Utah State University

DigitalCommons@USU

Economic Research Institute Study Papers

Economics and Finance

1996

Immiserized Growth in Liberalized Agriculture

Christopher B. Barrett
Utah State University

Follow this and additional works at: <https://digitalcommons.usu.edu/eri>

Recommended Citation

Barrett, Christopher B., "Immiserized Growth in Liberalized Agriculture" (1996). *Economic Research Institute Study Papers*. Paper 107.

<https://digitalcommons.usu.edu/eri/107>

This Article is brought to you for free and open access by the Economics and Finance at DigitalCommons@USU. It has been accepted for inclusion in Economic Research Institute Study Papers by an authorized administrator of DigitalCommons@USU. For more information, please contact digitalcommons@usu.edu.

Economic Research Institute Study Paper

ERI #96-41

**IMMISERIZED GROWTH IN LIBERALIZED
AGRICULTURE**

by

CHRISTOPHER B. BARRETT

**Department of Economics
Utah State University
3530 University Boulevard
Logan, UT 84322-3530**

December 1996—revised April 1997

**IMMISERIZED GROWTH IN LIBERALIZED
AGRICULTURE**

Christopher B. Barrett, Assistant Professor

**Department of Economics
Utah State University
3530 University Boulevard
Logan, UT 84322-3530**

The analyses and views reported in this paper are those of the authors. They are not necessarily endorsed by the Department of Economics or by Utah State University.

Utah State University is committed to the policy that all persons shall have equal access to its programs and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

Information on other titles in this series may be obtained from: Department of Economics, Utah State University, 3530 University Boulevard, Logan, Utah 84322-3530.

Copyright © 1996 by Christopher B. Barrett. All rights reserved. Readers may make verbatim copies of this document for noncommercial purposes by any means, provided that this copyright notice appears on all such copies.

IMMISERIZED GROWTH IN LIBERALIZED

AGRICULTURE

Christopher B. Barrett

ABSTRACT

This paper offers a simple model and corroborating empirical evidence that reconcile rivalrous claims about liberalization's impact on low-impact agrarian economies; growth and smallholder welfare reduction can go hand in hand. The model developed here reverses the causality of Bhagwati's well-known immiserizing growth model. Price shocks cause welfare effects that, in turn, drive output response, rather than output shocks, causing price shocks and then welfare effects, as in the trade theoretic original. Immiserized growth seems a plausible explanation for some important causes—e.g., the Malagasy case considered here—in which liberalization appears to have engendered both real agricultural growth and heightened food security stress among smallholder food producers.

Key words: immiserizing growth, liberalization, Madagascar, peasants, structural adjustment, welfare analysis

IMMISERIZED GROWTH IN LIBERALIZED AGRICULTURE¹

1. INTRODUCTION

The intertwined challenges of poverty reduction and economic growth are a recurrent theme in the literature on agricultural development. In the past decade, market-oriented liberalization has been promoted vigorously in low-income economies as a means to accomplish both ends simultaneously by reducing unproductive state interference. Yet the evidence remains inconclusive as to whether market-oriented reforms are bringing either poverty reduction or economic growth, at least sub-Saharan Africa (SSA). For instance, while the World Bank (1994) claims evidence of real economic and agricultural growth in response to the liberalization of prices and marketing channels, others argue that liberalization has intensified suffering among poor farmers, with little or no growth stimulus (Cornia, Jolly, and Stewart 1987; Commander 1989; Duncan and Howell 1992; and Stewart 1995). Might both sides to the debate be right?

This paper offers a simple model and corroborating empirical evidence that reconcile the rivalrous claims about liberalization's impact on low-income agrarian economies; growth and welfare reduction can go hand in hand. Others have explained mechanisms by which growth can exclude or even immiserize the poor (Carter and Mesbah 1993; Carter and Barham 1996). The innovation offered here is that measured output growth can be the direct result of—not the precursor to—smallholder welfare losses. The present model is a complement to existing explanations of the relationship between liberalization, growth, and poverty, not a substitute, because the immiserized

¹I thank Paul Dorosh and René Bernier for generously making the data available. The Social Science Research Council, the Institute for the Study of World Politics, and the Utah Agricultural Experiment Station provided funding that made this research possible. All remaining errors are mine. Approved as UAES journal paper #5034.

growth hypothesis is certainly not true everywhere. In some places, liberalization appears to have both improved farmer welfare and increased output (e.g., Baffes and Gautam 1996). But immiserized growth seems a plausible, perhaps even a compelling explanation, for some important cases—e.g., Madagascar, the empirical application in this paper—in which liberalization appears to have engendered both real agricultural growth and heightened food security stress among smallholder food producers. These cases are often an ideological battlefield, so understanding them better offers considerable returns to policymakers and analysts alike.

2. IMMISERIZING GROWTH AND IMMISERIZED GROWTH

Students of international trade will recognize the posited relationship between economic growth and intensified poverty from Bhagwati's classic theory of immiserizing growth (Bhagwati 1967). Immiserizing growth is said to occur when a country with an influential position in the international market for some product facing inelastic world demand expands output of that product, leading to a price reduction that decreases export revenues and national welfare. Textbook cases of the immiserizing growth hypothesis include Brazilian coffee and West African cocoa. The chain of causality considered here is somewhat different. Rather than output increases causing price changes that then reduce welfare, consider instead price changes that reduce welfare and thereby stimulate increased output. The correlations among the variables is the same, but the causality is quite different, prompting the modified label "immiserized growth" to signal that welfare reductions are precedent, rather than subsequent, to output expansion.

The innovative twist to the immiserized growth hypothesis is the notion that increased prices and output are associated with lower, not higher, producer welfare. The standard, neoclassical

producer theoretic view is that increased prices induce profit-maximizing farmers to increase production, yielding increased producer surplus (Balassa 1990). But that view is inconsistent with simultaneous observation of deepening poverty among important producer subpopulations. So in those settings where producers seem to be worse off and yet producing more, a different model is plainly necessary. The next section presents such a model. But first let me set the frame of the context in which the model should be understood and explain the basic logic of the formal model.

Price reform has been a defining feature of agricultural liberalization in low-income economies. As Krueger, Schiff, and Valdés (1988) demonstrated, direct (e.g., price controls) and indirect (e.g., exchange rate and trade policy) state intervention almost universally reduced the mean and variance of agricultural producer prices prior to market-oriented reforms. Limited available empirical evidence confirms what intuition would then suggest; the reduction or termination of direct and indirect state interventions through market-oriented reforms increased both the mean and the variance of agricultural producer prices (Barrett 1997). This is the price shock that initiates the immiserized growth process posited here. Given the apparent ubiquity of the Krueger et al. (1988) results, this is likely a widespread phenomenon where liberalization has been seriously attempted.

Immiserized growth then depends on the exogenous shock to prices having an adverse welfare effect on producers. This is clearly not textbook neoclassical theory of the firm, in which the convexity of profit functions ensures that producers benefit from higher and variable prices. But smallholder agriculture is quite different than the firms of neoclassical theory. Small farmers both consume and produce agricultural products, necessitating joint modeling of household decisions (Singh, Squire, and Strauss 1986; and DeJanvry, Fafchamps, and Sadoulet 1991), and they do so subject to considerable temporal price and yield risks. These two key features of smallholder

agriculture point to how producers might suffer welfare losses from increased mean or variance of commodity prices. Households that are net buyers suffer real income losses from increased expected prices, as will those that are price risk averse. The subpopulation of price risk-averse net buyer farmers thus stands to lose unambiguously from market-oriented reforms that increase both the mean and the variance of an agricultural price distribution. The past decade has brought widespread empirical evidence that many—indeed, in some places most—smallholder producers are net buyers of the food crops they grow (Weber et al. 1988; Deaton 1989; and Barrett and Dorosh 1996) and that many are also price risk averse (Finkelshtain and Chalfant 1992; and Barrett 1996).² It thus seems reasonable to believe that the sort of shocks that liberalization likely produces in food price distributions—increased means and variances—will reduce the welfare of smallholder subpopulations in some low-income agrarian economies.

The final link in the immiserized growth chain runs from welfare losses to increased agricultural output. This simply reflects the combination of (negative) income and substitution effects on leisure, a normal good, caused by an increased crop price mean or variance, which both reduces net buyer household welfare and raises the opportunity cost of leisure. Among populations endowed with just labor and land, and in which land markets are thin or missing, adjustments to labor allocation patterns become the primary means for coping with shocks (DeJanvry et al. 1991). In such settings, as in much low-income agriculture in SSA, a significant increase in farm labor

²Note that for net sellers, price risk might not be welfare-reducing if prices covary negatively with crop yields because of covariate supply shocks, because high (low) prices then compensate for low (high) yields, thereby stabilizing income (Newbery and Stiglitz 1981). For net buyers, however, price risk only compounds yield risk, amplifying income fluctuations. Since the welfare effects of price and yield risks are of the same sign among price risk-averse net buyers, it is easiest to work with just one stochastic variable. Because the interest here is in the effects of policy reforms that shock price distributions, I therefore work with price risk, although one could easily reproduce these results using yield risk and shocks to yield distributions caused, for instance, by technological change.

effort should manifest itself in greater agricultural output, regardless of whether the extra labor effort is due to improved profit opportunities or to increased food insecurity. Analysts commonly interpret output growth as a sign of the former. The logic and evidence advanced in this paper suggest, however, that growth may in some cases be associated with reduced welfare and heightened food insecurity. Immiserized growth appears a plausible explanation for experiences such as Madagascar's.

3. A NONSEPARABLE HOUSEHOLD MODEL

The gist of the present model is that households' land endowments and the available production technology jointly determine households' vulnerability to food price shocks and the way they insure against such shocks. The model is thus in the spirit of Finkelshtain and Chalfant (1991) or Barrett (1996). In the absence of complete contingency markets and given a uniform production technology, heterogeneous land endowments across households can generate behavioral differences derived from different marketed surplus positions—net buyer or net seller—and related differential capacities to self-insure against risk. Incomplete markets thereby generate cross-sectional behavioral differences.

Assume that a representative agricultural household exhibits Von Neumann-Morgenstern utility defined over consumption of leisure (L^L)³ in the first (growing) period and staples (S) and nonstaples (N) in the second (postharvest) period.⁴ $U(\cdot)$ is quasi-concave, but concave in each

³Superscripts distinguish among goods across subcategories. Subscripts denote partial derivatives.

⁴The model follows the basic construction of Finkelshtain and Chalfant or Barrett (1996).

argument individually, with $U_X|_{X=0} = \infty$ with respect to each argument X . The staple can be either produced or purchased; the nonstaple is available only through market purchase.

The household has an endowment of land (T) and of labor time (L^0). Deterministic staple commodity production is strictly increasing in land and agricultural labor and (weakly) concave in each. Agricultural labor is a function of household labor (L^H) and hired labor (L^D), but these may be imperfect substitutes. Just as the household can hire labor in, so can it hire out its time (L^S) at a parametric wage rate, w . The household faces a time constraint, $L^0 \geq L^H + L^S + L^L$. Exogenous transfers (I) supplement net wage earnings and agricultural revenues.

All product prices are unknown when production decisions (i.e., labor allocation decisions) are made, but postharvest prices are revealed before staples and nonstaples consumption decisions are made. The household's utility maximization problem can thus be expressed as

$$\begin{aligned}
 & \underset{L^D, L^H, L^L, L^S, N, S}{\text{Max}} \quad E \underset{N, S}{\text{Max}} \quad U(L^L, N, S) & (1) \\
 & \text{s.t.} \quad P^S S + P^N N \leq Y^* \\
 & Y^* \equiv w[L^S - L^D] + P^S F(L, T) + I \\
 & L \equiv h(L^D) + L^H \\
 & L^0 \geq L^S + L^L + L^H \\
 & h(L^D) \in [0, L^D] \\
 & L^D, L^H, L^L, L^S, N, S \geq 0
 \end{aligned}$$

where E is the mathematical expectation operator, P^S is the staple price, P^N is the nonstaple price, Y^* is endogenous income, and the function $h(\cdot)$ is a hired labor efficiency index used to convert hired labor units into household labor units. It takes the value zero if hired labor is completely inefficient, and L^D if hired labor is as efficient as household labor. By the strict monotonicity of $U(\cdot)$, the budget and time constraints will bind at any optimum. Productive efficiency is assumed.

The household allocates labor across the alternative uses conditional on anticipated ex post optimal choices of consumption volumes. Thus, by duality, we can work with the variable indirect utility function (Epstein 1975). $V(\cdot)$ is homogenous of degree zero in the relevant prices and income and, therefore, invariant to units of measurement. So let P^N be a numéraire, with $P = P^S/P^N$ and $Y = Y^*/P^N$. Assume the household exhibits Arrow-Pratt income risk aversion ($V_{YY} < 0$).

The peasant's labor allocation decisions can thus be represented by the optimization problem

$$\begin{aligned} & \underset{L^D, L^H, L^L}{\text{Max}} \quad E V(L^L, P, Y) \\ & \text{s.t. } Y = w[L^0 - L^D - L^L - L^H] + PF(L, T) + I \end{aligned} \quad (2)$$

for which the first-order necessary conditions for an optimum are

$$\text{w.r.t. hired labor, } L^D : E[V_Y[PF_{L^D} - w]] \leq 0 \quad (= 0 \text{ if } L^D > 0) \quad (3)$$

$$\text{w.r.t. household labor, } L^H : E[V_Y[PF_{L^H} - w]] \leq 0 \quad (= 0 \text{ if } L^H > 0) \quad (4)$$

$$\text{w.r.t. leisure, } L^L : E[V_{L^L} - V_Y w] \leq 0 \quad (= 0 \text{ if } L^L > 0) \quad (5)$$

Relation (5) will hold with equality by the assumptions made with respect to preferences. If the marginal revenue product of household labor (L^H), evaluated at $L^H = 0$, is at least as great as the market wage, w , then staples production is a rational activity, as is almost surely the case with any household endowed with cultivable land. While relation (4) almost surely holds with equality, that does not imply (3) will. Since hired labor might not be as efficient as household labor (if $h(L^D) < L^D$), households may or may not hire in workers at the market wage.

If staples production is optimal, then following Barrett's (1996) propositions 1 and 2, it can be shown that net seller (buyer) households will "underemploy" ("overemploy") land-clearing labor

relative to the certainty equivalent rate at which the expected marginal revenue product equals the parametric wage rate. That is, if μ is the mean of P , then

$$w < (>) \mu F_L \quad (6)$$

for net sellers (buyers) of S . Given a single, parametric wage rate facing all households and a common set of concave production and land clearing technologies, the implication is clear that households with a smaller endowment of cultivable land will devote more labor to agricultural production, per unit land, than will households with a larger endowment of land.

The next step is to assess how smallholder labor allocation patterns respond to exogenous shocks to the food price distribution, P . A natural way to proceed follows the mean-variance analytical approach of Meyer (1987), which is consistent with the expected utility maximization hypothesis maintained in (1). By this approach, P can be specified as

$$P_t = \mu_t + \sigma_t e_t \quad (7)$$

where μ is the mean price (a “location” parameter), $\sigma > 0$ is a mean-preserving spread (a “scale” parameter), and e is a mean zero, iid random shock.⁵ Both μ and σ may be subject to nonstationary structural shocks, such as those induced by policy reforms including exchange rate realignment, price (de)control, the introduction or termination of subsidies or taxes, or changed marketing arrangements.

Sensitivity analysis of the first-order conditions with respect to changes in μ and σ offers insight as to how smallholders’ incentives respond to exogenous shocks to food prices. First

⁵This framework does not impose restrictions on risk preferences, on the joint distribution of P and Y (an endogenously random variable), or on the functional form of the cumulative density function describing any particular random variable.

considering changes with respect to μ , rearrange (4) and substitute in (7), then partially differentiate the resulting expression with respect to μ as follows.

$$E V_Y w = E F_{L^H} V_Y (\mu + \sigma e) \quad (9)$$

$$\Upsilon \equiv \frac{E V_Y w}{E V_Y} = E V_Y (\mu + \sigma e) \quad (10)$$

$$\frac{\partial \Upsilon}{\partial \mu} = E (V_Y + P V_{Y\mu}) \quad (11)$$

If the household reduces its market labor supply (i.e., L^S had been positive), then L^H and L^L can both increase.⁶ Otherwise there is a direct labor-leisure tradeoff. The concavity of output in labor suffices to define the optimal reallocation of time. If $\partial \Upsilon / \partial \mu > (<) 0$, then it is optimal to increase (decrease) farm labor in response to a positive shock to the mean food price, either through a reduction in market labor supply, if L^S was positive, or through a reduction in leisure time, L^L . The first term on the right-hand side of (11) has an expression similar in form to the Slutsky equation. The first term is a substitution effect and is always positive; the second term is an income effect and can be of either sign. It is positive (negative) if and only if an increase in μ increases (decreases) the marginal utility of income, which by the assumption of income risk aversion implies that increasing the expected food price lowers (raises) real income, which is true if and only if the household is a net food buyer (seller). For net buyer households, a rise (fall) in μ induces reduced (expanded) leisure consumption via the income effect and therefore an unambiguous increase (decrease) in farm labor and output. For net seller households, by contrast, the income effect of an increase (decrease) in μ leads to greater (less) leisure consumption—a “wealth effect” in the jargon of the household modeling literature (Singh, Squire, and Strauss 1986)—and therefore ambiguous

⁶The change in net wage labor hiring ($L^D - L^S$) will be nonnegative since a higher μ increases the expected marginal revenue product of hired labor and the opportunity cost (in terms of home production foregone) of labor time supplied to the market.

effects on farm labor and output since the income and substitution effects are opposite in sign. So it is only the poorest farmers who respond unambiguously to higher expected food prices by allocating more labor to farming and thus produce more.

Similar sensitivity analysis with respect to σ enables investigation of the impact of shocks to food price variability on smallholder labor allocation, and thus on farm output. Again working from (10), differentiation with respect to σ yields another Slutsky-type expression:⁷

$$\text{sign} \left[\frac{\partial Y}{\partial \sigma} \right] = \text{sign} \left[\text{COV}(V_Y, P) + E V_{Y\sigma} P \right] \quad (12)$$

Again by the concavity of the production technology, $\partial Y / \partial \sigma > (<) 0$ indicates that it is optimal to increase (decrease) farm labor in response to a positive shock to the variance of the staple food price. The first term on the right-hand side of (12) is the substitution effect. The covariance between the marginal utility of income and price is negative (positive) for net food sellers (buyers), as Finkelshtain and Chalfant (1991) and Barrett (1996) demonstrate.

The second term on the right-hand side of (12), the income effect, depends on whether the expected marginal utility of income increases or decreases with respect to changes in σ . This depends on whether agents are price risk averse, as represented locally by the curvature of indirect utility in prices, V_{pp} . Barrett (1996) showed that net buyer smallholders are commonly price risk averse. In that case, an increase in σ is equivalent to a reduction in real income and hence the income effect on labor allocation and farm output will be positive. Thus, a positive (negative) shock to the staple food price variance will unambiguously increase (decrease) smallholder farm labor only among price risk-averse net buyers. For all other producer categories, the effects are ambiguous.

⁷The precise relationship is $\partial Y / \partial \sigma = \text{COV}(V_Y, e) + E V_{Y\sigma} P$, where $e = (P - \mu) / \sigma$. Obviously, $\text{sign}(\text{COV}(V_Y, P)) = \text{sign}(\text{COV}(V_Y, e))$, since μ and σ are constants.

This last result contrasts with the existing literature on supply response under risk, in which price risk leads producers to reduce, not increase, cultivated area (Behrman 1968; Just 1974; and Chavas and Holt 1990). This contrarian result stems from the basic observation that net buyer producers respond differently to price risk than do net sellers (Finkelshtain and Chalfant 1991; and Barrett 1996). Food producer households with rudimentary production technologies and meager land endowments are commonly net food buyers in the low-income tropics. The (negative) wealth effects experienced by price risk-averse small farmers following an increase in σ thereby induce a reallocation of time from leisure to farm labor in direct response to increased food insecurity.

4. IS IMMISERIZED GROWTH PLAUSIBLE? EMPIRICAL EVIDENCE FROM MADAGASCAR

Madagascar is a peasant economy *par excellence*. The vast majority of farms are small and owner-operated under rudimentary technologies. The average farm size is only 1.20 hectares and the Gini coefficient for the land distribution is but .408 (MPARA/FAO 1988). By international standards, both figures are quite low. Madagascar's economy is heavily dependent on rice, which accounts for more than half of both cultivated land and calorie consumption nationally. But yields per hectare are low, at 2.11 tons/hectare, 1990-92, slightly better than the mean for SSA but roughly 40 percent below the mean for developing economies as a whole.

Madagascar was considered a star market-oriented reformer in the late 1980s and early 1990s (Rajcoomar 1991) because of the vigor and range of its reforms, particularly with respect to agricultural marketing and pricing. By Barrett's (1997) estimates, the liberalization of the late 1980s increased mean national rice prices by 42 percent and the variance of rice prices by 53 percent. The evidence suggests market-oriented reforms were followed by an acceleration in agricultural output

growth of roughly 1 percent per year (World Bank 1994). Dramatic relaxation of food marketing channels and administrative pricing schemes formerly controlled by a state monopoly yielded an exogenous price shock and subsequent positive output response.

The empirical evidence also points to deepening poverty during and following liberalization, particularly in rural areas (World Bank 1989). Nutritional, educational, and expenditure data all suggest significant deterioration in average living standards among the nation's primarily rural poor. An important cause appears to be the significant liberalization-induced rise in the mean and variance of all major food crop prices, particularly rice. Barrett and Dorosh (1996) estimate that the rice price changes associated with liberalization brought significant (i.e., greater than 20 percent) welfare losses to better than one-third of the nation's rice farmers, who comprise most of the country's poor. Barrett (1996) similarly shows that most small farmers in Madagascar are price risk-averse net rice buyers. Liberalization thus seems to have brought Madagascar a significant positive shock to the mean and variance of the price of rice, the country's primary crop, and expansion in agricultural output, particularly in rice, and significant welfare losses among the country's primarily rural poor. All the pieces of the immiserized growth story exist in the Madagascar case.

Is it plausible that causality runs from price shocks to reduced welfare to increased output? Unfortunately, the available data do not permit direct testing of the immiserized growth hypothesis. That would require a farm-level panel of data spanning the pre- and postliberalization periods, which simply does not exist. Instead, this section employs a data set derived from a 1990 national survey of 825 rice farmers collected by the Cornell Food and Nutrition Policy Program and a Malagasy

consulting firm.⁸ These data provide strong indirect evidence of the plausibility of immiserized growth.

The survey data suggest that 63 percent of Madagascar's rice farmers are net rice buyers.⁹ This evidence thus suggests strongly that many—indeed, probably most—Malagasy rice farmers were made worse off by the real rice price increases of the 1980s. The most intriguing point, however, is that the net buyer proportion of rice farmers is largest in those regions that enjoyed the strongest output growth. Regionally, rapid production increases are associated with adverse farmer welfare effects caused by liberalization-induced price changes. This observation is central to the plausibility of an immiserized growth explanation for the simultaneity of output expansion and intensified poverty and food insecurity following agricultural liberalization in Madagascar. The spatial distribution of agricultural and rice output growth is strongly coincident with the spatial distribution of welfare losses associated with liberalization-induced food price changes.

A striking relationship emerges if one sorts the farm-level data into regional groupings according to a region's real and per capita supply response in the wake of liberalization. Eight of Madagascar's 17 agricultural enumeration regions enjoyed positive absolute and per capita agricultural growth over the liberalization period, 1981-90, four experienced positive absolute growth, but at a rate insufficient to maintain per capita output levels, and the remaining five suffered negative absolute and per capita agricultural growth (Figure 1). Such regional variation in growth

⁸Bernier and Dorosh (1993) describe the data and their collection.

⁹49.0 percent of respondents were net rice buyers. However, the survey's stratification method led to oversampling of large farms and undersampling of small farms. Correcting for this sample selection bias by estimating patterns within each census strata and then weighting those estimates by the distribution of households within the agricultural census (MPARA 1988), the estimated proportion of rice producers in Madagascar who are net buyers leaps to 63.3 percent. This estimate could also be a bit low because 1989-90 was a year of good rains and relatively high rice yields. Thus, most households probably enjoyed a positive stochastic yield shock, generating increased production. So if the net buyer proportion estimate of 63 percent is biased, it is probably on the low side.

responses appears quite common in liberalized African agriculture (Commander 1989; and Barrett and Carter 1997). Figure 2 depicts the cumulative cultivated land distribution for each of those three regional groups, revealing a strict ordering of the regional land distributions. Those regions that enjoyed real per capita agricultural growth are unusually densely populated by small farms, while those regions that suffered negative absolute agricultural output growth evince fewer small and more large farms. Table 1 offers summary data on the land distribution as well as regional estimates of the percentage of rice farmers who are net rice buyers and the regional elasticity of money metric welfare with respect to price, which Deaton (1989) shows is equal to the budget share of marketable surplus (price times the difference between output and consumption volumes, that product divided by income). The regions that experienced the fastest agricultural output growth were disproportionately populated by net buyers—69 percent of rice farmers in this region consumed more rice than they produced. These regions thereby suffered significant aggregate welfare losses following liberalization-induced rice price changes. Those regions that experienced positive absolute but negative per capita agricultural growth had a smaller (51 percent) percentage of net buyer farmers and enjoyed modestly positive aggregate welfare effects from food price shocks. Finally, those regions with the smallest number of net rice buyer farmers (43 percent) and that enjoyed the greatest aggregate welfare gain from rice price shocks also showed negative absolute and per capita agricultural growth.

There are at least four potential explanations for this pattern, but only the immiserized growth hypothesis appears supportable in the Malagasy case. First, interregional labor migration, either in response to or as a cause of differential regional growth rates, might lead to

Figure 1. Agricultural Growth Experiences by Region, 1981-90

Figure 2: Cumulative Land Distributions by Regional Group

Table 1. Regional Farm Size Distributions and Welfare Effects

Farm size	Regional Groups		
	Per capita growth: Positive Absolute growth: Positive	Negative Positive	Negative Negative
Farm size distribution:			
< 25 ares	3.8	1.7	0.4
25-49 ares	8.4	2.6	0.8
50-74 ares	16.7	7.6	5.9
75-99 ares	13.2	7.0	8.1
100-149 ares	24.7	23.5	18.2
150-199 ares	9.4	18.9	21.2
200-499 ares	20.6	33.8	39.4
≥ 500 ares	3.1	5.0	5.9
<i>Mean size</i>	<i>142</i>	<i>204</i>	<i>240</i>
Net buyer % among rice farmers	69	51	43
Mean marketable rice surplus (as % of income)	-0.08	0.03	0.06
Number of observations	287	302	236

disproportionate land subdivision in the most rapidly growing areas. But the positive per capita growth regions in Madagascar include both zones of known in-migration (e.g., the western littoral) and out-migration (the south central highlands), as do the regions of negative growth. Moreover, there is no empirical evidence that interregional rural-to-rural migration has been especially significant in the past decade or so in Madagascar.¹⁰ Second, it could be that some regions grow slowly because they remain burdened by large, inefficient, unresponsive state farms not yet privatized. This is highly unlikely, however, since unlike some other states converting from central planning to markets, Madagascar never had a significant state farming sector. Moreover, state farming was concentrated in industrial crops (e.g., cotton, tobacco), not in food crops which comprise a sizeable majority of acreage and output. Third, one could imagine that perhaps smaller farms have enjoyed technological change or soil qualities superior to larger farms. But given the apparent reduction in use of chemical inputs, the lack of expansion in irrigated areas in these regions (Bernier and Dorosh 1993), and the fact that the region with the nation's best soils (Lac Alaotra) suffered negative agricultural growth over the period, that explanation likewise seems incredible.

It would be grossly reductionist to attribute to food security stress the totality of the aggregate food supply response of Madagascar's farmers to a complex set of liberalization measures. This paper does not offer a definitive empirical test of the determinants of differentiated food supply response or welfare changes. Nonetheless, immiserized growth seems a plausible explanation for the general pattern of growth and welfare effects observed in Madagascar and one that, appealing, reconciles observations of growth acceleration with those of heightened poverty and food insecurity

¹⁰There is considerable popular belief, often repeated in the Malagasy press, that rural-to-urban migration has accelerated in the wake of liberalization. But even this claim cannot be tested carefully; good migration data do not seem to exist.

among small farmers. The apparent relationship between farm size distribution and agricultural growth experiences thus seems attributable most likely to behavioral differences across farms of differing land endowments. This is the traditional basis for explaining the oft-observed inverse relationship between farm size and productivity (Barrett 1996) and seems quite tenable in this situation. Policy shocks that increase the mean and variance of crop prices generate ambiguous output signals to net sellers but unambiguously stimulative signals to risk-averse net buyers in an environment of incomplete or imperfect markets (Finkelshtain and Chalfant 1991; and Barrett 1996). Unfortunately, this stimulus is undesirable from the smallholders' standpoint in that decreased welfare and increased food insecurity, not greater reward, elicit additional output. The bitter irony is that the primary objective of agricultural liberalization in Madagascar, as in other low-income agrarian nations—increased agricultural output—was realized but for unanticipated and undesirable reasons. Because of the (perhaps unanticipated) evolution of rice price distributions, the welfare of Madagascar's poorest farmers deteriorated rather than improved, but the threat to their survival compelled smallholders to work harder and produce more. The aggregate effect of the shifts in food price distributions on output depends on the proportion of farming households who are net buyers or net sellers, characteristics that are closely related to land endowments (Barrett and Dorosh 1996). Immiserized growth can occur at the sectoral or macroeconomic scale when a significant proportion of farmers are net buyers and account for a substantial portion of total output, as seems the case in Madagascar, and perhaps in a number of other low-income agrarian economies where the dispute rages over whether liberalization brings growth or deepened poverty or, as this model suggests, both.

5. CONCLUSIONS

Agricultural liberalization that increases the mean and variance of food prices can heighten food insecurity for risk-averse net buyer populations, which includes a surprisingly large proportion of food producers in low-income agrarian economies. A natural response of immiserized smallholders is to increase labor effort, which has the effect of increasing agricultural output. Unlike competing explanations, this immiserized growth hypothesis appears consistent with empirical evidence from Madagascar, which shows both welfare losses and output increases, each concentrated especially in regions densely populated by small farms. An important implication is that in economies where households both consume and produce crops and significant subpopulations are net buyers of the commodities they produce, one cannot infer welfare effects from output trends, as is possible under pure producer theory and is common practice.

REFERENCES

- Baffes, J. and M. Gautam. "Price Responsiveness, Efficiency, and the Impact of Structural Adjustment on Egyptian Crop Producers." *World Development* 24(April 1996):765-71.
- Balassa, B. "Incentive Policies and Export Performance in Sub-Saharan Africa." *World Development* 18(March 1990):383-391.
- Barrett, C.B. "On Price Risk and the Inverse Farm Size-Productivity Relationship. *Journal of Development Economics* 51(December 1996):193-215.
- Barrett, C.B. "Liberalization and Food Price Distributions: ARCH-M Evidence from Madagascar." *Food Policy* 22(February 1997): in press.
- Barrett, C.B., and M.R. Carter. "Microeconomically Coherent Agricultural Policy Reform in Africa." In J. Paulson (ed.), *The Role of the State in Key Markets* (London: Macmillan, 1997).
- Barrett, C.B., and P.A. Dorosh. "Farmers' Welfare and Changing Food Prices: Nonparametric Evidence from Rice in Madagascar." *American Journal of Agricultural Economics* (August 1996):656-69.
- Bernier, R., and P.A. Dorosh. "Constraints on Rice Production: The Farmers' Perspective." Working paper #39, Cornell University Food and Nutrition Policy Program, 1993.
- Bhagwati, J. "Immiserizing Growth." Reprinted in American Economic Association, *Readings in International Economics*. Homewood, IL: Richard D. Irwin, 1967.
- Carter, M.R., and D. Mesbah. "Can Land Market Reform Mitigate the Exclusionary Aspects of Rapid Agro-Export Growth?" *World Development* 21(July 1993):1085-100.
- Carter, M.R., and B.L. Barham. "Level Playing Fields and Laissez Faire: Postliberal Development Strategy in Inegalitarian Agrarian Economies." *World Development* 24(July 1996):1133-49.
- Chavas, J.P., and M.T. Holt. "Acreage Decisions Under Risk: The Case of Corn and Soybeans." *American Journal of Agricultural Economics* 72(August 1990):529-38.
- Commander, S., ed. *Structural Adjustment & Agriculture: Theory and Practice in Africa and Latin America*. London: James Currey, 1989.
- Cornia, G., R. Jolly, and F. Stewart, eds. *Adjustment With a Human Face*. 2 vols. Oxford: Clarendon Press, 1987.

- Deaton, A. "Rice Prices and Income Distribution in Thailand: A Non-Parametric Analysis." *Economic Journal* 95(Conference 1989):1-37.
- DeJanvry, A., M. Fafchamps, and E. Sadoulet. "Peasant Household Behavior With Missing Markets: Some Paradoxes Explained." *Economic Journal* 101(1991):1400-17.
- Duncan, A., and J. Howell. *Structural Adjustment and the African Farmer*. London: James Currey, 1992.
- Epstein, L. "Disaggregate Analysis of Consumer Choice Under Uncertainty." *Econometrica* 43(1975):877-92.
- Finkelshtain, I., and J.A. Chalfant. "Marketed Surplus Under Risk: Do Peasants Agree With Sandmo?" *American Journal of Agricultural Economics* 73(August 1991):557-67.
- Just, R.E. "An Investigation of the Importance of Risk in Farmers' Decisions." *American Journal of Agricultural Economics* 56(February 1974):14-25.
- Krueger, A.O., M. Schiff, and A. Valdés. "Agricultural Incentives in Developing Countries: Measuring the Effects of Sectoral and Economywide Policies." *World Bank Economic Review* 2(September 1988):255-71.
- Meyer, J. "Two-Moment Decision Models and Expected Utility Maximization." *American Economic Review* 77(June 1987):421-30.
- Ministère de la Production Agricole et de la Reforme Agraire and Food and Agriculture Organization of the United Nations. *Projet Recensement National de l'Agriculture et Système Permanent des Statistiques Agricoles* 5 vols. Antananarivo, 1988.
- Newbery, D.M.G., and J.E. Stiglitz. *The Theory of Commodity Price Stabilization*. Oxford: Oxford University Press, 1981.
- Rajcoomar, S. "Madagascar: Crafting Comprehensive Reforms." *Finance & Development* 28(September 1991):46-8.
- Singh, I., L. Squire, and J. Strauss, eds. *Agricultural Household Models: Extensions, Applications, and Policy*. Baltimore: Johns Hopkins University Press, 1986.
- Stewart, F. *Adjustment and Poverty*. London: Routledge, 1995.
- Weber, M.T., J.M. Staatz, J.S. Holtzman, E.W. Crawford, and R.H. Bernstein. "Informing Food Security Decisions in Africa: Empirical Analysis and Policy Dialogue." *American Journal of Agricultural Economics* 70(December 1988):1044-52.

World Bank. *Poverty Alleviation in Madagascar*. Report No. 7644-MAG. Washington: World Bank, 1989.

World Bank. *Adjustment in Africa: Reforms, Results and the Road Ahead*. Washington: World Bank, 1994.