Desarrollo y Sociedad
ISSN: 0120-3584
revistadesarrolloysociedad@uniandes.edu.co
Universidad de Los Andes
Colombia

Baez, Javier Eduardo
Income Volatility, Risk-Coping Behavior and Consumption Smoothing Mechanisms in Developing Countries: A Survey
Desarrollo y Sociedad, núm. 58, septiembre, 2006, pp. 37-83
Universidad de Los Andes
Bogotá, Colombia

DESARROLLO Y SOCIEDAD
SEGUNDO SEMESTRE DE 2006, PP. 37-83.
58

Income Volatility, Risk-Coping Behavior and Consumption Smoothing Mechanisms in Developing Countries: A Survey

Volatilidad en el ingreso, comportamiento ante el riesgo y mecanismos para estabilizar el consumo en países en desarrollo

Javier Eduardo Baez *

Abstract

This paper provides a review of the general concepts and influential findings of empirical research on risk-coping behavior and consumption smoothing arrangements in rural economies of developing countries. Low-income individuals live with high levels of risk and limited access to formal financial systems for credit and insurance. In general, the evidence indicates that their informal mechanisms to mitigate risk play an important role in partially protecting their consumption. However, these alternatives do not allow rural households to achieve an optimal allocation of risk across time and income cycles and are costly on equity grounds. In addition, risks that remain uninsured seem

* Graduate Student, Department of Economics and Graduate Associate at the Center for Policy Research, Maxwell School of Citizenship and Public Affairs, Syracuse University, Syracuse, New York, USA. I wish to thank Mark Rosenzweig, Dani Rodrik and Robert T. Jensen for thought provoking discussions that increased my interest and awareness of these issues. I also thank Gary Engelhardt, Jesse Bricker, Katie Fitzpatrick and two anonymous referees for very helpful comments. Correspondence can be sent to: Center for Policy Research, 426 Eggers Hall, Syracuse University, Syracuse, NY New York 13244 USA. Email: *jebaez@maxwell.syr.edu.*

This paper was received March 18, 2006, modified December 13, 2006 and accepted December 15, 2006.

to have adverse long term welfare consequences. Public interventions can play a significant role in improving the income security of rural households. In doing so, it is crucial to have a good understanding of the causes and not simply the symptoms of informal risk-coping behavior and its social welfare implications.

Key words: risk-coping behavior, consumption-smoothing arrangements, income volatility, informal insurance, developing countries.

JEL Classification: O120, O150, O160, O170.

Resumen

Este trabajo presenta una revisión de conceptos generales y resultados empíricos sobre el comportamiento ante el riesgo y los mecanismos disponibles para estabilizar el consumo de los hogares rurales en países en desarrollo. Individuos de bajos ingresos enfrentan usualmente altos niveles de riesgo y tienen un limitado acceso a sistemas financieros formales de crédito y aseguramiento. En general, la evidencia indica que sus mecanismos informales para mitigar el riesgo juegan un papel importante en proteger su consumo. Sin embargo, estas alternativas no permiten que estos hogares alcancen una asignacion óptima de riesgo a través del tiempo y ciclos del ingreso y resultan altamente inequitativas. Adicionalmente, el riesgo no asegurado parece tener efectos adversos de largo plazo en su bienestar. La política pública puede jugar un papel importante en mejorar la estabilidad del ingreso de los hogares rurales. Para ello, es crucial un buen entendimiento de las de las causas y no de los síntomas del comportamiento de aseguramiento informal ante el riesgo y de sus implicaciones sobre el bienestar.

Palabras clave: comportamiento ante el riesgo, mecanismos de estabilización del consumo, volatilidad del ingreso, aseguramiento informal, países en desarrollo.

Clasificación JEL: O120, O150, O160, O170.

Introduction

Among many other challenges, individuals in developing countries survive with low incomes under high levels of uncertainty. According

to the World Bank (2003), approximately 70% of the workers in low-income countries are employed in agricultural activities and, consequently, are relatively more vulnerable to factors beyond their control (e.g. weather, crop prices variation, diseases, pests, etc.). However, income fluctuations are not expected to alter consumption and well-being if poor households have the means to protect themselves by saving in "good" times and dissaving in "bad" times.

The absence of formal means to smooth the consumption of low-income households is a central feature of livelihoods in the developing world. Many of the non-market risk-coping mechanisms available to them are extremely precarious. The lack of assets, underdeveloped market opportunities for dealing with risk (credit and insurance), the shortage of public transfers during crises, the low levels of education and the limited ability to switch jobs, among other problems, limit the capacity of poor farmers to reduce the impact of adverse shocks. In many cases, the consequences of these downturns may be large enough to remain for a long time, lowering consumption below subsistence levels and, thereby, affecting nutrition, health, schooling and other human and physical vital assets related with future potential earnings. A better understanding of how the income of farmers in poor countries changes with unfavorable shocks, formal and informal arrangements available to deal with risk and the effects of income variability on basic dimensions of socioeconomic welfare is crucial for the design of development aimed policies.

This paper is a review of the literature on income volatility and consumption smoothing in rural areas of developing countries. Considering the popularity of these issues among researchers in development economics, particularly in the last 15 or 20 years, this work is not intended to be an exhaustive assessment of all relevant studies. The cases included here were chosen because they illustrate a particular approach to the question posed or have been highly influential. Nearly all the conclusions have been drawn from the same Indian data and a few other samples collected mainly in Asia and Africa. Latin America, a region with a massive proportion of people deriving their incomes from agriculture and living in poverty, is clearly underrepresented in this survey, in large part due to the lack of suitable information to investigate these issues.

This review is organized as follows. The next section discusses the main generalities that appear to typify the effects of uncertainty on consumption smoothing in the context of poor rural areas. Section two examines some empirical tests available in the literature to gauge whether consumption is protected against income and assets shortfalls. Section three reviews relevant evidence to illustrate the most important informal risk-mitigating institutions developed in low-income countries. Based on some empirical work, section four explores the short and long term effects of income fluctuations on the well-being of poor households. Finally section five concludes.

I. Poverty and vulnerability to risk

While it is true that risk and uncertainty are present in high-, middle- and low-income countries, it is also true that income volatility is more challenging for residents of most low-income countries. In these countries, the mechanisms to smooth risk either do not work well or do not exist. Low-income individuals in the developing world suffer disproportionately from almost all shocks because they are both more likely to be exposed to them and less protected from them.

Agriculture's share of GDP is higher in these countries. About 30% of the total output in low-income countries is obtained from agricultural-related activities, a share that falls to 10% and 2% for middle- and high-income economies, respectively (World Bank, 2004). Hence, the resources of a vast majority of poor households are generated in the form of farming jobs such as cash crops, subsistence cultivation, livestock production, fishing, forestry, hunting, and also as hired labor. All these sources of employment and income bear numerous and often unexpected risks such as weather-related shocks, fluctuations in international markets and prices, crop diseases, environmental degradation, pollution, population displacement, among others. Hence, the returns from agriculture are by nature very unpredictable and entail elevated degrees of uncertainty. Consequently, poor individuals live in high-risk environments because of their heavy reliance on this sector. The implications of this dependence in terms of risk-allocation behavior are non trivial. For instance, Morduch (1990) and Binswagner and Rosenzweig (1993) found that the coefficient of variation (CV) of farm profits in a group of villages in South India is close to 125%.

Putting that number in context and assuming a moderate degree of risk aversion, they estimated that farmers with just one third of that CV would be willing to give up to 16% of their earnings to achieve a perfect smoothing, which is a very high-risk premium.

Human diseases are also prevalent in the underdeveloped world. Despite huge advances in creating new medicines, technologies and treatments worldwide, many poor people in developing countries are experiencing unparalleled reversals in human well-being. According to the World Health Organization (WHO, 2006), life expectancies have fallen in some of the poorest nations to half the level of the richest ones. Usually low-income individuals do not have the same access to health care, and disease prevention programs are weak in these countries, particularly the most rural ones. A rising transmission of HIV/AIDS, the latent emergence of other chronic diseases (e.g. Ebola, Avian Influenza, Severe Acute Respiratory Syndrome) and the limited availability of effective vaccines and antiviral drugs to prevent diseases and cope with pandemics are also very predominant in these regions. Consequently, the poor appear to be less equipped to mitigate the effects of health-related risks.

Natural disasters are another reason for uncertainty. Their frequency and impact in terms of human casualties and economic costs have skyrocketed in the last two decades. The level of annual losses from these events in constant terms increased from $3.9 billion in the 1950's to $63 billion in the 1990's (International Red Cross, 2005). These events tend to hit poor people the hardest for many reasons. Poor people in rural areas often live in very fragile dwellings and occupy dangerous locations such as river banks, flood plains, steep slopes and wild land with inadequate infrastructure. Their living arrangements are often characterized by the lack of appropriate emergency management systems to resist natural disasters and bear financial and human losses. Furthermore, most developing countries face huge fiscal constraints to embark on helpful disaster recovery programs.

The fundamental question that arises is how to maintain satisfactory levels of consumption in face of volatile incomes. Depending on the sector and timing, actions can be taken either to mitigate the effects of negative production shocks on income (ex-ante) or to preserve con-

sumption for a given income realization (ex-post). Savings, insurance contracts, social insurance arrangements or communitarian risk-sharing schemes are examples of the first group of actions, while borrowing, trading of assets, private and public transfers and changes in the labor supply are examples of the latter.

However, once shocks occur, poor rural households and businesses often do not have the means to fully smooth consumption. Their incomes are already low, often do not have enough savings and their asset holdings such as tools, seeds and livestock are not only very liquid but are also used for production. They are also short of well developed instruments to deal with income shortfalls. On one hand, formal financial systems for credit and insurance are precarious, incomplete or do not exist at all. In turn, these capital market constraints reduce the capacity of households and farmers to invest in risk-coping technologies. On the other hand, informal mechanisms of credit and insurance, although partially useful to increase the risk bearing capabilities of villages to idiosyncratic shocks, do not allow an efficient reallocation of global risks. And public interventions like safety nets and emergency relief aid aimed to protect poor people from economic crises are quite limited.

Other features of these economies make it more difficult to build up formal arrangements to deal with uncertainty and moderate the effects of turndowns. For instance, institutional weaknesses, instability in the legal system, limited existence of intellectual and property rights, narrow land titling, lack of developed physical infrastructure and low levels of education make contract writing and enforcement very complex. Private savings may also be limited by problems such as high inflation, price variability of basic foodstuffs and high transaction costs that make it hard to find assets that guarantee a positive reward for delaying consumption.

II. Does household consumption track household income?

As will become evident below, despite these difficulties, poor households in developing countries still have ways to handle risk. By following strategies to smooth either income or consumption –or both, households might be able to diversify so that consumption levels

remain unaffected. But, with the realization of negative shocks do these mechanisms perform similarly to the benchmark set by fully functioning markets for credit and insurance? How vulnerable do households remain to temporary shocks? Since the theory can predict final allocations consistent with transitory events being either totally or just partially smoothed away, this concern becomes mainly a subject of empirical matter.

The literature offers some estimates of the extent to which consumption is protected against income fluctuations. Townsend's work (1994) –one of the most widely cited studies– examines this issue by jointly evaluating all the institutions that might insure rural households at the community level. Using a pool of cross-sectional data for the period 1975-1984 from the International Crops Research Institute of the Semi-Arid Tropics (Icrisat) –which provides the information for much of the empirical work in this field, he tested the full risk sharing hypothesis in three poor and high risk villages in southern India. More specifically, he runs regressions with household consumption as the dependent variable on average village consumption, household income and other controls. One would expect the coefficients on village consumption and transitory income to approach one and zero, respectively, as the markets for insurance and credit are more complete. Townsend did find evidence to reject full insurance in the sample, namely that income shocks matter in the determination of consumption and are statistically different from zero. However, the overall effect of income in consumption is surprisingly low, with the highest coefficient value being 0.14, suggesting the existence of a significant degree of insurance against idiosyncratic shocks at the village level. His results also hint at important differences in access to insurance by land ownership. Landless and small farmers, also the poorest in the sample, are less protected from this type of event.

An alternative test of full insurance incorporates savings as an explanatory variable. Paxson's study (1992), a paper I will return to in more depth in the next section, adopts such a design to examine whether farmers in some regions of Thailand used savings to smooth consumption. Her findings indicate that these households were able to save and dissave to stabilize consumption in response to unpredictable changes in income. Nevertheless, although her estimates of the mar-

ginal propensities to save out of transitory shocks to income are very high (ranging from 0.73 to 0.83) and suggest an important amount of consumption smoothing, they are not supportive of full insurance. And more importantly, since the author uses rainfall data to approximate transitory income, one should be cautious about generalizing these conclusions to other types of temporary shocks.

More recently, Morduch (2002) used panel data from Icrisat and implemented other tests to illustrate if formal and informal mechanisms together can reduce total income risk. His estimates of the coefficients on income growth are somewhere between 0.19 and 0.32, far from the value of 1.0 but yet a sign that complete insurance does not hold. Furthermore, he argues that for many subgroups, particularly lower status castes and poor households, those mechanisms work badly and do not stand as close substitutes of perfect insurance and credit systems. In an earlier paper, Morduch (1991) also found evidence consistent with the latter claim, in the sense that food consumption growth appeared to be substantially less uninsured among small-scale farmers and landless workers in rural India.

Despite limitations in database availability at the micro level, there are a few pieces of evidence for Latin America as well. Using two rounds of Mexican rural household surveys from *Progresa* (a poverty reduction program, now called *Oportunidades*, that started in 1997 and combines education, health and nutrition interventions), García-Verdú (2001) examined consumption responses to individual shocks. He found a considerable amount of risk-sharing pool among village members. But his results also indicate that household consumption and income seemed to be highly related in these villages, where changes in the latter account for nearly 47% of fluctuations in consumption. Likewise, Barrera and Perez (2005) investigated a household's ability to smooth consumption in the presence of idiosyncratic shocks using longitudinal data from Colombia and Nicaragua. Similar to the results mentioned above, they provide evidence that households were able to insure consumption, but this insurance was imperfect.

The work to date on the extent of consumption smoothing in rural areas is not completely decisive and does not allow one to draw definitive conclusions. However, even though just a small sample of the studies

has been cited here, some general patterns emerge from an extensive review of the available evidence. At least three lessons are worth mentioning. First, most if not all of the empirical work has mainly rejected the full-risk sharing model. Second, and regardless of that rejection, a large amount of consumption smoothing is taking place. Rural households are not purely consuming what they earn, although the poorest have less scope to do so. And third, considering some market failures (e.g. limited enforcement, costly monitoring, market size) that hinder formal insurance and credit institutions are more frequent in rural villages, informal mechanisms seem to play a significant role in protecting their consumption. Therefore, a good understanding of which and how these alternative mechanisms provide effective insurance and credit is crucial for policy design. Bearing that in mind, the next section is intended to present a review on several aspects of informal behavioral and institutional responses to risk.

III. Risk-coping mechanisms in low-income economies

In spite of the various obstacles that people may face in low-income settings, they often access alternative systems (usually called "informal') to mitigate risk. Indeed, as the literature shows, these households do insure consumption against income instability to some extent. Rosenszweig and Wolpin (1993) conducted simulations in Icrisat villages in rural India that are useful to motivate the discussion in regard to these informal mechanisms. They modeled and evaluated a system with complete insurance that was to be fully funded by farmers. They found that this type of intervention neither increased farmer's profits nor enhanced their welfare. A possible interpretation is that the frequent refusal of farmers to accept non-subsidized weather insurance is not evidence of risk neutrality but rather of significant access to informal arrangements to buffer risk.

Overall these strategies are not full insurance mechanisms and, as it will be illustrated later, many are believed to be relatively expensive on the grounds of efficiency and equity. But, in any case they can be seen as second-best responses to market failures that offer households some aid that they could not have otherwise attained. The performance of each informal institution depends largely on the type of uncertainty

they are dealing with. For instance, local pooling systems are more suitable for settings in which adverse shocks are mainly idiosyncratic while inter-village networks work better in the face of aggregated events.

In terms of policy-making, it is useful to distinguish between interventions that remove market failures and interventions that reinforce these informal mechanisms. Examples of the first type would be initiatives to provide credit that increase the access to risk-coping technologies like irrigation, plow and food storage infrastructure. Public investments in information systems and administrative staff to strengthen local financial structures (e.g. micro credit, cooperatives) already in place would be illustrative of the second sort of actions. Most important in evaluating the effectiveness of informal risk-coping arrangements is knowledge regarding their ability to provide good alternatives to reach an optimal allocation of risk bearing. In what follows I survey very general theoretical concepts and empirics associated with these informal responses to examine how effective they are and summarize some relevant aspects of their functioning.

A. Savings and assets as risk-reducing choices

In theory, savings are an optimal ex-post response to insure consumption over time. In a benchmark model of savings with perfect markets, farmers can borrow and lend freely, spending down savings when income is less than consumption and building them back up when consumption is less than income. As a result, the current consumption of households would be equal to the annuity value of total assets plus the discounted value of future income. Thus, purely transitory income changes should have little impact on consumption patterns. Households have mainly three forms to save and dissave: borrowing and lending from formal credits institutions and informal systems, accumulating and de-accumulating assets and storing durable goods.

But what are the barriers that may prevent optimal savings from happening? Obviously, having low-income is an obstacle to save and accumulate assets itself. Even so, as noted below, poor households use several forms of credit markets to insulate consumption from income variability. Still, saving initiatives of poor people face a number of

risks such as economic instability, inflation, high informality, scant social welfare coverage and poor land titling, just to mention a few. The obstacles to observe well developed institutions for insurance stem primarily from extensive market failures, the familiar problems of moral hazard, limited contract enforceability and information asymmetries. Quite often these failures are exacerbated in rural villages.

A good way to assess the framework of perfect capital markets is to verify whether savings assists in smoothing consumption through time. Paxson (1992) tested this model using both cross-sectional information on income and expenditures of Thai farm households (1975/76, 1981 and 1986) and rainfall information. Her research design has two main parts. First, she used rainfall shocks in central, northern and northeastern Thailand as instruments to separate transitory income from permanent income[1]. She also estimated the marginal propensity to save out of these measures of transitory income. Her results indicate that a large fraction of all extra income due to temporary shocks is saved rather than spent. These findings clearly support the savings responses implied by the standard model, but still concerns remain about their external validity. It may be possible that credit constrained households behave differently in the face of longer and harder shocks (i.e. droughts, natural disasters); alternatively, small credit institutions could fall apart when exposed to huge economic declines.

Farming earnings can be low and highly fluctuant and instruments to accumulate valuable stocks might not be abundant in small rural villages. Consequently, the savings of many poor households appear to be largely a preemptive response to shocks rather than for long-term investment. In principle, people would think there is nothing wrong with a household that accumulates a bit more savings than it should to prepare for future periods in which the household's income may be low. However, from an economist's standpoint, only permanent changes in income should have an effect on the level of savings. Thus, accumulation with preventive motives beyond these transitory

[1] A possible drawback of this strategy is that the measurement of income does not net out the value of family labor. That is to say that if an increase in income leads to a reduction in family labor supply, with more hired labor, the effect of weather shocks on true income and savings may be understated.

changes (usually termed as "precautionary savings") does not entail an optimal allocation of risk. Not surprisingly, the precautionary demand for savings is more widespread among poor and credit constrained households, with a considerable cost of foregone consumption.

Some body of the literature on savings and consumption smoothing has studied the issue of precautionary savings, although mainly for the U.S and the U.K. (see for example Zeldes [1989], Kimball [1990], Gourichas and Parker [2001] and Banks, Blundell and Brugiavini [2001]). More generally, Deaton (1991) used U.S. data to illustrate the case of significant saving behavior in simulations with uncorrelated shocks to income, as a signal of precautionary savings. This suggests that in rural populations, where credit constrains bind, "inefficient" saving behavior is more likely to occur. The empirical evidence seems to support this assertion. In fact, Udry (1995) found evidence of precautionary savings in rural villages of northern Nigeria. Based on a nine-round survey of farming households, he showed that these households saved significantly in anticipation to the occurrence of transitory shocks. His estimates are remarkably high, suggesting that anticipatory savings were of similar magnitude to those that occurred contingent upon the realization of an adverse event –nearly 15% of the average Nigerian household income due to a one standard-deviation adverse shock. Similarly, Deaton (1992) found for Côte d'Ivoire that significant financial and physical savings were taking place in anticipation of declines in income. In short, despite the empirical difficulties in distinguishing precautionary savings from prudence or borrowing constraints, the evidence supports significant inefficient saving behavior that is not easy to reconcile with the permanent-income hypothesis.

I now turn attention to the accumulation of physical assets that contribute to both production and consumption. If credit markets do not operate well, poor households may be forced to purchase and sell productive assets not as a profit-maximizing decision but to buffer consumption. Rosenszweig and Wolpin (1993) investigated the presence and extent of inter-linkages between production and consumption decisions using data for Icrisat villages in India. The authors analyzed the stock of bullocks, a bovine male that is employed to provide "animal traction" in monsoon agriculture in rural India. They showed that the probability that farmers sold bullocks in a region hit by an unfa-

vorable crisis is 34% larger, namely they are sold off in "bad" times. Their estimates also suggest that 60% of livestock sales went to buyers outside the village which is an indication of inter-village risk-sharing behavior. Furthermore, they argued that their holdings are by and large lower than the optimal levels. A similar question is explored by Fafchamps, Udry and Czukas (1998), who examined the relationship between income shocks and changes in livestock in the West African semi-arid tropics, an agricultural region bearing a substantial degree of uncertainty from periodic droughts. Although their results regarding the total net sales of cattle are somewhat mixed, they did find a non-trivial level of exchange of goats and sheep due to income fluctuations. More importantly, these exchanges did not appear to smooth risk away extensively and compensated on average for at most 30% of income shortfalls associated with village-level shocks.

Overall, poor farming households seem to use their few assets to deal with uncertain shortfalls, although technically these portfolio allocations are not efficient. Furthermore, other conditions can reduce the effectiveness of these risk management strategies when villages are credit constrained, particularly when times are bleak. For example, when negative income shocks and low levels of assets occur simultaneously or when economic downturns are quite long to exhaust all the stocks accumulated, then these risk management strategies are less effective.

B. From income smoothing to consumption smoothing

The environment of imperfect insurance and uncertainty affects productivity as well. Many theoretical and empirical claims suggest that a significant part of what is called consumption smoothing is actually disguised as income smoothing[2]. In the presence of borrowing constraints, the separability between production and consumption no longer holds. Farm assets are devoted in two dimensions: profitability and contribution to reduce risk. That is, farmers find that crops, plots, labor and even migration diversification can contribute to both generating income and mitigating risk.

---

[2] Morduch (1990, 1995) provides a good review of the main theoretical and applied issued related to the importance of income smoothing over consumption smoothing.

In the absence of solid ex-post consumption-smoothing mechanisms, rural households can limit income variability by planting the same crops in plots that are exposed to different weather shocks, growing crops with yields and prices that are uncorrelated, adopting different production processes, offering part of their labor to non-farm sectors and joining labor markets in other regions that are not subject to similar trends. This allocation of factors of production is costly though, as farmer's portfolios are chosen such that they entail a tradeoff between somewhat lower levels of expected returns and a reduction in the risk associated with fluctuations in income.

Income-earning decisions to limit consumption risk are not only influenced by the lack of proper insurance and credit markets but also by risk aversion and access to technology. In other words, if only preferences for risk are different, more risk averse households should opt for higher diversification and have lower average returns. All else equal, the same causal chain would apply if access to formal insurance systems varies among households. Although income smoothing is more likely to take place when credit and insurance constraints bind, the distinction between these three channels is crucial in strengthening empirical claims exploring the existence of this sort of actions.

The evidence on the subject of income smoothing is numerous, albeit most of the findings have been drawn either from the same datasets (i.e. Icrisat) or similar countries. Most of the research suggests that in order to limit risk, more credit constrained households are likely to switch their methods of production and employment choices to more conservatives ones. For instance, Eswaran and Kotwal (1989, 1990) showed how rural households in India with less access to consumption credit had a slower adoption of new technologies in the Green Revolution period and engaged in less profitable investments. Correspondingly, Morduch's study (1990) on Icrisat villages in South India revealed that poorest households diversified relatively more of their portfolios of crops and plots, and devoted a higher proportion of them to safer but less lucrative varieties of rice. Binswanger and Rosenzweig (1993) also examined the role of risk in the distribution of farming resources using panel data, again, from Icrisat surveys. The results support the hypothesis that rural household's portfolios are influenced by risk aversion, which is mainly due to the lack of

ex-post instruments to shield consumption. According to their estimates, a one-standard deviation decline in weather risk (i.e. timing of the rainy season) appeared to increase average profits by up to 35% among those farmers in the lowest wealth quartile. On the contrary, wealthiest farmers followed profit maximization rules more closely. In the same way, Dercon (1996) used data from Tanzania to show that poorer farmers were relatively more likely to grow sweet potatoes –a low-risk, low-return crop– compared to wealthier households.

Alternatively, rural households can mitigate shocks by favoring risk-reducing inputs and production methods. More than a few findings in the literature back this view. Morduch (1995) analyzed the input choices of rice farmers in south India. He found that those in the bottom of the distribution were likely to use labor more intensively than what was indicated by a profit maximizing behavior. Bliss and Stern (1982, cited by Morduch, 1995) argued that farmers in northern India could appreciably increase their profits by increasing the number of fertilizer applications. However, they spent less in fertilizer just to avoid investments on "useless" inputs in bad times. Along the same lines, Binswanger et al. (1993) showed that farmers in Icrisat villages allocated their assets such that the marginal product was very dissimilar across shares. Hence, they had been able to increase their wealth by substituting part of their assets in irrigated lands for shares in draft animals or traditional implements. Another dimension of this kind of response may lead to the reluctancy to adopt new technologies. Foster and Rosenzweig (1996) offered evidence to exemplify this strategy. The authors used two national data sets that describe farm households to estimate the determinants that affected the adoption of high yield varieties of seeds –an important component of what is known as the Green Revolution that started in the mid 1960's. They found that characteristics that may be associated with less credit binding constraints (e.g. more schooling and larger owned landholdings) were positively associated with the probability that farm household ever adopted the new seeds. In previous works, Rosenzweig (1990) and Besley and Case (1994) have found similar evidence.

Finally, I focus the attention on the role of off-farm labor markets, which also provide rural households with income diversification. By having a fraction of their labor supply employed in other agricultural

activities or sectors, households can be protected from the volatility that farming earnings entail. Rosenzweig and Stark (1989) looked into this idea in Icrisat rural villages and found that households that were more vulnerable to transitory risk were more likely to have a member employed in stable but lower wage activities. Drawing from the same sample, Kochar (1995) showed that 87.5% of small farmers reported earning wages from other labor markets not associated with their own farming activities, in contrast only 46.4% of the large farmers appeared to do so. In a subsequent work, Kochar (1999) found that these households increased the intensive margin of their labor supply in response to adverse crop income shocks. Hence, male wage income seemed to compensate for over 30% of the change in income for small and medium farms while they offset only 7% of the shock for the large ones. Likewise, Townsend (1995) and Jalan and Ravallion (1998) have verified similar patterns for rural farming in northern Thailand and China, respectively.

At least a few general ideas come out from reviewing the evidence of consumption smoothing through income smoothing. On the one hand, rural households facing binding constraints do undertake risk-reducing production methods. They diversify plots, crops, delay the onset of production, reject new economic opportunities and work in other markets. As noted above, the costs of these lower mean, lower variance alternatives are noteworthy. In addition to the forgone consumption and other inefficiencies, issues such as poverty and inequality can be intensified over time as the poorest households are more likely to rely heavily on these mechanisms.

C. Local risk-pooling arrangements

Rural families can also curb their exposure to risk through community-based insurance arrangements. Villages act as “small” economies where their unitary actors (i.e. households) are likely to share more information among them and have scope to pool their total consumption efficiently. Households can build helpful informal insurance networks of mutual assistance around family and community relationships. In other words, related households are both more likely to be better informed about each other’s resources and insure one another. In a full risk-pooling setting, a household that receives a negative idiosyncratic

event is expected to receive nothing less than its pre-shock fraction of total village income.

A first implication of this risk-sharing mechanism is that in principle it only protects its members against individual rather than aggregate community-level shocks to income. A stronger covariance of risk in the same agricultural activities means that these systems ought to work better in spatially separated arrangements. In principle, there are numerous reasons to think that risk is highly covariant within the same rural areas. First, farmers in the same village might specialize in the cultivation of the same crops because of soil characteristics, weather conditions and stronger demand for these products in close markets. Second, households face similar inputs, outputs and consumer goods prices. Third, weather-related shocks and natural disasters usually hit the whole population of the village. And fourth, aggregate production risk can lead to common general equilibrium effects in terms of employment, wages and prices.

Despite those concerns, most of the empirical literature available suggests that a large part of income risk in rural settings is household specific. Deaton (1992), for example, exploits two rounds of data from Côte d'Ivoire to assess the explanatory power of village-specific characteristics in explaining household income fluctuations. His tests suggest that common variation at the village level was slightly associated with specific income fluctuation within the households of the same town. Morduch (2003) decomposed household income in Icrisat villages in south India to show that between 75% and 96% of income variation is connected to idiosyncratic shocks and climatic and soil heterogeneity. Alderman and Garcia (1993) looked at a three year longitudinal dataset in rural Pakistan and found that, to a large extent, village and household income do not move jointly. Similarly, using data for India and Thailand, Townsend (1994, 1995) found that incomes did not covary across households at the village level and instead they were earned in ways such that they were exposed to dissimilar risks.

In view of those findings, not surprisingly, local risk-sharing institutions appear to be very common in rural communities. Subsequently, the idea of testing the predictions of the full risk-sharing model against empirical data from rural villages has attracted the attention of many

development economists. Townsend's paper (1994) on Icrisat data, previously cited, is a good place to start the empirical motivation. Although this work was previously discussed in more depth in the second section of this document, it is worth-mentioning a few points of his results again. First, household consumption was highly dependent on aggregate village income and slightly correlated with idiosyncratic shocks. Second, full consumption smoothing in these villages was rejected regardless of the considerable amount of risk pooling. Ravallion and Chaudhuri (1997) used the same dataset and alternative methods (i.e. specifications and instrumental variable methods) to deal with potential sources of bias in Townsend's approach. The results of these tests on risk-sharing were very comparable to those of Townsend and still rejected full risk-pooling. More recently, Gertler and Grueber (2002) used longitudinal data collected in Indonesia between 1991 and 1993 to study health, income and expenditure changes over this period. The authors found that although families relied heavily on private informal coping strategies, consumption insurance due to illness events was very imperfect. Ligon, Thomas and Worral (2002) found that a model that includes limited commitment performs better at predicting consumption changes due to household specific shocks in Icrisat Indian villages. The list of other papers on this topic is certainly long, but overall, a fair amount of evidence from other countries and surveys seem to reject full risk-sharing (see for example Morduch [1991] for India, Udry [1990] for Nigeria, Rashid [1990] and Alderman and Garcia [1993] for Pakistan, Deaton [1992] and Grimard [1997] for Côte d'Ivoire, Jalan and Ravallion [1998] for China, Suri [2003] for Kenya and Dercon and Krishnan [2004] for Ethiopia).

Other research efforts have been devoted to studying specific components of these methods: transfers between households. Subgroups that are somehow connected (e.g. families, neighbors, ethnic groups, clans, castes, religious affiliations, among others) can make use of mutual insurance arrangements, with members that experience low income draws receiving aid from those with high draws. Many studies have used detailed information on private inter-households transfers and intra-time income variability to test this form of consumption smoothing. Most have found evidence of state-contingent transfers or remittances between network members. For instance, Rosenzweig (1988) used panel data from six Icrisat villages in India over a period

of nine years to identify the determinants of household net transfers and explore the role of networks as risk-coping institutions. He showed that, in fact, reciprocal transfers within extended families were actively employed to reduce income variability, particularly between less wealthy families. Nevertheless, his calculations suggest that, on average, only two percent of the income shortfall was compensated by transfers among households.

Udry (1994), in his study of four northern Nigerian villages, found records of regular transfers between households but they were not large enough to attain full risk-sharing. Fafchamps and Lund (2003) collected longitudinal data from four villages of northern Philippines to look at the role of transfers between rural households. Using a very rich set of variables for mutual insurance groups, they found that gifts and transfers –often in the form of loans– were common among networks of relatives and friends in the event of household specific shocks. However, these loans only partially smoothed consumption. In the context of Latin America, Santos (2006) also found that private transfers and informal loans increased after a natural disaster in Nicaragua in 1998 and that the severity of the shock suffered by a particular household was positively correlated with the amount of private transfers received. However, subsequent estimates by Baez and Santos (2006) indicate that these transfers did not fully protect their consumption. Other pieces of evidence, mainly from Africa, have reached similar results (e.g. Lucas and Stark [1985] for Bostwana, Dercon and Krishman [2000] for Ethiopia, and Udry and Duflo [2004] for Côte d'Ivoire). Likewise, other economists have approached the motives of gift-giving transfers from an altruistic perspective (e.g. Lucas and Stark [1985], Altonji, Hayashi and Kotlikoff [1992], Foster and Rosenzweig [2000]). In general, their findings appear to endorse the notion that these exchanges, although important, are only partially able to cope with risk[3].

---

[3] It is important to mention that conclusions about risk-sharing drawn from data on intra-household transfers have to be interpreted with caution. There are several reasons why this inference may be misleading. It may be that some types of transfers are not recorded (e.g. in-kind transfers, small gifts, donated labor and other inputs, time allocated to household chores). It is possible that unconditional remittances are instead used by migrants to pay back for education and health, or perhaps to raise their chances of inheriting family wealth.

As mentioned at the beginning of this section, it appears that aggregate risks are left uninsured under local risk-pooling. Even in the presence of this sort of shocks, there may be substantial scope for complementary arrangements. For example, if rural towns are connected to larger centers with credit markets they can engage in inter-village loans. Alternatively, households within the networks can transfer people instead of money to create spatially-dispersed alternative options for income generation.

A logical empirical question coming out from the latter point is whether migration location choices somehow obey patterns to moderate aggregated risks. The evidence available is supportive of this idea. A paper previously quoted, Rosenzweig's (1988), showed that the transfer rate among rural Indian households is highly dependent on the household structure. That is, households with a greater number of members who migrated and have more daughters-in-law are not only more likely to exchange resources but also exhibit greater transfers. Paulson (2000), for instance, used both cross-sectional household information and rainfall data from Thailand to show that remittances had a strong insurance component. She also found that remitters from provinces with high covariant incomes with Bangkok were less likely to move there. Rosenzweig and Stark (1989) explored the idea of migration and marriage patterns in rural India. They observed that households in these communities used to follow systems of patrilocal exogamy to mitigate risk, with households exporting daughters and importing daughters-in-law[4]. The data revealed that families had a diversified portfolio of marital partners: over 92% of married women came from or went to another village, and in families with two or more married women, 94% of them have different origins. The list of other studies looking at the income security motives of migration is fairly long. Johnson and Whitelaw (1974), Stark and Bloom (1985), Lucas and Stark (1985), and Barham and Boucher (1998), just to mention a few, gather illustrative evidence of compensatory remittances in Africa, Asia and more recently in Latin America.

---

[4] More specifically, households find incentives to spread the family spatially so the bride comes from a different community and goes to live with the family of the husband. Therefore, this marriage residency pattern creates a risk-sharing partner (altruism) and develops monitoring capacity between families.

D. Informal financial systems

The poor development of formal market institutions for dealing with risk in low-income regions is often attributed to informational problems such as adverse selection, moral hazard, limited enforcement and verification costs. For several reasons, these market imperfections are sharper in rural communities. For instance, agricultural profits are very volatile, farmers are less likely to repay loans under the standard terms of commercial banks, they have little physical asses to offer as collateral, making it difficult to punish low repayment and, in general, to enforce contracts. Furthermore, the size of the market in small villages typically does not offset the high transaction costs implicit in formal credit activities. Such features of rural markets are commonly invoked to argue in favor of policy interventions that remove these failures.

Although those obstacles in fact exist, low-income countries have developed alternative informal mechanisms of credit. Rural households and farmers have access to a wide array of financial sources such as informal credit and insurance arrangements, credit cooperatives and mutuals, rotating savings and credit associations and informal borrowing from relatives, neighbors, landlords, moneylenders and shopkeepers. These systems have comparative advantages that can overcome the informational problems faced by formal markets. In principle, they are not strictly tied to the contractual obligations regularly observed in formal banks and insurance companies. On the contrary, their greater capacity to exert local monitoring and impose sanctions –usually under well-defined social rules– act as substitutes for traditional collateral guarantees and legal enforcement. Households in the same village have often lived alongside each other for a long time and their members are well informed other's activities and successes. In addition, these communities have developed to some extent codes of social sanction that are employed to enforce agreements. Hence, informal credit and insurance institutions are still able to work in environments where formal markets would not be very much likely to do so.

The underlying reasons of why these alternative institutions have emerged and the role played by them in providing informal credit and insurance have been examined in the literature. Theoretical tools from

modern microeconomics like information economics, contract theory and mechanism design theory have been devoted to jointly enrich the understanding of the first issue. In turn, the insights into the importance of these arrangements as risk-coping devices originate from empirical contributions on this subject, one of the most active fields in development economics. A good survey of the theories of contracting under informal settings is found in Conning and Udry (2005). For the purpose of this paper, a better focus is to review some relevant analyses from the empirical side of the literature. In what follows I present this overview for three of the most common informal mechanisms of lending in the rural economy: informal group loans, microfinance and, rotating savings and credit associations.

1. Informal group loans

Informal systems of risk-sharing all have the aim of providing forms of credit and insurance. However, they are social mechanisms that vary greatly from one village to another, making it very difficult to generalize how they begin, grow and develop. Yet, some studies provide useful illustrations for specific locations. Udry (1990), for instance, examined informal credit among relatives, friends and other networks in four rural villages of northern Nigeria. His article portrays a great description of how these loans occur and presents evidence that information asymmetries between borrowers and lenders were negligible. Collateral and contractual interlinkages were not used to secure these loans and they rarely constrained borrowing from happening. In an extension of his research on credit markets in Africa, Udry (1994) tested models of state-contingent loans against survey data from the same villages in Nigeria. His findings indicate that the terms of these informal loans (i.e. repayments contingent upon the realization of random income shocks) are such that risk is –at least in principle– pooled efficiently within the village. Rosenzweig (1988) found that informal borrowing accounted for about 11% of shortfalls in income as compared to the 2% of intra-household transfers in rural Indian villages. Fafchamps and Lund (2003) examined data from rural areas of the northern Philippines and found that only 20% of the loans in these regions were received from formal sources. Instead, most of the loans were transacted between relatives and friends in the same village, were used for consumption smoothing reasons, did not require collateral and were seldom interlinked with other arrangements.

Similar evidence stressing the prominent reliance on informal loans, including moneylenders and pawnbrokers, has been found for other countries as well (e.g. Besley [1995] and Kan [2000] for Taiwan, Jalan and Ravallion [1998] for China, Mohieldin and Wright [2000] for Egypt). Overall, the relevance of these results is twofold. On one hand, these second best transactions appear to be real and significant means to mitigate risk. On the other hand, the evidence of repayments responding to the circumstances of the lending household suggest that these loans allow a distribution of risk within the villages that comes closer to a fully Pareto efficient allocation.

2. Microfinance

I now switch the analysis to briefly describe the role played by group lending. One of its forms, microfinance institutions, have rapidly evolved and expanded as a borrowing option for low-income people in developing countries during the last two decades or so. The system is based on the informational advantages of agrarian communities to lessen the standard asymmetries that harm formal markets of credit. Rural villages are typically small, highly integrated and their members are mostly immobile. Hence, this people have a great deal of information about each other –often not available to outsiders– and thus, the capacity to impose social sanctions on those who do not comply with their financial obligations. Micro-credit organizations exploit these features to offer group-lending contracts under joint liability. That is, borrowers are required to form small groups (usually between 5 and 10 people) in which all members are jointly responsible for each other's loans and are committed to periodic repayment schedules. As a result, "good" risk individuals are expected to self-select into the same groups and exert peer pressure on the other members to repay or risk losing the funds. Traditionally these loans are given to women on the basis that they more often benefit the whole family compared to when loans are given to men and can strengthen their socioeconomic status.

According to estimates of the Consultative Group to Assist the Poor (2006), an agency backed by the World Bank and other institutions to track the performance of micro-credit organizations in developing countries, around 500 million low-income individuals have access to these financial services worldwide. About 84% percent of them are in

Asia and more than half of these beneficiaries are in China and India. One example of these mutual credit organizations is the Grameen Bank of Bangladesh, widely known as one of the leaders in the world of microfinance and a Nobel Peace Prize winner. In the year 2000, it offered subsidized loans to more than two million borrowers in 36,000 villages and had repayment rates of approximately 98%[5].

Technically, microfinance institutions are desirable in the interests of efficiency because they help to bring market outcomes closer to second best allocations. Furthermore, by providing subsidized interest rates, they also appear to be beneficial in the grounds of equity and poverty reduction. On the other hand, concerns remain over their costs, small scale and, mainly, high dependence on donations and lack of self-sustainability. Some studies, mostly policy reports, have examined these issues. Khandker (1998), just to mention one of them, conducted a cost-benefit analysis of Grameen Bank in Bangladesh. He estimated social costs of 0.91 cents per each dollar of benefits to clients, almost twice the benefits of other poverty alleviation programs like food-for-work and cash-conditioned transfers programs. However, Morduch's survey (1999) has a very detailed account of this and other cost-benefit evaluations of several micro-credit organizations that counterbalance the belief of their huge social benefit.

Simply looking at cost-benefit ratios does not provide enough insights into the opportunities available to households in the absence of micro-credit. Unfortunately, there are few papers that have adopted reliable research designs to assess the social impact of these opportunities. The direction of these findings is also, unfortunately, inconclusive. For example, Pitt and Khandker (1998) looked at the impact of participation in three micro credit programs in Bangladesh on a set of household- and individual-level outcomes. They found that credit provided to women increased household consumption, assets, labor supply and children schooling. Amin, Rai and Topa (2002) used panel data to evaluate the impact of the Grameen bank in two Bangladeshi villages. In contrast, they found that although mostly poor households joined micro-credit

[5] Morduch (1999) recalculated these repayment rates incorporating standard accounting and found that they are about 85% to 90%, which are still impressively high despite not requiring collateral.

programs, the less vulnerable among them (i.e. more access to insurance and smoothing devices) were more likely to receive loans from these programs. Other study by Coleman (1999) exploits quasi-experimental variation from phasing in of joint-liability banks in villages of northern Thailand in 1995-1996. The author concluded that program loans were having little impact on promoting an increase in physical assets, savings, production, sales, labor time and expenditures on health care and education. Likewise, Morduch (1999) reviewed administrative data from The Grameen Bank together with information from eligible villages with no access to micro-credit. He found equivalent school enrollment rates for children in treatment and control towns, as well as similar outcomes on other social dimensions.

The literature on microcredit is now full of case studies that illustrate specific experiences. Likewise, other more general and fundamental aspects of microfinance institutions have been deeply investigated. Although they will not be discussed here in detail, it may be useful to mention a few of them. For example, Morduch (1999b) highlights that some characteristics of their functioning (e.g. heavy reliance on external funding from donors, modest profits, high expenses per unit transacted, declining repayment rates, high transaction costs) represent potential threats to their future stability. Hossain (1988) and Morduch (1999b) have also examined the limitations of group lending to bear risk. Another concern lies in knowing whether group-lending contracts effectively mitigate informational asymmetries between lenders and borrowers, as theoretically studied by Stiglitz (1990), Varian (1990), and empirically by Udry (1994), Banerjee, Besley and Guinnane (1994) and Udry (1995). Others like Besley and Coate (1995) and Paxton, Graham and Thraen (2000) have argued both formally and empirically that joint-liability does not assure an improvement in payment rates.

The array of questions around these institutions is too broad to be covered in depth here. However, after bringing together some of the results available in the literature, there is a sense that microfinance programs are highly cost-sensitive, in some cases may produce only limited benefits and, even within a program, wealthier families could benefit more. Instead, these conclusions warrant careful thinking about the design of these institutions.

3. Rotating savings and credit associations

Rotating savings and credit associations (Roscas) constitute another common type of mutual organization in the rural world, particularly in Africa and other developing countries in Asia[6]. These associations are often founded by individuals that belong to similar ethnic backgrounds, native language and sometimes place of origin or location proximity. Members of these organizations come together and commit to putting a fixed amount of money into a "pot" during a specific length of time. Contributions vary based on the number of participating members, the duration of the agreement, the winning amount and some socioeconomic characteristics of their members. These contributions can be made daily, weekly, monthly and even half-yearly with usually small agreements having small cycle periods. Each period, an explicit amount of money is drawn from this fund –generally either by a random or bidding allocation– and given as a lump sum to one member. Under some circumstances, the pot is given to a member who is in most need for funding. This process is repeated without including past winners in subsequent lotteries –although they keep making their contributions– and it ends when each member of the group has received the pot once.

These informal collective arrangements have pros and cons. On one hand, Roscas provide opportunities for joint savings while keeping the resources fairly liquid, a salient benefit in environments with scant appealing savings instruments. They are also quite flexible and easily adaptable to the particular conditions and patterns of grouping in each village. In addition, and similar to micro-credit institutions, Roscas circumvent informational asymmetries by exploiting social connectedness at the village level. The involvement of the community in organizational and operational aspects produces favorable self-selected groups. Therefore, the groups are formed among individuals whose characteristics and general circumstances are well known to each other. The risk of default is handled by all members, with defaulters being prevented from any further participation in future agreements.

---

[6] Although mostly common in low-income economies, they are also found in developed countries, such as the U.S., and are primarily used by immigrant groups.

On the other hand, a concern lies in the cyclical timing of the system. The probability of obtaining the pot does not necessarily match someone's financial needs, which is particularly true in random Roscas. And a similar logic applies to the case of savings. Besides, since the funds can be received no more than once, bidding Roscas may partially solve this problem only if their members deal with shocks that do not persist. Location can be another downside of the system. Members of the cooperative usually live close to each other and are exposed to covariant risks. Thus, several individuals could have high necessities at the same time. Regarding the commitment with the fund, default may take place –even in the presence of social punishment to enforce pledge– because contributors themselves face stochastic income streams.

There is a fair amount of literature on the origins and operation of these organizations. Most of these contributions actually come from social sciences like anthropology and sociology[7]. The book by Ardener and Burman (1995) compiles numerous case studies and references of previous studies on Roscas from the perspective of these disciplines. As for the economics research, this has been largely committed to both formalize the economic role of these financial systems and assess their impact.

As for the first part of this literature, the theoretical work by Besley, Coate and Loury (1993) develops a model of savings for an indivisible durable good that offers a very sophisticated analysis of Roscas. Their findings can be summarized in three main points. First, they showed that each type of Rosca allows individuals to achieve a more efficient allocation than the one obtained in the case of autarky (i.e. without access to credit markets)[8]. Second, they demonstrated a higher performance of random over bidding Roscas under the assumption of homogenous preferences among members of the groups. On the contrary, bidding Roscas with heterogeneous individuals (e.g. different

---

[7] For instance, see the studies by Clifford Geertz (1962), Shirley Ardener (1964) and Fritz Bouman (1977, 1979).

[8] They support this view in terms of the reduction in individuals' utility of savings due to high financial intermediation costs, normally found in environments with high market imperfections.

tastes for the durable good, receipt of the pot) are superior. And third, they showed how the risk of default is greater for bidding Roscas. In a subsequent study (Besley et al., [1994]), the same authors expand their analysis about the allocative performance of these associations. Overall, their findings suggest that the allocations of either type of Rosca are inferior vis-à-vis those of formal credit devices. Therefore, individuals would be better off with access to credit and insurance markets. Calomiris and Rajamaran (1998) questioned the emphasis given in previous works to the role of consumption of lumpy durables as the sole reason for Roscas to exist. In contrast, they argued –both formally and descriptively– in favor of the insurance motives of types of Roscas that are widely reported in developing countries. There are other studies in the literature examining the basic structure of these systems (e.g. Kovsted and Lyk-Jensen (1999), Ambec and Nicolas Treich (2007)). On the whole, they seem to agree on their importance as an alternative credit institution; however they do call attention to the superiority of more formal risk-coping mechanisms.

Not surprisingly, given the great diversity of Roscas around the world, almost all the empirics on this subject are studies on a particular type of association. Although it may not be fair to draw conclusions from such specific analyses, a review of a number of of them still provides insights into their operation and impact on some socioeconomic outcomes. A first topic of interest is the common observation in the literature about the high participation of women in organizing and overseeing Roscas. Anderson and Baland (2002) explored this issue by looking at data from 520 households in Kibera, the largest slum in Kenya. Nearly 84% of Roscas' participants in their sample were women, most of them married and with a regular income-earning occupation. The authors used an intra-household bargaining approach to explain this observation and found that women joined Roscas as a way to protect their savings and prevent men from overspending on current consumption.

Levenson and Besley (1997) used a nationally representative survey of households in Taiwan and also examined participation in Roscas discriminated by income groups. Their tests indicate that membership increased with income and was relatively more widespread among people with stable occupations. In view of these findings, these asso-

ciations could be important receptors of savings from the wealthier households in areas with low access to formal sources of credit or where intermediation costs are high. In an earlier work on Taiwan again, Levenson and Besley (1996) found evidence to support the idea that participation in Roscas helped in explaining an increase in durables accumulation by households between 1977 and 1991. Finally, Handa and Kirton (1999) tested some of the theoretical foundations of Roscas discussed above against data from a rural region in Jamaica. Their results support several aspects of these associations such as their sustainability under different contracts and the homogeneity of their members. But more importantly, these results indicate that their members used these funds for the purchase of durable goods as well as precautionary savings for unexpected expenses.

In summary, a general overview of the literature on Roscas gives the idea that they are not perfect substitutes of formal markets for credit. However, as was noted in the case of micro-credit institutions, they are second best responses and dominant sources of finance to the rural economy. The debate is far from being conclusive. Some successes seem to be weighted by some failures. But apart from that, the big picture taken out of the evidence discussed here hints at the key role of both microfinance and Roscas to provide poor –and often credit constrained– households with some level of income security.

E. Agricultural contracting

The high-risk environment of most agricultural activities and, particularly the lack of formal markets for credit and insurance to deal with it, play a prominent role in shaping the types of contracts in the agrarian sector. Two main market failures characterize these contracting relationships. First is the classic moral hazard problem; here labor is not fully monitorable at reasonable costs and, thus, effort is not observable. Second, there are incomplete markets for insurance and credit in settings with risk-averse agents. Farmers face considerable risk even in commodities with well developed markets for future prices.

The first of these problems can be modeled as a specific case of the standard agency theory, with the decision-making power delegated from the landowner (“principal”) to the farmer (“agent”) under con-

ditions of asymmetric information. Under these conditions, contracts are designed to introduce the incentives that determine second best input choices and output levels. The mechanism design theory in the context of models of agricultural contracting –pioneered by Stiglitz (1974), Bell and Zusman (1976), Newbery (1997), Stiglitz and Braverman (1982) and widely expanded later by other authors– offers a decision environment with sophisticated tools to formalize these systems of incentives. Their predictions are quite illustrative and can be shortly summarized. On the one hand, with imperfect information, tenants can work on the land and earn a fixed wage. However, no incentives to exert an optimal labor allocation are provided under this scheme, unless the landlord can supervise workers' effort and choices at reasonable costs. On the other hand, if risk-aversion is added to the model, the second-best optimal choice of arrangement that provides stronger incentives is a pure rent contract.

Yet, the second market imperfection is more related to the focus of the discussion in this review. This failure implies that in the absence of formal risk-coping devices, contracts between landlords and tenants can be written so as to split the proportions of risks born by each of them. That is, payment schemes can be agreed such that they affect the incidence of risk on these two agents. In fact, as noted below, there are certain interlinkages in the contracts of the agricultural world that involve informal –and often inefficient– risk-sharing and credit instruments. I center the attention below in the two most common: sharecropping and interlinking.

Sharecropping is a system of farm tenancy in which the landlord allows the sharecropper to cultivate the land in return for a share of the crop obtained from this land[9]. In terms of efficiency, sharecropping lies in the middle of fixed wage and fixed rent contracts. The tenant bears the full cost of effort, receives just a fraction of the marginal product and, thus, supplies a suboptimal level of effort. Both sharecropping

[9] Kotwal and Eswaran (1984) offer another interesting extension of sharecropping that incorporates the exchange of non-marketed inputs: supervision time and management time. The analysis assumes that landlords have comparative advantages in management (i.e. skills in allocating inputs) and tenants have comparative advantage in supervision. Thus, the landlord supplies some level of management and the tenant supplies some of supervision, but less than the full optimal amount.

and pure rent provide incentives with no need of monitoring, but the latter is more efficient both in terms of productivity and risk allocation. In turn, interlinking is a form of agricultural contract that entails the landlord as the supplier of land, inputs, credit and even consumption goods to tenant farmers. As an extension of sharecropping, interlinking also provides a method by which part of the uncertainty is born by the landlord and the provision of goods, services and credit can maintain incentives for the tenant. Still, sharecropping and interlinking contracts may not be fully efficient compared to the first best scenario of complete markets for credit and insurance.

Testing empirically that the presence of interlinkages in tenancy contracts may not be fully efficient compared to the first best scenario (i.e. perfect information and complete markets for credit and insurance) is certainly a hard task. There are several sorts of population and land heterogeneity and few detailed data sets to deal with them. Still, the quantification of landlord- and tenant-level behavioral responses to sharecropping and interlinking contractual terms have received some attention in the literature. Shaban's paper (1987) is a classic work on the subject. He used data from Icrisat villages in India to examine whether inputs utilization and outputs differed systematically on lands under different tenure status, namely between sharecropped land and owned or rented plots. He found that output per acre and the number of hours worked under sharecropping contracts were relatively lower. Along the same lines, Foster and Rosenzweig (1994) test the performance of sharecropping against longitudinal data from a rural province in Philippines. Exploiting the change of body mass as a proxy of effort, they also found that share tenants were less productive. Dubois (2002) arrived to similar conclusions in this sample when comparing land quality.

If the inability to perfect monitor labor and specify effort in contracts do not justify the existence of sharecropping and interlinking, why do they exist? What is it that makes sharecropping a very popular payment agreement in agrarian structures of low-income countries? Much of its popularity arises from risk and the lack of effective systems to mitigate it. Interlinkages in agricultural contracts result from the informal exchange between incentives and risk-sharing. Tenants are poorer and, thus, expected to be more risk averse. Accordingly,

they tend to accept contracts with lower earnings instead of alternative payment schemes with higher but more uncertain earnings. The less able to protect consumption, the more likely they are to engage in these type of contracts. This does not mean that the degree of risk aversion is what determines this behavior, rather it is their fragile income security. Laffont and Matoussi (1995) provide evidence to back this idea. They looked at the role of credit constraints in sharecropping in a rural area of Tunis. Their results confirm the importance of risks in shaping these arrangements: the probability that a tenant accepts a share contract is negatively associated with their working capital. Similar results have been found for Turkey (Tunali [1993]).

It has been stressed throughout this review that rural economies suffer from greater market asymmetries that prevent the development of credit and insurance markets. In a setting with these limitations, tenancy contracts offer a tradeoff between incentives and insurance that might not be reached otherwise. Like the other informal systems discussed so far, they are second best alternatives and should not be underestimated. However, there is always the concern that these contracts –and the risk-sharing they entail– may be very costly for the poorest.

IV. Shocks, consumption insecurity and long term impacts

I will finish this overview with a brief discussion of the long term welfare consequences of income and assets shocks that remain uninsured. Hopefully, the concepts and material reviewed so far has illustrated that the capacity of poor rural households to maintain an optimal stream of consumption over various states of nature and along time is often imperfect. Thus, the question becomes, how do they adjust their expenditures? Since nutrition, schooling and health-care utilization represent large cash expenditures shares of their budgets, are these basic consumption components reduced when income is lower than expected? Do farmers rely on the labor of their children? Do these adjustments have long term impacts?

As previously illustrated in this document, there has been a broad and permanent concern about the limited ability of farmers to insure against

negative income fluctuations. Surprisingly, the literature has committed less attention to the long lasting effects of income volatility in developing countries. Still, some studies have tackled this issue and shed some light on the possible answers. For example, Jacoby and Skoufias (1997) examined the consequences of income shocks on human capital accumulation. They used data from six Icrisat rural villages in India to study the effects of income fluctuations on the time allocation of children ages 5 to 18. According to their results, children were less likely to enroll in school in periods with unanticipated aggregated and idiosyncratic shocks. Moreover, they found that poorest household had drawn more intensively upon the labor of their children to self-insure against these events. Foster (1995) explored rural households' vulnerability in other dimensions of well-being such as health and nutrition. In order to do that, Foster compared children growth in rural areas affected by very destructive floods in Bangladesh and observed that both landowning and landless households took out loans after the disaster. However, Foster found that better-off households (i.e. landowners) had more access to cheaper loans and, therefore, were more successful in offsetting the negative impact of the floods on child weight. In contrast, the nutritional status of children in landless families was more vulnerable to the conditions created by the flood. Similarly, Behrman (1988) had already found analogous effects of negative income shocks on children's health in rural India.

Similar responses have been identified for low-income countries in other regions of the world. For instance, Jensen (2000) assessed the impact of volatile income on children well-being using time series of cross-sectional data from rural communities in Côte d'Ivoire. He examined whether children living in regions that went through adverse weather shocks had lower investment in education and health. After the shock, school enrollment declined on average 20% for the treatment group compared to the control group, over one-third of the initial level. Similarly, the percentage of sick children taken for consultation and nutrition decreased considerably in regions facing negative shocks. Beegle, Dehejia and Gatti (2003) used panel data from Tanzania to show that temporary income shocks led to increased child labor, mostly in households with less collateralizable assets. As for Latin America, Baez and Santos (2006) followed a similar approach to examine children's vulnerability after a natural disaster in Nicaragua. They used

longitudinal data and exploited the trajectory of a hurricane in a quasi-experimental design. Their results indicate that affected children were 8.7 percentage points more likely to be undernourished. In addition, relative to controls, child labor participation more than doubled and health care utilization was reduced in nearly 30%.

The few results presented here point to the importance of assessing the long run effects of imperfect consumption smoothing. And, more importantly, they draw attention to the costly strategies often adopted to deal with transitory shocks. Adjustments including reductions in schooling, nutrition and health in households that are already poor can be extremely harmful, particularly if they disrupt human capital formation and future earning ability of children.

V. Concluding remarks

This paper has attempted to provide a brief overview of general concepts and influential findings of empirical research on risk-coping behavior and consumption smoothing arrangements in agrarian economies of developing countries. With that goal in mind, this report is intended to be a useful guide for non-specialists in the subject or for anyone beginning applied microeconomic research work on income volatility, insurance and credit market incompleteness in rural settings. This has become an important topic for the research agenda in development economics over the last two decades and numerous issues have been investigated. I have placed a particular interest in presenting the uneven vulnerability of poor people to risk, some of the informal mechanisms to deal with it and the extent of their performance. In doing so, I have been able to arrive at some general conclusions.

As the above review makes clear, more than a few formal models and empirical papers are indicative of the limited ability of poor rural households –which are the majority among the rural population– to "first-best" optimally transfer resources across time and income cycles. However, this review has also contrasted the first best outcome against the existence of alternative informal instruments to bear risk. The vast variety of these alternatives in the rural world makes broad generalizations difficult to make. In spite of that, taking all coping strategies together, consumption does not fully track income but still

does partially; income insecurity is more prevalent among the poorest. Furthermore, some of these informal mechanisms for dealing with risk are the result of nonseparabilities between consumption and production choices which in turn, appear to be extremely costly in terms of forgone consumption and production capacity.

Still, there are unanswered questions on the whole subject that surely will capture the attention of future research. For instance, what are the total costs of informal risk reduction through income smoothing and other means at the household level? Do they lead to a poverty trap? Since the poor appear to be less able to bear risk, how much does uninsured income risk explain income inequality? Which informal mechanisms work best? Is there conclusive evidence that improving access to credit and insurance markets raise efficiency? If so, what is the best way for governments and other institutions to provide missing markets or correct existing failures? Could publicly provided access to financial and insurance services crowd out current informal instruments with little gain to society? Although existing results have something to say about these issues, clearly more case-specific research work is needed before they can be accepted as general conclusions.

The findings discussed here have policy implications as well. Public interventions can play a significant role in strengthening the most effective informal systems already in place and improving the provision of more formal financial and insurance services. To do so, policy makers and analysts need to make a distinction between a "superficial accounting" and a more "sophisticated" and accurate diagnosis of the barriers to achieve fully functioning markets. The first approach would simply say that children's school attendance is lower in agricultural households and thus, public programs to build more schools and educational facilities in these villages should be supported. The second approach would explore the economic constraints of these households and the reasons of why children are kept away from schools even if these are available. The first type of analysis would say that poor farmers are poor and cannot deal with risk because they do not use the best technology available and do not have enough land, inputs and physical and human capital. The second one would explore the reasons of the economic environment (e.g. credit constraints) that do not allow households and farmers to reach their full productive potential.

Markets can be incomplete, imperfect, distorted or non-existent. The environment may be characterized by inherent limitations and underdeveloped institutions. A better understanding of the causes and not the symptoms of informal risk-coping behavior and its social welfare implications can surely lead to more efficient policy design.

References

ALDERMAN, H. and GARCIA, M. (1993). "Poverty, household food security and nutrition in rural Pakistan", *International Food Policy Research Institute Research Report*, Washington, D. C.

ALTONJI, J., HAYASHI, F. and KOTLIKOFF, L. (1992). "Is the extended family altruistically linked? direct tests using micro data", *American Economic Review*, 82(5):1177-1198.

AMBEC, S. and TREICH, N. (2007). "Roscas as financial agreements to cope with self-control problems", *Journal of Development Economics*, 82(1):120-137.

AMIN, S.; ASHOK, R. and TOPA, G. (2002). "Does microcredit reach the poor and vulnerable? Evidence from Northern Bangladesh", *Journal of Development Economics*, 70(1):59-82.

ANDERSON, S. and BALAND, J. (2002), "The Economics of Roscas and Intrahousehold Resource Allocation", *The Quarterly Journal of Economics*, 117(issue 3):963-995.

ARDENER, S. (1964). "The comparative study of rotating credit associations", *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, 94(2):202-29.

ARDENER, S. and BURMAN, S. (1995). *Money-go-rounds: The Importance of Rotatins Savings and Credit Associations for Women*, Washington D. C.

BAEZ, J. and SANTOS, I. (2006). "Children's vulnerability to shocks: hurricane Mitch in Nicaragua as a natural experiment", draft, doctoral dissertation, Maxwell School of public affairs (Syracuse University) and Kennedy School of Government (Harvard University).

BANERJEE, A.; BESLEY, T. and GUINNANE, T. (1994). "Thy neighbor's keeper: the design of a credit cooperative with theory and a test", *Quarterly Journal of Economics*, 109(2):491-515.

BANKS, J.; BLUNDELL R. and BRUGIAVINI, A. (2001). "Risk-pooling, precautionary saving and consumption growth", *Review of Economic Studies*, 68(4):757-779.

BARHAM, B. and BOUCHER, S. (1998). "Migration, remittances, and inequality: estimating the net effects of migration on income distribution", *Journal of Development Economics*, 55: 307-331.

BARRERA, F. and PEREZ, F. (2005). *Consumption Smoothing: Empirical Evidence from Colombia and Nicaragua*. Bogotá, Colombia, Mimeo, Fedesarrollo.

BEEGLE, K.; DEHEJIA R. and GATTI, R. (2003). "Child labor, crops shocks and credit constraints", *NBER Working Paper* 10088.

BEHRMAN, J. (1998). "Intrahousehold allocation of nutrients in rural india: are boys favored? Do parents exhibit inequality aversion?", *Oxford Economic Papers,* 40(1):32-54.

BELL C. and ZUSMAN, P. (1976), "a bargaining theoretic approach to cropsharing contracts", *American Economic Review*, 66(4):578-588.

BESLEY, T.; COATE, S. and LOURY, G. (1993). "The economics of rotating savings and credit associations", *American Economic Review*, 83(4):792-810.

BESLEY, T.; COATE, S. and LOURY, G. (1994). "Rotating savings and credit associations, credit markets and efficiency", *Review of Economic Studies,* 61(4):701-719.

BESLEY, T. and CASE, A. (1994). "Diffusion as a learning process: evidence from HYV cotton", Discussion paper N. 174, center for international studies, Woodrow Wilson School of public and international affairs, Princeton University.

BESLEY, T. (1995). "Nonmarket institutions for credit and risk sharing in low-income countries", *The Journal of Economic Perspectives*, 9(3):115-127.

BESLEY, T. and COATE, S. (1995). "Group lending, repayment incentives and social collateral", *Journal of Development Economics*, 46:1-18.

BESLEY, T. and LEVENSON, A. (1997). "The role of informal finance in household capital accumulation: Evidence from Taiwan", *The Economic Journal*, 106:39-59.

BESLEY, T. and LEVENSON, A. (1997). "The anatomy of an informal financial market: Rosca participation in Taiwan", *Journal of Development Economics*, 51(1):45-68.

BHARGAVA, A. and RAVALLION, M. (1993). "Does household consumption behave as a martingale? a test for rural South India", *Review of Economics and Statistics*, 75(3):500-504.

BINSWANGER, H. and ROZENSWEIG, M. (1993). "Wealth, weather risk and the composition and profitability of agricultural investments", *The Economic Journal*, 103:56-78.

BLISS, C. and STERN, N. (1982). *Palanpur: The Economy of an Indian Village*, Oxford, Oxford University Press.

BOUMAN, F. (1977). "Indigenous savings and credit associations in the third world: a message?", *Savings and Development*, 1:181-220.

BOUMAN, F. (1979). "The Rosca: financial technology of an informal savings and credit institution in developing economies", *Savings and Development*, 3(4):253-276.

CASE, A. (1995). "Symposium on consumption smoothing in developing countries", *Journal of Economic Perspectives*, 9(3):81-82.

CALOMIRIS, C. W. and RAJAMARAN, I. (1998). "The role of roscas: lumpy durables or event insurance", *Journal of Development Economics*, 56(1):207-216.

CHAUDHURI, S. and PAXSON, C. (1994). "Consumption smoothing and income seasonality in rural India", *Discussion Paper* N. 173, Princeton University Research Program in Development Studies.

CHETTY, R. and LOONEY, A. (2005). "Consumption smoothing and the welfare consequences of social insurance in developing economies", *NBER Working Paper* No. 11709.

COLEMAN, B. (1999). "The impact of group lending in Northeast Thailand", *Journal of Development Economics*, 60(1):105-141.

CONNING, J. and UDRY, C. (2005). "Rural financial markets in developing countries", in agricultural development: Farmers, farm production and farm markets, *Handbook of Agricultural Economics*, Vol. 3.

DEATON, A. (1989). "Saving in developing countries: theory and review", *World Bank Economic Review*, Proceedings of the World Bank annual conference on development economics, pp. 61-96.

DEATON, A. (1991). "Saving and liquidity constraints", *Econometrica*, 59(5):1221-1248.

DEATON, A. (1992). "Saving and income smoothing in Côte D'Ivoire", *Journal of African Economies*, 1(1):1-24.

DERCON, S. (1996). "Risk, crop-choice and savings: evidence from Tanzania", *Economic Development and Cultural Change*, 44(3):485-513.

DERCON, S. and KRISHNAN, P. (2000). "In sickness and in health: Risk sharing within households in rural Ethiopia", *Journal of Political Economy*, 108(4):688-727.

DUBOIS, P. (2002). "Moral hazard, land fertility and sharecropping in a rural area of the Philippines", *Journal of Development Economics*, 68(1)35-64.

ESWARAN, M. and KOTWAL, A. (1985). "A theory of contractual structure in agriculture", *American Economic Review*, 75(3):352-367.

ESWARAN, M. and KOTWAL, A. (1985). "Credit as insurance in agrarian economies", *Journal of Development Economics*, 31 (1):37-53.

ESWARAN, M. and KOTWAL, A. (1990). "Implications of credit constraints for risk behavior in less developed economics", *Oxford Economics Papers*, 42(2):473-482.

FAFCHAMPS, M.; UDRY, C. and CZUKAS, K. (1998). "Drought and saving in west africa: are livestock a buffer stock?", *Journal of Development Economics*, 55(2):273-305.

FAFCHAMPS, M. and LUND, S. (2003). "Risk-sharing networks in rural Philippines", *Journal of Development Economics*, 71(2):261-287.

FOSTER, A. D. and ROSENZWEIG, M. R. (1994). "A test for moral hazard in the labor market: Contractual arrangements, effort, and health", *Review of Economics and Statistics*, 76(2):213-227.

FOSTER, A. (1995). "Prices, credit markets and child growth in low-income rural areas", *The Economic Journal*, 105(430):551-570.

FOSTER, A. D. and ROSENZWEIG, M. R. (1996). "Technical change and human capital returns and investments: evidence from the Green Revolution", America *Economic Review*, 86 (4):931-953.

FOSTER, A. D. and ROSENZWEIG, M. R. (2001). "Imperfect commitment, altruism and the family: evidence from transfer behavior in low-income areas", *Review of Economics and Statistics*, 83(3):439-451.

FOSTER, A. D. and ROSENZWEIG, M. R. (2004). "Agricultural productivity growth, rural economic diversity, and economic reforms: India, 1970-2000", *Economic Development and Cultural Change*, 52(3):509-542.

GARCÍA,V. R. (2002). "Evaluation of conditional income support programs: The case of Mexico's Progresa", Doctoral Dissertation, University of Chicago.

GEERTZ, C. (1962). "The rotating credit association: a "Middle Rung" in development", *Economic Development and Cultural Change*, 10(3):241-44.

GERTLER, P. and GRUBER, J. (2002). "Insuring consumption against illness", *American Economic Review,* 92(1):51-70.

GRIMARD, F. (1997). "Household consumption smoothing through ethnic ties: Evidence from Côte d'Ivoire", *Journal of Development Economics,* 53:391-422.

GOURICHAS, P. and PARKER, J. (2002). "Consumption over the life cycle", *Econometrica,* 70:47-89.

HANDA, S. and KIRTON, C. "The economics of rotating savings and credit associations: Evidence from the Jamaican 'Partner'", *Journal of Development Economics*, 60(1):173-194.

HELMS, B. (2006). *Access for All. Building Inclusive Financial Services, the Consultative Group to Assist the Poor.* Washington D. C. Edited by the World Bank.

HOSSAIN, M. (1988). "Credit for alleviation of rural poverty: The Grameen Bank of Bangladesh", *International Food Policy Research Institute Research Report* 65.

INTERNATIONAL RED CROSS (2005). World disasters report – focus on information in disasters, Geneva, Switzerland.

JACOBY, H. G. and SKOUFIAS, E. (1997). "Risk, financial markets, and human capital in a developing country", *Review of Economic Studies*, 64(3):311-335.

JALAN, J. and RAVALLION, M. (1998). "Behavioral responses to risk in rural China", *Policy Research Working Paper Series*, World Bank, No. 1978.

JENSEN, R. (2000). "Agricultural volatility and investments in children", *American Economic Review*, 90(2):399-404.

JOHNSON, G. E. and WHITELAW, W. E. (1974). "Urban-rural income transfers in Kenya: An estimated-remittances function", *Economic Development and Cultural Change*, 22(3):473-479.

KAN, K. (2000). "Informal capital sources and household investment: Evidence from Taiwan", *Journal of Development Economics*, 62:209-232.

KHANDKER, S.; KHALILY, B. and KHAN, Z. (1995). "Grameen Bank: Performance and sustainability", *in World Bank Discussion Paper*, 306.

KHANDKER, S. (1998). Fighting poverty with microcredit: Experience in Bangladesh, New York: *Oxford University Press for the World Bank.*

KIMBALL, M. (1991). "Precautionary savings in the small and in the large", *Econometrica*, 58(1):53-73.

KOCHAR, A. (1995). "Explaining household vulnerability to idiosyncratic income shocks", American economic review, *Papers and Proceedings*, 85(2):159-164.

KOCHAR, A. (1999). "Smoothing consumption by smoothing income: Hours-of-work responses to idiosyncratic agricultural shocks in rural India", *The Review of Economics and Statistics*, 81(1):50-61.

KOVSTED, J. and LYK-JENSEN, P. (1999). "Rotating savings and credit associations: The choice between random and bidding allocation of funds", *Journal of Development Economics*, 60:143-172.

LAFFONT, J. J. and MATOUSSI, M. (1995). "Moral hazard, financial constraints and sharecropping in El Oulja", *Review of Economic Studies*, 62(3):381-399.

LIGON, E.; THOMAS, J. and WORRAL, T. (2002). "Informal insurance arrangements with limited commitment: theory and evidence from village economies", *Review of Economic Studies*, 69(1):209-244.

LIM, Y. and TOWNSEND, R. M. (1998). "General equilibrium models of financial systems: theory and measurement in village economies", *Review of Economic Dynamics*, 1:59-118.

LUCAS, R. and STARK, O. (1985). "Motivations to remit: evidence from Botswana", *Journal of Political Economy*, 93(5):901-918.

MOHIELDIN, M. and PETER W. WRIGHT, (2000). "Formal and informal credit markets in Egypt", *Economic Development and Cultural Change*, 48(3):657-670.

MORDUCH, J. (1990). "Risk, production, and saving: Theory and evidence from indian households", draft, Harvard University, 1990.

MORDUCH, J. (1990). "Povery and vulnerability", *American Economic Review,* Papers and Proceedings, 84(2):221-225.

MORDUCH, J. (1995). "Income Smoothing and Consumption Smoothing", *Journal of Economic Perspectives,* 9(3):103-114.

MORDUCH, J. (1999a), "The microfinance promise", *Journal of Economic Literature*, 37(4):1569-1614.

MORDUCH, J. (1999b). "The role of subsidies in microfinance: evidence from the Grameen Bank", *Journal of Development Economics*, 60:229-248.

MORDUCH, J. (2003). "Consumption smoothing across space: tests for village-level responses to risk", *in* Stefan Dercon (ed.), *Insurance against poverty*. Oxford University Press.

NEWBERY, D. (1975). "Tenurial obstacles to innovation", *Journal of Development Studies*, 11:263-277.

PAULSON, A. (2000). "Insurance motives for migration: evidence from Thailand", draft, *Kellog Graduate School of Management, Northwestern University*, March.

PAXTON, J.; GRAHAM, D. and THRAEN, C. "Modeling group loan repayment behavior: new insights from Burkina Faso", *Economic Development and Cultural Change*, 48(3):639-655.

PAXSON, C. (1992). "Using, weather variability to estimate the response of savings to transitory income in Thailand", *American Economic Review,* 82(1).

PAXSON, C. (1993). "Consumption and income seasonality in Thailand", *Journal of Political Economy*, 101(1):39-72.

PITT, MARK and KHANDKER, S. (1998). "The impact of group-based credit program on poor households in Bangladesh: Does the gender of participants matter?", *Journal of Political Economy*, 106(5):958-996.

RASHID, M. (1990). *Rural Consumption, Risk and Insurance. The Evidence from Rural Pakistan*. Mimeo, University of Chicago.

RAVALLION, M. and CHAUDHURI, S. (1997). "Risk and insurance in village India: Comment", *Econometrica,* 65(1):171-184.

ROSENZWEIG, M. (1988). "Risk, implicit contracts and the family in rural areas of low-income countries", *The Economic Journal*, 98:1148-1170.

ROSENZWEIG, M. and STARK O. (1989),."Consumption smoothing, migration, and marriage: evidence from rural India", *Journal of Political Economy*, 97:905-926.

ROSENZWEIG, M. and WOLPIN, K. (1993). "Credit market constraints, consumption smoothing, and the accumulation of durable production assets in low-income countries: investments in bullocks in India", *Journal of Political Economy,* 101(2): 223-244.

SANTOS, I. (2006). "Risk-sharing mechanisms and crowding out of inter-household transfers. Evidence from Nicaragua", draft, doctoral dissertation, Kennedy School of Government, Harvard University.

SHABAN, A. R. (1987). "Testing between competing models of sharecropping", *Journal of Political Economy,* 95(5):893-920.

STARK, O. and BLOOM, D. E. (1985). "The new economics of labor migration", *American Economic Review*, 75(2).

STIGLITZ, J. (1974). "Incentives and risk sharing in sharecropping", *Review of Economic Studies,* 41(2):219-255.

STIGLITZ, J. and BRAVERMAN, A. (1982). "Sharecropping and the interlinking of agrarian markets ", *American Economic Review*, 72(4):695-715.

STIGLITZ, J. (1990). "Peer monitoring and credit markets", *World Bank Economic Review*, 4(3):351-366.

SURI, T. (2003). "Spillover in village consumption: Testing the extent of partial insurance", *working paper*, Department of Economics, Yale University.

TOWNSEND, R. (1994). "Risk and insurance in village India", *Econometrica,* 62(3):539-91.

TOWNSEND, R. (1995). "Financial systems in Northern Thai Villages", *The Quarterly Journal of Economics*, 110(4):1011-46.

TOWNSEND, R. (1995). "Consumption insurance: an evaluation of risk-bearing systems in low-income economies", *Journal of Economic Perspectives*, 9(3):83-102.

TUNALI, I. (1993). "Choice of contracts in turkish agriculture", *Economic Development and Cultural Change*, 42 (1):67-86.

UDRY, C. (1990). "Credit markets in Northern Nigeria: Credit as insurance in a rural economy", *World Bank Economic Review*, 4(3)251-269.

UDRY, C. (1994). "Risk and Insurance in a rural credit market: An empirical investigation in Northern Nigeria", *Review of Economic Studies*, 61(3)495-526.

UDRY, C. (1995). "Risk and saving in Northern Nigeria", *American Economic Review*, 85(5):1287-1300.

UDRY, C. and DUFLO, E. (2004). "Intrahousehold resource allocation in Côte d'Ivoire", *working paper*, Department of Economics, Yale University.

VARIAN, H. (1990). "Monitoring agents with other agents", *Journal of Institutional Theoretical Economy*, 146:153-174.

WOLPIN, K. (1982). "A new test of the permanent income hypothesis: the Impact of weather on the income and consumption of farm households in India", *International Economic Review,* 23: 583-594.

WORLD B. (2003). *World Development Report 2004: Making Services Work for Poor People*, Washington D. C., Oxford University Press.

WORLD B. (2004). *Beyond Economic Growth – An Introduction to Sustainable Development*, 2nd edition. Washington, D. C.,

WORLD HEALTH ORGANIZATION (2006), The World health report 2006: working together for health, Geneva, Switzerland.

ZELDES, S. (1989). "Consumption and liquidity constraints: An empirical investigation", *Journal of Political Economy*, 97(2):305-346.