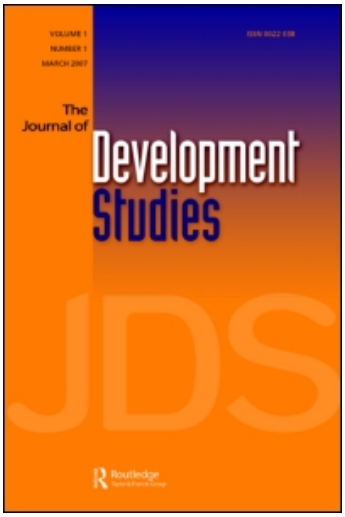

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Uncertainty, risk, and wealth and income distribution in peasant agriculture

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Uncertainty, Risk, and Wealth and Income Distribution in Peasant Agriculture

*By John Weeks**

I

SUMMARY

An ethical justification of the market system is that while generating inequality of income distribution it nevertheless provides an equal opportunity for people to improve their material well-being (1, p. 169). It is argued that the market system creates a society of unequals, but that it is a fluid society in which, though all may not improve absolutely and relatively, the opportunity to do so is randomly distributed through the population. In terms of economic development, this implies that within a free market framework, the distribution of the gains from growth need not be biased towards any economic class. To use a cliché, one of the justifications of a competitive market system is that there is nothing inherent in its operation which makes 'the rich get richer and the poor get poorer'. The main barriers to economic and social mobility are thus treated as imperfections in the market—racial and ethnic discrimination, differential access to capital markets, traditional constraints on job choice, and so on.

Recently Michael Lipton has suggested an analytical framework for explaining the optimizing behaviour of peasant cultivators which challenges this sanguine view (2). His 'survival algorithm' implies that inherent in the market organization of economic society is a tendency for the benefits from economic development to be distributed systematically in favour of the wealthier groups in the society.

In the following section I shall summarize Lipton's hypothesis and demonstrate its implications for the distribution of wealth and income over time in the agricultural sector of developing countries. In Section III policy conclusions of the analysis are presented.

II

Much debate has centred around whether peasant cultivators behave in a manner consistent with the Western model of the economically rational producer. Specifically, the debate has been over whether peasants maximize profits (6). Such behaviour under conditions of perfect competition implies that all factors of production are employed up to the point where their marginal value products equal their unit prices. The debate has also involved the question of whether 'under-employment' of labour exists in the agricultural sector of developing countries. These are basically separate issues, since profit maximization does not imply that labour is fully employed, nor does full employment of labour imply that profits are being maximized (2, 3).

Lipton argues that profit maximization is a special case of the more general behaviour pattern of utility maximization, and in peasant societies

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this utility maximization places emphasis on survival under conditions of uncertainty.[1] Stating Lipton's argument briefly, it is that (*a*) under conditions of imperfect knowledge (uncertainty) there is not a single marginal physical product for each factor, but a probability range within which the actual MPP for any factor will be in a given year, and the range may be quite great; (*b*) therefore, profit maximization does not involve equating a unique marginal value product to the price for each factor (which also may vary), but rather equating the marginal expected value product to the expected price for each factor; (*c*) this involves profit maximization over a period of several growing seasons, some of which may be prosperous, others of which may be disastrous; and (*d*) for most cultivators the negative pay-off is prohibitive—starvation or loss of land—because they lack accumulated wealth to cushion the impact of bad crop years. This is to say that poor farmers are risk-averters because they are poor[2]—'risk premium is an increasing function of risk *and a decreasing function of assets*' (2, p. 335; for a detailed discussion of the survival algorithm, see 2, pp. 330 ff.).

Economists usually treat the propensity to take risks as a partial explanation of the observed distribution of income and wealth—adventurous individuals are rewarded for undertaking occupations in which the pay-offs are high but unsure. Those with high incomes either by chance or ability obtained the high pay-offs; those with lower incomes either tried and were disappointed, or chose less risky occupations (1, ch. X). The 'survival algorithm' predicts the opposite—individuals take risks because they are wealthy; they do not usually become wealthy because they take risks (though they are likely to become wealthier as a consequence of risk-taking).

Why certain individuals take risks and others do not is a complex and not purely economic question.[3] However, this is also true for other phenomena which are treated as primarily economic, such as consumption behaviour. Treating the level of wealth as an explanation of risk-taking behaviour is more satisfactory than using risk-taking behaviour as an explanation of the level of individual wealth, because the latter injects risk-taking *ex machina* into the model of individual decision-making. It is neither scientific nor of explanatory value to treat the propensity to take risks as exogenous. Such a treatment merely leaves an unexplained 'loose end' which is used to account for part of the observed pattern of income and wealth distribution.[4] Economic analysis involves making simplifying assumptions about human behaviour, so that this behaviour can be analysed in terms of economic variables. In the following analysis I make the simplifying assumption that the propensity to take risks and accept conditions of uncertainty is a function of the individual's wealth.

In an agricultural economy, increases in output arise from three sources: (*a*) an increase in the quantity of existing factors of production; (*b*) fortuitious 'acts of nature' such as extremely favourable weather; and (*c*) innovative changes which either change the quality of existing factors of production or result in new factors of production.

The first two sources of growth may be assumed to be randomly distributed through the agricultural population—i.e. their blessings are as likely to fall upon the poor as the rich.[5] The grains from innovative changes are not distributed randomly, however. Innovative behaviour, particularly in agriculture, involves risk and uncertainty. Using a new technique, input

or crop represents risk-taking and uncertainty-bearing because by virtue of its 'newness' there is no previous experience upon which to predict the outcome. In addition, as Lipton and others point out (2, p. 348, 4, p. 1292 ff.). new seeds,[6] fertilizers and planting techniques all may increase the variability of land-yield. The situation is made more uncertain because frequently a combination of new inputs and techniques is necessary if the individual items are to have a beneficial effect (4).

Because those at the lower end of the income and wealth distribution apply not profit maximization, but a survival algorithm, they will not tend to innovate, and therefore will not receive the gains from innovative behaviour. This risk-avoidance arises from the negative weight in their objective functions given to potential losses they might incur if a new technique is tried. The conclusion to draw is that the market system, because it requires the consequences of risk-taking to be born individually, biases the distribution of a growing national income in favour of the wealthy in the process of economic development. The greater is the innovative component of economic growth, the greater will be the tendency for the distribution of income to become more unequal in the agricultural sector.[7]

The distinction being made in this analysis is between that part of risk-taking or uncertainty-bearing behaviour which is innate in the individual (not a consequence of economic variables) and that part which is wealth or income determined. It is much the same distinction as is made between 'demand' and 'effective demand'. The innate propensity can be called the 'desire' to bear risk or uncertainty; and the wealth and income effect, the 'ability' to bear risk and uncertainty. This distinction is demonstrated in Figure 1, in which the cultivator's expected mean value of the coming crop year's output, U_x, is measured on the horizontal axis, and the anticipated standard deviation of output on the vertical axis.[8] Both axes are measured in the same units. The iso-expected-utility curves, $E(U)_1$, $E(U)_2$, etc., are drawn on the assumption that the farmer is a risk-averter. This shape of the iso-expected-utility curves (representing the innate 'desire' to bear risk and uncertainty) is not necessary for the conclusions which follow; as we shall see, for any shape of E(U) the level of wealth affects the propensity to innovate. For simplicity it is assumed that inputs are homogeneous, so the relationship between U_x and S_x is constant whether part or all of the farmer's land is cultivated using the traditional production technique. The line segment NMM' shows the possible expected outputs, U_x, and their corresponding standard deviations, S_x, for the traditional technique, with M' being the maximum given the farmer's available land and other inputs.[9] Point D is defined as the 'disaster' point. If U_x falls below this level in any year, the farmer and his family face either starvation or loss of land.

I make the assumption that the possibility of falling below D is so heavily negatively weighted that the farmer will always choose the technique which minimizes the chances of an outcome to the left of D.[10] He can never reduce such a possibility to zero. He can only choose some maximum acceptable possibility of $U_x > D$. Again for simplicity, assume he believes the variation in U_x to be normally distributed. If a 66 per cent probability of $U_x > D$ is acceptable to him, then he will never choose a technique for which $U_x - D < S_x$, if he can avoid it; that is, the expected mean must be at least one standard deviation from

D. Line segment DMR represents such a maximum acceptable risk, i.e. the slope of DMR is unity. Alternatively, he may require greater certainty. Line segment DM'R' sets a 95 per cent certainty for $U_x > D$; each U_x on DM'R' is two standard deviations from D. A farmer whose maximum risk acceptance is shown by DM'R' is a risk-averter compared to the farmer whose maximum risk acceptance is shown by DMR, even though their iso-expected-utility maps may be the same.

All combinations of U_x and S_x to the left of MR are unacceptable in the first case, all those to the left of M'R' are unacceptable in the second case. Two further points need to be made. First, the line segment NM (for the case of 66 per cent certainty of $U_x > D$) and MM' (for the case of 95 per cent certainty of $U_x > D$) would represent unacceptable combinations of U_x and S_x if the farmer had any choice in the matter. However, if his land holding is less than sufficient to reach M or M', producing short of these

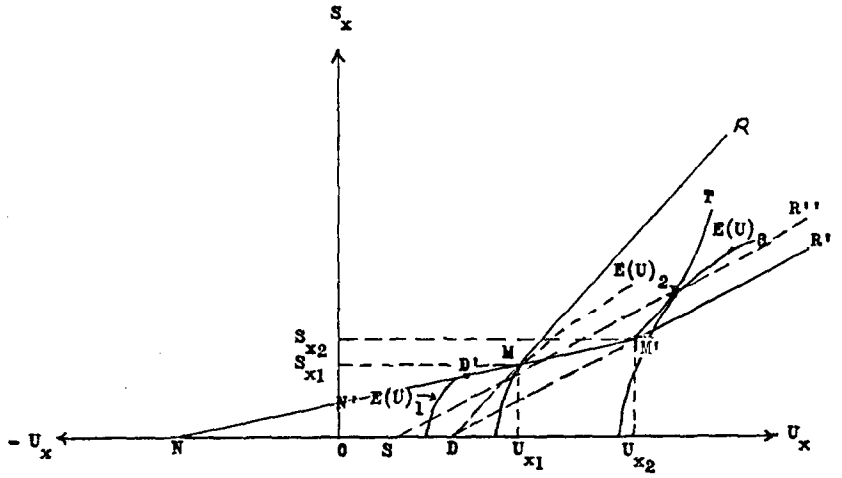

Figure 1

points is the closest he can come to meeting his acceptable risk combinations. In short, the smallness of his land holding may force him to accept more uncertainty than he would wish. The acceptable region is limited to the right of N'ME or N'MM'R'. Second, it follows from this that the utility map is constrained: e.g. $E(U)_1$ does not extend above N'MR (in the case of 66 per cent certainty).

We shall consider the case of the farmer whose maximum output with the traditional technique is M' and who requires 95 per cent certainty of $U_x > D$, if he has a choice. M'T represents output and variance possibilities from the introduction of a new technique.[11] It is characterized by increasing both expected output and expected variance, i.e. a rising S_x/U_x. As drawn, M'T will not be adopted by the hypothetical farmer, for in any year there is less than 95 per cent certainty of $U_x > D$.

It can be simply shown in Figure 1 that the decision to innovate is not independent of the level of wealth. For the farmer in question the maximum output with the traditional technique is M'. Innovation is constrained by the boundary of the unacceptable region, M'R'. If, however, he holds non-land assets equal to DS, he would adopt the new technique shown by M'T, operating at point I, where M'T is tangent to the iso-expected-

utility curve $E(U)_3$. The effect of the 'buffer fund' wealth is to shift DM'R' to the left in a parallel manner to SR''. In other words, his condition for acceptable risk becomes $U_x > D–DS$—the 'disaster' point is lowered. The greater is the farmer's wealth, the farther to the left shifts M'R'; thus the smaller is the unacceptable region.[12]

This wealth effect indicates that given the aggregate level of income and wealth in the rural community, innovative behaviour is in part a function of the distribution of income and wealth. It follows that there is a distribution of income and wealth that will optimize the degree of innovative behaviour, and that this optimum distribution would represent a more equal one that is currently the case in most developing countries. In the following section I shall discuss this optimum and other policy implications of the analysis.

III

> Peasant landlords and privileged tenants [in Southeast Asia] have displayed more aptitude for using opportunities offered by the increased availability of state aid and technological advances. Naturally, they have obtained more benefits than have other members of the agrarian structure who are apathetic and who have neither the means nor the incentive to avail themselves of the advantages offered. (4, p. 1367.)

The foregoing analysis shows that it may not be 'apathy' that prevents poor farmers from availing themselves of innovative advantages,[13] but that it is more likely the lack of 'means . . . to avail themselves' in a specific sense which limits innovative behaviour. Namely, it may be the lack of assets which reduces the poor farmer's area of choice in Figure 1, and thereby limits his innovative behaviour. From this derives an important policy implication. Government policies which identify the poorer cultivators as 'tradition-bound', 'conservative' and 'change-resistant', and therefore direct agricultural improvement programmes at the 'kulak' or middle-level peasant because he is more 'rational', 'innovative' and less 'tradition-bound', may be based on a false view of the motivation to innovate. The difference between poor cultivators and wealthier cultivators which is important for innovative behaviour may not be the degree of 'conservatism', but the difference between the poor and the rich pointed out by Ernest Hemingway to F. Scott Fitzgerald. In response to Fitzgerald's comment that 'the rich are different from us', Hemingway replied, 'Yes, they have more money'.

This greater propensity of the wealthier to innovate is an example of the false dichotomy between 'normative' and 'positive' economics. Several explanations are consistent with the different responses of poor and rich farmers. The tradition-bound-poor-peasant explanation supports a policy of directing agricultural extension programmes toward the relatively wealthy. The wealth-motivated-risk-taking explanation indicates that such a policy might well perpetuate and increase existing income differentials. Further, if the new techniques adopted by the better-off peasants do involve a higher S_x/U_x than the traditional technique, one would not expect any 'demonstration effect' to impress the poor cultivators, no matter how much higher is U_x. Because such a policy might consistently bias the gains from economic growth in favour of the wealthy, the choice between explanations cannot be made on the basis of analytical simplicity, but is an empirical question.

One can imagine a broad spectrum of agricultural policies which would provide the necessary security to stimulate innovative behaviour on the part of small-scale cultivators. The most limited would be a form of rural social insurance, which would make up the difference between actual output and what I have called the 'disaster' point in any year. To an extent, price stabilization policies, such as those followed by marketing boards in West Africa, attempt to do this. However, price stabilization is not the same thing as income stabilization, and, if we are to judge from the American experience, it is the poor farmer who benefits least from such programmes.

The somewhat more politically unpalatable programme of wealth redistribution theoretically would solve the problem in some cases, but presents difficulties in practice. In a particularly poor country where average *per capita* living standards and average *per capita* wealth are extremely low, a redistribution of wealth is unlikely to help. That is to say, in many countries, the total wealth is insufficient to provide a buffer fund (*vis-à-vis* the 'disaster' point) for the mass of the peasantry. The increase in innovative behaviour by the wealth-receivers (as a consequence of the redistribution) may not offset in the aggregate the decrease in the propensity to innovate by the expropriated. This is not to say that the concept of an optimum distribution of wealth is not useful, but only that in actually bringing it about one might get the perverse result of less innovative behaviour after the redistribution.

These practical difficulties aside, redistribution of wealth does not get at the basic problem, which is that in a market system uncertainty must be borne individually, and some individuals are more financially able to bear the risk than others. Redistribution only attacks the ability to bear risk, without affecting individual risk-bearing. A more logical solution would be to foster an agricultural system in which risk and uncertainty are borne collectively.

One method of 'collectivizing' risk and uncertainty would be a system of insurance for farmers, which would guarantee that they would not fall below the 'disaster' point. A scheme which would be within the reach of poor farmers is unlikely to come about through the normal functioning of the market. Private insurance schemes cover only risk, where the outcomes and their probabilities are known, and we are dealing with uncertainty. Even if the outcomes and their corresponding probabilities could be determined, the year to year variations in output are so great that premiums would be quite high—agriculture is a 'bad risk'. A government sponsored programme, on the other hand, could consider social profit, weighing the subsidies necessary to finance the programme against the net increase in agricultural output. However, such an insurance programme might well be beyond the administrative capacity of a developing country, since it would require trained agricultural field workers to service a large number of peasant farmers. Particularly in bad crop years, the demands on the programme would be great.

An alternative way to 'collectivize' risk and uncertainty would be to foster co-operative or collectivized farming. Many arguments have been raised in opposition to collectivization. Few authors have pointed out that this organization of the rural economy would reduce the risk and uncertainty for the individual farmers involved in the collective effort. The appeal of collectivization is increased when it is realized that this is in fact

the way small cultivators protect themselves. The extended family system, diatic relationships with middlemen and creditors, and even the paternal, subservient relationship with landlords, all form risk-sharing bonds (at the cost for poor farmers of not obtaining maximum economic advantage from these relationships). Governments could direct agricultural extension programmes toward communities, rather than toward individuals. A voluntary local co-operative organization of farmers could be made a prerequisite for such help. In this way, the government could formalize the existing informal mechanisms for risk and uncertainty sharing, and in doing so eliminate their exploitative characteristics.

In summary, given the present unequal distribution of wealth and income in developing countries, small scale cultivators behave in a manner that tends to distribute the gains from economic growth in favour of the relatively wealthy. This, however, would not need be the case were risk and uncertainty 'collectivized' (shared), instead of being borne individually as is the case in a market economy. Even within a market system we observe attempts at risk and uncertainty sharing. Unfortunately, neither the risk and uncertainty nor the gains from risk and uncertainty bearing are shared equitably. If we measure the degree to which risk and uncertainty are borne by the possibility of 'disaster', it is the relatively poor who carry most of the risk and uncertainty, and the relatively wealthy who gain most of the benefit.

NOTES

1. Profit maximization is not the general case of rational behaviour for the entrepreneur in Western countries, as demonstrated by Tibor Scitovsky (7, p. 142 ff.).

2. This risk-aversion applies not only to techniques of production, but also to marketing. For example, A. A. Yengoyan (9) found in the Philippines:

> When borrowers repay loans to their creditors, one may find UNK (a personalized creditor–debtor relationship) relations arising in which a former borrower continues to sell abaca to his former creditor with no outward interest in maximizing his economic position. Whereas a producer . . . could demand and bid-off his abaca to coastal and upland buyers at higher prices, UNK ties maintain the marketing of abaca in normal credit arrangements . . .
>
> . . . [T]he common reply to why one did not bid-off his hemp was that enduring personalistic relations were a means of insurance for small-scale cultivators. When one is beset by particular misfortunes, UNK is a means of assistance and also insures his future against the effects of calamities . . . Ultimately, some cultivators may take a loss in profits in order to maintain social insurance.

The behaviour described by Yengoyan is that predicted by Lipton's survival algorithm.

3. *Rural Sociology* is a journal which has allocated extensive space to studies of innovative behaviour among farmers (primarily American). Unfortunately, most of these studies have dealt with the timing of innovations, the psychological and sociological characteristics of innovators, and the sources of information on new techniques. For example (in *Rural Sociology* unless otherwise noted):

(*a*) Psychological and sociological characteristics of innovators: Charles R. Hopper and Dale Stangland, 'Farmers' Attitudes and Values in Relation to Adoption of Approved Prices in Corn Growing', XXIII (June 1958); Alfred Dean, Herbert A. Aurbach and C. Paul Marsh, 'Some Factors Related to Rationality in Decision Making among Farm Operators', XXIII (June 1958); Santi Priya Base, 'Characteristics of Farmers who Adopt Agricultural Practices in Indian Villages', XXVI (June 1961); Denton E. Morrison, 'Achievement Motivation of Farm Operators: A Measurement Study', XXIX (December 1964);

(*b*) Information sources; E. A. Wilkening, 'Roles of Communicating Agents in Technological Change in Agriculture', *Social Forces*, XXXIV (May 1956); James H. Copp, Maurice L. Sill and Emory J. Brown, 'The Function of Information Sources in

the Farm Practice Adoption Process', XXIII (June 1958); Robert G. Mason, 'The Use of Information Sources in the Process of Adoption', XXIX (March 1964); Frederick C. Fliegel, 'Literacy and Exposure to Instrumental Information among Farmers in Brazil', XXXI (March 1966); and

(*c*) Timing of innovations: E. M. Rogers and L. E. Rogers, 'A Methodological Analysis of Adoption Scales', XXVI (December 1961); S. P. Base, 'The Diffusion of a Farm Practice in Indian Village', XXIX (March 1964).

A few studies consider income or wealth as a variable affecting innovative behaviour. Some of these studies which have are: A. W. van den Ban, 'Progressive Farmers in the Netherlands', XXII (1957); James H. Copp, 'Toward Generalization in Farm Practice Research', XXIII, (June 1958); David E. Lindstrom, 'Diffusion of Agricultural and Home Economic Practices in a Japanese Rural Community', XXIII (June 1958).

4. Assuming risk-taking behaviour to be exogenous is also objectionable on the grounds that it represents an unscientific value, judgement. This assumption leads to the conclusion that income and wealth differentials are in part a reward for risk-taking. This in turn justifies the *status quo* income distribution. Since other assumptions leading to different conclusions (but consistent with the same behaviour) are possible, it is an arbitrary assumption and a case of special pleading.

5. Certainly in the case of (*a*), the blessing is likely to be non-randomly distributed with regard to the level of wealth and income. But this is ignored for it is not necessary to demonstrate the conclusions.

6. New crops also often involve greater uncertainty. Yengoyan found in his study in the Philippines that the introduction of coffee-growing resulted in initial success among primarily abaca-growing peasants, but its very success led to a rapid fall in the price of coffee. As a consequence, small-scale cultivators switched back to products for which the demand and supply were more stable and which involved more flexibility and less uncertainty than the slow-gestating coffee plants. In spite of the return of coffee prices to high levels, small-scale farmers were loath to again take up coffee growing (9, p. 35).

7. Again from the Philippine example: The end effect is that small-scale abaca cultivators settle on a level of living which may be maintained regardless of market changes and price fluctuations (9, p. 34).

8. The diagrammatic technique used is based on that in Richard C. Porter (5, pp. 5–8). For further elaboration, see James Tobin (8, pp. 65–86).

9. Porter discusses why this relationship may not be linear. NMM′ becomes negative because of fixed costs (5, p. 5).

10. This is an explicit formulation of the 'survival algorithm'.

11. The shape and position of M′T is partly subjective, since poor farmers may take a more pessimistic view of possible outcomes. This, of course, only strengthens the conclusions reached.

12. The analysis is partial equilibrium in nature, holding the rate of return on non-land assets constant. Therefore, the portion of total wealth (land plus non-land) invested in land is taken as given.

13. The problem may be one of 'apathy' to the extent that landlord-tenant relationships prevent the farmer from significantly benefiting from increases in output. In any case, it amplifies the conclusion that innovative behaviour is not entirely volutional, and qualifies the effect of increase in wealth on innovative behaviour.

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