Farm Household Production Theories: A Review of "Institutional" and "Behavioral" Responses

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Abstract. This paper reviews major lines of theoretical and empirical research on farm household production choices in developing countries. It provides a wide-ranging literature review of different microeconomic approaches to peasant economy, shedding light on the underlying reasons that lead modern development economists away from the neoclassical framework to study "real people in real environments." The paper focuses on recent insights into the way peasant households manage the trade-off between income risk and expected returns when making production decisions in the context of weak or missing institutions. Several contributions point out that farm household behavioral responses to market imperfections in low-income settings may generate situations of efficiency losses and "poverty traps." Yet, the extent to which such vicious circles are generated by the farm household decision-making process itself is currently a major object of study of development economics.

I. INTRODUCTION

Modern development economics contributions have highlighted the "knowledge gap" between observed farm household production choices and efficient behavior as predicted by standard neoclassical theories. Within this latter framework, the effect of market failures, institutional arrangements, and the *ex ante* abilities of households to manage risk have provided some of the explanations. In addition, more recent theoretical underpinnings of "behavioral economics"[1] have produced a new research agenda based on what remains out of the neoclassical framework.

[1]"Behavioral economics" in this context means the combination of psychology and economics applied to investigations of what happens in markets, wherein some of the agents display psychological human limitations and complications. Throughout this paper, the term "behavioral" is used to indicate the way of life and decision making of farm households within a neoclassical framework.

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Asian Development Review, vol. 24, no. 1, pp. 49–68

This paper presents a review of these theoretical and empirical contributions based on different analytical frameworks, while cumulatively shedding light into peasant household behavior in low-income settings with weak institutions and incomplete markets. In particular it reviews neoclassical explanations of household responses to the risk–return trade-off typically faced in farm production, and highlights the underlying reasons that lead modern development economists away from the traditional approach to study "real people in real environments."[2]

Peasant farm households account for no less than a quarter of the world's population. Most are in developing countries where they can represent up to 70 percent of the national population (Bardhan and Udry 1999). Agricultural production is significantly dependent on the performance of farmers and, at the same time, poverty is disproportionately concentrated among them. Therefore, understanding the determinants of their modes of production is a primary concern in any poverty alleviation strategy. This is particularly relevant for Asia, which is home to more than half of the world's 1.1 billion poor who live in rural areas and depend on agriculture.

Peasants are farm households, with access to a piece of land and utilizing mainly household labor in farm production. They are located in a larger dominant economic and political system that could affect their production behavior, but fundamentally they are characterized by partial engagement in markets, which are often imperfect or incomplete (Ellis 1992, 9–10).[3] Hunt (1991) identifies peasant farms as both production and consumption units: a proportion of produce is sold to meet their cash requirements and financial obligations, and a part is consumed by them. These units involve a variety of market and nonmarkets tasks such as agriculture; pastoralism; fishing; crafts; and gathering (fruits, nuts, fuelwood, water. etc.). Peasant farms typically have to work with developing markets that function sporadically and somewhat disconnectedly across locations and time. Asian agriculture, in particular, displays a large array of property, tenure, and contractual institutions regulating labor and land, but most of it is still smallholder farming, with the notable exception of tree crops or extensive sugar plantations (e.g., in Indonesia).

Farm households in developing countries have been the object of study of different areas of the social sciences, which has resulted in a wide array of contributions offering insights into the anthropological, sociological, and economic peculiarities of the modes of peasant production in the wider social system. Hence, peasant societies are described as communities (rather than single individuals) that retain specific cultural identities, and represent the "transition"

[2]"Real people and institutions" are those that internalize spillovers or manage moral hazard or information problems (Roumsset 2004).

[3]This is to delineate the difference between peasant and commercial farms. Hereafter, the terms peasant, farm household, and small farm are used interchangeably and are all distinct from large commercial farms.

from a primitive to a modern society. They are subordinate to other social groups, standing midway between subsistence and market participation (see Ellis 1992).

In addition, a considerable proportion of the economics literature has been devoted to the study of the production decisions of peasant farmers in developing countries. The classic models that incorporate the consumption goals of households into microeconomic models of peasant households' decision making are the so-called agricultural household models, which have become popular for explaining the behavior of farm households (as consumption and production units) in both perfect and incomplete market contexts (Taylor and Adelman 2003).[4]

The recognition that farm household behavior is typically influenced by several natural, market, and social uncertainties in developing countries has raised some complexities in terms of understanding their production decisions. Seeking to insure household members against hunger and destitution is of great importance to any rural family in a less developed setting (Dasgupta 1993). Within the standard expected utility approach, the introduction of risk in peasant production choices has entailed including household preferences toward risk (e.g., risk aversion). However, the risk behavior of agents is determined not only by preferences but also by the availability of institutions that facilitate risk bearing (Roumasset 1976). In other words, household preferences and market imperfections (e.g., in capital markets) are not independent (Eswaran and Kotwal 1989). Furthermore, where institutional arrangements provide imperfect insurance, households will self-protect by exercising caution in their production decisions (Morduch 1995). All these factors shape farm households' production choices and explain why vulnerable peasants are often observed to sacrifice expected profits for greater self-protection. This is because risk management is costly, and will differ across households at different points in the wealth distribution, with subsequent implications in terms of efficiency losses and poverty traps (Eswaran and Kotwal 1986, Morduch 1994). Yet, none of these studies refers to the psychological or decision costs of peasant production choices, even as some more recent work in the area of behavioral economics has considered these aspects (Duflo 2003).

The paper is organized as follows. Section II covers the main economic theoretical foundations of peasant household behavior, i.e., the profit-maximizing, utility-maximizing, and risk-averse peasant frameworks. Section III reviews some theoretical and empirical contributions that shed light on farm households' *ex ante* risk management strategies with respect to production choices in the context of imperfect capital markets. Section IV briefly reviews some empirical literature related to how asset-poor conditions—inherent in the economic conditions of farm households living and operating in developing

[4]In most developing countries there are market imperfections due to high transactions costs and imperfect information. These market imperfections are particularly common in relation to land resources, labor, credit, risk/insurance, and some basic commodities (de Janvry et al. 1991).

countries—influence farm household production choices. This presents another way to decompose the complex analysis of peasant production choices. Section V concludes.

II. STANDARD THEORIES OF FARM HOUSEHOLD PRODUCTION CHOICES

Three alternative economic theories of peasant household behavior are presented below. Each approach assumes that peasant households have an objective function to maximize, with a set of constraints. Moreover, these theories are based on a set of assumptions about the workings of the wider economy within which peasant production takes place. Not all these assumptions are shared by all theories, but all adopt the same theoretical method to explain farm household behavior.

First, consider the model of the "profit-maximizing" peasant, which has been criticized on the ground that it overlooks the aspect of consumption in peasant household decision processes. Subsequently, neoclassical agricultural household models, which incorporate both the production and consumption goals of farm households, have become popular. Mostly as a reaction to these models, other economists have crafted the risk aversion theory, which states that the objective function of peasant households is to secure the survival of the household by avoiding risk.

A. Profit-maximizing Peasant Theories

Schultz's (1964) hypothesis that farm households in developing countries are "poor but efficient" gave rise to a long debate among economists and a new wave of empirical work designed to test it.[5]

Referring explicitly to allocative efficiency, and implicitly to technical efficiency, Schultz describes the peasant production mode as profit-maximization behavior, where efficiency is defined in a context of perfect competition (i.e., where producers all apply the same prices, workers are paid according to the value of their marginal product, inefficient firms go out of business, and entrepreneurs display nondiminishing marginal utility of money income).

Several studies have adopted the allocative efficiency criterion to test whether peasants were or were not efficient (i.e., whether they were profit-maximizers or not) with some contradictory results (see Bliss and Stern 1982 on the economy of Indian villages). Conflicting evidence apart, the main caveat in this approach is that profit maximization has both a behavioral content (motivation of the household) and a technical-economic content (economic performance of the farm as a business enterprise). Most work in the area of efficiency infers the nature of the former by investigating on the latter. It is

[5]Prior to Schultz's work, development economics had been dominated by the notion that peasant farmers were poor because they were backward and inefficient.

therefore concerned less with the *way a farm household reaches* its decisions than with the *outcome* of those decisions for the efficiency of the farm as a firm.[6]

Economic work on farm household behavior, though, has evolved along the line of other important criticisms of the profit maximization theory, such as the existence of trade-offs between profit maximization and other household goals, and the role of uncertainty and risk in farm household production decisions. The next section presents these alternative specifications of farm household behavior.

B. Utility Maximization Theories

A number of *utility* maximization theories have been applied to peasant production behavior. The main difference between them and the theories described above is that utility maximization approaches encompass the dual character of peasant households as both families and enterprises and thereby take account of the consumption side of peasant decision making.

The seminal work of Chayanov in the 1920s emphasized the influence of family size and structure on peasant economic behavior, through the subjective evaluation of labor within the household, in the absence of the labor market (Chayanov 1966).[7]

In expanding the scope of the Chayanovian model and assuming perfect markets, the *neoclassical farm household model* became popular in the 1960s to explain the behavior of farm households in simultaneous decision making about consumption and production. This model typically incorporates the notion of full household income (Becker 1965) and conceives of the household as a production unit that converts purchased goods and services as well as its own resources into use values or utilities when consumed.[8] Thus, the household maximizes utility through the consumption of all available commodities (i.e., home-produced goods, market-purchased goods, and leisure), subject to full income constraints. The model shows that if all markets exist and all goods are tradeables, prices are exogenous and production decisions are taken independently of consumption

[6]From the perspective of policy implications, interventions that seek to increase the output of the peasant sector by raising farm output prices or by lowering the cost of variables inputs are predicted from profit maximization as a behavioral trait of peasant farm households.

[7]Essentially, the assumption of absence of a labor market in this model makes the value of labor time—and hence the optimum level of labor use—a subjective matter that varies across households according to their demographic structure. Chayanov's model also assumes an unlimited supply of land. These are the main shortcomings of the model, which the new farm household models will exclude.

[8]The degree of subsistence consumption of own output and family labor usage as a proportion of total labor employed could be used as a criterion to identify any farm. The extreme case where all output is consumed by the household, and all labor is family labor, is called pure subsistence production; at the other extreme is the pure commercial farm where all output is sold and all labor is employed labor. The remainder falls somewhere between these two extremes.

decision.[9] In such conditions the decision making process could be regarded as recursive (or separable), because time spent on leisure and time used in production becomes independent; utilization of family labor will be directly linked to the market-determined wage rate, and income is singled out as the only link between production and consumption[10] (see Singh et al. 1986).

In the absence of a labor market, as in the Chayanovian model, or any other missing market, the decision may not be recursive because the family will be left to decide about the percentage of its total available time to be devoted to production (the difference being assumed to be used for leisure). Therefore, there is no separability between consumption and production. The decision process becomes circular as consumption affects income and income affects consumption.

Hence, the validity of recursive modelling of household resource allocation depends on the household being a price taker and the absence of missing or imperfect markets (for output or input, including labor and capital).

In reality, households operating in developing countries are likely to face more than one market imperfection, which prevents first-best transactions and investments from taking place. Empirical analyses of recursivity in farm household decision making have generally produced negative results (Bardhan and Udry 1999).

Hence, theoretical advances on farm household models with missing markets (see de Janvry et al. 1991) have opened up a new research agenda for neoclassical economists: the household's objective is still to maximize (a discounted future stream of expected) utility from a list of consumption goods (including home-produced goods, purchased goods, and leisure), but subject to what may be a large set of constraints, in which a missing market is yet another constraint on the household. At the same time, the task of empirical economics has shifted to providing evidence of market inefficiencies and their impact on (second-best) household production choices.

However, these theories have some serious shortcomings in explaining peasant economies. Similar to profit-maximizing theory, they ignore the effect on farm household behavior of the uncertainty and risk involved in peasant production, and the social context in which peasant production takes place. Most of these models are static and assume that prospects are certain or, equivalently, that households are *risk-neutral.* When it comes to empirically testing farm household models, the research focus, analytical tractability, and available data

[9]The solution for this model is the first-best choice situation, in which the marginal rate of substitution between each pair of goods in consumption is equal to the marginal rate of transformation in production, or MRS = MRT.

[10]In contrast to consumer theory in which the household budget is generally assumed to be fixed, in the farm household model, the budget constraint is endogenous and depends on production decisions that contribute to income through farm profits. Thus, to the standard Slutsky effects in the consumer model, the agricultural household models add an additional, "farm profit" effect, which may be positive (e.g., if the price of the home-produced staple increases) or negative (such as when the market wage increases, squeezing profits). See Taylor and Adelman (2003) for a review.

result in significant simplifications of both the objective function and the constraints (Taylor and Adelman 2003). Criticisms of this theoretical framework are particularly severe when uncertainty and risk aversion[11] are acknowledged to play a central role in farm household production decisions.

C. The Risk-averse Peasant

According to Ellis (1992), peasants produce under very high levels of uncertainty induced by natural hazards (weather, pests, diseases, natural disasters); market fluctuations; and social uncertainty (insecurity associated with control over resources, such as land tenure and state interventions, and war). These conditions pose risks to peasant production and make farmers very cautious in their decision making (see Walker and Jodha 1986). It is not surprising, therefore, that farmers (in common with most other decision makers) are generally assumed to exhibit *risk aversion* in their decision making. Lipton's (1968) criticism of the profit approach sought to show how the existence of uncertainty and risk eroded the theoretical basis of the profit-maximizing model. He argued that small farmers are, of necessity, risk-averse, because they have to secure their household needs from their current production or face starvation. There is no room for aiming at higher income levels by taking risky decisions (Lipton and Longhurst 1989).

There are two ways of conceptualizing farm households' risk-aversion: the standard expected utility theory and the disaster avoidance approach. According to the former approach, farm households make choices from available risky alternatives, based on what appeals most to their given preferences in relation to outcomes and their beliefs about the probability of their occurrence.[12] This normative approach is based on a set of assumptions (which are sufficient for the validity of the Von Neumann-Morgenstern expected utility model; see Mas-Colell et al. 1995),[13] and on an implicit hypothesis that farm decision makers are in fact utility maximizers. Both household behavior and its revealed attitude toward risk (e.g., risk aversion) are reflected in its utility function. Other things being equal, a risk-averse household prefers a smooth consumption stream to a fluctuating one, which—in contexts of incomplete capital markets or underdeveloped institutional arrangements—entails a low risk portfolio choice of productive activities (see Morduch 1994).

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[11]Although in the very early literature they were studied as different concepts, uncertainty and risk are used as substitutes here.

[12]In general, the theory of decision making under uncertainty deals with choices among probability distributions with different outcomes. In appraising risky choices, the neoclassical expected utility framework is based on the decision maker's personal preference among outcomes, and his or her subjective probabilities of their occurrence. The utility function for outcomes is typically concave, reflecting risk aversion; in essence, expected utility introduces a person's subjective appetite for risk in order to explain behavior.

On the other hand, the complexity of risks faced by peasant farmers has led some analysts to develop allocative choice models that do not depend on the ability to calculate expected returns for large numbers of alternative prospects or knowledge about complex probability distribution of outcomes.[14] Roumasset (1976)'s early criticism of expected utility theory builds on the application of the latter to decision making by subsistence farmers in Southeast Asia. He asserts that main limitations of this theory are related to the measurement of risk aversion (which cannot be defined independently of the utility function) and the absence of decision costs. Moreover, expected utility maximization can be described as a "full optimality model" since it prescribes the best choice of an individual, given the relevant constraints. However, it fails to specify the decision process that makes the outcomes possible, and thus ignores any important role of decision costs in analyzing decision-making behavior under uncertainty. As Roumasset emphasizes, "where costs of obtaining and processing information are substantial it is not necessarily rational for an individual to act consistently with his underlying preferences. A complete preordering only guarantees that an individual can make binary comparisons. But going from the binary comparisons to the most preferred alternatives is not a trivial step" (Roumasset 1976, 24). In cases of finite information processing devices, it is difficult to generate choices consistent with a preordering.

Therefore, the full optimality approach appears to be a weak basis for describing the decision process of small-farm operators in developing countries.[15] On the other hand, to many analysts it seemed reasonable to assume that individuals act according to behavioral rules: they choose among a limited number of objectives from their realm of experience by a finite process of thought that may appropriately be described by "rules of thumb" (see Dasgupta 1993).

Critics of the full optimality approach in peasant production modelling formulated the idea of household production behavior at low levels of income in uncertain environments. They assume that, when choosing among risky income streams, households first opt for safety and from the safe alternatives they choose based on expected utility (and possibly expected income).[16] These models based on a feasible decision process (or a rule of thumb) are known as *safety first* models of choice under uncertainty: here, the decision maker is assumed to

[14]Indeed, many theoretical and empirical works, not only on peasant behavior, have challenged the expected utility theory. There is a wide literature on systematic violations of the von Neumann-Morgenstern theory, especially in the more recent experimental and behavioral investigations (see Kahneman et al. 1982). Yet, there is tension between experimental conditions and real life choices involving matters such as planting crops, taking out insurance, etc.

[15]Actually, the debate would be over the normative or descriptive scope of farm household production theories. Yet in implicitly assuming that farm decision makers are in fact utility maximizers, the expected utility theory turns to be both descriptive as well as prescriptive (Roumasset 1976).

[16]This argument reverses the expected utility theory, in that the continuity assumption guarantees that no one gamble is infinitely preferred to another.

ensure survival for him or herself and therefore wants to avoid the risk of his or her income or return falling below a certain minimum (subsistence) level. Thus, risk is defined as the probability that the stochastic variable in question (income) will take on a value less than some critical or disaster level. This safety-first criterion can lead to the household favoring either risky income streams or low-risk alternatives.[17] This is to say that there are no reasons to expect that individuals behave in conformity with the expected utility theory at very low levels of income, which is in stressful circumstances. The disaster avoidance perspective is helpful for describing individual choice under such conditions (Dasgupta 1993).

Thus, the attraction of the safety-first approach is that it is a *positive* method to capture some specific behaviors that can be culled from the expected utility theory (as the *normative* model of choice under uncertainty) near threshold income levels. The *safety-first* model does not take actual decision rules as given, as in a "pure behavioral (and experimental) approach", but results from the attempt to incorporate into a model the strong points from both the behavioral and full optimality approaches, which seems an appropriate descriptive device for a risky choice in low-income farmers. In practice, although these two perspectives do not necessarily imply different course of actions, they may, depending on the options and initial conditions. From a wider perspective, though, while utility maximization theory cannot highlight such problems as extreme poverty, insecurity, and deprivation that characterize peasant life in most parts of the world, the safety first theory explicitly captures these aspects of peasant behavior in rural economies.

III. FARM HOUSEHOLD CHOICES UNDER UNCERTAINTY: "INSTITUTIONAL" AND "BEHAVIORAL" EXPLANATIONS

The theoretical literature on uncertainty and its serious impact on the economic behavior of the peasant household provide much scope for empirical research into the issue of risk.

An early strand of the literature focuses on the preferences of farm households toward risk. Majority of these studies, on the basis of both

[17]There are a few variants of the safety first model according to which the household objective is to minimize the probability of disaster or maximize return given a constraint on the probability of disaster (see Ellis 1992). The disaster avoidance motive may be defined using an expected utility model where there is a jump or vertical section in the utility function (and even convexity around the threshold income level; see Dasgupta 1993). The jump represents a large disutility associated with the loss of another unit of money (Masson 1974). This type of utility function, in contrast with expected utility theory, has some interesting investment decision implications.

For example, *if the disaster is considered to be serious enough,* an individual may invest proportionately more of his portfolio in a project, as the variance on the project's return increases. Similarly, the safety-first principle may be incorporated into a lexicographic context, where however, the ordering cannot be represented by a real-valued utility function, discrete or continuous (see Mas-Colell et al. 1995).

experimental and observed data on farmer behavior, conclude that peasants are risk-averse, (e.g., Moscardi and de Janvry 1977, Binswanger and Sillers 1983).[18]

However, this empirical literature wrongly attributes to risk aversion all the departures from economic efficiency and confounds risk behavior with other underlying factors. Roumasset (1976) finds that in several areas in the Philippines, risk-neutral rice growers behave as they were risk-averse while facing different land quality, imperfect or costly product markets, and different temporal input demand. Furthermore, in an early application of experimental economics in India, Binswanger (1980) found that the differences in risk aversion were too small to explain the full differential investment behavior among farm households with access to similar technologies and facing similar risks. He postulated that such differences could only be explained by the differences in farm households' constraints, such as access to credit, marketing, extension programs, institutional arrangements etc.

In work that had a major influence on subsequent research, Eswaran and Kotwal (1989 and 1990), using the expected utility framework, formalized the argument that risk preferences are influenced by the resource constraints and capital market imperfections faced by decision makers. Thus, differences in risk behaviors may not arise from differences in preferences, but may be due to differences in access to institutional arrangements that enable households to pool risks across time.[19] Credit-bound, poorly resourced households may act as if risk-averse. This is particularly noticeable in developing countries where market imperfections are prominent and consumption and production decisions are nonseparable.

The thinness of markets may mean that terms of trade are implicit (e.g., gift exchange) or that contracts have to be personalized. It does not mean, though, that households are not sensitive to income risk or uncertain conditions of production. On the contrary, seeking to *insure* all household members against hunger and destitution is of paramount importance to any rural family living in a less developed setting (Dasgupta 1993).

Another aspect neglected by the standard empirical perspective on the risk-averse peasant is the potential role of uninsured risks in shaping farm household behavior with respect to production and consumption choices. Estimates of risk preferences based on the assumption that farmers have to absorb all income risk may be misleading. They should be made taking into account market imperfections on one hand, and nonmarket insurance mechanisms (or the abilities of households to pool risks across times and contingencies) on the other (Morduch 1994 and 1995).[20]

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[18]See also Binswanger (1981) and Roumasset (1976) for empirical evidence on risk-taking behavior of farm households.

[19]Access to credit provides households with the facility to absorb random shocks in income.

[20]To better explain this point, according to expected utility theory, a risk-averse household will choose a smoothed consumption pattern. Thus, observed consumption variability could be misinterpreted as a risk-loving attitude of the household, which may

Hence, an important body of literature has switched the focus on behavioral responses to risk in rural households, that is, *ex ante* mechanisms of risk management in contexts where perfect markets for risk and credit allocation do not exist (or, in other words, when households' consumption and production decisions are nonseparable)[21] (see Dercon 2002 for a review).

Living and operating in risky environments where capital markets are rationed (i.e., for consumption-smoothing purposes, households are credit-constrained) affects how farm households decide about resource allocation and, in Morduch's words, about "both the composition and nature of income generating activities" (Morduch 1995, 7). This is especially so with respect to choices made by the most vulnerable and poorest households, an aspect that will be discussed later in this paper.

Hence, (partially) uninsured risks shape farm households' decision making processes, creating an incentive for resources to be devoted to securing a more stable income stream, along the lines of Roumasset's early theoretical arguments. *Ex ante* risk management strategies involve trying to shape the risks peasants face by exercising caution in making production decisions, i.e., adopting activity portfolios that are more favorable in terms of risks but (often) less so in terms of profits (Morduch 1994; see also Dasgupta 1993, chapter 9). For example, cultivating drought-resistant crops, adopting intercropping methods, pursuing off-farm activities, migration, etc., are examples of low-risk activities or diversification into portfolios of activities with differing risk profiles. Also the use of contracts (such as sharecropping) may contribute to decreasing income variance (and incentives for producing profit-maximizing levels of output). Banerjee et al. (2002), for example, study the effect of Operation Barga, a major change in property rights and agricultural tenancy law, on agricultural productivity in the Indian state of West Bengal. They show that such a program—which is a limited intervention that empowers tenants through the regulation of rents and tenure security of tenants without giving sharecroppers the full

actually be credit-constrained. Furthermore, observed consumption smoothing could be interpreted as the result of the household's risk aversion, overlooking *ex ante* household mechanisms designed to insure against risk that would inherently lead to low consumption variability in a context of capital market imperfections.

[21]This is to say that *ex post* mechanisms of risk coping (including formal insurance and credit markets) are missing or incomplete. There is a wide literature on informal risk-coping strategies, i.e., activities to cope with the consequences of income risk in the absence of insurance markets. Two types are commonly observed: self-insurance using savings (including cattle) to be sold off when the need arises, and informal mutual support mechanisms, where members of the group or community subsidize each other in times of need, typically on a reciprocal basis (Dercon 2002). This paper does not include this body of literature, as it is focused on household production choices in risky environments. Therefore only household strategies attempting to reduce the riskiness of the income process *ex ante* (e.g., income smoothing; see Morduch 1995) are reviewed. Consumption and income smoothing are difficult to disentangle, though. The degree of the latter depends on the amount of risk, the degree of risk aversion, and the extent to which other consumption smoothing mechanisms are available. But measuring the ability to smooth consumption *ex post* depends on knowing about the degree of *ex ante* income smoothing (Morduch 1995).

landownership—can have a positive effect on productivity, without a cost in terms of equity. This is so because different tenures make credit, tools, management, and land available to farm laborers in different proportions—as also pointed out by Roumasset (1976 and 2004). These, as are other strategies of empowerment (politically), easy to implement while being a valid way out of the persistent trade-off between risk and efficiency.

There is a wide array of empirical studies providing evidence of the conflict between risk and productive choices, which may result in efficiency losses when safety is paramount. Rosenzweig and Binswanger (1993) estimate the impact of riskiness (based on measures of rainfall variability) on the agricultural investment portfolios of farmers. They show that uninsured weather risk is a significant cause of lower efficiency, and that farmers in riskier environments select portfolios of assets that are less risky (i.e., less sensitive to rainfall variation), but also less profitable. Similarly, Morduch (1993) found evidence that Indian farm households close to subsistence (i.e., those whose consumption is more vulnerable to income shocks) are less likely to use risky high-yielding seed varieties than low-risk traditional varieties.

These results consistently suggest that vulnerable peasants (and especially the well-off ones who have more to lose) will tend to prefer a safe or conservative strategy with a low return, over a risky strategy with potential higher returns (Duflo 2003). In the case of adoption of a new technology, for example, given the costs involved in information, it can be wisest for households to postpone their investments until they know more about the expected (risky) conditions. This might explain the low take-up of pineapple cultivation in Ghana, despite the high rates of return (Goldstein and Udry 1990).[22]

Many studies (including those mentioned above) take into account multiple aspects involved in farm households' choice that are related to security, particularly engagement in multiple activities and/or plot diversification. These activities include income diversification from the despatch of a household member to work in a different (uncorrelated) market.

Spatially diversified families represent an institution arising from or influenced by the risky nature of rural production and the difficulties of self-insurance in low-income, rural settings (Rosenzweig 1988, Townsend 1994). This argument is at the basis of migration for insurance motives, whereby greater income uncertainty may encourage out-migration as a risk diversification strategy (see Stark and Levhari 1982, Katz and Stark 1986, Daveri and Faini 1996). For example, Rosenzweig and Stark (1989) find that households in rural India facing less volatility in farm profits are those that seek income sources that are not covariate with their home base (and find it in other households where sons have married into).

The idea that farm households aim at reducing income risk and therefore may forego profit-maximizing activities (which may include a range of activities

[22]Furthermore, once it is known that weather conditions, for example, will be risky, households may choose to limit production to cut potential losses.

with lower expected profits rather than a profit-maximizing single business) has inspired a new wave of behavioral and experimental works on farm household decision processes. Indeed, the "simplicity"[23] of low-income economies has fostered a range of experimental studies on the functioning of rural institutions and the economic behavior of farm households living and operating in something close to a controlled environment.[24]

On the basis of an experimental study on maize fertilizer adoption in Kenya, Duflo and Kremer (2004) argue that neoclassical economic theories are not sufficient to explain farm household behavior. Preliminary results showed that simple, effective technology does not diffuse, and that social learning is slow, even when the switch to the new technology is subsidized. Access to credit does not seem to be an impediment. Only commitment devices at a specific point in time[25] seem to contribute to increase the adoption rate. This is to say that only when households perceive the program as an obligation, not entitlement, does adoption rate increase. As Duflo (2003) states, when choices involve the subsistence of one's family, trade-offs are distorted in peculiar ways (particular to individuals) and also, to some extent, pressure from extended family or neighbors may have an influence. According to behavioral economists, rural communities may not always seek out the best options because they are constrained by psychological and/or social norms.[26] Thus, the idea of individual decision making based on bounded rationality, and not pure self-interest and psychological decision costs, is a better explanation of farm household behavior in low-income economies. Nevertheless, as Morduch (1995) says, the simplicity of low-developed communities may obscure a deeper complexity, as—given institutional imperfections and behavioral nonmarket rational household mechanisms—the nonseparability of choices in different spheres is the rule, rather than the exception, rendering very few household choice exogenous (even perhaps under experimental conditions).

[23]The simplicity of rural economies is revealed through missing markets, limited spatial integration, and straightforward income-generating activities (and a subsequent readily specifiable production process). However, this simplicity is paradoxically an important dimension of the complexity (Morduch 1995).

[24]Indeed, Duflo (2003, 9) states that "there may be more to learn about human behavior from the choices made by Kenyan farmers confronted with a real choice than from those made by American undergraduate in laboratory conditions." Experimental studies in developing countries can be found, among others, in Hoff and Pandey (2004), who test the effects of Indian caste system on performance; and Miguel and Kremer (2004) who look at social learning effect on deworming in Kenya.

[25]Only programs that help farmers to commit at the point when they have money to use fertilizer in the future, as in after harvesting, are those that have an impact on future fertilizer adoption.

[26]Mutual insurance arrangements across households in traditional village communities in developing countries are often codified through social norms of behavior (see Dasgupta 1993).

IV. ENTRY CONSTRAINTS TO EFFICIENT BEHAVIOR

The final element highlighted in this review is intimately tied to what characterizes farm households and their members in developing countries, which is that they are typically poor.[27] Having poor initial asset endowments of course entails an equity issue, but also may mean that the poor may not be able to use their own assets as efficiently as the rich. In other words, not only living under uncertainty (as discussed above), but also being poor contributes to deviations in the behavior of farm households from the full-optimal-efficient framework. These two conditions invariably coexist in developing countries; therefore both risk and poverty perspectives are needed to analyze farm household production decisions. Again, there are several examples of institutional and behavioral explanations.

The nature of agricultural production typically implies a need for working capital to acquire necessary inputs. In a classic paper, Eswaran and Kotwal (1986) developed a model to show that, in the context of an imperfect credit market (where land may act as collateral) the land-rich farmer can easily acquire fertilizer and, if necessary, additional land and extra labor to make sure inputs are used as efficiently as possible. On the other hand, the land-poor farm household will necessarily be using its assets—land and labor—less efficiently.[28] In a later study on credit as insurance, Eswaran and Kotwal (1989) show that asset-poor households cannot enter into high-risk activities because they do not own enough (and they do not have access to credit) to cope with downside risks. To reduce their income risk, poor households may enter into low-risk, low-return activities. The consequence is further impoverishment and presumably increased inequality.[29]

These results are not based on differences in risk preference: controlling for preference, the poor select a low-risk, low-return portfolio, whereas the rich take on a riskier set of activities. Thus they are a reflection of the options available to poor households.[30]

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[27]The present paper reviews works that conceive of farm households as being poor (noncommercial farms). In this section, some arguments are offered on the link between poverty (in rural households) and efficiency.

[28]The poor farmer will be using less than optimal amounts of fertilizer, and will be farming too intensively in terms of labor, with more labor per unit of land than efficiency would require.

[29]The rich do not just earn more income because they have more assets, but also because they can use them more efficiently. Market failures exacerbate initial inequalities. Along the same lines, but in a dynamic framework, Banerjee and Newman (1993) demonstrate the adverse impacts of asset inequality on entry into profitable activities (and thus on growth) as linked to credit market failures. This intuition is at the basis of a number of growth models, leading to poverty traps for some and accumulation for others (e.g., Galor and Zeira 1993, Aghion and Bolton 1997).

[30]This reflects the idea of "poverty as desperation", where resource constraints leave little role for preferences; see Banerjee (2001).

Looking at behavioral responses to risk, poverty also influences the *ex ante* ability to reduce uncertainty at the household level. As mentioned above, the optimal consumption-smoothing mechanism requires borrowing opportunities. However, in the absence of credit markets, a household can use its own resources (wealth) to smooth consumption over time, a mechanism that clearly prevents poorly resourced households from being able to absorb risk (Morduch 1994).[31]

In general, income-risk management strategies are not without costs (both financial and decisional): as mentioned above, they result in a reduction in mean income to balance the lower risk and variability in income. This affects the household's long-term income and ability to escape poverty.

Furthermore, if widespread diversification of farm household income sources is a means of managing risk in developing countries, there are important constraints to entering into profitable and risk-reducing diversification. Nonagricultural activities or profitable alternative agricultural activities are not easily accessed. Entry constraints could take the form of working capital, skills, and other requirements.[32] Dercon (1998) shows the importance of entry barriers to relatively lucrative activities in rural Tanzania and Ethiopia as being more important than comparative advantages in determining entry to high-return activities.

Risk management strategies imply substantial efficiency losses for the poor, which the rich—typically better protected via assets and institutional arrangements—do not have to endure (Dercon 2002). There is growing evidence that entry constraints limit the usefulness of income diversification, thereby having a different potential effect on household wealth distribution. Rosenzweig and Binswanger (1993), for example, showed that poor farmers are more affected by income risk than wealthier ones; and that as the environment becomes riskier, more vulnerable households shift production into more conservative, but less profitable modes.[33] Poor farmers have been found to hold livestock as a precaution against risk even when more productive investment opportunities exist (see Rosenzweig and Wolpin 1993 on investment in bullocks in India). Thus,

[31]Household wealth is typically land and livestock (children too), although land is the most valued possession. Because of this, while livestock may be easily sold to smooth consumption, the household will be willing to sell land only if the prospects from doing so are very promising (see Dasgupta 1993, chapter 9). Moreover, when profitable activities are risky, farmers may not be willing to commit their assets since they cannot afford to suffer failure. This is one reason why the land market is typically thin in developing countries.

[32]In Mendola (2007), heterogeneity of constraints in Bangladesh dealing with migration household decisions is examined. Poor farm households typically enter into migration with low entry costs and low returns (i.e., domestic migration). Entry into high-return migration (i.e., international migration) in which most households would probably like to engage in an "income-maximizing perspective", is restricted to richer and large-holder households, presumably those with more access to capital.

[33]They found that the loss in efficiency between the richest and poorest quintiles in their sample from India was more than 25 percent, attributable to portfolio adjustments in assets and activities due to risk exposure. Over time, these are very substantial efficiency losses, disproportionately affecting the poor.

wealth effects on exposure to uninsured risk influence investment decisions among farm households.

This process may produce *poverty traps*, in which poor farmers, in order to avoid further destitution (i.e., to assure themselves less variability in consumption and nutritional levels), are forced to forego more profitable, but risky opportunities, and thereby the opportunity to move out of poverty.[34]

Given assets inequality, the poorest farmers are likely to adopt technology or activity portfolios with lower returns and may find it impossible to accumulate any wealth, while the better-off farmers earn higher returns and are able to get rich. There is some empirical evidence on these dynamics being significant causes of poverty persistence and establishment of possibly permanent poverty traps in developing countries. Jalan and Ravallion (2003), for example, investigate portfolio, behavioral responses to risk, and poverty traps using household panel data for rural areas in the People's Republic of China (PRC). They find that middle-income groups invest in unproductive wealth as a response to idiosyncratic risk income; high-income households do not need to do so; while the poor cannot afford to do so. Thus, they estimate that eliminating income risk would promote productive portfolio behavior by a higher magnitude for middle-income groups with respect to the better-off or the poor. Yet, while they find no evidence that uninsured risks discourage schooling, they find that risk inhibits the out-migration of labor. This has serious implications in terms of persistence of poverty and inequality, with labor mobility and economic migration constituting crucial self-insurance and wealth-generating household strategies (see, for example, Rozelle et al. 1999 and Taylor et al. 2003 on rural PRC; Mendola 2007 on rural Bangladesh).

Overall, a large body of evidence points to the significant consequences of uninsured risks in developing countries, and particularly in relation to poor farmers and their productive capacity. The root causes of inefficient farm household behavior are again a market failure or a behavioral response to risk, which is exacerbated by inequality and poverty.

V. CONCLUSIONS

This paper has provided a synthesis of main theoretical frameworks, and some important empirical contributions, for analyzing how farm households behave with respect to risky and costly production choices. The review shed light on several reasons underlying "contradictory" empirical results or common policy failures with respect to (agricultural) development and poverty reduction. This is particularly relevant in order not only to identify which behaviors and institutions

[34]This reflects the idea of "poverty as vulnerability", where being vulnerable (or being risk-averse) impedes the ability of the agent to move out of the poverty trap equilibrium; see Banerjee 2001). A poverty trap is an equilibrium outcome and a situation from which one cannot emerge without outside help, such as redistribution or aid, or via a fundamental change in the functioning of markets.

are (exogenously) inefficient, but most importantly, to explain the diversity of different (formal and informal) institutions in the Asian region.

Assuming perfect markets, profit maximization and utility-maximizing peasant theories take efficiency—i.e., profit or full income maximization under one constraint in a competitive economy—as a central issue in peasant production analysis. It has been argued that the high risk and uncertainty faced by subsistence producers erode the prescriptive relevance of these theories. Thus, standard theory includes peasant risk aversion in its full-optimal utility maximization framework, thereby spotting the preferences of farm households toward risk as a key element in explaining uncertain production choices. However, the analysis of risk preferences based on the assumption that farmers have to absorb all income risk, without taking into account market imperfections and nonmarket insurance mechanisms, may be misleading (Morduch 1995). Differently said, the risk-averse behavior of farm households may be the result of other mechanisms related to the institutional context—such as insufficient channels to self-insure or share risk with the rest of the world (e.g., Townsend 1994, Morduch 1993, Roumasset 2004).

A wide array of theoretical and empirical contributions on farm household production choices under uncertainty have shown that market imperfections, such as rationed capital markets, may contribute to shaping risk preferences and behavioral responses to risk, entailing heterogeneous effects across household wealth distribution. When borrowing constraints are binding and production risks uninsured (whereby credit access may act as an insurance mechanism), households may self-protect by exercising caution in making production decisions. Thus, living and operating in risky environments make farm households adopt income-risk-reducing behavior, i.e., they choose (*ex ante*) safe or conservative strategies.

There is a large body of evidence on the various household strategies aimed at reducing income risk. It has been shown that farm households with poor asset endowment and limited formal protection will underinvest more than better-off farmers. This is to say that risk, along with asset-poor initial conditions, may contribute to making small farm households inefficient and persistently poor.

The paper has offered a few insights into the way farm household production behavior is shaped by market failures and risk,[35] but there is more to be learned about the peasant economy. Current research efforts are being directed toward behavioral economics (i.e., including individual psychological traits) through experimental analysis. Many program evaluation experiments and field experiments are currently under way in developing countries in a bid to acquire a deeper understanding of the determinants of decision making in poor and developing settings. However, it remains questionable whether investigations into farm household behavior under uncertainty should directly involve farmers into

[35]There are of course other reasons why farmers are prevented from making the best use of their resources, which are related for example to coordination failures, learning processes, and political economy.

an experimental setting, or should be based on the analysis of the institutional and social environment the farmer is embedded in, his wealth position, his investment possibilities, and so forth. This is important in shaping both development microeconomic theory and policy design in developing countries. On one hand the theory should explain evolution of (formal and informal) institutions by accounting for the nature and causes of agricultural economic organization in their multiple (complementary) aspects. On the other hand, evidence of (*ex ante*) household subsistence strategies should not be interpreted as a motivation for *laissez faire,* as many barriers to risk sharing and household self-insurance mechanisms should still be removed.

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