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Multiple Job-Holdings Among Dairy Farm Families in New York And Ontario

1. Introduction

Rising nonfarm wages and a greater increase in the supply of agricultural products relative to demand has depressed farm earnings for some households relative to those in the nonfarm sector over the last several decades. The resulting adjustment of labor out of agriculture has occurred through a large reduction in the number of farms and also through dual employment of those remaining on the farm (Huffman, 1991). Multiple job holding may be viewed as a temporary phenomena in response to financial pressures in agriculture, but it has always been present (Fuller, 1991). In recent years, fully 60% of U.S. farm households rely on off-farm work by the spouse, operator, or both to maintain family household income (USDA, 1992).

Reasons for examining multiple job holding are generally grouped into 3 issues (Carlin and Bentley, 1991). First, are human resource issues surrounding efficiency and equity differences between those working full-time on the farm and those with off-farm jobs. If the latter group are less productive, then understanding the characteristics of those individuals would aid in targeting extension efforts to help improve their efficiency. However, the need for such efforts and for other farm programs such as income support are brought into question if total household income for multiple job holding farm families is similar to those families without off-farm jobs. Second, are rural development issues which are related to the equity considerations just mentioned. If total family incomes are greater for households with off-farm jobs, then the prosperity of rural areas may be enhanced more through efforts to increase non-farm employment opportunities than through direct income support to farmers. Third, are forecasts related to farm structure. The trend to a bi-modal distribution of farm sizes is supported if multiple job holding participants tend to be middle aged. Such individuals are unlikely to view off-farm work as

a temporary phase in a transition to full-time farming, but rather as a full-time occupation with farming as a sideline activity.

Previous empirical studies of multiple job holding have tended to focus on the characteristics of those obtaining off-farm employment and the factors affecting the hours supplied to those off-farm activities (e.g. Bollman, 1980; Huffman, 1980; Sumner, 1982; Simpson and Kapitany 1983; Gould and Saupe, 1989; Huffman and Lange, 1989; Lass, Findeis and Hallberg, 1989; Lass and Gempesaw, 1992; and Weersink 1992). Focus has been on human capital characteristics with the general finding that the increasing off-farm employment rate is due to changes in marginal returns to labor between off-farm and farm activities arising largely from improved human capital skills. None of these studies have explicitly addressed the reasons behind the decision to seek off-farm employment. Neither have they been able to examine in-depth the important issue of how this major component of the farm sector responds to alternative policies (Sumner 1991) since most studies have used cross-sectional data for a given region. A comparison between countries would permit the analysis of how multiple job holding responds to differing government policies.

The purpose of this paper is to examine the reasons for and factors affecting multiple job holdings of dairy farm families in neighboring regions of two counties, United States and Canada. The bordering regions of New York and Ontario have similar geographic conditions but significantly different farm support and social service policies. Milk production in Ontario is controlled through a supply management system that enables producers in that province to earn higher and more stable returns than their counterparts in New York. Households in Ontario also benefit from free access to medical care but pay higher taxes. The lack of such coverage for families in New York can be a reason for a member of a farm household to seek off-farm employment in order to obtain fringe benefits such as medical insurance. The contrasting forms of government support in the two regions and the focus on dairy, which requires more labor commitment to the farm than other agricultural products, should permit insights into how off-farm labor decisions are

affected by government policy. The paper begins with a theoretical model of multiple job holdings decisions by farm families followed by the econometric means of estimating the model that accounts for joint decision making and self-selection biases. The next section of the paper examines differences between the two regions in the extent of multiple job holdings and its explanatory variables along with a discussion of how policy has contributed to these differences. We then analyze efficiency and equity measures for differing work regimes and factors affecting the decision to participate in off-farm work. Primary reasons for multiple job holdings given by the household and their relationship to farm income are then examined. Finally, factors affecting both demand and supply for off-farm labor are discussed. Differences in off-farm employment patterns between New York and Ontario as partial indicators of how alternative government policies affect multiple job holding decisions by dairy farm families are emphasized.

2. Theoretical Model

The decision to work off-farm by operators and spouses can be viewed through an agricultural household model which combines agricultural production, consumption and labor supply decisions into a single framework. Similar models have been used by Huffman and Lange (1989), Gould and Saupe (1989), and Lass and Gempesaw (1992). In these models, the household is assumed to maximize utility by consuming various commodities which it produces by combining market goods and time. Household utility is assumed to be derived from consumption of purchased goods (G) and leisure time for the operator (L^O) and spouse (L^S). The level of utility derived from purchased goods and leisure is affected by exogenous variables such as human capital characteristics of the operator (H^O) and spouse (H^S) along with other household and area characteristics (Z_H).

$$U = U(G, L^O, L^S; H^O, H^S, Z_H) \qquad (1)$$

Utility is maximized subject to constraints on time, income and farm productivity. Time for the operator and spouse are assumed to be heterogeneous. Each allocate their total

time endowment (T) to either leisure (L) or work which consists of time spent working on the farm (F) and possibly in off-farm employment (M). It is assumed that a positive amount of time is allocated to leisure and farm work but that hours of off-farm work may be zero for either the operator or spouse.

$$T = L^i + F^i + M^i, \quad L^i > 0, F^i > 0, \text{ and } M^i \geq 0, \quad i = O, S \tag{2}$$

Working on or off the farm is done to generate income for purchase of consumption goods bought at a price P_G. Total amount spent on goods for direct or indirect consumption is limited by the amount earned from farm income, off-farm income and other exogenous household income (V). Assuming the household faces perfectly competitive output and input markets, farm income ($P_Q Q$ - RX) is equal to the price of farm output (P_Q) multiplied by quantity produced (Q) less variable costs of production $R\,X$ where R is the input price vector and X is the quantity of purchased farm inputs. Off-farm income is the product of the wage rate (W) and the hours worked off-farm by both the operator and spouse ($W^O M^O + W^S M^S$). The budget constraint on household income is therefore

$$P_G G = P_Q Q - RX + W^O M^O + W^S M^S + V. \tag{3}$$

The wage rates facing operators and spouses are assumed to depend on their respective human capital characteristics (H) and local labor market conditions (Z_M).

$$W^i = W^i (H^i, Z_M) \quad i = O, S \tag{4}$$

While off-farm wage rates are assumed to be independent of the hours worked, marginal returns to farm labor by the operator and spouse are assumed to diminish with increases in hours of farm work. The production function therefore imposes an additional constraint on utility maximization by the household. Farm production technology is represented by

$$Q = f (F^O, F^S, X; H^O, H^S, Z_F) \tag{5}$$

where $f(.)$ is a strictly concave production function and Z_F is a vector of exogenous farm specific characteristics.

The household maximizes utility (1) subject to its time (2), budget (3) and farm productivity (5) constraints through its choice of consumption goods purchased, quantity of farm inputs purchased and the work hours of the operator and spouse allocated to farm and off-farm employment. Optimal levels of these choice variables can be determined by simultaneously solving the first order conditions (see Huffman, 1991). An interior solution is assumed for all choice variables with the exception of off-farm work by both the operator and spouse. Optimal hours of off-farm work are zero if the marginal return to off-farm labor or wage rate is less than the marginal value of farm labor evaluated at the point of optimal time allocation between farm work and leisure and with no off-farm work. If at this point marginal returns to off-farm labor are greater than farm work, the individual will increase off-farm work hours and thereby increasing the marginal value of farm labor until the marginal returns to both forms of employment are equated to the marginal rate of substitution between leisure and consumption goods ($W=P_Q f_F(.) = U_L/U_G$).

Given the assumption that the farm household is a price taker in output and input markets, the household model is recursive if an interior solution exists for all choice variables. Decisions on farm labor and purchased inputs are first made and then consumption decisions on purchased goods and leisure. Off-farm labor supply functions are derived residually from the time constraint and will contain all exogenous variables in the constrained optimization problem.

$$M^{i*} = s_i\,(W^O, W^S, P_G, P_Q, R, V, H^O, H^S, T, Z_H, Z_F, Z_M) \quad i = O, S. \quad (6)$$

However, if optimal hours of off-farm work are zero for either the operator or spouse, household decisions regarding farm production and consumption decisions must be made jointly, rather than recursively. Off-farm labor supply is still determined residually as function of the same variables in (6) except that the unobservable wage rate for an individual not working off-farm is not a determinant of the hours worked off-farm by the other partner. However, the supply function for this partner is conditional upon the participation decision by the partner without off-farm employment.

3. Econometric Model

The approach for estimating the model of multiple job holdings just presented is based on Huffman and Lange (1989) and involves estimating the demand for off-farm labor and the supply of this labor by both the operator and the spouse. These decisions on off-farm employment for both members are made jointly by the household and can result in four possible scenarios; (1) both operator and spouse work off-farm ($M^O>0$, $M^S>0$); (2) only the operator works off-farm ($M^O>0$, $M^S=0$); only the spouse has off-farm employment ($M^O=0$, $M^S>0$); and (4) neither partner works off-farm ($M^O=0$, $M^S=0$). These four regimes, which will be denoted by the subscript j later, have been respectively classified as; dual career, traditional part time, dual career part time, and traditional (Deseran, Falk and Jenkins, 1984).

The off-farm labor demand equations for the operator and spouse are;

$$W^i = \beta_i + \beta_{iH} H^i + \beta_{iZ} Z_M + \nu_i \quad \text{if } W^i > W^{iR} \qquad i = O, S \qquad (7)$$

where β are unknown parameters and ν is an error term. As noted in equation (4), the wage rate (W) is assumed to depend on human capital characteristics (H) and local labor market conditions (Z_M). The wage rate is observed only when the decision is made to work off the farm which will occur when the wage rate is greater than the reservation wage (W^R). The reservation wage is the marginal value of farm labor, assuming no off-farm work ($M^i = 0$) and evaluated at the point of optimal allocation of time between farm work and leisure. Thus, the reservation wage depends on non-wage variables exogenous to the household's consumption, production and labor supply decisions, Z.

The supply of off-farm labor depends on the exogenous variables Z and the wage rates as shown in equation (6). However, the unobservable wage rate for an individual working only on the farm is not a determinant of the hours worked off-farm by the other partner. The off-farm labor supply functions, M^i_j for individual i under off-farm employment scenario j can be expressed as;

$$M^O = \begin{cases} M_1^O = \alpha_{OO}W^O + \alpha_{OS}W^S + \alpha_{ZO}Z + \mu_O & \text{if } W^O \geq W^{OR} \text{ and } W^S \geq W^{SR} \\ M_2^O = \alpha'_{OO}W^O + \alpha'_{ZO}Z + \mu'_O & \text{if } W^O \geq W^{OR} \text{ and } W^S < W^{SR} \\ M_4^O = 0 & \text{otherwise} \end{cases} \quad (8)$$

$$M^S = \begin{cases} M_1^S = \alpha_{SS}W^S + \alpha_{SO}W^O + \alpha_{ZS}Z + \mu_S & \text{if } W^O \geq W^{OR} \text{ and } W^S \geq W^{SR} \\ M_3^S = \alpha'_{SS}W^S + \alpha'_{ZS}Z + \mu'_S & \text{if } W^O < W^{OR} \text{ and } W^S \geq W^{SR} \\ M_4^S = 0 & \text{otherwise} \end{cases} \quad (9)$$

where α are unknown parameters and μ are error terms.

Sample selection bias is a potential problem in estimating either off-farm labor demand (7) or supply (8 and 9) equations due to the possibility of zero hours worked by some individuals. To correct for such bias, the decision to obtain off-farm employment must be modeled. The probabilities of off-farm work for the operator (Pr(O)) and spouse (Pr(S)) can be represented as (Gould and Saupe, 1989);

$$\begin{aligned} \Pr(O) &= \Pr(W^O > W^{OR}) \\ &= \Pr(W^O > W^{OR} \mid W^S < W^{SR}) + \Pr(W^O > W^{OR} \mid W^S \geq W^{SR}) \\ &= \Pr(\varepsilon_O > \Theta_O) \end{aligned} \quad (10)$$

$$\begin{aligned} \Pr(S) &= \Pr(W^S > W^{SR}) \\ &= \Pr(W^S > W^{SR} \mid W^O < W^{OR}) + \Pr(W^S > W^{SR} \mid W^O \geq W^{OR}) \\ &= \Pr(\varepsilon_S > \Theta_S) \end{aligned} \quad (11)$$

where $\varepsilon_O = \nu_O + (\mu_O / \alpha_{OO}) + (\alpha_{OS} / \alpha_{OO})\nu_S$

$$\varepsilon_S = \nu_S + (\mu_S / \alpha_{SS}) + (\alpha_{SO} / \alpha_{SS})\nu_O$$

$$\Theta_O = -\beta_O - \beta_{OH}H^O - \beta_{OZ}Z_M - (\beta_S - \beta_{SH}H^S - \beta_{SZ}Z_M)(\alpha_{OS} / \alpha_{OO}) + \alpha_{ZO}\alpha_{OO}Z$$

$$\Theta_S = -\beta_S - \beta_{SH}H^S - \beta_{SZ}Z_M - (\beta_O - \beta_{OH}H^O - \beta_{OZ}Z_M)(\alpha_{SO} / \alpha_{SS}) + \alpha_{ZS}\alpha_{SS}Z$$

Such joint participation decisions can be estimated with a bivariate probit model.

The inter-related nature of the wage and hours worked equations suggests that the conditional means of the disturbance terms in these equations are unlikely to be zero. The biases can be corrected by creating new variables from the bivariate probit equations that are conditional means of the disturbance terms and substituting them into the demand and supply equations (Amemiya, 1974; Fishe, Trost and Lurie, 1981; Gould and Saupe, 1989;

Huffman and Lange, 1989). For example, the off-farm labor demand equation (7) is modified to the following;

$$W^i = \beta_i + \beta_{i\,H} H^i + \beta_{i\,Z} Z_M + \beta_{i\,\Lambda 1}\Lambda 1 + \beta_{i\,\Lambda 2}\Lambda 2 + \phi_i \qquad i = O, S \qquad (7')$$

where $\Lambda 1$ and $\Lambda 2$ are the sample correction factors estimated from the bivariate probit equations for the operator and spouse respectively and ϕ is the error term.

Similarly, the conditional expectations of the error terms in the labor supply equations (8) and (9) may also not be zero. Operator and spouse selectivity adjustments calculated from the bivariate probit model of the participation decision must then be added to account for the non zero expectations. The following are the resulting four unconditional labor supply equations associated with the three scenarios under which one of the household members are working off-farm;

$$M_1^O = \alpha_{OO} W^O + \alpha_{OS} W^S + \alpha_{ZO} Z + \xi_{O1}\Lambda_{O1} + \xi_{S1}\Lambda_{S1} + \psi_O \qquad (12)$$

$$M_1^S = \alpha_{SO} W^O + \alpha_{SS} W^S + \alpha_{ZS} Z + \xi'_{O1}\Lambda_{O1} + \xi'_{S1}\Lambda_{S1} + \psi_S \qquad (13)$$

$$M_2^O = \alpha'_{OO} W^O + \alpha'_{ZO} Z + \xi_{O2}\Lambda_{O2} + \xi_{S2}\Lambda_{S2} + \psi'_O \qquad (14)$$

$$M_3^S = \alpha'_{SS} W^S + \alpha'_{ZS} Z + \xi'_{O3}\Lambda_{O3} + \xi'_{S3}\Lambda_{S3} + \psi'_S \qquad (15)$$

where the random error terms, y, now have the desired zero expectations.

4. Data

Data used in the analysis were obtained from a May 1991 survey of dairy farm families in four nearby areas in New York and Ontario, with two regions in each state/province. A random sample of 500 dairy farms from northern and western counties in New York was provided by the New York Agricultural Statistics Service. The Ontario sample was drawn for two regions agronomically similar to the two in New York. A random sample of 220 producers from eastern Ontario and 304 from southwestern Ontario was generated from the Ontario Milk Marketing Board's computerized data base. Overall response rate was 29.4% for New York and 40.9% for Ontario.

The demand and supply of off-farm labor are influenced by four general categories of variables; household or family characteristics (Z_H), human capital characteristics (H), farm characteristics (Z_F) and local labor market condition (Z_M). Means, standard deviations and the units of measurement for the explanatory variables under the four possible work regimes (j) are given in Table 1.

Family characteristics include the number of children in different age categories and the level of satisfaction the family has with farm life. The effect of children on off-farm employment decisions was measured by the number of children in each of three different age categories (less than 6, between 6-11, and between 12-18). Increases in the number of preschool age children is hypothesized to decrease the probability of off-farm employment particularly for spouses. In contrast, time demands may decrease and expenses increase for older children suggesting a greater likelihood of the operator or spouse seeking employment outside the farm. Dairy farm families in each region were asked about their level of satisfaction using a Likert scale with 1 being very satisfied and 5 representing very dissatisfied. The more content individuals are with their situation on the farm, the less likely they are to desire off-farm employment.

Human capital characteristics include age, education and farm experience. The effect of age on off-farm employment is ambiguous since both farm and off-farm labor productivity are assumed to increase with experience as measured by age. To account for possible life cycle effects, age is also included in quadratic form. As with age, education has a similar *a priori* ambiguous effect on off-farm labor supply. However, most previous studies have found education to have a larger effect on market earnings than on the marginal value of farm labor, thereby increasing the probability of participation and off-farm employment hours. Education is measured as the highest level of schooling obtained through a discrete variable ranging from 1 representing some grade school to 7 representing post graduate. The number of years farming is a human capital variable specifically expected to increase the marginal productivity of labor on the farm relative to off-farm.

Farm characteristics will influence the value of farm labor productivity. Farm labor (F) along with purchased inputs X determines farm output Q. Since the level of farm inputs and off-farm labor hours are determined simultaneously, farm output cannot be included in the estimation off-farm participation and supply equations unless it is estimated and the predicted values incorporated (Huffman, 1980). Although off-farm employment decisions are made simultaneously with the allocation of farm inputs, some inputs can be assumed to be fixed for farms in a single cross-section (Gould and Saupe, 1989). Fixed factors considered in this study were number of tillable acres and herd size. It is hypothesized that increases in these size variables will increase marginal returns to farm labor and thereby decrease the probability of off-farm work and hours of such work supplied. Additional farm characteristics focused on the firm's financial position. Decreases in net farm income may induce the need for off-farm income to meet a desired level of total household income. The need for off-farm employment may also increase with the level of financial obligations which was measured by the debt to asset ratio (Simpson and Kapitany, 1983).

Local labor market conditions influence the availability of off-farm employment and wage rate. Access to employment opportunities was measured by distance to the nearest town providing emergency medical services. A binary variable for state or province (New York or Ontario) in which the farm was located was also included to capture differences in labor market conditions and in policies between the two countries which may affect off-farm employment decisions not captured by previous variables. It is hypothesized that households in New York are more likely to seek work off the farm due to the lower degree of farm and social support from the government which thereby lowers the marginal value product to labor on the farm. In addition, a regional binary variable was also included (east/north or western). Increased employment opportunities and thus higher wages are assumed to exist in the more populated western areas of both regions.

5. Results

Regional Differences in Explanatory Variables

Econometric results of the participation, demand and supply of off-farm labor are presented after an initial analysis of differences in the variables affecting off-farm labor activity between regions which are largely due to contrasting social and farm policy regimes. In terms of family, human capital and location characteristics, New York and Ontario dairy households are similar. An overwhelming number of the operators are married with an average age in the mid to late 40s. Ontario families tend to be slightly younger and a bit larger with about one-third having three or more children living at home as opposed to less than one-quarter of New York families. The percentage of Ontario producers who left school before completing high school is more than double that of New York, 43% compared with 19%, although a similar percentage in both regions received post-secondary education. Women involved in the survey are more highly educated than the men regardless of region.

Farm characteristics represent the major difference between surveyed households. New York producers on average milk nearly twice as many cows (81) as their Ontario peers (47), and the New York milk herds, in general, are much larger. Nearly 75% of Ontario producers milk fewer than 51 cows while less than half of the New Yorkers milk a similar number. Only 4% of Ontario dairies are 100-plus herds whereas over 20% of New York herds are of that size. Milk production per cow is also higher in New York by an average of 15%. Despite producing less milk, the average Ontario producer's net farm income is approximately 60% ($10,000) higher than that realized by the average operator in New York. Over 38% of New York farms had negative farm income in 1990 while only 14% of Ontario farms did. Not only are farm incomes higher in Ontario but they are also more diversified with non-milk sales approximately 3 times higher than for New York dairies. Ontarians also have lower debt to asset ratios (0.26 vs. 0.39). Over 65% of the Ontario dairies have positive net farm incomes and debt-to-asset ratios less than 0.40

whereas only 31% of the New York farms are in such a favorable financial condition. Differences in farm financial position are reflected in differences in satisfaction expressed by producers toward dairy farming.

Regional variations in these factors influencing off-farm employment are due to contrasting policy regimes. The supply managed marketing system for milk in Ontario ensures operators a fair return calculated on the basis of a cost of production formula. In 1991, the system generated receipts per unit of milk sold that were 20% higher in Ontario than New York and consequently largely explains the above noted regional differences in net farm income. Since this system has been in place since the late 1960s, the difference in farm support policy also explains the stronger asset and equity position for producers in Ontario. The stronger financial position enjoyed by Ontario dairy households as a result of their marketing system reduces the need for off-farm income relative to their counterparts in New York. The need for off-farm earnings is reduced further in Ontario by the investment levels required to expand production. Higher non-milk sales for Ontario dairy farms as compared to ones in New York is likely due to quota costs. The resulting greater diversification of income sources reduces the need for off-farm employment to serve as self-insurance device. Greater government support for social services in Ontario, particularly for medical care, may explain the larger dairy farm families noted above in Ontario as the costs for caring for such as family are reduced. The presence of young children has been hypothesized earlier to reduce the desirability of off-farm work. Thus, government policy has served to decrease the reservation wage while increasing the marginal returns to farm work and thereby decreased the likelihood of off-farm employment by Ontario dairy households as compared to those in New York.

Work Allocation

The regional differences in factors affecting off-farm employment due to differences in policy regime are borne out as more of the New York farms (47%) than the Ontario farm

(36%) had either a spouse, an operator or both employed off-farm (Table 1). In all regions, the most common situation for those families having someone working off-farm was for the spouse to be the sole individual with off-farm employment (49 in New York, 33% of respondents; 65 in Ontario, 27% of respondents). The small number of operators with outside jobs and the lower off-farm employment rate as compared to the national average (60% in the US) reflects the time commitment required to manage a dairy farm relative to other farm enterprises.

In general, few differences existed between average hours worked off-farm by operators and spouses in New York and Ontario. Operators in all regions with off-farm jobs spent an average of 450 hours less than their spouses spend in their outside jobs (Table 1). Total farm and off-farm labor hours were greater for operators with off-farm employment than those without. There were few regional differences in the average hours worked off-farm by operators. However, New York spouses averaged about 4.5 more off-farm hours per week of employment than Ontario spouses.

Efficiency Comparison

It is often assumed that those households with a member employed off-farm will be less efficient than those households which are able to devote more time to managing the farm operation. A simple comparison of this hypothesis is conducted using a partial productivity measurement, milk yield. Milk production per cow is lower on average for those households in which the operator works off the farm and highest for those in which only the spouse has off-farm employment (Table 1). The result may be related to the education level of the operator. Average operator education is lowest for those households in which the operator only works (2.59) and highest for the two regimes in which the spouse has off-farm employment (4.04 for j=1 and 3.48 for j=3). Higher education levels may be associated with more progressive attitudes towards spousal off-farm work and also with higher on-farm productivity.

Equity Issues

A more fundamental issue associated with rural development policy and targeting of farm support programs is an equity, rather than an efficiency, comparison among the work regimes. Equity is measured here in terms of total family income since financial well being is not solely a function of net farm income which is as expected highest for households with neither operator or spouse working off the farm (Table 1). Although average family income is higher for the situations when only either the operator or the spouse is working off-farm, there is no significant difference between the four work regimes.

Off-Farm Work Participation

The probability of off-farm employment was estimated using a bivariate probit model (equations 10 and 11) that accounted for the joint participation of the operator and spouse in making this decision. The bivariate probit estimates are reported in Table 2. The correlation coefficient of the error term was positive and significantly different than zero at the 5% level of significance. The bivariate probit model was thus the appropriate estimation technique rather than two univariate probit estimations. However, sign and magnitudes of the coefficients from the univariate probit models were consistent with those generated by the bivariate probit model, which correctly predicted 86% of the actual outcomes for those who did not work off the farm and 67% for those who did.

Family characteristics had a significant effect on the probability of the spouse working off the farm but little influence on the operator's decision. The number of small children reduces the probability of the spouse seeking off-farm employment, reflecting higher opportunity costs of home production and work time with young children (Long and Jones, 1980). The result is consistent with many prior studies (Alwang and Stallman, 1992; Gould and Saupe, 1989; Huffman and Lange, 1989; and Lass and Gempesaw, 1992). In contrast, the presence of young children has a positive but insignificant effect on the participation decision for operators, suggesting that children have little influence on the

operator's reservation wage. Higher satisfaction with farm life also reduces the probability of the spouse working off-farm. Although displeasure with farm living is an impetus for off-farm employment by the spouse, it had the opposite (but insignificant) effect on the probability of working off-farm for the operator.

Human capital characteristics played a major role in the off-farm employment decisions of the dairy farm families sampled. For operators, a concave life-cycle pattern was found. Age has a positive impact on off-farm labor participation until 42 years after which the probability of participation declines. The effect is consistent with the findings of Sumner (1980) and Weersink (1992) for operators only and of Lass and Gempesaw (1992) and Gould and Saupe (1989) for operators making joint decisions. In contrast, the probability of off-farm employment for spouses was found to decrease with age until approximately age 60.

Increases in own education increase the probability of off-farm work for both operators and spouse, implying that increases in schooling have a larger effect on market earnings than the marginal productivity of farm labor. The result is consistent with most previous studies. Increases in education level of the spouse were found to reduce the probability of the operator working off the farm. This suggests that more education by the spouse improves the quality of labor in farm production, thereby raising the operator's reservation wage. A similar effect was noted by Sumner (1980) and by Huffman and Lange (1989). In contrast, more schooling by the operator was found to increase the likelihood of the spouse seeking off-farm employment. The result, also found by Gould and Saupe (1989) and by Huffman and Lange (1989), may be associated with a more open attitude towards spousal off-farm work by those operators with more education.

Farm characteristics were found to have little influence on the probability of off-farm employment. As expected, increases in the fixed factors of tillable acres and the number of milk cows reduce the probability of working off-farm since the marginal productivity of farm labor increases with farm size for a given wage rate. However, the

results are insignificant for both operator and spouse. Increases in financial pressures as measured by decreases in net farm income or increases in the debt to asset ratio also reduce the likelihood of off-farm employment . However, the only significant variable was net farm income for the operator's decision. Differences in farm policy between Ontario and New York are reflected in the regional values for these farm characteristics. The supply management system in Ontario has resulted in farms with fewer cows than those in New York, but with higher net farm income and lower debt to asset ratios. As a result, differences in farm policy have an indirect influence on the likelihood of off-farm employment.

Location variables also had little impact on off-farm labor participation. The greater the distance to a major centre, the lower the probability of off-farm employment for spouses. This was expected given that an increase in travel cost will increase the reservation wage; however, the coefficient was insignificant.

Reasons for Off-farm Employment

Although the previous analysis provides an understanding of the factors affecting the decision to work off the farm, a unique aspect of the survey instrument in this study is that households were asked directly for the major reason why a member(s) worked off the farm. Maintaining the dairy farm business was the most frequently cited reason for off-farm employment of operators in both New York and Ontario (Figure 1). However, nearly half (45%) of the operators in New York working off-farm said they needed that income to maintain the dairy farm business while less than one-third (29%) of the Ontario operators did so for the same reason. Over 14% of New York operators working off-farm did so for the fringe benefits (often medical insurance). Under the nationalized health care system in Ontario, none of the operators working off-farm did so to obtain fringe benefits. None of the New York operators said they engage in off-farm employment to make contact with other people whereas 18% of the Ontario operators indicated this was their principal reason

for working off-farm. Although the same percentage of New York and Ontario operators worked off-farm to maintain family income, a much smaller share of New York producers work to supplement family income or increase income stability. Thus, it appears that off-farm employment by operators is far more important for the basic needs of New York farm business and households than for those in Ontario.

Spouses of the farm operators expressed more flexibility about their choices to work off-farm. Still, the two most important reasons given by New York spouses for having off-farm jobs were to help maintain either the farm business (23%) or a minimum family income (25%). Ontario farms were not only less dependent on off-farm income generated by the operator to maintain the farm or family income, but also on off-farm income generated by the spouse. Only 5% of Ontario spouses worked off-farm to help maintain the farm and 15% to help maintain family income. The two most important reasons cited by Ontario spouses for working off-farm were to supplement family income (18%) and increase income stability (16%).

In order to better understand the relationship between farm income and the reasons why people seek off-farm employment, the eight reasons posed to the household (as shown in Figure 1) were grouped into three categories; (1) to obtain necessities; (2) to improve living standards; and (3) reasons not related to money. Necessities groups maintaining either the farm business or family income. Increasing or stabilizing family income along with fringe benefits are considered ways to improve living standards, whereas contact with other people, farming not primary business and "other" are considered reasons unrelated to income. The percentage of respondents within each of the three categories of reasons was plotted against four farm income classes in Figure 2.

The level of farm income affects why people work off-farm except when the benefit derived from off-farm employment is unrelated to income. For farms showing net losses, 70% of the operators in New York and 50% of those in Ontario worked off-farm to achieve basic necessities. Similar percentages citing this reason were found in the 0-$19,999

income category. At the other end of the income scale, none of the operators with farm incomes greater than $40,000 in either region worked off the farm to pay for basic necessities. The importance of achieving necessities also declined with income levels for spouses in both regions but the reasons tend to be more evenly distributed among the four net farm income categories.

The results particularly for the operators lend support to the view of multiple job holding as a flexible mechanism to adjust to changes in the economic environment facing the household. In the case of insufficient farm returns, off-farm earnings provide for minimum subsistence levels. Once those are achieved, such earnings provide the opportunity to raise living standards and protect against downturns in farm income below levels necessary to achieve basic necessities. Indeed, Barlett (1991) observed that the primary reason for a sample of Kansas farmers worked off-farm was the uncertainty associated with farm income. Wealth effects appear evident in high income levels where reasons other than income determine the primary reason for off-farm employment. Thus, multiple job holding is a self insurance activity that can minimize the impact of farm income downturns in the same way that credit and insurance markets can help smooth consumption.

Off-farm Labor Demand

Off-farm labor demand equations with sample selection correction factors incorporated from the bivariate probit model (equation 7') were estimated using ordinary least squares for all observations reporting a market wage. The wage offer equation (Table 3) was estimated for the spouse only due to the small number of dairy farm operators working off the farm.

Off-farm wage rate for the spouse was found to increase with age until 52 years and then decrease. The concave profile is consistent with the normal life cycle patterns found by previous studies (Alwang and Stallmann, 1992; Gould and Saupe, 1989; and Huffman

and Lange, 1989). In contrast, a convex effect on wages was noted for education. The results suggest that individuals with at least some post secondary education earn significantly more than other dairy farm spouses working off-farm. Although wages tended to be higher in Ontario than New York, the effect of the regional dummy variable was insignificant.

Off-Farm Labor Supply Equations

The previous sections examined the characteristics of those participating in off-farm employment and the primary reason for that decision. We now move to examining the factors affecting the number of hours worked off the farm. As with the wage demand equation, off-farm labor supply (equations 12-15) was estimated in two stages. Wage rates were predicted from estimates of the labor demand equation in Table 3 and sample selection correction factors were generated from estimates of the probability of participation in Table 2. Resulting estimates are reported in Table 3. This equation also was estimated only for the households in which the spouse alone had off-farm employment (equation 14).

Off-farm wage rates were found to have an insignificant influence on the amount of labor supplied by spouses in the sample. The negative effect was also obtained by Huffman and Lange (1989) and by Lass and Gempesaw (1992) when only the spouse works off the farm. Instead of wages, a major factor determining the number of off-farm labor hours supplied is family characteristics. An increase in the number of young children in the household reduces off-farm hours as expected given the time commitment involved in raising pre-school children. As the age of the children increases, off-farm hours increase because the children are increasingly able to care for themselves. Dissatisfaction with farm life was also found to increase the time allocated to off-farm employment.

Farm characteristics also had an impact on supply decisions. An increase in farm size as measured by the number of milk cows was found to reduce the hours worked off-farm by the spouse while tillable acres was found to have an insignificant effect. Farm

financial pressures tend to increase the amount of labor supplied off the farm, perhaps in an effort to reduce those pressures. The debt to asset ratio has a significant positive influence on spousal off-farm labor supply. Although net farm income has the expected negative sign which suggests that leisure is a normal good, the effect was insignificant.

Regional effects appear to have to have little influence on off-farm labor hours. Distance to major centre was insignificant suggesting that this variable determines participation rather than hours supplied. More hours tended to be supplied by spouses in New York dairy farm families than those in Ontario and less by those in the western parts of the corresponding state or province, but the effects are statistically insignificant.

6. Conclusions

The two major contributions of this paper are in the examination of specific reasons why farm households members work off-farm and in the exploration of government policy impacts on multiple job holding. Rather than infer the reasons for off-farm employment through an analysis of the characteristics of those with off-farm jobs, this study directly asked those individuals why they had an off-farm job. In the case of low farm returns, off-farm earnings provide for basic necessities and maintain the dairy farm business. Once those are achieved, the primary reasons for multiple job holding are related to raising living standards and protecting against downturns in farm income. Reasons unrelated to money are cited by households with high farm income levels. Thus, the results indicate the importance of farm income on why people work off the farm and provide evidence of multiple job holding as a flexible mechanism for coping with changes in the economic environment facing the household. There also appears to be wealth effects associated with multiple job holding as a self insurance activity.

The effect of farm income on the reason for off-farm employment is consistent across both countries. However, the level of farm income between the regions varies significantly and is due to differences in farm support programs for the dairy sector.

Similarly, other regional differences in the factors affecting multiple job holding are the consequences of differing government agricultural and social policies between the two countries. The general impact of these factors, categorized into family, human capital and farm characteristics, found in our econometric models on multiple job holdings largely confirm results of previous studies. The extension is in the analysis of how those characteristics change with the policy regime. Free medical care in Ontario lowers the reservation wage for household members while the supply managed milk marketing systems ensures higher and more stable returns for Ontario dairy farms as compared to those in New York, thereby increasing the marginal value product to farm labor. The effect of these policies on the relative returns to labor in agriculture and non-farm employment explains the lower participation rate and hours supplied in off-farm work by Ontario households. The move to freer trade in dairy products and the likelihood of lower farm returns would thus increase multiple job holding among dairy farm families in both countries

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Table 1. Means (and Standard Deviations) for Variables in Off-farm Labor Participation, Demand and Supply Models by Work Regime

Variables	Both Work (j=1) O	Both Work (j=1) S	Operator Only (j=2) O	Operator Only (j=2) S	Spouse Only (j=3) O	Spouse Only (j=3) S	Neither (j=4) O	Neither (j=4) S
A. Endogenous								
Off-farm work status	1.0	1.0	1.0	0	0	1.0	0	0
Off-farm labor hours (M)	732.73	1147.6	739.53	0	0	1150.2	0	0
	(744.8)	(758.3)	(823.79)			(667.2)		
Farm labor hours (F)	2959.5	877.5	3059.3	1744.2	3474.2	949.4	3395.5	1773.9
	(153.4)	(241.1)	(157.1)	(305.3)	(54.1)	(81.9)	(46.6)	(78.1)
Off-farm wage rate (W) (S/hr)	14.19	14.60	15.59	-	-	11.24	-	-
	(6.29)	(3.66)	(5.11)			(8.58)		
B. Exogenous								
Family Characteristics (Z_H)								
Children-No <6 yrs	0.50		0.41		0.56		0.48	
	(0.51)		(0.50)		(0.57)		(0.61)	
No. 6-11 yrs	0.04		0.18		0.02		0.06	
	(0.21)		(0.39)		(0.13)		(0.24)	
No. 12-18 yrs	0.04		0.00		0.03		0.06	
	(0.21)		(0.00)		(0.16)		(0.23)	
Satisfaction with farm life	2.36		1.76		2.29		2.00	
(1=very satisfied, 5=very dissat.)	(0.90)		(0.66)		(0.95)		(0.99)	
Human Cap Characteristics (H)								
Age-years	46.00	43.80	43.64	44.20	43.64	41.38	46.78	45.43
	(7.99)	(8.21)	(14.11)	(13.20)	(11.17)	(11.19)	(12.53)	(13.61)
Education	4.04	4.32	2.59	2.53	3.48	4.46	3.07	3.50
(1=grade school, 7=grad school)	(2.03)	(1.67)	(1.12)	(1.30)	(1.54)	(1.45)	(1.63)	(1.67)
Years operating farm	22.68		22.78		21.82		22.64	
	(9.74)		(14.32)		(12.48)		(12.99)	
Farm Characteristics (Z_F)								
Tillable acres	248.14		202.88		257.63		247.84	
	(153.1)		(125.33)		(175.7)		(181.4)	
Number of milk cows	48.91		46.82		58.47		58.74	
	(35.4)		(32.48)		(39.69)		(48.98)	
Milk yield per cow (000 kgs)	5.376		4.989		6.723		5.904	
	(6.52)		(7.01)		(7.76)		(9.11)	
Net farm income (000 US$)	9.478		25.450		29.382		35.237	
	(21.76)		(29.40)		(28.23)		(47.44)	
Debt/assets	0.44		0.41		0.33		0.30	
	(0.46)		(0.26)		(0.22)		(0.28)	
Location Characteristics (Z_M)								
Distance to major centre (km)	17.42		16.73		17.51		19.04	
	(14.61)		(9.69)		(11.65)		(16.69)	
Country (1=New York, 0=Ont)	.48		.43		.38		.36	
Region (1=east/north, 0=west)	.43		.50		.54		.54	
Sample Size	22		17		112		289	

Table 2. Bivariate Probit Estimates of Off-farm Labor Participation

Variable	Operator	Spouse
Intercept	-12.955	2.169
	(-0.956)	(1.084)
Family Characteristics		
Children-No < 6 yrs	0.303	-0.285
	(0.327)	(-0.847)
No. 6-11 yrs	0.424	-1.385
	(0.417)	(-1.833)
Satisfaction with farm life	-0.125	0.191
(1= very satisfied, 5= very dissat.)	(-0.288)	(1.690)
Human Capital Characteristics (H)		
Age-years	0.485	-0.149
	(0.863)	(-1.688)
Age*Age	-0.006	0.001
	(-0.942)	(1.136)
Education	0.146	0.259
(1=grade school, 7=grad school)	(0.629)	(2.742)
Years operating farm	0.062	0.014
	(0.785)	(0.646)
Farm Characteristics		
Tillable acres	-0.0003	-0.0003
	(-0.105)	(-0.294)
Number of milk cows	-0.0004	-0.003
	(-0.024)	(-0.489)
Net farm income (000 $)	-0.021	-0.003
	(-0.848)	(-0.496)
Debt/assets	0.794	0.185
	(0.619)	(0.309)
Location Characteristics		
Distance to major centre (km)	0.003	-0.005
	(0.099)	(-0.458)
Country (1=New York, 0=Ontario)	-0.334	0.141
	(-0.440)	(0.434)
Region (1=east/north, 0=west)	0.222	-0.163
	(0.232)	(-0.565)
Correlation Coefficient	0.759	
	(2.099)	
Log-likelihood Funciton	-113.55	
% M=0 correctly predicted	86.4	
% M>0 correctly predicted	67.3	

t-ratios in parantheses

Table 3. Estimates of Off-farm Labor Demand and Supply Equations for Spouse

Variable	Demand (Wage rate)	Supply (Annual Hours Worked)
Intercept		1831.24
		(2.65)
Spouse wage rate		-0.243
		(-0.01)
Family Characteristics		
Children- No < 6 yrs		-505.11
		(-2.21)
No. 6-11 yrs		-89.10
		(-0.13)
No. 12-18 yrs		365.02
		(0.72)
Satisfaction with farm life		-117.45
(1= very satisfied, 5= very dissat.)		(-0.97)
Human Capital Characteristics (H)		
Age-years	0.781	
	(1.67)	
Age * Age	-0.007	
	(-1.29)	
Education	-6.741	
(1=grade school, 7=grad school)	(-1.62)	
Education * Education	0.953	
	(2.08)	
Years operating farm		4.197
		(0.32)
Farm Characteristics		
Tillable acres		0.114
		(0.12)
Number of milk cows		-5.81
		(-1.64)
Net farm income (000 $)		-0.422
		(-0.11)
Debt/assets		745.62
		(1.76)
Location Characteristics		
Distance to job (km)		4.282
		(0.49)
Country (1=New York, 0=Ontario)	-1.016	225.98
	(-0.56)	(0.89))
Region (1=east/north, 0=west)	3.294	-92.56
	(1.91)	(-0.41))
Sample Selection Variables		
Operator	6.61	108.51
	(0.54)	(0.16)
Spouse	4.42	61.53
	(0.39)	(0.12)
Adjusted R^2	0.287	.036

Figure 1. Primary Reason for Off-farm Employment by Operator and Spouse
(% of Respondents)

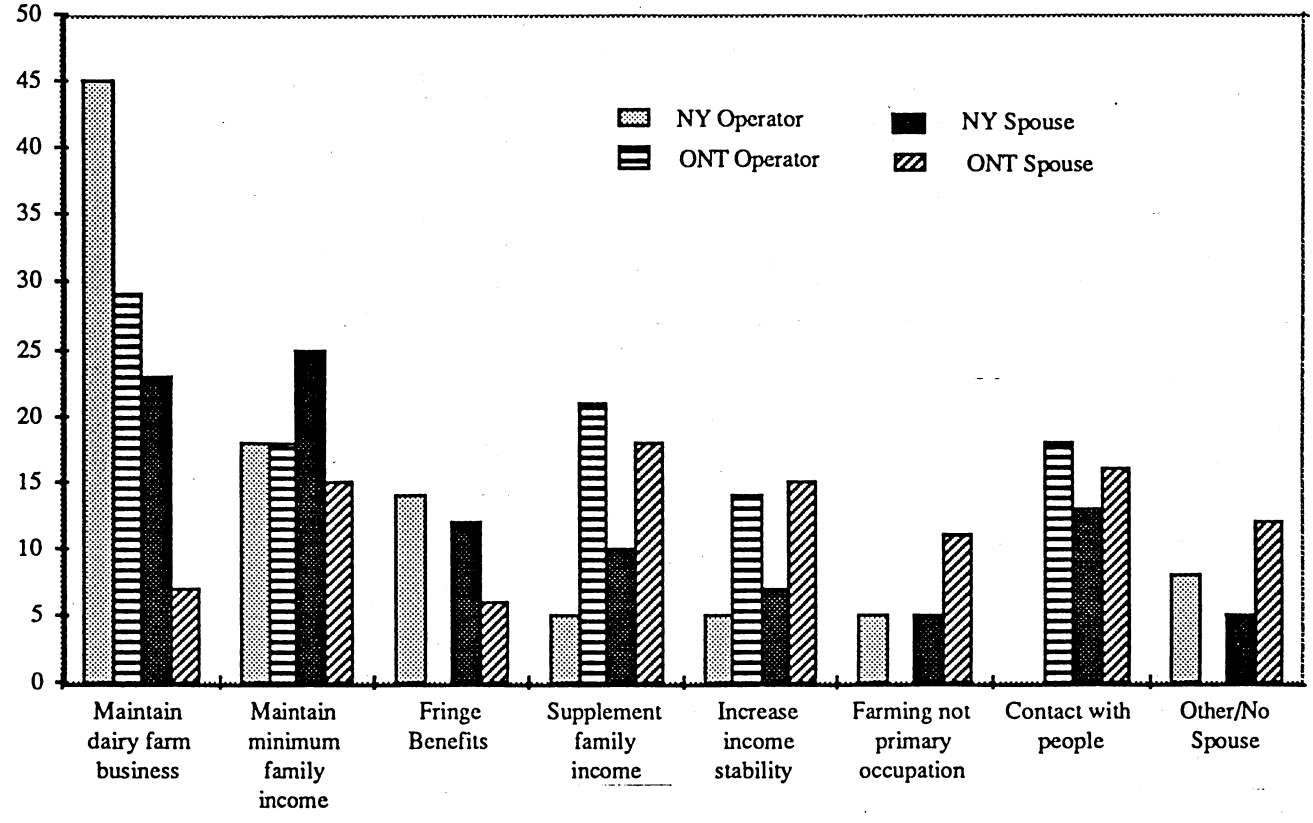

Figure 2. Primary Reason for Off-farm Employment for Operator and Spouse by Income Class