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Determinants of Off-farm Labor Participation and Impacts on Income Distribution Among U.S. Farm Families

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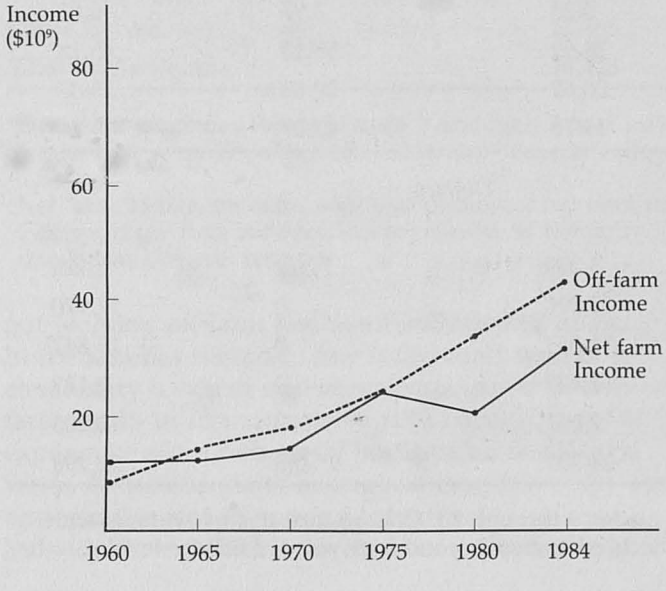
Introduction

Since World War II, the structure of American agriculture has been affected by changes resulting in fewer farms and farmers. While the total number of farms in the United States has declined, size of the average farm and real value of gross sales per farm have increased significantly. This has led to more large farms, many of which generate incomes that exceed average family incomes in the United States (Lee 1981). However, many farmers continue to earn low or even negative net farm incomes. This is particularly true for farmers in the small and medium farm size classes, i.e., those with annual farm sales of less than $100,000. Among these farm families, an increasingly large proportion combine farming activities with off-farm employment to increase and stabilize incomes.

Today, many small and some medium size farms rely heavily on off-farm income. Net farm income increased from $14.4 billion in 1970 to $20.2 billion in 1980, a 40 percent increase (Fig. 1). For this same period, off-farm income increased from $17.6 to $35.1 billion, a rate more than double the rate of increase for net farm earnings. Thus, today a higher proportion of farm family incomes are earned off-farm. In recent years, off-farm income has comprised more than 50 percent of total (net) income earned by farm families in the United States.

Figure 1. Total net farm income and off-farm income of U.S. farm families: 1960-84.



Source: U.S. Department of Agriculture, *Economic Indicators of the Farm Sector: Farm Sector Review, 1984.*

The greater reliance on off-farm income has important implications for the level and stability of farm family incomes (Reinsel 1974; Tweeten 1983), for the distribution of incomes among United States farm families (Ahearn, Johnson, and Strickland 1985), and for policies and programs designed to aid farm families (Findeis 1986). In this study, factors affecting off-farm labor participation among farm operators and spouses in the United States are examined and off-farm labor participation functions are estimated. In addition, the effects of off-farm income on the total and regional distributions of income among United States farm families are assessed. The findings of this study provide a better understanding of those factors contributing to the trend toward greater reliance on off-farm income and of the implications of this trend for the regional distribution of farm family income.

Factors affecting off-farm work decisions

The farm population in the United States is no longer homogeneous in terms of work. While some farm operators and spouses work full-time on their farms, others commit time to part or full-time off-farm work. The incentives for working off-farm or for owning and operating a farm vary widely among those farm families in which one or more family members are employed off-farm (Barlett 1986; Fuguitt 1958, 1961).

Previous studies have shown that individuals who work off-farm tend to be younger, better educated, and less likely to have young children at home. Tables 1 and 2 provide comparisons of operators and spouses employed off-farm to those with no off-farm work, based on data from the March *Current Population Survey (CPS)* for 1979 and 1985. The *CPS*, the source of Government statistics on employment and unemployment in the United States, provides demographic data on a selected sample of United States households. The *Current Population Survey* provides data on labor-force participation and employment status, work experience, income, occupation, and industry of employment for all persons in a household above a minimum working age. One of the positive aspects of the *CPS* is that data are available for individuals in the labor force as well as for those individuals not in the labor force.

Families sampled for this study lived on farms and included both an operator and spouse. Participants in off-farm employment are defined as individuals reporting either wage and salary income or self-employment income from an off-farm job or jobs. In the 1979 and 1985 surveys, the incomes reported are those earned in 1978 and 1984.

Tables 1 and 2 present mean values for characteristics that can be represented by continuous variables (i.e., age, years of education, and income) and percentages (percent of total) for the binary and categorical variables (i.e., levels of education, children of preschool age, present employment status of spouse, regional location of the farm, and location in a Standard Metropolitan Statistical Area (SMSA)). The descriptive statistics clearly indicate differences among individuals working off-farm and those not employed in off-farm jobs. Among farm operators and spouses alike, individuals reporting off-farm earnings were generally younger and better educated. Most of the farmers in both groups — participant and nonparticipant — had attained some high school education. However, those farmers that worked off-farm had higher levels of education. For example, in the 1985 survey 38.6 percent of farm operators working off-farm had attended college whereas only 25.5 percent of nonparticipants had done so. Among farm spouses a similar pattern is observed: 40.4 percent of the spouses working off-farm had attended college, while only 29.3 percent of those

Table 1. Comparison of operator characteristics among part- and full-time farm families in the United States.

Characteristics	1978 Without off-farm employment n=870	1978 With off-farm employment n=953	1984 Without off-farm employment n=624	1984 With off-farm employment n=560
		Years		
Mean age	53.51	46.54	50.53	45.66
Mean education	11.10	13.38	12.58	13.63
		Percent of total		
Level of education:[a]				
Elementary	27.93	13.74	19.39	9.11
High school	52.07	50.26	55.13	52.32
College	18.39	25.60	22.76	31.07
Beyond college	1.61	10.39	2.72	7.50
Farm couples with children younger than 6 years	15.29	21.09	18.11	23.04
Spouse employed off-farm	31.84	53.62	44.71	65.89
Residence in SMSA	10.92	20.25	10.90	17.14
Location:				
Northeast	4.02	5.35	4.97	6.61
North Central	50.46	38.92	55.13	45.18
South	27.59	36.62	20.83	28.57
West	17.93	19.10	19.07	19.64
		Dollars		
Mean income:[b]				
Net farm income	9,476	3,239	7,572	2,125
Off-farm income	0	13,996	0	17,970
Wages and salaries	0	11,563	0	15,847
Self-employment	0	2,433	0	2,123
Other income	6,654	7,067	9,893	12,203
Total family income	16,130	24,302	17,465	32,298

[a]Elementary includes through grade 8 and high school includes grades 9 through 12. College includes individuals with one to four years of college education and "beyond college" reflects education beyond four years of college-level training.

[b]Net farm income includes only that portion of net farm income allocated to the farm operator in the 1979 and 1985 *CPS*. Other income thus includes income earned by the farm operator's spouse (on-farm and off-farm) and children, as well as dividends, interest, rent, etc.

Table 2. Comparison of spouse characteristics among part- and full-time farm families in the United States.

Characteristics	1978 Without off-farm employment n=1035	1978 With off-farm employment n=788	1984 Without off-farm employment n=536	1984 With off-farm employment n=648
		Years		
Mean age	49.40	42.48	49.26	42.02
Mean education	12.58	13.68	13.06	13.83
		Percent of total		
Level of education:[a]				
Elementary	15.94	6.73	8.77	4.78
High school	59.90	55.96	61.94	54.78
College	22.71	28.68	27.05	34.41
Beyond college	1.45	8.63	2.24	6.02
Farm couples with children younger than 6 years	18.36	18.27	19.96	20.83
Spouse employed off-farm	42.71	64.85	35.63	56.94
Residence in SMSA	15.17	16.62	12.50	14.97
Location:				
Northeast	4.25	5.33	6.34	5.25
North Central	45.22	43.40	49.81	50.93
South	31.88	32.87	23.32	25.46
West	18.65	18.40	20.52	18.36
		Dollars		
Mean income:[b]				
Net farm income	6,963	5,233	6,197	4,002
Off-farm income	0	5,466	0	8,374
Wages and salaries	0	5,078	0	7,716
Self-employment	0	369	0	658
Other income	11,465	12,316	14,213	15,471
Total family income	18,428	22,995	20,410	27,847

[a]Elementary includes through grade 8 and high school includes grades 9 through 12. College includes individuals with one to four years of college education and "beyond college" reflects education beyond four years of college-level training.

[b]Net farm income includes only that portion of net farm income allocated to the farm spouse in the 1979 and 1985 *CPS*. Other income thus includes income earned by the farm operator (on-farm and off-farm) and children, as well as dividends, interest, rent, etc.

not working off-farm had some college education. In the families sampled, few individuals with only elementary levels of education participated in off-farm work. In contrast, those with college experience more frequently participated in off-farm work. These observations suggest that the opportunity cost of farming is higher for individuals with higher levels of education.

Differences between the two groups in sources and magnitudes of income are also observed. Farm operators who also worked off-farm received less than one-third the net farm income received by full-time farmers. However, these operators supplemented their lower net farm incomes with substantial off-farm earnings, resulting in total family incomes almost double those of the full-time operators. In addition, farm spouses generated a considerable amount of off-farm income. In the 1985 sample, farm spouses working off-farm contributed an average $8,400 in off-farm labor income to the farm household.

Other comparisons of United States farm families appear in Tables 3 and 4. These tables include selected characteristics of farm families with one spouse, both spouses, or neither spouse working off-farm in each of the two survey years. These families are referred to as single earner, dual earner, and no off-farm work families, respectively. Dual earner farm families earned, on average, higher total family incomes. However, the average net farm income of dual earner families is very low in comparison to single earner and no off-farm work families. Families with only one off-farm earner had considerably higher average total family incomes than families with no earnings from off-farm employment, but earned considerably less than dual earner families.

Between 1978 and 1984, the average total family income generated by dual off-farm earner families increased by 34 percent. Only nominal increases were seen in average incomes of families with neither spouse or only one spouse working off farm (Tables 3, 4). Families not employed off farm in the 1985 sample averaged $12,300 total family income; dual-earner families averaged $31,000.

Table 3. Comparison of household characteristics among farm families with respect to off-farm income, 1978.

Characteristics	Single earner families n=719	Dual earner families n=511	Families without off-farm employment[a] n=592
		Percent of total	
Farm couples with children younger than 6 years	21.00	18.98	14.50
Residence in SMSA	15.86	20.55	11.64
Region of residence:			
Northeast	5.42	5.28	3.37
North Central	41.86	40.31	51.10
South	32.00	36.99	28.67
West	20.72	17.42	16.86
		Dollars	
Mean income:			
Net farm income	6,468	2,505	9,106
Off-farm income	11,019	18,995	0
Other income	2,946	1,684	4,052
Total family income	20,433	23,184	13,158

[a]Neither farm operator nor spouse works off-farm.

Table 4. Comparison of household characteristics among farm families with respect to off-farm income, 1984.

Characteristics	Single earner families n=470	Dual earner families n=369	Families without off-farm employment[a] n=345
		Percent of total	
Farm couples with children younger than 6 years	21.28	22.22	17.39
Residence in SMSA	11.28	18.97	11.88
Region of residence:			
Northeast	5.32	6.23	5.80
North Central	50.42	46.88	45.80
South	24.47	28.46	20.29
West	19.79	18.43	19.71
		Dollars	
Mean income:			
Net farm income	5,285	1,760	8,062
Off-farm income	11,057	27,894	0
Other income	2,639	1,358	4,256
Total family income	18,981	31,012	12,318

[a]Neither farm operator nor spouse works off-farm.

Models of off-farm labor participation

Individuals are assumed to allocate their time between off-farm and on-farm work consistent with the marginal returns to labor employed off-farm and in farming (see Bollman 1979; Sumner 1982; Lee 1965). The quantity of labor supplied for off-farm work will depend in part on the off-farm wage, which is a function of the individual's human capital. The individual's ability to supply labor to off-farm work is further constrained by household work and leisure.

Whether the farm operator or spouse participates in off-farm work depends on the individual's willingness and ability to supply labor off-farm as well as on the demand for labor. The former will depend on the individual's human capital, on the characteristics of the farm family (e.g., presence of children), and on the characteristics of the farm that affect the relative returns to on-farm labor. The demand for labor reflects the availability of off-farm job opportunities accessible to farm family members. The location of the farm may affect accessibility.

Previous studies have shown that individuals working off-farm tend to be younger, better educated, and (in the case of the spouse) less likely to have young children at home (Findeis, Hallberg, and Lass 1987). The economic theory of time allocation (Becker 1965), previous studies of off-farm employment decisions (e.g., Simpson and Kapitany 1983; Thompson 1985; Sumner 1982; Leistritz, Vreugdenhil, Ekstrom, and Leholm 1985) suggest variables that may significantly influence off-farm labor participation decisions. To estimate the influence of selected characteristics, the following dichotomous dependent variable participation models are specified, where (i = o) designates the farm operator and (i = s) refers to the farm spouse:

Participation function of the farm operator:

$$PART_o = f_o(AGE_o, EDUC_o, EMP_s, SMSA_f, R_f, Y_f, OT_f) \quad (1)$$

Participation function of the farm spouse:

$$PART_s = f_s(AGE_s, EDUC_s, EMP_o, CH_f,$$

where:

$PART_i$ = probability of participation in off-farm work;

AGE_i = individual's age;

$EDUC_i$ = individual's education;

EMP_i = employment status of individual's spouse (i = s for farm operator's spouse; i = o for the spouse of the "farm spouse");

CH_f = presence of preschool-age children in the farm family;

$SMSA_f$ = location of farm family in a Standard Metropolitan Statistical Area;

R_f = regional location of farm family;

Y_f = net farm income; and

OT_f = other income, which includes income received from sources other than farm and off-farm work.

Model estimation

The data used to estimate each model are from the March *Current Population Survey* for the years 1979 and 1985. Models are estimated for each year separately to examine differences (and similarities) in the significance and direction of the parameter estimates.

The dependent variable for each participation model is dichotomous (0,1), representing the off-farm labor force participation decision of the farm operator or spouse. The dependent variable $(PART_i)$ is assigned a value of 1 if the individual works off-farm and 0 if otherwise. If the farm operator or spouse receives income in the form of off-farm wages and salaries or nonfarm self-employment income, he or she is assumed to be employed off-farm.

The independent variables representing age, net farm income, and "other income" are incorporated as continuous variables in the models. The age variable (AGE_i) is measured by the age of the individual at his/her last birthday. A positive relationship is anticipated between an individual's age and participation in off-farm work up to a certain age; beyond this age a negative relationship between advancing age and dual employment on-farm and off-farm is predicted. For this reason, the square of age $(AGESQ_i)$ is also included as an explanatory variable to capture the life-cycle effect of advancing age on off-farm employment. Studies (e.g., Sumner 1982) have shown age to have an important influence on off-farm labor participation.

Since an increase in income from one source relative to another is likely to decrease the time allocated to the alternative employment, income variables are included in the model to capture their influence on off-farm work participation decisions. Previous studies (Furtan, Van Kooten, and Thompson 1985; Sumner 1982) have documented that income variables affect off-farm work decisions of farm household members. The two income variables included as independent variables in this study are net farm income (Y_f) and other income (OT_f). Net farm income is the reported annual net farm income in thousands of dollars, and includes government farm program payments to farmers. The other income variable (OT_f) measures the income received from sources other than from operation of the farm, or from off-farm employment. Other income includes Supplemental Security Income and public assistance; interest, dividends, rent, and trust income; veterans' payments, unemployment compensation, and workmen's compensation; pension, alimony and child support; and other similar forms of income. This variable is measured as the sum of reported annual incomes from these sources in thousands of dollars. Inverse relationships are expected between annual net farm income and participation in off-farm employment among both farm operators and spouses. For operators and spouses alike, an increase in income from other sources is expected to decrease the motivation to work off-farm.

The other exogenous variables specified in equations (1) and (2) are incorporated into the estimated models as binary variables (0,1). Education is incorporated into the model in the form of three binary variables representing four alternative levels of education: some education but not completing high school ($NCHS_i$), high school graduate with no additional education, one to four years of college-level training ($COLGE_i$) and more than four years of college education ($GTCOL_i$). Individuals are analyzed relative to those that are high school graduates but without formal education beyond high school. This procedure is used to avoid statistical estimation problems associated with the use of binary variables.

Family characteristics are included in the model in the form of binary variables representing the employment status of the spouse (i.e., on-farm alone or dual employment on-farm and off-farm) and the presence of young children. The employment status variable (EMP_i) represents the off-farm work status of the individual's spouse. This variable is assigned a value of 1 if the individual's spouse receives off-farm earnings and 0 if he/she earns no off-farm income. The presence of preschool-age children is also included in the spouse participation equation and is hypothesized to negatively affect off-farm labor force participation decisions. The variable representing the presence of young children ($CHL6_f$) is given the value 1 if the farm couple have children under six years of age, 0 if otherwise. This variable was not included in the farm operator equation because the presence of young children has generally not been shown to affect off-farm labor participation among farm operators (see Findeis, Hallberg, and Lass 1987).

Location variables, specifically residence in an SMSA and location by region in the United States, are included in both model specifications. The SMSA variable represents whether the individual's farm is located in a Standard Metropolitan Statistical Area. This variable is to capture the degree of urbanization and may reflect access to off-farm jobs. In addition, three binary variables are incorporated into the model to differentiate farms by regional location in the United States: the Northeast (NE_f), South ($SOUTH_f$), West ($WEST_f$), and North Central regions.[1] The location variables take the value of 1 or 0, based on the farm family's residence in each particular region. The North Central region is used as the reference region in all models, and thus a variable representing residence in this region is included implicitly in each model.

Given these variables, the off-farm labor participation models estimated here can be written:

Farm operator:

$$\begin{aligned} PART_o = {} & \beta_o + \beta_1 AGE_o + \beta_2 AGESQ_o \\ & + \beta_3 NCHS_o + \beta_4 COLGE_o \\ & + \beta_5 GTCOL_o + \beta_6 EMP_s \\ & + \beta_7 SMSA_f + \beta_8 NE_f + \beta_9 SOUTH_f \\ & + \beta_{10} WEST_f + \beta_{11} Y_f + \beta_{12} OT_f \end{aligned} \quad (3)$$

Farm spouse:

$$\begin{aligned} PART_s = {} & \beta_o + \beta_1 AGE_s + \beta_2 AGESQ_s \\ & + \beta_3 NCHS_s + \beta_4 COLGE_s \\ & + \beta_5 GTCOL_s + \beta_6 EMP_o \\ & + \beta_7 CHL6_f + \beta_8 SMSA_f + \beta_9 NE_f \\ & + \beta_{10} SOUTH_f + \beta_{11} WEST_f \\ & + \beta_{12} Y_f + \beta_{13} OT_f \end{aligned} \quad (4)$$

where:

$PART_i$ = probability of participation in off-farm work ($i = o$ for operator, $i = s$ for spouse),

AGE_i = variable measuring age in years,

$AGESQ_i$ = age variable squared,

$NCHS_i$ = binary variable (0,1) with 1 indicating attainment of some education but not a high school graduate,

$COLGE_i$ = binary variable (0,1) with 1 indicating one to four years of college-level education,

$GTCOL_i$ = binary variable (0,1) with 1 indicating more than four years of college education,

EMP_i = binary variable (0,1) with 1 indicating participation of the individual's spouse in off-farm work,

$SMSA_f$ = binary variable (0,1) with 1 indicating residence in an SMSA,

$CHL6_f$ = binary variable (0,1) with 1 indicating the presence of children younger than six years,

NE_f = binary variable (0,1) with 1 indicating the individual resides in the Northeast,

$SOUTH_f$ = binary variable (0,1) with 1 indicating the individual resides in the South,

[1]The Northeast region includes the New England and Middle Atlantic Divisions as defined by the Bureau of the Census. The North Central region includes the East North Central and West North Central Divisions. The West includes the Mountain Division and the Pacific Division. The South includes the East South Central, West South Central, and South Atlantic Divisions.

$WEST_f$ = binary variable (0,1) with 1 indicating the individual resides in the West,

Y_f = variable indicating the net farm income received, and

OT_f = variable indicating the total income received from sources other than farming and off-farm employment.

Equations (3) and (4) are estimated for farm operators and spouses in the United States for each year to determine those factors that significantly influence off-farm labor participation decisions.

Results of the probit analyses

Estimates of the parameters for equations (3) and (4) are obtained using probit analysis, which restricts the predicted probabilities of participation choice to the (0,1) interval.[2] Tables 5 through 8 present the analysis results for farm operators and spouses separately. These tables include the maximum likelihood estimates, t-ratios, and partial derivatives of the exogenous variables. A reference group is defined for each model to account for the omitted binary variables. The reference group contained farm operators (or spouses) who resided in a nonmetropolitan area in the North Central region, had spouses not employed off-farm, and had graduated from high school but did not have additional education beyond high school. Operators and spouses with these characteristics are used as reference groups for intergroup comparisons.

The statistics measuring goodness-of-fit of the models are also reported in Tables 5 through 8. Since the maximum likelihood approach is used to estimate the model parameters, the log-likelihood ratio provides an appropriate test for goodness-of-fit. For each participation equation, the log-likelihood ratio is significant at the given chi-square distribution degrees of freedom, indicating that the combined effects of the independent variables on off-farm work participation decisions differ significantly from zero. Comparisons of the frequencies of actual outcomes and predicted outcomes of the models further substantiate the likelihood ratio tests (Tables 5, 6, 7, and 8).

Analysis of labor participation functions of farm operators

Tables 5 and 6 present the estimated operators' off-farm participation functions for the two sample years. The signs of the estimates are consistent across both years for all variables included in the models. The coefficients of age, college level education, education beyond four years of college, residence in an SMSA, employment of spouse in an off-farm job, and residence in the Northeast, South, or West are positive relative to the reference group. The coefficients of the age squared, net farm income, and "other income" variables are negative, as is the coefficient of the variable representing low levels of education ($NCHS_o$). The signs of the estimates are consistent with expectations of the relationships between the independent variables and participation in off-farm work.

The coefficients of the variables representing less than a high school level education and net farm income are highly significant and negative in both years, indicating that lower levels of education and higher net farm incomes are associated with lower levels of off-farm labor participation. In contrast, more than four years of college education, employment of the spouse in a nonfarm job, residence in an SMSA, and location in the South are characteristics that significantly increase the likelihood that the farm operator will work off-farm. These observations are consistent across both years.

Table 5. Estimated off-farm labor participation function for United States farm operators, 1978.

Variable	Estimate	t-statistic	Partial derivative[a]
Intercept	−1.4279	−3.93	—
AGE_o	0.0855	5.62	0.0335
$AGESQ_o$	−0.0010	−6.72	−0.0004
$NCHS_o$	−0.3297	−4.14	−0.1340
$COLGE_o$	0.0143	0.07	0.0039
$GTCOL_o$	0.7925	4.55	0.2681
$SMSA_f$	0.3753	4.06	0.1398
EMP_s	0.3661	5.49	0.1397
NE_f	0.1212	0.78	0.0465
$SOUTH_f$	0.3265	4.32	0.1272
$WEST_f$	0.1623	1.81	0.0669
Y_f	−0.0453	−12.19	−0.0178
OT_f	−0.0029	−0.45	−0.0011
Log-likelihood ratio: −1015.5			
Percentage of correct predictions: 73			
Sample size = 1,823			

[a]The partial derivative for an exogenous variable measures the change in the probability of participation in off-farm employment per unit increase of the exogenous variable.

[2]For a clear discussion of alternative estimation techniques for dichotomous dependent variable models, see Aldrich and Nelson (1984).

Table 6. Estimated off-farm labor participation function for United States farm operators, 1984.

Variable	Estimate	t-statistic	Partial derivative[a]
Intercept	−0.4467	−1.00	—
AGE_o	0.0172	0.89	0.0068
$AGESQ_o$	−0.0003	−1.38	−0.0001
$NCHS_o$	−0.3449	−3.28	−0.1315
$COLGE_o$	0.1501	1.60	0.0594
$GTCOL_o$	0.5512	2.91	0.2155
$SMSA_f$	0.3127	2.74	0.1270
EMP_s	0.3553	4.43	0.1411
NE_f	0.2979	1.77	0.1193
$SOUTH_f$	0.3932	4.11	0.1584
$WEST_f$	0.0976	0.95	0.0397
Y_f	−0.0215	−6.39	−0.0099
OT_f	−0.0138	−1.35	−0.0054
Log-likelihood ratio: −729.9			
Percentage of correct predictions: 66			
Sample size = 1,184			

[a]The partial derivative for an exogenous variable measures the change in the probability of participation in off-farm employment per unit increase of the exogenous variable.

Implications

Low net farm returns increase the probability of off-farm work. In this study, net farm income in either year has a highly significant negative relationship with the probability of off-farm work. For 1978 and 1984, the probability of working off-farm decreases by 2 percent and 1 percent, respectively, for each $1,000-increase in net farm income.

The significant age and age-squared estimators for 1978 validate the curvilinear relationship between the operator's age and off-farm work, at least for that year. This relationship is consistent with previous studies (e.g., Sumner 1982) and suggests an increase in the productivity of work time among young operators which decreases as the individual approaches retirement age. Alternatively, younger workers may have greater incentives to work off-farm to gain off-farm job skills or to finance additional assets. Older operators, on the other hand, may have sufficient off-farm income from other sources (e.g., Social Security, private pensions, interest payments, and dividends from accumulated assets) and therefore be less interested in dual employment on-farm and off-farm. In cases where income from farming and from "other income" sources is low, the older farmer may not be physically capable of supplying more hours to off-farm work or not possess the skills necessary for many off-farm jobs.

Education also has a significant impact on participation in off-farm work: farm operators with more education are more likely to be employed off-farm than are operators with less schooling. Operators who had not attended high school were least likely to be employed off-farm in either year, while individuals with some college level education were more likely to participate. Except for the college level education variable, the estimated relationships between each of the education variables and off-farm work were statistically significant.

The significant negative relationship between $NCHS_o$ (not a high school graduate) and off-farm work may reflect the higher on-farm (relative to off-farm) wage for individuals with limited education or may reflect the limited availability of unskilled off-farm job opportunities. The greater probability for off-farm work among farmers with more education indicates that higher educational levels improve the individual's potential market wage, thus encouraging off-farm labor force participation. These findings are consistent with those of previous studies (Bollman 1979; Furtan, Van Kooten, and Thompson 1985; Desaran, Falk, and Jenkins 1984).

In both years, operators whose spouses worked off-farm were more likely to work off-farm than operators with spouses not employed off-farm. There are several potential reasons for these results. Some part-time farm couples may have started farming after being in the off-farm labor force initially. Couples moving into farming may choose to continue in their off-farm jobs at least until the farm operation is stabilized. The reverse could also be the case: farm families incurring losses from farming may rely more heavily on off-farm sources of income and both spouses may work out of necessity.

The results also indicate that operators residing in metropolitan locations and/or in the South, relative to those living in the North Central region, were more likely to work off-farm. This reflects the continuing reliance of North Central farmers on farming as the major income source. The higher participation rates among farm households in the South may reflect the larger number of smaller farms in that region. The higher participation rates in the South may also be an indication of the availability of off-farm employment opportunities in this region where employment grew steadily during the late 1970s.

The lack of a significant difference between the North Central and Northeast regions may be due to

the prevalence of dairy farms in the Northeast. Dairy farmers are less likely to participate in the off-farm labor market due to the on-farm time constraints imposed by dairy operations (Salant, Saupe, and Belknap 1984).

Off-farm labor participation among farm spouses

The off-farm labor participation functions estimated for farm spouses for 1978 and 1984 are presented in Tables 7 and 8, respectively. Higher levels of education are expected to enhance the farm spouse's off-farm earning capacity, leading to higher off-farm work participation rates. Data for both years show that the likelihood of spouses with some college level education being employed off-farm was significantly higher than for spouses who graduated from high school but did not attend college. Spouses with some college education beyond high school comprised approximately one-third of the samples. For individuals with more than four years of college, the probability of participation was significantly higher than for farm spouses with high school educations only — more than one-third higher for 1978 and one-quarter higher for 1984. For both years, the estimates are highly significant.

These results are not surprising. Higher levels of education are generally associated with higher wage rates and thus additional education increases the opportunity cost of time spent on household and farm activities. Conversely, the wage that can be earned off-farm by farm spouses who have not graduated from high school is likely to be low, and may at least partially explain the lower participation rates witnessed for individuals with low levels of education.

Off-farm employment of the farm operator also has a highly significant positive influence on the probability of the spouse working off-farm. The study results indicate that spouses of farm operators with off-farm jobs have a significantly higher probability of being employed off-farm relative to spouses of full-time farmers. In contrast, responsibility for children in the home has a significant negative effect on the off-farm employment of farm spouses. In both years, the coefficient of the variable representing presence of young children is negative and highly significant. Clearly, the presence of young children significantly decreases the probability of the farm spouse working off-farm. This result was anticipated: younger children demand more care and attention, requiring the spouse's time at home and reducing time available for off-farm work activities.

Table 7. Estimated off-farm labor participation function for United States farm spouses, 1978.

Variable	Estimate	t-statistic	Partial derivative[a]
Intercept	0.5481	1.41	—
AGE_s	−0.0039	−0.24	−0.0013
$AGESQ_s$	−0.0003	−1.62	−0.0001
$NCHS_s$	−0.1171	−1.42	−0.0404
$COLGE_s$	0.2085	2.73	0.0403
$GTCOL_s$	1.1528	6.57	0.4345
$SMSA_f$	−0.0143	−0.15	−0.0034
EMP_o	0.3819	5.59	0.1328
$CHL6_f$	−0.6456	−6.32	−0.1913
NE_f	0.1052	0.71	0.0352
$SOUTH_f$	−0.0047	−0.06	−0.0000
$WEST_f$	−0.0474	−0.55	−0.0170
Y_f	−0.0057	−1.78	−0.0002
OT_f	−0.0083	−0.41	−0.0028
Log-likelihood ratio: −1101.5			
Percentage of correct predictions: 66			
Sample size = 1,823			

[a]The partial derivative for an exogenous variable measures the change in the probability of participation in off-farm employment per unit increase of the exogenous variable.

Table 8. Estimated off-farm labor participation function for United States farm spouses, 1984.

Variable	Estimate	t-statistic	Partial derivative[a]
Intercept	0.1966	0.37	—
AGE_s	0.0327	1.44	0.0130
$AGESQ_s$	−0.0007	−3.00	−0.0003
$NCHS_s$	−0.1820	−1.55	−0.0756
$COLGE_s$	0.1762	1.97	0.0717
$GTCOL_s$	0.6963	3.22	0.2646
$SMSA_f$	0.0894	0.77	0.0359
EMP_o	0.4085	5.09	0.1625
$CHL6_f$	−0.5593	−4.45	−0.2170
NE_f	−0.2156	−1.25	−0.0871
$SOUTH_f$	−0.0021	−0.02	−0.0000
$WEST_f$	−0.1532	−1.49	−0.0637
Y_f	−0.0054	−1.99	−0.0022
OT_f	−0.0199	−1.49	−0.0079
Log-likelihood ratio: −712.18			
Percentage of correct predictions: 67			
Sample size = 1,184			

[a]The partial derivative for an exogenous variable measures the change in the probability of participation in off-farm employment per unit increase of the exogenous variable.

An inverse relationship was also observed between the net farm income of the farm family and participation of the spouse in off-farm work. This indicates that higher net farm incomes are generally associated with lower off-farm participation rates, for operators and spouses alike, while lower net farm incomes are often earned by families with higher off-farm earnings. However, the impact of net farm income on participation among farm spouses is smaller than might be anticipated: a $1,000 increase in annual net farm income decreases the spouse's probability of participation by at most 0.22 percent in both years.

With a few exceptions, the variables representing age, regional location, residence in an SMSA, and "other income" were not statistically significant. Interestingly, location had little influence on the off-farm work decisions among spouses. Other considerations equal, farm spouses in the Northeast, South, and West are as likely to be employed off-farm as farm spouses in the North Central region. Additionally, farm spouses residing in SMSAs were no more likely to work off-farm than farm spouses in more rural areas.

Implications of off-farm income for the distribution of farm family income

The off-farm employment participation models examined in this study suggest factors that have encouraged participation in the off-farm labor market. The higher off-farm employment rates observed in recent years have implications for rural communities as well as for the structure of agriculture. In addition, the trend toward increased reliance on sources of income other than farming has implications for the distribution of income in agriculture.

To formulate appropriate policies to aid farm families, it is necessary to understand the impacts of factors influencing participation in off-farm work. Equally important is a knowledge of the distribution of total family income among farm families. An understanding of the sources of income that support farm families and of the impacts of changes in the income earned from different sources is useful for policy formulation. This information helps policymakers target farm families needing help through government programs.

Analyzing distribution of income by income source

The distribution of income can be analyzed to determine how total income or income from a specific income source is distributed among individuals of a population. The Gini coefficient, frequently used in studies of income distribution, can be used to summarize the degree of concentration of a given income distribution. This coefficient is based on the Lorenz curve, a curve obtained by plotting the cumulative percent of income-receiving units on the horizontal axis against the cumulative percent of aggregate income received by these units on the vertical axis. The Gini ratio is defined as the area between the line of equality (the diagonal) and the Lorenz curve, as a proportion of the total area under the line of equality. A zero value for the Gini coefficient indicates that the Lorenz curve coincides with the line of equality. This suggests an equal distribution of income. If income is distributed perfectly unequally, the Gini coefficient equals 1. The larger the Gini coefficient, the more unequal the distribution of income.

In this study, an approach suggested by Pyatt, Chen, and Fei (1980) is adopted to calculate Gini coefficients for total farm family income and "pseudo" Gini values for selected disaggregated sources of total income earned by farm families (e.g., net farm income, off-farm income, government-source income). This approach provides an exact formulation of the relationship between the Gini coefficient (based on total income across farm families) and measures of inequality corresponding to alternative income sources. Ahearn et al. (1985) used this approach to obtain estimates of these measures for a sample of United States farm families, but used grouped data analyzed at the national level. In contrast, the Gini coefficients and pseudo Gini ratios calculated in this study are based on individual data (as opposed to grouped data) to derive more accurate measures of income inequality. The analysis is conducted by region as well as for the United States in total.

Pyatt et al. (1980) proposed that for individual family data, the Gini coefficient for total family income (G_t) equals the sum of the cross-products of three terms related to each income source. The three terms for a specific income source are: (1) the proportion of each income source in total income, S_k; (2) the pseudo Gini coefficient (G_k) for the distribution of the kth income source; and (3) a correlation effect (R_k) depending on the respective rankings of families according to total income and the income from the kth source. The three terms

forming the decomposition used by Pyatt et al. (1980) are calculated as follows:

$$S_k = \bar{y}_k/\bar{y} \quad (5)$$

$$G_k = [2/ny_k]\,[\mathrm{Cov}(y_k, \rho(y_k))] \quad (6)$$

$$R_k = \mathrm{Cov}(y_k, \rho(y))/\mathrm{Cov}(y_k, \rho(y_k)) \quad (7)$$

where:

S_k = share of income from kth income source as a percentage of total income,

$\bar{y}$ = mean of total family income,

y_k = income from kth income source,

$\bar{y}_k$ = mean of income from kth income source,

$\rho(y)$ = rank of observations by total family income,[3]

$\rho(y_k)$ = rank of observations by kth source of income,[3]

G_k = pseudo Gini for income from kth income source,

n = number of observations, and

R_k = correlation effect for kth income source.

The Gini coefficient for all income sources (aggregated) can then be written

$$G_t = \sum_k G_k R_k S_k \quad (8)$$

Lerman and Yitzhaki (1985) proposed a similar approach and presented a method to measure the impacts of marginal changes in income by source on overall income inequality. Based on the methodologies developed by Pyatt et al. as cited, and Lerman and Yitzhaki (1985), the following relative measures are used here to analyze the distribution of income among farm families more intensively:

1) *Proportional contribution to inequality (P_k):* P_k is given by the ratio of the kth source's contribution to inequality to the total Gini index. That is:

$$P_k = G_k R_k S_k / G_t \quad (9)$$

2) *Relative inequality (I_k):* I_k is the ratio of the proportional contribution to inequality (P_k) to the kth source's share of total income (S_k) and can be written:

$$I_k = (G_k R_k S_k / G_t)\,(1/S_k) \quad (10)$$

Or, analogously,

$$I_k = G_k R_k / G_t \quad (11)$$

[3]The observations are ranked in ascending order, with each tie assigned the average value of the consecutive ranks that would have been otherwise assigned.

3) *Relative marginal effect (M_k):* M_k is the kth source's marginal effect relative to the overall Gini index and is the difference between the proportional contribution to inequality (P_k) and the share of total income for each source (S_k):

$$M_k = (G_k R_k S_k / G_t) - (S_k) \quad (12)$$

It should be noted that the sum of the k relative marginal effects is zero (i.e., $\sum_k M_k = 0$).

Distribution of farm family income

The 1985 *CPS* data utilized to estimate the off-farm employment participation functions for farm operators and spouses is used again to estimate the Gini coefficients and related measures necessary to analyze the distribution of farm family incomes. Total family income is decomposed by five sources of income and the contribution of each income source to total inequality is analyzed. The five income categories include: (1) net farm income; (2) off-farm income from employment; (3) off-farm income received as rent, dividends, interest, and trust income; (4) government-source income; and (5) "other income."

Using these data, the Gini coefficient for all income equals 0.48 for U.S. farm households. For the Northeast, South, West, and North Central regions, the Gini values range from 0.42 to 0.51. These coefficients indicate that there is a more equal distribution of income for families in the Northeast and South (Gini coefficients of 0.42 and 0.43) relative to family incomes of farmers in the West and North Central regions (Gini coefficients of 0.48 and 0.51, respectively). The distribution of income among farm families in the North Central region is the most unequal of the four regions analyzed, since the Gini coefficient in this region is the highest.

When farm income alone is considered, a very unequal distribution results, an observation substantiated by the pseudo Gini values for net farm income (Tables 9, 10). The net farm income pseudo Gini values are greater than one[4] in the United States and in each of the four regions. This result reflects the observation that most farm families receive low net farm incomes and only a relatively small proportion of families earn high net

[4]Since negative incomes are included, it is possible to calculate pseudo Gini values greater than 1.0 (Pyatt et al. 1980). Pyatt et al. suggest that using negative incomes is justified when the average value of the specific income source is positive for the entire population. Kinsey (1985), commenting on Ahearn et al. (1985), observed that a Gini coefficient calculated using negative incomes recoded to zero underestimates the inequality of the income distribution.

returns from farming. These results indicate that net farm income and total family income are not necessarily directly related. The other components of farm family income have significant impacts on the distribution of farm family incomes.

The compilations in Tables 9 and 10 suggest that incomes from sources other than farming are responsible for reducing the degree of inequality created by the farm-income component. Although the Gini values are high (0.83 to 0.92) for INTDIV income, government-source income and "other income" (suggesting that incomes from these sources are not evenly distributed across farm families), the pseudo Gini values for off-farm income are significantly lower (0.41 to 0.64). As listed in Table 10, off-farm income is more equally distributed in the West (a pseudo Gini of 0.41) relative to other regions of the United States where the coefficients for off-farm income range around 0.60. The pseudo Gini for off-farm income in the United States equals 0.61.

Marginal contributions to inequality

Measures of the contribution of different income sources to total inequality ($G_kR_kS_k$), the proportional contribution to inequality (P_k), the relative inequality (I_k), and the relative marginal inequality (M_k) for each income source are also presented in Tables 9 and 10. As indicated in columns (3) and (4) of these tables, off-farm income significantly contributes to inequality on an absolute basis due to the size of the off-farm income component relative to earnings from other sources. However, the relative inequality values (column 5) indicate that, when compared to off-farm income, net farm income contributes a greater proportion to inequality among families than the proportion it contributes to total family income. This result holds true at both the national and regional levels, except in the South where off-farm income contributes a relatively greater proportion to inequality.

Column 6 in Tables 9 and 10 lists the relative marginal inequality values. In Table 9, the relative marginal inequality values for the United States in total indicate that, with the exception of net farm income, income increases from each of the k income sources can be expected to reduce income inequality at the margin. Off-farm income and income from government sources reduce inequality significantly; the Gini coefficient declines by 0.039 (an 8% decrease) when income from either source increases by one percent. Comparable increases in "other income" and INTDIV income reduce inequality at the margin in the United States, but not as significantly as either off-farm income or government-source income.

The relative marginal effects for each region (Table 10) provide valuable information to policymakers, since these effects indicate the changes in regional income distribution within agriculture that can be expected as a result of income increases from alternative income sources. Regional differences are evident between the West and North Central regions, which are characterized by a greater proportion of full-time farms, and the South and Northeast. In the South and Northeast, farm operations tend to be smaller, and off-farm income comprises a higher proportion of total family income.

The relative marginal effects in the West and North Central regions are similar in direction to the effects for the United States. However, in both regions, the magnitudes of the net farm and off-farm income relative marginal effects are higher than for the total United States. In the West and North Central regions a one percent increase in net farm

Table 9. Contribution of sources of income to overall inequality among United States farm families.

Income source	(1) Share in total (S_k)	(2) Pseudo Gini index (G_k)	(3) Contribution to total inequality ($G_kR_kS_k$)	(4) Proportional contribution to inequality (P_k)	(5) Relative inequality (I_k)	(6) Relative marginal inequality (M_k)
Net farm income	0.204	1.328	0.141	0.296	1.451	0.092
Off-farm income	0.602	0.614	0.268	0.563	0.935	−0.039
INTDIV income[a]	0.122	0.903	0.056	0.118	0.967	−0.004
Government income	0.043	0.886	0.002	0.004	0.093	−0.039
Other income	0.030	0.920	0.009	0.019	0.633	−0.011
Total family income	1.000	0.476[b]	0.476	—	—	—

Source of Income Data: *Current Population Survey*, March 1985. Reported incomes in the March 1985 *Survey* are for 1984.
[a]INTDIV income includes rent, dividends, interest payments, and trust income.
[b]The calculated index for total family income is the conventional Gini coefficient for total income.

Table 10. Contribution of sources of income to overall inequality by region, 1984.

Income source	(1) Share in total (S_k)	(2) Pseudo Gini index (G_k)	(3) Contribution to total inequality ($G_kR_kS_k$)	(4) Proportional contribution to inequality (P_k)	(5) Relative inequality (I_k)	(6) Relative marginal inequality (M_k)
Northeast:						
Net farm income	0.136	1.320	0.061	0.147	1.081	0.011
Off-farm income	0.688	0.568	0.308	0.740	1.076	0.052
INTDIV income	0.086	0.863	0.022	0.053	0.616	−0.033
Government income	0.058	0.891	0.010	0.024	0.414	−0.034
Other income	0.033	0.914	0.015	0.036	1.091	0.003
Total income	1.000	0.416[a]	0.416	—	—	—
North Central:						
Net farm income	0.229	1.378	0.183	0.360	1.572	0.131
Off-farm income	0.562	0.635	0.243	0.477	0.849	−0.085
INTDIV income	0.141	0.829	0.069	0.135	0.957	−0.006
Government income	0.046	0.887	0.008	0.016	0.348	−0.030
Other income	0.022	0.916	0.006	0.012	0.545	−0.010
Total income	1.000	0.509[a]	0.509	—	—	—
South:						
Net farm income	0.184	1.127	0.079	0.186	1.011	0.002
Off-farm income	0.640	0.577	0.288	0.678	1.060	0.038
INTDIV income	0.101	0.843	0.039	0.092	0.911	−0.009
Government income	0.038	0.881	0.006	0.014	0.368	−0.024
Other income	0.040	0.924	0.014	0.033	0.825	−0.007
Total income	1.000	0.425[a]	0.425	—	—	—
West:						
Net farm income	0.201	1.436	0.158	0.328	1.632	0.127
Off-farm income	0.611	0.414	0.268	0.556	0.910	−0.055
INTDIV income	0.118	0.829	0.050	0.104	0.881	−0.014
Government income	0.039	0.901	0.000	0.000	0.000	−0.039
Other income	0.032	0.913	0.007	0.015	0.469	−0.017
Total income	1.000	0.482[a]	0.482	—	—	—

[a]The calculated index for total family income is the conventional Gini coefficient for total income.

income can be expected to increase the Gini coefficient by almost 0.13 (compared to 0.09 for the United States), and thus contribute to greater inequality. A one percent increase in off-farm income reduces the inequality measure by 0.09 in the North Central region and by 0.06 in the West. These compare to 0.04 for the United States.

These results reveal an interesting phenomenon that may be specific to the West and North Central regions. The positive relative marginal inequality values for net farm income suggest the existence of wide variations in the distributions of net farm income in these regions. Increases in farm income will benefit farmers earning high net farm incomes more than those with low income, resulting in a wider income gap between these two groups. On the other hand, programs to increase income from off-farm sources will benefit farmers with low incomes and lead to a more equal distribution of incomes in these regions. Although percentage changes in off-farm income have a smaller impact on the Gini coefficient than changes in net farm income, increases in off-farm income reduce inequality and increases in net farm income increase inequality in the North Central and West regions.

In contrast, an increase in either net farm or off-farm income increases income inequality at the margin among farm families in the Northeast and South. The latter outcome is surprising, since it has generally been held that increases in off-farm income reduce income inequality. A possible explanation is that many farm families at the upper end of the income distribution in these regions are part-time farm families earning significant amounts of off-farm income. When off-farm income increases, these families earn proportionately more income and the distribution of income becomes more unequal. In the other regions studied, the reliance on off-farm income is more concentrated among those farm families that are not earning the highest incomes. In these regions the highest incomes are earned by families that rely principally on income from farming.

It is important to note, however, that the relative marginal effects for the South and the Northeast are small relative to the effects calculated for the North Central and West regions and for the United States in total. For example, a one percent increase in net farm income in the South results in only a 0.002 increase in the inequality measure but the same percentage increase in off-farm income increases the value of the Gini coefficient by 0.04. Similarly, in the Northeast these income sources increase the income inequality coefficient by 0.01 and 0.05 for one percent increases in net farm and off-farm income, respectively. Increases in net farm income have very small impacts on regional income inequality at the margin in either the South or the Northeast.

The preceding discussion emphasizes the importance of regional differences for policy formulation and implementation. One common outcome in all regions is that an increase in government-source income reduces income inequality among United States farm families. Additionally, the negative relative marginal inequality values for off-farm income in the West and North Central regions suggest that motivating farmers to pursue off-farm employment is a desirable policy, as it serves to reduce the existing income disparity among farm families.

Conclusions

This study is an effort to contribute to the growing area of research on off-farm employment and income by identifying the factors (nationally) that encourage the farm operator and spouse to participate in off-farm work and determining the distributional impacts of higher off-farm labor participation rates. The summary results (Table 11) reveal the principal microlevel results of the study. Education is found to be an extremely important factor influencing off-farm work participation decisions of operators and of spouses. A strong negative relationship is observed between low levels of education and off-farm work, while the relationships between college and postgraduate college education and off-farm work are positive. This suggests a higher opportunity cost for full-time farmers and farm spouses with higher levels of education.

Residence in a metropolitan area (SMSA) also has a positive influence on off-farm labor participation among operators, but is not statistically significant for spouses. The former observation reflects the greater number of small farms located near metro areas and may also indicate that more opportunities for off-farm work exist in SMSAs, giving farm operators in these areas a variety of job options. For spouses, location is found to be of little significance. However, the employment of the operator or spouse in an off-farm job has a strong

Table 11. Direction of influence of significant variables in estimated off-farm participation equations of United States farm operators and spouses, 1978 and 1984.

Explanatory Variable	Farm operator 1978	Farm operator 1984	Farm spouse 1978	Farm spouse 1984
Age	pos	—	—	—
Square of age	neg	—	—	neg
Not a high school graduate	neg	neg	—	—
Some college education	—	—	pos	pos
Postgraduate college education	pos	pos	pos	pos
Resides in SMSA	pos	pos	—	—
Spouse employed off-farm	pos	pos	pos	pos
Presence of children under six years	na	na	neg	neg
Northeast	—	—	—	—
South	pos	pos	—	—
West	—	—	—	—
Net farm income	neg	neg	—	neg
Other income	—	—	—	—

na = Not applicable because this variable is not present in the equation.
— = Not statistically significant at the 5% level.

positive influence on the counterpart's decision to work off-farm. This may be indicative of the growing prevalence of dual-career couples, or may reflect the seriousness of the farm income problem. The latter may necessitate that both individuals work off-farm.

Southern farm operators had the highest probability, relative to farmers from other regions, of working off-farm in both study years. Location did not differentially affect the likelihood that the spouse would work off-farm, but the presence of children under age six restricted the spouse's off-farm work activities. This result reflects the increased demand for household labor in families with young children. Additionally, net farm income was found to be negatively related to off-farm employment for farm operators and, to a lesser extent, for spouses. Other considerations equal, the lower the net farm income, the greater the probability of off-farm work.

These findings call for policies that encourage additional education among farm operators and spouses, and programs that provide training for off-farm jobs, at least for farm families that earn low net farm incomes but prefer not to leave farming altogether. The estimated relationships between the variable representing the employment status of the spouse and off-farm work suggest that encouragement of off-farm employment for either the operator or spouse in turn will encourage the other spouse to work off-farm. This would help alleviate the income problems of families with low net farm incomes.

Macrolevel implications

The analysis of the distribution of income among United States farm families (for the United States and by region) yielded Gini coefficients for the four regions ranging from 0.42 to 0.51 for *total* farm family income. The relatively low Gini coefficients indicate considerable income equality, due principally to the off-farm income component of total farm family income. The distributions of *net* farm income in the regions, however, appear to be more dispersed.

At the margin, income increases from sources other than farming reduce income inequality among United States farm families. However, these effects are not consistent across regions. In those regions where full-time farms predominate (i.e., the West and North Central regions) the relative marginal effects of net farm income and off-farm income are similar in direction to the effects estimated for the United States: the relative marginal effects for net farm income are positive and the effects for off-farm income are negative. These results indicate the need for regional programs to encourage off-farm employment, and thus alleviate the effects of low net farm incomes and reduce income disparity among farm families. The disparity now exists because of the wide variation of net farm incomes among farm families in these regions.

At the same time the relative marginal effects are positive for both net farm and off-farm income in the Northeast and South. These results indicate that higher levels of off-farm income will lead to greater income inequality, a finding that was not anticipated. However, in both the Northeast and South, the relative marginal effects are small for net farm and off-farm income alike. In all regions, government-source income reduced inequality, while changes in "other income" and income from rent, dividends, interest, and trusts had only small impacts on the Gini coefficients at the margin.

Policy implications

As more and more farm families depend less and less on farming as a major income source, traditional farm policies will have correspondingly less impact on the income situations of these families. Policymakers should recognize the prominent role played by off-farm income in supplementing low net farm returns and reducing income disparity among farm families, at least in some regions. Programs should be developed to facilitate a smooth transition for farmers with financial problems from farm to nonfarm occupations, or to encourage the alternative lifestyle of combining farm and off-farm work. This may be off-farm work by the farm operator, the farm spouse, or both.

An integrated rural development policy, considering rural farm and nonfarm populations alike, is most likely to increase the incomes of the farm population. Rather than committing public funds principally to traditional farm programs, it may be socially attractive to divest some of these funds to support rural development, specifically rural industrialization programs to create and sustain rural jobs. Such a policy could serve to supplement the low net farm incomes of many farm families.

It is necessary to design regional programs that meet the specific needs of farming communities in different regions as well. It is clear that the impacts of low net farm incomes are of major economic significance in those regions where the number of off-farm jobs is too small to accommodate those who prefer to pursue dual employment (on-farm and off-farm) or choose to leave agriculture

altogether. The data for both years show this to be the case in the West and North Central regions.

References

Ahearn, Mary, Jim Johnson, and Roger Strickland. The Distribution of Income and Wealth of Farm Operator Households. *American Journal of Agricultural Economics* 67(1985):1087-1094.

Aldrich, John D., and Forrest D. Nelson. *Linear Probability, Logit, and Probit Models.* Sage University Paper Series on Quantitative Applications in the Social Sciences, 07-045. Beverly Hills and London: Sage Publications. 1984.

Barlett, Peggy. Part-time Farming: Saving the Farm or Saving the Lifestyle? *Rural Sociology* 51(1986):289-313.

Becker, Gary S. A Theory of the Allocation of Time. *The Economic Journal* 299(1965):493-517.

Bollman, Ray D. Off-Farm Work by Farmers: An Application of the Kinked Demand Curve for Labor. *Canadian Journal of Agricultural Economics* 27(1979):37-60.

Desaran, Forrest A., William W. Falk, and Pamela Jenkins. Determinants of Earnings of Farm Families in the U.S. *Rural Sociology* 49(1984):210-229.

Findeis, Jill. The Importance of Off-Farm Income to Agriculture. *Future of Pennsylvania Agriculture: Proceedings of a Conference.* University Park, PA: Penn State College of Agriculture and the Agricultural Advisory Council. 1986.

Findeis, Jill L., M. C. Hallberg, and Daniel Lass. "Off-farm Employment: Research and Issues." Paper presented at the Organized Symposium: Off-farm Employment and Labor Adjustments, American Agricultural Economics Association Annual Meeting, East Lansing, MI. August 2-5, 1987. (Staff Paper 146).

Fuguitt, Glenn V. Part-Time Farming and the Push-Pull Hypothesis. *American Journal of Sociology* 23(1958):392-397.

_____ . A Typology of the Part-Time Farmer. *Rural Sociology* 26(1961):39-48.

Furtan, W. H., G. C. Van Kooten and S. J. Thompson. The Estimation of Off-Farm Labour Supply Functions in Saskatchewan. *Journal of Agricultural Economics* 36(1985):211-220.

Huffman, Wallace E. Farm and Off-Farm Work Decisions: The Role of Human Capital. *The Review of Economics and Statistics* 62(1980):14-23.

_____ . Allocative Efficiency: The Role of Human Capital. *Quarterly Journal of Economics* (1977):59-79.

Kinsey, Jean. Measuring the Well-Being of Farm Households: Farm, Off-Farm and In-Kind Sources of Income: Discussion. *American Journal of Agricultural Economics* 67(1985):1105-1107.

Lee, John E., Jr. Allocating Farm Resources Between Farm and Nonfarm Uses. *Journal of Farm Economics* 47(1965):83-92.

_____ . Food and Agricultural Policy: A Suggested Approach. *Agricultural-Food Policy Review: Perspectives for the 1980's.* Washington, DC: USDA/ ERS. 1981.

Leistritz, F. Larry, Harvey G. Vreugdenhil, Brenda L. Ekstrom, and Arlen G. Leholm. *Off-Farm Income and Employment of North Dakota Farm Families.* Agricultural Economics Miscellaneous Report No. 88. Fargo, ND: North Dakota State University. 1985.

Lerman, Robert, and Shlomo Yitzhaki. Income Inequality Effects by Income Source: A New Approach and Application to the U.S. *The Review of Economics and Statistics* 67(1985):151-156.

Pyatt, Graham, Chau-Nan Chen, and John Fei. The Distribution of Income by Factor Components. *World Bank Reprint Series: Number 162.* 1980.

Reddy, Venkateshwar K. Determinants of Off-Farm Labor Force Participation and Income Distribution Among U.S. Farm Families. Master of Science Thesis. Department of Agricultural Economics and Rural Sociology. Penn State. May 1987.

Reinsel, Edward I. Farm Family Incomes and Farmers' Incomes Improve at Different Rates. *Agricultural Finance Review* 34(1974):31-35.

Salant, Priscilla, William Saupe, and John Belknap. *Highlights of the 1983 Wisconsin Family Farm Survey.* Madison, WI: College of Agricultural and Life Sciences, University of Wisconsin. 1984.

Simpson, Wayne, and Marilyn Kapitany. Off-Farm Work Behavior of Farm Operators. *American Journal of Agricultural Economics* 65(1983):801-805.

Sumner, Daniel. The Off-farm Labor Supply of Farmers. *American Journal of Agricultural Economics* 64(1982):499-509.

Thompson, Shelley. A Model of Off-Farm Employment. *Forum No. 10,* Kieler Wissenschaftsverlag, Federal Republic of Germany. 1985.

Tweeten, Luther. Economic Instability in Agriculture: The Contributions of Prices,

Government Programs and Exports. *American Journal of Agricultural Economics* 65(1983):922-931.

United States Department of Agriculture (USDA/ERS). *Economic Indicators of the Farm Sector: Farm Sector Review, 1984*. Washington, DC: GPO. 1985.

U.S. Department of Commerce, Bureau of the Census. *Current Population Survey: Annual Demographic File* (March, 1979 and March, 1985). Washington, DC: GPO.

Digest

Off-farm income from off-farm employment of farm family members provides a significant income supplement for many U.S. farm families. Various factors may affect whether farm operators or farm spouses are employed off-farm. Some factors that may influence off-farm work decisions include the individual's age and level of education, family characteristics such as the presence of children and the off-farm employment of a spouse, and the regional location of the farm residence. Using data on farm families from the March 1979 and 1985 Current Population Surveys, this study examines the effects of selected individual, family, and location characteristics on the likelihood of off-farm work for U.S. farm operators and farm spouses.

The increasing reliance on off-farm income also has important implications for the distribution of income among farm families. In all regions of the United States (Northeast, South, North Central, and West), off-farm income is more evenly distributed than net farm income across farm families with different income levels. However, marginal increases in off-farm income are shown to increase income equality in the North Central and West regions. In the Northeast and South, marginal increases in off-farm income lead to greater inequality.