FACTORS ASSOCIATED WITH FARM HOUSEHOLD POVERTY

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Abstract

A logit model is used to analyze factors associated with the incidence of poverty in Ohio farm households. This analysis suggests that the incidence of poverty is positively associated with financial risk, negatively associated with non-farm employment, household equity, and farm size, but not associated with participation in government programs.

During the past twenty years the U.S. farming sector experienced substantial change--first growth and then retrenchment. The long period of economic crisis in the 1980's was characterized by reduced exports, high interest rates and falling employment opportunities for the rural labor force in mining, energy, and manufacturing. The result was relatively high unemployment rates for rural residents and a relatively high incidence of rural poverty.

There has always been a higher incidence of poverty in rural areas compared to urban areas (Lerman and Mikesell, 1988). Rural poverty reached an all time high (21 percent) in 1981 and decreased to 16 percent in 1986 (de Janvry, 1987). The higher incidence of poverty in the rural areas has been attributed to several factors: ineffective or nonexistent rural development programs, agricultural policies believed to be biased to larger farm operators, and economic policies favoring urban interests (de Janvry, 1987).

The general perception is that poverty in the farm sector is confined to smaller farm operations with low incomes. In recent years, several studies have highlighted the structural change in the number and size distribution of farms. Farms appear to be to evolving either toward larger farms able to realize economies of size in production and marketing or smaller part time farms receiving a majority of income from non-farm sources (Tweeten). The small farms are either operated by those who have been forced to obtain income from off-farm

sources because of decreases in farm income or operators who essentially are farming for hobby or for tax loss purposes.[1] Poverty is thought most likely to occur in farm households which operate small farms and are unable to find off-farm employment. In a recent study, Lobao reported that smaller family farming is positively and larger family farming negatively related to poverty. Many studies suggest that poverty is associated with employment opportunities (e.g., region and proximity to employers) and human capital factors (e.g., education and age). In this study we use data from the Ohio Farm Longitudinal Survey to evaluate the influences of selected farm and operator characteristics on the incidence of poverty.

The Data Set

The data set in this study is a subset of the data from the Ohio Farm Longitudinal Survey conducted by The Ohio State University in 1987, 1988, and 1990. Data were collected from 891 farm households in 1987, 922 farm households in 1988, and 994 farm households in 1990.

Longitudinal studies are designed to examine change over time. The sample in this study is designed to be representative of the farm operator population. After the first year, the sample is comprised of those participating in the previous year plus replacements for those dropping out of the study or those being systematically replaced. Replacement over time is necessary to assure representativeness of the sample.

Farm operators in the sample were selected randomly from the population of Ohio farm operators and fully depict the range of conditions existing on Ohio

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[1]With the 1986 Tax Reform Act, persons who own farms but are not actively engaged in the management of the farm firm itself have less favorable tax treatment.

farms. Of the 891 households in the 1987 sample, 655 participated in 1988 and another 326 were chosen randomly to add to the sample. In 1988, replacement operators gross sales were not significantly different than the gross sales of those dropping out of the sample.

The 494 farm households used for this analysis participated in 1987, 1988, and 1990 and had complete farm and household data for all three years. Farm households were surveyed for demographics, off-farm employment, financial, production and marketing data. Table 1 presents a summary of selected financial, production, and demographic information of the farm households in the data set. These variables are used in our analysis and are explained later in more detail.

The Model and the Variables

To account for the changes in poverty in the farming sector, we evaluated several variables that we believe are determinants of poverty. These are a) non-farm employment, b) farm size, c) participation in government programs, d) owner equity, e) financial leverage, and f) retirement income.

In this analysis, a logit model is used to assess the influence of selected variables on the incidence of poverty in the data set. Poverty is modeled as a 0-1 dependent variable based on income thresholds established by the U.S. Census Bureau. Zero and one represent no poverty and poverty, respectively. Total income from farm and non-farm sources is pooled together and is used in conjunction with the poverty thresholds in establishing the incidence of poverty.

Non-farm employment is included as an independent variable because operators compensate for shortfalls in farm income by securing non-farm employment. This phenomenon generally occurs on small farms where farm income is not enough to support the farm household. Upton and Haworth found that income from non-farm sources is negatively correlated to various measures of farm size

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and growth. Thus, it may be hypothesized that less non-farm employment translates to a higher incidence of poverty. The variable representing non-farm labor is defined as the hours worked off-farm for the household as a proportion of the total hours, both farm and non-farm, worked by the household.

Many studies report that the incidence of poverty is found mainly on farms that are relatively small. Because increased farm size generally translates to higher net farm income, the incidence of poverty is hypothesized to be negatively associated with gross farm income. Because farm size is positively correlated with owner equity, another independent variable, the inverse of farm size (1/gross sales) is used as a measure of farm size. The inverse gross sales variable is not highly correlated to owner equity. As gross sales increases, 1/(gross sales) gets smaller and thus 1/(gross sales) should be positively correlated with poverty.

Government payments as a percentage of gross farm sales is used as a proxy for participation in government programs. Numerous studies have cited government programs as a major factor in the growth of farms. Gardner and Pope suggest that government policies reduce risk by truncating the lower tail of the probability distribution of returns. In addition, the increase in set aside acres that accompany government programs gives management the incentive to expand or more intensively manage a given parcel of land (Garcia et.al.), and deficiency payments enhance gross farm income. The result is that participation on government programs is hypothesized to have a positive effect on gross sales and net income. Thus, participation is hypothesized to be negatively associated with poverty.

The owner equity of a farm household is its total assets less liabilities. Returns to equity, either from farm or non-farm sources, provide income to reduce

the incidence of poverty. In addition, the equity of a farm household is a substantial factor in securing financial resources for growth and expansion. Farm households with small equity bases are hindered from securing capital resources, and are limited in growth and income potential. Owner equity is expected to be negatively associated with the incidence of poverty.

Increased financial risk through leveraged debt may allow positive growth of the farm firm if debt financed enterprises yield sufficient revenue to offset costs of borrowing. Analogously, the effect of debt on farm firm growth will be negative if debt is not adequately amortized by the debt financed enterprises. High debt loads are often indicative of serious financial trouble in a farm household. Farm foreclosures resulting from financial insolvency are typically characterized by farm households struggling to survive financially and often times living in poverty. Thus, high debt as reflected by the debt-to-asset (D/A) ratio is expected to be positively associated with poverty.

Retirement income stabilizes variations in farm household income. It makes up for the shortfalls in farm income when farm income is not enough to support the household. In this analysis, retirement income is the sum of social security payments, private pensions and annuity income. Retirement income is expected to be negatively associated with poverty.

Results

The results of the logit model analysis are presented in Table 2. The overall significance of the model exceeds the 99 percent level. The classification table is a measure of goodness of fit for the logit model. Poverty is predicted to be 1 (positive) if the estimated probability is greater than 0.131.

The model measures the incidence of persistent poverty based on income averaged over three measurement periods. The incidence of poverty was approximately 20 percent within each year; however, across the three measurement periods, the incidence of poverty was 13.1 percent. The higher incidence of poverty within each year reflects the yearly variation that is bound to occur because of fluctuations in income.

The model predicts the correct poverty situation (poverty or no poverty) approximately 68.6 percent of the time (Table 2). Sensitivity refers to the proportion of true positives (poverty = 1) that are predicted to be positive. Herein, the sensitivity is 69.1 percent. Specifically, the proportion of true negatives (no poverty = 0) predicted to be negative, is 64.9 percent. The proportion of predicted positives that are actually negative or the false positive rate is 6.2 percent. The false negative rate or the proportion of predicted negatives that are actually positive is 78.5 percent.

In this model, the estimated relationships between the variables and the incidence of poverty have the hypothesized signs and are significant, except for the government participation and retirement income variables. The sign of the non-farm employment variable is negative, and the inverse of gross farm sales is positive as expected. This suggests that the probability of being in poverty is higher when off-farm employment decreases or when gross farm sales decreases. Thus, the incidence of poverty is dependent on the opportunities to pursue non-farm employment and increase gross farm sales. Lobao reported similar results indicating that households with smaller farms have relatively less income and experience higher rates of unemployment.

Debt-to-asset ratio is significantly positive and indicates that higher financial leverage is positively associated with poverty. Apparently for most

borrowers, rates of return to assets were less than interest rate on liabilities and leverage reduced household income. As expected, owner equity is negatively associated with poverty; however, the significance level of the equity variable is only 8 percent.

The lack of significant relationships between the government participation and retirement income variables and the incidence of poverty indicates that these variables do not accurately predict the incidence of poverty. These findings are noteworthy since they are counterintuitive. One goal of agricultural programs is to reduce poverty; however, the incidence of poverty is not significantly affected by government program participation. The effect of retirement income on the farm household's well-being is overshadowed by factors such as farm size, equity, and financial leverage.

Summary

In this paper, a logit model using several selected variables to determine the incidence of poverty is estimated for a sample of Ohio farms. This analysis suggests that the incidence of poverty is positively associated with financial risk and negatively associated with non-farm employment, farm size, and household equity. Government farm program participation and household retirement income have little effect.

From an agricultural policy perspective, our analysis suggests that a reduction in farm household poverty may be achieved through rural development efforts aimed at increasing non-farm employment opportunities and enhancing farm size. Farm programs appear to have little effect on alleviating poverty.

Table 1. The Variables Used in this Analysis.

Variable Name	Variable Definition	Mean	Standard Deviation
OFFVTOT	Hours worked off-farm as a proportion of total hours worked (1987,1988, 1990)	0.25335	0.29714
1/GROSS	The inverse of gross farm sales (1987, 1988, 1990)	0.08255	0.20017
GOVT	Receipts from government farm program (proportion of gross farm sales 1987, 1988, 1990)	0.11860	0.14363
OWNEREQ	Total assets less liabilities ($1000) (average for 1987, 1988, 1990)	382.018	359.645
D/A	Debt-to-asset ratio, (average of 1987, 1988, 1990)	0.14785	0.19820
RETIRE	Retirement income from Social ($1000) Security and private pensions (average of 1987, 1988, 1990)	2.09216	3.88279

Table 2. Results of the Poverty Logit Model.

VARIABLE	BETA	STANDARD ERROR	CHI-SQUARE	SIGNIFICANCE LEVEL
INTERCEPT	-2.7940	0.3816	53.60	0.0001
OFFVTOT	-2.4418	0.7812	9.76	0.0018
1/GROSS	1.3418	0.5787	5.37	0.0204
GOVT	0.7181	1.1880	0.36	0.5455
OWNEREQ	-0.0006	0.0003	2.95	0.0854
D/A	3.2479	0.7360	19.47	0.0001
RETIRE	-0.0199	0.0464	0.18	0.6682

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MODEL CHI-SQUARE:      39.56*
SIGNIFICANCE LEVEL:    0.00001
CORRECT RATIO:         68.6%
SENSITIVITY:           69.1%
SPECIFICITY:           64.9%
FALSE POSITIVE RATE:    6.2%
FALSE NEGATIVE RATE:   78.5%
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* - WITH 6 DEGREES OF FREEDOM (-2 LOG LIKELIHOOD RATIO)

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