in the incomes of extended family members, thus rejecting a model of family-based insurance. Deaton rejects full village risk-sharing in Cote d'Ivoire. Although consumption co-moves more within than across villages, household incomes do affect consumption even controlling for village fixed effects. Further evidence against the model of full village risk-sharing is provided by both Morduch (1991) and Rosenzweig (1988), both of whom use the same data set as Townsend, and Udry (1991) who uses data from Northern Nigerian villages.

The evidence on the risk-sharing model is somewhat mixed. All papers statistically reject full risk-sharing for at least some specifications. However, most results do indicate

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easily shown that both the consumption-tracks-income model or the permanent income model will yield values of $\beta_1$ that go to one as the number of households and time periods goes to infinity. Furthermore, Ravallion and Chauduri (1991) re-ran Townsend's regressions using modified measures of consumption (and a shorter number of years), and their results indicate that estimates of $\beta_1$ have extremely large standard errors.

that there are large co-movements in consumption within villages, and that the effect of individual income on consumption is small. Do these results indicate, as Townsend claims, that the full insurance model represents "a surprisingly good benchmark"?

To answer this question, one must ask whether these tests of full insurance have much power against reasonable alternative hypotheses. One alternative hypothesis is that households do not insure each other, but do act as permanent income savers. As discussed above, permanent income models are consistent with a small effect of income changes on consumption changes, if income changes are largely transitory. A finding that $\beta_2$ is small is not evidence of risk-sharing. Furthermore, there are several reasons why consumption may track village consumption, even in the absence of risk-sharing. Suppose, for example, that village-level shocks to income are largely permanent (due to permanent changes in technology, prices, etc.) and that idiosyncratic shocks to income are largely transitory. In this case, a permanent income model of saving would imply that $\beta_1$ is close to one and $\beta_2$ is close to 0, even if risk is not pooled.

The likely presence of measurement error makes the results even more difficult to interpret. If risk is not fully pooled, and if there is measurement error in household income, estimates of $\beta_2$ will suffer from attenuation bias. Furthermore, measurement errors in income and consumption will be positively correlated if home-grown food is counted in both income and consumption. This correlation will produce an upward bias in $\beta_2$ that counteracts the downward attenuation bias, and it is not possible to determine, a priori, which effect will predominate. Deaton estimates $\beta_2$ using an instrumental variables approach to take into account correlated measurement errors, and finds that instrumental variables estimates of $\beta_2$ that are generally lower than ordinary least squares estimates. However, his methods do not

handle attenuation bias due to mismeasured income, and may therefore produce estimates of $\beta_2$ that are too low.

A final problem it that the failure to control properly for the factors that shift preferences (i.e. the $z_{iht}$) could result in an incorrect rejection of the full insurance model. Many of the factors that affect preferences for consumption may also affect a household's income. For example, poor health may result in an increase in the marginal value of consumption as well as a reduction in income. If the factor that shifts preferences are unobserved by the researcher (and omitted from the model), the parameter estimate $\beta_2$ may be biased away from 0, and the bias could go in either direction. For example, if (unobserved) health shocks are fully insured, the consumption of a household that experiences an adverse health shock might rise, since the community will compensate the household both for its decline in income as well as for its increased need for consumption. In this particular example, the estimate of $\beta_2$ would be biased to something *less* than zero.

In summary, the tests of insurance models discussed above appear to indicate the following. Full risk-sharing is generally rejected. Given that full risk-sharing hinges on the complete absence of moral hazard, private information and on the perfect ability to enforce insurance contracts, this result is not very surprising. While many of the results are consistent with some risk-sharing, they are also consistent with other models of consumption determination. Although household consumption does not track household income, it is difficult to determine how much of this consumption-smoothing behavior represents intertemporal smoothing, through saving and borrowing, how much represents interhousehold consumption smoothing, through insurance, and how much is the spurious result of measurement error bias.

(iv) Evidence on Partial Risk Sharing

Even if risk is not fully pooled between households within villages, extended families, or countries, it is still possible that partial risk-sharing is an important method of consumption smoothing. One way to assess the importance of risk-sharing is to look directly at the methods that households use to smooth consumption. If groups of households share risk, then one should in principle be able to observe transfers or remittances between households. Furthermore, these transfers should be state-contingent, with households who experience high income draws providing transfers to those with low draws.

There are several reasons why one must be cautious about inferring too much about the importance of risk-sharing by looking at data on transfers. First, many types of risk-sharing arrangements will result in "transfers" that are quite difficult to measure. Udry's research on Nigeria (1990, 1991), for example, highlights the idea that partial risk-sharing may be accomplished through credit contracts with state-contingent repayment terms. Discerning the insurance component of a credit contract is difficult without data on the economic circumstances of both the borrower and lender as well as the actual loan repayments made. Transfers may also take the form of donated labor or other productive assets. Another possibility is that extended families share risk by transferring people rather than money between households. For example, households with high income draws may take in relatives from households with low income draws. Furthermore, both long-term labor contracts and land rent contracts may contain insurance components. In all of these cases, the implicit transfers generated by risk-sharing will not appear as measured transfers in standard data sources. Another problem is that partial risk-sharing may generate very infrequent transfers between households. For example, households may collect transfers from family members

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only in the event of extreme disasters that rarely occur. In this case, few transfers might be recorded in the data in any given year, even if partial risk-sharing plays a very important role in buffering consumption.

A second important point is that the transfers and remittances that are observed need not be the result of risk-sharing. Lucas and Stark (1985) discuss a range of motives for family members who have migrated to send remittances to their families. For example, migrants may send remittances to increase their chances of inheriting family assets, or to pay families back for the costs of education. A related point is made by Cox (1987), who argues that transfers between generations actually represent payments for services exchanged between family members. It could also be the case that loans between family members may masquerade as "gifts." Simply documenting that transfers exist does not necessarily imply risk-sharing.

Remittances may also be made for purely altruistic reasons, possibly with no expectation (on the part of the remitter) that the transfers will ever be reciprocated. Furthermore, a finding that transfers depend on the realized economic circumstances of both the giving and receiving household (i.e. are state-contingent) need not imply that transfers are the result of risk-sharing. For example, Becker (1974) shows that even one-sided altruism (where one person cares about the welfare of another, but not vice versa) may result in state contingent transfers, with the donor household giving more the higher its own income and the lower the recipient household's income. Similarly, Ravallion and Dearden's study of "moral economy" in Java which focuses primarily on the redistributive role of transfers includes results that are compatible with risk sharing as well. In general, it is difficult to distinguish between altruism and (selfish) risk-sharing.

Despite the problems in interpreting data on transfers and remittances, there is a some evidence that suggests that households use transfers and remittances to partially share risk. For example, Udry (1990) finds that loan repayments are sensitive to shocks received by the lending household, indicating that credit contracts are used to make state-contingent transfers. However, because Udry does not have explicit measures of the size of income shocks (but only discrete variables that indicate whether a shock occurred), it is difficult to determine whether these transfers play a large role in buffering consumption. Ravallion and Dearden (1988) find that in rural (but not urban) areas of Java, households that experience ill health receive greater transfers, even controlling for income. However, it is not known how much of the costs of illness are covered by these transfers. Rosenzweig (1988) finds that the net transfers a family receives increase when household income falls (relative to its average value). Furthermore, households with more kinship connections to other households (in the same and different villages) have transfers that are more responsive to income shocks. Although this evidence supports the idea that transfers are a source of consumption smoothing, the results also indicate that the size of these transfers is quite small relative to the size of income shocks: transfers make up for roughly 2% of an income decline. Other evidence in support of partial risk-pooling is provided by Lucas and Stark (1985). Their results indicate that the receipt of remittances by rural households in Botswana depends on an interaction between the severity of droughts and ownership of drought-sensitive assets, such as cattle. However, the question of how much insurance these transfers provide is not answered.

If family members who live in distant locations provide insurance, a logical question is whether migration decisions are made in order to diversify risk as implied in Reardon et. al.

(1988). This question is explored by Rosenzweig and Stark (1989), who observe that most

migration in rural India is not by males seeking employment, but females entering into

marriage. These marriages may mitigate the effects of income risk by establishing ties to

households in distant locations with income shocks less correlated than those of local

families.

These few pieces of evidence support the idea that transfers among households have an

insurance component, although Rosenzweig (1988) indicates that these transfers buffer

consumption from income shocks by only a small amount. There is simply not enough

literature from enough countries to draw general conclusions about the scope and importance

of household risk-sharing. And, it is unlikely that any firm conclusions can be reached until

more comprehensive household-level data become available from a wider range of countries.


## V. Conclusion

Formal tests of perfect consumption smoothing, either intertemporally through savings

or spatially through sharing of idiosyncratic income shocks, do not provide convincing

evidence that such patterns are prevalent in village economies. Nor is it hard to picture why

this would be the case. Even in a small community information is asymmetric and

monitoring of states of nature and of individual efforts make complete sharing unlikely.

Similarly, there is often a restricted menu of savings instruments available in a community.

The consumption tracks income alternative is, however, no more likely. Most individuals

appear to have appreciable ability to mitigate income fluctuations.

Beyond the rejection of polar cases, what can be generalized about the diverse and often

effective consumption smoothing institutions that have been recorded? Clearly, one would

like to know the costs of risk reduction. In particular, does the desire for consumption smoothing lead to a poverty trap for communities at large? That is, do the prevalent types of risk reducing strategies imply a high premium? This could be in terms of production strategies which are low risk-low return or in terms of asymmetries in asset sales and purchase prices or other fairly costly means used to stabilize consumption. Bencivenga and Smith (1991) argue that in the absence of financial intermediation, consumers may self-insure by investing excessively in unproductive liquid investments rather productive illiquid investments, yielding slower growth for the economy.

While there is not a single risk premium which summarizes the cost of risk aversion in developing countries, available evidence indicates that there is some relationship between *ex post* consumption smoothing possibilities and production decisions. Moreover, the poor appear to be less able to bear risk. As such, there is a convergence of efficiency and equity issues. For example, Binswanger and Rosenzweig (1990) find that the poor have a return for every rupee invested that is 30% below that earned with a profit maximizing portfolio similar to that held by the wealthiest households. As restricted access to consumption credit is often inferred to be a primary explanation for such patterns, it is plausible - but to date not indicated - that interventions which improve access to credit markets can raise producer efficiency. For a variety of reasons effective instruments to achieve such ends are difficult to identify (Besley, 1992), although the benefits of such programs may be underestimated to the degree that the efficiency gains due to risk diffusion are not considered.

The fact that the absence of insurance possibilities limits households' ability to reduce consumption fluctuations does not necessarily imply that the most effective intervention would be to set up insurance programs. Are there other ways that governments or other

institutions can provide missing markets if coinsurance is either imperfect (missing for some groups or incomplete under covariate risks) or costly? If imperfections are due to factors for which scale is important such as the need for reinsurance or information processing such interventions may be possible. Conversely, if imperfections are due to asymmetries in information and moral hazard, outside agencies offer no particular advantage. A related consideration is that interventions might merely substitute for existing institutions with little welfare gain (Cox and Jimenez, 1990).

A number of studies have suggested programs to reduce the riskiness of income (as opposed to consumption) streams - for example, through employment guarantee or similar public work schemes. Often such programs are evaluated in terms of income transfers and of assets created; the stream of benefits may, however, also include increased farm efficiency due to indirect effects on portfolios and input allocation. Moreover, in addition to the first round effect of reduced income risk such programs may have a secondary effect by increasing access to consumption credit as they may reduce the risk of default. Little evidence is currently available, however, to support (or refute) this hypothesis.

There is a wide class of other policies that may be used to reduce the riskiness of income streams. For example, countries may (and often do) stabilize the prices that producer's receive for their crops. In some cases, prices are fixed and enforced by marketing boards. In other cases, countries impose export taxes that cushion farmers from fluctuations in world prices. Although such policies create inefficiencies in production decisions, these losses may be counterbalanced by the welfare gains of risk reduction (see Hoff, 1990 and Skinner, 1990). Evaluation of the benefits of such policies depends critically on how effectively households insure themselves against price risk in the absence of the

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policy, and the importance of price risk in overall risk. In general, more research is needed to establish the importance of different types of risk in total income risk, and on how effectively households are insured against each type of risk.

As mentioned, despite some equity implications, a number of mechanisms are shown to effectively smooth consumption over a range of income fluctuations. However, there is also some evidence that types of coinsurance and self-insurance (savings) which work under a range of risks break down under others. In particular, although a single bad year seldom results in a famine, successive bad years may have severe consequences as individual savings prove insufficient and informal - and localized - credit becomes increasingly expensive. Although the case for or against intervention in such situations is conceptual similar than under more limited income shocks, the costs and benefits may be sufficiently different to justify a wider set of programs. As such, as additional information on existing coping mechanisms accrues, it may be able to identify a range of cost effective interventions suitable to localized conditions.

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