EFFECTS OF LOCAL LABOR MARKET CONDITIONS ON HUSBAND-WIFE WAGE LABOR PARTICIPATION AND LABOR DEMAND: U.S. FARM AND RURAL NONFARM HOUSEHOLDS

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Effects of Local Labor Market Conditions on Husband-Wife Wage Labor Participation and Labor Demand: U.S. Farm and Rural Nonfarm Households, 1978-82

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Nonmetropolitan America contains almost 25 percent of the nation's population and 33 percent of its labor force. Rural residents are more likely to experience subemployment or poverty than their urban counterparts, and nonmetropolitan areas have lower wage rates and family income than urban areas. During the 1970s, rural areas benefitted from a shift of manufacturing jobs from the metropolitan to nonmetro areas. However, during the 1980s employment prospects for nonmetro areas have deteriorated (USDA 1987). Part of this change in prospects is a result of increased international competition for U.S. manufactured goods and agricultural products. In addition, a major business-cycle contraction started in 1981. The relatively rapid growth of service sector employment during the 1980s has largely by-passed rural labor markets.

The objective of this paper is to examine the wage-labor decisions of farm and rural nonfarm married couples and to test for effects of local economic conditions on participation decisions and labor demand. The econometric analysis focuses on the period 1978-82 when rural households were facing major changes in local and national economic conditions. Farm and nonmetro (herein called rural) married couples in the Current Population Surveys are the units of analysis. The CPS data on households for 1978-79 and 1981-82 are combined together and augmented with state level labor market variables, and for farm households, with state farm input and output prices and climatic conditions. The econometric results show that human capital

variables are relatively more important than local economic variables for explaining labor demand and labor force participation of married males and females.

The paper has the following organization. First, the models of household decisions on labor force participation for rural nonfarm wage earning households and of farm households with self-employment and wage income are presented. Second, the data and econometric model are discussed. The econometric results for the wage and participation equations are examined next. Finally, a few implications for rural economic policy are suggested.

The Economic Model

Households make labor force participation decisions of their members jointly with consumption and other decisions. In the modeling that follows, the focus is on single-family, husband-wife households. The wage labor participation decisions of husbands and wives--which require information on labor supply and labor demand--are examined for farm and rural nonfarm households. The nonfarm households are assumed to have only wage and asset income; farm households have asset income, self-employment income from their farm business, and the possibility for off-farm wage income. Thus, the wage-labor participation decisions of farm households are more complex than for rural nonfarm households. Also, see Rosenzweig (1980) for modeling of labor supply decisions by males and females in farm and rural nonfarm households, and Barnum and Squire (1979) and Huffman and Lange (1988) for modeling of wage labor supply decisions of farm households. The decision-making framework is summarized by the set of equations (1)-(4). Equation numbers that contain "n"

refer specifically to rural nonfarm and "a" refer to farm households. Other equations refer to both types of households:

$$(1) \quad U = U(T_h^M, T_h^F, Y; E^M, E^F, \tau)$$

$$(2n) \quad \bar{T} = T_m^j + T_h^j, \; T_m^j \geq 0, \; j = M, F$$

$$(2a) \quad \bar{T} = T_f^j + T_m^j + T_h^j, \; T_m^j \geq 0, \; j = M, F$$

$$(3n) \quad W^M T_m^M + W^F T_m^F + V = P_y Y$$

$$(3a) \quad W^M T_m^M + W^F T_m^F + P_Q Q - WX + V = P_y Y,$$

$$Q = Q(T_f^M, T_f^F, X; E^M, E^F, \phi)$$

$$(4) \quad W^j(\gamma) = W^j(E^j, \psi)$$

Farm and nonfarm households are assumed to derive utility from the leisure time of the husband (T_h^M) and wife (T_h^F) and from goods purchased in the market (Y). Household utility also depends on husband's and wife's schooling (E^M, E^F) because of taste or efficiency effects and other household characteristics (τ), e.g., number of children in the household, age of head of the household, commuting distance to service centers, which are not current choices.

Farm and nonfarm households receive an endowment of time each year ($\bar{T}$) for the husband and wife, which is treated as being heterogeneous. In nonfarm households, the time of each adult is assumed to be allocated between work for a wage (T_m^j) and leisure (T_h^j). In farm households, time is allocated among work on their own farm (T_f^j), work for a wage (off-farm) (T_m^j), and leisure (T_h^j). In farm and nonfarm households, optimal hours of wage work might be

zero in any year. Hence, a non-negativity constraint is imposed on wage work ($T_m^j \geq 0$).

Households spend cash income on goods purchased in the market for consumption (Y). For nonfarm households, the income is received from earnings of the husband and wife ($W^M T^M + W^F T^F$) and from asset income (V). Farm households also have self-employment or net income from a farm business ($P_Q Q - WX$). The production of farm output (Q) is by inputs of husband's and wife's farm hours (T_f^j) and by purchased inputs (X). The efficiency of the production process is affected by schooling of the husband and wife (E^j) and by other farm-specific characteristics (ϕ), e.g., climate.

Households are assumed to face perfectly elastic supply of the consumption good (Y) and, in the case of farm households, for farm inputs. Farm households are assumed to face a perfectly elastic demand for farm output. The demand for market labor is also assumed to be perfectly elastic with respect to the wage, but the wage is assumed to depend on marketable skills (E^j) and local labor market characteristics (ψ). The latter variables include the occupation mix of jobs, rate of growth of jobs, and the unemployment rate. Imperfect labor/employer mobility are reasons why these characteristics might affect local wage rates.

The farm and nonfarm households are assumed to make decisions by maximizing utility (Eq. (1)) subject to the relevant resource constraints. For nonfarm households, the decisions are on husband's and wife's leisure (T_h^j) and on the consumption good (Y), and the constraints are on human time of the husband and wife (Eq. (2n)) and on cash income (Eq. (3n)). For farm households, the decisions are on husband's and wife's leisure (T_h^j), husband's

and wife's farm hours (T_f^j), purchased consumption good (Y), and purchased farm inputs (X). The constraints are on human time of the husband and wife (Eq. (2a)) and on cash income and the farm production function (Eq. (3a)). (See Tokle for more details.)

An individual in these households participates in wage work when his (her) reservation wage is less than the wage he (she) can expect to receive in the market. In nonfarm households, the husband (wife) participates in wage work when the marginal value of his (her) leisure is less than the wage he (she) could expect to receive in the market (Pencavel 1986, pp. 26-30). For farm households, the husband (wife) participates in (off-farm) wage work when the marginal value of his (her) leisure and (or) farm hours are less than he (she) can expect to receive from nonfarm wage work (Strauss 1986; Huffman and Lange 1988).

The reservation wage equation is derived from the (wage) labor supply equation. When hours of wage work is set equal to zero, the (wage) labor supply equation can be rearranged to express the wage, now the reservation wage, in terms of other determinants of labor supply. When the labor supply curve has a positive slope, variables that cause the labor supply curve to shift to the left will increase the reservation wage, e.g., the wife's reservation wage will increase when the number of young children in the household increases.

The number of young children in a household is not expected to affect the market labor demand or wage function. Thus, additional young children are expected to reduce the probability of married women (farm or nonfarm) working for a wage. An increase of a woman's schooling is expected to change both her labor supply and labor demand. An increase in her schooling is expected to

raise the wage she is offered in the market. If additional schooling causes the woman's labor supply curve to shift to the right, then the rise in her wage offer and the decline in her reservation wage contribute to a larger probability of her working for a wage.

Because the wage labor participation decision is made by comparing the reservation and market wage rates, the equation for explaining the probability of participating in wage work is determined by the nonwage variables that are included in the (wage) labor supply and demand equations. For the i-th household and j-th married individual, define

$$D_i^j = \begin{cases} 1 \text{ if the j-th individual works for a wage} \\ 0 \text{ otherwise} \end{cases}$$

where j equals 1 for husband and 2 for wife, then

$$(5n) \quad P_r(D_i^j = 1) = g_n^j(E_i^M, E_i^F, \tau_i, \psi_i, V_i, P_{Y_i})$$

$$(5a) \quad = g_a^j(E_i^M, E_i^F, \tau_i, \psi_i, V_i, P_{Y_i}, W_i, P_{Q_i}, \phi_i), \; j = M, F$$

are the participation equations for husbands and wives in nonfarm and farm households (Tokle).

The Data and Econometric Model

Married couples in the Current Population Surveys are the units of analysis in this study. Husband-wife households account for more than 80 percent of all households in the rural population.

The Data

The Current Population Surveys (CPS) are conducted annually of U.S. households, and after 1977, the state of residence and farm-nonfarm residence are identified. Special household files were created which give information on important characteristics of the husband and wife and on the household.

The size of the relevant labor market and market for farm inputs and

outputs was somewhat arbitrarily set as the state in which a household resides. This definition has the major advantage of being the smallest political-economic-geographic unit for which annual data are regularly collected on labor market conditions and agricultural prices. Also, government programs frequently target state units. The major disadvantages are (i) state units are in some cases too large and heterogeneous to adequately summarize the economic conditions facing individual households and (ii) households may reside in one state but work and engage in most of their economic activity in an adjacent state. In the end, the advantages of state units seemed to outweigh the disadvantages, and the special CPS files for each household were augmented with state level variables that describe the labor market, and for farm households, with state variables for prices of farm outputs and inputs and for climatic conditions.

To obtain variation in local (state) economic conditions that might affect (wage) labor participation decisions, data for 1978-79 and 1981-82 were chosen. The period 1975-79 is the trough-to-peak part of a national business cycle expansion (Executive Office of the President 1987). The national average unemployment rate was 8.3 percent in 1975 and it declined to 5.8 percent in 1979. The late 1970s was also a period when net farm income was relatively good. The period starting in 1980 is one with a business cycle contraction. The national unemployment rate rose from 7 percent in 1980 to 9.5 percent in 1982-83. The sharp rise of interest rates and fall in the value of the U.S. dollar were contributing factors to the drop in net farm income during 1981 and 1982. Although the depression of the farm economy continued after 1982, extending the analysis through 1983 did not seem wise because 1983 is the year for the first large government payment-in-kind (PIK) program. Twenty-five percent of the base acreage in covered crops was taken

out of production in that year.

Additional changes during 1979-82 were part of the long term rise in the share of workers employed in service occupations and geographical shift in the areas having job growth (decline). See Singelmann 1978; Ott 1987; and USDA 1987.

The Econometric Model

Empirical participation and labor demand equations are specified. The reduced-form equations for the empirical specification of the participation equations contain regressors for individual-household characteristics and for local economic conditions. The equation explaining the probability of wage work for the i-th household and j-th married individual in a farm household is:

$$
\begin{aligned}
(6a)\quad P_r(D_i^j = 1) = F[&\beta_1^j + \beta_2^j\,\mathrm{AGEM}_i + \beta_3^j\,\mathrm{AGEM}_i^2 + \beta_4^j\,\mathrm{EDM}_i + \beta_5^j\,\mathrm{EDF}_i + \beta_6^j\,\mathrm{RACE}_i \\
&+ \beta_t^j\,\mathrm{KIDS06}_i + \beta_8^j\,\mathrm{KIDS618}_i + \beta_9^j\,\ln\,\mathrm{ASSETINC}_i + \beta_{10}^j\,\ln\,\mathrm{WAGEMFG}_i \\
&+ \beta_{11}^j\,\mathrm{UNEMP}_i + \beta_{12}^j\,\mathrm{ABNUEMP}_i + \beta_{13}^j\,\mathrm{JOBGR}_i + \beta_{14}^j\,\Delta\mathrm{SHRSERV}_i + \beta_{15}^j\,\mathrm{NC}_i \\
&+ \beta_{16}^j\,\mathrm{SOUTH}_i + \beta_{17}^j\,\mathrm{WEST}_i + \beta_{18}^j\,\ln\,\mathrm{PCPOP}_i + \beta_{19}^j\,\ln\,\mathrm{PLIVST}_i \\
&+ \beta_{20}^j\,\ln\,\mathrm{FARMWAG}_i + \beta_{21}^j\,\ln\,\mathrm{POTINP}_i + \beta_{22}^j\,\mathrm{RAIN}_i + \beta_{23}^j\,\mathrm{GDD}_i \\
&+ \beta_{24}^j\,\mathrm{RAIN}_i \times \mathrm{GDD}_i + \beta_{25}^j\,\mathrm{TIME}_i],\ i = 1, \ldots, n;\ j = M, F;
\end{aligned}
$$

where $F(\cdot)$ is the normal distribution function and the variables are defined in Table 1. For rural nonfarm household members, the coefficients $\beta_{18} - \beta_{24}$ are assumed to be zero, and the farm output and input prices and climatic variables do not enter these participation equations.

The equation for labor demand or the real wage faced by the i-th household for each married individual has a similar specification. The regressors are the individual's human capital and local labor market

variables:

$$(7)\quad \ln WAGE_i = \delta_1 + \delta_2 ED_i + \delta_3 AGE_i + \delta_4 AGE_i^2 + \delta_5 RACE_i + \delta_6 \ln WAGEMFG_i + \delta_7 UNEMP_i + \delta_8 ABNUNEMP_i + \delta_9 JOBGR_i + \delta_{10} \Delta SHRSERV_i + \delta_{11} NC_i + \delta_{12} SOUTH_i + \delta_{13} WEST_i + \delta_{14} TIME + \delta_{15} \lambda_i + \epsilon_i,\ i = 1, \ldots, n.$$

where ϵ_i is a random disturbance term.

The first eight regressors of the participation equation (Eq. (6)) and the regional dummy variables represent individual and household characteristics that are expected to affect participation decisions. Age, race, number of children, and region are the set of other household characteristics (τ) that affect the tastes of households or the efficiency of household production. Husband's and wife's ages are highly correlated, and we employ only husband's age in the participation equation.

Five variables plus the regional dummy variables represent characteristics of local labor markets that might be expected to affect participation decisions. The average wage rate for manufacturing is a proxy for the general wage structure. However, a larger share of men than women are employed in this industry, so the proxy seems likely to be better for male wage opportunities than for female opportunities. Two unemployment rates are included: the overall state unemployment rate and the abnormal unemployment rate. The overall unemployment rate differs across states largely because of differences in occupational-industrial mix of employment. It differs over time due primarily to the business cycle. The second unemployment variable measures the abnormal unemployment rate or the deviation of the current unemployment rate from normal.[1/] Thus, ABNUEMP represents business-cycle effects of unemployment and a rise in ABNUEMP is expected to reduce real wage rates.

The expected effect of UNEMP on labor demand is unclear. Industries that have higher than average wage rates generally have higher than average unemployment holding "skill" constant, e.g., construction. A higher unemployment rate is expected, however, to reduce labor force participation because it reduces the probability of finding employment. Bowen and Finegan (1969) found that the unemployment rate had a negative and significant effect on aggregate labor force participation rates of rural nonfarm males age 25-54 years.

The growth rate of employment in a local labor market can be interpreted as any combination of shifts of the labor supply and demand curves so that their intersection occurs at a larger number of persons being employed or total hours of employment. The wage rate could rise, fall, or remain unchanged. The change in the wage rate will, however, depend on the amount of time for adjustments to occur across interrelated labor markets. The effect of job or employment growth (JOBGR) on labor demand could be any of the above three outcomes. The primary effect of JOBGR on participation is expected to be through its effect on the wage offer. Thus, the effect of JOBGR on participation should be of the same direction as its effect on labor demand.

There is a general belief that the change in the occupational mix of jobs toward services represents an upgrading of earnings prospects (Tienda 1986). If this is the case, then an increase in the share of local labor market employment that is in the service sector is expected to increase wage offers faced by individuals. Thus, the expected effect of ΔSHRSERV on wage offers is positive. Also, the expected effect of ΔSHRSERV on participation is positive or in the same direction that it affects wage offers. The regional dummy variables (NC, SOUTH, WEST) proxy a number of differences that seem likely to exist across major regions of the U.S., i.e., cost of living, extent of unionism, occupation-industrial mix that might affect labor demand.

The seven variables for farm output and input prices and climate are included in the participation equation of farm household members. An increase of output prices is expected to increase the demand for farm labor of a husband or wife (Tokle). However, an increase of these prices also increases net-farm income and can be expected to change the demand for leisure. If leisure is a normal consumption good, the demand for leisure is expected to increase. Thus, a rise in farm output prices is expected to reduce the probability of wage work. An increase of input prices can cause an increase, decrease, or no change in the demand for farm labor. It can also be expected to decrease the demand for leisure, when leisure is a normal good. Thus, the effect of input prices on the probability of off-farm work is uncertain.

Farms located in areas where climatic conditions are more favorable--larger annual rainfall and longer growing seasons--are expected to have a larger demand for farm labor of husbands and wives that farms in other locations. Favorable weather is conducive to more "intensive" farming operations and a wider range of possible farming enterprises. More favorable climate will also have an income effect and increase the demand for leisure. Thus, more favorable climate is expected to reduce the probability of wage work.

The real wage rate, the individual's nominal wage divided by the consumer price index, is the dependent variable in equation (7). The individual's age (and age squared) is used in place of work experience in the wage equation. Wage-work experience is just a summary of cumulative decisions on past participation and can be correlated with the disturbance term ϵ_i (see Mroz 1987; DaVanzo, DeTray, and Greenberg 1973). The conditions in the local labor market that might affect labor demand are represented by eight variables, starting with the manufacturing wage. A sample selection term is also included to adjust for the fact that individuals who are observed to be

working for a wage are a nonrandom selection from the population. A time trend is included in both the participation and labor demand equations to account for effects of variables that are pure trend or highly correlated with trend.

See Table 1 for sample mean values of the variables.

The Results

Labor Demand Equations

Labor demand equations were fitted to the data for rural nonfarm husbands and wives. Sufficient data do not exist to be able to construct a market wage for off-farm work of farm household members. The wage equations, estimated by a two-step procedure, are reported in Table 2, and some of these results will be used directly for interpreting the fitted participation equations.

The human capital variables are strongly significant in the wage equations. The positive but diminishing marginal effect of an individual's age (or experience) on his (her) wage or labor demand has been reported in many studies. The age-log wage function for men is higher at every age than for women. This occurs because women are more likely than men to spend time out of the labor force after completing school, and as a result women have less experience on average to sell at each age. The real wage peaks at about the same age for men and women, 47.9 versus 46.2 years.

A one-year increase in schooling causes a larger percentage increase of the female than male wage, 6.7 versus 5.1 percent. These are consistent with other estimates (Topel 1986; Gerner and Zick 1983). Rural nonfarm women actually earn significantly less on average than rural nonfarm men--$3.48 versus $2.00 per hour in 1967 prices. Thus, the absolute or dollar value increase in the wage for an additional year of schooling is larger for men

than for women.

Nonwhite rural nonfarm men earn 20 percent less than rural nonfarm white men, other measured variables constant, and nonwhite women earn 7.3 percent less than white women. Both coefficients are significantly different from zero at the 1 percent level. Topel (1986) found an 18 percent difference in the wages of white and nonwhite men, which is similar to our estimate. Other studies have also shown large gaps in the wage of white and black men on average but little or no gap in white and black womens' income (Hamermesh and Rees 1984). Thus, our results show a relative difference in wage rates for men and women by race that is similar to other studies.

The local labor market variables have a mixed performance in the labor demand equations. Some gain in explanatory power comes from the local manufacturing wage, abnormal unemployment rate, and change in the share of service sector jobs.[2/] The coefficient of ln WAGEMFG is positive in the labor demand equations for men and women, but it is significantly different from zero only for men. Thus, the local manufacturing wage is a much better proxy for the local wage structure facing rural nonfarm men than women. To some extent this is not too surprising because a much larger share of the men are employed in manufacturing than in the case for women -- 25.9 percent versus 20.2 percent for nonmetropolitan residences in 1980.

Although the unemployment rate does not have a significant effect in either labor demand equation, the coefficient for the abnormal unemployment rate is negative in both equations. It is significantly different from zero in the female wage equation. Thus, real wage rates show some flexibility over the business cycle in the direction that is expected.

An increased share of local jobs that are in the service occupation (ΔSHRSERV) increases the wage rates for rural nonfarm men and women, and the

effect is statistically significant in both equations. Furthermore, the coefficients of ΔSHRSERV are very similar in size for the male and female equations. Two factors associated with the increase in service employment, the rapid growth in demand for services and the increasing relative importance of service employment requiring specialized skill, seem to cause wage rates to increase.

Differences in the rate of job growth (JOBGR) are not a significant source of wage differences in these data. This result arises from the fact that employment growth arises from changes that influence local wage rates in opposite directions. Thus, the fact that the midwestern states had a loss of jobs during the early 1980s does not by itself seem to be a source of reduced real wage rates for rural nonfarm household members.

Real wage rates differ significantly across major Census regions and over time due to trend. Relative to the northeast, the real wage rate in the north central states for rural nonfarm men is 11 percent lower and for women 5 percent lower. For the south, there is a larger percentage reduction of female than males wage rates, 8.8 percent versus 6.2 percent. In the west, the male wage rate is 3.6 percent higher for men, and the female wage rate is not significantly different than for women in the northeast.

Real wage rates for rural nonfarm men and women have been falling over the period 1978-82. The real wage declined at a compound average rate of 3.2 percent for men and a slower 2.7 percent for women. Bils (1985) also reported a negative trend rate of decline for real wage rates for the period 1966-80, along with a negative regional effect associated with residing in the south.

Neither wage equation shows statistically significant sample-selection effects. For women, the finding is roughly consistent with results reported by Mroz.

Participation in Wage Work

The bivariate probit estimates of the equations explaining the probability of wage work for married farm and rural nonfarm couples are reported in Table 3. The first two columns of results are for rural nonfarm married men and women, and the last two columns are for farm married men and women. For both the rural nonfarm and farm couples, the estimate of the cross-equation correlation coefficient is positive--0.19 for rural nonfarm and 0.26 for farm couples, and they are significantly different from zero at the 1 percent level. Thus, the probabilities of a husband and wife working for a wage are not independent, i.e., univariate probit is not an appropriate estimation procedure.

Let us turn to the specific results. An individual's age has a positive but diminishing marginal effect on his (her) probability of wage work for farm males and rural nonfarm males and females. For these individuals, the largest probability of wage work occurs at age 50.0, 33.5, and 19.4, respectively. For farm females, the probability of wage work is largest at young ages and decreases as they become older. A husband or wife who has more schooling has a higher probability of wage work in farm and rural nonfarm households. These results imply that additional schooling raises an individual's market wage by more than it raises their reservation wage. This conclusion is, however, held with lower confidence for farm males.

At the sample mean, the marginal effect of a year of schooling has a much larger effect on the probability of female than male participation (see Table 4). This suggests that a year of schooling for a wife causes the difference between her wage offer and reservation wage to increase by more than for her husband. This result is consistent with other studies. Also,

the marginal effects of schooling on the probability of wage work are larger for rural nonfarm than farm males but are very similar for rural nonfarm and farm females.

An increment to a spouse's schooling can reduce the probability of a mate participating in wage work. This occurs when the spouse's schooling causes the reservation wage of the mate to increase. Negative and statistically significant effects of a rural nonfarm husband's schooling on his wife's participation and of a farm wife's schooling on her husband's wage work participation exist. Huffman and Lange (1988) also found a similar negative effect of a farm wife's schooling on her husband's probability of wage work. The other cross-person effects of schooling are positive but not significantly different from zero at the 5 percent level.

Additional children less than age 19 reduce the probability of farm and rural farm married women working for a wage. The implication is that additional children raise the reservation wage of women. The largest reduction occurs for children less than 6 years of age--a 11 percent reduction in the probability of wage work per child for rural nonfarm and farm wives (see Table 4). For older children, the negative marginal effect is slightly larger for farm than for rural nonfarm wives. The negative but generally not statistically significant coefficient of KIDS06 and KIDS618 in the male participation equations implies that the tendency for children to raise the reservation wage of married men is weak. These results are consistent with other studies.

Larger asset income reduces the probability of wage work of husbands and wives in the farm and rural nonfarm households. This result implies that home time of husbands and wives is a normal good. The race dummy variable is positive, indicating that nonwhites have a higher probability of wage work,

other measured things equal.

The state labor market variables have statistically stronger effects on the probability of wage work of rural nonfarm than of farm household members. A rise in the local manufacturing wage was shown in the previous section to raise the wage of males but not of females. Thus, the positive coefficients in the participation equation for nonfarm and farm males are consistent with this effect on labor demand. The negative effect on female participation seems to arise primarily from cross-person effects, if male and female home time are substitutes in consumption. In this case, a rise in the wage rate for males causes an increase in the demand for female home time and increases the reservation wage of females. With no significant change in the female market wage, the probability of female participation is reduced.

Although the local unemployment rate (UNEMP) did not have an effect on labor demand, it reduces the probability of wage work participation of nonfarm males and females and of farm males. These results are statistically significant and for nonfarm household members are consistent with other studies.

Although the real wage rate received by individuals was not affected significantly by the unemployment rate, the expected wage--the wage adjusted for the probability of finding employment--is reduced when the unemployment rate increases. Thus, it may be reasonable for UNEMP to have a negative coefficient in the participation equation for rural nonfarm household members. We do not have a good explanation for the positive coefficients of UNEMP in the participation equation for farm household members.

The signs of the coefficients for ABNUEMP are negative in three of the four participation equations. They are consistent with the negative effect of ABNUEMP in the labor demand equations. The coefficients, however, have small t-ratios. Although JOBGR did not have a statistically significant effect in

the wage equations, it performs more strongly in the participation equations. A more rapid rate of local job growth reduces the probability of wage work of rural nonfarm household members and increases the probability of wage work of farm household members. The reasons for the differences between farm and nonfarm household members are unclear. The implication is, however, that when growth (decline) of employment occurs, it is favorable toward the skills of farm (rural nonfarm) household members.

Although ΔSHRSERV had a positive and significant coefficient in the labor demand equations, only two of the four coefficients in the participation equations are consistent with this result. None of the coefficients, however, of this variable is significantly different from zero.

The coefficients of the regional dummy variables provide estimates of broad regional effects that are not captured in other regressors. In the south and west, the probability of wage work is lower for rural nonfarm men and women than for persons in the northeast. In the north-central states, the probability of wage work by rural nonfarm males is smaller than for males in the northeast but for rural nonfarm females the probability is higher. For husbands and wives with a farm residence, the probability of wage work tends to be lower in the north-central region and south than in the northeast. For the west, none of the effects on farm household members is significant.

The probability of off-farm work of farm household members is not strongly affected by farm output and input prices and the effects of climatic variables are opposite expectations. The estimated coefficients of the prices of crop and livestock outputs are positive and opposite expectations. However, only one of them is significantly different from zero at the 5 percent level. The coefficient of the farm wage is positive in the husband's participation equation and consistent with expectations. The effects of the

farm wage on the wife's probability of wage work and of the price of other inputs on the probability of husband's and wife's probability of wage work are not significantly different from zero.

The probability of wage work for rural nonfarm women has a positive and statistically significant trend. None of the other coefficients of TIME are significantly different from zero. In particular, there is not a similar positive effect of TIME for married farm women.

Conclusions

The results presented in the paper show that an individual's schooling and age (experience) are statistically strong determinants of the (real) wage rate of rural males and females. Local labor market conditions are more important for explaining rural male than female wage rates. Wage rates for males are closely linked to the state average wage rate in manufacturing but not for females. Higher than normal state unemployment rates tend to lower the real wage rate received by both males and females. A larger share of state employment in service occupations causes wage rates for males and females to increase, but job growth does not matter. In addition, real wage rates for rural males and females do differ significantly across major census regions. Based upon these conclusions, rural development policies devoted to raising schooling completion levels, increasing the share of jobs in the service occupations, and lowering the unemployment rate seem likely to raise real wage rates of rural household members.

Wage-work participation decisions of rural nonfarm household members are less complex than for farm household members because farm households also have a self-employed farm business. Male's (female's) schooling has a positive effect on his (her) probability of wage work. The marginal effect is,

however, larger for rural nonfarm than for farm males. The marginal effects are about equal for farm and nonfarm females. In addition, the marginal effect on the probability of wage work of a year of schooling for females is much larger than for males. For farm males and rural nonfarm males and females, an individual's age has a positive but diminishing marginal effect on the probability of wage work. For farm females, the probability of wage work is largest at a young age and decreases as they become older.

The marginal effect of additional young children on the probability of wage work of married women is much larger (about 5 times) than for older children. The marginal effect on the probability of wage work of additional children in a specific age group is about the same for farm and rural nonfarm women. If market provided day care of children is more accessible to nonfarm than farm households, these results suggest the lack of market provided day care does not restrict the off-farm work decisions of married women living on farms. For rural men, the marginal effect of additional children in a specific age group is to reduce the probability of wage work. These effects are much smaller and statistically weaker for men than for women.

Local labor market variables have a stronger effect on the wage-work participation decisions of rural nonfarm than on farm household members, but the effect is not particularly strong. A higher local manufacturing wage rate tends to increase the wage-work participation rate of rural farm and nonfarm males. A higher state unemployment rate reduces the probability of wage-work participation for rural nonfarm males and females, but not for farm males and females. Recent job growth tends to raise the probability of wage work for married farm males and females but not for nonfarm males and females. A change in the mix of local jobs toward a larger share in the service occupations does not have a statistically significant effect on the probability of

wage work. Thus, rural development that promotes job growth may increase the wage work frequency of married farm household members.

For farm household members, farm output and input prices have statistically weak effects on the probability of wage work. Thus, changes in farm profitability, at least over 1978-82, do not seem to be a major factor in explaining off-farm participation of farm couples.

An individual's wage-work decision is affected by his (her) spouse. More schooling by an individual's spouse generally lowers the probability of him (her) working for a wage. Also, the residual in husband's and wife's wage-work participation decisions are positively correlated.

In conclusion, greater public investment in schooling for rural areas seems likely in the long run to have favorable effects on wage rates and wage work participation of households. In the short run, some improvement in wage prospects of individuals living in rural areas can come from enhancing the relative importance of service sector jobs.

Table 1. Variable Names and Sample Means for Current Population Survey Samples (1978-79-81-82)

Symbol	Variable description	Mean: Nonfarm sample	Mean: Farm sample
AGEM	Husband's age (yrs)	47.0	50.5
AGEF	Wife's age (yrs)	43.9	47.2
EDM	Husband's schooling (yrs)	11.5	11.3
EDF	Wife's schooling (yrs)	11.6	11.8
RACE	1 if nonwhite; 0 otherwise	.07	.03
KIDS06	Number of children under age 6	.31	.27
KIDS618	Number of children ages 6-18	.66	.69
ASSETINC	Real nonwage and nonfarm income (interest and dividends) (1967 prices)	$469.00	$852.00
WAGEMFG	Real state ave. wage-manufacturing	2.94	3.06
UNEMP	State unemployment rate	7.08	6.67
ABNUEMP	Deviation of state unemployment rate from normal (1967 prices)	-.23	-.27
JOBGR	State growth rate in employment	.048	.037
ΔSHRSERV	Change in share of a state's jobs in service occupations	1.00	.91
NC	1 for residence in North Central Region; 0 otherwise	.28	.46
SOUTH	1 for residence in south; 0 otherwise	.51	.38
WEST	1 for residence in west; 0 otherwise	.06	.12
TIME	Trend	3	3
PCROP	State price index for crops	-	.49
PLIVE	State price index for livestock	-	.54
FARMWAGE	State wage for hired farm labor	-	.54
POTINP	State price index for nonlabor farm inputs	-	.51
RAIN	State average precipitation	-	35.7
GDD	State average growing season length	-	3,335.6
D_M	1 if male works for a wage, 0 otherwise	.75	.43
D_F	1 if female works for a wage, 0 otherwise	.54	.39
WAGEM	Male nonfarm wage ($/hr)	$3.48	Not avail.
WAGEF	Female nonfarm wage ($/hr)	$2.00	Not avail.

Table 2. Labor Demand Equations: Rural Nonfarm Males and Females--CPS 1978-79-81-82

Regressors	ln WAGE			
	Males		Females	
Intercept	-1.35 (15.17)[a/]	-0.735 (10.04)	-0.943 (11.49)	-0.970 (14.65)
AGE	0.067 (17.49)	0.063 (18.93)	0.036 (14.20)	0.036 (14.30)
$AGE^2/100$	-0.070 (13.48)	-0.065 (14.53)	-0.039 (12.19)	-0.040 (12.36)
ED	0.051 (34.82)	0.049 (35.79)	0.067 (27.63)	0.067 (28.10)
RACE	-0.202 (13.74)	-0.220 (14.98)	-0.073 (3.92)	-0.070 (3.80)
ln WAGEMFG	0.462 (12.66)		0.004 (0.07)	
UNEMP	0.002 (0.83)		-0.001 (0.27)	
ABNUEMP	-0.006 (1.12)		-0.013 (2.00)	
JOBGR	0.130 (1.09)		-0.127 (0.84)	
ΔSHRSERV	0.009 (3.66)		0.008 (2.34)	
NC	-0.114 (8.85)	-0.055 (4.65)	-0.051 (2.93)	-0.041 (2.58)
SOUTH	-0.062 (4.74)	-0.123 (10.81)	-0.088 (5.08)	-0.090 (6.04)
WEST	0.036 (1.82)	-0.040 (2.19)	-0.031 (1.23)	-0.044 (1.81)
TIME	-0.032 (9.08)	-0.029 (12.28)	-0.027 (5.65)	-0.018 (5.82)
$\hat{\lambda}$	0.075 (1.37)	0.139 (2.98)	-0.039 (1.49)	-0.043 (1.73)
R^2	0.1648	0.1585	0.0774	0.0769
Sample size	24,571	24,571	17,508	17,508

[a/] The t-ratios that are reported in parentheses are conditional on the sample selection variable (λ).

Table 3. Probability of Wage Work: Bivariate Probit Estimates

Regressors	Rural Nonfarm Couples		Farm Couples	
	Males	Females	Males	Females
Individual/household				
AGEM	0.106 (27.16)[a/]	0.026 (7.62)	0.031 (3.64)	0.004 (0.40)
$AGEM^2/100$	-0.158 (41.53)	-0.067 (19.36)	-0.061 (7.23)	-0.037 (4.01)
EDM	0.041 (11.44)	-0.017 (5.50)	0.011 (1.51)	-0.008 (1.07)
EDF	0.007 (1.63)	0.095 (25.73)	-0.029 (3.30)	0.079 (9.13)
RACE	0.106 (3.22)	0.309 (10.42)	0.317 (2.93)	0.406 (3.82)
KIDS06	-0.027 (1.38)	-0.495 (35.43)	-0.034 (1.05)	-0.389 (11.52)
KIDS618	-0.010 (1.00)	-0.083 (10.90)	-0.039 (2.35)	-0.074 (4.52)
ln ASSETINC	-0.359 (4.53)	-0.867 (11.16)	-0.352 (2.71)	-0.542 (4.06)
Local Economic Conditions				
ln WAGEMFG	0.124 (1.53)	-0.617 (9.21)	0.269 (1.63)	-0.034 (0.21)
UNEMP	-0.050 (8.04)	-0.042 (8.50)	0.049 (2.93)	0.011 (0.65)
ABNUEMP	-0.007 (0.57)	0.010 (0.96)	-0.015 (0.55)	-0.045 (1.62)
JOBGR	-1.270 (4.54)	-0.202 (0.84)	0.083 (0.21)	0.687 (1.63)
ΔSHRSERV	0.006 (1.00)	-0.004 (0.75)	-0.013 (0.87)	0.007 (0.05)
NC	-0.125 (3.49)	0.185 (6.69)	-0.208 (1.77)	-0.172 (1.51)
SOUTH	-0.214 (6.68)	-0.105 (4.20)	-0.021 (0.17)	-0.327 (2.71)

Table 3. Continued.

Regressors	Rural Nonfarm Couples		Farm Couples	
	Males	Females	Males	Females
WEST	-0.163 (3.98)	-0.026 (0.79)	0.013 (0.10)	-0.076 (0.59)
ln PCROP	-	-	0.432 (2.07)	0.174 (0.81)
ln PLIVST	-	-	0.005 (0.02)	0.025 (0.12)
ln FARMWAG	-	-	0.524 (2.15)	-0.222 (0.39)
ln POTIN	-	-	-0.402 (0.73)	-0.348 (1.42)
RAIN	-	-	0.011 (2.42)	0.007 (1.52)
GDD/1000	-	-	0.171 (4.65)	0.129 (3.56)
RAIN x GDD/1000	-	-	-0.020 (2.35)	-0.013 (1.55)
TIME	0.001 (0.16)	0.040 (5.61)	-0.022 (0.86)	-0.008 (0.32)
INTERCEPT	3.03 (4.12)	8.68 (12.08)	2.71 (2.15)	4.23 (3.25)
ρ (cross eq. corr.)	0.19 (15.8)		0.26 (12.4)	
ln (likelihood fn)	-29,554		-6,972	
no. observations	32,662		5,866	

a/ Asymptotic t-ratios are in parentheses.

Table 4. Marginal Effects on the Probability of Wage Work, 1978-82

Regressors	Farm		Rural Nonfarm	
	Male	Female	Male	Female
AGEM	-0.009	-0.010	-0.009	-0.008
EDM	0.003	-0.002	0.009	-0.004
EDF	-0.008	0.023	0.002	0.020
RACE	0.090	0.116	0.023	0.066
KIDS06	-0.010	-0.111	-0.006	-0.106
KIDS618	-0.011	-0.021	-0.002	-0.018
ln ASSETINC	-0.100	-0.154	-0.077	-0.186
ln WAGEMFG	0.077	-0.010	0.027	-0.132
UNEMP	0.014	0.003	-0.011	-0.009
ABNUEMP	-0.004	-0.013	-0.002	0.002
JOBG	0.024	0.196	-0.272	-0.043
ΔSHRSERV	-0.004	0.0002	0.001	-0.009
NC	-0.059	-0.049	-0.027	0.040
SOUTH	-0.006	-0.093	-0.046	-0.022
WEST	0.004	-0.022	-0.035	-0.006
TIME	-0.006	-0.002	0.0002	0.009

Footnotes

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[1]The "normal" unemployment rate was the predicted value of the unemployment rate obtained from fitting the following regression equation to data for each state for the years 1950-1982: $UE_t = b_1 + b_2 TIME_t + b_3 UE_{t-1} + b_4 UE_{t-2} + e_t$ where UE_t is the state annual unemployment rate in t and e_t is a random disturbance term. $ABNUEMP_t = UE_t - \hat{UE}_t$.

[2]A joint test of the null hypothesis that the coefficients of the local labor market variable ln WAGEMFG, UNEMP, ABNUNEMP, JOBGR, and ΔSHRSEREMP are all zero was performed on both wage equations. The sample value of the F statistic was 35.3 for husbands and 1.9 for wives. The tabled value of the F statistic with 5 and ∞ degrees of freedom at the 1% significance level 3.02. Thus, only in the wage equation for males is the null hypothesis of no effect of local labor market variables rejected.

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