WORK AND INCOME

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Introduction

The focus of this paper is to estimate the effect that a negative income tax (NIT) will have upon farm work and income. Experimental effects could be substantially different from that of a national income maintenance program for a number of reasons:

1) Three years, including an adjustment and learning process, may be too short a time horizon for farmers to completely adjust their farming enterprise to the different prices caused by the experiment.

2) There is evidence that families may not have understood how the transfer scheme operated. With a saturated national program, the level of knowledge might be different (Harrar).

3) Measurement errors in the collection of the data may result in erroneous conclusions being reached.[1]

The theory supporting this analysis has been discussed elsewhere, and for the sake of brevity, has been deleted here. See Evans, Kerachsky and Primus for a full development of the labor supply theory for the farm family firm.

The conventional consumer theory used in many labor supply models predicts a decline in total labor supplied by a farm operator under NIT. Among different farm enterprises, the greatest reduction in labor input will be felt where the value of the marginal product for labor is smallest and where adjustment in size of farm enterprise (e.g., hogs versus cattle versus crops) is easiest. Enterprises with large illiquid and inflexible

*Presented at AAEA/IAAEA joint meeting, San Diego, July 31 - Aug. 3, 1977.

capital requirements (e.g., crop farming in Iowa) should experience the least change in scale of operation.

Estimation Methodology

The prime tool for these analyses was a time series--cross-section pooling regression program developed from the procedures in Nerlove. The sample contains all farm families with a male head less than or equal to 72 years of age at the end of the experiment, who farmed each year, had constant marital status, and had at least 400 hours of farm work in one of the years between 1969 and 1972.

Because of the different production functions and methods of production, the Iowa and North Carolina samples were split. Tobacco growing is primarily a labor intensive operation, while corn-growing in Iowa is a highly capital intensive operation.

Each year of the experiment for each farmer constitutes one observation. This has the advantage of increasing degrees of freedom and allowing the behavioral response to the program over time to be traced. The number of individual farmers in North Carolina is 94, 42 were control and 52 experimental. In Iowa the number of control families for this analysis is 54 while the number of experimental families is 50.

One of the methods for analyzing the effect would be to construct a demand-supply model. A properly constructed model could estimate correctly the treatment coefficients taking into account the simultaneous decisions, amounts of labor, capital (both long and short run) being allocated to each of several farm enterprises, including off-farm work by various members of the farm family. Such a model, however, needs adequate measures of the VMP of labor and capital, respectively, in crop and

livestock operations. Given only income and expense data in monetary terms, the ex post nature of the data, the failure to collect input data by enterprise and poor measures of capital, it is difficult to estimate the structural equations with a sufficient degree of accuracy. Thus, the prime focus of this study is to estimate accurately the treatment parameters in a reduced-form model.

The basic form of the model is as follows:

$$D = f\ (C,\ E,\ C*E,\ R)$$

where

D = Dependent variable; a measure of farm income or effort

C = Control variables

E = Experimental variables

C*E = Control and experimental interactions, and

R = A reporting variable

Control variables are included to insure that differences between the control and experimental samples, which occurred as a by-product or accident of random sampling, are not included in the coefficients on the treatment variables. They are needed to yield consistent experimental coefficients given the stratified design of the sample. Also, these variables are often important determinants of the dependent variables. Without their inclusion, the equations would suffer from specification error resulting in biased experimental variable coefficients. These variables included a measure of 1969 work effort, age and education of the farm operator, debt to asset ratio, net farm equity, change in off-farm work, and dummy variables representing time.

Experimental variables are different formulations of the tax and guarantee parameters. Interactions are needed between the two groups of variables to test for differences between subpopulations (e.g., race) or as further refinements to determine where the treatment response took place.

A reporting variable was added to explain some of the variation in the experimental group response. A simple look at the distribution of hours worked for 1970-1972 versus 1969 hours worked for the experimental group shows a considerable variation. Some experimental families increased their hours substantially while other families' hours declined substantially. Farmers who intentionally or unintentionally misreport income to the payments process via their monthly income report forms might behave differently. Upon the edited estimates of quarterly income, (See Primus (1975) for a complete discussion of editing techniques.) an estimate of the amount of payments farms should receive can be estimated.[2] Based upon this, some farmers received one thousand dollars more in payments than they should have received.[3]

Theoretically, these experimental farmers are facing a different marginal tax rate than their assigned tax rate. A change in their true income does not affect their payment as the subscribed mathematical formula underlying the NIT transfer scheme would indicate. Consequently, their behavioral response will be altered as compared to other farmers in the experimental group. The income effect would still be in effect, but the substitution effects would dissipate, the extent to which would be based upon the amount of misreporting and closeness to the breakeven level. As a partial control for this phenomenon, a variable was added which is

actual minus predicted payments divided by the mean of the two variables.

Results

The conclusion relating to the experimental effect upon farm effort is sensitive to which measure of farm-hours is used. Farm-hours was measured in two different ways: budgeted hours and recall hours.

Budgeted hours. Each year, the respondents were asked the number of acres grown in each crop and the number of different kinds of livestock that were sold. By obtaining a coefficient from other published research and extension farm planning manuals, an estimate of the number of hours a particular farming enterprise required was constructed. Adjustments for size and kind of capital equipment and amount of hired labor on the farm were also made. Thus, this variable represents the labor input of the entire family to the farming enterprise. The chief disadvantage of using this variable is that farm overhead labor, such as building maintenance, repair of general purpose tractors, or gathering of market information is not taken into consideration. This may not pose a problem if one assumes that overhead is simply proportional to the scale of operation.

The experimental effects on farm-hours for each region controlling for pre-experimental factors are summarized in Table 1. The percentage differential can be interpreted as the average percentage change for experimental farmers relative to the control group.

The operations with small amounts of fixed capital and operations which could be adjusted easily from one year to the next, experienced the most disincentive. Observe the performance of livestock operations in Iowa and crop productions in North Carolina versus that of the capital intensive

TABLE 1

PERCENTAGE DIFFERENTIAL IN BUDGETED FARM HOURS[a]

	NORTH CAROLINA	IOWA
Crop Hours	-15.1%[b]	-2.1%
Livestock Hours[c]		-15.8%[d]
Total Hours	-12.7%[d]	-8.0%[b]
Adjusted Total Hours[e]	-5.9%	-11.5%[b]

[a] Percentage differential can be interpreted as the average change in hours for the experimental group relative to the control group.

[b] This set of differentials for North Carolina is significant at the .95 level.

[c] Results for livestock hours are not presented for North Carolina because livestock is a minor enterprise and the analysis is dominated by a few observations.

[d] This set of differentials for Iowa is significant at the .90 level.

[e] Adjusted total hours subtracts machine hire and hired labor hours and adds custom work performed by the farm operator.

crop operations in Iowa. In terms of budgeted hours, the former had a significant disincentive. Probably, the weakest aspect of this evidence is in the inconsistency in North Carolina between adjusted total hours (removing the effect of machine hire, hired labor, and adding custom work) and total hours. Because payment farmers have an incentive to buy hired labor, the price has declined relative to control farmers, one would have expected the disincentive would increase when examining adjusted total hours.

The reporting variable was highly significant and positive in all budgeted hours equations except for adjusted total hours in North Carolina and crop-hours in Iowa where it was insignificant. In Iowa, percentage differentials calculated at plus or minus one standard deviation of the reporting variable, ranges from four to six percent. The percentage disincentive was always less where the level of payment to farmers seemed to be in the greatest error. In North Carolina, the change was in the same direction and the range was fifteen percent.

Recall hours. During the interviews which were conducted once every three months, a question was asked regarding the number of hours worked by the respondent on his farm or business the previous week. No effort was made to have the respondents keep track of the number of hours worked on a day-to-day basis. By multiplying by 13 and summing over the four quarters in a year, a yearly estimate of hours worked could be made.

The chief disadvantage with this variable is a Hawthorne type effect, in this case, interpreted to mean a change in reporting behavior resulting from observation. For example, imagine respondents with low levels of education who suddenly begin receiving $1,500 a year. On each opportunity where contact is made with the benefactor, there is probably a tendency to

convey an image of a hard-working and industrious individual. There might even be a feeling that the payments are somehow tied to their work effort (i.e., more money for more work), despite statements from project administrators to the contrary.

The experimental effects on farm recall hours are different from that of budgeted hours. The percentage differential is an insignificant but positive four to seven percent. Simultaneous models used by Kerachsky and Evans employing annual recall hours showed a positive incentive of around 10 percent. In North Carolina, this difference was significant. The reporting variable was insignificant in all equations where the dependent variable is recall hours.

Farm Income

Farm income was also measured in two different ways: net and gross farm income. Net income refers to gross income minus total expenses during a designated time period, usually a year. Gross income is defined as all income during a time period less than the purchase amounts paid for cattle, hogs, or sheep which are sold during the designated time period. This income may occur from livestock sold, crops sold, acreage diversion payment, gas tax refunds, and all other sources of farm income.

Expenses include fertilizer, crop insurance, interest, depreciation, and other similar expense items. Farmers had the option of electing straight line or accelerated depreciation, consistent with their reporting to the Internal Revenue Service (IRS). In all cases, the net and gross farm incomes were to be on a cash rather than an accrual basis.

From a policy relevant viewpoint, net farm income may be the appropriate variable. This measures a family's ability to attain a decent

standard of living, and if through the experiment, this variable has a treatment effect, it could have substantial cost implications for a national negative income tax program. However, gross farm income and net farm income suffer due to timing implications. A farmer, to a large extent, controls the timing of income and expenses. An experimental farmer has a strong incentive to build inventories of grain and livestock and pay expenses immediately, while delaying the receipt of income. In this way, his payment would be maximized. A farmer with access to credit would not have much difficulty in paying expenses immediately and delaying income and consequently, would show a larger disincentive for income than what actually occurred.

Reporting of income is probably affected by the experiment.[4] The amount of payments the families received is a direct function of the amount of income that the respondent reports. Consequently, an experimental individual has every incentive to report all the expenses he can. Furthermore, he may even change his behavior and incur expenses within the duration of the experiment that otherwise might be delayed. Examples of this would be major overhauls of tractors or building upkeep. Adjusting the period of analysis would be an attempt to overcome this problem.

If a disincentive in hours did occur, one would expect that the reduction in hours would be in those enterprises where the marginal return to labor is the smallest. Thus, farm profit should decline by a smaller percentage than labor input. If an incentive in hours occurred, one could probably expect that, because of diminishing marginal returns, farm profit would increase, although less than the percentage increase in farm hours.

Again, the actual effect on farm profit is sensitive to the definition of farm profit and the model specification. When profit is defined

as gross farm revenue less variable costs or as the monetary returns to fixed inputs and to farmers' own labor, and the model is estimated in simultaneous equation framework using recall hours, the empirical analysis indicates that the experiment had negative effects upon profit (Evans). These effects are generally large--between ten and thirty percent. Furthermore, the percentage effects in North Carolina tend to be larger than those in Iowa. However, the results for both regions are significant at only marginally acceptable levels.

When profit is defined as gross farm revenue less depreciation and variable costs, or as the monetary returns to farmers' own labor, and the equation is estimated as a reduced form controlling for pre-experimental conditions, the experimental effect is still negative. However, in contrast to the earlier results, it is insignificant and smaller--between seven and ten percent. Gross farm income had similar results to that of farm profit.

For both results, the experimental effects on profit did not vary systematically or significantly with changes in the tax rate or guarantee. Furthermore, there were no distinct time trends associated with these effects. Generally, the results for farm profits were consistent with budgeted hours as opposed to recall hours.

The reporting variable was again positive and highly significant in the farm equations. The percentage differentials were different by 49 percent for returns to labor in North Carolina and 75 percent in Iowa calculated at minus versus plus one standard deviation of the reporting variable. The range in gross farm income was less: around 16 percent in North Carolina and 22 percent in Iowa.

Conclusion

The major hypothesis advanced is that work effort should decline with an introduction of a NIT scheme. The answer to this hypothesis unfortunately depends upon the variable being analyzed. If recall hours are chosen, one would conclude that the experiment had no effect upon hours worked. On the other hand, if budgeted hours is used, the evidence is quite strong that the treatment did affect hours or work in a significant negative direction.

Providing unequivocally which variable is correct is a highly elusive goal. A measurement of hours worked for the farmer is the intersection between his labor demand and labor supply curves. It cannot be argued that recall hours represents the supply curve, and budgeted hours represents a labor-demand curve. Both variables are attempting to measure the intersection of the two curves by different methods. To establish which is the better variable, one must determine which measurement technique is best. To argue that economic theory should determine which is correct because one agrees better with the theory is not an independent test of the theory and not a particularly useful way of doing empirical research. Obviously, however, the variable which is judged best by independent criteria, statistical methodology, or whatever, will hopefully correspond best to theoretical predictions.

Recall hours are based solely upon a respondent's declaration of the number of hours worked the previous week including overhead hours, while budgeted hours depends directly upon numbers of acres of corn, acres of soybeans, hogs sold, cattle sold, etc. These latter numbers are more likely to be remembered because they influence all subsequent

management decisions. This is not to say that there were no errors in the reporting of year-end numbers; but if and when changes to these quantities were needed, the changes could be documented and these changes were relatively small compared with changes in asset or income variables (Primus,1975).

A further argument can be advanced. Presume that one has a number of different productive activities which need to be summarized as one. One immediately thinks of constructing a linear combination of these different activities. It is contended here that those weights should represent labor coefficients from other studies. However, because individually most productive enterprises decrease (Saupe) although not always significantly in quantity with respect to treatment variables, all reasonable coefficient sets would show a negative treatment effect. Consequently, if recall hours and budgeted hours are to be reconciled, three possibilities arise: 1) A Hawthorne effect does exist and is responsible for the difference. 2) While the experimental families have reduced their farm work effort in terms of growing corn or raising pigs, they have increased the number of overhead hours. While this may be true, it certainly isn't policy relevant that the farmer must now take five trips to town instead of the previous two to accomplish the same mission. 3) An accident of random sampling resulted in experimental families using more labor intensive techniques of production. This hypothesis is essentially negated, however, when various functional forms of work effort in 1969 (the pre-experimental year) are entered in the model.

The results for budgeted hours are roughly consistent with net and gross farm income. Particularly, this is true when a measurement variable (actual negative income payments minus predicted negative income tax

payments based upon edited quarterly data) is added to the model. Those families where actual payments exceeded predicted payments by a large amount are affected less by the program parameters (tax and guarantee rates) than families where actual payments equals predicted payments. Consequently, there is more disincentive in families where the latter occurred in terms of hours and income. The fact that the reporting variable was significant in the budgeted hours equation and not the recall hours equation strengthens the case that the budgeted hours is the better measure of farm work effort.

While there remains several disturbing aspects of the data, it seems clear that farm families reduced their crop hours significantly in North Carolina and their livestock hours in Iowa. The overall effect on total hours is negative, significant, and on the order of six to thirteen percent.

FOOTNOTES

* The author is currently a consultant to the Office of Survey Development at ASPE/HEW. This paper is based upon analysis done for the Institute for Research on Poverty and at Georgetown University. Complete discussions of the theoretical and empirical work summarized in this paper are available from the Institute.

[1] Measurement errors in the data were significant. Net farm income was changed by an average of $1,312 in North Carolina and $2,633 in Iowa through the editing process.

[2] The same mathematical formula as was used in the actual payments was applied to information collected by the surveys. All components of income and expenses were included. The survey's estimate can also differ because of the accounting period. Actual payments used a one or three month averaging period with a 12-month carryover procedure. Surveys did not collect information monthly, so the accounting period was simply a year with no carryover scheme. This could not have, particularly in the last two years of the experiment, accounted for some of the huge differences in actual versus predicted payments.

[3] Predicted payments were on the average $845 less in North Carolina and $676 less than actual payments in Iowa. The standard deviation of the differences was $845 and $1030, respectively.

[4] There was a significant difference between control and experimentals in reporting from farm records when answering the quarterly interviews with experimentals reporting more frequently from farm account records.

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