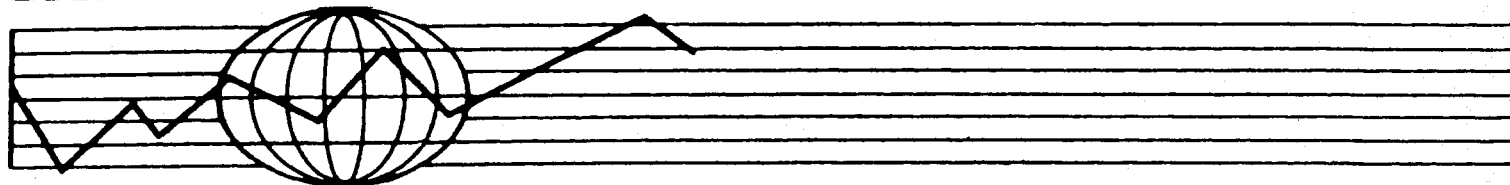**ECONOMIC DEVELOPMENT CENTER**

LABOR MARKETS IN LOW INCOME COUNTRIES: DISTORTIONS, MOBILITY AND MIGRATION

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March 1987

Prepared for the <u>Handbook</u> <u>in</u> <u>Development</u> <u>Economics</u>,

H. Chenery and T. N. Srinivasan, editors

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Labor being by far the most abundant resource in low-income countries, the determination of the returns to labor plays a central role in models of development. Any barriers to the reallocation of labor resources accompanying economic development are potentially critical impediments to further income growth. In the last 25 years, a great deal of knowledge has accumulated about labor-markets in low-income countries. Extreme views on labor market processes that had influenced thought for many years have been moderated by the accumulation of empirical knowledge into a more eclectic and empirically-grounded approach. This transformation has been influenced by both new developments in microeconomic theory concerned with information and risk problems, critical realities of low-income countries, and the increased availability of good data, which have disciplined theoretical exercises and helped weed out the merely clever models from those that inform.

One polar view of labor markets in developing countries was that such markets are riddled with imperfection and/or operate quite distinctly from those in high-income countries; with low-income sometimes being taken to mean that labor was not a scarce resource in some sectors. The alternative view was that labor markets in low-income countries conform more closely to textbook Marshallian markets than do such markets in high-income countries, as the principally rural-based technology in such settings is relatively homogeneous, direct governmental interventions in the labor market are rare, relatively little of the labor force is unionized, and contractual arrangements are relatively uncomplex. There now appears to be important elements of truth in both views, although the influence of problems in other markets, principally intertemporal markets, on labor arrangements is understated in both perspectives.

Are there features of low-income countries that require special attention in modeling the operation of labor markets? Certainly one important and

pervasive characteristic of low-income countries is the large proportion of the labor force in agriculture. To the extent that agricultural production requires different organizations than and/or confronts problems different from those in industrialized sectors, labor market analysis in such countries will differ from those in other settings. A second salient feature of low-income countries is the low proportion of workers who earn income wholly or chiefly in the wage labor market compared to the labor force in high-income countries. Workers in family enterprises or unpaid family laborers (the alternative employment modes) not only dominate the labor force in agriculture, but make up a significantly larger proportion of the work force in the non-agriculture sector as well, compared to that sector in high-income countries. The behavior of the family enterprise and its members, particularly in the context of agricultural production, thus forms the core of many labor market models depicting low-income labor markets.

In this essay, I discuss the operation of low-income labor markets with reference to the models that have been and continue to be influential in shaping the study of such markets. These models are evaluated in terms of their ability to shed light on the realities of the allocation, pricing and employment of labor in low-income countries. In section I, I discuss models directly concerned with and evidence on the employment and pricing of labor in the rural (agricultural) sector. I begin with those models concerned with the shadow value of labor in agriculture that were motivated by the highly-influential "surplus labor" development models positing the redundancy of a large proportion of the rural labor force (Lewis (1954), Ranis and Fei (1961)). This section is also concerned with how rural wages are determined and their rigidity, the social and private costs of reallocating labor from agriculture to other activites, labor supply behavior, labor market dualism and unemployment

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determination. Section II is concerned with risk-mitigating and effort-eliciting contractual arrangements involving rural labor and the organization of the agricultural enterprise in an environment characterized by incomplete markets.

In Section III, I consider the issue of whether labor is efficiently allocated across sectors and across geographical areas and problems of barriers to mobility. Models of migration incorporating human capital investments, information and capital constraints, uncertainty with respect to employment, riskiness in annual incomes, temporary migration, remittances, and heterogeneity in preferences and abilities among workers are discussed. Section IV is concerned with urban labor markets, and addresses issues concerning the duality of urban labor markets and unemployment determination. In the final section, I highlight issues about which there has been little research but which appear to be of importance to the study of developing economies, in particular, life-cycle and intergenerational labor market mobility.

I. EMPLOYMENT AND WAGE DETERMINATION IN RURAL LABOR MARKETS

1. Surplus Labor, Disguised Employment and Unemployment

Since the majority of the population of low-income countries reside in rural areas and agriculture constitutes the largest industry in terms of employment, it is not suprising that most of the literature concerned with low-income-country labor markets is concerned with rural labor markets. A central question addressed is the determination of the opportunity cost of removing a laborer from the agricultural sector. The macro development models of Lewis (1954) and Ranis and Fei (1961), as noted, presumed that in the early stages of development, agricultural laborers would be shifted to the industrial sector without any reduction in total agricultural output. Such economies are characterized as surplus labor economies, i.e., the shadow wage of an

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agricultural laborer is nil. These models also assumed that the private costs of moving out of agriculture for an agricultural agent was his/her consumption, approximated by the average product in agriculture. Thus, private and social costs of reallocating labor are presumed also to be different, the discrepancy implying the immobility of agricultural labor vis a vis the industrial sector and representing a source of inefficiency.

In this section, I review the combined models of household behavior and the operation of the rural labor market that yield the surplus labor presumptions of these macro development models, as in Sen (1966). Three basic extreme approaches have been taken in the literature concerned with the opportunity cost or surplus labor issue. In the first, no labor market is presumed to exist at all. In the second, labor markets are assumed to operate perfectly and in the third, agriculture is assumed to be characterized by rigid wages and unemployment, i.e., agents seeking employment but unable to find it.

In considering these basic models, I will employ for the most part the same prototype model of the agricultural household. I will assume that the household has multiple members, that some members (dependents) do not provide resources to the family (do not work), that household size and its composition are exogenous, that there is a single family welfare function in which the consumption and leisure time of each member is given equal weight, and that the household obtains returns from the land its members work, with the land area being fixed in size. Specifically, I assume that a household with n members and N workers owns or has assigned to it a piece of land on which it produces output X which it also consumes (or sells). The technology of production is given by:

$$X = F(L, A) \qquad F_L, F_A \geq 0; F_{LL} < 0, \qquad (1)$$

where $L = Nh$, $h =$ hours of work and X is total output.

The family welfare function is:

$$U = U(c, \ell), \tag{2}$$

where $c = X/n$ and $\ell = \Omega - h$; i.e., c is average family consumption and ℓ is the leisure of each of the N family workers, where Ω is the total time available to each worker. Each rural household maximizes (2) subject to (1) and other constraints discussed below.

a.   Absent Labor Markets: the Autarkic Household

The simplest route to surplus labor is to assume that there is no labor market and that, contrary to (2), the leisure of household members is not valued. In that case, the only choice variable for the household is the number of hours each member will work and the first-order condition for that choice is:

$$U_c F_L = 0 \tag{3}$$

where U_c and F_L are the marginal utility of consumption and the marginal product of family labor respectively. If U_c is positive, that is, low-income households have not reached satiety with respect to consumption, expression (3) indicates that work time is allocated such that the marginal product of an additional time unit of work (hour) by any family member is zero. Since this is optimal, expression (3) shows that the total output of families with the same amount of land A is invariant to the number of family laborers as long as the work time of family workers never reaches the full extent of Ω hours. Moreover, if a family worker leaves and is not provided any resources by the family (does not become a new dependent), the loss to him/her of moving out is c*, average family

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consumption at $F_L = 0$. The discrepancy between the social and private costs of moving are due here both to (i) the absence of a labor market and (ii) the family sharing rule, for if the migrant family members still received c* when working outside the household, then c* would not enter into the decision to leave.

Sen (1966) considered an autarkic model in which the family welfare function included leisure, as in (2). In that case the first-order condition is:

$$(N/n) \ U_c/U_\ell = F_L, \tag{4}$$

and the marginal product of an extra hour of work by the family worker is no longer zero. Here, labor is in surplus only if the removal of a family member leaves the marginal rate of substitution between consumption and leisure unchanged, since in that case F_L and total output is unaltered. Thus, the existence of labor surplus depends importantly on the characteristics of the family welfare function; specifically, on family members fully compensating for the lost hours of work associated with the loss of a family worker by increasing their labor supply. Sen characterizes this situation as one in which there is disguised unemployment, since hours of work have a non-zero marginal product but laborers can be removed from the household (agriculture) without any loss in output.

b. Perfect Labor Markets

The possibility of compensatory family labor supply leading to disguised unemployment and surplus labor is independent of Sen's assumption of absent labor markets. Consider the perfect-labor market model in which each family member can work as many hours as he/she wants at a given wage per hour and in which labor hours can be hired at a constant wage per hour. Assume, initially,

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for simplicity, that hired laborers are perfect substitutes in production for family laborers. Thus the wage rate of a worker is the same whether he is working on his or her own farm or outside. What is "perfect" about this setup is that there is full information about the work of all individuals and no uncertainty about (labor) costs or returns, features that will be addressed below.

It will be demonstrated below that in such a model, the allocation of labor to production is independent of the family's welfare function; consumption and production decisions are separable and the household will, in maximizing its utility, always maximize farm profits. Letting the maximized profit level be given by Π^*, per-capita family consumption is given by:

$$c = \Pi^*/n + Wh(N/n) \tag{5}$$

and the first order condition for the allocation of family work time is:

$$U_\ell/U_c = W(N/n). \tag{6}$$

Note that the shadow value of leisure for family workers is less than the wage rate, since as long as there are dependents, per-capita consumption increases by less than the (hourly) wage rate when work increases by one hour.

To ascertain if the removal of one worker from the family leads to an increase in the work by other family members when labor markets are perfect we can treat N and n as variables (ignoring, for simplicity, the discrete nature of family membership). In the case in which a migratory family member does not retain his/her rights to farm profits, this can be expressed as a (small) decrease in N compensated by an equal decrease in n. In that case, it can be readily shown that the elasticity of leisure ℓ per remaining family worker with

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respect to a change in the number of family workers N is given by:

$$\eta_{\ell,N} = \frac{N-n}{n} \eta_{\ell,w}^c + N(Wh - c) \, \varepsilon_{\ell,\Pi*} \tag{7}$$

where $\eta_{\ell,w}^c$ is the compensated own price elasticity of leisure and $\varepsilon_{\ell,\Pi*}$ is the income elasticity of leisure.

Expression (6) contains two terms. The first corresponds to the compensated price effect: a <u>reduction</u> in the number of family workers increases the dependency ratio (N-n)/N, lowers the shadow wage of leisure (remaining family workers must give up a larger share of their earnings (Wh)), and thus <u>decreases</u> family labor supply per remaining worker. The sign of the income effect, the second term in (6), will depend on (i) whether a reduction in the number of family workers lowers or raises per-capita consumption, whether earnings per worker Wh exceeds c, and (ii) on whether leisure is a normal good, $\varepsilon_{\ell,\Pi*} > 0$.

If we assume the normality of leisure, then (7) indicates that when the earnings of a family worker is less (more) than per-capita consumption, so that there is a gain to (loss of) per-capita consumption when a worker leaves the family, the demand for leisure declines (rises). Thus, for example, if absent family members lose their rights to family income and lose their obligations to pool their incomes, leisure is a normal good, and consumption from non-earnings income is sufficiently high (so that Wh < c), the labor supply of each remaining family worker unambiguously <u>decreases</u> when a laborer is removed from the household. In that case, output declines by <u>more</u> than the earnings contribution of the shifted laborer. Note that in the special case in which there are no dependents and no non-earnings income (e.g., a landless household), the loss of a family worker leaves the labor supply of remaining workers unaltered--there is neither an income effect (since Wh = c) nor a substitution effect. The loss in

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total output is thus equal to the contribution of the laborer.

The elasticity of total family labor supply Nh with respect to the number of workers N, η, is $1 - \eta_{hN}$ where $\eta = -\eta_{hN} \ell_N$. The labor surplus hypothesis of fully compensating family labor supply is thus $\eta = 0$; when $\eta_{hN} > 1$, family workers decrease their labor supply when a worker leaves, and when $0 < \eta_{hN} < 1$, remaining family workers increase their labor supply but by less than the loss in total family labor supply induced by the loss of the worker.

Estimates of the family worker labor supply elasticity have been obtained by Lau, Lin and Yotoupolos for Taiwan (1978) and Thailand (1979), by Barnum and Squire (1978) for Malaysia, and by Strauss for Sierra Leone (1983) based on the perfect labor market model. In all of these studies, in which absent members are assumed neither to receive nor contribute to family income, total family labor supply is estimated to decline when a household worker is removed. The Lau et al. studies impose a unitary income-leisure elasticity and estimated η to be 1.3 in Taiwan and .94 in Thailand; the Barnum and Squire and Strauss studies used a somewhat more flexible form for the household expenditure system. In both of these studies, estimates of the income-leisure elasticity are far below 1, with η being .62 in (Malaysia) and 0.55 in Sierra Leone, although it was assumed that removal of a family worker has only an income effect. All of these estimates thus reject the behaviorally-based labor surplus hypothesis in the countries studied. Note, of course, that given the same behavioral rules embodied in the household model, differences across the Malaysian and Sierra Leone samples in either the mean proportions of agricultural earnings in total household agricultural income or in dependency ratios, from (7), imply that there will be cross-sample differences in η.

Both η and a family member's opportunity cost of outmigration depend on the family sharing rule. If the migrant worker retains all familial rights and obligations, then the relative private gain (or loss) from migrating depends

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only on the ratio of market wage rates at home to those in the new area, implicitly assumed to be the same in equation (5). The sign of $\eta_{\ell,N}$ will then depend only on whether the migrant worker's earnings are higher or lower in the new setting or in the rural market. The evidence on migrant-family income pooling is discussed below in the context of the migration literature.

   c. <u>Unemployment, Underemployment and Rigid Wages: the Nutrition-Based Efficiency Model</u>

The third theoretical route to surplus or redundant labor is to hypothesize that there are agricultural agents willing to or seeking work but unable to find employment, unable to contribute to production. If wages do not decline in the face of this excess supply of laborers, the removal of workers from agriculture presumably leaves the number of employed people and thus agricultural output unchanged. The question of theoretical interest in this approach is why wage rates are downwardly rigid.

The most important explanation for the downward rigidity of rural wages is the nutrition-based-efficiency wage model (Leibenstein (1957), Stiglitz (1976), Mirrlees (1975)). In this framework, labor effort (or labor power) is distinguished from labor time worked. While time worked is (or may be) a family decision variable, as above, individual labor effort per unit of time is hypothesized to be a technological (i.e., non-behavioral) and particular function of individual nutritional intake or consumption at low consumption levels. The appeal of the nutrition-efficiency wage model is that it provides a reason why low-income labor markets might be different from high-income labor markets. In this model, low income <u>per se</u> is the cause of a labor market problem (unemployment), not the reverse. Like the labor surplus hypothesis, however, as will be discussed below, it is unclear if the model has any relevance to any known population on this planet.

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The central element of the nutrition-based efficiency wage theory is a hypothesized technical association between a worker's consumption c and his work effort λ per unit of time. Thus the production function (1) is modified such that output is a function of total labor effort, rather than just labor time.

$$X = F(Nh\lambda(c)), \quad \lambda' > 0, \ F' > 0 \tag{8}$$

In Mirrlees (1976) and Stiglitz (1976), the work effort λ-function is given by Figure 1. Alternatively, as used in Bliss and Stern (1978) and Dasgupta and Ray (1984), the functional relationship between c and λ is given by Figure 2. The non-convexity in the Mirrlees-Stiglitz function gives rise to a number of theoretical oddities, including the implication that an unequal distribution of consumption among family members may be optimal even when the family welfare function is additive in family members' utilities. Both forms provide the same explanation for the possible coexistence of unemployment and downwardly rigid wages.

In its simplest form, the efficiency wage theory assumes that the consumption of all workers is provided solely out of wage income, there are no lags between productivity and consumption, and employers can appropriate all of the additional effort induced by the wage increase. The latter two assumptions imply that the theory, if it is relevant at all, may be most appropriately applied to longer-term contractual relationships between the worker and employer, i.e., when the contractual period exceeds the likely lag between consumption and productivity, and in situations where the employer can monitor the consumption of the worker (by providing, for example, meals at the work site). While the latter is not uncommon, the predominant contractual period in many rural areas of low income countries does not exceed one day (see Section II below).

The efficiency wage model also assumes that laborers are in infinitely
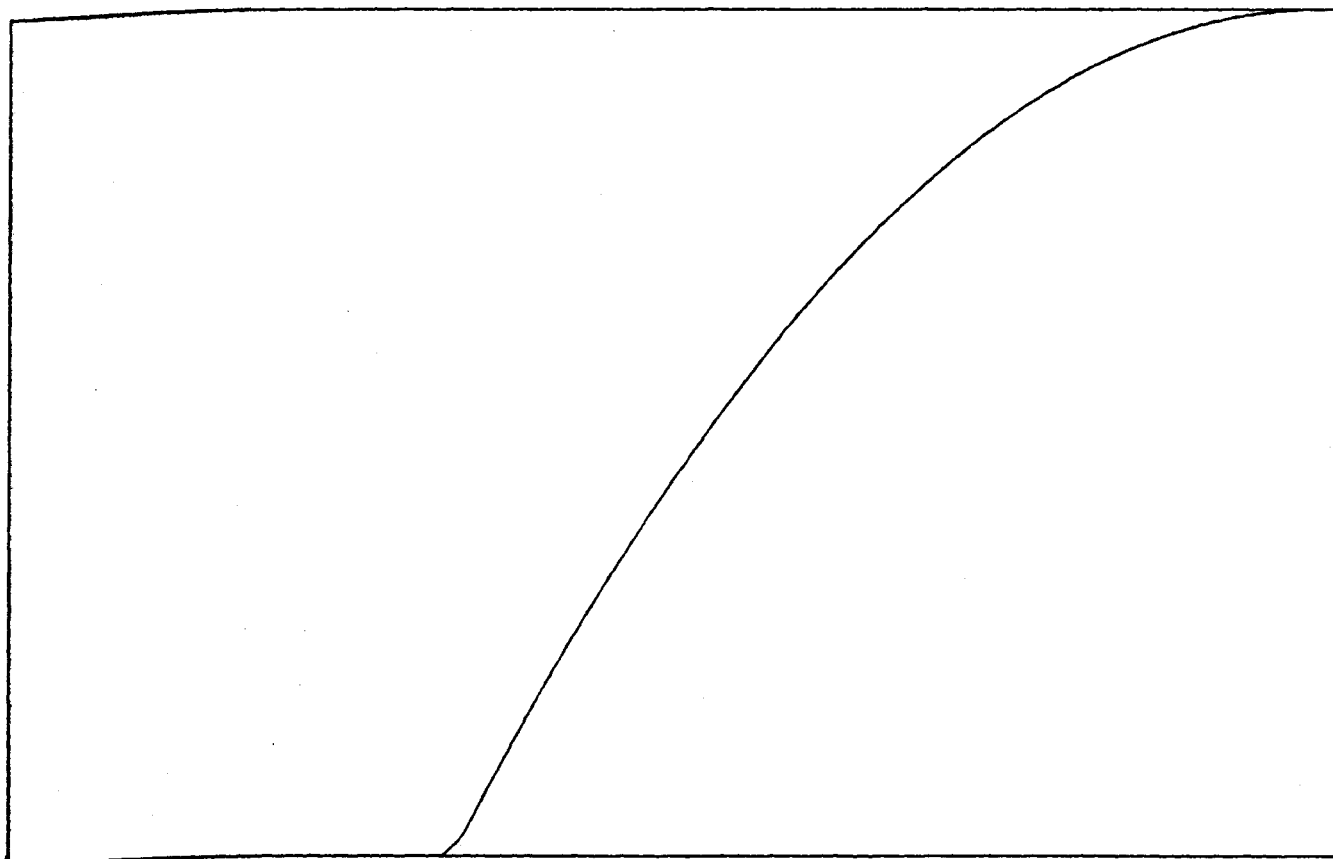
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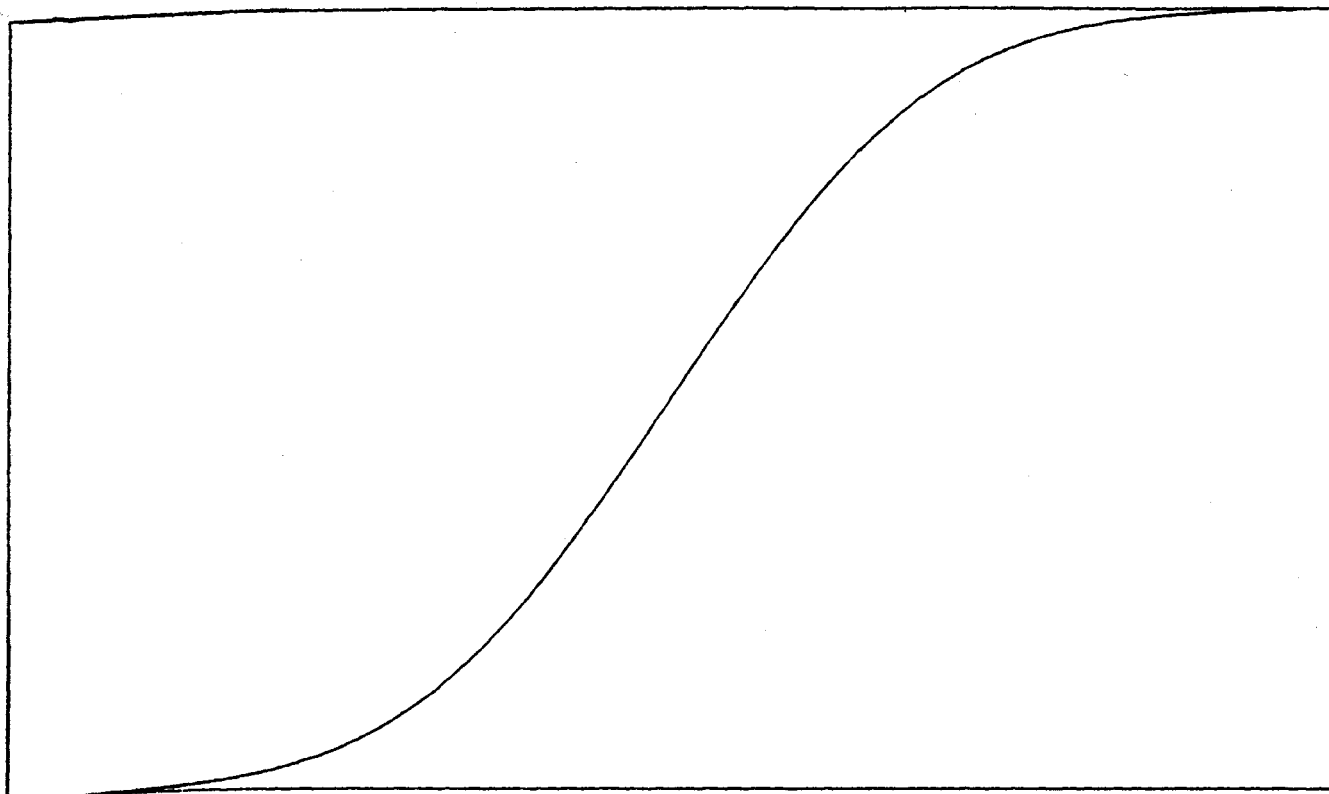
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FOOD CONSUMPTION

elastic supply at some time wage W. It is easy to show that, given (8), profit-maximizing firms may pay a time wage higher than W if W is sufficiently low. The firm or employer's problem is to select the amount of labor and the time wage that maximizes profits. Assuming for simplicity that each worker works some standard amount of time, then the farm or firm chooses optimally the number of employees N and the wage paid each worker (=his or her consumption); i.e.:

$$\text{Max } F(N\lambda(W)) - NW \qquad\qquad\qquad (9)$$
$$N, W$$

The necessary first-order conditions for (9) yield an equation which can be solved for the _efficiency_ wage, that time wage which minimizes the cost per level of effort, given by:

$$\frac{\bar{W}}{\lambda} = \frac{1}{\lambda'} , \qquad\qquad\qquad (10)$$

where it is assumed that $c = W$. This efficiency wage ω is chosen such that the average cost per level of effort just equals marginal cost $(\lambda')^{-1}$, or the tangent from the origins in Figures 1 and 2 to the respective λ curves. Expression 10 indicates that firms paying time wages below ω will experience diminished profits; an excess supply of workers cannot therefore bid down the time wage below ω. The efficiency wage sets a floor to wages.

Some immediate difficulties with this simplest form of the theory are that, as long as wages are the only source of consumption, the optimal level of savings is zero and there would be no dependents (Gersovitz (1985)). Moreover, all unemployed workers would disappear (starve). Leibenstein (1957) attempts to resolve this latter problem by hypothesizing that employers altruistically conspire to lower wages below ω (and thus their profits and total output) so that all workers are employed. In that case, removal of a worker from the rural area allows this "institutional" wage to rise. More interestingly, outmigration

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increases total output, since all workers, now consuming more, supply more effort until the institutional wage rises to just equal the efficiency wage--the marginal product of a laborer in this full employment equilibrium is _less_ than zero. Leibenstein labels the maximum quantity of workers who, if removed from the agricultural sector, would increase agricultural output, as the underemployed. This definition of underemployment, while precise, differs from others in the literature, discussed below.

An alternative to the employer altruism-conspiracy scenario is one in which jobs are rationed randomly on a daily basis among potential workers. Those workers who are hired on a given day receive the efficiency wage and put in the "full" level of effort dictated by the efficiency wage function. On those days workers are not hired, they do not eat. In this case the workers receive a wage lower than the efficiency wage in the expected value sense; a "wage" that rises and falls inversely with the number (supply) of workers willing to work. Here, since workers eat on some days, they need not disappear as long as there are biological "savings." However, this story requires that the efficiency-consumption relationship is strictly contemporaneous--a day's work effort is a function only of that day's wage (consumption).

If the efficiency wage model is modified to include alternative sources of consumption other than wage income for some workers, the model predicts diversity in time wages among workers, as long as employers have information about individual workers' circumstances (a likely scenario in the village economy). In particular, the model would imply that the time wage rates received by workers will vary with the number of workers and dependents in their family and with their income from land (land ownership holdings) to the extent that employers are informed about workers' alternative income sources and family composition. To see this, assume that there are excess supplies of landless

laborers so that the equilibrium wage per unit of labor effort λ is $\omega / \lambda(\omega)$,

where $c = \omega$ for workers from landless households. Two polar cases have been

discussed in detail. In one, the employment decision is made by a monopsonistic

employer (Bliss and Stern (1978a)); in the other, employers are competitive

(Dasgupta and Ray (1984)).

Consider a monopsonist who can employ the landless laborers ν_0 at time wage

ω and ν_1 "landed" laborers from households in which some non-earnings income V

is shared among N members (all of whom work); the monopsonist maximizes profits

by choosing the time wage ω_1 to be paid to the ν_1 landed laborers and optimal

quantities of ν_0 and ν_1. The problem is:

$$\max \ F(\lambda_0(\omega)\nu_0 + \lambda_1 \ (\omega_1)\nu_1) - \nu_0\omega - \nu_1\omega_1 \qquad (11)$$

subject to a landed laborer availability constraint $\nu_1 \leq \bar{\nu}_1$ from which it can be

shown that

$$\lambda'(\omega) = \lambda' \ (\omega_1 + V/N). \qquad (12)$$

and $\nu_1 = \bar{\nu}_1$; that is, the monopsonist pays out wage rates such that the

consumption of both landless and landed laborers is equalized. Since this means

that the monopsonist pays a lower time wage to landed workers, $\omega_1 < \omega$, to

achieve the same efficiency per worker-hour , such workers are preferred to

landless workers and landed workers will always be hired before the landless.

Landless workers are only hired if not enough landed laborers are available for

work. Among the landed, moreover, those with higher non-earnings income receive

lower wages and those with more family members (or dependents) receive higher

wages. The monopsonistic-efficiency wage model thus implies that (i) no landed

workers are unemployed (if any landless workers are employed) or, conversely,

only landless workers are unemployed, (ii) landless workers receive higher time

wages than landed workers, and (iii) time wage rates are inversely related to sources of non-wage income and positively associated with family size or the number of dependents (for those with alternative income sources).

In the competitive equilibrium case considered in detail in Dasgupta and Ray (1984), wage rates also differ across worker types. Here, because of competition, each worker receives the same payment per unit of work effort. Thus those workers with higher levels of alternative consumption sources, and who supply more effort per time unit, command a higher time wage in the market, in contrast to the monopsonist case. Thus, if the landless are employed, they receive time wages lower than workers with alternative consumption sources. In this case, (i) those (landed) workers with the highest consumption prior to their wage employment both command the highest time wage and are the least likely to be unemployed (note that such workers may choose not to seek work if their non-employment income is sufficiently high), (ii) time wage rates are lower for those (landed) workers with more dependents and (iii) if the competitively-set effort wage implies a time wage for the landless at or below the efficiency wage then at least some and possibly all landless workers are unemployed. An interesting and serendipitous distributional implication of this model is that there may exist an equalizing redistribution of landholdings, if there is unemployment under the regime of unequal landholdings, that will increase total output. The reason is that the redistribution increases the amount of efficiency units employed by reducing the number of individuals too poor to gain employment. However, in this model the problem of the appropriability by competitive employers of wage-induced efficiency gains is not discussed, a problem that is naturally circumvented in the monopsony model.

It is clear that a nice feature of the nutrition-based efficiency wage model is its large number of testable implications. Despite this, there have been few direct tests of the predictions of the theory. Bliss and Stern (1978b)

review some evidence both from the nutrition and economics literatures (but perform no rigorous tests of their own). There are a number of different tests possible. The most basic would be to test if productivity is positively related to food consumption. Another would be to test if wage rates are related to workers' consumption or to the determinants of per-capita consumption, such as the number of dependents or the amount of income-producing assets. Before considering these, however, it is important to examine empirically the central proposition that wage rates have a floor and unemployment is substantial in rural labor markets, for these are the phenomena that motivate the theory.

India would appear to be a good country in which to test the applicability of the nutrition-wage efficiency theory, as it is a low-income country with reasonably good data on employment and wages. Inspection of the 1961 Indian Census reveals rural unemployment rates for males and females of less than one percent. However, as noted by Sen (1975), the Census criteria for rural unemployment are very restrictive. A person is unemployed only if he or she did not work at least one hour per day on a regular basis during the "working" season and is "seeking" work, where work is inclusive of activities in family businesses that provide no direct compensation. The National Sample Survey (NSS) of 1960-61, and subsequent rounds of that survey through the latest (1982-83), have constructed alternative measures of unemployment based on different definitions. In 1960-61, for example, rural unemployment rates according to the NSS were 2.6 percent for males and 6.5 percent for females, where the unemployed were defined as persons who did not work at least one day in a reference week and were seeking work, criteria more like those of employment surveys in developed countries. While the concept of unemployment is difficult to measure, whether current or usual employment status is used, measured rates do not suggest that unemployment, as more or less conventionally defined, is any more a

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salient feature of rural labor markets in the second most populous country in the world than it is in developed countries. Moreover, wage rates are quite flexible over the crop season in India, as they are in Egypt (Hansen (1969)) and Indonesia (White and Makali (1979)). It is not clear, therefore, why a special theory of unemployment is required for rural labor markets. However, the seasonality of agricultural production implies some special employment problems, discussed below, some of which may uniquely lead to unemployment.

The lack of an overly conspicuous unemployment rate according to the only data sources available providing information on this phenomenon may not be sufficient to convince those who understand the difficulties of measuring unemployment of the absence of important wage-rigidities. Thus it may also be useful to examine whether the distribution of (time) wage rates in India exhibits a floor. In particular, if the nutrition-productivity relationship is stable, based as it is on presumably biological grounds, one would expect that the minimum of real wages across the year would be similar across areas. The difficulty is that computation of area-specific real wages, at least in a country such as India, is problematic, given quite different sets of relative prices and consumption patterns across regions. Moreover, the model implies, as we have seen, that wages will differ by the characteristics of workers. Thus, inter-area differences in family structure and in landholding patterns will result in variations in the distributions of time wages paid across areas. However, the ratio of male to female wage rates should exhibit stability across areas if the consumption-productivity association is stable since (i) this ratio is unaffected by inter-area variability in relative food prices and (ii) males and females may not be distributed too differentially across households characterized by their landholdings. Table 1 displays the distributions of the male-female agricultural wage ratios across Indian districts in 1960-61, from Rosenzweig (1984), and for six Indian villages in the semi-arid tropics of that

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Table 1

Distribution of Female-Male Agricultural Wage Ratios in India:

159 Districts in 1960/61 (All India) and Six Villages,

1974/75-1982/83, in the Semi-Arid Tropics

Percent of Men's Wages	District Distribution 1960/61[a]	Villages Distribution 1974/75-1982/83
< 40	3.1	1.9
40-45	1.9	9.3
45-50	3.8	11.1
50-55	3.1	16.7
55-60	8.2	16.7
60-65	8.8	14.8
65-70	9.4	11.1
70-75	23.9	9.3
75-80	15.1	7.4
80-85	9.4	1.9
85-90	5.0	-
90-95	4.4	-
95-100	3.8	-
Mean	79.6	58.7

a. Source: Agricultural Wages in India 1960-61.

b. Source: ICRISAT Village Studies, 1984.

country in 1974-75 through 1983-84. As can be seen, there is considerable variability exhibited. Such variation, unexplained by the nutrition-wage theory, of course, requires an explanation. One possibility is that the relative number of male and female workers varies by wealth holdings. Geographical variability in wage rates and labor supply behavior are discussed below.

What of wage diversity, called an "odd implication" of the nutrition-efficiency wage theory by one of its authors (Mirrlees (1976))? Do individuals by dint of their relationship to land receive different wage rates for the same work? Rosenzweig (1980), using data on 700 male and 522 female rural agricultural workers from a national probability sample of rural Indian households, tested this proposition. He found that, controlling for age, weather, schooling and some local industry variables, a worker's wage rate in agriculture was not statistically significantly related to the amount of land owned by the worker or his/her family. He did not test whether the number of dependents affected the wage rate received, since this would have involved the difficult task of taking into account the possibility, implied by fertility models (e.g., Willis (1973)) and evidence (e.g. Rosenzweig and Evenson (1977)), that family size is itself a function of wage rates. The uniformity of sex-specific daily wages paid adult workers is also noted by Bardhan and Rudra (1981) in West Bengal and by White and Makali (1979) in West Java.

There does not appear to be support for any of the wage diversity predictions of the nutrition-based efficiency model nor any obvious evidence of the phenomenon the theory was originally designed to explain, namely, the coexistence of high unemployment rates and rigid wages in rural areas of low-income countries. What of the hypothesis that productivity is significantly affected by food consumption, of the relationships depicted in Figures 1 and 2?

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Bliss and Stern (1978b) and Strauss (1986) review the evidence from both experimental and non-experimental studies. Both studies do not find much, if any, rigorous supporting evidence. One fundamental problem with the evidence is that food consumption is obviously dependent on a worker's earnings as well as (possibly) a determinant of earnings. None of the studies prior to Strauss' work have treated this problem econometrically--that is, it is not clear whether Figures 1 and 2 merely trace out a consumption function.

Strauss (1986) estimated a production function similar to that in expression (8) based on Sierra Leone survey data, with per-capita calorie consumption of family workers employed as a production input. He employed simultaneous equations methods to circumvent the problem that unobserved factors influencing output, such as land quality, farmer ability, etc., will also increase consumption (and influence other input allocations). His estimates indicate that output does increase at a decreasing rate with per-capita calorie consumption (the effects are statistically significant). Strauss does not attempt, however, to test whether the relationship has a nonconvex segment, as in Figure 1. Of course, the model implies that no one would be observed to be on this segment of the effort-consumption curve in equilibrium. Experimental data may be needed.

Despite the evidence for the nutrition-productivity association, Strauss reports that daily wage rates in Sierra Leone vary by season, by sex and by region but not by the caloric demands of the task performed. It is curious why wage payments do not appear to reflect the nutrition-based differences in productivity found by Strauss. Agents might be ignorant of the relationship (or know it not to be important!), but more likely what bars the use of such information, if true, is the difficulty of ascertaining or monitoring the food consumption of individual workers. The income-sharing egalitarian household may "tax away" any additional earnings of individual members by reducing their food

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allocation and workers have incentives to "appear" well-fed. Only the food consumption of family members or attached servants (longer-term contract labor) could be monitored and/or controlled; but the latter form of employment is relatively scarce; most workers do not work even from day to day for the same employer (Strauss (1986), Bardhan and Rudra (1979)). The difficulties of ascertaining the intra-household allocation of food are well-known to survey researchers; measuring and monitoring an individual's contributions to output may be no less difficult than ascertaining his/her inherent productivity through the monitoring of food intake. Such issues of moral hazard and information constraints are not discussed in the literature on the nutrition-based efficiency wage theory; these considerations are discussed more fully below.

The nutrition-based efficiency wage model is only one of a set of models developed to explain the (second-best) optimality of downwardly rigid wages and an excess-applicant equilibrium. Other models include the labor recruitment model of Bardhan (1979), the screening model of Weiss (1980), and the turnover model of Stiglitz (1974). These models have no particular relevance to low income rural labor markets; since the pervasiveness of daily labor markets in such settings implies that turnover or recruitment costs are probably quite low. The prevalence of such spot labor markets vis a vis other contractual arrangements in rural areas has not received a satisfactory explanation however. I discuss alternative equilibrium models in the context of urban labor markets, where their applicability appears more obvious.

2. The Family Enterprise Model and Agricultural Dualism

The conventional model of labor markets distinguishes between the institutions that determine the supply of labor to the market--households--and the institutions that utilize and demand labor for production purposes--firms. For an important segment of the rural economy of low-income countries, both the

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demand for and supply of market labor are determined within the same organization, the family enterprise. The majority of households in agriculture, and a large proportion of households in the non-agricultural sector, integrate production and consumption decisions.

The modeling of the family enterprise in the context of "peasant" agriculture has a long tradition beginning with Chayanov (1925 [1966]). Singh et al. (1985) provide an excellent overview and summation of the relevant work concerned with modeling and econometrically estimating the family enterprise model in agriculture, what they call the agricultural household model. A prototypical model is analagous to the standard international trade model of a small, price-taking economy and is similar to the perfect labor model described in the previous sections in which households (i) are price-takers for all production inputs and consumption goods (including lesiure) and (ii) family and hired labor are perfectly substitutable in production. In this static one-period, perfect certainty model in which all markets exist and are competitive, as noted, consumption and production allocations are separable; the allocation of production inputs are independent of the household's preference orderings, and thus of (i) the relative prices of goods that are consumed but not produced and (ii) the household's wealth. Thus all households in maximizing their utility also maximize profits.

The separability property of the perfect markets family enterprise model has important implications. To see this, consider a one-person variant of the model. Preference orderings are described by the utility function (13).

$$U(X^c, \ell) \quad U_i > 0, \ U_{ii} < 0 \quad i = X^c, \ell \tag{13}$$

where X^c = good consumed, ℓ = leisure time. Given a market wage rate W and a price p for the good produced according to the technology embodied in (1), the income constraint of the "household", is:

$$V + pF(L,A) - WL + Wh - pX^c = V + \Pi - Wh - pX^c = 0 \tag{14}$$

where V = income from sources other than wages and profits, and $h = \Omega - \ell$. The household maximizes (13) subject to (14), choosing optimal quantities of labor in production L, leisure time ℓ, and consumption X^c. The necessary first-order condition for the labor input in production is:

$$pF_L = W, \tag{15}$$

which is the profit-maximizing condition.

The optimal leisure-consumption good combination is given by (6), with N = n and p = 1. Condition (6) is identical to that for landless households not engaged in production activities, that merely sell labor in the market, since their full income constraint is identical to that in (14) except that $\Pi = 0$. Thus, labor supply behavior would appear to be similar across producer-consumer and pure consumer households facing identical prices and having equal endowments of <u>wealth</u> $(V + \Pi)$. However, that is not the case. Consider the effect of a wage change on labor supply. The appropriate expression, in elasticity terms, is:

$$\eta_{h,w} = -\eta^c_{\ell,w} - \frac{W(h-L^*)}{F} \varepsilon_{\ell,F} \tag{16}$$

where F = full income = $pX^* - WL^* + \Omega W + V$, and X^* is the profit-maximizing output level. The first term is the negative of the conventional Hicks-Slutsky compensated own price (wage) elasticity, and must be positive. The second term is the income elasticity weighted by the share of <u>net</u> labor supply in full income, where net labor supply is the difference between the (optimal) amount of labor used in production L^* and the (optimal) amount of labor supplied by the family worker.

Net labor supply can be positive or negative. On "large" (small) farms, where total labor demand exceeds (is less than) the amount of labor supplied by the family, net labor supply is negative (positive); that is, labor is "imported" (exported). Increases in the market wage rate thus reduce full income for importers of labor and increase full income for net exporters of labor. Consequently, if utility functions are approximately homothetic and leisure is normal, households without land (exporters of labor to the market) will, on average, exhibit lower labor supply elasticities than will households with land. Rosenzweig (1980) tests and confirms these implications of the complete markets, static agricultural householed model using Indian household data.

Households will also differ with respect to the responsiveness of their labor supply to changes in the price of goods that are both consumed and produced. The relevant elasticity expression is:

$$\eta_{h,p} = -\eta_{\ell,p}^c - \frac{p(X*-X^c)}{F} \varepsilon_{\ell,F} \tag{17}$$

Again, the income elasticity of leisure is weighted by a term that differs across households with different levels of productive assets but the same exogenous wealth, in this case according to whether the household is a net consumer or supplier of the X good. A rise in the price of the agricultural good increases the income of net suppliers of the X-good to the market ($X*>X^c$) and reduces their labor supply if leisure is a normal good and leisure and goods are not strong complements. For landless and small-farm net purchasers, however, the price rise could increase labor supply.

Despite these differentials in the responsiveness of labor supply to exogenously-induced alterations in wages that are associated with land ownership in the complete markets model, a reallocation of land holdings does not affect

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the efficiency with which inputs are used or total output (net of demand effects) in the absence of technological scale economies. The absence of a land market implicit in these models (land holdings are usually assumed exogenously given and identical to operational holdings) thus is not a barrier to efficiency because of the free movement of labor (and all other production inputs) across farms.

In contrast to the complete markets model is the model of the family enterprise in which no markets exist (Sen (1966)), or, equivalently, in which there is a separate market for each household. In this autarkic or perfectly segmented markets model, labor in production is always (and can only be) supplied to a plot of land by the household that owns (or is assigned to) that land, i.e., h = L. From the first-order condition for labor allocation in this model, given by (4), it can be seen that a family's preference orderings affect production. Hence, the allocation of inputs will be dissimilar among farmers heterogenous in wealth (financial assets) even among farmers with identical-sized plots of land, and, given heterogeneity in preferences or household demographic structure, even among farmers with identical sets of assets.

The "subjective equilibria" of the absent or segmented markets model are inconsistent with the achievement of productive efficiency, as the shadow or virtual prices of productive inputs will differ across farms; that is, a reallocation of labor across "markets" can increase total output. Moreover, unlike in the complete markets model, a rise in the product price, which has both income and substitution effects on family labor supply, can induce a reduction in output. A "backward-bending" output supply schedule is likely when what is provided is also consumed and leisure and the consumer-produced good are substitutes in consumption. The "backward-bending" supply curve of family labor, a possibility in both models, can only be reflected in the output supply response of autarkic households, since neither income nor substitution effects

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in consumption are relevant to the allocation of farm labor or other production inputs when no markets are absent.

Dualistic models of agriculture posit the coexistence of households characterized by the two models. In particular, "small" landholders do not participate in the labor market and are characterized by autarky, while "large" landowners purchase labor at the market wage and profit maximize. The implication of this framework stressed by its proponents is that the poorer, small landowners in their subjective equilibria will supply more labor per acre than will the large landowners, since the cost of labor to the larger farmers is likely to exceed the subjective marginal rate of substitution between leisure and goods among small farmers. Note that absent labor markets are not sufficient for this inefficiency result, since there would be incentives for larger farmers to rent out their land to smaller landowners in order to take advantage of their lower labor costs. Given barriers to both the movement of labor and land across farms, the obvious prescription for the achievement of increased efficiency and output, as in the nutrition-based, efficiency wage model, is an egalitarian redistribution of landholdings.

Empirical evidence appears to strongly reject this extreme form of dualism. Evidence from Egypt (Hansen (1969) and from India (Paglin (1965), Rosenzweig (1978, 1984)), for example, indicates that small farm households participate substantially in the labor market; indeed, as both buyers and sellers of labor. Dichotomization of family enterprises according to their objective functions (profits or utility) or by their isolation from markets thus appears less empirically relevant than distinguishing among households by their status as net consumers or producers of specific agricultural goods or net importers or exporters of wage labor. These latter distinctions are relevant to the distributional impact of policies altering wage rates (labor demand) or

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commodity prices, since we have seen that they determine the direction and magnitude of income gains from such price changes. Discrepancies across farms in the prices of production inputs might exist, however, for other reasons than posed in the traditional, extreme dualism models. These are discussed in the next section.

There have been a number of econometric studies of the complete markets, family enterprise model; these are reviewed in Singh, et al. (1986). All of these studies maintain but do not test the assumption of separability; thus estimates of the technology are obtained separately from and independently of estimates of the parameters describing household preferences and consumer demand, sometimes with different samples (from the same country) for each household sector. One additional pervasive feature of these econometric studies is the aggregation of family labor supply and labor demand across sex and age groups and the specification of one labor price (a "unisex" wage). While the Hicks composite goods theorem justifies aggregation of consumption goods over individual family members, since each member faces the same goods price vector, as displayed in Table 1, for example, relative wage rates for male and female (and child) labor vary significantly across areas and over time.

In Rosenzweig's (1980) study of Indian household data, it is shown that not only do male and female labor supply elasticities differ substantially, with female labor supply being substantially more elastic than male labor supply (as in developed countries), but there are important cross-wage effects. For example, increases in relative male wage rates significantly reduce the amount of labor supplied to the market by women (wives), while increases in female wage rates relative to male wage rates raise female labor supplied to the market and slightly reduce the amount of male market time. The marked differentiation in agricultural tasks by gender (K. Bardhan (1984)) also suggests that sex-specific labor inputs are not perfectly substitutable in production, as also assumed in

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most econometric studies.

Lopez (1985) is the first econometric study to test (and reject) the separability (complete markets) assumption; however, the model formulated assumes a specific source of non-separability--that the time spent in on-farm and in off-farm activities are different consumption commodities. Aside from this, the Lopez study, as in all other applications of consumer demand models, embeds the test in a particular specification of household preferences (in this case, a specification implying linear Engel curves). In addition, Lopez employs geographically aggregated data (Canadian census divisions) and ignores labor heterogeneity associated with sex. Pitt and Rosenzweig (1985), in a more loosely-structured econometric analysis of household data from Indonesia (with, however, sex-specific disaggregated labor), performed an indirect test of separability. They found that while a farmer's illness significantly reduced his labor supply, farm profits net of actual and imputed family labor costs were not affected. These results imply that those farm households afflicted by illness were able to substitute hired for the lost family labor time with no sacrifice in factor returns. The econometric evidence on separability is, at this stage, inconclusive.

The perfect markets (separable) and segmented, household-specific markets (autarkic) models represent polar opposites. A more general framework for modeling rural markets would incorporate the possibility that the household faces two prices in each market, a purchase price, paid by the household when it buys the commodity, and a sale price, received when it sells the commodity. The separable model assumes that in all markets purchase and sale prices are equal. When a wedge exists between these two prices, however, some households may optimally choose not to participate in one or the other side of the market or not to transact at all. The existence of distinct transaction prices in

particular markets thus may provide implications for observed behavior in rural economies, but themselves require explanation.

II. RURAL LABOR CONTRACTS: RISK, INFORMATION AND INCENTIVES PROBLEMS

The complete markets and autarkic household models, as noted, are extreme caricatures of rural labor markets. While the latter appears to be of little relevance to at least Asian and Latin American low-income countries and the former may be a reasonably good approximation of the behavior of agents in rural labor markets, with the important advantage of econometric tractability, a number of nontrivial problems are ignored. First, even the daily labor market does not operate perfectly smoothly. Not all seekers of wage work can find employment at any time and not all employees can find workers at the market wage when they need them. When small-farm household members on a given day seek but cannot find work, they are likely to work their own land, supplying labor on that day up to the point where their marginal rate of substitution between goods and leisure equals the marginal value product of their labor time rather than the market wage. Similarly, on larger farms, when insufficient labor time can be purchased on the market, i.e., the notional demand for labor at the going wage exceeds the amount of labor that is hired, the marginal value of labor will exceed the market wage. Such frictions in the labor market could yield the result that the marginal product of labor on small farms is less than that on large farms ("weak" dualism), although, again, such discrepancies could be minimized if there were no barriers to the land rental or sales market. Note that in this model, if the probability distribution of these frictions is common knowledge (and appropriately specified), the expected marginal product of labor may not differ between small and large farms.

Ryan and Ghodake (1984) compared unemployment probabilities for men and women in the daily agricultural labor market in six villages in the semi-arid

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tropics of India. They found that in 13-14 percent of the total number of days male laborers were willing to work, they could not find employment. Their results did not support, however, the additional hypothesis that small farmers behave as if the opportunity cost of male labor is the male market wage multiplied by the probability of finding employment, although they did find evidence of such behavior with respect to the opportunity cost of female labor, Bardhan (1979) also concluded from his study of Indian survey data that male labor supply behavior is not importantly affected by unemployment prospects, although that of females is. No empirical studies appear to exist which document the uncertainties surrounding the hiring of labor. This is peculiar, since employers and employees are often the same people and there do not appear to be any obvious asymmetries in the market. Indeed, Bell and Srinivasan (1985) emphasize the employee-employer symmetry of employment uncertainties in their study of the demand for and supply of farm servants, discussed below.

More fundamental aspects of low-income, rural labor markets are also not reflected in the complete markets model. These include the inherent riskiness and seasonality of agricultural production, the absence of an insurance market, and information cum incentives problems. As a consequence, the model cannot account for such contractual arrangements as sharecropping, the prevalence of daily (casual) or spot markets relative to longer-term implicit or explicit labor contracts, or even why the family enterprise is the dominant agricultural organization.

A principal theme of the rapidly-expanding literature concened with contractual arrangement in rural economies is how the incompleteness of markets (the existence of unmarketable inputs) combined with some of the special attrributes of agricultural technology shape labor arrangements. Two classes of models, each emphasizing different market problems, are predominant in the literature. The first class of models emphasizes the riskiness of agriculture

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due principally to the unpredictability of an important agricultural production input, weather, and the absence of a market for output insurance. These two characteristics of the rural economy imply that contractual arrangements in the labor market might contain elements that in part substitute for the absent insurance contracts, given risk-averse agents.

A second problem highlighted in this literature rests on the assumption that "labor" is composed of two bundled factors - time and effort - as in the efficiency wage models, except that effort in this context is a choice variable and effort cannot be costlessly monitored. While work time and work effort both affect the utility (negatively) of their suppliers and contribute to output, there is no distinct market for each. The time wage-rate alone insufficiently rewards effort, which must be elicited by other means. Thus, in this class of models, the utility function (2) becomes

$$U = U(c, \ell, e), \tag{18}$$

where e = effort, $U_e < 0$, and labor is expressed in terms of effort units in the technology, as in (8).

The prevalence of the family enterprise in agriculture can at least in part be explained on the basis of the problems of production risk inherent in agriculture and on effort incentives or "moral hazard" problems (Binswanger and Rosenzweig (1986)). For example, family members may be more able than others to enter into risk-sharing and consumption smoothing arrangements, as discussed in Section III.4 below.

The tendency for workers to withhold effort, to shirk, without supervision when paid only according to their time worked is viewed as the principal reason why production costs rise after a certain point with the scale of agricultural operations. While payments according to tasks performed or output produced

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(piece rates) provide superior incentives to time wages, since they directly reward effort, such arrangements are not feasible where haste can cause damage (weeding or apple picking). Thus, farm operations cannot be performed exclusively with workers paid by piece rates. Family labor is seen as superior to hired labor, since family laborers are residual claimants on the profits of the family enterprise, as in the model described by equations (1), (2) and (5); their consumption levels are thus directly tied to their work effort. As the number of family members increases, however, the share each individual family member receives from family profits is diluted. Thus, there is a natural upper bound to the optim al size of the family labor force and to the size of agricultural operations. Large landowners can avoid hiring (time) wage laborers by renting their land out in smaller parcels to other families, since land tenancy transforms non-family workers into residual claimants with the accompanying incentive efficiencies.

Binswanger and Rosenzweig also claim that the salient exception to the income-sharing, family-run farm enterprise, the plantation system, with its large-scale use of hired labor, can be explained by the inherent technological features of the crops grown. The plantation system is only advantageous when (i) there are important scale economies in processing <u>and</u> coordination problems between harvesting and processing, as in sugar cane, and/or (ii) the crops require sustained care across the usual crop cycles, which bars the use of annual tenancy contracts.

1. Casual and Permanent Laborers: Spot and Future Markets for Labor

The two classes of models, one emphasizing risk and the other incentives, problems, characterize the literature concerned with explaining an important feature of the rural labor market--the coexistence of "casual" laborers, hired on a daily basis in the spot market, with "permanent" laborers, also called attached farm servants, who are hired in advance for multiple time periods at a

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fixed wage. All models purporting to describe the "two-tiered" rural labor market highlight the two-stage nature of agricultural technology. The production process is described by (19) and (20), instead of (1).

$$x - f(L_1, A) \tag{19}$$

$$X - F(L_2, A, x, \theta) \tag{20}$$

where x - intermediate output, a function of first-period inputs, and θ represents exogenous and stochastic inputs beyond the control of the farmer (state of nature, weather). The work force in period i is composed of casual and permanent workers, the latter being hired in both production periods. Thus, $L_i - L_p + L_{ci}$; $i - 1, 2$.

Bell and Srinivasan (1985) and Bardhan (1983) emphasize that the demand for labor in the second stage of production cannot be known in advance because of weather uncertainty. As a consequence, both (net) buyers and sellers of labor each year face riskiness in the wages to be paid or received at the end of the crop cycle. A risk-averse landless household, the model predicts, would find it optimal for at least some members to enter into an annual (futures) contract that sets the second-stage wage in advance (the attached servant contract). With some sellers of labor in the household using only the daily spot market and others engaged as attached farm servants, family income is hedged against wage (and employment) risk; for net purchasers of labor, use of both types of labor contracts also reduces exposure to risk. Since the attached servant contract serves as an insurance substitute, if agents are risk-averse the (certain) income from the annual contract will be less than the expected income over the year obtained from participation in the casual labor market, spot (casual) wages W_c exceed permanent labor wages (W_p) in an equilibrium characterized by fully compensatory wages differentials. These models thus imply that the choice of

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wage contract will depend on both the levels and sources (riskiness) of household non-labor income.

Despite the apparent advantages of annual or crop-cycle wage contracts, they do not appear to be important in all environments. Bell and Srinivasan in fact report that in their sample from 20 Indian villages "...most households do not have such contracts." (p. 3), although Bardhan finds them to be prevalent in the Indian State of West Bengal, from which his data are taken. These particular risk-shedding models can explain the apparent lack of interest in such contracts in some areas and not in others on the basis of differences in endowed (wage and output) risk, but this central implication of these models has not been tested. One alternative possibility, not considered, is that other contractual arrangements may be superior; as discussed below, output-sharing arrangements also diminish risk. Moreover, participation by some household members in non-agricultural activities also diminishes the household's exposure to agricultural wage uncertainty, and such opportunities may vary across environments. Another possibility is that second-stage wages co-vary positively with gross income from production (final-stage wages are high (low) when there is a lot of (little) production to harvest); wage risk does not independently increase income risk for net purchasers of labor in all environments.

Eswaran and Kotwal's (1985a) model of permanent wage contracts, in contrast to the stochastic price and output models, assumes away risk aversion and instead emphasizes incentives prob lems attendant to eliciting unmonitorable effort. They assume that (i) agents mazimize utility function (18), (ii) first-period tasks in (19) are distinct from second-period tasks in that effort cannot be easily monitored in that period (tasks require discretion in period one), and (iii) landlords can discern worker effort in period one at the completion of period two. A permanent wage contract serves to elicit first-period effort;

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thus, only permanent laborers are hired in the first period; i.e., $L_1 = L_p$, $L_2 = L_p + L_c$ and $L_j = e*N_j$, where $e*$ is the appropriate effort and N_j = number of workers of type j (j = p,c).

What induces (permanent) workers to supply effort at level $e*$, despite its disutility and unobservability, is the prospect of being fired (becoming a casual laborer) when their shirking is discovered at the end of the harvest cycle. Of course, the termination threat is only credible if the utility from not shirking exceeds the utility from shirking and being relegated to the casual labor market. This must imply that permanent worker contracts are superior (in terms of worker welfare, inclusive of effort) to a series of casual or spot contracts. To see this, consider a time horizon of four periods (two seasons). The (indirect) utility for an honest permanent worker, supplying $e*$ of effort in the first period, is $V(W_p, e*)$. If the per-period discount rate is δ, then it must be true that a shirking worker, who supplies no effort in the first period and then is fired at the end of the season, is not better-off than an honest worker; i.e.,

$$V(W_p, e*) \ (1+\delta+\delta^2+\delta^3) > V(W_p, 0) + \delta V(W_p, e*) + \delta^2 V(0,0) + \delta^3 \ V(W_c, e*), \quad (21)$$

so that, since $V(0,0) < V(W_p, e*) < V(W_p, 0)$,

$$V(W_p, e*) \ (1+\delta) > \delta V(W_c, e*), \quad (22)$$

where W_c is the casual worker wage rate. Note that workers can be monitored in the second period of each season so that $e*$ of effort is always supplied then.

Expression (22) suggests that there will be an excess supply of permanent workers, since W_p will not be bid down to equate the per-season utilities of the two types of workers, as this would result in shirking and lower output. No unemployment must ensue, however, since, in the absence of any other

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restrictions on the technology and preferences, all workers can be employed as casual laborers. In contrast to the wage-insurance models, the Eswaran-Kotwal model thus consists of two classes of workers, one of which (the permanent worker class) is better off than the other. Moreover, unlike the former models, this model implies little (or no) turnover among the privileged permanent workers; permanence pertains both to intra season and inter-year employment.

A shortcoming of the Eswaran-Kotwal wage-contract model is that it does not provide the assignment rules characterizing which workers are in each class nor does it predict whether the <u>daily</u> wage rates of permanent workers W_p will exceed or not those of daily laborers W_c. As in the literature concerned with wage risk models, moreover, alternative contractual arrangements, in particular, tenancy, that elicit effort under the same set of technological assumptions, are not considered, although the assumption that workers cannot validate the landlord's assessment of their performance effectively rules out worker's posting a performance bond. And, of course, the existence of wage heterogeneity across individuals performing different tasks could be explained by worker heterogeneity in innate or acquired skills.

2.   Tenancy Contracts

There has been considerable attention to the contractual terms associated with the rental of land in the development literature, and no complete discussion of this literature will be attempted here (see Chapter __, this volume, and Otsuka and Hayami (1986)). The relevance of the tenancy contract in this context is that such contracts also influence the allocation and returns to labor. Tenancy contracts are an important rural institution in many low-income countries--in Egypt, Iran and Pakistan, for example, about 40 percent of cultivated land is under tenancy; in Taiwan, over half of cultivated land was cultivated by tenants in the 1930s.

The theoretical literature concerned with tenancy is characterized by the

same two themes as the pure labor contract literature--leasing of land provides landowners access to unmarketable inputs, such as labor effort, and/or the land rental terms serve to mitigate risk in production. As noted, if there are difficulties monitoring the effort of non-family workers, the renting of land to tenants for a fixed fee (rent) transforms the workforce to residual claimants and solves the effort problem. This one problem of eliciting labor effort (worker's moral hazard), however, is insufficient to explain the existence (or coxistence) of land tenancy contracts in which owner and tenant share the proceeds of cultivation (sharecropping), since such a contract may lead to an inefficient allocation of resources (inputs) compared to fixed rent tenancy.

Consider the budget equation for a tenant who leases in land, self-cultivates and works in the labor market at a fixed wage w. Consumption of this tenant farmer, C_T, is given by

$$c_T = \alpha X_T - R + X_o + wL, \tag{23}$$

where α = share rent, R = fixed rent, X_T = output from tenanted land, X_o = output from self cultivated land, and L = time in wage labor market. With the utility function and technology described by (1) and (2) as before, the equilibrium conditions for the allocation of the tenant's labor time is

$$w = \alpha \; \frac{\partial X_T}{\partial L_T} = \frac{\partial X_o}{\partial L_o} \; . \tag{24}$$

Thus, returns to labor time are not equated across all activities when α is less than one. In particular, in the absence of other contractual stipulations, the marginal product of labor (and other inputs) will be higher on sharecropped land than on own-cultivated land and higher there than the market price of labor. It has been argued (e.g., Cheung (1969)) that landlords would, as part of the contract stipulate input levels, such that labor and other inputs would be

allocated efficiently. However, this leaves open the question of the enforceability of labor effort, which was a rationale for land rental to begin with - why does the landowner not just charge a fixed fee (let $R > 0$, $\alpha = 1$ in (23)), which results in efficient allocations without monitoring? There are two answers--avoidance of risk and the existence of unmarketable inputs owned by the leasor.

If tenants are risk averse and output risk is uninsurable, then lessees may be unwilling to accept all of the risk of production, leaving the landowner exposed only to the risk of nonpayment of the fixed fee that a fixed rental entails. By sharing output, landlords and tenants share production risk, and share it optimally when the optimal allocation of inputs on tenanted land is enforceable. As Newbery (1975) has pointed out, however, risk reduction to the same degree can be accomplished by the tenant (without inefficiency) by his allocating a share of his time to risky activities (self-cultivation) and a share to a non risky activity, such as afforded by an attached-servant labor contract. While it may be argued that it is difficult for one individual to divide up his time among activities (transaction costs, market frictions), the existence of the multi-member household, ignored in almost all tenancy models, means that a family can allocate each or some of its members to different activities. Risk diversification and/or risk reduction may thus be achieved without incurring transaction costs or sacrificing the returns to specialization. The choice or prevalence of fixed rent and share tenancy contracts will then depend on the availability of alternative risk-reducing opportunities.

Eswaran and Kotwal (1985b) have set out a framework that focuses directly on the issue of why certain forms of labor cum land arrangements are chosen over others. In their model, riskiness is ignored and the problem of obtaining unmarketable inputs plays a central role. They posit the existence of two

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productive factors that cannot be bought or sold directly - managerial skill and labor effort. The prevalence of share, fixed rent or pure wage contracts then depends on both the importance of these two inputs in production (the technology) and the ownership <u>distribution</u> of the inputs across landowners and tenants. When owners of land have a monopoly on managerial knowledge and only tenancy can elicit unmonitorable labor effort from workers, owners and tenants find it in their interest to share their inputs through share tenancy. A fixed-rent tenancy is inferior in this case since it provides no incentives for the landowner to supply his skills to production. It is the <u>double</u> coincidence of moral hazard (two, not one, market failures) that makes share tenancy potentially superior to fixed rate tenancy, even though neither tenant nor landowner supplies the full level of his own input that would be forthcoming under self-cultivation. This model thus suggests that as landowners lose their managerial advantage relative to tenants, due to the introduction of new technologies or through the acquisition of cultivation experience by tenants, fixed rental becomes more likely; as labor tasks become more routinized, through mechanization or other technological changes, the use of wage labor as opposed to tenancy contracts becomes more prevalent.

Empirical studies pertinent to tenancy models have chiefly been devoted to the narrowly-defined efficiency issue concerning whether share tenancy induces the withholding of inputs, as implied in (24), and less to the question of the determination of the choice of contractual forms. The conceptual experiment needed to resolve the input allocation question is straightforward--compare the input allocations (or marginal products) for the same farmer, on the same plot of land, under the same weather conditions but under different contracts. However, no survey has as yet produced information on such an experiment; indeed, the probability of weather conditions being identical in different years is zero! Most of the empirical studies compare input intensities across

different farmers with different plots of land and different contracts; the possibility that there is heterogeneity in farmer's characteristics or land which may importantly affect the choice of contract and input allocations makes such studies inconclusive. For example, Eswaran and Kotwal's model implies that less competent tenant farmers sharecrop rather than rent (and possibly so do less competent landowners); sharecropping tenants may thus appear to be less productive, but not necessarily because of insufficient incentives. Studies by Bell (1977) and Shaban (1986) of the efficiency question exploit data that comes closest to the best experiment; they were able to compare the same farmer under different contracts, but on different plots of land. Although there are controls for several different measured land characteristics, heterogeneity in unobserved characteristics of land may bias the results, which appear consistent with the input misallocation hypothesis in that input intensities appear to be lower on sharecropped land compared to self-cultivated land or to land leased under fixed rent. No attempt was made in either of these studies to measure or compare marginal products of inputs across contracts, however, which would have required estimation of the technology parameters.

The more fundamental issue of contract choice has received far less empirical study. As for permanent labor contracts, specific forms of tenancy contracts are prevalent in some areas and not in others, even within the same country. For example, in the Philippines 84 percent of rented land is sharecropped, while in Egypt only twelve percent of rented land is leased on a share basis. In India, 90 percent of rented landholdings are sharecropped in the state of West Bengal (where, it will be recalled, attached servant contracts were also prevalent), while in the Indian state of Madras, 78 percent of tenancy contracts were fixed-rent (National Sample Survey, Eighth Round).

The risk-based tenancy models imply that differences in the riskiness of

the environment and the availability of less risky income opportunities can explain tenancy contract choice. The conceptual experiment is again straightforward--provide, randomly, different amounts of fixed payments across potential tenants; those receiving greater assured levels of income should be more likely to select fixed rent contracts (as long as risk-aversion is non-increasing with wealth). Such an experiment, of course, has not been performed.

Bell and Sussangkarn (1985) in an important study in a sense have attempted to simulate the riskless income experiment, but based on information on tenants from cross-section data. They tested if tenants with greater levels of transfer income, greater numbers of non-agricultural family workers, and greater landholdings were more willing to engage in riskier tenant contracts. The difficulty with this exercise is that sources of income and the occupational composition of the family labor force are also attempts by the household to cope with risk. Indeed (non-governmental) net transfer income is in part the manifestation of an implicit contract with non-household agents that presumably is designed to smooth consumption under risk. The estimated associations between different means of risk-coping (contracts) and the outcomes of risk-sharing arrangements does not shed much light on how opportunities for risk reduction and environmental (exogenous) risk in production influence the portfolio of explicit and implicit contracts. Attached farm servant and share-tenancy contracts are in part substitutes for each other as risk-mitigating mechanisms but are also more likely to be observed in risker environments or among households who are risk-averse; the sign of the association between different contractual forms is not obvious from the theory, nor therefore can it represent a test of the insurance-based tenancy model.

The Eswaran-Kotwal tenancy model, which focuses on the distribution of managerial knowledge and the technology of supervision, suggests, as noted, that owners and tenants are more likely to share in allocation decisions under a

share contract than under a fixed rent tenancy agreement. Bell and Srinivasan (1985), based on data from 10 villages in the Punjab in India, did, indeed, find this to be true. This model also implies that as tenants acquire more experience in farming, they will be less dependent on the managerial input of the landowner and will thus be more likely to become fixed rent tenants. There is as yet little information on this "tenancy ladder" implication or on how technical change, which may obsolesce land-specific experience, influences contractual arrangements. Longitudinal information on the life-cycle land relationships of rural agents would be useful in this regard. Such data could also be helpful in testing the risk-insurance tenancy model in that it might allow better methods for dealing with the problem that observationally-identical tenants are heterogeneous in their aversion to risk, which jointly influences all of their contractual choices, and thus the sources, variability and levels of their incomes.

As noted, the complete markets models, since they ignore incentives problems and do not incorporate risk, cannot account for sharecropping or explain the mixture of contractual arrangements engaged in by farmers. The alternative models that do accommodate these considerations, however, have tended to concentrate on one or another part of the farm or household allocation problem (choosing farm servants or daily laborers, choosing fixed or share rent tenancy contracts) to the neglect of other important decisions (labor supply, land rental, consumption choices) and narrowly define the range of formal and informal contractual alternatives. The compete markets model has thus seen the most direct econometric applications; econometrically tractable models of the farm-household model embodying risk-behavior and contractual choice await development.

III. GEOGRAPHIC MOBILITY

Whatever the absolute level of the marginal contribution to output of the rural labor force, the reallocation of labor from less to more productive activities or sectors is a central element in development models. Moreover, sectoral or spatial disparities in the returns to homogeneous labor, i.e., controlling for skill differences, are evidence of market imperfections, although not necessarily of imperfections in the labor market. While, as noted, mobility of labor across farms within small localities in rural areas appears high, there appears to be evidence of important spatial barriers to mobility in low-income countries. Wage rates for seemingly comparable tasks in agriculture appear to differ persistently across geographical areas (Rosenzweig (1978)) and even between adjacent villages, and "unskilled" manufacturing wage rates in urban areas have remained, over long periods of time, from 1.5 to 2 times agricultural wage rates (Squire (1982)), although careful analyses of real wage differentials by skill group remain to be performed. Indeed, a large part of disparities in wage rates can be explained by differentials in skill-related attributes across workers (e.g., schooling and work experience).

In his econometric analysis of the determination of rural wage rates across districts in India, Rosenzweig (1978) assumes inter-district immobility and finds that, consistent with this assumption, within each district relative supplies of male, female and child labor influence the district's absolute and relative wage levels in accordance with classical supply-demand models. Thus, the spatial variation in relative male-female wage rates appears at least in part to be determined by differentials in the relative supplies of female labor associated with caste and religious restrictions, and to demand factors associated with locality-specific weather conditions, given stratification by sex in agriculture tasks. In Rosenzweig's (1980) econometric analysis of labor supply and wage rate determination based on household data, the findings suggest

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that women are less mobile than men (as found also by Bardhan (1979) and Ryan and Ghodake (1984)) and that landless laborers are more geographically-mobile than owners of land.

There is also substantial evidence, however, of large population movements in low-income countries, particularly from rural to higher-wage urban areas. Yap (1975) reports that migration typically accounts for from 30 to 60 percent of urban population growth rates in such countries. There thus appears to be both large spatial population flows as well as persistent spatial disparities in labor returns. Are there particular barriers to mobility in low-income countries? Do standard models of migration not pertain to such settings? A large proportion of the development economics literature is concerned with these questions of the mobility of labor.

1.   The Basic Human Capital Model of Migration

The beginning point in modeling the migration decision of agents is the human capital model. In this framework, migration is viewed as an income-augmenting investment in which costs are incurred initially and returns accrue over time. An individual compares the direct costs of migrating with the discounted present value of income gains, if any, from each potential destination; he or she thus finds the maximum of a set of potential migration gains across all possible destinations, where the gain G_j for any destination j is:

$$G_j = \int_0^T e^{(g-r)t} (Y_{Dj} - Y_o) dt - c_j, \qquad (25)$$

c_j is the cost of migration (transportation costs) to destination j, Y_{Dj} is the per-period income the individual would receive by migrating to j, Y_o is per-period origin income, and r is the discount rate. Y_o, Y_D and c may also have time subscripts, may vary with age, although direct migration costs are incurred

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all at once. If max $\{G_j\}$ is positive, then the potential migrant will choose to move to that destination with the highest gain.

The human capital migration model in (25) yields the following predictions, aside from the implication that agents' migration choices will tend to erase income differentials: (i) the young, who will reap returns over a longer period, will have larger values of G and will be more mobile than the old, (ii) neutral productivity growth across areas or sectors (given by g in (18)) will increase mobility; that is, accelerating along a balanced growth path, say in urban and rural areas, will induce a greater absolute differential in favor of the high-income (urban) area, increase G, and thus raise the level of rural-urban migration flows, and (iii) a greater distance (higher c) between two areas reduces migration flows between them. As Yap (1977) reports in her survey of econometric studies of internal migration in low-income countries, there is substantial evidence that, indeed, the vast majority of migrants are young, high-growth economies are characterized by high levels of migrant flows, and migration rates between any two areas i and j are positively related to the size of the differential in real earnings or wages across i and j and are negatively related to the distance between them. Kuznets (1982) also concludes, based on ILO data pertaining to 181 countries from 1950 to 1970, that those countries that had greater rates of growth of per-capita product also were marked by more rapid shifts out of the agricultural sector, although it is unclear whether the growth rates were "balanced."

Like the perfect markets model, the simple human capital approach to migration yields a number of empirically-verified implications but abstracts from a number of problems, some particularly relevant to low-income countries. These include capital market and information constraints, uncertainty with respect to both employment prospects and intertemporal income fluctuation, joint household decision-making, and the existence of heterogeneity among agents and

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in area-specific non-income attributes (relative prices of goods and services).

The model thus seeks to explain permanent rather than seasonal migration and ignores multiple moves, assuming perfect foresight. Additionally, without introducing worker heterogeneity into the model, it is difficult to reconcile the model with the observation that migration streams often flow simultaneously from place i to place j and from place j to place i. Nevetheless, the major implication of this framework, that wage differences across regions explains interregional migration for comparably skilled workers, appears to have received strong support.

2.   Information and Capital Market Constraints on Mobility

The importance of information flows is used to explain why it is usually found that the more educated are likely to be migrants than the less educated and why distance between origin and destination is less of a migration deterrent for the more educated (e.g., Schwartz (1969), Levy and Wadycki (1974)), as the more educated are presumed to be better-informed about spatially-separated alternative earnings opportunities. Similarly, the existence of information sources in destination areas is presumed important and is also consistent with pervasive findings that the stock of prior immigrants to an area j from a destination i is positively correlated with current immigration flows from origin i to j (e.g., Greenwood (1971)). Such findings, however, may merely reflect the persistence of unmeasured factors influencing migration from i to j. Indeed, the interpretation of the estimated effects of wage differentials on migration flows based on specifications including lagged migration (the stock of immigrants) is not obvious, particularly when such variables are treated inappropriately as exogeneous. There is, however, more direct evidence of the positive influence of destination-area contacts on migration flows (Nelson (1979)).

The findings that the more educated are likely to be migrants and that migrants, at least to cities, tend not to be from the poorest families in the origin area suggest that migration may be income-constrained. Capital market constraints may thus influence the degree to which returns to labor remain geographically diverse. Basu (1983) develops an alternative model in which geographic wage diversity coexists with frictionless geographic mobility as a result of capital market imperfections. The risk of default is assumed to induce landlords in rural areas to confine their lending to laborers under longer-term contract to them; that is, to borrowers over whom they have more "control" or information. Basu then explains spatial wage diversity as reflecting differentials in interest costs to moneylenders (landlords) across areas--the contractual interlocking of loans and wage payments implies that laborers choose among alternative wage-interest cost contracts. With complete labor mobility, the utility value of the different combined wage-interest contracts must be equal (for homogenous laborers) across areas. Thus, where interest costs are high (for landlords), wage rates offered by landlords to laborer-borrowers must also be high. Basu thus views capital immobility, combined with incentives problems, as the principal cause of spatial wage diversity. Of course, the reasons why capital costs are not arbitraged spatially is not indicated, nor is there any evidence presented or cited on flows of capital. Moreover, as noted above, labor contracts of more than one day are not prevalent in many rural labor markets; the interlinked credit-pure wage labor contract is thus not adequate to explain the pervasiveness of spatial rural wage differentials.

A more direct capital market cum information constraint on labor mobility in rural areas is suggested by the findings that (i) laborers with land are less mobile than the landless (Rosenzweig (1980)) and (ii) migrants to urban areas from households owning land in rural areas are more likely to be temporary

migrants, (e.g., Balan et al. (1973), Nabi (1984)). If households owning land are unable, or find it difficult, to sell their holdings, then movement out of the rural area by the household entails a capital loss. Indeed, Rosenzweig and Wolpin (1985) show that in India less than two percent of landowners sell any of their land in a given year, and almost all who do, do so because of severe cash constraints induced by at least two consecutive years of poor weather. However, they also provide evidence consistent with the hypothesis that variability in land qualities across plots combined with weather risk leads to specificities in plot-specific experience (information) returns. Thus, even when land markets operate perfectly farmers incur a capital loss upon the sale of land they and their family have farmed. Mobility is reduced because part of the capital accumulated by farmers is not transportable.

3.   Two-Sector Unemployment Equilibrium Models

Another way to reconcile persistent disparities between unskilled urban and rural wages with unfettered labor mobility is to assume that the risk of finding a higher wage urban job is not negligible and that potential migrants take employment risk into account. In Todaro (1969), the basic human capital model of migration is modified so that the per-period income flow in the urban sector is weighted by the probability of obtaining a job in that sector; G_j becomes G'_j.

$$G'_j = \int_0^T e^{(g-r)t} (p(t)Y_{Dj} - Y_o)dt - c_j \tag{26}$$

where $p(t)$ is the destination (urban) employment probability. G'_j is now the expected net return from migration, and is clearly lower than G_j as long as $p(t) < 1$.

Harris and Todaro (1970), based on the model of Todaro (1969), embed the notion of employment risk into a two-sector general equilibrium model of

migration, employment and wage determination. In this model, wages are determined competitively (by supply and demand) in the rural sector, but the wage rate in the urban sector is an institutionally set ("politically determined") rigid minimum wage set above the initial rural wage. Employment is a Bernoulli process in which the probability of employment in the urban sector is equal to the number of urban jobs (E_U) divided by the size of the urban labor force or number of job seekers (N_U). Since all agents are assumed to maximize G' (are risk neutral), and are perfectly mobile, and the rural wage ($=$ marginal product in agriculture) is origin income, the unemployment equilibrium condition is:

$$W_R = W_U(E_U/N_U); \tag{27}$$

i.e., the rural wage is equal to the expected urban wage. Thus, in this model the only labor market distortion is in the urban sector (and is unexplained; see below); the institutionally-set urban wage leads to a misallocation of labor resources across areas and to wasted resources (unemployed workers).

Given the technology of production in the urban and rural sectors (described in Harris and Todaro by standard, neoclassical functions with fixed capital stocks and mobile labor as inputs) and a fixed total endowment of labor in the economy, equation (27) describes how rural wages, urban unemployment and rural and urban employment change when the exogenously-determined institutional wage is altered. In the case in which labor demand in the urban sector is inelastic (demand elasticity < 1), a rise in the minimum wage reduces employment and output in both the rural and urban sectors and increases urban unemployment. In that case, when the minimum wage increases, employment decreases proportionally less than the urban wage increase, leading to an increase in the expected urban wage and increased migration from the rural to the urban sector. However, if urban demand is elastic, a rise in the urban minimum wage increases rural output

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and lowers the wage in the agricultural sector; in that case, migration flows

from the urban sector to the rural sector. In either case, an exogenous

increase in urban employment brought on, say, by an urban wage subsidy induces

migration from the rural to the urban sector and increases the number of urban

unemployed, since the urban (minimum) wage is unaffected.

It is the seemingly paradoxical result that urban wage subsidies increase

the size of the urban unemployment pool that apparently has made the Harris-

Todaro version of the two-sector unemployment equilibrium model of interest.

Moreover, the basic idea that migrants pay attention to destination employment

prospects as well as wage levels appears consistent with the evidence obtained

in many econometric migration studies (e.g., Levy and Wadycki, (1972)).

However, if nominal urban manufacturing wages are taken as representative of the

urban wage, then the magnitude of actual urban unemployment rates does not

reconcile the observed rural-urban wage differential, does not balance (27)--

nominal urban manufacturing wages are allegedly from 50 to 100 percent higher

than nominal rural agricultural wages, while urban unemployment rates are

typically less than 10 percent.

One way to solve the problem that the Harris-Todaro framework appears to

overpredict unemployment rates is to carefully measure sectoral wage differences

for comparable classes of workers and to appropriately allow for sectoral cost

of living differentials. Careful empirical studies of the alleged wage gap have

been absent. Instead, researchers have modified the model, adding, for example,

an additional sector to the urban area--workers are assumed to queue for the

high-wage urban jobs, not in the unemployment line, but in an urban informal,

subsistence, or "murky" sector (where the minimum wage presumably does not

pertain), as in Fields (1974) and Cole and Sanders (1985). Presumably, the

weighted average of urban high (minimum) wages, weighted by the urban

unemployment rate, and lower murky-sector wages is approximately equal to the rural wage. However, it is difficult to measure the return to labor in the informal urban sector (see below) and, again, little empirical evidence exists on this component of this modified, three-sector balance equation. In addition, despite the critical role that the magnitude of the urban demand elasticity plays in the Harris-Todaro model (see also Mincer (1976)), there is little or no evidence to support the assumption that the urban aggregate demand elasticity is less than one.

An unsatisfying feature of the Harris-Todaro model itself is that the source of the labor market imperfection, the urban minimum wage, is determined outside the model in an ad hoc manner. While governments do impose binding minimum wages, it is difficult to believe that the fixed wages would be set independently of unemployment or migration rates. The evidence on how constraining governmentally-imposed minimum wages are in urban areas is not clear in any event (Squire (1982)). Stiglitz (1974) and Calvo (1978) have attempted to rectify this shortcoming of the Harris-Todaro framework. Calvo assumes monopolistic behavior by urban labor unions to obtain an equilibrium wage differential. Stiglitz formulates a two-sector unemployment equilibrium model in which urban unemployment results from the behavior of competitive urban firms; urban wages and urban unemployment along with rural wages are thus endogenously-determined in these models. As in the Harris-Todaro model, moreover, there is no rural unemployment, and rural wages are competitively set (the nutrition-efficiency wage model is not employed).

In the Stiglitz model, monopolistically-competitive firms in the urban sector incur hiring and training costs associated with labor turnover and set wages to minimize the cost per worker. The total labor costs C_L of the firm are assumed to be given by:

$$C_L = WL + qtL, \tag{28}$$

where L = firm's labor force, t = training or hiring costs per worker, and q = probability that an employee leaves the firm (quit rate). As in the efficiency wage model, labor costs are both directly and indirectly a function of the wage rate paid by the firm, here because it is assumed that the quit rate declines as the firm's wage increases. Unlike in the efficiency wage model, however, worker costs (turnover) are a function of _relative_, not absolute, wage rates and are influenced by the unemployment rate. In particular, Stiglitz assumes that

$$q = q(W_U/W^e_U, \ W_U/W_R, U), \tag{29}$$

where W^e_U = mean wage of all other urban firms, U = urban unemployment rate, and $q_i < 0$, i = 1, 2, 3. That is, workers are less likely to quit if the rewards in the firm in which they are employed are high relative to those of their alternatives, namely migrating to the rural sector or becoming unemployed. The firm can only use its own wage as an instrument to minimize (28); moreover, in equilibrium all wages in the urban sector will be equal ($W_U = W^e_U$). The wage paid by urban firms will thus be a function of the unemployment rate and the rural wage, and in equation (27) all components of the equilibrium equation are endogenously-determined.

The consequences of a wage subsidy (financed by a profit tax) differ between the Harris-Todaro and Stiglitz "turnover" models of unemployment equilibrium. In the former, wage subsidies, up to a certain point, increase the economy's total output. In the turnover model, however, wage subsidies lower output. This is because part of the wage subsidy is partially shifted to workers (which cannot happen in the rigid wage model). The rise in employment and the urban wage leads unambiguously to a rise in the urban unemployment rate, from (28).

An important feature of Stiglitz's turnover model is that urban unemployment is not only endogenous but is optimal, in the sense that if the government chose the urban wage and urban employment levels so as to maximize total output in the economy (allowing free migration), it would set the urban wage above the rural wage and allow a non-zero level of unemployment. The lost output due to (optimal) unemployment is less than the gain to output from the lower turnover costs--unemployment prospects and the urban-rural wage gap "discipline" workers and lower labor costs. This unemployment result, and all of the welfare-theoretic implications of the model, rest on the assumption that a firm (government) can only influence turnover via the wage it pays. Indeed, none of the costs of turnover are borne by workers. The optimality of unemployment comes about because of the artificial restriction placed on the types of contractual arrangements the firm can engage in with its labor force. As has been well established in the human capital literature (Becker (1975)), for example, when workers are free to leave firms and training is specific to a firm, as assumed in the Stiglitz model where trained workers receive no higher wages than untrained workers, sharing of the costs of training with workers is optimal. When workers incur part of the costs of their training and thus share in the returns from that training, they incur a capital loss when they leave the firm, as the training is not valued elsewhere in the economy. The sharing of training costs and the wage wedge between the firm where the specific training was undertaken and other firms eliminates the need for the pool of unemployed or the rural-urban wage gap to serve as turnover deterrents.

The firm behavior embedded in the Stiglitz turnover model, its essential ingredient, implies that worker's wage rates do not rise over time, as employees neither pay for nor obtain the rewards from training costs. However, pervasive evidence from a large number of countries suggests that urban workers wages rise over their life-cycle, consistent with such workers financing at least some

investment costs and reaping returns. There is no evidence supporting the training arrangements assumed in and fundamental to the Stiglitz turnover model.

Fry (1979) tests a turnover model similar to that of Stiglitz, by ascertaining if workers who are less likely to remain with a firm are also less likely to receive training. Again, all costs are assumed to be borne by firms. He finds that among urban workers in Zambia, those from the poorest backgrounds were more likely to be trained as a consequence of their being less likely to return home. This finding, however, is perfectly consistent with a model in which workers, anticipating how long they intend to remain with a firm, choose to incur training costs. The data do not indicate who finances the training; moreover, Fry does not attempt to test whether wage rates rise with tenure in the firm in order to test the assumption that workers do not invest in training.

Finally, Stiglitz (1982) also develops unemployment equilibrium models incorporating equilibrium condition (27) in which (i) the absolute magnitude of the wage paid by a firm raises worker effort (the efficiency wage model without nutritional underpinnings) and (ii) the wage paid by the firm relative to wages paid by other firms determines the firm's ability to recruit high quality workers (the "efficiency wage-quality" model). In these models, unemployment persists, even when the government sets urban wages and employment to maximize total output. No evidence appears to exist to support the critical behavioral assumptions that are the basis of the effort-wage or quality-wage relationships, and no consideration is given in these models to the possible superiority of alternative contractual arrangements that minimize shirking or optimally sort workers and do not entail unemployment.

4. Risk, Remittances and Family Behavior

The two-sector unemployment equilibrium (UE) models do not contain features special to low-income countries. Indeed, a similar model to that of Harris and

Todaro has been applied to describe the employment effects of minimum wages across covered and uncovered sectors in the United States (Mincer (1976)), and turnover costs and problems of worker effort and recruitment are not especially confined to low-income urban areas. More importantly, neither the basic human capital model nor the UE models can readily explain temporary migration--planned return migration--or the directions and magnitudes of cross-area resource transfers associated with migration. Yet in the African setting that the UE model was designed to describe, the vast majority of urban migrants state that they intend to return to their rural home, had left their wives and children in their origin area, and/or owned land in the rural area (e.g., Kenya (Rempel (1974), Harris and Todaro (1970)). Moreover, flows of funds--remittances--from urban migrants to family members in home areas in both Africa and South Asia account for ten to twenty-five percent of urban migrants' incomes (Rempel and Lobdell (1978)). The negative impact of migration on incomes in rural areas is thus overestimated by the UE model.

Temporary migrants might be considered members of a geographically extended family described by the income-sharing household model of (1), (2) and (5). In such a model, when the consumption of each member enters an additively-separable household utility function, it is easy to show that family members (temporary migrants) with wages above the mean consumption level of the family will transfer funds to other members (origin members) until consumption levels of all members are equalized. Thus, remittances will be greater the higher is the income of the migrant member and lower the higher are the pre-remittance incomes of the origin family members.

The geographically-extended joint household model is not entirely an adequate explanation of temporary migration. First, it does not explain why, if incomes are higher where the temporary migrant resides, the entire family does not move to the high-income area. Second, it does not explain, without resort

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to arbitrary assumptions about preferences, why higher-income migrants remit funds to their lower-income parents or other relatives at origin. Third, the available evidence from national probability samples from Kenya (Knowles and Anker (1981)) and Botswana (Lucas and Stark (1985)) suggests that while the migrant's income is positively related to the size of transfer made to the origin family, in accordance with the model, remittances are not negatively related to the pre-transfer income or wealth of the origin household members, as the joint household model also predicts. Finally, the model does not explain why geographically extended families should be prevalent in low-income but not in high-income countries.

As noted, an important feature of low-income countries is the inability of farmers to insure against production risk. Since farming is by far the principal occupation in low-income settings compared to high-income countries, attention to risk-induced behavior may illuminate spatial labor mobility in such areas. Note that the rural household, by diversifying its spatial portfolio of income sources, reduces total income risk in a context (agriculture) in which the principal source of risk is locational. Even occupational diversification among co-resident family members may not be adequate in rural areas where incomes from agriculture significantly influence non-agricultural activity levels. Thus, temporary migration of rural household members may be a manifestation of a familial, risk-sharing insurance contract, with remittances reflecting both insurance payoffs and compensation for the family's investment costs incurred in sending the migrant away or in financing his/her schooling. The migrant's income net of his (temporary migrants are predominantly male) transfers may be higher than that of his rural kin, reflecting compensation for the disutility of being away from home. Finally, incentives for remitting may be provided by prospects of inheritance, as in the bequest model of Kotlikoff

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and Spivak (1981).

Lucas and Stark (1985) is the first study to attempt to test the household-theoretic approach to temporary migration and remittances. Based on a national survey of households in Botswana, they find evidence consistent with the hypotheses that (i) temporary migration is in part a co-insurance arrangement, as remittances are higher when family incomes are temporarily low, (ii) prospects of bequests influence remittance flows positively as well as who migrates, as (male) migrants from wealthier (larger cattle herd) families send more remittances and sons are more likely to inherit in Botswana, and (iii) remittances rise with the migrant's (predicted) earnings and schooling. The latter finding is interpreted as indicating that remittances reflect in part the repayment of investment costs undertaken by the family on behalf of the migrant.

Lucas and Stark's findings are suggestive of the complexity of household arrangements. They do not, however, derive their hypotheses within the context of a rigorously-formulated, integrated model of the household incorporating risk-sharing via formal labor or tenancy contracts, intergenerational and spatial transfers, wealth accumulation and/or bargaining. Moreover, their finding that family wealth and remittances are positively associated could merely reflect the greater ability of households receiving remittances to accumulate wealth, rather than the bequest motive or the absence of altruistic income-sharing (which implies a negative wealth-remittance correlation). Longitudinal data may be required to distinguish among hypotheses. As in the case of contractual arrangements involving labor, richer models of the family enterprise appear needed to understand fully the complex nature of the spatial mobility of labor.

5. Heterogeneity and Selective Migration

All of the models of migration discussed assume that potential migrants are concerned only with income. However, areas are also differentiated by or

heterogeneous in other attributes that utility-maximizing agents may value (and may value differentially). Thus, wage disparities across urban and rural areas may be consistent with a hedonic equilibrium in which the higher wages of the city compensate new city dwellers for the lost amenities of rural life. The utility associated with the high-wage, urban squalor bundle may be no greater than the utility associated with low-wage rural life for the representative agent.

Schultz (1983) and Rosenzweig and Wolpin (1984), based on separate household data sets from Colombia, found that migration behavior is influenced by characteristics of areas other than income prospects (i.e., relative prices). Moreover, their results suggest that households are heterogenous in their preferences. Households appeared to differentially sort themselves across localities differing in relative prices. In particular, households who migrated exhibited different fertility and health investment behavior prior to their migration compared to observationally identical households at both origin and destination. Such differences appeared consistent with households, characterized by differing demands for human capital investments, being differentially influenced by spatial diversity in the relative prices of such investments. The selective migration of households heterogenous in preferences may thus bias estimates based upon cross-sectional associations between the average behavior of populations containing residents and migrants and locality-specific program subsidies and/or relative prices.

Heterogeneity among individuals in earnings ability may also account for the urban-rural wage gap, even when such measured characteristics as schooling and age are taken into account. To the extent that a proportion of the population in urban areas in low-income countries consists of relatively recent migrants, and (self-selected) migrants have superior earnings abilities in

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cities compared to rural residents, the observed urban-rural wage group may overestimate the return to migration for the non-mobile. Indeed, the human capital migration model implies that those individuals with the highest returns from migration would be the most likely to migrate. Comparison of the wages of (origin) individuals who choose not to migrate with those (destination) individuals who migrate may thus lead to the false conclusion that there is underinvestment in migration.

Robinson and Tomes (1983) were the first to test the earnings ability migration selectivity hypothesis. Applying standard, two-stage selection correction procedures (Heckman (1974)) to household data from Canada, they found that returns to migration were significantly overestimated when such selectivity was not taken into account--persons who moved to an area j from area i earned more in j than those who did not move from i would have earned in j. Almost all samples from low-income countries provide earnings information only for migrants at destination and for non-migrants at origin; few estimates of migration behavior or the returns to migration in such settings have taken into account this selectivity problem.

IV. URBAN LABOR MARKETS

1.   Diversity and Unemployment

The environment in which labor markets operate in urban areas is different in three important respects from that in rural areas. First, there is substantially more heterogeneity in the products produced; technologies are thus diverse, requiring a wide variety of worker activities and skills. Second, production in urban areas is not as highly seasonal or as highly sensitive to weather variations. Third, production activities are, definitionally, not as geographically dispersed as in rural agriculture.

These technological features of the urban environment have important

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implications for the operation of the urban labor market. Production diversity

is likely to be manifested in heterogeneity in the rewards to labor to the

extent that (i) individuals differ in innate talents and these are

differentially productive across technologies (products) and/or (ii) there are

cross-sector differences in the productivity of acquired skills (through

schooling or via job training). Whether this technological complexity

translates into differences in payments to labor services among people with the

same skills depends on the extent of labor mobility. The high density of urban

areas suggests that mobility costs--inclusive of the cost of information flows--

are lower in urban than in rural areas; "natural" barriers to mobility are less.

The existence of technological differentials in rewards to different worker

characteristics, however, implies that the payoffs to search, to finding the

right match, are high. Thus, periods of search, particularly for new entrants

to the labor force for whom the payoffs are received over the longest period

and/or for persons with specialized skills, may be long. Indeed, unemployment

rates in urban areas are significantly higher than they are in rural areas of

low-income countries and are predominantly concentrated among the young and the

more educated, far more so than in rural areas. Table 2 provides the ratios of

urban to rural unemployment rates and urban youth to overall urban unemployment

rates for a number of diverse countries that display these characteristics.

Urban areas of low-income countries, also in contrast to rural areas, are

also characterized by more intensively regulated labor markets. Unlike in

agriculture, many urban industries are subject to minimum wage restrictions and

to laws governing employment conditions and worker layoffs, although there is

typically as well a largely unregulated service sector. Workers may, in

addition, participate in formal, publicly-administered unemployment insurance

schemes. Moreover, again unlike in most rural agricultural environments, trade

Table 2

Ratios of Urban to Rural and Young Male to Total Male

Unemployment Rates in Selected Low-Income Countries

Country	Urban to Rural	Ratio Males Aged 15-24 to Male Total	Year
Chile	3.1	n.a.	1968
Colombia	n.a.	2.1	1968
India	1.7	1.4	1972-73
Republic of Korea	4.1	1.8	1965
Malaysia	1.6	2.4	1971
Philippines	1.9	2.2	1967
Trinidad	1.9	1.9	1971

Source: Squire (1981)

unions may play a large role in determining the pricing and allocation of labor and, in some areas, the government is one of the most important employers. Unemployment differentials between the urban and rural areas thus may in part be due to publicly-enforced labor market restrictions, as assumed in the Harris-Todaro model, but also may reflect the inherent differences between the two environments.

An informed reader will see that most of the features of the low-income-country urban environments described also characterize urban areas of high-income countries. And the issues of the impact of governmental labor market interventions and trade unions and the determinants and consequences of job search strategies, which appear to be particularly pertinent to such settings, form an important part of the core of modern labor economics. Few distinct analytical models specifically targeted in any meaningful way to problems of low-income country urban labor markets have emerged in the literature.

2.   Urban Dualism and Dual Labor Markets

There are some distinct features of <u>low-income</u> urban settings. Chief among them is the importance of family-based enterprises, as in agriculture. And, presumably, the consumption-production household models, applied principally to rural settings, are of use in understanding urban-based labor market phenomena. A problem in studying such enterprises is that even in this sector of the urban economy, product diversity (e.g. food shops, automobile shops, pharmacies) almost precludes estimation of "the" technology that is importantly influencing production and consumption decisions in such households.

The contrast between the organization of small-scale family enterprises and the large industrial firms that coexist in urban settings has led to the emergence of a literature characterizing the urban sector as dualistic (Fields (1975), Mazumdar (1977), Sabot (1977)). This approach emphasizes differences between the urban "informal" sector, characterized by small, family-based firms,

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and the urban "formal" sector, characterized by large enterprises subject to legal restrictions, i.e., characterized by more institutionalized (rigid) wage setting procedures. Such a characterization is purely descriptive, having no predictive content. The vast empirical literature on urban labor markets in low-income countries, influenced by this framework, however, focuses on testing the hypothesis that there are barriers to mobility across these sectors, that there are two distinct labor markets with workers on average better off in one sector than in the other.

In these empirical studies, wages or earnings of workers of given measured human capital characteristics (schooling, age) are compared across different types of firms as indicated by firm size or firm ownership type; e.g., public, private, multinational, family-based. Findings of wage differences by firm size for workers of given schooling and some measure of potential labor market experience are common (e.g., Mazumdar (1981))--workers in larger firms earning more than workers of smaller firms. How are such findings to be interpreted? Do they suggest barriers to mobility--non-competing groups--or do they merely reflect compensatory differentials, rewards for unmeasured skills or compensation for unmeasured differences in the disutility of the workplace?

First, technological differences in production across industries, sectors and products may entail different organizations, inclusive of operational scale, and possibly different contractual wage payments. Thus, some sectors (firms) may "require" specific job skills and others may need to reward productivity by delayed incentives arrangements when the outcomes of effort are not immediately observed (Lazear (1979)). In that case life-cycle wage schedules may differ across firms and cross-sectional differences in wages among workers of the same age or years in the labor market may not reflect any differences in lifetime earnings. Second, if workers are heterogeneous in unmeasured skills and such

skills have greater payoffs in large enterprises (the consequences of errors in judgment may be greater, for example), then seemingly identical employees of firms of different size may have different lifetime earnings (Rosen (1981)).

A third reason that such studies may find intersectoral wage differences is that the earnings of family workers in family-based enterprises reflect the contribution of other production factors, since such workers are residual claimants; their earnings are not comparable to those of salaried employees or wage workers. The relevant comparison is the marginal product of labor in family enterprises with the wage rates of employees in other sectors (among "comparable" workers). This requires the estimation of the family enterprise technology, not an "earnings" function, and is made problematical by the heterogeneity of technology in the urban sector.

A second class of empirical studies in the "dualistic" tradition tests if the structure of the relationship between earnings and worker characteristics differs across two sectors or earnings groups. A difficulty with this "dual labor market" approach, (Cain (1976)), in addition to some of those measurement and interpretation problems mentioned, is the seeming arbitrariness of (i) there being only two non-competing groups, (ii) the qualitative criterion for grouping (firm size, earnings level, etc.) and/or (iii) the quantitative cutoff points. Moreover, as discussed in Heckman and Hotz (1986), such tests require that the selectivity bias associated with workers allocating themselves across sectors (income groups) according to unmeasured earnings characteristics be taken into account and that the assumed functional form of the earnings relationship (whose parameters are hypothesized to differ across groups) be correct. Misspecification of the earnings function and/or the process sorting workers across groups may lead to highly misleading inferences. This problem, in its generality, is not unique to these hypothesis tests, however. It is the lack of a precise behavioral interpretation of the results that is the principal

shortcoming of the dualistic labor market empirical studies

V.   CONCLUSION

The starting point for most studies concerned with labor markets in low-income countries is the assumption of some market distortion. Solid empirical research documenting many alleged distortions, however, has been relatively scarce. Where careful work has been carried out, e.g., econometric estimation of farm household behavior and wage determination, rural unemployment measurement, many of the pre-suppositions of development theorists have been shown to be wrong or overemphasized. Moreover, the most important of the alleged distortions characterizing labor markets, the persistance of spatial differentials in real wages for workers within homogeneous skill classes, has received relatively little documentation, despite the multiplicity of models designed to explain such phenomena. As many policies carried out or promoted are supported by reference to the inefficiencies associated with the "natural" distortions existing in labor markets, the accumulation of evidence on the magnitudes of distortions as well as empirical evidence relevant to the implications of models incorporating market problems remains a high priority.

The growth rate of empirical evidence pertinent to markets and agents' behavior in low income environments, particularly in rural areas, has increased rapidly in recent years. In part as a result, the development economics literature concerned with the allocation of labor in low-income countries has moved from its emphasis on rigidities and distortions to focusing on the range of alternative arrangements and mechanisms employed by agents in such countries. Characterizations of low-income settings as composed of capitalist farms and family farms, of formal and informal sectors and even as agricultural and non-agricultural or rural and urban significantly understate the mobility of agents

in such environments and overlook some essential features of these areas. We have seen that in many settings almost all farming households import (hire) labor from and export (supply) labor to the market, a substantial fraction of income in rural farm households has its source in the non-agricultural sector (30 percent in India (Rosenzweig and Wolpin (1985)), considerable resources flow between family members located in rural and urban areas, and many workers in urban areas have immediate family members and own land in rural areas to which they eventually return.

There has also been increased recognition that an important aspect of low-income labor markets is the variety of arrangements used to cope with risk and information problems, from formal futures contracts to informal intra-family transfer arrangements, and the spatial variability of these important institutions. Yet models developed to describe rural behavior have generally focused on only one type of arrangement, ignoring alternative arrangements and thus the important question of contractual choice. Little is thus known about how flexible both prices and contractual arrangements are to change. The choice-theoretic models imply that prices, contractual terms and the mix of institutions presumably respond importantly to technological changes, particularly if they reduce or mitigate problems such institutions are designed to alleviate. New substitute arrangements such as governmental efforts to increase the availability of credit or to improve water control may also influence the mix of "traditional" institutions, inclusive of traditional family living arrangements. But there is little detailed, micro time-series information on and few integrative models pertinent to these important changes that accompany the transformation of agriculture (Timmer, Chapter __). The literature is not yet ready to predict the full range of consequences of interventions in the rural sector designed to encourage productivity growth, reduce disparities in incomes or reduce apparent inefficiencies and distortions.

Even less is understood about the degree of life-cycle and intergenerational mobility experienced by agents in low-income countries. How rigid is the distinction between types of workers? Do wage earners remain as wage workers all their lives? How open are opportunities for using allocative or entrepreneurrial skills, e.g., is tenancy a route to land ownership? Longitudinal and/or retrospective life-history data, now scarce, may provide an essential base for examining such issues and for model formulation aimed at integrating capital accumulation with labor allocation. In addition, more focus on the family as the central allocating mechanism may be warranted (see, for example, Pollak (1985)). Understanding the causes and consequences of the transformation of institutional arrangements, formal and informal; the processes by which skills are accumulated, and the mobility of households and individuals lies at the core of development economics. Only what appears to be a promising foundation for an enquiry into these issues appears to have been established.

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