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OFF-FARM LABOR SUPPLY:
THE CASE OF LAGUNA, THE PHILIPPINES
by

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ABSTRACT

Recent studies show that off-farm earnings are important for low income rural households. Little is known about the supply of labor by these households to off-farm work. This paper reports on research concerning off-farm labor supply response of small rice producing farms in Laguna, the Philippines. The Philippines government is attempting to alleviate rural poverty through increased off-farm employment.

The research is based on a theoretical labor supply model for a two-person household. Off-farm labor supply is specified as a function of on and off-farm wage rates, nonearnings income and a series of farm and household characteristics. Tobit analysis is used to estimate the relationships. The results show that husbands in the household are very responsive to off-farm wage rates. The labor supply elasticity with respect to off-farm wage rates approached four. Farm size had a negative effect on off-farm work, while the number of young and old children had a positive effect.

Rural households are likely to be responsive to off-farm employment opportunities. Decisionmakers in the Philippines and elsewhere must attempt to reverse the large-scale bias found in current policies if small-scale rural enterprises and off-farm employment are to realize their potential in reducing rural poverty and improving income distribution.

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Dwight A. Smith and Richard L. Meyer**

INTRODUCTION

Most agricultural development strategies emphasize increasing farm income to reduce rural poverty. Recent studies (such as 3, 4, 7) suggest, however, that off-farm earnings are important for many low income rural households. Therefore, efforts to increase off-farm earnings may be an important way to improve rural welfare, especially in light of the disappointing progress made in accelerating small farm income.

The Philippine government has recognized this possibility and has made increasing off-farm employment an explicit objective (6). Almost two-thirds of the population is employed in agriculture and labor productivity is low, resulting in average annual earnings per worker of approximately US\$450. Unfortunately, little is known about labor supply response in rural areas. This paper reports on a study of off-farm labor supply response of rice producing households in the Laguna Region. It complements earlier work testing a neoclassical labor supply model in a developing economy (2).

A MODEL OF OFF-FARM LABOR SUPPLY

The home commodities model developed by Becker and extended by Gronau provides a theoretical framework for the study of off-farm work by farm households. The following assumptions are made: the family has a utility function, maximizes utility, and has an accurate perception of the value of its nonmarket time; no institutional constraints limit time spent in off-farm work, that is, individuals face an elastic labor demand curve over the range of labor supply considered. Unlike off-farm work, it is assumed that additional time worked on the farm is subject to diminishing returns. Furthermore, the farm household is endowed with a given stock of capital, land and labor, has a single period planning horizon, and has no overriding preference for farming.

The original research on which this paper is based (8) analyzed labor supply of both husbands and wives. Space permits presenting only

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the results for husbands. The empirical model based on a two-person household is:

$$T = f(W_{Fh}, W_{Mh}, W_{Fw}, W_{Mw}, V, E)$$

where T measures the number of days husbands worked off the farm for wages. The labor supply decision is considered two-dimensional: first, the decision to work off the farm, and then the amount of off-farm work. This variable is continuous where husbands not working off the farm are recorded as zero days.

W_{Fh} and W_{Fw} are estimates of the value of the husband's and wife's farm work obtained by asking respondents to specify the cost of replacing their labor with hired labor.¹ The rates are weighted by the amount of time spent performing the task on the farm. An increase in the husband's own on-farm wage rate (i.e., the marginal value of farm time) is expected to reduce his off-farm labor supply. The effect on the husband's off-farm labor time of an increase in the wife's on-farm wage is expected to be positive, if their time inputs are substitutes, and negative if they are complements. W_{Mh} and W_{Mw} are imputed off-farm wage rates. A regression containing human capital attributes of age and education was estimated to impute wage rates reflecting income earning potential. The effect of a change in the husband's off-farm wage on his off-farm work cannot be predicted since the term includes both income and substitution effects. An increase in the wife's off-farm wage rate is expected to reduce the husband's off-farm labor supply so long as time inputs are substitutes in home and market activities.

Nonearnings income (V) includes imputed returns to farm capital, net rental income and remittances. An increase in nonearnings income is expected to reduce off-farm labor supply so long as home time is a productive resource and home goods are normal goods. E refers to a set of environmental variables which influence time allocation due to their relatively fixed nature. Farm size, measured in hectares, was included to reflect an implicit higher farm wage. Studies tend to show an inverse relation between farm size and off-farm employment (3 , 7). Farm mechanization may increase off-farm labor supply by substituting for family labor. Farm machinery was measured as stock value in pesos per hectare. Size of dwelling would be expected to influence off-farm labor, especially for the wife in societies where home maintenance is largely a female task. Size of dwelling was measured in square meters.

Some research has attempted to account for home productivity by incorporating number and age structure of children in the analysis (2). Three variables for different aged children were tested in this study: number of children younger than 7 years of age, between 7 and 15, and older than 15. Additional young children may encourage husbands to increase off-farm work to substitute for their wives' loss of income with increased child care. Older children cease being time-intensive commodities and begin to enter the household's time allocation. It is expected that children first engage in home and

¹This concept is discussed in Evenson.

farm production, then enter the off-farm market as possible substitutes for the parents' time.

RESULTS

Characteristics of Households

Data for this study were obtained from 188 farm households included in a larger survey conducted by the University of the Philippines in the Province of Laguna. The data covered the twelve month period ending April 1977. This analysis included households with both spouses present and farming at least one-half hectare. Husbands ranged between 25 and 65 years of age. Descriptive results are shown in Table 1.

Husbands worked off the farm in 38 households, wives in 13 households and both husbands and wives in another 10 households. Working husbands worked on the average just over 100 days regardless of whether their wives worked. Working wives, however, worked more than twice as many days off the farm when their husbands did not. Children reported about 100 days of off-farm work, except where both husband and wife work off the farm suggesting a possible substitution of children for parents in home production. Unfortunately, the data did not permit testing the effect of children's work on parents' off-farm work. Households averaged about ₱ 10,000 (approximately US\$1,500) in net household income (including home consumption of farm production), of which 13 percent was off-farm earnings. Nearly 40 percent of household income was derived off farm when both husband and wife had off-farm employment.

Regression Results

Table 2 presents results for one regression with only wage and income variables and a second which includes environmental variables. Tobit analysis was used to correct for the truncation associated with observations clustered at zero work days (9). Overall, the model gave surprisingly good results in spite of obvious data limitations. The test of significance for Tobit analysis, -2λ , indicates the hypothesis that all coefficients are zero can be rejected at the .01 level for the second model, but not the first.

Responsiveness of husbands to off-farm wage rates is shown by significant positive coefficients in both models. Thus, the substitution effect of wages outweighs the income effect and husbands substitute additional off-farm work for leisure. The wage rate elasticity approached 4 in the second model, implying highly elastic response to increased wages. As expected, farm size had a significant negative effect on off-farm work, while young children and older children are associated with more off-farm work. Husbands appear to substitute for the wife's off-farm work when she cares for young children. As children grow older, they engage in the production of home commodities thereby releasing the husband for more off-farm work. Coefficients for own on-farm wage rates, wife's on and off-farm wages, nonearnings income, machinery, number of children between 7 and 15 years, and size of dwelling were all insignificant in explaining labor supply; however, the signs were frequently as expected. The predicted and observed probability of off-farm work, and expected and observed total labor supply are reasonably similar, providing additional confidence in the model.

TABLE 1: Mean Values of Earnings and Days Worked Off-Farm by Type of Household, Sample Households, Laguna, the Philippines, 1976-77

Characteristic	Sample Mean	Type of Household ^{a/}				F-Ratio ^{b/}
		(1)	(2)	(3)	(4)	
<u>No. of Observations</u>	188	127	38	13	10	13.997**
<u>Days Worked Off-Farm</u>						
By Husband	28.7	0	110	0	105	48.458**
By Wife	17.2	0	0	183	77	75.629**
By Children	91.7	101	75	111	16	1.179
<u>Off-Farm Earnings^{c/}</u>						
By Husband	473	0	1361	0	3487	13.997**
By Wife	119	0	0	1173	652	58.978**
By Children	705	825	286	1291	54	1.236
<u>Net Farm Income^{d/}</u>	8182	9013	6142	8790	5345	0.962
<u>Household Income</u>	9935	10354	8033	11762	10514	1.294

a/ The households are classified as follows: 1 = neither husband nor wife work off the farm; 2 = husband works off-farm, wife does not; 3 = husband does not work off-farm, wife does; 4 = both husband and wife work off-farm.

b/ F = Between Groups Mean Square. The degrees of freedom are 3 and 184 for the numerator and Within Groups Mean Square demoninator, respectively. * = significant at the 0.05 level; ** = significant at the 0.01 level,

c/ Rounded to nearest peso. All earnings and income reported in Philippine Pesos. In 1977, 7 P = 1 US dollar.

d/ Defined as the value of farm sales plus home consumption minus farm operating costs.

TABLE 2: Regression Coefficients and Related Statistics for Models of All Farm Husbands Using Tobit Analysis^{a/}

Independent Variables	Regression (1)	Partial Elasticities	Regression (2)	Partial Elasticities
Intercept	-445.7642*** (2.62)		-435.9772*** (2.57)	
Husband's On-Farm Wage	0.2259 (0.49)	0.032	0.1824 (0.44)	0.030
Husband's Off-Farm Wage	17.3997** (2.17)	3.072	18.5587** (2.33)	3.791
Wife's On-Farm Wage	-1.0457 (1.22)	-0.125	-0.6111 (0.78)	-0.084
Wife's Off-Farm Wage	-1.5967 (0.11)	-0.079	1.6271 (0.12)	0.093
Nonearnings Income	-0.0029 (0.22)	-0.017	0.0089 (0.62)	0.060
Farm Size			-38.7082*** (2.53)	-0.986
Machinery			0.0031 (0.425)	0.049
Young Children			39.9757** (1.92)	0.254
Middle Children			0.6574 (0.05)	0.014
Older Children			8.8067*** (2.60)	0.215
Dwelling			-0.2420 (1.178)	-0.256
-2λ ^{b/}		6.242		29.171***
Predicted Probability of Off-Farm Work		0.246		0.214
Observed Frequency of Off-Farm Work		0.255		0.255
Expected Mean of T_{Mh}^c		27.1112		23.2276
Observed Mean of T_{Mh}		27.9046		27.9046

a/ The absolute values of "t" are shown in parentheses. These are not exact t-tests. They are asymptotically normal variables. The reference to "t-tests" is to provide an analog to ordinary least squares regression. * = significant at 0.10 level; ** = significant at 0.05 level; *** = significant at 0.01 level.

b/ λ is the log of the likelihood ratio. For large n, -2λ is distributed chi-square with k degrees of freedom, where k is the number of explanatory variables in the regression other than the constant. This is analogous to an F-test on a vector of coefficients in standard OLS regressions.

c/ The expected mean of T_{Mh} is calculated at the mean of all explanatory variables.

IMPLICATIONS

Off-farm wage rates and farm and household characteristics appear to influence allocation of time in Laguna households. The off-farm labor supply elasticity with respect to off-farm wage rate was surprisingly high. Differences in earning potential between farm and off-farm work can be expected to affect the amount of time household members work off the farm. Off-farm wage rates exert a "pull" effect when they rise relative to on-farm income. Conversely, a decrease in farm size or increase in family size is likely to exert a "push" effect as households must seek off-farm work to achieve income and consumption objectives.

These results are encouraging regarding the use of household economics to study labor supply in low income rural households in LDCs. Obviously, refinements are required in measurement of time, wages and income. Earnings of children and their effect on household time allocation must be studied. Time series data are needed to analyze the dynamic process of adjustment and adaptation to off-farm employment opportunities. Farm enterprise changes and mechanization are but two issues to be considered as households adjust farming operations to off-farm work. Migration issues are also relevant. Off-farm work may constitute an important first step in the decision to migrate.

Philippine decisionmakers can anticipate that rural households will respond to increased off-farm wages and employment alternatives by supplying more off-farm labor, at least in this area of the country. This same response occurred in Taiwan (7) and may be expected in some other LDCs as well. Having determined the nature of supply response, the question for development strategy becomes one of labor demand. What type of firms and industries should be encouraged, and what type of incentives are needed to facilitate their expansion in rural areas? Several issues are important: the flexibility of labor demand relative to the seasonality of farm work; skill requirements relative to the education and experience of rural households; spatial location of firms and the resulting commuting costs; future profit and demand potential of selected firms and industries; and financial, management and technical constraints faced by nonfarm firms. Recent research has shown that small-scale enterprises in rural areas employ resources more consistent with LDC resource endowments than large size activities. Furthermore, small-scale enterprises appear to have much greater potential than previously assumed when rapid industrialization strategies were developed. LDC decisionmakers face the challenge of altering the large-scale policy bias currently found in many countries so a strategy of small-scale rural enterprises and off-farm employment can realize its true potential and provide the quantity of employment essential for future rural welfare.

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