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Off-Farm Work Participation, Off-Farm Labor Supply and On-Farm Labor Demand of U.S. Farm Operators

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Although farmers tend to be tied to the land and to be somewhat geographically immobile, off-farm work of farmers is a relatively common international phenomena. In all of the developed countries since the 1950s or 1960s, the aggregate demand for operator and family labor has declined (OECD 1994,1995), the demand for housework has also declined as family size has declined and labor saving household technologies have been adopted, and the real nonfarm wage has generally increased. Facing adjustments in labor allocation, farm households in developed countries frequently choose to continue in farming but to supply some labor to the nonfarm sector, e.g., OECD 1994; Hallberg, et. Al 1991). As agriculture continues to adjust to new farm and trade policies and new technologies, a better understanding of the economics of time allocation seems to hold important implications for the well-being of farm people.

The objective of this paper is to present new econometric evidence for off-farm work participation, off-farm hours of work, and on-farm hours of work for U.S. farm operators. The closely related literature for U.S. farmers has focused on off-farm work but not generally combined an examination of on-farm and off-farm work together (e.g., see Gould and Saupe; Huffman and Lange; Jensen and Salant; Lass, Findeis, and Hallberg 1989; Sumner 1982). The analysis unfolds in three sections. See Huffman and El-Osta 1997 for additional details.

The Economic and Econometric Model

An agricultural household model provides the conceptual framework for predications about farmers' farm and off-farm work participation and hours of work decisions (see Huffman 1980; Strauss; Huffman 1991; Huffman 1996). The conceptual model is implemented through the empirical specification of equations for off-farm participation and off-farm and on-farm work hours for farm operators. Define the empirical off-farm wage (W_{mj}) and reservation wage (W_{rj}) equations for the j-th farm operator as follows:

$$\ln W_{mj} = S_{1j}\alpha_1 + \epsilon_{mj} \tag{1}$$

$$\ln W_{rj} = S_{2j}\alpha_2 + \epsilon_{rj} \tag{2}$$

where ϵ_{mj} and ϵ_{rj} are zero mean random disturbance terms for the population of all farm operators. Operators are assumed to participate in off-farm work when their reservation wage is less than their market wage offer. Hence, define an off-farm wage work participation indicator variable D_j as:

$$D_j = \begin{cases} 1 \;\; if \;\; \ln W_{rj} < \ln W_{mj} \\ 0 \;\; if \;\; \ln W_{rj} \geq \ln W_{mj} \end{cases}. \tag{3}$$

Because ϵ_{mj} and ϵ_{rj} are random, the probability of off-farm work participation is obtained as:

$$P_r(D_j = 1) = P_r(\ln W_{rj} < \ln W_{mj}) = P_r(\epsilon_{rj} - \epsilon_{mj} < S_{1j}\alpha_1 - S_{2j}\alpha_2) = F_\upsilon(S_j\alpha) \tag{4}$$

where $\upsilon_j = \epsilon_{rj} - \epsilon_{mj}$, $S_j\alpha = S_{1j}\alpha_1 - S_{2j}\alpha_2$ and F( ) is a cumulative distribution function for the random variable υ. Equation (4) is a reduced-form off-farm wage work participation equation where the explanatory variables S_j are from the market wage and reservation wage equations (1) and (2). If we have a consistent estimate of the wage equation for off-farm work for all farm operators, then we can use $\ln \hat{W}_{mj}$ and S_{2j} as regressors in a structural off-farm work participation equation. An off-farm wage increase is expected to increase the probability of off-farm wage work.

For the hours of work component of this study, two sets of behavioral equations are considered. For farm operators that participate in off-farm wage work, we will estimate on-farm labor demand and off-farm labor supply equations:

$$T_f = \beta_{11} W_m + Z_1 \beta_1 + \mu_f \tag{5}$$

$$T_m = \beta_{12} W_m + \beta_{22} V + Z_2 \beta_2 + \mu_m \tag{6}$$

where Z_1 includes regressors other than W_m that are expected to explain on-farm labor demand, Z_2 includes regressors other than W_m and V that are expected to explain off-farm labor supply, and μ_f and μ_m are random disturbance terms. Consistent with our theory, other income (V) does not enter the on-farm labor demand equation (5). In equation (5), we expect the sign of β_{11} to be negative, and in equation (6), we expect β_{22} to be negative (i.e., leisure is a normal good) and β_{12} to be non-negative. With $\beta_{12} > 0$, the income effect of a wage rate change and the substitution effect pull in the opposite direction but the substitution effect dominates.

For farm operators that do not participate in off-farm wage work, we will estimate an on-farm labor demand equation:

$$T_f = \gamma_1 V + Z_3 \gamma_3 + \mu_f^* \tag{7}$$

where Z_3 is regressors other than V that are expected to explain on-farm hours and μ_f^* is a random disturbance term. Consistent with theory, Z_3 is different from Z_1 because the demand for operator's on-farm work is not separable from household consumption decisions. In particular, other income (V) is a regressor in the on-farm demand equation (7) but not in (5), and we expect γ_1 to be negative (leisure is a normal good) in equation (7).

A brief empirical definition of all variables included in the econometric model is presented in table 1. Some of the variables are farm/farmer specific and others represent state or regional effects.

Furthermore, to complete the specification of the econometric model, we designate the variables that are included in Z_1, Z_2, and Z_3. Exactly what farm attributes should be included is subject to debate, e.g., Huffman 1991; Lass, Findies, and Hallberg 1989, 1991; Lass and Gempesaw 1992; Kimhi 1994. Attributes that should be included are quasi-fixed or exogenous to off-farm participation and hours of on- and off-farm work decisions of farm operators. To accommodate divergent views on this subject, we proceed under two different assumptions. *Assumption 1:* the value of farmland owned (LAND), which is an instrument for farmland, and value of farm capital in machinery and equipment, breeding stock, and farm buildings (FCAPITAL) are to be included in Z_1, Z_2, and Z_3. Hence, on-farm and off-farm work decisions are conditional on LAND and FCAPITAL. *Assumption 2*: LAND and FCAPITAL are attributes that are jointly determined with farm operator's off-farm participation and on- and off-farm hours, and they are excluded from Z_1, Z_2, and Z_3.

Additional variables included in Z_1 are: EDS, wife's education is an indicator of the potential productivity/opportunity cost of her time; FRAISED, an indicator of early farm-specific work experiences of the farm operator; FHEALIM, an indicator of a health limiting condition of the farm operator; MILESCITY, an indicator of potential commuting distance to off-farm work and to shopping for farm and household goods and services; FARMWAGE, state wage rate for hired farm labor; RAIN and JANT, state climatic indicators that can be expected to affect farm productivity; and NE, MIDWEST, and WEST, regional geographic indicators for real output and nonlabor input prices. Additional variables included in Z_2 are: EDS, FRAISED, FHEALIM, HHSIZE, MILESCITY, FARMWAGE, RAIN, JANT, NE, MIDWEST, and WEST. Additional variables included in Z_3 are: AGE, an indicator of life stage of operator and taste for consumption of leisure relative to purchased goods; ED and EDS, indicators of potential productivity of husband's and wife's time; and FRAISED; FHEALIM; HHSIZE; MILESCITY; FARMWAGE; RAIN; JANT; NE; MIDWEST; and WEST.

In the operator's off-farm wage equation (1), S_1 includes his education (ED), his potential post-schooling experience (EXP) and state amenity factors associated with winter weather (JANT, $JANT^2$), state labor market conditions, PURATE and ESHOCK, and regional dummy variables. EXP is chosen over actual labor market experience because it is less likely to be endogenous to off-farm work decisions (Mroz). EXP is expected to have a quadratic effect on *ln* W because of finite length human life (Becker 1993). Other studies have shown that state labor markets are interrelated through migration and migrants attempt to equalize real compensation. Nominal wage rate differences then exist across states because of cost of living and amenity differences (Tolley 1974; Kenny and Denslow 1980) and because of permanent and transitory labor market adjustments (Topel). Topel and Tokle and Huffman found that nonfarm wage rates were higher, other things equal, where predicted state unemployment rates were high. The higher wage rates compensated for anticipated future unemployment. Some labor market events are unanticipated, and they may affect wage rates, too. In the reduced-form off-farm participation equation, the set of regressors (S) are approximately the set of variables S_1, V, and Z_2.

The Data and Empirical Results

The econometric model is to be fitted to the sample of farm operator in the USDA's 1991 Farm Costs and Returns Survey (FCRS). A major advantage of this sample is its large size and nationally representative base, but we also discuss some of the imperfections in the design. We augment the FCRS with selected state economic data. See table 1 for sample means of variables for different subgroups of farm operators.

The econometric model consists of equations (1),(4)-(7). They are reduced-form and structural logit off-farm participation equations which are fitted to the whole sample. For farm operators that participate in off-farm work, the econometric model also consists of an off-farm wage equation, an on-farm hours of work and off-farm hours of work equation. For farm operators who do not participate in off-farm work, the econometric model consists of an on-farm hours of work equation, which has a different specification than for off-farm participants. Potential sample selectivity in the wage and hours equations is considered (e.g., Heckman 1979; Lee; Newey et.at.) but the uncorrected estimates seemed better statistically and economically.

Reduced-form off-farm labor participation. The results from fitting the reduced-form logit off-farm work participation equation to data for 2,076 U.S. farm operators are reported in columns (1) and (2) of table 2. The two equations differ in treatment of farm land and farm capital; assumption 1 applies to column (1) and assumption 2 applies to column (2). LAND and FCAPITAL have strong negative effects when included. The effects of other income, operator's age and education are very much as expected. Being farm raised and having a health limitation reduces the probability of off-farm work.

Off-farm wage/labor demand. The off-farm wage equation is fitted to 551 observations on male farm operators that reported off-farm earnings in 1991. The results are reported in column (5), table 2. The farm operator's off-farm wage equation is of interest because the predicted wage is an instrument for the actual or potential off-farm wage of farmers. It, also, provides evidence on the returns to human capital of farm operators in the nonfarm labor market, which seems to have increased since 1979 (Juhn et.al.).

Structural off-farm participation equation. The results from fitting the structural logit off-farm wage work participation equation for farm operators is reported in table 2, columns (3) and (4). This equation differs from the reduced-form off-farm participation equations in that the off-farm wage rate is predicted for all sample operators using equation (5), table 2, and included as a regressor, and regressors that enter only the off-farm wage equation are excluded. In the structural participation equation, operator's off-farm wage and other income have strong effects. At the sample mean, a $1 per hours increase in the operator's off-farm wage increases his probability of off-farm work by 3.4 percent. A $1,000 increase in other income deceases the probability by 0.5 percent.

Off-farm and on-farm hours: Off-farm work participants. The off-farm labor supply and on-farm labor demand equations are fitted to data for the 551 observations on farm operators who participated in off-farm work. In table 3, columns (1)-(4), results are reported for assumption 1 and 2 about LAND and FCAPITAL. The equations are fitted without a sample selection variable. Nawata and Nagase (1996) show that Heckman's two-step procedure (Heckman 1979) for sample selection correction sometimes yields highly biased parameter estimates. This occurs when the sample selection variable is highly correlated with the other regressors included in the behavioral equation of interest.

For these farmers, the results show their hours of on-farm work are unresponsive to the off-farm wage, but their off-farm hours respond positively. At the mean, the compensated own-wage elasticity of off-farm hours is 0.16. The income elasticity of off-farm hours is -0.018. Furthermore, the size of the wage and income elasticity estimates is insensitive to including or excluding farm land and farm capital as regressors.

On-farm hours: No off-farm work. The on-farm labor demand equation is fitted to 1,525 observations on farm operators who specialize in farm work. In table 3, columns (5) and (6), results are reported for assumptions 1 and 2 about LAND and FCAPITAL. For these operators, the income elasticity of demand for on-farm hours is negative, -0.015.

Conclusions

Overall, our results show strong effects of economic variables on the probability of off-farm work of farmers whish is similar to nonfarm wage earners (Heckman 1993). Farmers' on-farm and off-farm hours are also shown not to be exogenous to farm and nonfarm economic variables, and they respond in reasonable economic directions. Furthermore, farmers with better off-farm wage opportunities, e.g., more education, show increased probability and increased hours of off-farm work. Thus, off-farm work is an important avenue for structural adjustment in agriculture (Gardner 1992; OECD 1994) and rural areas (Huang and Orazem).

References

Ahearn, Mary, Janet Perry, and Hisham El-Osta. *The Economic Well-Being of Farm Operator Households*. U.S. Depart. Agr. Agr. Econ. Report No. 666, 1993.

Becker, Gary S. *Human Capital*. 3rd Ed., Chicago, IL: University of Chicago Press, 1993.

El-Osta, Hisham, and Mary Ahearn. "Estimating the Opportunity Cost of Unpaid Farm Labor, U.S. Farm Operators," ERS Technical Bulletin No. 1848, March 1996.

Fuller, Wayne A., William Kennedy, Daniel Schnell, Gary Sullivan, and Heon Jin Park. *PC CARP*. Statistical Laboratory, Iowa State University, 1986.

Gardner, Bruce L. "Changing Economic Perspectives on the Farm Problem," *J. Econ. Lit.* 30(March 1992):62-101.

Greene, William H. *Economic Analysis*. Upper Saddle River, NJ: Prentice Hall, Inc., 1997.

Gould, Brian and William Saupe. "Off-farm Labor Market Entry and Exit." *Amer. J. Agr. Econ.* 71 (November 1989):960-969.

Heckman, James. "What Has Been Learned About Labor Supply in The Past Twenty Years?" *Am. Econ. Rev.* 83(May 1993):116-21.

_______. "Sample Selection Bias as a Specification Error," *Econometrica* 47(Jan 1979):153-161.

Huang, Tzu Ling and P.O. Orazem. "Rural Population Growth, 1950-1990: The Role of Human Capital, Industry Structure and Government, " Dept. Economics, Iowa State University, January 1997.

Huffman, Wallace E. "Farm and Off-Farm Work Decisions: The Role of Human Capital." *Rev. Econ. Stat.* LXII(1980):14-23.

————— . Agricultural Household Models: Survey and Critique. in *Multiple Job-Holding Among Farm Families*, Hallberg, M.C., Jill L. Findeis, and Daniel A. Lass (eds). Iowa State University Press, Ames, 1991.

_______ . "Farm Labor: Key Conceptual and Measurement Issues on the Routes to Better Farm Cost and Return Estimates." Iowa State University, Dept. of Economics Staff Paper Series No.280, April 1996.

Huffman, Wallace E. and Hisham El-Osta. "Off-Farm Work Participation, Off-Farm Labor Supply and On-Farm Labor Demand of U.S. Farm Operators," Iowa State University, Dept. of Economics Staff Paper No. 290, December 1997.

Huffman, Wallace E., and M. D. Lange. "Off-Farm Work Decisions of Husbands and Wives: Joint Decision Making." *Rev. Econ. Stat.* 71(August 1989):471-480.

Jensen, Helen H., and Priscilla Salant. "The Role of Fringe Benefits in Operator Off-Farm Labor Supply." *Amer. J. Agr. Econ.* 67(December 1985):1095-1099.

Juhn, C., K.M. Murphy, and B. Pierce. "Wage Inequality and the Rise in Returns to Skill," *J. Pol. Econ.* 100(June 1993):410-442.

Kenny, Lawrence W. and D.A. Denslow, Jr. "Compensation Differentials in Teachers' Salaries," *J. Urban Econ.* 7(1980):198-207.

Kimhi, A. "Quasi Maximum Likelihood Estimation of Multivariate Probit Models: Farm Couples' Labor Participation," *Am. J. Agr. Econ.* 76(Nov 1994):828-835.

Lass, Daniel A., Jill Findeis, and Milt Hallberg. "Off-farm Labor Employment Decisions by Massachusetts farm households." *North. J. Agr. Res. Econ.* 18(1989):149-159.

Lass, Daniel A., Jill L. Findeis, and Milton C. Hallberg. "Factors Affecting the Supply of Off-farm Labor: A Review of Empirical Evidence." In *Multiple Job-Holding Among Farm Families*, Hallberg, M.C., Jill L. Findeis, and Daniel A. Lass (eds). Iowa State University Press, Ames, 1991.

Lass, Daniel A. and C.M. Gempesaw II. "The Supply of Off-Farm Labor: A Random Coefficient Approach," *Am. J. Agr. Econ.*74(May 1992):400-408.

Lee, Lung-Fei. "Some Approaches to the Correction of Selectivity Bias," *Rev. Econ. Studies* 49(1982):355-372.

Mroz, T.A. "The Sensitivity of an Empirical Model of Married Women's Hours of Work to Economic and Statistical Assumption," *Econometrica* 55(July 1987):765-799.

Nawata, Kazumitsu and N. Nagase. "Estimation of Sample Selection Bias Models," *Econometric Review* 15(1996):387-400.

Newey, Whitney K., J.L. Powell, and J.R. Walker, "Semiparametric Estimation of Selection Models: Some Empirical Results," *Am. Econ. Rev.* 80(May 1990):324-328.

OECD. *Technological Change and Structural Adjustment in OECD Agriculture.* Paris, 1995.

OECD. *Farm Employment and Economic Adjustment in OECD Countries.* Paris, 1994.

Rosen, Sherwin. "The Theory of Equalizing Differences." *Handbook of Labor Economics.* Vol. 1, ed., O. Ashenfelter and R. Layard, pp. 641-92. New York: North-Holland Publ. Co. 1986.

Sumner, Daniel. "The Off-Farm Labor Supply of Farmers." *Amer. J. of Agr. Econ.* 64(1982):499-509.

Strauss, John. "The Theory and Comparative Statics of Agricultural Household Models: A General Approach," in I. Singh, L. Squin, and J. Strauss, eds., *Agricultural Household Models*. Baltimore, MD: The Johns Hopkins University Press, 1986, pp. 71-94.

Tokle, J. G. and Wallace E. Huffman. "Local Economic Conditions and Wage Labor Decisions of Farm and Rural Nonfarm Couples." *Amer. J. Agr. Econ.* 73(1991):652-670.

Tolley, G.S. "The Welfare Economics of City Bigness." *J. Urban Econ.* 1(1974):324-45.

Topel, Robert H. "Local Labor Markets," *J. Polit. Econ.* 94(1986):S111-43.
U.S. Department of Agriculture. *Farm Labor*. National Agr. Stat. Service. Nov. 1992.
U.S. Department of Commerce. *Census of Agriculture*, 1992. Volume 1, Part 51, Washington, DC: Bureau of the Census, 1994.

Table 1. Variable names and sample mean values, U.S. farm operators by off-farm work status, 1991.

Variable symbols	Variable definition	Farm operators (mean)	
		No off-farm work	With off-farm wage work
D	1 if farm operator worked off-farm for a wage or salary in 1991; 0 otherwise	0	1.0
OFFHOURS	Farm operator's annual hours of off-farm wage or salary work in 1991	0	1,895
FARMHOURS	Farm operator's annual hours of own on-farm or ranch work in 1991	2,041	1,111
OFFWAGE	Off-farm wage = gross cash wages, salaries, commissions, including cash bonuses, from working off own farm in 1991 divided by OFFHOURS, $/hr	---	14.07
OTHINC	Farm operator household's other income = total household cash income less net farm income and gross cash wages, salaries, tips, commissions and cash bonuses for work off own farm by operator and his wife in 1991 ($)	15,329	4,256
AGE	Farm operator's age	57.7	47.2
ED	Years of schooling completed by farm operator	12.4	13.0
EDS	Years of schooling completed by wife of farm operator	12.7	13.1
EXP	Farm operator's potential post-schooling experience = AGE - ED - 6	39.3	28.19
FRAISED	1 if farm operator was raised on a farm; 0 otherwise	0.83	0.72
FHEALIM	1 if operator has any chronic health problems that limit amount or kind of farm work; 0 otherwise	0.14	0.04 [a]
HHSIZE	Number of persons who live in the household	2.87	3.50
MILESCITY	Miles from farm to nearest city having population of at least 10,000	25.6	23.1

Table 1. (continued)

Variable symbols	Variable definition	Farm operators (mean) No off-farm work	Farm operators (mean) With off-farm wage work
LAND	Value of farmland owned = value of farmland owned 12-31-91 less expenditures for construction, repairs and maintenance during 1991, $1000	218.2	87.2
FCAPITAL	Value of farm machinery and equipment, breeding stock, and farm buildings (excluding the farm dwelling), 1-1-91, $1000	129.4	49.7
FARMWAGE	State average wage rate for hired farm labor in 1991 ($)	5.94	5.95
RAIN	State normal annual precipitation (divided by 12) [Teigen]	3.02	3.17
JANT	State normal January average temperature (degree F) [Weiss et al.]	31.6	32.1
PURATE	Predicted or anticipated state unemployment rate. Prediction obtained from OLS regression of state annual unemployment rate on intercept, trend, and trend squared, 1967-1991.	5.58	5.81
ESHOCK	Relative state employment growth shock. OLS residual from state annual employment equation less OLS residual from national annual employment equation, 1967-1991.	2.78	2.60
NE	1 if household is located in Northeast Census region; 0 otherwise	0.06	0.04
MIDWEST	1 if household is located in Midwest Census region; 0 otherwise	0.45	0.41
WEST	1 if household is located in West Census region; 0 otherwise	0.12	0.12
SOUTH	1 if household is located in South Census region; 0 otherwise	0.37	0.42
Sample Size		1,525	551
Population		863,939	504,130

[a] Variable has a coefficient of variation equal to 28%.

Table 2. Estimated coefficients for off-farm wage labor participation and off-farm wage equations: U.S. farm operators, 1991 (adjusted t-ratios in parentheses)

Regressors	Off-Farm Wage Labor Participation				Off-Farm
	Reduced-form Equation		Structural Equation		Wage Eq. [1]
	(1)	(2)	(3)	(4)	(5)
OTHINC	-3.75×10^{-3}	-3.39×10^{-5}	-5.76×10^{-5}	-5.38×10^{-5}	
	(3.63)	(3.72)	(4.86)	(4.90)	
$OTHINC^2/1000$	3.97×10^{-8}	3.44×10^{-8}	6.59×10^{-8}	6.09×10^{-8}	
	(2.84)	(2.51)	(4.27)	(4.22)	
AGE	0.400	0.343			
	(6.52)	(6.11)			
$AGE^2/100$	-0.439	-0.382			
	(7.03)	(6.75)			
ED	0.117	0.098			0.086
	(2.47)	(2.12)			(4.70)
EDS	-0.020	-0.068	-1.11×10^{-3}	-0.062	
	(0.36)	(1.32)	(0.02)	(1.23)	
EXP					0.040
					(2.79)
$EXP^2/100$					-0.073
					(2.81)
FRAISED	-0.387	-0.717	-0.351	-0.692	
	(1.60)	(3.17)	(1.48)	(3.12)	
FHEALIM	-0.701	-0.637	-0.786	-0.718	
	(2.16)	(1.96)	(2.34)	(2.15)	
HHSIZE	0.090	0.091	0.211	0.216	
	(1.29)	(1.48)	(3.43)	(3.85)	
MILESCITY	7.78×10^{-4}	-1.13×10^{-3}	-1.08×10^{-4}	-2.72×10^{-3}	
	(0.22)	(0.33)	(0.03)	(0.81)	
LAND	-6.28×10^{-4}		-9.74×10^{-4}		
	(1.29)		(1.92)		
FCAPITAL	-9.49×10^{-3}		-8.84×10^{-3}		
	(5.88)		(5.72)		

Table 2. (continued)

Regressors	Off-Farm Wage Labor Participation: Reduced-form Equation (1)	(2)	Structural Equation (3)	(4)	Off-Farm Wage Eq.[1] (5)
FARMWAGE	0.526	0.582	0.517	0.524	
	(1.69)	(2.09)	(1.72)	(1.93)	
RAIN	0.281	0.281	0.389	0.436	
	(1.72)	(1.78)	(2.47)	(2.88)	
JANT	-0.013	0.014	-0.067	-0.056	-0.017
	(0.29)	(0.36)	(4.49)	(4.00)	(1.42)
$JANT^2/100$	-0.071	-0.090			0.023
	(1.17)	(1.62)			(1.11)
PURATE	0.128	0.146			0.098
	(1.63)	(1.87)			(2.73)
ESHOCK	-0.071	-0.064			-0.049
	(1.89)	(1.84)			(2.74)
NE	-1.690	-1.901	-2.290	-2.482	0.190
	(2.81)	(3.90)	(3.89)	(5.17)	(1.06)
MIDWEST	-1.023	-1.056	-1.209	-1.223	0.037
	(2.61)	(2.87)	(2.97)	(3.23)	(0.33)
WEST	0.258	0.023	-0.148	-0.250	0.237
	(0.49)	(0.05)	(0.30)	(0.55)	(2.42)
OFFWAGE[2]			0.215	0.194	
			(7.56)	(6.69)	
Intercept	-11.70	-11.11	-3.405	-3.435	0.631
	(4.53)	(4.89)	(1.94)	(2.23)	(1.61)
X^2-statistic	155.6	144.8	167.5	159.7	--
McFadden's R^2	0.323	0.230	0.281	0.185	
R^2					0.206
Sample	2,076	2,076	2,076	2,076	551

[1] Dependent variable is ℓn(OFFWAGE).
[2] Wage is predicted for all farm operators using column (5) of the table.

Table 3. Estimated coefficients for off-farm labor supply and on-farm labor demand equations: U.S. farm operators, 1991 (adjusted t-ratios in parentheses)

Regressors	Farm operators reporting off-farm wage work: Assumption 1 Off-farm hours	Assumption 1 On-farm hours	Assumption 2 Off-farm hours	Assumption 2 On-farm hours	No off-farm wage work: Asspt. 1 On-farm hours	Asspt. 2 On-farm hours
OFFWAGE [a]	25.30 (1.84)	1.95 (0.15)	24.54 (1.77)	-1.36 (0.09)		
OTHINC	-0.008 (1.94)		-0.010 (2.36)		-0.002 (2.01)	-0.002 (2.10)
AGE					-24.15 (5.21)	-24.01 (4.97)
ED					20.56 (0.67)	27.65 (0.89)
EDS	11.16 (0.50)	-21.13 (-0.86)	9.68 (0.41)	-18.33 (0.67)	35.38 (1.29)	54.66 (1.94)
FRAISED	-26.28 (0.28)	207.61 (2.34)	-60.69 (0.66)	280.13 (2.79)	404.25 (3.10)	473.49 (3.52)
FHEALIM	-103.75 (0.45)	205.60 (0.85)	-77.95 (0.34)	161.51 (0.63)	-341.04 (2.75)	-389.03 (3.07)
HHSIZE	-26.34 (0.95)		-18.68 (0.66)		8.50 (0.18)	18.10 (0.37)
MILESCITY	-4.82 (3.05)	4.90 (2.92)	-5.28 (3.32)	5.58 (2.96)	2.22 (1.10)	2.07 (1.00)
LAND	0.023 (0.09)	-0.72 (2.27)			0.15 (1.55)	
FCAPITAL	-1.57 (2.75)	4.30 (4.01)			0.83 (2.06)	
FARMWAGE	-123.84 (1.01)	45.57 (0.36)	-121.61 (0.96)	20.51 (0.15)	-12.26 (0.08)	-12.52 (0.08)
RAIN	-54.05 (0.90)	-99.72 (1.52)	-36.69 (0.61)	-127.02 (1.84)	42.14 (0.57)	44.01 (0.58)
JANT	19.49 (3.42)	-10.71 (1.66)	20.13 (3.41)	-13.01 (1.83)	-12.85 (1.78)	-13.75 (1.86)
NE	175.28 (0.73)	69.23 (0.24)	144.30 (0.60)	115.49 (0.37)	400.77 (1.60)	441.45 (1.69)
MIDWEST	241.83 (1.39)	-46.47 (0.25)	233.14 (1.31)	-30.09 (0.14)	257.88 (1.15)	275.00 (1.76)
WEST	-92.67 (0.50)	-332.73 (1.65)	-68.39 (0.37)	-407.82 (1.86)	206.64 (0.85)	294.82 (1.18)
Intercept	1,977.4 (2.51)	1,387.5 (1.78)	1,857.45 (2.24)	1,783.87 (2.08)	2,442.62 (2.41)	2,172.29 (2.01)
R^2	0.140	0.257	0.112	0.131	0.295	0.254
Sample size	551	551	551	551	1,525	1,525

[a] The wage is predicted using the estimates from table 2, column 5.