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MARKETS, INSTITUTIONS AND FAMILY SIZE IN RURAL PHILIPPINE HOUSEHOLDS

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In recent years economic studies have shown that rural families respond to market signals and to the availability of new technology and public sector infrastructure. Economic studies have also shown that market transctions are not costless. Information as to prices and opportunities to purchase goods is costly to the suppliers of goods. The buyer of goods or of labor services must also incur costs to search for goods or workers and must often purchase goods or labor services with very poor information. These costs of engaging in market transactions vary a great deal over the development process.

In poorly developed market economies, high transactions and related costs produce a pattern of market organizations with heavy reliance on traditional institutions for handling transactions. The family is one such institution because family ties or bonds allow more efficient contractual arrangements than do markets. The family enterprise dominates such economies. In highly developed market economies, market transactions are low cost. Competitive suppliers provide information at low cost. The public sector provides goods and standards that facilitate transactions. Communication is low cost. In such economies the family enterprise loses its advantage in many sectors of the economy, and market transactions dominate economic activity. In this paper we develop a framework for explaining the transition from nonmarket to market institutions. We use the framework to generate specific hypotheses which are confronted, in turn, with evidence from the rural Philippines. Our specific focus is on the most pervasive and important of all traditional institutions – the rural household.

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The framework we propose is an integration of the new household economics (NHE) and the new institutional economics (NIE). The new household economics uses a utility maximization model to analyze a variety of household activities including home production, fertility and the allocation of time. Having abstracted from the costs of alternative economic organization, however, NHE is not well suited to understanding which activities will be organized in the market system. The NIE focuses explicitly on organizational choice by incorporating transaction cost considerations but so far it (NIE) has focused attention primarily on the firm (Williamson 1975; Stiglitz 1976; Roumasset 1978; Roumasset and Uy 1980; Fama and Jensen 1983). By integrating these theories, we propose to provide a framework for explaining the comparative roles of both the household farm and the market in allocating resources.

Theoretical Background

Under the precondition for a full Walrasian equilibrium, we do not need a separate theory of the agricultural household. The household simply maximizes its utility subject to a budget constraint which includes the income of its profit maximizing farm. The widespread interest in a separate theory of the "peasant farm" can therefore be interpreted as stemming from the belief that these neoclassical assumptions are inappropriate for understanding the rural household-farm. In particular, the transaction costs of using markets and imperfections in markets render the separating hyperplane between farm and household activities inapplicable.[1]

Consider the following agricultural household model of the NHE Type. It postulates a household utility function:

$$(1) \quad U = U\ (N, L_c, E, L_m, L_f, S)$$

where

N = the number of children

E = human capital investment per child (i.e., schooling and health)

L_c = leisure per child

1. See Fabella, this issue.

L_m, L_f = leisure of the mother and father
S = a bundle of other goods

The following production constraints are assumed to hold:

$$(2)\quad N = N(X_n, t_{nm})$$
$$E = E(X_e, t_{em}, t_{ec}, C)$$
$$S = S(X_s, t_{sm}, t_{sc})$$
$$A = A(Xa, t_{af}, t_{ah}, Nt_{ac}, L)$$

where A is an agricultural good and $A(\ )$ is its production function, X_f is a vector of purchased inputs and t_{af} is the time allocated to agricultural production by the father, t_{ah} is time by hired workers and Nt_{ac} is time allocated by children. L is agricultural land. For N, E and S the constraints are "production-like" and may be thought of as home production from vectors of purchased goods X_n, X_e and X_s and time allocated by the mother and children. C measures community health and schooling.

The following time restrictions also hold:

$$(3)\quad L_c = T_c - t_{ec} - t_{ac} - t_{wc} - t_{sc}$$
$$L_m = t_m - t_{nm} - NEt_{em} - t_{sm} - t_{wm}$$
$$L_f = T_f - t_{af} - t_{wf}$$

where t_{wc}, t_{wm}, and t_{wf} are time spent working in a labor market and t_{ec} is time per child spent in educational activities. These restrictions simply account for all time. The financial constraint facing the household is

$$(4)\quad V + W_m t_{wm} + W_f t_{wf} + NW_c t_{wc} + \pi_a = P_n X_n + NEP_e X_e + P_s X_s$$

where $\pi_a = P_a A - P_c X_c - W_h t_{ah} - W_c t_{ac}$

This constraint states that nonlabor income, V, plus earnings in labor marets (W_m, W_f W_c and W_h are wage rates) plus net agricultural profits, must equal spending on purchased goods X_n, X_e, and X_s. The problem of the household is then to maximize household utility ($\bar{1}$) sub-

ject to the production (2), time (3), and financial constraints (4). The problem can be simplified by combining the constraints into a single "full income" constraint. This is done by substituting the time constraints (3) directly into (4). This yields:

$$(5)\quad V + W_m(T_m - t_{nm}NE t_{em} - t_{sm} - L_m) + W_f(T_f - t_{af} - L_f) + N(W_c(T_c - t_{ec} - t_{ac} - L_c) + P_a A - P_i X_i - W_h T_{dh} = P_n X_n + NEP_e X_e + P_s X_s$$

When we incorporate the following definitions of intensities."

$$X'_n = X_n / N; X_e = X_e / E; X'_s = X_s / S; t'_{nm} = t_{nm} / N;$$
$$t'_{em} = t_{em} / E; \quad t'_{sm} / S; \quad t'_{ec} = t_{ec} / E$$

We can rewrite (5) in "shadow price" form.

$$(6)\quad V + W_m T_m + W_f T_f + NW_e T_e + P_a A - W_n t_{ah} = L_m(W_m) + L_f(W_f) + NL_c(W_c) + S(P_s X'_s + W_m t'_{sm}) + Ne(PeX'e + W_c T'_c / N + W_m t'_{em}) + N(P_n X'_n + W_m t'_{nm} - W_c t_{ac} - W_c t_{wc})$$

The household can be viewed as maximizing utility (1) subject to (6). This yields a standard consumer behavior result except that shadow prices are substituted for market prices. The model, however, does presume costless markets. This household values the agricultural good at P_a, the market price and its household labor at market wages. With high transactions costs this will not be the case. The household will find that because it is costly to sell A and costly to buy A it will face a "wedge" between its real net sales price and its real net purchase price. The existence of this wedge will induce the household to reduce its transactions in the food and will forge a link or interrelationship between consumption and production.

Figure 1 illustrates this. Equilibrium rice production, R^*, is determined where the marginal opportunity cost schedule intersects the household demand curve. If the intersection occurs in the intermediate region as shown, then the family is self-sufficient. If the opportunity

cost of labor required to produce one more unit of rice is high as represented by MC', then the family will buy rice at the opportunity cost P_b. In the range of self-sufficiency, equilibrium is determined by the household demand for rice. Thus, production and consumption decisions are interrelated.

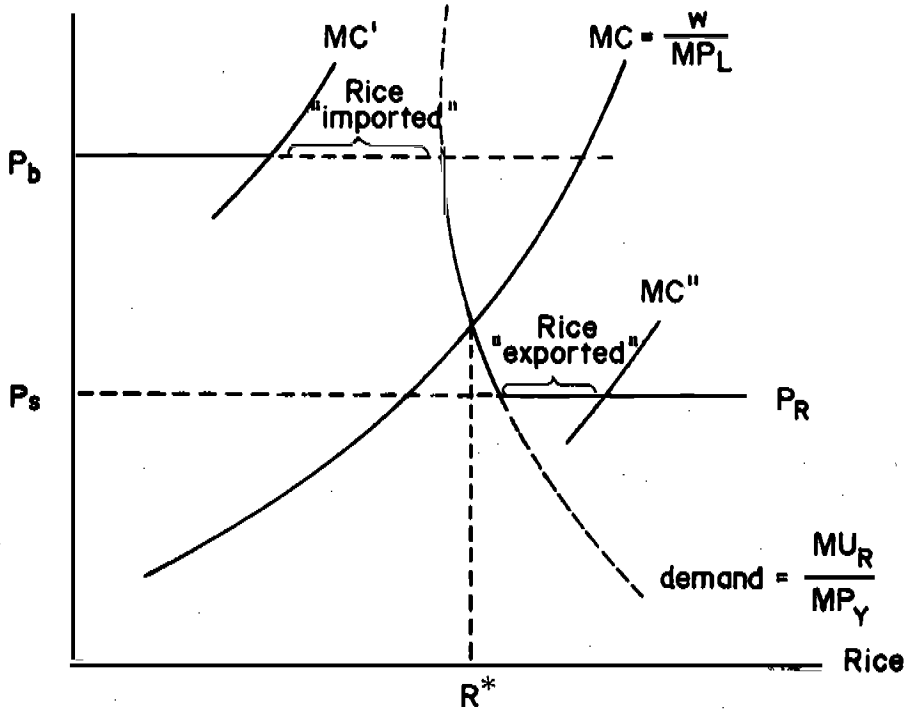

FIGURE 1

P_b = buying price
P_s = selling price
P_R = shadow price
MC_L = marginal opportunity cost of labor $= \frac{w}{MP_L}$

The relevant economic price is equal to P_b so long as the family is buying rice, and to P_s if the family is selling rice and is coincident with the household demand curve in the intermediate region. The difference between P_b and P_s depends largely on transportation costs. It can also reflect high communications costs and local monopoly power. Note, however, that local markets can serve to reduce the price

differential even in remote regions. P_b and P_s are local prices and both may be low in remote regions.

The real economic price of labor is also bounded by the buying and selling prices of labor, i.e., how much the family must pay to hire and monitor labor and the net wage that family members can earn outside the labor markets. Once training, supervision, information and transporation costs are taken into account, the range between these prices can be large, especially for skilled labor (Roumasset and Uy 1980)

The excess burden analysis of the NIE can be brought to bear on the issue at this point. This analysis allows us to introduce a number of *costs* of market organization and functioning. We assume that efficiency is a powerful determinant of organizational form. The most efficient organization is defined as that which minimizes the agency costs that arise because contracts are not costlessly written and enforced (Roumasset and Uy 1980; Fama and Jensen 1983).

> Agency costs include the costs of structuring, monitoring, and bonding a set of contracts among agents with conflicting interests, plus the residual loss incurred because the cost of full enforcement of contracts exceeds the benefits. (Fama and Jensen, 1983, p. 327)

The emphasis on minimizing agency costs can be justified either as a part of profit-maximization (Stiglitz 1976) or for its value in ensuring the firm's survival (Alchian 1950; Fama and Jensen 1980).

Different organizational forms will be appropriate for different activities and in different environments. For example, piece-rates may be paid to workers where "quality shirking" can be easily measured by the inspection of the finished task (e.g., planted cane points). Where simple inspection does not serve as an efficient quality-control mechanism (e.g., for applying chemical inputs), then wage rates may be preferred (Roumasset and Uy 1983).

The economic/physical environment may similarly influence the choice of organizational form. For example, where management of production and the resource base are relatively important, there is a tendency to observe specialized forms, wherein most of labor and perhaps even management is hired. On poor quality land, however, where decision-making and land management are less important relative to the problem of labor shirking, organizations such as family farms, which award the residual to labor, are employed (Roumasset and Uy 1983).

Farm size may be viewed as being codetermined with organizational form. Family farms will accordingly be relatively small and vary with household size (Chayanov 1966). Commercial farms chosen because of the relative importance of mangement will tend to be larger to exploit the economies of scale of decision making.

Figure 2 shows costs as a function of supervision time by the farm manager. The curve *SUPC* shows the costs of supervision activity to the farm. (These rise nonlinearly since some supervision can be done while the farm manager is working with the workers being supervised. As more time is required for supervision, joint work becomes more difficult.) The curve *SHC(H)* depicts lost profits from time shirking by workers in a high transactions cost environment (i.e. with low social cohesion). The curve *SHC(L)* depicts the same costs in an environment where it is easier to recruit workers and enforce contracts. The farm manager is assumed to choose the level of supervision to minimize the "agency costs," i.e. the total costs of supervision plus shirking for a given contract. In Figure 2 these minimized costs are shown as $E^*(H)$ and $E^*(L)$.

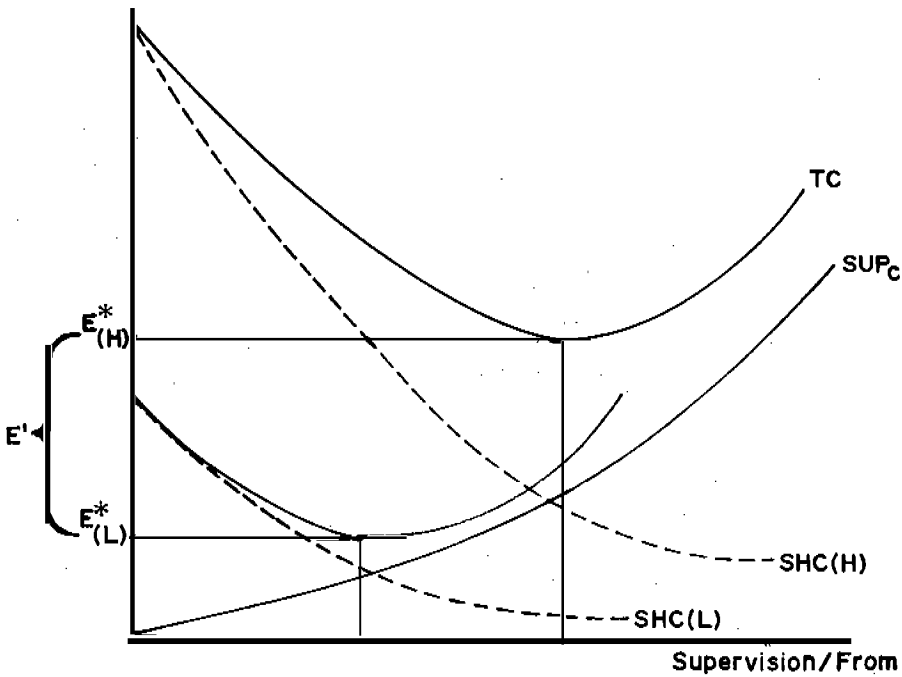

FIGURE 2
LABOR SUPERVISION

Supervision can be purchased in markets by farmers, as well as supplied by farm managers. For example, a farmer may make a piece rate contract with a "team" for transplanting or harvesting work where the team provides its own internal supervision in order to establish a "reputation" for low levels of shirking. Some farm operations may be conducted under one form of contract, while others use a different form. The farmers may have an incentive to use "tie-in" contracts where a worker agrees to provide services such as weeding in order to earn the right to harvest.

As communication improves and new forms of contracts are devised, agency costs tend to decline. This tendency may be offset, however, where family and village institutions become weaker, such that traditional sanctions against shirking are less effective. In general new institutions are then developed to substitute for the loss of traditional sanctions.

The existence of these costs adds a new degree of complexity to household analysis. In rural labor markets, the real cost of hired labor to the farm manager would be higher than the nominal wage (or equivalent piece rate) by the minimized agency cost. Costs of production would be higher but unless there is a differential in the agency cost for family and hired workers, this would not change the nature of the shadow price computations.

The real cost to the farmer of hiring in labor will be the nominal wage W plus the agency cost in the labor market $[E^*(H)$ or $E^*(L)]$ A family worker working off the farm will also have to bear transactions costs in high transaction costs environments, and the real hiring out wage for the household will be lower than the nominal hiring out wages (W_F, W_m, W_c) by these additional costs (or agency costs from the perspective of the workers).

The analysis of household behavior would now change because the household faces different real buying and selling prices. Intuitively, it is easy to see that transactions costs in the product markets push the household transactions costs in the consumes and consuming goods that it produces. The real cost to the household of a good that it produces goes down with a rise in transaction costs, and the real cost of a purchased good goes up. Thus, the bundle of agricultural goods will be altered to include more goods consumed by the household.

Even if there were no advantage to family labor in the sense that the agency cost of family labor is lower than the agency cost associated with hired workers, high transaction costs would also push farms to-

ward self-sufficiency in labor. This is because a family worker on a farm does not bear the transactions costs of seeking and maintaining work in a nonfamily job. A small farm with excess labor, for example, could rent land in competition with larger farms and "sell" its labor to itself, thus avoiding transactions costs.

This tendency toward the self-sufficient farm will be strengthened considerably if the family institution itself provides a means for reducing agency costs. There is abundant evidence that it does. Family ties and obligations and sharing mechanisms within the family reduce the incentives to shirk. The shirking costs of family workers are likewise lower than those of hired workers because of family bonds and incentives. The agency costs associated with family workers is thus lower than that for hired workers by $E' = E^*(H) - E^*(L)$. This family premium, E', depends on the transactions cost environment. In low transactions cost environments it will be low. In high transactions costs it will be relatively high because the family institution may be insulated to some degree from the factors causing costs to be high.

Figure 3 shows how the real opportunity cost of family labor varies by farm size and transaction cost environment. Two levels of transaction cost environments are depicted: low (E' and T') and high (E'' and T''). In low transaction cost environment, farm sizes below L (for a given family size, N) have an opportunity cost of labor that is the nominal wage W_h minus the costs that they incur in hiring out their labor, T. As farm size increases from L_1 to L_2 the farm is self-sufficient in labor; it neither hires out labor nor hires in labor. For farm sizes above L_2, the farm hires in labor and the opportunity cost or value of family labor is the hired wage rate W plus the agency cost premium E'. When transactions cost rise, the "wedge" gets larger and the range of self-sufficiency gets wider.

High transactions cost environments then place economic pressures on farm (and other nonagricultural enterprises) to move toward self-sufficiency in labor and in products. (The analysis has also been applied to credit markets; see James and Roumasset 1982.)

Family Size and Transactions Costs

Reference to the agricultural household model shows that N, the number of children desired by the family, will be a function of the shadow price of children. The expression for the shadow price is

$$SP(N) = P_n X'_n + W_n t'_{nm} - W_c t'_{ac} - W_c t'_{wc} + E\,(SP_E)$$

where $SP(E) = P_e X'_e + W_m t'_{em} + W_c t'_{ec}$

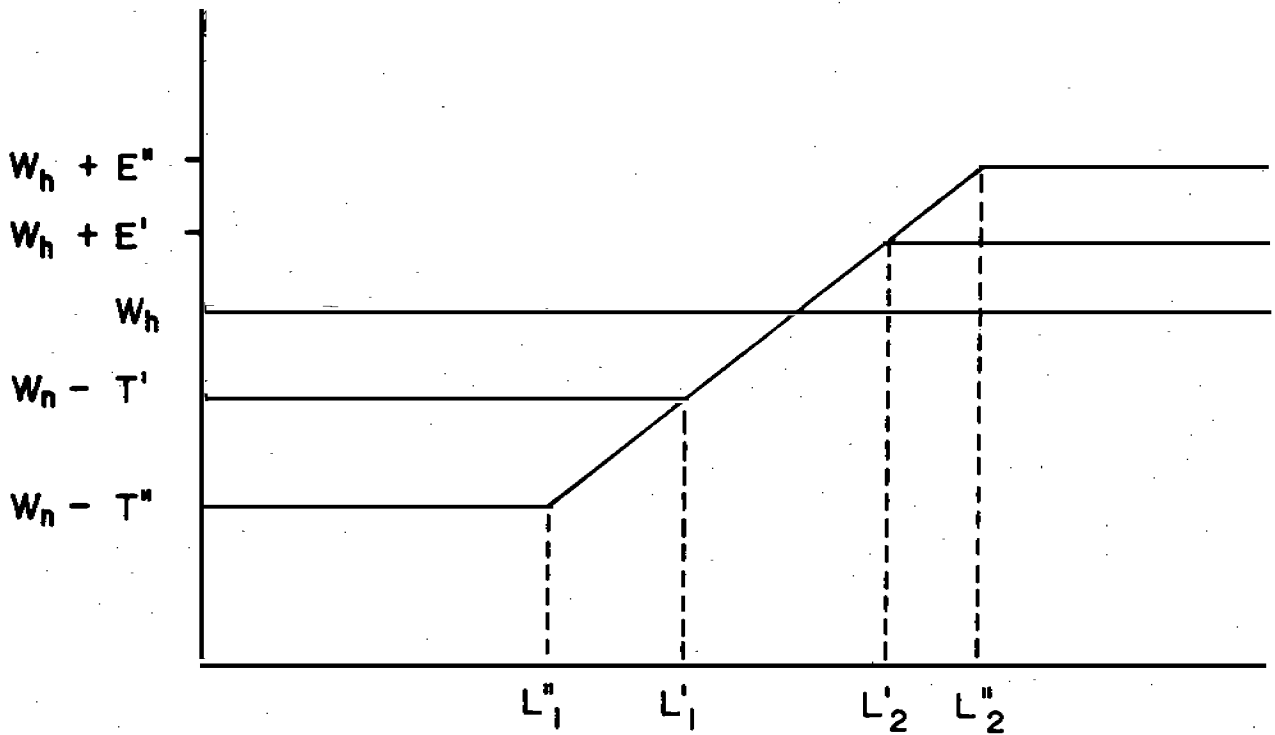

FIGURE 3
EXCESS BURDEN AND FARM SIZE

This shows that the real costs of children are not independent of the educational choice, i.e, they are a function of the level of E and the shadow price of E (human capital). Thus, E and N are jointly determined in the model. Transactions costs can influence this shadow price in a number of ways. They can affect P_n, W_m and, of course, W_c, the real value of child time. Since child earnings in agriculture or through work in markets lower the real costs of children, the agency cost-farm size analysis depicted in Figure 3 will apply to fertility choice. Households with low landholdings (below L'_1 or L''_1) will be hiring out labor and the value to the family of their time will suffer a loss, T' or T''. On the other hand, relative to the nominal wage W_h, households with large landholdings (greater than L'_2 or L''_1) will experience a premium (E' or E'') in the value of their child work because children can substitute for hired workers who are costly to supervise. It should be noted that the real value of the time of the mother will be similarly affected if she does agricultural work or works in the market.

These wage effects will then be transmitted into shadow price effects on children. As transaction costs rise, a difference between hiring in and hiring out households will emerge as regards family size, child leisure, child human capital, and other dimensions of rural household behavior. This difference will be greater the greater are transaction costs.

An examination of the shadow price expression shows that for a hiring-in household, a higher E' and hence, a higher W_e and W_m, lower $SP(N)$ through the t_{ac} term. Its impact through the t_{ec} terms is to raise $SP(E)$ and thus lower E. The total impact on $SP(N)$ is thus indeterminate. A higher W_m raises $SP(E)$ and will hence lower E. This will also have an indeterminate effect on $SP(N)$. A higher W_m will raise $SP(N)$ through the t'_{nm} term. Thus, we cannot sign the effect of E' on $SP(N)$ definitely for hiring-in households although we consider it highly likely that the t_{ac} term will dominate all others. This is because the t'_{nm} term is not likely to be too large because mothers can combine child care with farm work and because younger siblings can also take over some of the child care. The effect of a rise in E' on $SP(E)$ is definitely negative and should reduce E. It should also reduce child leisure because, while it raises the value of family work time, a rising E has other negative income effects, e.g., it raises the cost of hired workers; hence, it is unlikely to have the income effect that a wage increase has.

These points are illustrated in Figure 4 where we have separated the child earnings term from other parts of the shadow price of children and added it to the "benefits" side of the considerations. The curve mc_N

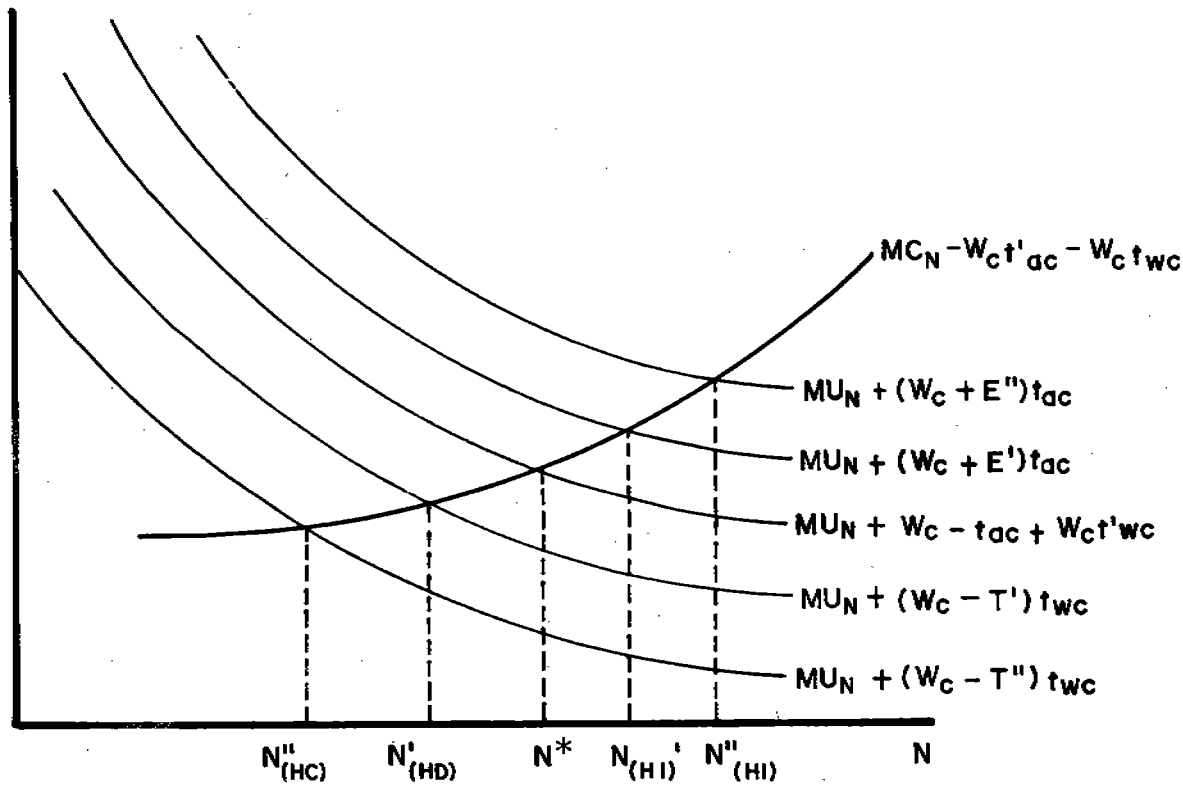

FIGURE 4
DESIRED FAMILY SIZE AND TRANSACTIONS COSTS

shows that other costs rise with N' because of production constraints (diminishing returns in the home production constraints). The curve $MU_N + W_c (T'_{ac} + TW'_{wc})$ shows diminishing marginal utility to N. Desired N is N^**without* transaction costs. With transaction costs desired, N falls for hiring-out households and rises for hiring-in households.

Empirical Application – Rural Philippine Households

The implications of the models discussed above for family size on fertility and for child health can be examined with data from a survey of rural households in Laguna Province in the Philippines (Popkin, King and Evenson 1978). This particular Laguna data set is a pooled cross-section time series data set for 241 rural households. These households were surveyed in 1975, 1977, 1979 and 1982. The key endogenous or choice variable in this analysis is the fertility choice of the household. Since the bulk of the sample was drawn in 1975, the 1982 measure of children ever born is actually the completed family size for more than two-thirds of the sample. We have thus opted to use children ever born (CEB) as our measure of fertility. The age of the mother is an independent exogenous variable controlling for incomplete fertility in our sample.

A secondary endogenous or choice variable of interest is a measure of changes in the health of children in these households between 1979 and 1982. We have three measures of general health for these children:

(a) The change in height between 1979 and 1982.
(b) The change in weight between 1979 and 1982.
(c) The change in weight/height between 1979 and 1982.

The logic of the model discussed above states that:

(1) Higher transactions costs for households with little land (i.e., hiring out households) will cause lower fertility, less child work (more child leisure), and better child health gains – holding all other factors constant.

(2) Higher transactions costs for households with large landholdings (i.e., hiring in households) will cause higher fertility, more child work, and lower health gains – holding other factors constant.

In order to test these propositions we require a measure of transactions costs. Transactions costs are not easy to measure. The Laguna data are from households located in 20 different barangays. The baran-

gays vary in size and distance from commercial activities as well as in institutions. Thus, transactions costs do vary in the cross-section sample of households.

Our procedure for testing the basic proposition of this paper entailed four steps:

In step 1 we estimated a probit equation predicting labor force participation by adult men nand women.

In step 2 we "predicted" wages for men, women and children actually working. A "Mills ratio" from stage 1 was used to correct for selectivity bias.

In step 3 we utilized data on supervision time by farmers per hired worker to predict an implicit transactions cost level for each barrio. The predicted wages from step 2 and the Mills ratios from step 1 were used in this analysis.

In step 4 we estimated fertility and health change equations. The Mills ratios from step 1, the predicted wages from step 2 and the predicted transactions costs from step 3 were included as regressors. The predicted transactions cost variable was interacted with farm size to test the implications of the model.[2]

The step 1 probit equations utilized age, age squared, education, land farmed, a measure of wealth and several barrio dummy variables for barrios as predictors. The wage prediction equation utilized age, age squared, education and barrio dummies as predictors.

Table 1 reports the step 3 results measuring the transactions costs variable. The regression includes predicted wages of fathers (NFWAGE), mothers (NMWAGE) and children (NCWAGE) from step 2 and the mills ratios LANDAM and LAMDAF from step 1. The procedure is to regress hours of supervision time (SUP) on hours of hired work supervised, "interacted" with barrio dummy variables (some of the 20 barrios are combined because of proximity to one another, on hours of family labor by men (FAMM) and women (FAMW) and exchange labor are included in the regression. The coefficients on the hired labor-barrio dummy variables are then treated as transactions cost indexes. This procedure, while not ideal, does measure barrio differences in supervision per hired hour of work. The fact that the family workers and ex-

2. This procedure treats farm size as exogenous in the short run. We have argued that farm size will respond to transactions costs and will be jointly determined with family size. In future work we will treat farm size as endogenously determined.

TABLE 1

DEP VAR: SUP		SSE DFE MSE	F RATIO PROB > F R-SQUARE
VARIABLE	DF	PARAMETER ESTIMATE	T RATIO
INTERCEPT	1	−16.685845	−0.8884
HIRE12	1	0.408159	3.8074
HIRE34	1	0.458874	1.5277
HIRE56	1	0.344776	1.5971
HIRE710	1	0.457456	5.9063
HIRE11	1	0.847728	5.9684
HIRE12	1	0.529146	5.6482
HIRE1314	1	0.309987	1.8810
HIRE1516	1	0.618486	7.8457
HIRE1920	1	0.658436	7.6045
FARM	1	−0.012811	−0.1819
FAMW	1	0.107477	0.7175
EXCT	1	0.018181	0.1399
NFWAGE	1	0.686173	0.9954
NMWAGE	1	0.495619	0.6799
NCWAGE	1	0.707337	0.5902
LAMDAM	1	−16.888549	2.0873
LAMDAF	1	−15.209445	−2.3443

change worker coefficient are not significantly different form zero is the basis for treating these coefficients as proxies for E' (see Figure 3).

Tables 2 and 3 report fertility regressions. In Table 2 the dependent variable is children ever born (CEB). In Table 3, the dependent variable is children born after age 25 of the mother (CHAF25). A comparison of the two tables is suggestive of the timing of contraceptive behavior. In Table 2 we obtain the following "standard" results:

(a) The mortality rating (MORTCEB) is positively correlated with fertility.
(b) Distance from a family planning center (DISTFP) is positively related to fertility.
(c) Mother's education (MRD) is negatively related to fertility.
(d) Mother's wage levels (NMWAGE) are negatively related to fertility.

TABLE 2

DEP VAR: CEB		SSE DFE MSE	F RATIO PROB>F R-SQUARE
VARIABLE	DF	PARAMETER ESTIMATE	T RATIO
INTERCEPT	1	5.351028	2.3140
MORTCEB	1	3.118607	2.2062
PRICE	1	0.032567	0.2445
LANDGE	1	−0.655135	−1.5395
YRUSED	1	−0.042487	−1.2308
INWEALTH	1	−.0000294382	−1.1301
DISTFP	1	0.027566	3.4687
MAGE	1	0.124509	4.1919
FED	1	0.019791	1.2468
MED	1	−0.071473	−3.1606
NCWAGE	1	−0.034021	−0.8448
NMWAGE	1	−0.029991	−0.2014
NFWAGE	1	−0.00377101	−0.1094
LAMDAM	1	−0.521952	−1.1933
LAMDAF	1	−0.122598	−0.4454
SUPRSD6	1	−3.280883	−1.9620
LANDSUP6	1	1.117107	1.3328

In addition, we find support for our basic hypothesis. The predicted transaction cost variable (SUPRSD6) has the expected negative sign, and the interaction with farm size (LANDSUP6) has a positive sign. Thus, for low farm size, high transactions costs reduce fertility. When farm size is high, high transactions costs increase fertility. (The size switch occurs at 2.9 hectares of land.)[3]

Tables 4 and 5 provide further support for the model. It shows that the effect of farm size on child health gains, holding transaction costs constant, is positive. However, the impact of transaction costs (SUPRSD6) depends on farm size. For low farm size, i.e., for households not hiring in labor, high transactions costs actually result in higher height and

3. This treatment of the land variable should be handled in a nonlinear fashion. Changes in land size below the 1 point(s) and above the 2 point(s) (Figure 3) will not affect behavior.

TABLE 3

DEP VAR: CHAF25		SSE DFE MSE	F RATIO PROB > F R-SQUARE
VARIABLE	DF	PARAMETER ESTIMATE	T RATIO
INTERCEPT	1	−1.436988	−0.8401
MORTCEB	1	0.868368	0.8305
PRICE	1	−0.063882	−0.6749
LAND	1	−0.584529	−1.8570
YRUSED	1	−0.027885	−1.0921
INWEALTH	1	−.0000231066	−1.1993
DISTFP	1	0.008659537	1.4732
MAGE	1	0.182468	8.3054
FED	1	−0.000173419	−0.0148
MED	1	−0.020403	−1.2198
NCWAGE	1	−0.013479	−0.4525
NMWAGE	1	0.0006416607	0.0348
NFWAGE	1	−0.035769	−1.9089
LAMDAM	1	−0.325572	−1.0063
LAMDAF	1	−0.025709	−0.1260
SUPRSD6	1	−1.983971	−1.6043
LANDSUP6	1	1.075194	1.7343

weight gains. When farm size is large and the household is hiring in labor, higher transaction costs reduce health gains. This may seem counter-intuitive to some but it is consistent with the basic model. The premium, E^I, that children have in the hiring-in household results in larger family size, more child work and lower health gains. The "discount", T^I, in hiring-out households results in lower family size, less child work and lower health gains.

The effects on weight per unit of height are not very conclusive. Since a factor impacting on health affects both height and weight gains, we would not expect very strong impacts on the ratio. It is of interest to note, however, that the coefficient of LANDSUP6 is positive on weight/height for children aged from 8 to 15. This suggests that the "sweatshop" effect of transaction costs which leads to lower health gains impacts more on height than weight and that the impact on health itself may not be too severe.

TABLE 4
REGRESSION FOR CHILDREN UNDER 8

DEP VAR: CHANGEHT		SSE DFE MSE	F RATIO PROB > F R-SQUARE
VARIABLE	DF	PARAMETER ESTIMATE	T RATIO
INTERCEPT	1	5.351028	2.3140
SEX79	1	3.118607	2.2062
NMWAGE	1	0.032567	0.2445
NFWAGE	1	−0.655135	−1.5395
NCWAGE	1	−0.042487	−1.2308
LAND	1	− 0.000294382	−1.1301
INWEALTH	1	0.027566	3.4687
FPCLINIC	1	0.124509	4.1919
FPDIST	1	0.019791	1.2468
SUPRSD6	1	−0.071473	−3.1606
LANDSUP6	1	−0.034021	−0.8448
A2	1	−0.029991	−0.2014
A3	1	−0.00277101	−0.1094
A4	1	−0.581952	−1.1933
A5	1	−0.128998	−0.4454
A6	1		
INTERCEPT	1	17.444628	0.0000
SEX79	1	1.786907	3.0087
NMWAGE	1	0.026007	0.6044
NFWAGE	1	0.065698	1.6428
NCWAGE	1	−0.00652414	−0.0995
LAND	1	).979897	1.1782
INWEALTH	1	−.0000163113	−0.5143
PFCLINIC	1	−58.195339	−0.0000
FPDIST	1	−0.00221462	−0.2282
SUPRSD6	1	3.412071	1.3197
LANDSUP6	1	−2.458428	−1.4114
A2	1	19.571506	21.7869
A3	1	11.744530	11.0631
A4	1	9.394404	9.2066
A5	1	5.620624	5.5473
A6	1	3.221217	3.1403

Table 4 (continued)

DEP VAR: WTHT		SSE DFE MSE	F RATIO PROB>F R-SQUARE
VARIABLE	DF	PARAMETER ESTIMATE	T RATIO
INTERCEPT	1	−0.098824	2.3140
SEX79	1	−0.040422	2.2062
NMWAGE	1	−0.00037365	0.2445
NFWAGE	1	−0.00145486	−1.5395
NCWAGE	1	−0.000133967	1.2308
LAND	1	−0.010400	−1.1301
INWEALTH	1	2.831285-07	3.4687
FPCLINIC	1	1.029699	4.1919
FPDIST	1	.00003879343	1.2488
SUPRSD6	1	−0.040551	−3.1606
LANDSUP6	1	0.024501	−0.8449
A2	1	−0.243304	−0.2014
A3	1	−0.117546	−0.1094
A4	1	−0.094675	−1.1933
A5	1	−0.054271	−0.4454
A6	1	−0.026111	−1.9620

Conclusions

This test of transactions cost impacts on fertility and child health is carried out in a small cross-section sample of households. A fuller treatment of transactions costs could be made with a larger sample where more variations in transactions cost environments might be observed. Given the limitation of the data, however, we believe that we can claim empirical support for the basic propositions inherent in the NHE-NIE model developed here. In view of the fact that public policies can affect transactions cost environments, these findings have policy relevance. They suggest that further work on this topic will have merit.

TABLE 5
REGRESSION FOR CHILDREN BETWEEN 8 AND 15

DEP VAR: CHANGEHT		SSE DFE MSE	F RATIO PROB > F R-SQUARE
VARIABLE	DF	PARAMETER ESTIMATE	T RATIO
INTERCEPT	1	−37.689890	−0.0000
SEX79	1	−0.624496	−1.7310
NMWAGE	1	−0.00232511	0.1004
NFWAGE	1	0.017868	0.7234
NCWAGE	1	0.026250	0.6576
LAND	1	0.720404	1.4168
INWEALTH	1	.00000893028	0.3669
FPCLINIC	1	−21.279428	−0.0000
FPDIST	1	0.012775	2.0092
SUPRSD6	1	2.590467	1.3562
LANDSUP6	1	−1.903600	−1.9289
A8	1	13.723932	17.8385
A9	1	11.533914	15.9277
A10	1	10.187260	14.2165
A11	1	7.597643	10.4046
A12	1	5.689680	8.1430
A13	1	4.392379	5.7424
A14	1	2.499382	3.0743
INTERCEPT	1	−50.849548	−0.0000
SEX79	1	−4.252602	−3.4922
NMWAGE	1	−0.00199552	−0.0255
NFWAGE	1	0.106122	1.2729
NCWAGE	1	0.005402928	0.0401
LAND	1	3.964313	2.3099
INWEALTH	1	−.0000136504	−0.1661
FPCLINIC	1	−36.271090	−0.0000
FPDIST	1	0.045076	2.1003
SUPRSD6	1	8.614450	1.3362
LANDSUP6	1	−89.780459	−2.9361
A8	1	48.771678	18.7812
A9	1	43.053490	17.6141
A10	1	41.345756	17.0939

Table 5 (continued)

DEP VAR: WTHT		SSE DFE MSE	F RATIO PROB>F R-SQUARE
VARIABLE	DF	PARAMETER ESTIMATE	T RATIO
A11	1	32.384763	13.1390
A12	1	27.630967	11.7157
A13	1	18.565940	7.1910
A14	1	13.430508	4.8941
intercept	1	0.212151	0.0000
SEX79	1	0.066050	3.7315
NMWAGE	1	0.0002163624	0.1904
NFWAGE	1	−0.00147914	−1.2206
NCWAGE	1	0.000496771	0.2537
LAND	1	−0.060158	−2.4115
INWEALTH	1	3.96897E-07	0.3324
FPCLINIC	1	1.247821	0.0000
FPDIST	1	−0.000563043	−1.8049
SUPRSD6	1	−0.089603	−0.9562
LANDSUP6	1	0.143224	2.9581
A8	1	−0.618066	−16.3743
A9	1	−0.540599	−15.2160
A10	1	−0.530690	−15.0947
A11	1	−0.402901	−11.2459
A12	1	−0.353269	−10.3051
A13	1	−0.220820	-5.8842
A14	1	−0.160556	−4.0252

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