AN ABSTRACT OF THE THESIS OF

RALPH THOMAS SCHOTZKO for the degree of DOCTOR OF PHILOSOPHY

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Title: AN ANALYSIS OF THE EFFECTS OF SOCIAL SECURITY TAXES ON RESOURCE ALLOCATION IN THE U.S. FARM SECTOR

Abstract approved: John A. Edwards

Social security taxes are, in effect, taxes on factor usage. An increase in the employees tax rate on wages and salaries increases the unit cost of labor. At the same time the tax rate increase reduces the disposable income of employees. An increase in the self-employment tax rate reduces after-tax returns to self-employed individuals from their own labor and capital.

In addition the social security tax system is regressive since it has a limit on the amount of income taxable.

Resource allocation in the farm sector may be altered by changes in tax rates and maximum income taxable for social security purposes.

In order to evaluate the effects of social security taxes on resource allocation, it was assumed that the farm-firm-household could be represented by a utility

function with the arguments, leisure, consumption, and real cash balances. Utility maximization is constrained by the flow of funds into and out of the farm-household. The primary source of income is the farming operation and expenditures include outlays for production, consumption, and carryover of cash balances. Time availability within the farm-household also constrains utility maximization.

A Lagrangian expression containing the utility function and the constraints was employed in deriving a product supply function, input demand functions, and a farm-household labor employment function. Completion of the system required the development of product demand and input supply functions. The complete system to be estimated contained seven equations and seven unknowns.

The mathematical characteristics of the system precluded the use of regression techniques on the complete system. Therefore, the complete system was divided into two subsystems. One subsystem contained the equations describing the farm labor market. This subsystem was linearized which facilitated estimation by two stage least squares. The other subsystem contained equations for product demand, product supply, current operating inputs and capital stock. Results from the second subsystem were obtained by simulation using predicted labor values from the first subsystem.

Since social security tax rates for both wages and salaries and self-employment income enter the system in a nonlinear manner, it is not possible to test statistically the effects of the tax rates. However, direction and relative magnitude of the effects as well as elasticities can be obtained.

Data availability was insufficient for analysis of the effects of the maximum taxable income feature. The results indicate that increases in the tax rate on wages have reduced both the supply of and demand for hired labor in the farm sector. The effect on demand has been greater than on supply. Therefore, the social security tax on wages may be a factor in rural unemployment.

The social security tax on self-employment income has reduced the use of farm-household labor; however, the aggregate effect appears to be quite small.

Public assistance payments were included as an explanatory variable in the hired labor supply equation. While not conclusive, the results indicate that farm labor supply is more responsive to changes in public assistance payment levels than to changes in social security tax rates.

The results of the simulated portion of the analysis did not predict significant changes in output or in the use of current operating inputs and capital stock levels which would have prevailed in the absence of tax assessments.

The major implications of the analysis are that social security taxes increase rural unemployment and induce labor saving technical change.

An Analysis of the Effects of Social Security Taxes on Resource Allocation in the U.S. Farm Sector

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Ralph Thomas Schotzko

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APPROVED:

Professor of Agricultural and
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in charge of major

Head of the Department of
Agricultural and Resource Economics

Dean of Graduate School

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CHAPTER I. INTRODUCTION

Introduction

Until recently the social security system in the United States has been much like a sacred cow. There has been almost universal acceptance of the philosophy behind the program. The benefits obtainable by individuals through the social security program have reduced the responsibilities of many families for their indigent members. In addition, the tax assessments levied against wages and salaries have been, until recent years, quite modest.

Consequently, those who spoke out against either social security taxes or benefits were likely to cause reactions of strong disapproval by the general populace.

However, the changing demographic profile of the U.S. as well as changes in the provision of benefits are generating fears about the future of the social security program. As the age distribution of the population shifts to the upper age brackets, fewer wage and salary earners will be available to support the retired and disabled members of society. In recent years benefits, per person and in total amount, and tax assessments have been increasing much more rapidly than during the first 20 years of the program.

Table 1 contains data on social security taxes and benefits.[1/]

Because of the extent of coverage by social security in the U.S., all sectors in the economy are likely to be affected by changes in tax assessments and benefits.

Social security benefits are an income transfer from current to former members (or their families) of the labor force. Changes in the size of the transfer may affect both consumption and saving. If those bearing the increased cost of the income transfer reduce consumption by an amount equal to the transfer increase and if those receiving the transfer increase consume all of the additional income, then the impact will be relatively small. If there is any effect it will occur as a shift in the distribution of demand for consumption commodities from the nonessential to the essential.

If, however, saving by wage and salary earners is reduced to any extent, then not only is there an increase in the demand for consumption commodities but also a reduction in the amount of money available for investment.

The increased transfer payments may also affect resource allocation among industries. Disregarding the

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[1/] In 1951 some agricultural employees were permitted to enroll in the social security program. However, it was 1954 before legislation was passed by Congress to include a substantial part of the farm sector.

Table 1. Selected old age, survivors, disability and health insurance data (OASDHI).

Year	Payroll tax rate[1] %	Self-employed tax rate[1,3] %	Maximum taxable income[1] $	Average monthly retirement benefit[1] $	Ratio of OASDHI tax contributions to personal savings[2] %	Percent of labor force covered by OASDHI[1]	OASDHI tax contributions[1] (millions) $	OASDHI benefit payments[1] (billions) $
1937	1		3,000		20.1		765	1
1938	1		3,000		51.4		360	10
1939	1		3,000		22.3		580	14
1940	1		3,000	22.71	8.6	57.8	325	35
1941	1		3,000	22.72	7.2	62.1	789	88
1942	1		3,000	23.64	3.7	65.1	1,012	131
1943	1		3,000	24.50	3.7	69.1	1,239	166
1944	1		3,000	24.61	3.5	70.3	1,316	209
1945	1		3,000	25.11	4.3	68.9	1,285	274
1946	1		3,000	25.42	8.5	64.8	1,295	378
1947	1		3,000	26.21	21.3	64.6	1,557	466
1948	1		3,000	27.14	12.6	65.3	1,685	556
1949	1		3,000	28.39	17.7	64.0	1,666	667
1950	1.5		3,000	30.43	20.4	64.5	2,667	961
1951	1.5	2.25	3,600	37.54	19.4	79.5	3,363	1,885
1952	1.5	2.25	3,600	45.80	21.1	79.8	3,819	2,194
1953	1.5	2.25	3,600	56.76	21.6	80.1	3,945	3,006
1954	2.0	3.00	3,600	60.11	31.5	79.3	5,163	3,670
1955	2.0	3.00	4,200	69.74	36.2	85.3	5,713	4,968
1956	2.0	3.00	4,200	67.36	30.0	86.7	6,173	5,715
1957	2.25	3.375	4,200	67.59	33.0	87.0	6,825	7,404
1958	2.25	3.375	4,200	74.47	33.9	87.5	7,566	8,576
1959	2.50	3.75	4,800	81.46	42.2	87.8	8,052	10,298
1960	3.00	4.50	4,800	81.73	63.9	88.0	10,866	11,245
1961	3.00	4.50	4,800	78.15	53.2	87.9	11,285	12,749

Table 1 (continued)

Year	Payroll tax rate[1] %	Self-employed tax rate[1,3] %	Maximum taxable income[1] $	average monthly retirement benefit[1] $	Ratio of OASDHI tax contributions to personal savings[2] %	Percent of labor force covered by OASDHI[1]	OASDHI tax contributions[1] (millions) $	OASDHI benefit payments[1] (billions) $
1962	3.125	4.7	4,800	78.80	55.8	88.0	12,059	14,461
1963	3.625	5.4	4,800	80.30	73.1	88.2	14,541	15,427
1964	3.625	5.4	4,800	81.24	59.9	88.3	15,689	16,223
1965	3.625	5.4	4,800	84.86	56.4	89.1	16,017	18,311
1966	4.2	6.15	6,600	93.75	63.3	89.5	20,580	21,070
1967	4.4	6.4	6,600	89.74	57.3	89.6	23,138	25,967
1968	4.4	6.4	7,800	103.82	59.6	89.9	23,719	30,651
1969	4.8	6.9	7,800	106.13	73.2	90.3	27,947	33,371
1970	4.8	6.9	7,800	123.82	53.8	89.5	30,256	38,982
1971	5.2	7.5	9,000	138.29	55.7	89.4	33,723	45,065
1972	5.2	7.5	9,000	149.73	71.8	89.6	37,781	50,270
1973	5.85	8.0	10,800	169.80	61.8	90.0	45,975	58,194
1974	5.85	7.9	13,200	186.12	67.6	90.0	52,081	66,586

[1] Taken from Social Security Bulletin Annual Statistical Supplement 1974, U.S. Department of Health, Education and Welfare. Social Security Administration, U.S. Government Printing Office, Washington, D.C.

[2] Savings Data from Historical Statistics of the United States Colonial Times to 1970, U.S. Department of Commerce, Bureau of the Census, part 1, p. 263; and from July issues of Survey of Current Business, U.S. Department of Commerce, Bureau of Economic Analysis.

[3] Coverage extended to nonfarm self-employed in 1951.

effects of increased demand, the major effect is likely to be on the supply of labor.

For any employee an increase in the tax assessment reduces disposable income. Assuming that the marginal propensity to consume does not increase as income increases and that the proportion of expenditures on necessities, such as food, shelter, and clothing declines as income increases, the low wage earner is more acutely affected by changes in tax assessments. Therefore changes in tax rates will affect the distribution of the supply of labor to various industries on the basis of wages offered. The low wage industries will be less attractive to labor. The position of low wage industries is worsened when public assistance is also included in the analysis. Public assistance payments provide an alternative source of income for those individuals who cannot work or for those whose income expectations are not met by the low wage positions.

Previous Research

While much research has been conducted on the social security system in the U.S., most of it may be classified as descriptive. However, in recent years analytic studies have been undertaken addressing some of the more important economic issues surrounding social security. These economic studies are grouped here on the basis of the level of aggregation.

Macroeconomic Studies

The research discussed here includes two studies employing conventional macroeconomic theory.

One such study considered the impact of legislation passed by Congress in 1965 on aggregate demand and output [Vroman]. This was an analysis of the nonfarm sector and it did not address the question of resource allocation.

Another study utilized a consumption function based on the Ando-Modigliani life-cycle hypothesis to estimate the wealth effect of social security legislation on aggregate saving and capital accumulation [Feldstein]. The results, which are very tentative, indicate that both private saving and capital accumulation have been reduced considerably by the wealth effect associated with social security. Based on Feldstein's analysis, personal saving was reduced by 38 percent during the 1960's.

The final study in this section was a simulation analysis [Walker]. This analysis estimated the combined effects of all major social insurance programs on the farm, rural nonfarm, and urban sectors with respect to income distribution, growth, and investment. The results indicate that income growth was constrained over the period 1960-69 by social insurance programs. Income was redistributed downward and investment was reduced. The rural poor tended to gain relatively more from the redistributional aspects of the programs. The largest reduction in investment was in the farm sector. No attempt was made to analyze the effect of the programs on labor or other inputs.

Industry Level Analyses

The research discussed in this section has dealt primarily with the payroll tax employed by social security.

One analysis attempted to measure the amount of resource malallocation associated with the employer's portion of the payroll tax on wages and salaries [Deran]. Four different measures were used. They included OASDI tax liabilities as a percentage of total wages, value added, and value of shipments. None of these measures were applied to the farm sector. The fourth measure, which was used in estimating the magnitude of malallocation for the year 1963, was based on the OASDI tax liability for each industry as a percentage of national income originating in that industry. This last measure was applied to the farm sector as well as 49 other industries.

It is difficult to accept the results presented in Deran's article. For some of the low wage labor-intensive industries the ratio of tax liability to total wages paid is greater than the tax rate for the year in which the data were collected.

However, the most misleading part of the article is the measurement of resource malallocation. Deran concludes that agriculture is undertaxed. This conclusion is reached without considering the self-employment tax assessments. The self-employment tax liability of the farm sector for the year analyzed, 1963, was approximately three times as great as the employer's portion of the payroll tax. While Deran's numerical results are correct, the conclusions drawn with respect to agriculture are misleading.

The most exhaustive analysis of the payroll tax, with specific reference to the U.S. social security system, was conducted under the auspices of the Brookings Institution [Brittain]. The analysis covers several topics including tax incidence, effects on income inequality, income redistribution, and allocative and growth effects.

Brittain's quantitative analysis provides a number of interesting and significant points. The most substantial point concerns the incidence of the employer's portion of the tax on wages and salaries [Brittain, p. 21-82]. While Social Security Administration officials have maintained that the employer bears half of the payroll tax on wages and salaries, Brittain's analysis indicates that this is incorrect. The employer's portion of the tax is shifted partly back onto the employee through reduced growth in wages and salaries and partly forward through price increases.

Brittain [p. 248-50] also argues that the forced saving associated with the payroll tax is greater than would have occurred without the tax. However, no empirical analysis is provided for this hypothesis. His argument is predicated on the assumption that the reduction in savings by high income households caused by social security taxes is less than the increase in saving by low income earners.

In the analysis of the allocative effects of social security taxes across the U.S. economy, Brittain draws upon a variety of information and hypotheses to substantiate his conclusion that these effects are minimal [p. 238-48].

First, as the results of the empirical analysis imply, labor bears the full cost of the social security tax, the returns on capital investment will not be affected and there is no incentive for employers to increase investment in labor-saving capital.

Secondly, although the sectors in the economy not covered by social security have an advantage with respect to labor, any movement to these sectors will be insignificant because of the small size of the uncovered sectors relative to the rest of the economy.

Finally, movement between industries by labor will be minimal because the tax rates are the same in all industries. However, this argument requires the assumption that wages and salaries of the various skill levels are constant across industries.

Farm Sector Analyses

The effects of social security on the farm sector apparently have not been viewed with concern by economists because research in this area is almost nonexistent. In the years immediately following extension of social security coverage to the farm sector, some consideration was given to the possible effects. However, these were primarily statements of possible hypotheses concerning the effects [Wunderlich].

At about the same time several land grant institutions conducted surveys of the farm sector in their respective states. The purposes of these surveys, without exception, were related to the participation in, knowledge of, and attitude toward the social security system [see, for example, Bauder].

With the exception of the work of Walker and Deran mentioned above no other recent research has considered the effects of social security on the farm sector.

Social Security Taxes and the U.S. Farm Sector: An Overview

The characteristics of the social security tax structure are such that, potentially, changes in tax assessments may affect both resource allocation and output. Since the typical farm is a family operated enterprise, both the self-employment tax and the payroll tax as well as the maximum taxable income feature may cause changes in the optimum level of output and resource utilization.

The self-employment tax reduces the amount of disposable income available to the farm-household. Assuming that, over the relevant range, the amount of household labor employed is positively related to income net of production expenses and taxes, increases in the self-employment tax will reduce the quantity of farm-household labor utilized on the farm. In addition, as long as the increases in tax rates are not completely offset by reductions in consumption, then either investment or saving or both will be reduced.

Also, since there is a maximum income taxable for social security purposes the effects of the tax will weigh more heavily on the low income farm-houshold. For the high net income farm-household the self-employment tax is equivalent to a fixed cost and, therefore, from a profit maximizing point of view does not affect the marginal conditions for optimal production.

The regressive nature of the self-employment tax may be one of the factors associated with increasing farm size and the declining number of farms.

The employee tax affects both the farm operator and the employee. Given the perfectly competitive nature of the output market for the farm sector, increased costs cannot be passed on to the consumer. Therefore, either the farm operator bears the entire burden of the tax or passes some part of it back to the employee through lower wages. If the employer bears any part of the payroll tax, then the demand for hired labor declines. To the extent that employees bear the cost of the employer's portion of the payroll tax, the supply of hired labor in the farm sector will be reduced.

If neither the employer nor the employee bears the entire employer's portion of the payroll tax, an increase in the tax rate will reduce the demand for labor and, at the same time, reduce the supply of labor. In addition, a reduction in the quantity of labor utilized on the farm may affect the use of other inputs.

Purposes of Research

The purposes of this thesis are to determine the extent and direction of changes in labor utilization caused by changes in the payroll and self-employment tax rates and to measure the indirect effects on current operating inputs, capital stock, and output in the farm sector.

CHAPTER II. THE THEORETICAL MODEL

Introduction

At the beginning of each crop year, the farm operator has a given set of resources which are at his disposal. These include physical, financial, and human resources. The operator allocates these resources in an attempt to maximize utility. In addition to the resource constraints, utility maximization is subject to additional constraints that are institutional and which influence the allocative decisions of the farm operator.

Although much work has been done in analyzing some institutional constraints, such as production subsidies and acreage allotment programs, little or no attention has been given to other institutional constraints. The purpose of this chapter is to develop a theoretical construct that may be employed in the analysis of one such constraint, social security taxation.

Theoretical Framework for the Farm-Firm-Household

In order to evaluate the effects of social security taxes on the farm sector, it will be assumed that each farm unit can be represented as a farm-firm-household. Each farm-firm-household is assumed to have a utility function with the arguments, consumption, real wealth and leisure.

At the beginning of each time period the farm-firm-household has a stock of physical capital, which includes buildings, machinery and equipment, a given level of wealth in money terms and a supply of human resources. There is also a given supply of land.

These resources are allocated to consumption, wealth to be carried over to the next time period, investment in capital stock and production. Production also generates revenue which may be allocated to the above uses. However, not all of the revenue generated by production can be so allocated. Some of this revenue will be used to cover the costs of production which include the wages of hired labor and the employer's portion of the social security tax assessed on wages, the cost of current operating inputs, such as petroleum products, fertilizer, seed, feed, etc., the user cost of capital, interest on real estate debt and real estate taxes. Total revenue less these costs yields net revenue before taxes. It is on this net revenue that the farm operator is assessed self-employment social security taxes.

The user cost of capital includes depreciation and interest. While capital investment may be undertaken at any time, not all of that investment is relevant for tax purposes in any one time period. Only that portion of the capital stock, including new capital investment, that is "consumed" in the production process is relevant. The interest deductible for tax purposes is that which is paid for the use of financial assets obtained from sources external to the farm-firm.

A third user cost of capital, capital gains or losses, is not included in this study. Social security taxes paid by the farm-firm-household are based on the net revenue as defined above. While other options are available for tax computations by those who have a low gross or net income it will be assumed that if the net revenue before taxes for the farm-firm-household is less than the maximum taxable income for social security purposes, then the amount taken as tax is a percentage of net revenue. If net revenue before taxes is greater than the maximum taxable income, then the amount of tax paid is equal to the product of the tax rate and the maximum taxable income.

It should be noted that nonwage income such as interest on financial assets does not affect the amount of tax paid for social security purposes.

The production function is assumed to be a Cobb-Douglas type function and contains the arguments, labor, current operating inputs, land, and capital stock. It is also assumed that there are no qualitative differences between farm-household labor and hired labor.

It is also necessary to make an assumption about the incidence of the payroll tax. For the purposes of this analysis, the most practical approach is to assume that the employer and the employee equally share the burden of the tax.

In most economics research it is not possible to include every variable that may be relevant and the same is true here. While other variables could be included as relevant to the maximization process employed here, it will be assumed that the functions are sufficiently defined to allow unbiased determination of the effects of social security taxes.

Mathematically, the system is as follows:

Utility function:

$$U = u(C, L, \frac{M}{\phi^M})$$

Production function:

$$Q = \beta_0 A^{\beta_1} O^{\beta_2} K^{\beta_3} R^{\beta_4} \qquad \beta_i > 0$$

Farm-household time constraint:

$$D = H + L$$

Income constraint:

$$\phi^C C + M - (1-t_2)[\phi^Q Q - (1+t_1)w^F N - \chi K - \phi^O O - \phi^R R] - M_0 = 0$$

where $C \equiv$ quantity of consumption

$L \equiv$ quantity of leisure time

$\frac{M}{\phi^M} \equiv$ quantity of real wealth

$Q \equiv$ quantity of output

$\beta_i \equiv$ production function coefficient for the ith input

$A \equiv$ total quantity of labor employed in the production process $(A = H + N)$

$D \equiv$ total quantity of time available in the farm-household for allocation to leisure or labor

$H \equiv$ quantity of farm-household labor employed in agricultural production

$N \equiv$ quantity of hired labor employed

$O \equiv$ quantity of current operating inputs

$K \equiv$ quantity of capital stock available for productive use

$\phi^i \equiv$ price of the ith commodity

$t_1 \equiv$ social security payroll tax rate

$t_2 \equiv$ social security self-employment tax rate

$w^F \equiv$ farm wage rate

$\chi \equiv$ user cost of capital $\chi = \phi^K(r+\delta)$

$r \equiv$ interest rate

$\delta \equiv$ depreciation rate

$R \equiv$ acres of land

$M_0 \equiv$ quantity of wealth carried over from the previous period

The utility function is assumed to have positive first partial derivatives and negative second partials.

The same assumptions are made for the production function. Therefore, $\beta_i < 1$ for $1 \leq i \leq 4$.

The Lagrangian expression to be maximized is

$$\ell = U-\lambda_1\{\phi^C C+M-(1-t_2)[\phi^Q Q-(1+t_1)w^F N-\chi K-\phi^0 O-\phi^R R]$$

$$-M_0\} - \lambda_2\{L+H-D\}.$$

The first order conditions for maximization are

$$\frac{\partial \ell}{\partial C} = \frac{\partial U}{\partial C} - \lambda_1 \phi^C = 0$$

$$\frac{\partial \ell}{\partial L} = \frac{\partial U}{\partial L} - \lambda_2 = 0$$

$$\frac{\partial \ell}{\partial (\frac{M}{\phi^M})} = \frac{\partial U}{\partial (\frac{M}{\phi^M})} - \lambda_1 \phi^M = 0$$

$$\frac{\partial \ell}{\partial N} = \lambda_1 (1-t_2)[\frac{\beta_1 \phi^Q Q}{H+N} - (1+t_1)w^F] = 0$$

$$\frac{\partial \ell}{\partial H} = \lambda_1 (1-t_2) \frac{\beta_1 \phi^Q Q}{H+N} - \lambda_2 = 0$$

$$\frac{\partial \ell}{\partial 0} = \lambda_1 (1-t_2)[\frac{\beta_2 \phi^Q Q}{0} - \phi^0] = 0$$

$$\frac{\partial \ell}{\partial K} = \lambda_1 (1-t_2)[\frac{\beta_3 \phi^Q Q}{K} - \chi] = 0$$

$$\frac{\partial \ell}{\partial R} = \lambda_1(1-t_2)\left[\frac{\beta_4 \phi^Q Q}{R} - \phi^R\right] = 0$$

$$\frac{\partial \ell}{\partial \lambda_1} = (1-t_2)[\phi^Q Q-(1+t_1)w^F N-\phi^0 0-\chi K-\phi^R R] + M_0-\phi^C C-M = 0$$

$$\frac{\partial \ell}{\partial \lambda_2} = D - L - H = 0$$

Utilizing the first order conditions, it is possible to derive demand functions for the productive inputs, a farm-household employment function and a product supply function. They are:

Current operating inputs:

$$O = \frac{\beta_2 \phi^Q Q}{\phi^0}$$

Capital:

$$K = \frac{\beta_3 \phi^Q Q}{\chi}$$

Labor:

$$A = \frac{\beta_1 \phi^Q Q}{(1+t_1)w^F}$$

Land:

$$R = \frac{\beta_4 \phi^Q Q}{\phi^R}$$

Household employment function:

$$H = h(\phi^{M}, M_0, D, (1-t_2)NI, \phi^{C})$$

Hired labor demand function:

$$N = \frac{\beta_1 \phi^{Q} Q}{(1+t_1) w^{F}} - H$$

Product supply function:

$$Q^{S} = \{\beta_0^1 [(1+t_1)w^{F}]^{-\beta_1} (\phi^{0})^{-\beta_2} (\chi)^{-\beta_3} (\phi^{R})^{-\beta_4}\}^{\beta_1^1} (\phi^{Q})^{\beta_2^1}$$

where $\beta_0^1 \equiv \beta_0 \beta_1^{\beta_1} \beta_2^{\beta_2} \beta_3^{\beta_3} \beta_4^{\beta_4}$

$$\beta_1^1 \equiv \frac{1}{1-\beta_1-\beta_2-\beta_3-\beta_4}$$

$$\beta_2^1 \equiv \frac{\beta_1+\beta_2+\beta_3+\beta_4}{1-\beta_1-\beta_2-\beta_3-\beta_4}$$

$$NI \equiv \text{Net Income} = \phi^{Q}Q - (1+t_1)w^{F}N - \phi^{0}0 - \chi K - \phi^{R}R$$

and the other variables are defined above.

The quantities demanded of productive inputs may be analyzed by either marginal value product functions or derived demand functions. If the production function is substituted for Q in the demand function for current operating inputs, for example, the demand function may be written as

$$\phi^{0} = \phi^{Q} \cdot MPP_{0}.$$

Similar expressions can be derived for capital, total labor and land demand functions.

If, instead of the production function, the output supply function is substituted for Q, then demand for the input is a function of its own price, product price and the prices of the other inputs. This second function has one disadvantage. If constant returns to scale prevail, the product supply function and the derived demand functions are indeterminate. Both functions, marginal value product and derived demand, describe curves that are convex to the origin and become asymptotic to both axes.

Note that the hired labor demand function is a residual and is determined jointly by the total quantity of labor demanded and the quantity of farm-household labor employed on the farm.

Labor Demand and Farm-Household Employment

From a theoretical point of view farm-household employment is a function of prices, tax rates, carryover of wealth, and total time available in the farm-household. While each of the variables in the profit function (NI) influences the farm-household's allocation of labor it is the combined effect, or profits, that constrains the achievement of the household's desired objectives.

It will be assumed that wealth and the quantity of farm-household labor employed on the farm are inversely related. Net income is assumed to be positively related with the quantity of farm-household labor employed.[2/]

The impact of the self-employment tax on the farm-firm's resource allocation will depend on the level of income from farming. If net taxable income is greater than the maximum taxable for social security, then the tax is a fixed cost. While fixed costs affect the amount of household labor employed through net income, they do not affect the marginal rates of substitution among the arguments in the utility function.

If the self-employment income from farming is less than the maximum, then the amount of farm-household labor utilized in the production process will be affected at the margin.

The Effects of Changes in the Self-Employment Tax Rate, t_2, on Consumption and Leisure

Assuming indifference curves that are negatively sloped throughout, the analysis can be presented on the basis of the marginal rate of substitution of consumption for leisure which is derived as follows:

$$MRS_{C,L} = \frac{\lambda_2}{\lambda_1 \phi^C}$$

where $MRS_{C,L}$ is the ratio of the marginal utility of leisure to the marginal utility of consumption.

[2/] For an exposition of the theory of the supply of labor employing these assumptions see Bronfenbrenner [p. 210-216].

The value of the ratio λ_2/λ_1 is obtained from the Lagrangian partial derivative with respect to farm-household labor, H.

$$\frac{\lambda_2}{\lambda_1} = \beta_1(1-t_2)(\frac{\phi^Q Q}{H+N})$$

Therefore

$$MRS_{C,L} = \beta_1(\frac{1-t_2}{\phi^C}) \frac{\phi^Q Q}{H+N}$$

If labor is being utilized up to the point where the marginal value product of labor is equal to the unit cost of labor, as given by the partial derivative with respect to hired labor, N, then

$$MRS_{C,L} = \frac{(1-t_2)(1+t_1)w^F}{\phi^C}$$

If net taxable income is greater than the maximum, then the effective self-employment tax rate, t_2, is zero and the marginal tradeoff between leisure and consumption is not affected by the tax rate. This will hold for changes in both the tax rate and the maximum taxable income as long as net income from farming is greater than the maximum taxable.

As long as net income is less than the maximum the effective value of t_2 is greater than zero. Under these circumstances an increase in t_2 causes the term on the right hand side of the above expression, $(1-t_2)(1+t_1)w^F/\phi^C$, to decline. In order to return to equilibrium, consumption will decline and leisure time will be increased.

This implies a reduction in the amount of household labor employed on the farm. Because of this reduction the marginal value product of labor will increase. Consequently, additional hired labor will be employed. The amount of the increase in hired labor will depend on whether the increase in aggregate demand for hired labor leads to an increase in the wage rate. Any increase in the farm wage rate will reduce the effects of the increase in the self-employment tax rate, t_2.

Analysis of the Effects of Changes in the Self-Employment Tax Rate using the Farm-Household Employment Function

The analysis can also be presented in terms of the farm-household employment function, the marginal value product function for labor, and the derived demand function for hired labor using a graphical approach.

The analysis is presented in figures 1 and 2. Figure 1 shows the relationship between the total demand for labor and the demand for hired labor. Starting with farm wage rate w_0, farm-household employment curve E_1, MVP curve for total labor M, and hired labor demand curve n_1^D, A_1

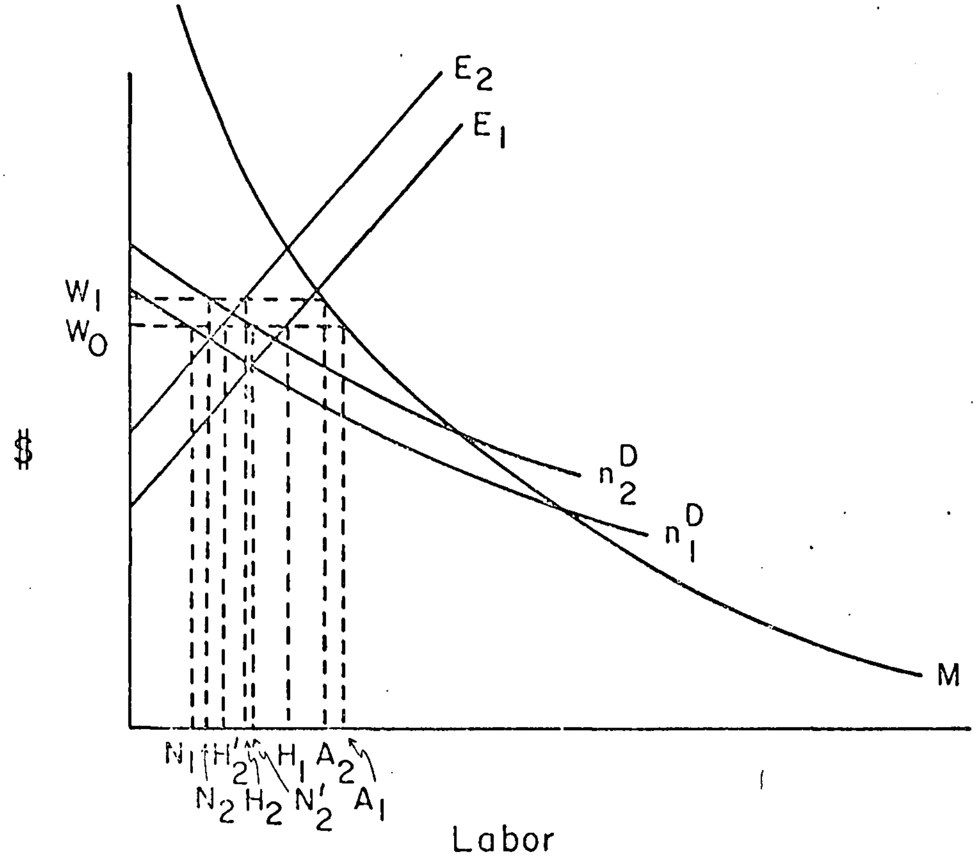

Figure 1. On-farm labor adjustments to self-employment tax rate changes.

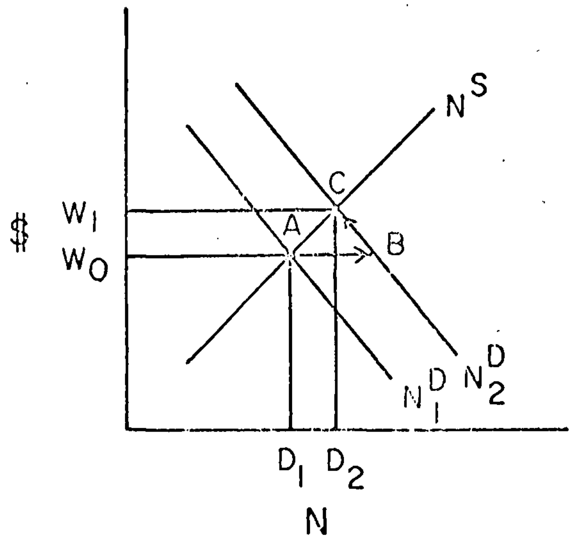

Figure 2. Hired labor market adjustments to self-employment tax rate changes.

represents the total amount of labor demanded at wage w_0.[3/] H_1 and N_1 ($A_1 = N_1 + H_1$) indicate the amount of farm-household labor employed and the quantity of hired labor demanded at that wage rate, respectively. An increase in the self-employment tax rate shifts the household employment curve upward to E_2. This shifts the demand curve for hired labor from n_1^D to n_2^D. The reduction in household labor employed is H_1 minus H_2' and the increase in quantity demanded of hired labor is N_2' minus N_1. The aggregate increase in quantity demanded, as shown in figure 2, affects the wage rate through the movement from one equilibrium point to the next (from A to B to C). The resulting wage rate increase leads to an amount H_2 units of labor being supplied by the farm-household and N_2 units of labor employed for a total of A_2 units of labor employed in the farming operation.

The Effects of Changes in the Employee's Tax Rate, t_1

The effects of a change in the employee's tax rate can be evaluated using the same graphic structure and are presented in figures 3 and 4.

Before the employee's tax rate, t_1, increases, the hired labor market is in equilibrium at point A in figure 3

[3/] The derived demand curve for total labor assumes the same shape as curve M.

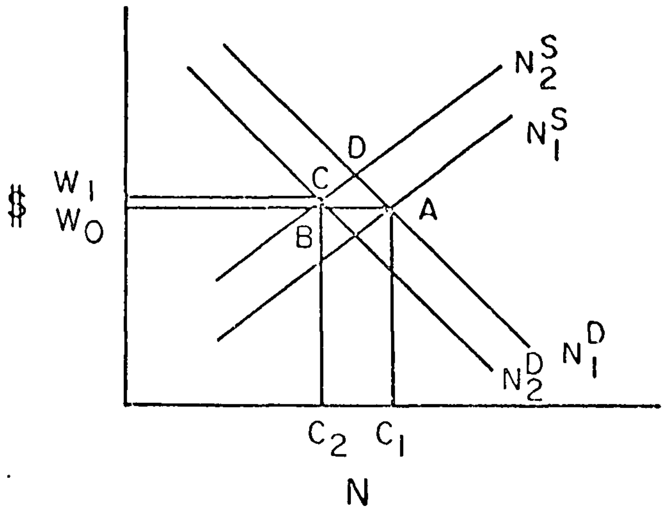

Figure 3. Hired labor market adjustments to employee's tax rate changes.

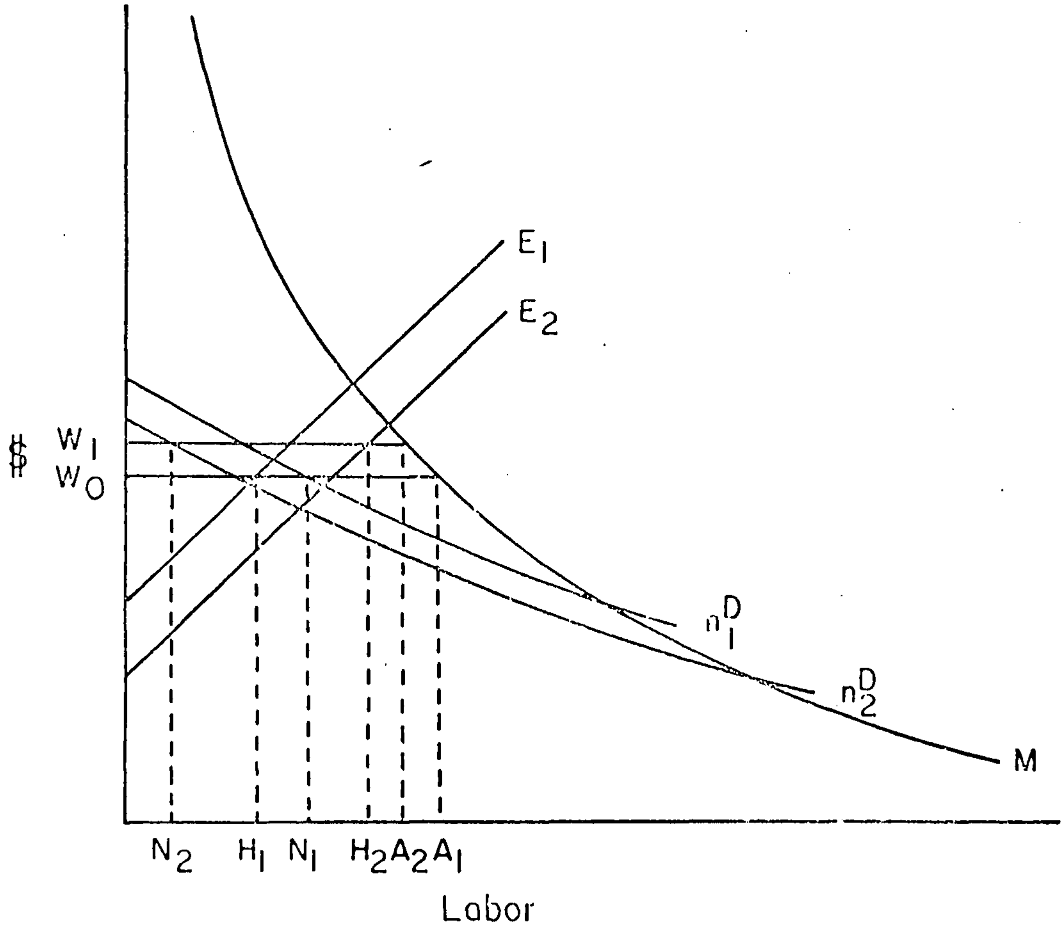

Figure 4. On-farm labor adjustments to employee's tax rate changes.

with wage rate w_0 and c_1 units of hired labor employed by the farm sector. When the tax rate, t_1, increases, the aggregate hired labor supply curve shifts to the left reducing the quantity of labor supplied at any wage rate. To return to equilibrium, wages are "bid" up until point D is reached.

The increase in t_1 also affects the use of farm-household labor. At the farm level an increase in t_1 causes a shift in the household employment curve, E_1 to E_2 in figure 4.

The cumulative effect of the shift in the household employment curve is reflected in figure 3 by a downward shift in the aggregate demand curve for hired labor. Consequently, the equilibrium wage rate will be some value less than that indicated by point D, point C in figure 3.

In figure 4 the beginning equilibrium level of labor employed on the farm is H_1 units of farm-household labor and N_1 units of hired labor for a total labor input of A_1 units. After adjustment for the increase in t_1, the new amounts are H_2 and N_2 units of household and hired labor, respectively.

Effects of Simultaneous Changes in the Self-Employment and Employee Tax Rates

The total effect of a simultaneous increase (decrease) in both tax rates will depend on the extent of the shifts in the farm-household employment curve and the labor supply curve. If both taxes increase,the farm-household employment curve will shift to the left as a result of the increase in t_2 and then to the right as a result of the increase in t_1. In figure 5 these shifts are reflected by the hired labor demand curves, N_1^D, N_2^D, and N_3^D, respectively. The change in t_1 also causes a shift in the hired labor supply curve from N_1^S to N_2^S. The combined result is an increase in the wage rate and may or may not lead to a reduction in the amount of hired labor employed.

If the increase in t_2 is sufficiently greater than the increase in t_1, the amount of hired labor employed will increase. However, the increased labor cost will reduce the total amount of labor employed.

Effects of the Maximum Income Taxable for Social Security

The farm-households with self-employment income greater than the maximum taxable income for social security purposes are not affected in the same manner as low income farm-households by changes in t_2. An increase in t_2 or the maximum taxable income implies an increase in fixed costs for the high income farm-household. Consequently, the only decision to be made is whether to produce or not. Not many of these farm-households would be expected to discontinue production because of social security taxes.

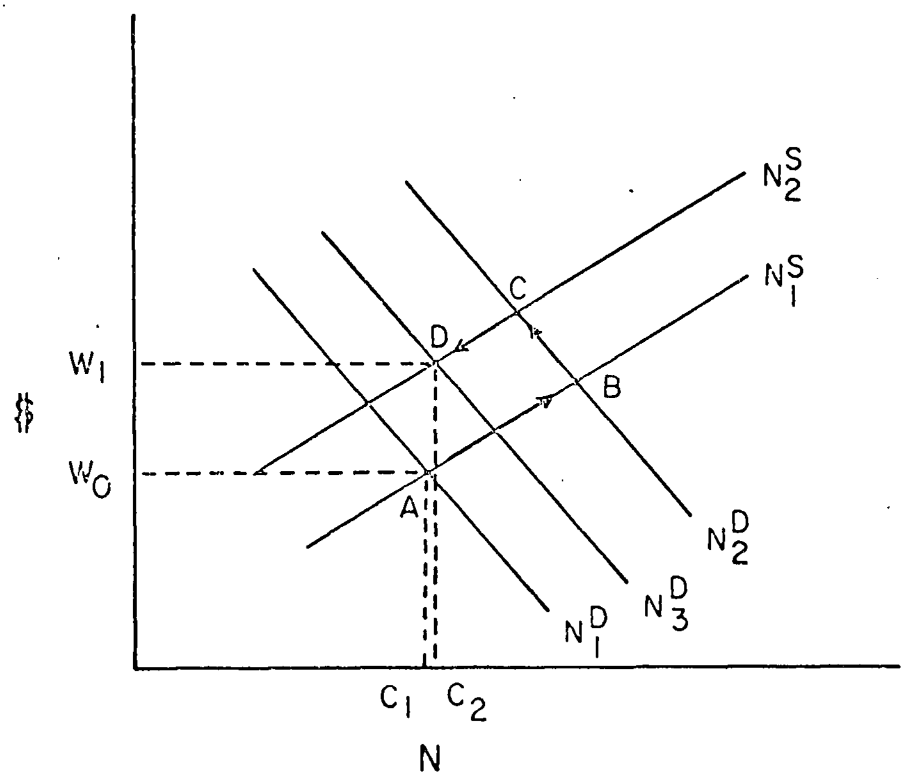

Figure 5. Hired labor market adjustments to changes in both tax rates.

Some farm-households will have net incomes that fluctuate around the maximum taxable income from year to year and some may permanently shift from above the maximum taxable income to below as the ceiling on taxable income is increased. The effects of changes in the tax rates will be some combination of the effects discussed above. The effect of an increase in t_1 is the same on high income farm-households as it is on low income farm-households.

By virtue of the nature of the distribution of farms by income the increase in the employment of household labor by high income farm-households caused by increasing t_1 is not expected to offset the decline in the employment of household labor on low income farms caused by increasing t_2.

Supply of Hired Labor

The supply of hired labor to the farm sector is hypothesized to be a function of the farm wage rate net of social security taxes, nonfarm wage rate net of social security taxes, the level of unemployment in the economy, the level of public assistance payments and the quantity of hired labor employed in the previous time period.

The inclusion of all variables except public assistance and unemployment is based on the results of several earlier econometric analyses which lend support to their significance [Hammonds, *et al.*]. Social security taxes were, however, not included in the earlier studies.

Wages net of social security tax provide a more accurate measure of disposable income since this tax represents the largest single deduction for most farm workers. This may also be the case for workers who migrate from rural to urban employment. The skills and work experience of these migrants are such that even with the increased income associated with nonfarm employment the deduction for social security is still relatively important.

Public Assistance and the Supply of Labor

At any given point in time an employable individual in a rural nonfarm household has three alternative potential sources of income. The individual may seek farm employment, nonfarm employment or withdraw from the labor force and accept public assistance.

If the individual is employed in the farm sector he will remain there unless the opportunity costs become too great. However, if the returns to farm employment fall sufficiently below either the returns to nonfarm employment or public assistance, or both, the individual will prefer one of the alternatives to farm employment. Even in times of weak conditions in the overall economy farm workers have the alternative of public assistance which may provide a disposable income that is greater than the returns from farm work.

On the income-leisure indifference surface, figure 6, it is possible to represent the effect of public assistance on the supply of labor by an individual. The slope of the line connecting y_1 and h is equal to the negative of the wage rate where h represents the maximum amount of time available for allocation to labor or leisure. Without the availability of public assistance the wage rate associated with the curve y_1h dictates that this individual will sell $(h-H_1)$ units of labor time and consume H_1 units of leisure while receiving an income of y_2. This places the individual on indifference curve U_2. However, with the availability of public assistance, the individual has the opportunity to receive public assistance payments in the amount of P.A. and consume h units of leisure time. This places the individual at point B on the indifference surface. Under the usual assumptions associated with indifference maps B is preferred to A and this individual will prefer public assistance with leisure to the higher income and less leisure.

Public assistance may provide either a short-run or a long-run solution for low income individuals, such as farm workers. Depending on the individual's attitudes toward leisure and/or public assistance, this person may use public assistance either as a source of income while conducting a job search or, because of a strong preference for

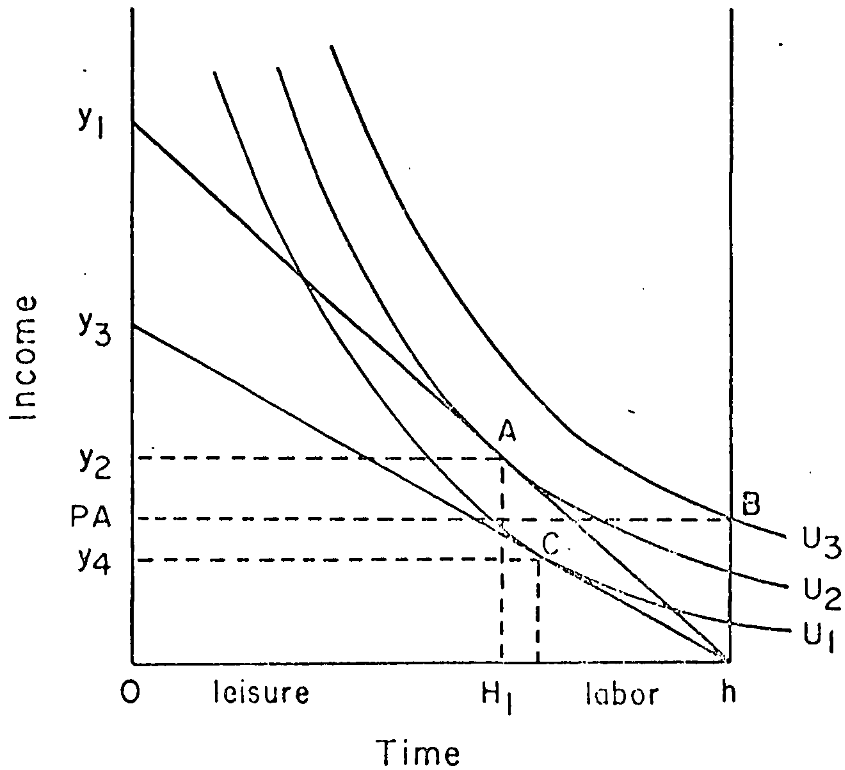

Figure 6. Income-leisure indifference surface.

leisure, may use public assistance as a permanent source of income.

Public assistance may facilitate the job search in two ways. If the individual has a strong preference for the rural environment he may conduct his search in the vicinity of his present residence. If the individual's expectations of income from urban employment are great enough to, at least, compensate him for the qualitative and quantitative costs of migration, the individual will migrate to an urban area in search of employment. Under either alternative, public assistance is available to provide financial support during the period of unemployment.

While public assistance may be a factor affecting current members of the farm labor force, it may also influence the number of potential entrants into this market. During periods of strong economic activity, expectations about the possibility of nonfarm employment by members of the farm labor force are raised, inducing migration from rural to urban areas. With the availability of public assistance, the reverse effect of urban to rural migration during periods of economic downturn in the general economy, as occurred during the depression of the 1930's, will be weaker than the outmigration mentioned above.

The Unemployment Rate

The civilian unemployment rate is included as a proxy variable for the probability of obtaining nonfarm employment. As the unemployment rate increases expectations of successfully seeking nonfarm employment will decline. This is, essentially, the approach taken by Tyrchniewica and Schuh [p. 775].

Specification of the Hired Labor Supply Function

In general form the hired labor supply function is

$$N^S = n[1-t_1)w^F, (1-t_1)w^N, P.A., u, N_0]$$

where t_1 and w^F are defined above, and

N^S ≡ quantity of hired labor in the t^{th} period

w^N ≡ nonfarm wage rate

P.A. ≡ public assistance payments

u ≡ unemployment rate in the nonfarm sector

N_0 ≡ lagged endogenous variable

Demand and Supply for Capital Stock, Current Operating Inputs and Land

Demand Functions

Marginal value product functions are employed as demand functions for capital stock, current operating inputs and land. Therefore, the quantity demanded of capital stock, for example, is a function of the respective quantities of land, labor, and current operating inputs employed in production, the product price, and the price of capital stock. The current operating input demand function and the land demand function can be stated in a similar manner.

Use of the unconstrained profit function with a Cobb-Douglas type production function in the income constraint yields a complementary relationship among the inputs. Therefore, with constant technology, a reduction in the quantity demanded of any input will lead to a reduction in the quantity demanded of the other inputs.

Supply Functions

The supply of nonhuman inputs to the farm-firm approaches perfect elasticity. A change in the quantity purchased of any input by the farm-firm has little effect on price paid for the input.

The elasticity of the aggregate input supply curve facing the farm sector depends on several factors. Heady and Tweeten provide a concise summarization of some of these factors into the following categories:

> (a) the historic input price-quantity relationships, (b) empirical studies of the cost structure of nonagricultural industries, (c) the goals of the industries, and (d) the relative importance of agricultural purchases in the sales of nonfarm firms [p. 62].

Historically, shifts in the demand for these nonhuman inputs have not appreciably affected price. Consequently, the most recent input price increases are more likely to have been caused by increasing costs on the supply side than by increasing demand.

In their discussion Heady and Tweeten also point out that empirical analysis of major nonfarm-firm cost structures indicates that the short-run supply curves are highly elastic. Further analysis on the industries reveals structures that are less than perfectly competitive yielding a situation where the emphasis is on nonprice competition [p. 63].

The fourth category involves the concept of the importance of being unimportant. In general, the quantity consumed of nonfarm inputs by the farm sector represents a relatively small amount of the total production by the nonfarm sector. Therefore, shifts in demand by the farm sector for these inputs are not likely to have a large impact on input prices.

For these reasons it will be assumed that the supply curves for capital stock and current operating inputs are perfectly elastic.

The supply of land is assumed to be given. It is also assumed that planning for the production period is based on that given quantity of land. This is more likely to be valid for crop production than for livestock production because of the more discrete nature of the crop production cycle.

Product Demand Function

The product demand function utilized in this analysis is taken from Rosine and Helmberger [p. 721]. The reason for using this function is primarily empirical. The empirical analysis of the effects of social security taxes on inputs other than labor is based on procedures discussed by Rosine and Helmberger; and since analysis of the effects of social security taxes on product demand is not included in the analysis, their demand function provides sufficient linkage to the nonfarm sector in the product market.

The demand function for agricultural products at the farm gate is

$$Q^D = \gamma_0 (\phi^Q)^{\gamma_1} P^{\gamma_2}$$

where $P \equiv$ U.S. population

$\gamma_i \equiv$ functional parameters

$Q^D \equiv$ quantity of output demand

$\phi^Q \equiv$ product price

The complete theoretical system as developed in this chapter is

Product supply:

$$Q^S = \{\beta_0^1[(1+t_1)w^F]^{-\beta_1}(\phi^0)^{-\beta_2}(\chi)^{-\beta_3}(\phi^R)^{-\beta_4}\}^{\beta_1^1}(\phi^Q)^{\beta_2^1}$$

Product demand:

$$Q^D = \gamma_0(\phi^Q)^{\gamma_1}P^{\gamma_2}$$

Labor demand:

$$A = \frac{\beta_1\phi^Q Q}{(1+t_1)w^F}$$

Current operating input demand:

$$0 = \frac{\beta_2\phi^Q Q}{\phi^0}$$

Capital stock demand:

$$K = \frac{\beta_3\phi^Q Q}{\chi}$$

Land demand:

$$R = \frac{\beta_4\phi^Q Q}{\phi^R}$$

Farm-household employment:

$$H = h(\phi^M,\ M_0,\ (1-t_2)NI,\ D,\ \phi^C)$$

Hired labor demand:

$$N^D = A - H$$

Hired labor supply:

$$N^S = n[(1-t_1)w^F, (1-t_1)w^N, P.A., u, N_0]$$

Identities

$$Q^S = Q^D$$

$$N^D = N^S$$

Hypotheses

The hypotheses to be evaluated in this study pertain to the effects of the social security tax system and public assistance payments.

It is hypothesized that increases (decreases) in the employee's payroll tax rate, t_1, decrease (increase) the demand for hired labor and increase (decrease) the quantity employed of farm-household labor.

Increases (decreases) in the social security self-employment tax rate, t_2, decrease (increase) the quantity employed of farm-household labor.

The combined effect of a simultaneous increase (decrease) in both tax rates is a decrease (increase) in the quantity of farm-household labor employed.

An increase (decrease) in either or both tax rates will decrease (increase) the quantity of capital stock and current operating inputs employed in production.

An increase (decrease) in public assistance payments decreases (increases) the quantity of hired labor supplied to the farm sector.

Presentation of Empirical Analysis and Results

As shown above the complete system includes product demand and supply functions, marginal value product functions for the inputs, a hired labor supply function, and an employment function for farm-household labor.

There are three problems associated with estimating this system. First, the system is nonlinear. The demand function for hired labor is a nonlinear expression and is not compatible with the usual regression techniques. The second problem is the duplication of parameter estimates. Consequently, unique estimates of the coefficients cannot be obtained. The other problem is data availability. In order to overcome these problems, the system has been separated into two subsystems.

One subsystem describes the labor market and includes the total labor demand function, the farm-household employment function, and the hired labor supply function. Chapter III discusses this subsystem including estimation procedures, data, and results obtained.

The other subsystem includes the product demand and supply functions and the demand functions for capital stock and current operating inputs. This subsystem is discussed in Chapter IV.

Chapter V presents the combined results and conclusions of the analysis and includes a comparison of these results with the studies discussed in Chapter I.

CHAPTER III. FARM LABOR ANALYSIS: EQUATION SPECIFICATION, EMPIRICAL PROCEDURES AND RESULTS

Introduction

As indicated in Chapter II, the set of functions describing the farm labor market are nonlinear. In addition, data are not available for all of the specified variables nor are data available to incorporate all features of the social security tax system. In particular, the maximum taxable income feature is not included. This feature is eliminated by conducting the analysis on a per farm basis. Consequently, all of the quantity variables are divided by the number of farms. Other less general modifications that are made for estimation purposes are discussed with the appropriate subsystem.

The purpose of this chapter is to present the structural equations describing the farm labor market. Discussion of theory modifications will be included as well as data employed in parameter estimation, estimation procedures and results.

Demand Equation for all Farm Labor

Because of the manner in which the theoretical model has been divided into the subsystems, the problem of non-unique parameter estimates does not arise in this set of equations. Therefore, either the derived demand equation or the marginal value product equation may be used in this subsystem. However, use of the marginal value product equation introduces additional linkages when the subsystems are assumed to be interdependent increasing the possibility of instability in the combined system (the dependence assumptions are discussed later in this chapter). Therefore, the derived demand equation is utilized in this analysis. The equation to be estimated is

$$A = b_0 + b_1(1+t_1)w^F + b_2\phi^0 + b_3\chi + b_4\phi^R + b_6\phi^Q.$$

Farm Household Employment Equation

The theoretically derived farm-household employment function is deficient in, at least, two respects. First, data on total time in the farm-household available for allocation to leisure or labor, D, is not available. Consequently, this variable was deleted.

Secondly, no allowance is made for the opportunity costs associated with remaining in the farm sector. Therefore, nonfarm wages net of social security taxes are included as a measure of the opportunity cost.

In addition to the opportunity costs, the quantity of hired labor employed is included as an explanatory variable in the farm-household employment equation. There is a substitution relation between hired labor and farm-household labor. This variable is included to explicitly account for the variation in farm-household labor associated with the substitution effect.

The price variables for consumption commodities, ϕ^C, and wealth, ϕ^M, as well as the carryover stock of wealth, M_0, are also altered for estimation. The consumption commodity price is deleted. Since all of the price variables are deflated to achieve constant purchasing power the effect of the consumption commodity price is implicitly included in every equation.

While data are available on the carryover of wealth the price of wealth is difficult, if not impossible, to define. Therefore, a single variable, equity (E), is employed as a proxy for both wealth carryover and the price of wealth.

The equation for farm-household labor is

$$H = b_7 + b_8E + b_9(1-t_1)w^N + b_{10}(1-t_2)NI + b_{11}N.$$

Hired Labor Supply Equation

The structural equation for hired labor supply contains the same arguments as presented in the theoretical function. The structural equation is

$$N = b_{13} + b_{14}P.A. + b_{15}(1-t_1)w^N + b_{16}(1-t_1)w^F$$

$$+ b_{17}N_0 + b_{19}u.$$

Data Sources[4/]

The total quantity of labor demanded, A, is approximated by the U.S.D.A. estimates of total labor required for all farmwork in hours [1975 Changes in Farm Production and Efficiency: A Summary Report].

The quantity of hired labor in hours, N, is determined by dividing the sum of cash wages paid plus the value of perquisites adjusted for social security tax payments by the average hourly wage for farm labor. Cash wages paid and value of perquisites are found in Farm Income Statistics.

The quantity of farm-household labor, H, is obtained by deducting the quantity of hired labor from the total quantity of labor employed.

The farm wage rate, w^F, is the average hourly wage without room and board. This rate is deflated by prices paid by farmers for all commodities. Both series can be found in Agricultural Statistics.

The price for agricultural output, ϕ^Q, is the index of prices received by farmers for all output and is deflated by prices paid for all commodities [Agricultural Statistics].

[4/] All basic data employed in this study are listed in Appendix D.

The index representing the price of current operating inputs, ϕ^0, is a weighted sum of the indexes of prices paid for livestock, feed, fertilizer, seed, motor supplies, building and fencing supplies, and prices paid for all commodities used in production [Agricultural Statistics]. Each index is weighted by the ratio of expenditures for the inputs associated with that index to total expenditures for current operating inputs [Farm Income Statistics]. The index of prices paid for all commodities is weighted by miscellaneous expenditures less interest on non-real estate debt. This composite index for ϕ^0 is deflated by the prices paid index for all commodities used in production and family maintenance.

The user cost of capital, χ, is the product of the price of capital, ϕ^K, and the sum of the rate of interest, r, and the rate of depreciation δ, [$\chi = \phi^K(r+\delta)$].

The current price of capital, ϕ^K, is a weighted sum of indexes. This price index includes the indexes of prices paid for motor vehicles, farm machinery, and building and fencing supplies [Agricultural Statistics]. The weights are ratios of current gross expenditures on each separate category and the sum of expenditures for all types of capital stock included in the variable. The capital stock price index is also deflated.

The interest rate, r, is determined by the ratio of interest paid on non-real estate debt, I_p, to total non-real estate debt, d, for each year.[5/] The data on interest paid are available in Farm Income Statistics and non-real estate debt is carried in the Balance Sheet of the Farming Sector. Further, the rate of interest is weighted by the ratio of non-real estate debt to non-real estate assets (which are defined to be capital stock in current value, $\phi^K K$) to obtain a more accurate estimate of the actual interest paid each year on non-real estate debt.

Therefore,

$$r\phi^K K = \frac{I_p}{d} \cdot \frac{d}{\phi^K K} \cdot \phi^K K$$

$$r\phi^K K = I_p \; .$$

The rate of depreciation for each year is determined by the equation

$$I_t = K_{t+1} - (1-\delta)K_t$$

The values for K_i are the observations on the capital stock variable, K. Capital stock includes machinery, motor vehicles and service buildings all valued in 1967 dollars (a more complete discussion is contained in Chapter IV). Gross investment, I_t, includes expenditures on all buildings and land improvements, motor vehicles, and other

[5/] This rate is not an opportunity cost, but reflects the cost of using external funds.

machinery and equipment [Farm Income Statistics]. The expenditures on buildings and land include new construction, additions, and major improvements.

The actual values for the social security tax rate on both wages, t_1, and self-employment income, t_2, are used in this study [Social Security Bulletin].

Aid to families with dependent children is used as an estimate of P.A., the average payment under public assistance. The data are an average payment per family per month for each year [Social Security Bulletin]. These values are deflated by the consumer price index [Agricultural Statistics].

During the years 1955-1960, inclusive, households with unemployed male heads were ineligible for these payments [Collins]. However, this is not contradictory to the theoretical analysis because the household becomes eligible if the male head migrates alone.

The expenses associated with land include interest on real estate debt, rent, and real estate taxes. The price, or cost, per acre, ϕ^R, is determined by dividing the total real estate costs by the number of farms and the average number of acres per farm. The price per acre is deflated by the index of prices paid by farmers for all commodities including interest, taxes, and wage rates [Agricultural Statistics].

The equity variable, E, includes the value of real estate, deposits and currency, U.S. savings bonds, and investment in cooperatives in 1967 dollars less farm real estate debt weighted by prices paid by farmers for all commodities [Balance Sheet of the Farming Sector].

The nonfarm wage rate, w^N, is represented by the average hourly wage rate paid factory workers multiplied by the average work week in hours for each year and deflated by the Consumer Price Index [Economic Indicators].

The unemployment rate, u, for the civilian population is found in Economic Indicators.

Net income, NI, is obtained by deducting the costs of production from the value of output according to the definition

$$NI = \phi^Q Q - (1+t_1)w^F N - \phi^0 0 - \chi K - \phi^R R.$$

The quantity variables are defined in Chapter IV. All data are for the years 1955-1974 inclusive. Estimates of the number of farms in each year are available in Farm Income Statistics.

Estimation Procedures

Combining the equations listed earlier in this chapter with the identity that the sum of hired labor, N, and farm-household labor, H, is equal to the total demand for labor, A, yields a system of three equations and three endogenous variables (H, N, w^F) assuming independent subsystems. If the subsystems are assumed to be interdependent then income net of production costs, NI, and product price, ϕ^Q, are added to the list of endogenous variables.

Identifiability of this or any simultaneous system is determined by the order and rank conditions [Kmenta]. The order condition which requires that the number of exogenous (or predetermined) variables excluded from the given equation equal or exceed the number of endogenous variables included in the equation less one [Kmenta, p. 543] is met by the equations under both assumptions about the relationship of the two subsystems. The equations under both assumptions are overidentified. The rank condition is assumed to have been met.

The problems of overidentification are avoided here by employing two-stage least squares (TSLS). The purpose of this approach is to eliminate the correlation between the error term in the structural equation and the endogenous variables contained in that equation as predetermined variables. This correlation is eliminated in the first stage by regressing the endogenous variables on the right-hand side on all of the contemporaneously exogenous variables in the subsystem. These regression equations are used to generate estimates of the endogenous variables.

In the second stage the structural equations are estimated using the predicted values of the endogenous variables on the righthand side instead of the actual data. Mathematically, the structural equation being estimated is

$$y_t = Y_t B + X_t G + u_t$$

where $y_t \equiv$ "the" endogenous variable vector

$Y_t \equiv$ matrix of other endogenous variables in the equation

$B \equiv$ vector of coefficients associated with the endogenous variables in Y_t

$X_t \equiv$ matrix of predetermined variables in the equation

$G \equiv$ vector of coefficients associated with the predetermined variables

$u_t \equiv$ vector of error terms

The first stage consists of estimating

$$Y_t = X\pi + v$$

where $X \equiv$ matrix of all predetermined variables in the system

$v \equiv$ vector of error terms

The second stage consists of estimating

$$y_t = Y_t B + X_t G + u^*$$

where $Y_t = X\pi$.

$u^* = u_t + vB$

It is assumed that the expected value of the structural error term, u_t, is zero, the error terms are serially unrelated, and that the expected variance of the error term is σ^2. In addition the predetermined variables are assumed to be independent of the error term [Johnston, p. 342].

The results of TSLS are useful in three ways. The estimated parameters can be tested for significance. The estimated structural equations provide sufficient information to estimate elasticities for the pertinent variables. Finally, the simulated subsystem utilizes predicted values from the simultaneous subsystem in determining the effects of social security taxes on resource utilization.

The number of endogenous variables varies according to whether the two subsystems comprising the complete system are assumed to be independent or interdependent. The simultaneous system describing the farm labor market was estimated under both assumptions.

Under the independent assumption the only link between the subsystems is total labor, A. Consequently, only N and w^F require first stage estimation.

The interdependent subsystems assumption requires that product price, ϕ^Q, and net income, NI, also be estimated in the first stage because these two variables are endogenously determined in the second subsystem. In addition, the simultaneous subsystem is estimated assuming social security taxes are unimportant, i.e. $t_1 = t_2 = 0$. The results of these estimations are presented in the following sections.

Results Assuming Independent Subsystems

Under the assumption of independent subsystems reduced form estimates are required for only two endogenous variables, N and w^F. All reduced form equations are contained in Appendix A. The estimated structural equations are presented in table 2.

Hired Labor Supply Equation

The original specification of the hired labor supply equation included unemployment and the average wage rate for factory workers net of social security taxes as independent variables. However, neither was significant and the signs of their respective coefficients were the reverse of expectations. Consequently, another approach to nonfarm income was adopted.

Following Tyrchniewicz and Schuh, average weekly income for factory workers is used to represent nonfarm income. To allow for expectations concerning employment in the nonfarm sector, Tyrchniewicz and Schuh weight weekly income by one minus the unemployment rate. This adjustment is employed here also. Although this variable does not appear to be significant in the labor supply equation, it does exhibit the expected sign.

Use of the t-test to determine the statistical significance of the parameters in the labor supply equation as

Table 2. Estimated structural equations assuming independent subsystems.

Hired Labor Supply

$$N^S = 37.269 - 2.5232PA + 175.77(1-t_1)\hat{w}^F - 1.1669(1-t_1)w^N + 1.286N_0 \qquad R^2 = .94$$

(.316) (1.63) (1.21) (.637) (6.52)***

Total Labor Demand

$$A = 3357.2 - 69.631\phi^R - 628.76(1-t_1)\hat{w}^F - 8.2118\phi^Q - 1931.3\chi + 308.2\phi^0 \qquad R^2 = .97$$

(3.43)*** (1.77)* (1.63) (.019) (2.74)*** (.569)

Farm-Household Employment

$$H = 3070.9 - .0049917E - .36698\hat{N} + .0080249(1-t_2)NI - 44.837T - 6.5266(1-t_1)w^N \qquad R^2 = .98$$

(10.21)*** (1.01) (1.03) (.405) (7.91)*** (1.35)

***Statistically significant at 1% level.
**Statistically significant at 5% level.
*Statistically significant at 10% level.

well as in the other equations is misleading. TSLS methods do not yield minimum estimates of the variances of the individual coefficients.

In addition to inefficiency, collinear relations among the predetermined variables will also inflate the variances of the parameters.

The effects of multicollinearity can be evaluated by inverting the simple correlation matrix. The values on the main diagonal of the inverted matrix are the amounts the variances for the appropriate coefficients are inflated by multicollinearity.

Since the t-tests are based on the standard error of the coefficient the t values are inflated by the square root of the appropriate main diagonal element. The presence of multicollinearity has inflated the standard errors of the coefficients associated with nonfarm wages and farm wage rates by a factor of approximately 2.4 and 3.8, respectively, in the hired labor supply equation.

Total Labor Demand Equation

The total labor demand equation contains those variables which are specified by the labor demand function, but it is estimated in linear form.

The marginal value product function for labor was also estimated but it was rejected because the demand equation produced more satisfactory results. The marginal value product equation had more sign reversals than the demand equation. In addition, the demand equation minimizes the number of linkages between the subsystems and reduces the estimation complexity of the combined systems. The estimated results are as specified by the theoretical demand function except that product price and price of current operating inputs exhibit the wrong sign.

One of the assumptions implicit in the type of production function employed here is that the inputs are complementary. Therefore, input prices are expected to be inversely related to quantity demanded of any input. However, the sign on the coefficient for the price of current operating inputs implies a substitution relation. There are two possible explanations for the estimated sign.

The effect of this variable on labor demanded may be statistically weak as implied by the t value. If this is true then it is possible that a strong collinear relation with one or more of the other predetermined variables may have caused a sign reversal.

While some multicollinearity is present, it is not known if the effect is strong enough to cause a sign reversal. The main diagonal element for price of current operating inputs in the inverted correlation matrix indicates that the standard error of the coefficient has been inflated approximately 2.5 times. Therefore, it is necessary to consider the possibility that the estimated results are correct.

To understand why the sign obtained on the price of current operating inputs may be correct, it is necessary to break the price into its component parts. Over 50 percent of the weights used in generating this price index are associated with inputs that may, indeed, be substitutes for labor. Among them are building and fencing supplies, motor supplies, feed and miscellaneous expenses. Miscellaneous expenses include, among other things, electricity expenses and small tool and equipment purchases.

The sign reversal on the product price coefficient is statistically insignificant. The t value associated with this parameter is so small that it is unlikely that removal of the inefficiencies caused by the estimation procedure and multicollinearity would yield significance. The variance inflation factor is only 4.8.

Other recent econometric work on the farm labor market generated positive signs on the product price coefficient [Hammonds, et al.]. However, the results are not strictly comparable because the data employed and years covered in the studies are different. In addition, the price variable employed by Hammonds was the ratio of prices received to prices paid. The use of this ratio does not preclude an insignificant product price effect.

Farm-Household Employment Equation

The farm-household employment equation generates the expected signs for all of the coefficients. The variance inflation factors for the insignificant variables in this equation (E, $\hat{N}$ and $(1-t_2)NI$) are relatively small. The range of values on the main diagonal of the inverted correlation matrix is 2.9 to 7.3. However, the values for E and N (4.0 and 4.9 respectively) indicate that the true significance of these variables may be sufficiently underestimated to incorrectly imply insignificance.

Besides the statistical problems the use of incomplete data for net income and equity further obscures the true effects of these variables.

The equity variable, in particular, may be seriously inaccurate. The data published by the U.S.D.A. as cash balances and holdings of U.S. bonds are very crude estimates and ownership of cooperatives is distributed among people who may or may not be in the farm sector. It was not possible to obtain estimates of the holdings of financial assets other than U.S. bonds by the farm sector. The Internal Revenue Service, in recent years, has provided much more accurate information on financial assets; however, the series available does not cover the entire study period.

The nonfarm wage variable in this equation is the same as the nonfarm wage variable in the hired labor supply equation.

A trend variable, T, is included in the farm-household employment equation to reduce the effects of time trend and excluded explanatory variables. The trend variable was also included in the other equations but the results were unsatisfactory and it was deleted.

Predicted Endogenous Variables with Independent Subsystems

The results of the second subsystem depend on the ability of the simultaneous equation subsystem to predict. Consequently, the reduced form equations for each of the endogenous variables were derived from the structural equations. Estimates of the endogenous variables were obtained and are presented in figures 7 through 10. Each figure contains actual and estimated values of the endogenous variable. The simple correlation coefficient between the data sets associated with each figure is also provided.

In general, the predicted values move well with the actual values over the period of analysis. The lowest simple correlation coefficient is .953. In addition, over the four sets of comparisons only one predicted value deviates from the actual value by more than 10 percent.

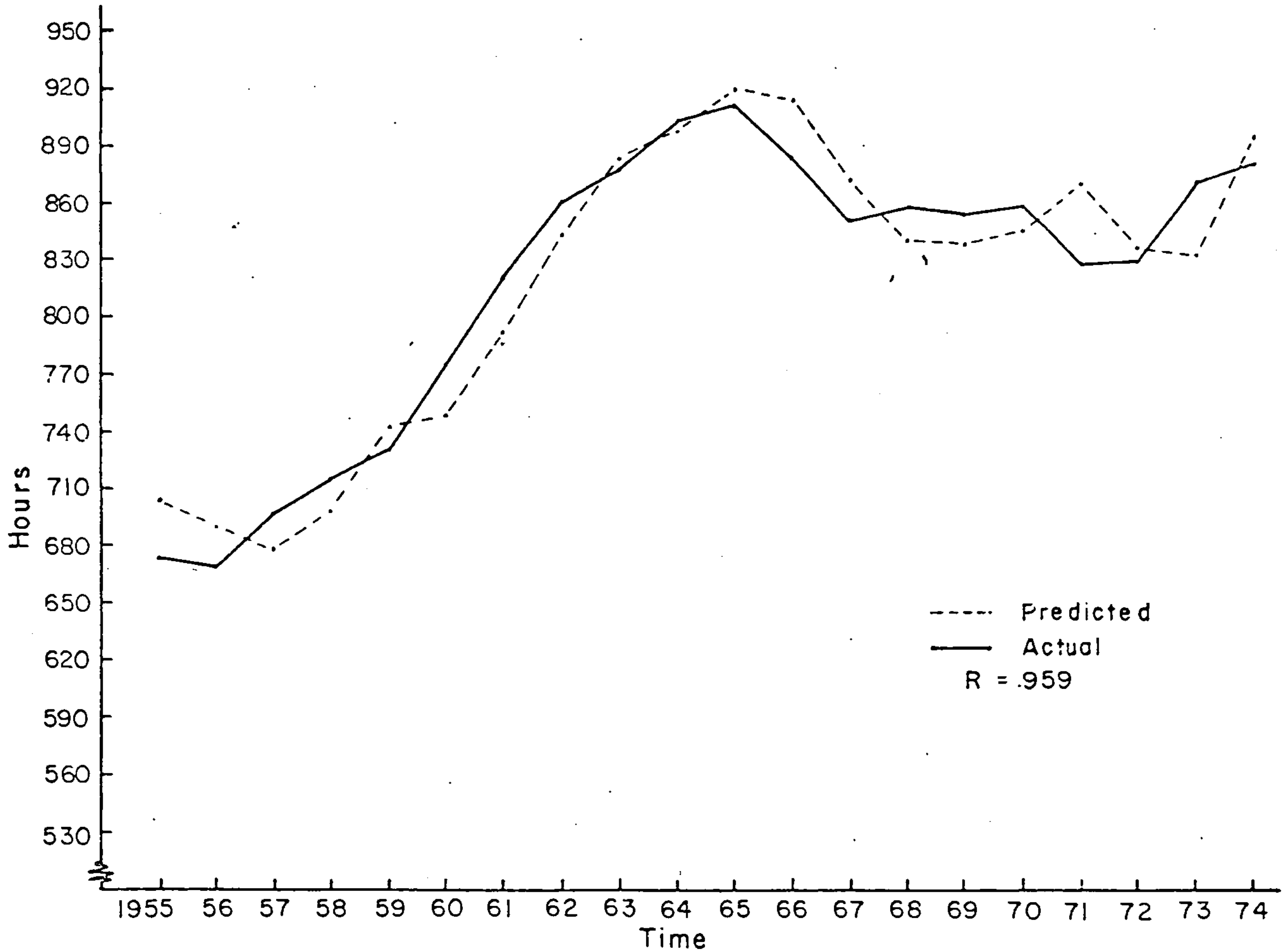

Figure 7. Predicted and actual hours of hired labor under independent assumptions.

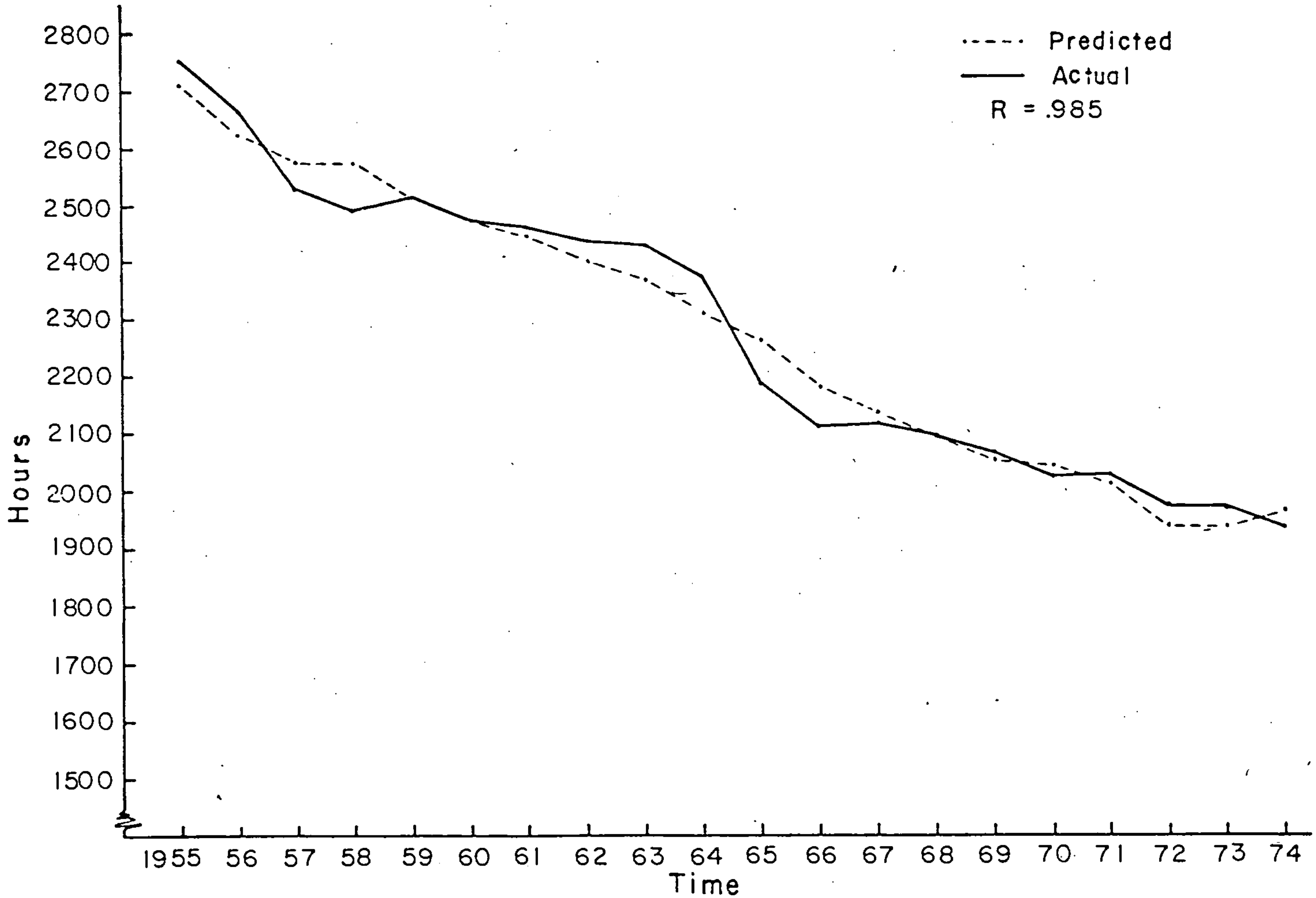

Figure 8. Total hours of labor employed under independent assumption.

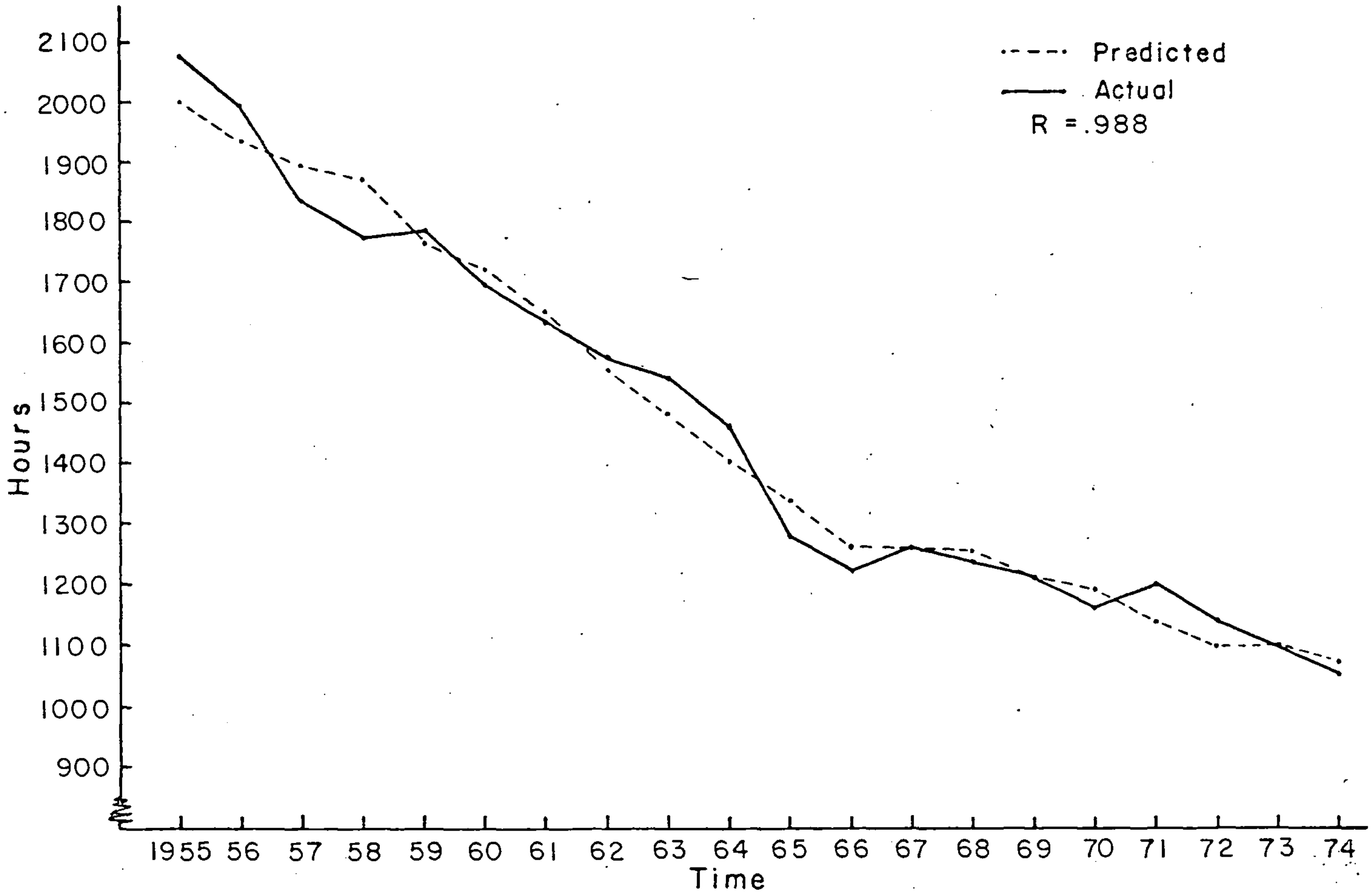

Figure 9. Predicted and actual hours of household labor under independent assumption.

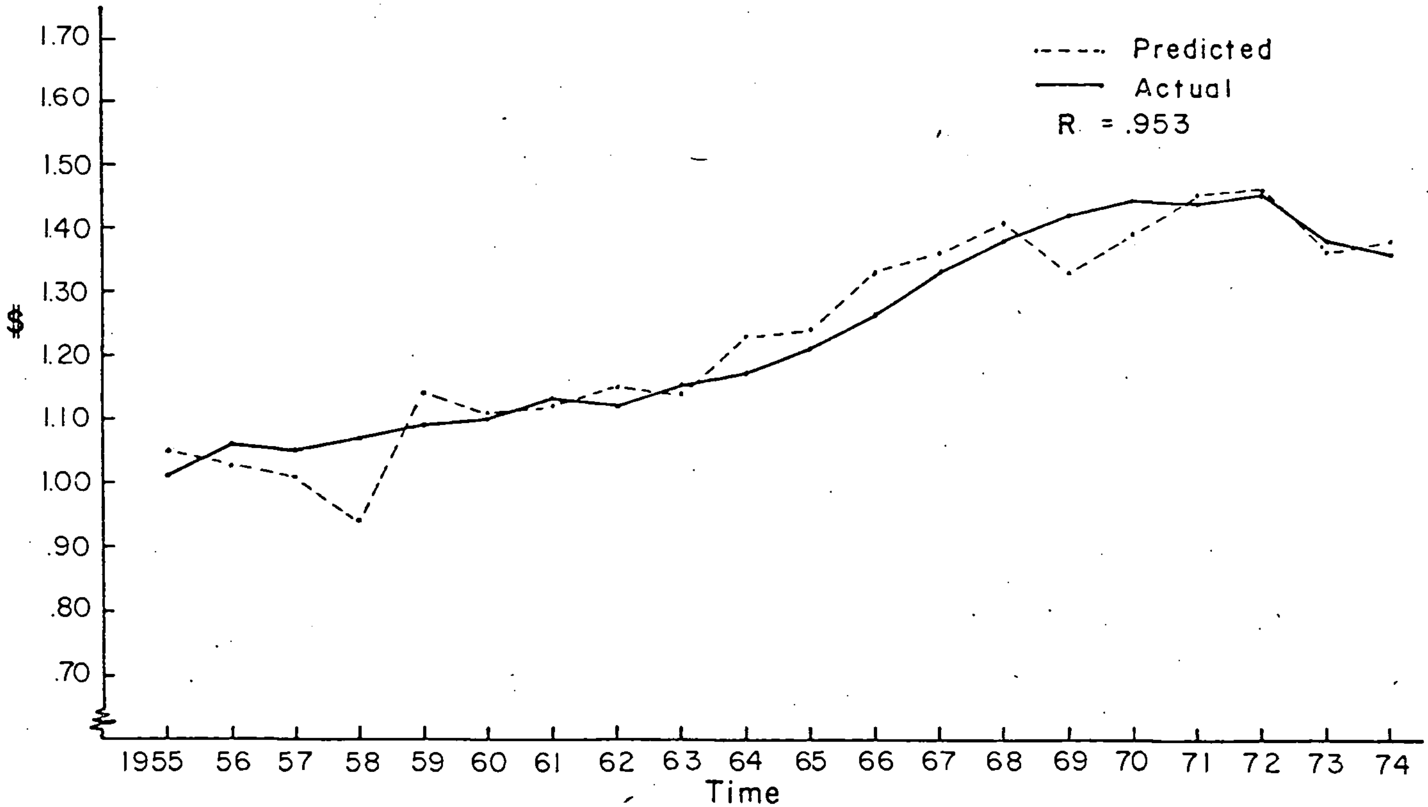

Figure 10. Predicted and actual wages under the independent assumption.

Results Assuming Dependent Subsystems

The equations estimated under this assumption are presented in table 3. The effect of the assumption is to increase the number of variables to be estimated in the first stage. The net income, NI, and product price, ϕ^Q, variables are also estimated in the first stage. The exogenous variables in the second subsystem are included in the first stage regressions as explanatory variables. The first stage regressions are in Appendix A.

Hired Labor Supply Equation

The effects of the dependent assumption resulted in a lower coefficient for the farm wage rate and a larger intercept. The statistical significance of both the farm and nonfarm wage variables are still understated. The variance inflation factors for the farm and nonfarm wage parameters are 14.25 and 5.66, respectively.

Total Labor Demand Equation

The estimation results for this equation show considerable variation from the results assuming independent subsystems. The largest variation is in the product price coefficient. There is a sign reversal with the coefficient now exhibiting the expected sign. The absolute value of the coefficient is also changed. The estimate obtained

Table 3. Estimated structural equations assuming dependent subsystems.

Hired Labor Supply

$$N^S = 51.679 - 2.2093PA + 143.58(1-t_1)\hat{w}^F - 1.136(1-t_1)w^N + 1.2576N_0 \qquad R^2 = .94$$

(.435) (1.43) (.994) (.612) (6.34)***

Total Labor Demand

$$A = 3043.6 - 85.387\phi^R - 485.99(1+t_1)\hat{w}^F + 194.87\hat{\phi}^Q - 1964.2\chi + 296.04\phi^O \qquad R^2 = .97$$

(3.09)*** (2.10)** (1.24) (.420) (2.78)*** (.548)

Farm-Household Employment

$$H = 3099.6 - .0030409E + .019842(1-t_2)\hat{NI} - .40049\hat{N} - 43.962T - 8.02(1-t_1)w^N \qquad R^2 = .98$$

(10.58)*** (.616) (.954) (1.17) (7.94)*** (1.68)

***Statistically significant at 1% level.
**Statistically significant at 5% level.
*Statistically significant at 10% level.

here is over 20 times larger than the estimate derived with the independent assumption. Other deviations of more than 10 percent are found in the intercept term and the coefficients associated with land price and farm wage variables.

Product price still does not appear to be significant. The variance inflation factor is 5.6. Multicollinearity may, however, disguise the actual significance of the farm wage rate. The variance inflation factor for this variable is 29.4.

Farm-Household Employment Equation

The variation in estimated results is not as great with this equation as compared to the variation noted in the total labor demand estimates. The largest variation is in the net income, NI, parameter. The net income parameter doubled in size and its significance, as reflected in the t-value, increased while the equity, E, parameter was reduced in both size and level of significance. Given the variance inflation factors for E and NI (2.26 and 2.99, respectively), the actual significance of these variables is not obvious. While the inflation factors in this equation indicate that E would not be significant at the 10 percent level in the absence of multicollinearity, the reverse is true for NI. Referring back to the farm-household equation estimated with the independent assumption, it can be seen that the results concerning statistical significance are reversed.

Predicted Endogenous Variables with Dependent Subsystems

The endogenous variables considered here are those for which reduced form equations can be derived from the simultaneous system (w^F, N, H, and A). The actual values of NI and ϕ^Q were used in generating the predicted values. The predicted values for the labor variables with the dependent assumption are the same as the predictions employing the independent assumption. The simple correlation coefficients and actual deviations for these variables show little variation from one assumption to the other.

The predicted values for the farm wage rate under the dependent assumption are not as accurate as those under the independent assumption. While the distribution of the predicted values around the actual values is the same, the estimates derived here show greater deviation from the actual values for almost every year. These larger deviations may be a result of the dependent assumption. The structural coefficients for ϕ^Q and NI are based on first stage estimates of these variables under the dependent assumption. This set of estimates are presented in figures 11 through 14.

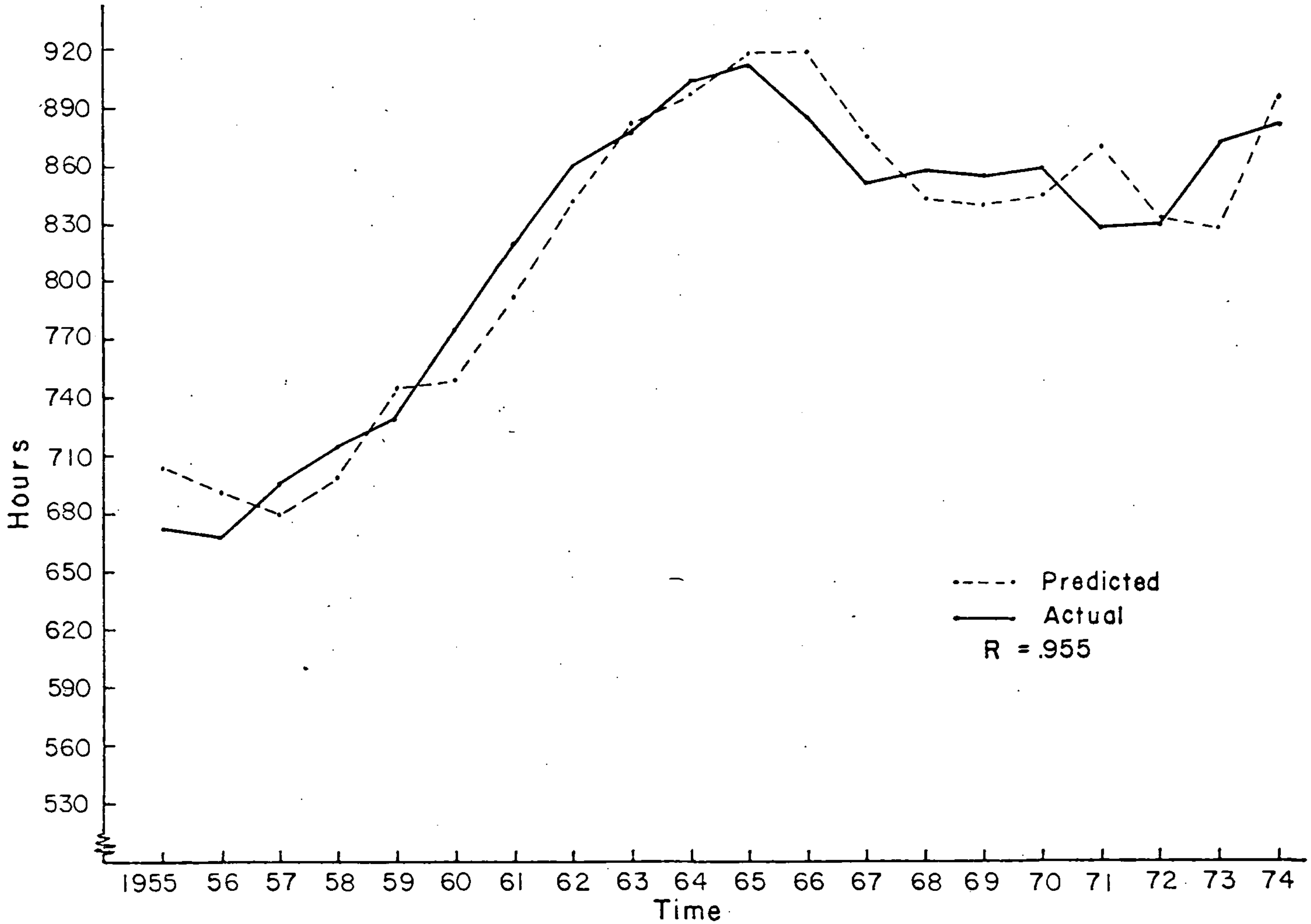

Figure 11. Predicted and actual hours of hired labor under dependent assumption.

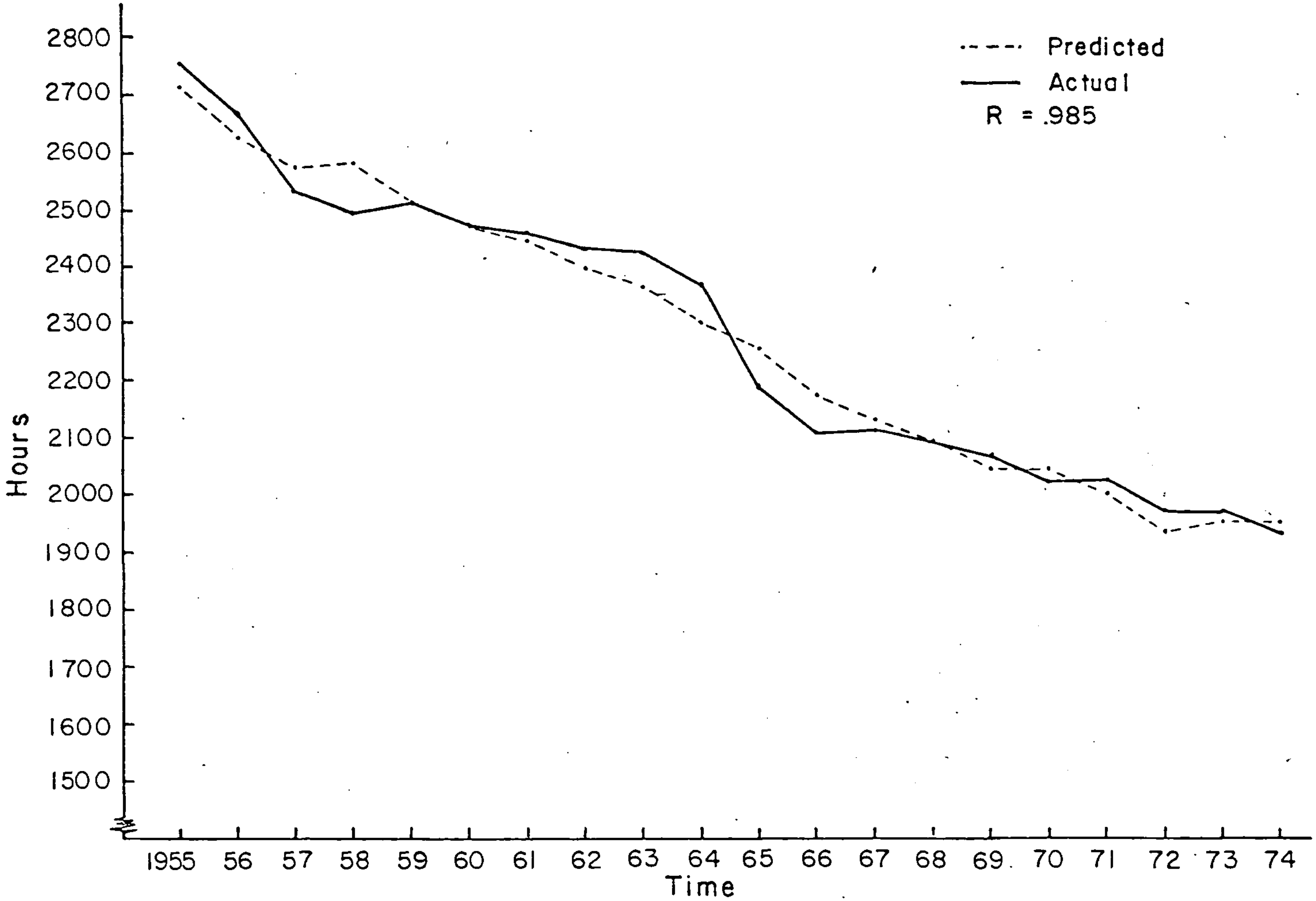

Figure 12. Total hours of labor employed under dependent assumption.

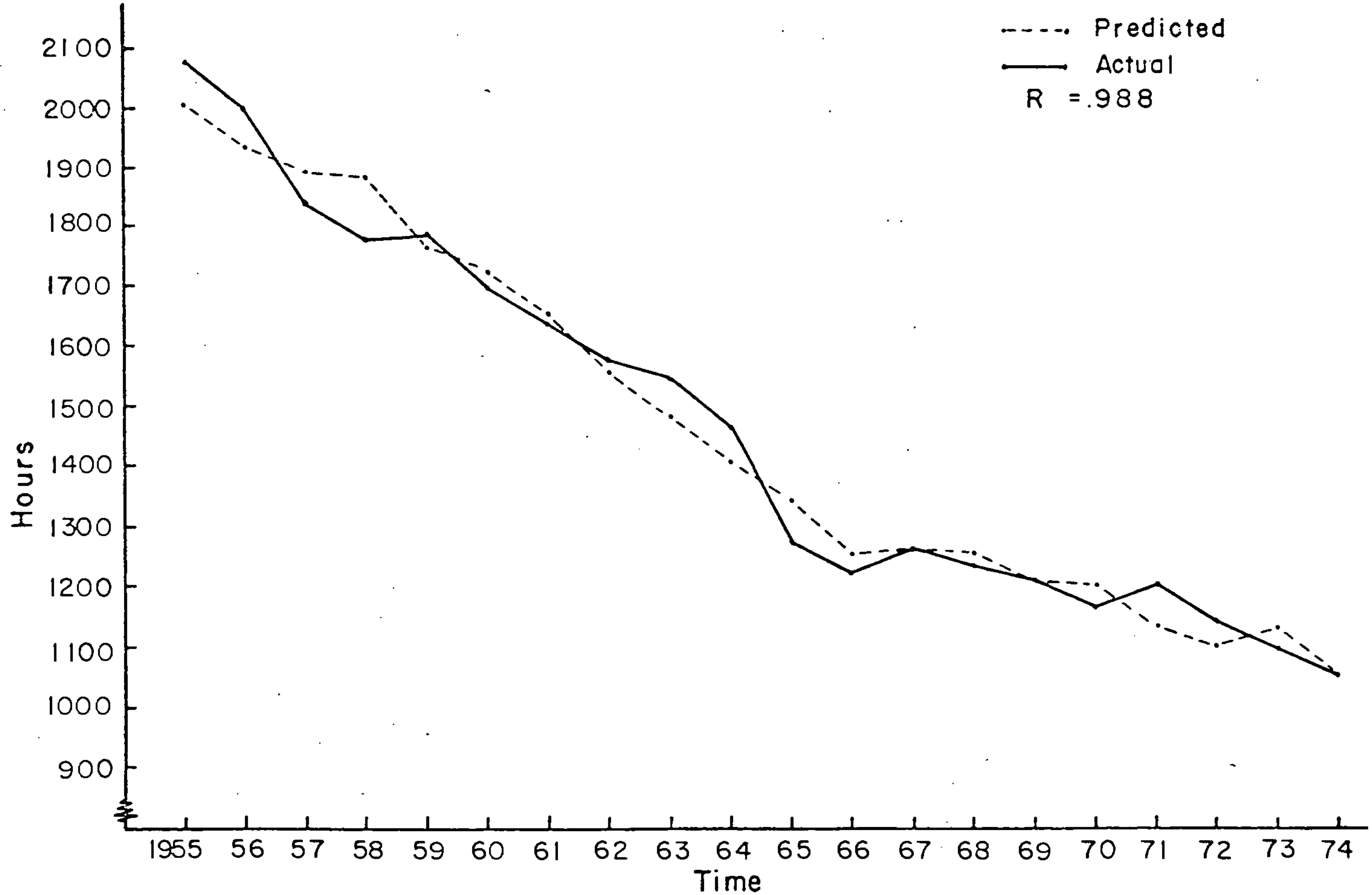

Figure 13. Predicted and actual hours of household labor under dependent assumption.

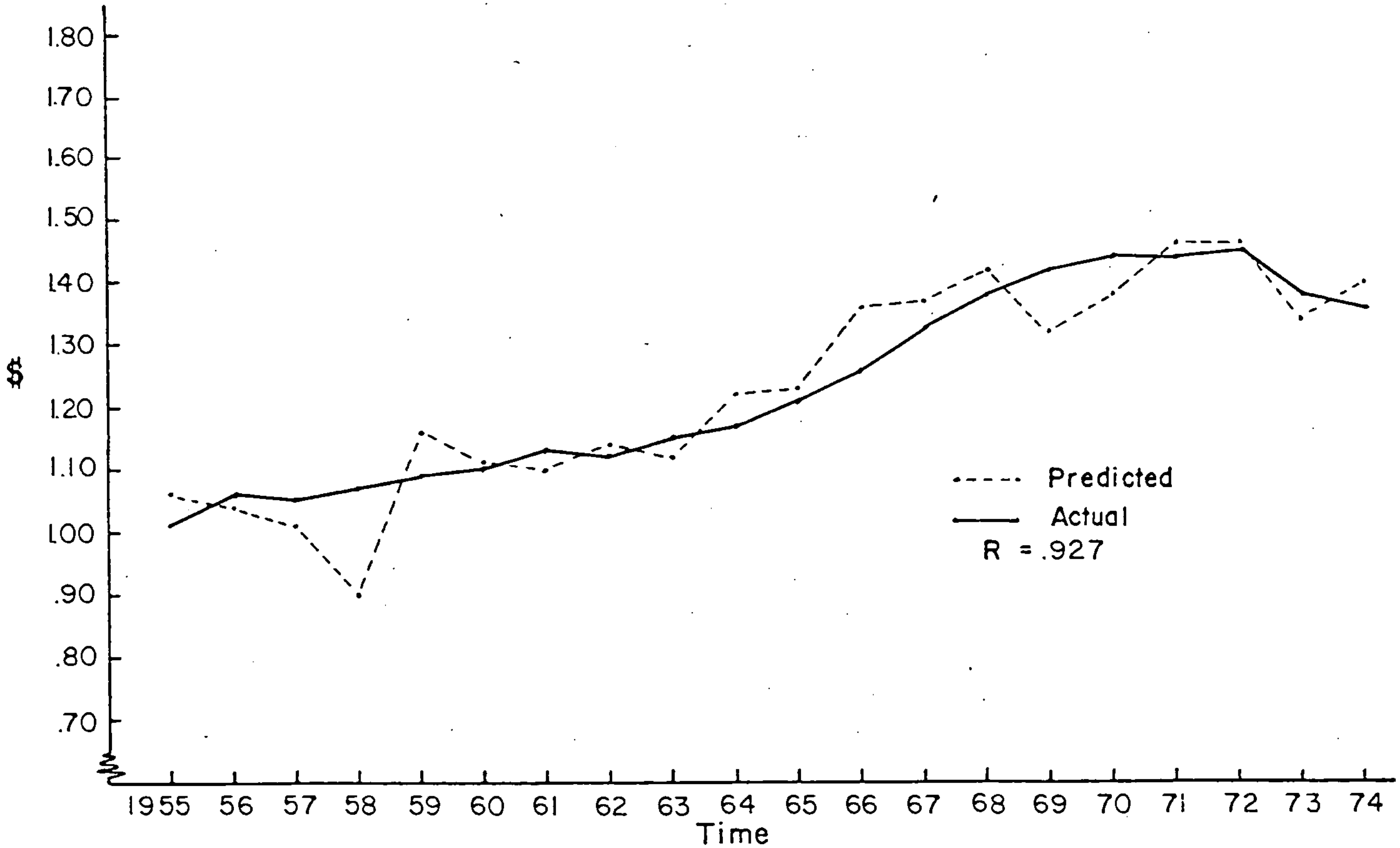

Figure 14. Predicted and actual wages under dependent assumption.

Results without Social Security Taxes assuming Dependent Subsystems

Since social security taxes are included in the simultaneous system in a nonlinear manner, it is not possible to directly test the significance of the tax rates. However, by estimating the system without the tax rates, comparisons may be made with the system estimated assuming dependent subsystems that included the tax rates. The results of the estimation without tax rates are presented in table 4.

Hired Labor Supply Equation

The results obtained here do not deviate, to any great extent, from those obtained with the tax rates. The variation in parameter estimates does not exceed 20 percent for any parameter.

While the significance levels associated with the t-values do not vary, deletion of the tax rates appears to increase the significance of the farm wage rate and reduce the statistical importance of the nonfarm wage.

Total Labor Demand Equation

The parameter estimates for this equation are statistically the same as those in the with-tax equation. The

Table 4. Estimated structural equations without social security tax rates.

Hired Labor Supply

$$N^S = 51.907 - 2.2235PA + 132.88\hat{w}^F - .94305w^N + 1.2484N_0 \qquad R^2 = .94$$

(.59) (1.59) (1.11) (.55) (6.34)***

Total Labor Demand

$$A = 3151.7 - 87.78\phi^R - 548.83\hat{w}^F + 191.25\hat{\phi}^Q - 1970.3\chi + 258.12\phi^0 \qquad R^2 = .97$$

(3.10)*** (2.35)** (1.31) (.42) (2.82)** (.47)

Farm-Household Employment

$$H = 3074.1 - .00348E + .01669\hat{N}I - .42074\hat{N} - 42.771T - 7.1249w^N \qquad R^2 = .98$$

(10.61)*** (.705) (.86) (1.22) (6.96)*** (1.56)

***Statistically significant at 1% level.
**Statistically significant at 5% level.
*Statistically significant at 10% level.

variation in the t values from one set of estimates to another is small.

Farm-Household Employment Equation

A visual comparison of the results for this equation with the with-tax equation indicates that these results show the least variation in parameter estimates and t values of the three equations.

Predicted Endogenous Variables without Tax Rates

Based on the simple correlation coefficients, this system predicts the endogenous variables slightly more accurately than the system with tax rates. Two of the four correlation coefficients are the same for both systems. However, the system without tax rates yields results slightly better for both hired labor and farm wage rates. The predicted values are compared with actual observations in figures 15 through 18.

Elasticities

Elasticities for social security tax rates, farm wage rate and public assistance have been calculated from each of the systems and are presented in table 5. For purposes of comparison, certain elasticities were calculated twice from the system that was estimated without social security tax rates. One set of estimates was obtained by

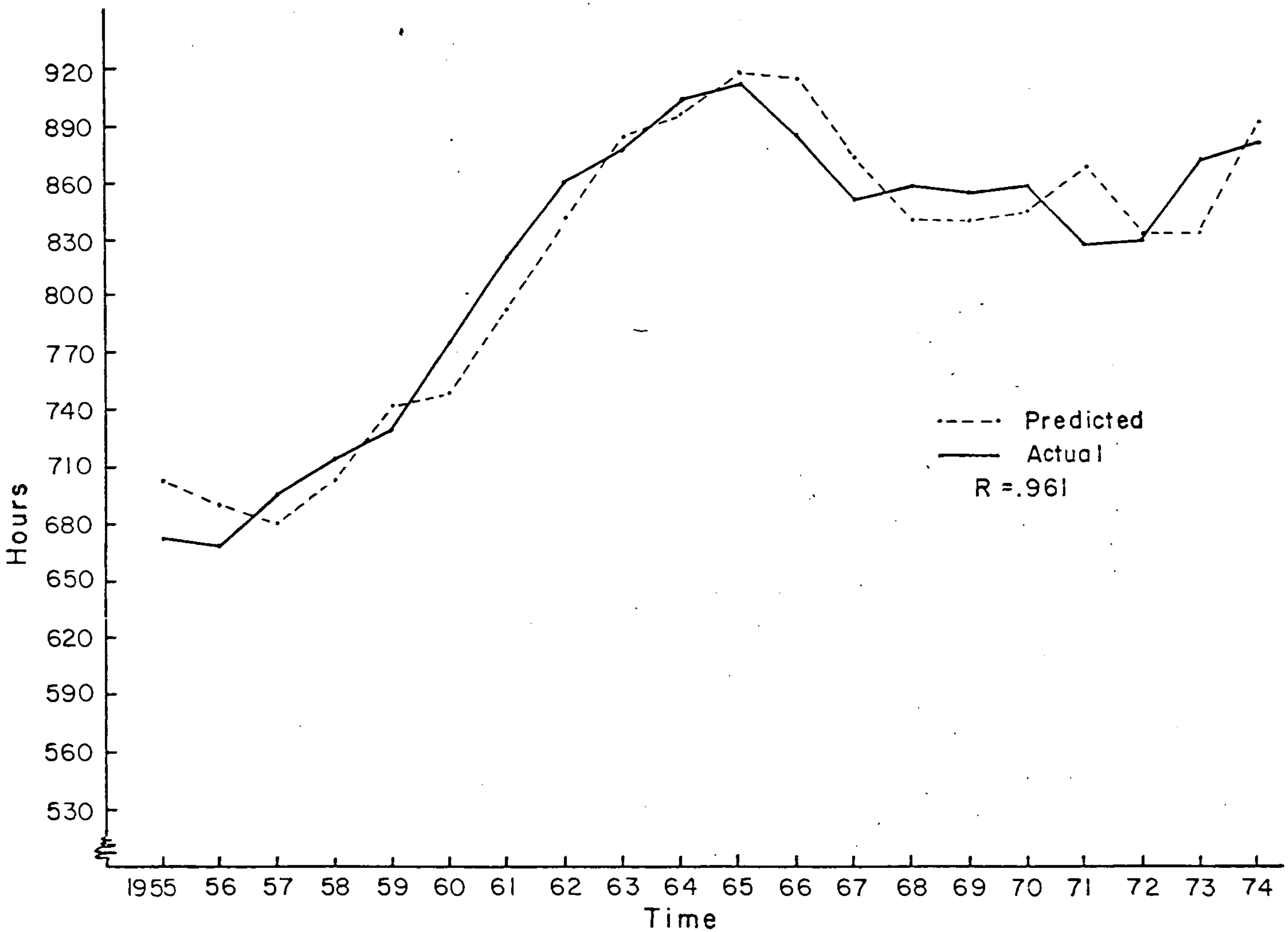

Figure 15. Actual and predicted hours of hired labor without social security tax rates.

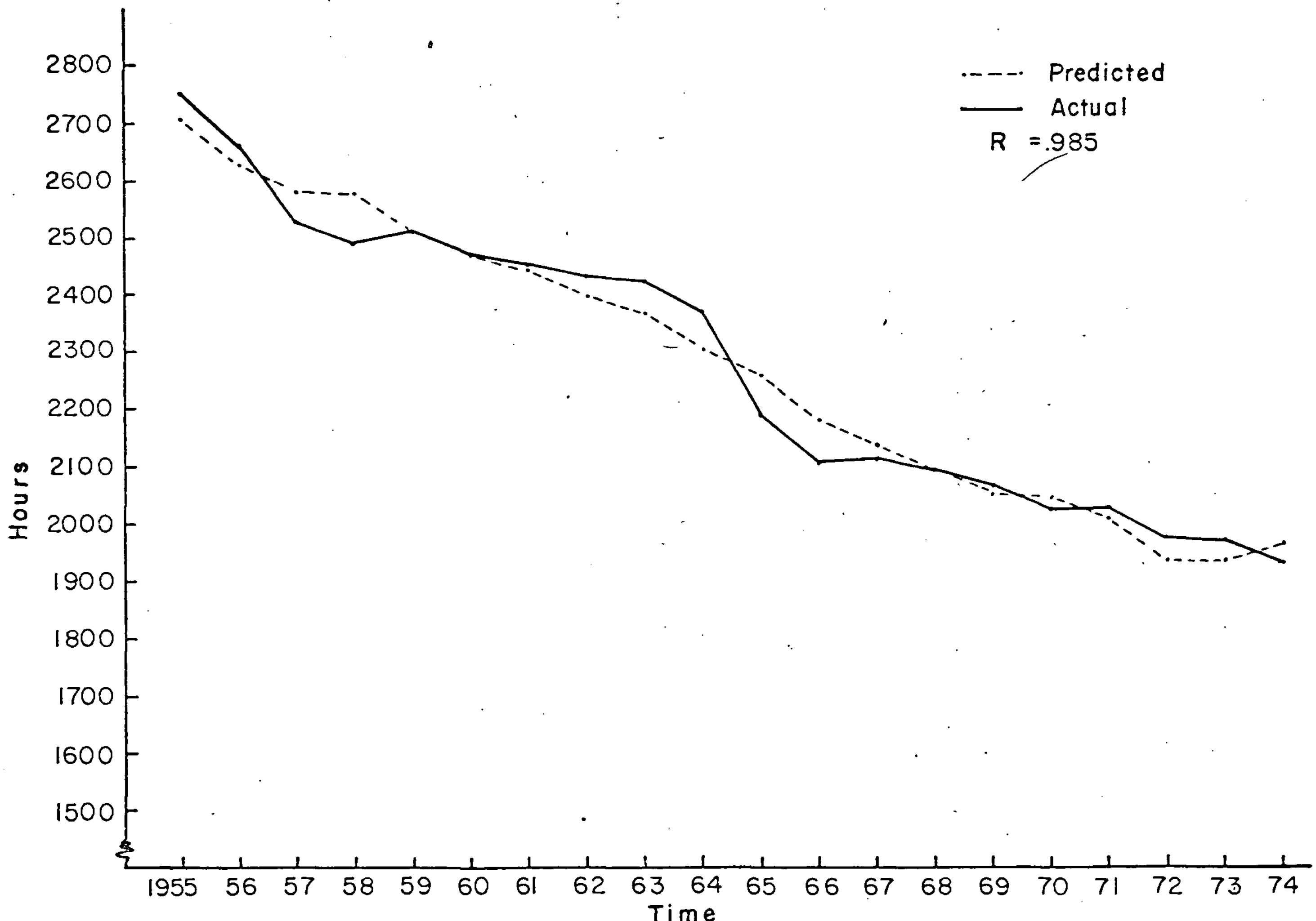

Figure 16. Actual and predicted total hours of labor employed without social security taxes.

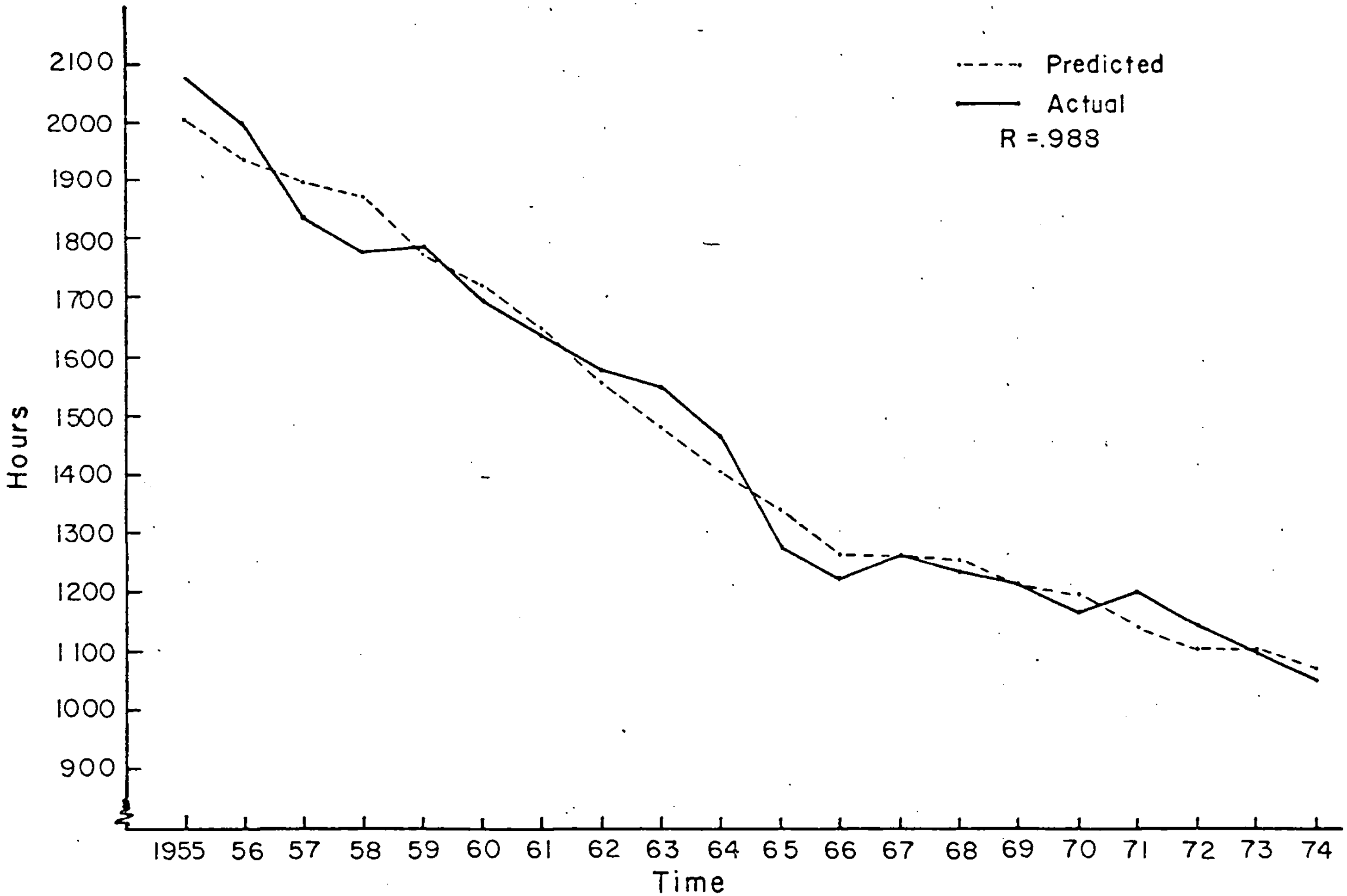

Figure 17. Actual and predicted hours of household labor without social security taxes.

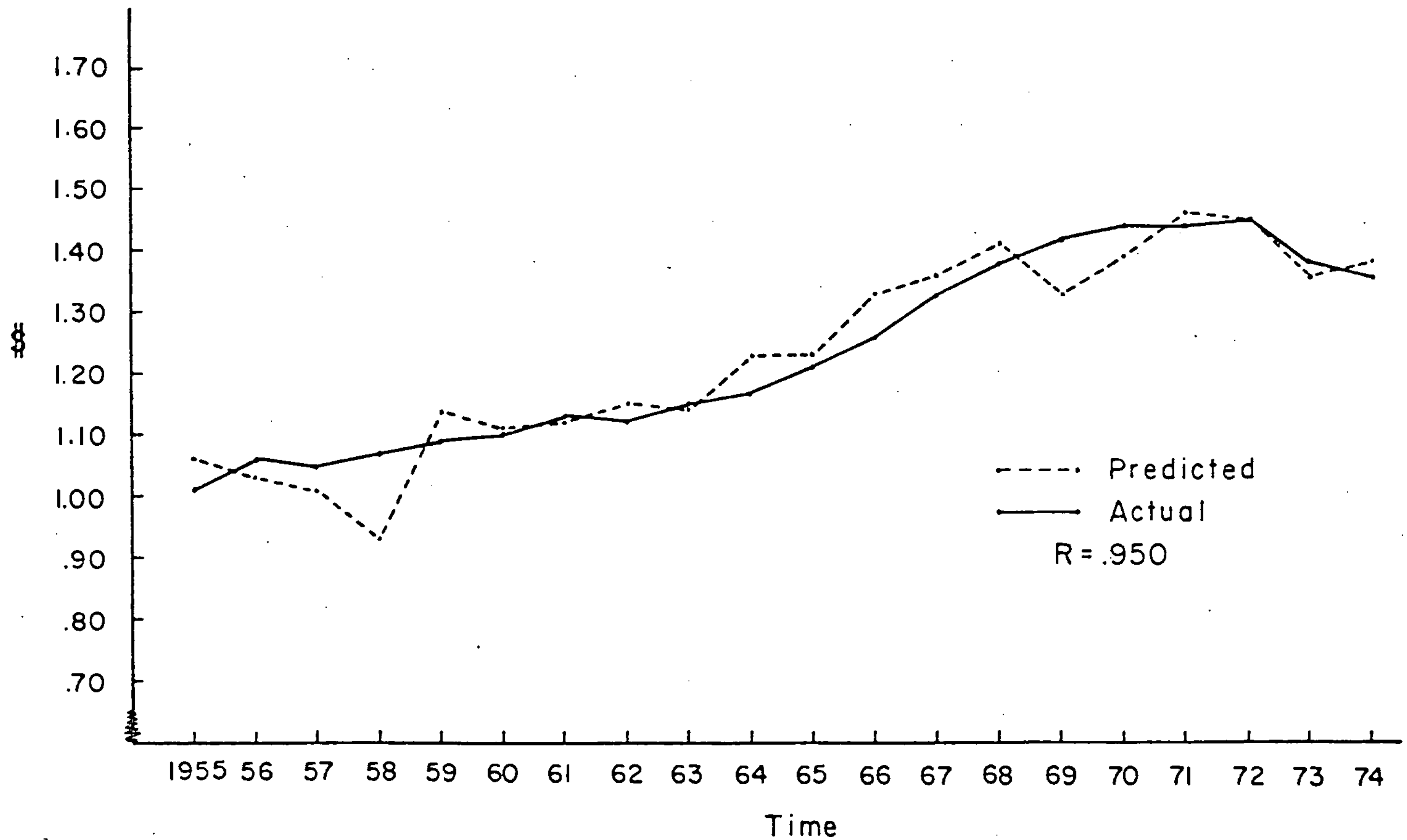

Figure 18. Actual and predicted wage rates without social security tax rates.

Table 5. Elasticities.

	Independent Systems	Dependent Systems	Without Taxes[1]	Without Taxes[2]
Hired Labor Supply				
PA	-.428	-.375	-.377	-.377
t_1	-.00446	-.00277	-.0031	--
w^F	.255	.2080	.1925	.2147
Hired Labor Demand				
t_1	-.107	-.11298	-.10977	--
t_2	.0044	.01164	.00258	--
w^F	-1.561	-1.277	-1.699	-1.64
Household Employment				
t_1	.0396	.0477	.0434	--
t_2	-.000184	-.00501	-.00196	--
w^F	.3215	.2896	.38576	.3729
Total Labor Demand				
t_1	-.0128	-.0099	-.01325	--
w^F	-.3523	-.2723	-.36326	-.3500

[1]Calculated from system estimated without tax rates and tax rates inserted after estimation.

[2]Calculated from system estimated without tax rates included either before or after estimation.

inserting the tax variables into the system after the regressions had been completed. The second set of estimates was derived without the inclusion of the tax variables.

The elasticities for the social security tax rates indicate that social security taxes are relatively unimportant. This is particularly true for the supply of hired labor. A one percent increase in the employee's payroll tax reduces the quantity supplied of labor by .004 percent. At the mean this is a reduction of less than .04 hour per farm. Using the mean number of farms, this reduction is equivalent to 12000 ten hour man days out of 289 million total man days.

The most significant effect of the employee's tax rate is on the demand for hired labor where a one percent increase in the tax rate reduces quantity demanded by approximately .11 percent. At the mean this translates into a reduction of .9 hours of hired labor per farm per one percent increase in the employee's tax rate. This converts into approximately 320,000 man days across the farm sector.

While the effects of tax rate changes are small, the difference of the effects on supply and demand for hired labor implies that social security taxes are a factor in the rural unemployment problem.

Increases in the self-employment tax rate will reduce the effects of increases in the employee's tax rate.

However, it is obvious from the size of the elasticities that the effects of changes in the self-employment tax rate will be small.

The residual nature of the demand for hired labor is evident from the farm wage elasticities. While the total demand for labor is inelastic with respect to farm wage rate changes, the demand for hired labor is elastic. In addition, the use of household labor is inelastic with respect to the wage rate. Given the direction of the effects of wage changes, an increase in the wage rate reduces the total demand for labor but increases the use of farm-household labor. Therefore the demand for hired labor is reduced by both the reduced demand and increased use of farm-household labor.

While the estimated system without taxes does not yield parameter estimates significantly different than the estimates obtained under the dependent assumption, there is some variation in the elasticities derived from the two systems. These are the elasticities in the second and third columns in table 5. Whether the variations in the estimated point elasticities between systems is sufficient to negate the implication of the results of comparison of the parameter estimates is not known.

The insignificantly different parameter estimates for the two systems implies that the effects of social security may be determined without directly including the tax rates in the analysis. The last column in table 5 contains elasticities estimated from the third subsystem and does not include social security tax rates.

CHAPTER IV. SIMULATION SUBSYSTEM

Introduction

Partitioning the overall system of equations into two subsystems does not completely eliminate the estimation problems with the overall system. While the subsystem describing the farm labor market can be estimated by TSLS the subsystem describing the other factor markets and the product market is not amenable to this estimation procedure.

Originally, attempts were made to estimate the complete system following the approach of Rosine and Helmberger. These attempts were unsuccessful because it was not possible to incorporate the linear labor equality into the nonlinear system.

The reason for using the Rosine and Helmberger approach was to circumvent the problem of nonunique parameter estimates. After the first unsuccessful estimation attempts were made, the equations representing the farm labor market were deleted from the complete system and estimated as described in the previous chapter. The Rosine and Helmberger approach was then employed in evaluating the remaining equations. While this approach does not provide the same type of information obtainable from TSLS, it is expected to provide indications of the direction and magnitude of the indirect effects of social security taxes on the utilization of other inputs and output.

This chapter contains a discussion of the equations in the subsystem, estimation procedures, data, and results. The results include estimates of resource allocation in the absence of social security taxes in the farm sector.

Simulated System

This section includes a description of the equations contained in the simulated system and a discussion of the data used in measuring the variables.

Equations

The second subsystem contains the production function for agricultural output, the demand function for output, and the marginal value product functions for capital stock and current operating inputs. The use of these functions is necessitated by the estimation procedures employed.

The equations are utilized in the following functional form:

Production function:

$$\hat{Q} = \beta_0 A^{\beta_1} \hat{O}^{\beta_2} \hat{K}^{\beta_3} R^{\beta_4}$$

Current operating inputs:

$$\phi^0 = \beta_2 \beta_0 A^{\beta_1} \hat{O}^{\beta_2 - 1} \hat{K}^{\beta_3} R^{\beta_4} \hat{\phi}^Q$$

Capital stock:

$$\chi = \beta_3 \beta_0 A^{\beta_1} \hat{O}^{\beta_2} \hat{K}^{\beta_3 - 1} R^{\beta_r} \hat{\phi} Q$$

Product demand:

$$\hat{Q}^D = \gamma_0 (\hat{\phi} Q)^{\gamma_1} P^{\gamma_2}$$

The Data

The quantity of agricultural output, Q, is defined to include cash receipts from market sales, home consumption, net change in inventories, government payments and other farm income [Farm Income Statistics]. These data are converted to a 1967 base using as deflators the index of prices received for livestock and livestock products, the index of prices received for all crops and the index of prices paid by farmers for all commodities [Agricultural Statistics]. The prices paid index is used to deflate government payments and other farm income.

Although government payments and other farm income are not strictly returns from production they do not represent a large proportion of total income. Over the twenty year period 1955 to 1974 these two income sources average 5-1/2 percent of actual marketings. In 19 of the 20 years government payments dominated other farm income and most of the government payments are in the form of production subsidies. Therefore the amount of income not directly related to farm production is small. In addition, combining these income sources, which are all taxable, simplifies the model.

The quantity of current operating inputs, O, includes feed purchased, livestock purchased, seed purchased, fertilizer and lime purchased, miscellaneous expenses less interest on nonreal estate debt, repairs and operation of service buildings, motor vehicles, and machinery, and petroleum fuel and oil. Repairs of service buildings includes land improvements but does not include maintenance of the farm dwelling. Each item is weighted by a price index with a 1967 base.

Price indexes are available for feed, livestock, fertilizer, and seed purchased. Repairs of service buildings and land improvements are weighted by the price index for building and fencing materials. The price index for motor supplies is used to deflate repairs and operation of motor vehicles and machinery, petroleum fuel and oil. Miscellaneous expenses are deflated by the price index for all commodities bought for use in production [Agricultural Statistics, Farm Income Statistics]. All indexes used in this study have a 1967 base and all index values are divided by 100.

Capital stock, K, includes machinery, motor vehicles, and service buildings. The value of machinery and motor vehicles on January 1, of each year is reported in the

Balance Sheet of the Farming Sector. The 1975 edition of this publication lists yearly values in 1967 dollars.

The current value of service buildings is determined with the use of unpublished U.S.D.A. data on the value of farm dwellings. Published data on the value of dwellings and service buildings is available in Farm Real Estate Market Developments. Deduction of dwelling values yields the value of service buildings in current dollars. These values are deflated using the index of real estate values.

Each of the above variables is divided by the number of farms to obtain quantity per farm. Estimates of farm numbers per year are available in Farm Income Statistics.

Data on average acres per farm, R, are available in the 1975 edition of Agricultural Statistics for the years 1960-1974 inclusive. Estimates for the first five years of the study period are obtained by dividing total land in farms by the number of farms [Farm Real Estate Historical Series Data 1850-1970].

Estimates of the U.S. population, P, by year are used on a per farm basis [Agricultural Statistics].

Estimation Procedures

The method employed here has been discussed and used by Rosine and Helmberger. Their approach includes the use of parameter estimates for each year in predicting endogenous variables.

Simulation Procedures

In the Rosine and Helmberger approach the equations are transformed into logarithms and set up as a simultaneous equation system. In matrix form the system can be written as

$$GX + BY = u$$

where G ≡ matrix of coefficients associated with the predetermined variables

X ≡ vector of predetermined variables

B ≡ matrix of coefficients associated with the endogenous variables

Y ≡ vector of endogenous variables

u ≡ vector of error terms

By substituting into G and B estimated values for the coefficients the endogenous variables are estimated by

$$\hat{Y} = -B^{-1}GX$$

The predictive power of this subsystem is measured by a comparison of the predicted values of the endogenous variables with the corresponding actual values.

One of the characteristics of the Cobb-Douglas type production function under conditions of unconstrained profit maximization is that the function coefficients are equal to the ratio of input outlay to gross revenue in equilibrium. These results are obtained directly from the marginal conditions. The coefficient estimates are derived by these ratios.

The constant term, β_0, is obtained using the other estimated coefficient values in the following manner

$$\beta_0 = Ln(Q) - \hat{\beta}_1 Ln(A) - \hat{\beta}_2 Ln(O) - \hat{\beta}_3 Ln(K) - \hat{\beta}_4 Ln(R).$$

A set of production function coefficients is derived for each year. The coefficients for the product demand equation are derived by ordinary least squares. Given the estimated production function parameters, the endogenous variables are estimated using the predetermined variables.

In order to determine the effects of the social security tax rates on the variables endogenous to the simulated system, estimates of total labor, A, are obtained from the reduced form equations for N and H in the simultaneous system estimated by TSLS.

Setting net income equal to zero and product price equal to its actual value, estimates of N and H are obtained. These estimates are summed together and then used in solving the simulated system for ϕ^Q, Q, O, and K. Using these values and the appropriate exogenous variable net income is estimated. Using the new value of net income and product price the total labor variables is reestimated. This process is repeated until the control variable converges. Labor and product price were employed as control variables.

By adjusting the tax rates variations in the endogenous variables in both systems can be predicted. In this study predicted values are generated for the endogenous variables in the absence of the taxes. From these predictions inferences can be made about the direction of the effects of the taxes and their aggregate impact on the farm sector since 1955. Three sets of predictions are made. Two sets of predictions involve setting one tax rate equal to zero while the other rate assumes its actual value. The third set of predictions is based on both tax rates being set equal to zero.

Parameter Estimation

Three sets of production function coefficient estimates are considered. The first set is derived in the manner suggested by Rosine and Helmberger. The value of an individual input parameter is determined by the ratio of expenditures for that input to total production costs. The labor coefficient is derived by multiplying hourly labor cost by total labor employed and then dividing by total outlay. Total outlay includes the imputed value of the farm-household labor employed.

The second set of estimates is based on gross revenue. Each input coefficient is equal to the ratio of the expenditures for that input and gross revenue.

The third set of coefficients is the same as the second except that those variables which are endogenous to either subsystem are replaced by estimated values. The estimated values are obtained by regressing the actual values against all of the exogenous variables in the complete system. These regression equations are used to generate the estimated values.[6]

The coefficients for the product demand equation were obtained by regression. Simple regression of the equation resulted in an incorrect sign for the product price. Following Rosine and Helmberger the product price coefficient is assumed to be negative and greater than minus one. To obtain the best fit the product price coefficient was assigned values ranging from -.1 to -.9 in steps of .1. Regressions were completed for each of these values. The best fit in terms of R^2 was associated with the value of -.1. The equation employed in this analysis is

$$\hat{Q}^D = 49.13144(\phi^Q)^{-.1}(P)^{1.4138}(T)^{-.04998}$$

Simulation Results

The results of the simulated portion of the analysis include evaluation of the system's ability to predict and presentation of the predicted tax effects.

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[6] All three sets of coefficients are listed in Appendix B.

Predictive Power

Testing the predictive power of the system involved the generation of predictions for the endogenous variables. Using the social security tax rates as they actually occurred the total labor variable, A, is estimated. Estimates of Q, O, K, and ϕ^Q are obtained from the simulated subsystem and the process is repeated until product price converges. The convergent limit was defined to be a change in predicted value of ϕ^Q from one iteration to the next of less than .01 percent. For most years the final change in both N and H was also within the limit set for ϕ^Q.

Table 6 contains the average absolute deviations of the predicted variables from the actual values for those variables. These averages are listed according to the simultaneous labor system used to predict total labor employed and the set of production function coefficients used in the simulated system. The last row contains the average of each column.[7/]

It is obvious from the table that the assumption of dependent subsystems generates predictions closer to the actual values. It is also apparent that the estimates of the production function coefficients based on the ratio of

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[7/] Appendix C contains a complete listing of predicted values under the various assumptions about tax rate levels and production function coefficient estimates.

Table 6. Average absolute deviations of predicted variables.*

Coefficient estimator	Simultaneous System: Simultaneous subsystem assuming independent systems: Input outlay / Gross Rev.	Input outlay / Total outlay	Input outlay / Est. Gross Rev.	Simultaneous subsystem assuming dependent systems: Input outlay / Gross Rev.	Input outlay / Total outlay	Input outlay / Est. Gross Rev.
Endogenous variables						
Q	.017	.019	.021	.021	.018	.021
O	.093	.029	.037	.043	.027	.038
K	.093	.030	.037	.044	.028	.039
ϕ^Q	.100	.106	.130	.136	.106	.132
H	.464	.453	.432	.034	.032	.032
A	.299	.307	.313	.021	.019	.019
W^F	.048	.059	.070	.058	.057	.060
N	.036	.072	.117	.031	.032	.031
Column average	.144	.134	.145	.049	.040	.047

$*|\overline{X}| = \frac{1}{n}\Sigma\left|\frac{X_i - \hat{X}_i}{X_i}\right|$

input outlay to total outlay generate somewhat closer estimates than the other coefficient estimates under the same dependence assumption.

Of the four variables predicted by the simulated system, Q, O, K, and ϕ^Q, only the predicted values of ϕ^Q are consistently poor. Using an average deviation of five percent as a maximum acceptable limit, predicted product price is not predicted with sufficient accuracy in any case. However, since product price is not a variable of primary concern, no effort was made to reduce the variation.

Although net income is also calculated and employed in each iteration of the simulation process, it has not been included in table 6. The cumulative effects of the deviation of the endogenous variables cause the predicted value of net income to deviate widely from the actual value. The individual deviations of predicted net income are as much as 70 percent. The effects of social security taxes will be evaluated using only the predictions from the input outlay-total outlay coefficients.

Effects of Social Security Taxes

The impact of social security taxes on the endogenous variables is estimated by setting the tax rates equal to zero, both separately and simultaneously, and solving the combined systems using the iteration process described above. The effects of the taxes are determined by the difference between the predicted values with and without the tax rates. Any differences that occur represent the extent of the effect of the tax assessments.

Tables 7 through 13 contain the predicted changes in the endogenous variables when the tax rates are set equal to zero. Positive values indicate that social security tax assessments have reduced the endogenous variables. Accordingly, negative values indicate that the value of the endogenous variable has been greater with the tax assessments.

A table for product price has not been included. In the two sets of predictions only one year has any change in product price. The results for that year indicated that product price would have been greater by $.01 without the payroll tax and without either tax. All other years indicate no change in product price.

While the purpose of the simulation subsystem was to estimate the effects of social security taxes on output, product price, current operating inputs and capital stock, tables have also been included for the variables endogenous to the system estimated by TSLS.

The results indicate that agricultural output was affected very little by the social security tax system. Under the assumption of independent systems the results do not indicate any change. The dependent systems approach indicates that some reduction in output may have occurred as a result of social security taxes. Without either tax

Table 7. Predicted change in output.

Year	Independent systems $t_1=0$	Independent systems $t_1=t_2=0$	Independent systems $t_2=0$	Dependent systems $t_1=0$	Dependent systems $t_1=t_2=0$	Dependent systems $t_2=0$
1955	0	0	0	-1	-1	-1
1956	-1	-1	0	0	-1	0
1957	0	0	0	0	0	0
1958	0	0	0	0	0	0
1959	0	0	0	0	0	0
1960	-1	-1	0	0	0	0
1961	0	0	0	0	0	0
1962	0	0	0	0	0	0
1963	0	0	0	1	1	0
1964	-1	-1	-1	1	1	0
1965	-1	-1	0	0	0	0
1966	0	0	0	1	1	0
1967	0	0	0	1	1	0
1968	-1	-1	-1	2	2	1
1969	0	0	0	1	2	0
1970	0	0	0	1	2	0
1971	0	0	0	1	2	1
1972	0	0	0	3	3	1
1973	1	0	0	4	3	0
1974	0	0	-1	2	3	0

Table 8. Predicted change in use of current operating inputs.

	Independent systems			Dependent systems		
	$t_1=0$	$t_1=t_2=0$	$t_2=0$	$t_1=0$	$t_1=t_2=0$	$t_2=0$
1955	0	-3	0	-1	-1	0
1956	-1	-1	0	0	0	0
1957	-1	0	0	0	0	0
1958	0	0	1	0	0	0
1959	-1	-1	0	1	1	0
1960	0	0	0	0	0	0
1961	-1	-1	0	0	0	-1
1962	-1	-1	0	1	1	0
1963	-1	-1	0	2	1	-1
1964	-1	-2	0	3	3	0
1965	-1	-2	-1	3	3	-1
1966	-1	-2	-1	4	4	-1
1967	-1	-2	0	6	7	1
1968	-1	-2	-1	8	11	2
1969	-1	-2	-1	8	11	3
1970	0	-1	-1	10	13	3
1971	-1	-2	-1	6	11	5
1972	1	0	-2	13	15	1
1973	2	0	-4	16	14	-3
1974	2	0	-3	14	17	2

Table 9. Predicted change in quantity of capital stock.

Year	Independent systems $t_1=0$	Independent systems $t_1=t_2=0$	Independent systems $t_2=0$	Dependent systems $t_1=0$	Dependent systems $t_1=t_2=0$	Dependent systems $t_2=0$
1955	0	0	0	-4	-6	-3
1956	-1	-1	1	-2	-3	-1
1957	-2	-1	1	0	1	1
1958	-2	-2	0	0	0	0
1959	-2	-2	0	1	1	0
1960	-2	-1	1	0	0	0
1961	-2	-2	0	1	0	-1
1962	-2	-3	0	2	2	-1
1963	-3	-3	-1	4	3	-1
1964	-3	-3	0	7	7	0
1965	-2	-3	-1	7	7	-1
1966	-3	-4	-2	10	9	-2
1967	-3	-4	-1	11	14	2
1968	-2	-3	-1	16	21	2
1969	-2	-3	-1	15	22	5
1970	-1	-3	-2	17	24	5
1971	-2	-3	-2	11	23	10
1972	1	-1	-4	22	26	2
1973	4	0	-6	27	23	-7
1974	4	1	-5	25	21	3

Table 10. Predicted change in use of household labor.

Year	Independent systems $t_1=0$	Independent systems $t_1=t_2=0$	Independent systems $t_2=0$	Dependent systems $t_1=0$	Dependent systems $t_1=t_2=0$	Dependent systems $t_2=0$
1955	-3	-2	1	-18	-17	1
1956	-5	-5	1	-21	-20	1
1957	-9	-9	0	-27	-26	0
1958	-12	-12	1	-29	-28	1
1959	-18	-17	0	-37	-36	1
1960	-23	-22	1	-46	-44	3
1961	-29	-28	1	-53	-50	3
1962	-36	-35	2	-63	-59	3
1963	-45	-43	2	-75	-71	4
1964	-55	-53	2	-86	-81	5
1965	-65	-63	3	-97	-89	7
1966	-79	-76	3	-117	-109	8
1967	-94	-90	4	-130	-120	10
1968	-109	-105	5	-143	-131	12
1969	-127	-122	5	-162	-150	13
1970	-147	-140	6	-178	-161	17
1971	-168	-161	8	-201	-184	19
1972	-193	-183	10	-224	-201	24
1973	-220	-210	10	-252	-228	25
1974	-250	-241	9	-275	-255	21

Table 11. Predicted change in use of hired labor.

Year	Independent systems			Dependent systems		
	t_1=0	t_1=t_2=0	t_2=0	t_1=0	t_1=t_2=0	t_2=0
1955	8	8	0	7	7	0
1956	16	15	0	15	14	0
1957	24	24	0	23	22	-1
1958	34	34	0	31	30	-1
1959	47	47	0	43	42	-1
1960	62	61	-1	57	55	-2
1961	79	78	-1	72	70	-2
1962	99	98	-1	89	86	-3
1963	122	121	-1	110	106	-4
1964	149	148	-2	133	128	-5
1965	178	175	-2	157	151	-6
1966	213	210	-3	189	181	-8
1967	253	249	-4	222	211	-10
1968	296	291	-5	257	245	-12
1969	344	338	-6	295	280	-15
1970	397	389	-8	338	320	-18
1971	459	449	-9	386	364	-22
1972	527	513	-12	436	410	-27
1973	601	585	-14	494	462	-31
1974	682	665	-16	555	519	-36

Table 12. Predicted change in total use of labor.

Year	Independent systems			Dependent systems		
	$t_1=0$	$t_1=t_2=0$	$t_2=0$	$t_1=0$	$t_1=t_2=0$	$t_2=0$
1955	5	5	0	-11	-10	1
1956	10	10	0	-7	-6	0
1957	16	16	0	-4	-4	0
1958	21	21	0	3	3	1
1959	29	29	0	6	6	0
1960	39	39	1	10	11	0
1961	50	50	0	19	20	1
1962	62	62	0	27	27	0
1963	77	77	0	35	35	1
1964	94	99	0	48	48	1
1965	102	102	0	61	62	1
1966	135	135	0	72	72	1
1967	159	159	0	92	92	1
1968	186	186	-1	114	113	-1
1969	217	216	-1	134	131	-2
1970	251	250	-1	160	158	-2
1971	290	288	-2	184	180	-4
1972	333	330	-2	213	210	-3
1973	381	376	-4	241	234	-6
1974	432	424	-8	280	265	-15

Table 13. Predicted change in farm wage rate.

Year	Independent systems			Dependent systems		
	$t_1=0$	$t_1=t_2=0$	$t_2=0$	$t_1=0$	$t_1=t_2=0$	$t_2=0$
1955	.03	.03	0	.04	.04	0
1956	.02	.02	0	.03	.03	0
1957	.02	.02	0	.03	.03	0
1958	.01	.01	0	.01	.01	0
1959	.01	.01	0	.02	.02	0
1960	.00	.00	0	.01	.01	-.01
1961	-.01	-.01	0	-.01	-.01	0
1962	-.04	-.04	0	-.02	-.02	0
1963	-.04	-.04	0	-.03	-.03	0
1964	-.07	-.07	0	-.05	-.05	0
1965	-.09	-.09	0	-.08	-.08	0
1966	-.10	-.10	0	-.09	-.09	0
1967	-.15	-.14	0	-.13	-.13	0
1968	-.19	-.19	0	-.17	-.17	0
1969	-.23	-.23	0	-.21	-.21	0
1970	-.29	-.29	0	-.27	-.26	0
1971	-.33	-.33	.01	-.30	-.29	.01
1972	-.38	-.39	.01	-.37	-.36	.01
1973	-.46	-.45	.01	-.42	-.41	.01
1974	-.54	-.53	.02	-.49	-.46	.03

aggregate real output would have been approximately 8.5 million real dollars greater. This, however, is only .02 percent of total output.

The predictions about the effects of social security taxes on the use of current operating inputs show greater change than for output. The results from the independent system indicate that if taxes have had any effect it has been to increase the use of current operating inputs.

The dependent assumption system indicates that current operating inputs would have been employed in greater quantity had the taxes not been asssessed. The aggregate effect in 1974 was estimated to have been about 48 million real dollars less input employed. This is approximately .2 percent of the total quantity actually employed. According to the results the employees tax assessment has had a greater effect on the use of current operating inputs than the self-employment tax.

The predicted change in the quantity of capital also varies according to system. The independent assumption system yields predictions that, without either tax, slightly less capital stock would have been available for use during the middle portion of the study period. In the later years the effects of the taxes apparently cancelled out with the quantity of capital stock being the same with or without the taxes.

Under the dependent assumption quantity of capital stock is less with the taxes than without them. Without either tax approximately 60 million real dollars of additional capital stock would have been available for use in 1974. If only the self-employment tax had been assessed the quantity of capital stock would have been greater by 71 million real dollars. This is approximately .2 percent of total capital stock in 1974.

Tables 10, 11, and 12 contain the predicted changes in the labor variables. While the values differ between assumptions, they tend to be consistent in magnitude. Without the taxes the use of household labor would have been less, use of hired labor more, and total labor employed would have been greater.

The aggregate labor effect in 1974 of the taxes was predicted to be a reduction in labor employed of approximately 75 million days of labor assuming ten hour work days. This is based on the dependent assumption. This prediction reflects a 14 percent increase over the quantity actually employed.

Predicted wage changes are contained in table 13. According to these results, social security taxes have caused farm wages to increase. By 1974 wage rates with the taxes are predicted to have been 34 percent higher than if the taxes had not been assessed.

CHAPTER V. CONCLUSIONS AND IMPLICATIONS

Conclusions

The manner in which social security taxes enter the system makes it impossible to test statistically the validity of the hypotheses pertaining to t_1 and t_2. However, certain inferences may be made concerning the direction of the effects of these taxes.

Simultaneous System

From the results of the labor market analysis it can be inferred that increases in the employee's tax rate for social security have increased the use of farm-household labor. Increases in the self-employment tax rate have reduced the quantity of farm-household labor employed by the farm-firm.

Since the elasticity of farm-household labor with respect to the employee's tax rate is absolutely greater than the elasticity with respect to the self-employment tax rate the effect of simultaneous increases of the same relative magnitude in both tax rates is an increase in the use of farm-household labor.

Increases in the employee's tax rate have reduced both the quantity demanded and quantity supplied of hired labor in the farm sector.

The statistical results do not indicate that public assistance payments are a significant factor in explaining the supply of hired labor. However, the statistical inefficiency associated with the analysis obscures the true significance of this variable. Further analysis of public assistance of a less aggregate nature should help to evaluate this hypothesis.

Simulation System

The simulated portion of the analysis indicates that social security taxes may have reduced the use of current operating inputs and the quantity of capital stock available for use. However, these conclusions are very tentative. The deviations associated with tax elimination in the simulation are small. None of the predicted effects deviate by as much as the average deviation associated with prediction of the actual values. Without additional information to the contrary, it is possible that the results obtained here are caused by other exogenous factors.

According to the results obtained here agricultural output has not been affected by social security taxes. It should also be noted that since technology was not held constant in the simulation analysis the apparent lack of significant variation in output, current operating inputs and capital stock may also be the result of technological change.

The results of the simulation with respect to farm-household and hired labor are consistent with the conclusions drawn from the estimated simultaneous equation system. Social security taxes have increased the quantity of farm-household labor employed per farm while reducing the quantity of hired labor employed.

The combined effects of the taxes on the total quantity of labor employed per farm have been a reduction in the amount employed.

Elasticities

The elasticities of the labor variables with respect to social security tax rates are small. However, the absolute size of the tax rates affects the size of the elasticities and the tax rates have been relatively small. Consequently, small incremental increases in the tax rates can have considerable impact on labor in the farm sector. For example, an increase in t_1 from 5 percent to 6 percent represents an increase of 20 percent in the tax rate which is equivalent to multiplying the effect of a 1 percent increase in t_1 by 20.

During the years covered by this analysis, the average annual increase in the employee's tax rate was six percent. Using mean values and the elasticities estimated under the dependent assumption the average yearly effects can be derived. Over the study period the supply of hired labor to the farm sector was reduced by an average .014 percent per year by increases in the employee's tax rate. At the same time the average yearly reduction in the demand for hired labor associated with the average yearly increase in the employee's tax rate was .7 percent. The effect on farm-household of the average increase in t_1 was a .29 percent increase in quantity employed.

These figures lead to two observations. The increase in quantity employed of farm-household labor associated with the increase in the employee's tax rate is less than the reduction in the use of hired labor. In addition, the reduction in the demand for hired labor associated with increases in t_1 is greater than the associated reduction in the supply of hired labor. Consequently, increases in t_1 may be associated with the relatively high unemployment in rural areas, ceteris paribus.

The elasticities for hired labor demand and farm-household employment with respect to the self-employment tax rate indicate directional effects opposite the elasticities for t_1. In addition, the self-employment tax rate has increased at an average rate of 5.5 percent. With the lower average increase in t_2 and the smaller elasticities associated with t_2 the effects of t_2 dampen the effects associated with increases in t_1.

The farm wage elasticities allow comparisons relevant to the social security tax rate elasticities generated in this analysis. The farm wage elasticities for the supply and demand for hired labor are consistent with some of the earlier estimates of these elasticities. The work of Hammonds, et al., included a series of estimates of the supply elasticity that ranged in value from .135 to .386 [p. 21]. Their estimate for the most recent set of years was .245. Comparison with the results of the analysis here indicates little variation in the estimates.

Schuh and Tyrchniewicz obtained a supply elasticity of .649 [p. 779]. However, Schuh obtained an estimate of .25 in earlier work. The elasticity of demand for hired labor with respect to farm wages obtained is somewhat larger than those obtained in the earlier studies. Schuh's estimates of the mean ranged from -.12 to -.31. Schuh and Tyrchniewicz generated a single estimate of -.261. Schuh's estimates were based on data covering the period 1929-1957. Schuh and Tyrchuiewicz used data for the years 1929-1961. Both of these estimates appear to be consistent with the work done by Hammonds, et al. However, Hammonds' estimates for more recent time periods are considerably larger. For the years 1941-1969 his estimate is -.854.

While the estimates in the present study are larger than any of the previous estimates of the demand elasticity at the mean the present mean estimates are less than Hammonds' estimate for 1969.

Further analysis of the previous studies indicates that use of data for the years prior to 1932 generate a downward bias on the supply elasticities for hired labor. This is most obvious in Hammonds' work. Using data for the years 1931-1959, Hammonds estimates the short-run supply elasticity to be -.335. For the years 1932-1960 the estimate is -.515. Addition of the year 1960 may have had an effect. However, the estimate derived by Schuh and Tyrchniewicz is based on data for the years 1929-1961. Consequently, it appears that the data from the earlier years tends to have greater influence than data from the later years. In addition, structural changes have occurred since 1955 in the farm sector that have had considerable impact on hired labor. The use of data prior to this time will tend to reduce the statistical impact of the later data.

Given the effects of using data from different time periods, the elasticity estimates obtained in the present analysis with respect to farm wages are consistent with the earlier results and this provides an indication of the accuracy of the elasticities for the tax rates. Since statistical testing is not possible and no other estimates are available, the comparison of wage elasticities is the only indicator available for evaluating the reliability of the tax rate elasticities.

The results of the simultaneous equation analysis also indicate that future analysis of the social security tax rate elasticities need not be based on systems that explicitly include the social security tax rate variables. The elasticities can also be derived by inserting the tax rates after the parameters of the system have been estimated. The results from this approach were presented in table 5. Comparison of these estimates with the elasticities obtained from the dependent system indicates that while relative differences are large for the tax rate elasticities in some cases, the absolute deviations are small. The same conclusions about the effects of social security tax rates can be drawn from the without tax system as from the with tax systems.

Weaknesses of the Analysis

The results obtained here are considered very tentative. First, the nonlinear manner in which the tax variables enter the model preclude statistical evaluation of their effects. Secondly, the data employed do not adequately measure the variables as defined. In addition to the problems in measuring wealth and capital stock, the labor variable may have been approximated speciously. The data for this variable are an estimate of the total time required to produce the output of the farm sector. The actual amount of labor employed may have been more or less than the estimates.

A third problem which may exist pertains to the simulation analysis. While the total labor variable is predicted to have been 14 percent greater without taxes none of the other variables (other than farm wages) deviated by as much as 1 percent. Consequently, this method of simulation may be insensitive to changes in the variables, particularly labor.

In addition there are problems inherent in any analysis that requires simplifications. Many factors are involved in the growth of the farm sector. However, inclusion of all possible variables is not possible. Consequently, some specification error exists in the analysis.

Implications

Previous research on the topic of social security taxes generated conclusions which, in some cases, are consistent with the conclusions of the present study. Consideration of both consistent and inconsistent conclusions leads to implications about current knowledge of the effects of social security taxes and about future research.

Comparison of Present and Past Research

While the most significant conclusions of the current study concern labor, only Brittain gives this area extensive consideration. Brittain downplays the allocative effects of the taxes on labor because of what he calls rigidity and immobility in the labor market [p. 48]. However, it is precisely these factors that are likely to be important in maintaining the higher unemployment in rural areas that is implied by the estimated effects of social security taxes in the present analysis.

If the effects of public assistance are significant, then the effects of social security taxes are likely to be greater because of the reduced rate of migration from rural to urban labor markets caused by public assistance.

Brittain also concludes that labor bears the full cost of the employee's tax through reduced wages and higher prices [p. 61]. While the present analysis assumes that employer and employee share the tax burden equally, the simulation results for the farm wage rate imply that the farm wage rate increased much more rapidly with the taxes than without the taxes. This implies that the employer in the farm sector may bear part of the tax burden.

Analysis of the effects of social security taxes on the level of capital stock tends to support Brittain's conclusion that labor-saving capital investment is not induced by social security taxes. Brittain's conclusion is based on the result that nonfarm employees bear the full cost of the employee's tax [p. 238-9]. The same reasoning cannot be used to justify the results of the present analysis. The equal shares assumption about the bearing of the tax burden implies that investment in labor-saving capital will occur as the tax rates increase. On the other hand the complementary relationship among the variables implied by the functional form of the production function should result in greater capital stock without the taxes. The assumption of a constant supply of land may also constrain the predicted quantity of capital stock.

It is not known if these assumptions, in some combination, cause the small deviation of predicted capital stock without taxes from the actual values with taxes or if social security taxes have not affected capital stock levels.

Walker's results indicate that social insurance reduced investment in the farm sector. However, his analysis included all major social insurance programs and considered both taxes and benefits. Therefore, Walker's study does little to clarify the question of the effects of social security taxes on levels of capital stock.

Feldstein's results indicate that net private saving has been reduced significantly by social security taxes. Agreement of his results with those of the present study requires varying levels of capital stock as the tax rates are set equal to zero. Agreement could also be shown through variations in the equity variable, E, as the tax rates increase.

Neither of the implications of Feldstein's work can be substantiated by the present study. The first result has been discussed above and no attempt was made in the present analysis to analyze the second result.

While the conclusions of both Walker and Feldstein may be correct, the present study does not obtain the same conclusions. Consequently, while the level of capital stock in the farm sector has not been predicted to have been influenced by social security taxes in the present study, further analysis would be required to evaluate this aspect of the effects of social security taxes.

The study by Deran is interesting in that it employs several measures to show the costs of social security in both high and low wage industries. The measures were ratios of the employer's portion of the employee's tax assessment to total wages, to value added, and to value of shipments, respectively. These measures succinctly show how social security taxes are relatively more important to the low wage labor-intensive industries.

Deran also attempted to measure the allocative effect of the employer's tax assessment on wages and salaries. This portion of her analysis is suspect. First, while the data are correct the implications are misleading. Any analysis of the effects of social security taxes on the farm sector must include the self-employment tax because over the period 1955-1974 hired labor made up only 36 percent of total labor employed on the average. Deran's data were for the year 1963.

Second, Deran's method of determining the allocative effect of the tax payment in terms of output is based on two assumptions. She assumed that product prices were raised when social security taxes increased and that the product price elasticity was approximately one [p. 15]. Neither assumption approximates the realities of the farm sector.

Using these assumptions Deran estimates the overproduction associated with her derived estimates of undertaxation in agriculture. Using a theoretical neutral tax structure as a reference point, she estimated that the actual tax structure resulted in overproduction in agricultural output in the amount of $117 million [p. 16]. The present study indicates that even without either tax, output would not have varied from actual production.

In general, the conclusions indicate that the use of labor, particularly hired labor, has been affected by social security taxes. However, variations in the use of other inputs are not as strongly associated with changes in the tax rates. Because of the contradictory results of the various studies, including the present analysis, none may be considered definitive with respect to the issues addressed in this thesis.

Future Research

The ways in which social security influences individual decision makers across the farm sector are not nearly as simplistic as represented in this study. The self-employment tax is likely to be much more important to the small farm operator than to the large farm operator. In addition, social security benefits may be a variable in the decision making process, particularly for the farm operator near retirement age. Nor is social security the only variable influencing decisions. Production controls, investment tax credits, and other such variables may be more important than social security taxes and benefits.

If more accurate parameter estimation is desired, then efforts should be directed toward the collection of primary data. This would allow grouping of observations by income level and enhance estimation of the effects of the self-employment tax. Of primary concern here is the low income farm-household because it is these households which are most severely constrained by the tax.

While the self-employment tax may hasten the movement of young small farm operators out of agriculture, social security benefits may retard movement by the older farm operators. Analysis of these effects may provide additional information about the rate of decline in farm numbers.

Further analysis of the effects of social security on capital investment will require primary data. Because of the variety of forms that investment and disinvestment may take, a considerable amount of data may be required.

Any effects that social security might have on capital investment are likely to surface as a reduced rate of investment or as disinvestment for the low income operator. On the other hand, high income operators may be induced to increase investment in labor-saving capital.

If social security taxes have affected capital stock levels, it is possible that the use of aggregate data allows these effects to offset each other. In any case, the potential returns to any future research on social security should be critically evaluated with the potential returns associated with research on the effects of other institutional constraints.

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APPENDIX A

FIRST STAGE REGRESSION EQUATIONS

Table A1. First stage regression equations assuming independent subsystems.

$$w^F = -2.0160 + 11.76(1-t_1) + .006449PA - .00023615w^N$$
$$\quad (.282) \qquad (.501) \qquad (3.52)^{***} \qquad (.101)$$

$$- .0000059031E - 8.0385(1-t_2) + .03086\phi^R + .00002272NI$$
$$\quad (.857) \qquad (.471) \qquad (.616) \qquad (.765)$$

$$- .72059\phi^Q + .49266\chi + .010372\phi^0 - .00064027N_0$$
$$\quad (1.47) \qquad (1.07) \qquad (.038) \qquad (2.12)^{*}$$

$$F = 100.42^{***} \qquad R^2 = .993$$

$$N = 7219.7 - 15474.0(1-t_1) - 3.5995PA - 3.6451w^N$$
$$\quad (1.06) \qquad (.710) \qquad (2.11)^{*} \qquad (1.68)$$

$$+ .0066431E + 8793.3(1-t_2) + 6.3093\phi^R + .0049746NI$$
$$\quad (1.05) \qquad (.554) \qquad (.135) \qquad (.180)$$

$$+ 94.796\phi^Q + 134.38\chi - 386.19\phi^0 + 1.1694N_0$$
$$\quad (.208) \qquad (.313) \qquad (1.54) \qquad (4.17)^{***}$$

$$F = 29.86^{***} \qquad R^2 = .976$$

Table A2. First stage regression equations assuming dependent subsystems.

$$N = 3269.4 - 11083.0(1-t_1) - 2.373P.A. - 3.2028w^N$$
(.564) (.588) (1.06) (1.76)

$$- 10.383P + .0044136E + 8013.8(1-t_2) + 44.760\phi^R + 2.7556R$$
(1.22) (.825) (.582) (1.31) (2.26)*

$$+ 25.912\chi - 239.21\phi^0 + .95634N_0$$
(1.03) (1.23) (6.09)***

$F = 48.07$*** $R^2 = .985$

$$\phi^Q = 2.5036 - 10.875(1-t_1) + .0025401P.A. + .0011531w^N$$
(.323) (.431) (.848) (.474)

$$- .027038P - .00000031029E + 8.8454(1-t_2) + .015266\phi^R$$
(2.37)** (.043) (.480) (3.33)**

$$+ .0025386R + .91444\chi + .27664\phi^0 - .00021378N_0$$
(1.56) (2.72)** (1.06) (1.02)

$F = 18.27$*** $R^2 = .962$

$$NI = 53479.0 - 192070.0(1-t_1) + 6.8769P.A. + 28.305w^N$$
(.340) (.375) (.113) (.573)

$$- 240.01P + .18653E + 126410(1-t_2) + 2949.9\phi^R + 24.694R$$
(1.04) (1.28) (.338) (3.18)** (.747)

$$- 473.27\chi + 3568.1\phi^0 - 11.123N_0$$
(.069) (.674) (2.61)**

$F = 14.4285$*** $R^2 = .952$

Table A2 (continued)

$$w^F = 2.8547 - 7.2248(1-t_1) + .0016944P.A. + .0010169w^N$$
$$(.461) \quad (.358) \quad (.708) \quad (.523)$$

$$+ .028057P + .0000055368E + 5.3828(1-t_2) - .055831\phi^R$$
$$(3.07)^{**} \quad (.968) \quad (.365) \quad (1.53)$$

$$- .0028963R - .37386\chi - .1104\phi^0 - .00075903N_0$$
$$(2.22)^{*} \quad (1.39) \quad (.529) \quad (4.52)^{***}$$

$$F = 162.6183^{***} \qquad R^2 = .996$$

Table A3. First stage regression equations exluding social security tax rates.

$$w^F = 1.0278 + .0024297P.A. + .00068574w^N + .025444P$$
$$\quad (3.75)^{***} \quad (2.11)^{*} \quad (.450) \quad (5.08)^{***}$$
$$+ .0000037261E - .045249\phi^R - .0027074R - .32858\chi$$
$$\quad (1.54) \quad (2.27)^{**} \quad (2.67)^{**} \quad (1.53)$$
$$- .098704\phi^0 - .0007453N_0$$
$$\quad (.57) \quad (5.15)^{***}$$

$$F = 244.34^{***} \qquad R^2 = .995$$

$$\phi^Q = .54861 + .0036996P.A. + .00049848w^N - .031774P$$
$$\quad (1.58) \quad (2.55)^{**} \quad (.259) \quad (5.02)^{***}$$
$$- .0000030399E + .16928\phi^R + .0027308R + .98267\chi$$
$$\quad (.993) \quad (6.72)^{***} \quad (2.13)^{*} \quad (3.64)^{***}$$
$$+ .27362\phi^0 - .00018109N_0$$
$$\quad (1.25) \quad (.990)$$

$$F = 26.8721^{***} \qquad R^2 = .960$$

$$N = 205.9 - 1.2623P.A. - 3.6596w^N - 14.129P + .0016372E$$
$$\quad (.793) \quad (1.19) \quad (2.54)^{**} \quad (2.98)^{**} \quad (.714)$$
$$+ 60.767\phi^R + 3.0756R + 328.56\chi - 214.51\phi^0 + .97329N_0$$
$$\quad (3.22)^{***} \quad (3.20)^{***} \quad (1.62) \quad (1.31) \quad (7.10)^{***}$$

$$F = 70.35^{***} \qquad R^2 = .984$$

Table A3 (continued)

$$NI = \underset{(1.86)^{*}}{12960.0} + \underset{(.862)}{25.24P.A.} + \underset{(.593)}{23.012w^{N}} - \underset{(2.29)^{**}}{291.49P} + \underset{(2.25)^{**}}{.13848E}$$

$$+ \underset{(6.34)^{***}}{3215.7\phi^{R}} + \underset{(1.23)}{31.784R} + \underset{(.134)}{729.10\chi} + \underset{(.985)}{4342.4\phi^{0}} - \underset{(3.00)^{**}}{11.033N_{0}}$$

$F = 21.54^{***}$ $\qquad R^2 = .951$

APPENDIX B

PRODUCTION FUNCTION COEFFICIENTS FOR SIMULATION ANALYSIS

Table B1. Production function coefficients estimated by ratio of input outlay to total outlay.

Year	β_0	β_1	β_2	β_3	β_4
1955	2.9091	.3774	.4412	.0906	.0907
1956	2.7149	.3449	.4203	.1478	.0870
1957	2.5770	.3080	.4183	.1924	.0813
1958	2.6606	.2864	.4356	.1948	.0832
1959	2.8134	.2935	.4683	.1501	.0881
1960	2.9086	.2827	.4538	.1707	.0928
1961	3.0715	.2718	.4624	.1672	.0986
1962	3.1083	.2551	.4760	.1680	.1009
1963	3.2237	.2495	.4788	.1658	.1059
1964	3.3038	.2470	.4785	.1635	.1110
1965	3.5049	.2247	.4870	.1712	.1171
1966	3.4586	.2128	.5021	.1686	.1165
1967	3.5099	.2139	.5017	.1703	.1141
1968	3.5790	.2160	.4964	.1674	.1202
1969	3.4941	.2049	.4777	.2021	.1153
1970	3.6967	.2050	.4976	.1773	.1202
1971	3.7400	.1929	.5186	.1724	.1160
1972	4.0419	.1895	.5077	.1656	.1372
1973	4.2087	.1658	.5253	.1588	.1501
1974	3.9400	.1677	.5194	.1637	.1492

Table B2. Production function coefficients estimated by ratio of input outlay to gross revenue.

Year	β_0	β_1	β_2	β_3	β_4
1955	6.5938	.3381	.3952	.0812	.0813
1956	4.2332	.3257	.3969	.1396	.0821
1957	3.0792	.3012	.4091	.1882	.0795
1958	4.3874	.2687	.4088	.1828	.0781
1959	4.1579	.2794	.4457	.1429	.0838
1960	4.6233	.2666	.4280	.1610	.0875
1961	5.7015	.2512	.4273	.1545	.0911
1962	6.1569	.2338	.4363	.1540	.0925
1963	6.2113	.2296	.4406	.1525	.0975
1964	5.5851	.2313	.4480	.1530	.1039
1965	10.1161	.1958	.4245	.1493	.1020
1966	11.1715	.1827	.4313	.1448	.1001
1967	7.5880	.1942	.4555	.1546	.1036
1968	7.9594	.1954	.4890	.1514	.1088
1969	6.7884	.1888	.4402	.1862	.1062
1970	8.3229	.1853	.4497	.1602	.1086
1971	5.6257	.1836	.4937	.1641	.1104
1972	14.0022	.1617	.4330	.1412	.1170
1973	35.9641	.1237	.3919	.1185	.1119
1974	13.7782	.1428	.4422	.1394	.1270

Table B3. Production function coefficients estimated by ratio of input outlay to total outlay using predicted values for endogenous variables.

Year	β_0	β_1	β_2	β_3	β_4
1955	6.4793	.3384	.3962	.0818	.0817
1956	4.0718	.3262	.4004	.1401	.0825
1957	3.1274	.3006	.4097	.1867	.0791
1958	4.3557	.2687	.4097	.1828	.0781
1959	4.1238	.2794	.4465	.1430	.0839
1960	4.6905	.2656	.4275	.1608	.0873
1961	5.6881	.2519	.4277	.1539	.0910
1962	6.0738	.2326	.4399	.1534	.0921
1963	6.0638	.2299	.4420	.1533	.0978
1964	5.5019	.2307	.4501	.1532	.1039
1965	9.8941	.1958	.4620	.1500	.1022
1966	11.1637	.1837	.4304	.1448	.1003
1967	7.5880	.1942	.4555	.1546	.1036
1968	7.8848	.1961	.4489	.1518	.1089
1969	6.7430	.1887	.4408	.1864	.1064
1970	8.0690	.1864	.4510	.1610	.1092
1971	5.5881	.1841	.4934	.1644	.1108
1972	13.8446	.1621	.4327	.1417	.1179
1973	37.2841	.1234	.3891	.1179	.1116
1974	13.6005	.1431	.4426	.1397	.1276

APPENDIX C

ESTIMATED VALUES BASED ON SIMULATION ANALYSIS

TABLE 1.1 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7654	2693	10170	.99	1.06	705	2585	3291	2392
1956	7905	2808	10533	1.00	1.01	727	2522	3249	2156
1957	8294	2893	10920	1.02	.95	744	2473	3217	2180
1958	8792	3283	10383	.99	.89	754	2420	3174	1912
1959	9297	3717	10572	1.01	1.10	786	2360	3146	2293
1960	9914	3831	10935	1.03	1.05	810	2306	3117	2824
1961	10592	4060	11014	1.03	1.08	832	2246	3078	3001
1962	11325	4513	11395	1.01	1.14	856	2187	3043	2765
1963	12021	4855	11498	1.03	1.14	880	2131	3011	3171
1964	12742	5258	12333	1.05	1.21	899	2079	2978	3740
1965	13452	5225	11827	1.06	1.23	914	2032	2946	4402
1966	14249	5865	12481	1.03	1.33	917	1987	2905	3861
1967	14910	6112	12498	1.11	1.30	904	1959	2864	5582
1968	15712	6658	13646	1.10	1.32	896	1923	2819	5879
1969	16415	6890	13843	1.10	1.26	876	1893	2770	5914
1970	16913	7069	13300	1.14	1.33	862	1873	2735	7354
1971	17433	7062	13216	1.18	1.39	865	1839	2704	7810
1972	18013	7323	12832	1.13	1.38	872	1802	2674	7823
1973	18719	7429	12906	.95	1.36	886	1750	2637	3830
1974	18998	8464	16101	.95	1.38	915	1715	2630	2445

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 AND T2 ARE SET EQUAL TO APPROPRIATE TAX RATES.

TABLE 1.2 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / TOTAL-OUTLAY. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7665	3053	11530	.97	1.07	706	2580	3287	1797
1956	7961	3210	12040	.93	1.02	729	2512	3242	1063
1957	8383	3442	12557	.92	.96	749	2459	3208	662
1958	8837	3701	11705	.94	.90	761	2408	3170	838
1959	9354	4175	11973	.95	1.10	796	2347	3144	1114
1960	9963	4285	12234	.99	1.05	824	2293	3117	1698
1961	10612	4487	12171	1.01	1.07	848	2233	3082	2175
1962	11325	4926	12438	1.01	1.13	874	2175	3050	2149
1963	12020	5270	12478	1.03	1.13	901	2118	3020	2576
1964	12766	5731	13442	1.03	1.20	924	2062	2987	2849
1965	13399	5741	12995	1.10	1.20	942	2020	2963	4183
1966	14166	6406	13631	1.09	1.29	948	1976	2924	3901
1967	14911	6736	13773	1.11	1.28	940	1939	2880	4711
1968	15700	7298	14957	1.11	1.29	937	1902	2840	5154
1969	16423	7515	15100	1.10	1.23	923	1869	2792	4962
1970	16893	7720	14525	1.16	1.29	915	1849	2764	6701
1971	17488	7683	14378	1.15	1.35	926	1805	2732	6328
1972	17885	7933	13910	1.22	1.31	939	1781	2721	8381
1973	18320	7861	13656	1.18	1.25	955	1749	2704	7045
1974	18787	8793	16726	1.06	1.29	989	1698	2688	3972

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T1 AND T2 ARE SET EQUAL TO APPROPRIATE TAX RATES.

TABLE 1.3 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE USING ESTIMATED VARIABLES. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7762	3150	11955	.86	1.08	708	2572	3281	851
1956	8004	3246	12113	.88	1.02	732	2508	3241	658
1957	8404	3464	12522	.90	.96	753	2456	3209	468
1958	8895	3741	11800	.88	.90	767	2402	3169	298
1959	9403	4216	11976	.91	1.10	803	2340	3144	639
1960	10028	4338	12383	.92	1.05	833	2285	3118	1051
1961	10704	4562	12315	.93	1.07	860	2222	3082	1258
1962	11427	5022	12529	.93	1.12	889	2162	3052	1131
1963	12124	5351	12693	.94	1.12	919	2104	3023	1515
1964	12856	5827	13615	.96	1.19	945	2047	2993	1891
1965	13594	5888	13348	.95	1.20	969	1995	2964	2140
1966	14408	6617	14107	.92	1.29	982	1944	2927	1383
1967	15063	6837	13981	1.00	1.26	981	1912	2893	3100
1968	15872	7444	15296	1.00	1.27	985	1871	2856	3281
1969	16564	7617	15295	1.01	1.19	979	1837	2816	3460
1970	17068	7836	14771	1.04	1.25	980	1810	2791	4770
1971	17573	7712	14464	1.09	1.29	1000	1771	2772	5381
1972	18174	8071	14196	1.04	1.27	1026	1726	2753	5211
1973	18874	8075	14056	.87	1.22	1061	1670	2732	1585
1974	19140	9198	17525	.88	1.22	1114	1625	2739	158

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 AND T2 ARE SET EQUAL TO APPROPRIATE TAX RATES.

TABLE 2.1 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7653	2690	10157	.99	1.09	713	2583	3296	2388
1956	7904	2802	10512	1.00	1.03	741	2517	3258	2165
1957	8292	2985	10891	1.02	.97	767	2464	3231	2190
1958	8789	3272	10343	.99	.90	786	2408	3194	1934
1959	9293	3699	10519	1.02	1.10	830	2344	3174	2326
1960	9908	3806	10864	1.04	1.05	870	2285	3155	2877
1961	10584	4023	10926	1.04	1.06	908	2218	3126	3079
1962	11315	4471	11291	1.02	1.11	950	2153	3104	2867
1963	12009	4302	11369	1.04	1.10	997	2089	3085	3304
1964	12726	5186	12164	1.07	1.15	1042	2028	3070	3923
1965	13433	5148	11653	1.08	1.14	1085	1971	3056	4611
1966	14227	5768	12274	1.04	1.22	1122	1913	3036	4093
1967	14883	5992	12252	1.13	1.16	1148	1872	3020	5913
1968	15677	6499	13319	1.13	1.14	1181	1821	3003	6324
1969	16376	6712	13484	1.13	1.04	1207	1776	2984	6455
1970	16865	6854	12895	1.18	1.05	1245	1737	2983	8016
1971	17381	6836	12794	1.22	1.07	1307	1682	2990	8545
1972	17950	7046	12346	1.17	1.00	1378	1623	3001	8718
1973	18652	7145	12413	.98	.91	1464	1545	3010	4732
1974	18923	8104	15415	.98	.85	1572	1482	3055	3531

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T1 = 0 WHILE T2 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 2.2 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / TOTAL-OUTLAY. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7665	3053	11530	.97	1.10	714	2577	3292	1781
1956	7960	3209	12039	.93	1.04	745	2507	3252	1045
1957	8383	3441	12555	.92	.98	773	2450	3224	642
1958	8837	3701	11703	.94	.91	795	2396	3191	819
1959	9354	4174	11871	.95	1.11	843	2329	3173	1082
1960	9962	4286	12232	.99	1.05	886	2270	3156	1662
1961	10612	4486	12159	1.01	1.06	927	2204	3132	2136
1962	11325	4925	12436	1.01	1.09	973	2139	3112	2103
1963	12020	5269	12475	1.03	1.09	1023	2073	3097	2523
1964	12765	5730	13439	1.04	1.13	1073	2007	3081	2785
1965	13398	5740	12993	1.10	1.11	1120	1955	3075	4124
1966	14165	6405	13628	1.09	1.19	1161	1897	3059	3807
1967	14911	6735	13770	1.11	1.13	1193	1845	3039	4621
1968	15699	7297	14955	1.11	1.10	1233	1793	3026	5063
1969	16423	7515	15098	1.10	1.00	1267	1742	3009	4892
1970	16893	7720	14524	1.16	1.00	1312	1702	3015	6623
1971	17488	7682	14376	1.15	1.02	1385	1637	3022	6237
1972	17885	7939	13911	1.22	.93	1466	1588	3054	8318
1973	18321	7963	13660	1.18	.79	1556	1529	3085	7076
1974	18787	8795	16730	1.06	.75	1671	1448	3120	3971

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 = 0 WHILE T2 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 2.3 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE USING ESTIMATED VARIABLES. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7762	3150	11955	.86	1.11	716	2569	3286	835
1956	8004	3246	12112	.88	1.04	748	2502	3251	639
1957	8404	3464	12521	.90	.98	777	2447	3225	446
1958	8895	3741	11800	.89	.91	801	2390	3191	279
1959	9403	4215	11976	.91	1.11	850	2323	3174	605
1960	10029	4338	12383	.92	1.05	895	2262	3157	1013
1961	10704	4562	12315	.93	1.06	939	2193	3132	1217
1962	11427	5022	12529	.93	1.09	988	2126	3114	1083
1963	12124	5351	12693	.94	1.08	1041	2059	3100	1461
1964	12856	5927	13615	.96	1.12	1094	1992	3087	1827
1965	13594	5989	13349	.95	1.11	1147	1929	3077	2077
1966	14409	6616	14107	.92	1.18	1196	1865	3062	1291
1967	15063	6839	13992	1.00	1.11	1234	1819	3053	3016
1968	15872	7445	15299	1.00	1.08	1281	1761	3043	3202
1969	16564	7619	15299	1.01	.96	1322	1711	3033	3409
1970	17069	7840	14776	1.04	.96	1376	1665	3041	4719
1971	17574	7716	14472	1.03	.97	1457	1603	3061	5312
1972	18175	8076	14206	1.04	.87	1549	1534	3084	5220
1973	18875	8081	14065	.87	.76	1657	1452	3109	1633
1974	19142	9209	17545	.88	.67	1783	1379	3168	359

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 = 0 WHILE T2 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 3.1 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7653	2683	10156	.99	1.09	712	2583	3296	2390
1956	7904	2802	10511	1.00	1.03	741	2517	3259	2165
1957	8292	2985	10890	1.02	.97	766	2465	3232	2192
1958	8789	3272	10347	.99	.90	785	2409	3194	1935
1959	9293	3598	10519	1.02	1.10	829	2345	3175	2329
1960	9908	3305	10864	1.04	1.05	869	2287	3156	2980
1961	10584	4028	10925	1.04	1.06	905	2220	3127	3082
1962	11315	4472	11291	1.02	1.11	948	2155	3104	2853
1963	12009	4802	11369	1.04	1.10	994	2091	3086	3305
1964	12725	5186	12165	1.07	1.15	1038	2030	3069	3926
1965	13433	5148	11654	1.08	1.14	1081	1975	3056	4614
1966	14227	5769	12276	1.04	1.22	1118	1917	3035	4094
1967	14883	5992	12253	1.13	1.16	1142	1877	3019	5916
1968	15677	6500	13322	1.13	1.14	1174	1827	3002	6325
1969	16377	6713	13437	1.13	1.04	1199	1782	2982	6455
1970	16865	6856	12899	1.18	1.05	1234	1746	2980	8016
1971	17382	6839	12798	1.22	1.08	1294	1692	2987	8544
1972	17951	7049	12352	1.17	1.00	1363	1634	2997	8711
1973	18654	7151	12423	.99	.92	1447	1554	3002	4709
1974	18924	8111	15430	.98	.87	1553	1491	3044	3556

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T1 = 0 AND T2 = 0.

TABLE 3.2 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / TOTAL-OUTLAY. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7665	3053	11530	.97	1.10	714	2578	3292	1781
1956	7960	3209	12039	.93	1.04	744	2507	3252	1045
1957	8393	3442	12556	.92	.98	773	2450	3224	642
1958	8837	3701	11703	.94	.91	795	2396	3191	819
1959	9354	4174	11871	.95	1.11	843	2330	3173	1082
1960	9962	4286	12233	.99	1.05	885	2271	3156	1663
1961	10612	4485	12169	1.01	1.06	926	2205	3132	2137
1962	11325	4925	12435	1.01	1.09	972	2140	3112	2105
1963	12020	5269	12475	1.03	1.09	1022	2075	3097	2526
1964	12765	5729	13439	1.04	1.13	1071	2009	3081	2788
1965	13398	5739	12992	1.10	1.11	1117	1957	3075	4127
1966	14166	6404	13627	1.09	1.19	1158	1900	3059	3813
1967	14911	6734	13769	1.11	1.14	1189	1849	3039	4626
1968	15699	7295	14954	1.11	1.10	1228	1797	3026	5070
1969	16423	7514	15097	1.10	1.00	1261	1747	3008	4898
1970	16893	7719	14522	1.16	1.00	1304	1709	3014	6629
1971	17488	7681	14375	1.15	1.02	1375	1644	3020	6244
1972	17885	7938	13909	1.22	.92	1452	1598	3051	8349
1973	18320	7861	13656	1.18	.80	1540	1539	3080	7083
1974	18787	8793	16727	1.06	.76	1654	1457	3112	3965

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 = 0 AND T2 = 0 .

TABLE 3.3 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE USING ESTIMATED VARIABLES. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7762	3150	11955	.86	1.11	716	2570	3286	935
1956	8004	3246	12113	.88	1.04	748	2503	3251	639
1957	8404	3464	12521	.90	.98	777	2447	3225	446
1958	8895	3741	11800	.88	.91	800	2390	3191	278
1959	9403	4215	11976	.91	1.11	850	2323	3174	606
1960	10028	4338	12383	.92	1.05	895	2262	3157	1014
1961	10704	4562	12315	.93	1.06	939	2193	3132	1217
1962	11427	5022	12529	.93	1.09	987	2126	3114	1083
1963	12124	5351	12693	.94	1.08	1040	2059	3100	1462
1964	12856	5927	13615	.96	1.12	1093	1994	3087	1929
1965	13594	5888	13348	.95	1.11	1146	1930	3077	2079
1966	14409	6617	14108	.92	1.18	1194	1867	3061	1291
1967	15063	6939	13981	1.00	1.11	1231	1821	3053	3020
1968	15872	7445	15298	1.00	1.08	1278	1764	3042	3206
1969	16564	7618	15298	1.01	.96	1318	1714	3033	3414
1970	17068	7339	14775	1.04	.96	1371	1669	3041	4725
1971	17574	7715	14471	1.09	.96	1450	1609	3060	5338
1972	18175	8075	14204	1.04	.87	1540	1541	3081	5224
1973	18875	8081	14065	.87	.77	1647	1456	3104	1678
1974	19142	9206	17542	.88	.68	1778	1383	3161	354

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T1 = 0 AND T2 = 0 .

TABLE 4.1 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7654	2693	10169	.99	1.06	705	2586	3292	2394
1956	7905	2909	10532	1.00	1.01	727	2522	3250	2157
1957	8294	2993	10919	1.02	.95	744	2473	3217	2192
1958	8792	3283	10383	.99	.89	753	2420	3174	1913
1959	9297	3717	10572	1.01	1.10	785	2361	3146	2295
1960	9914	3931	10934	1.04	1.05	809	2309	3118	2826
1961	10592	4060	11013	1.03	1.08	830	2247	3078	3003
1962	11325	4513	11395	1.01	1.14	854	2189	3043	2767
1963	12021	4856	11498	1.03	1.14	877	2133	3011	3172
1964	12742	5258	12333	1.05	1.21	896	2081	2978	3743
1965	13452	5225	11829	1.06	1.23	910	2036	2946	4405
1966	14249	5866	12492	1.03	1.33	913	1990	2904	3862
1967	14910	6113	12499	1.11	1.30	899	1964	2863	5587
1968	15712	6659	13649	1.10	1.33	889	1929	2818	5832
1969	16416	6892	13846	1.10	1.27	868	1900	2768	5916
1970	16913	7071	13304	1.14	1.33	852	1881	2733	7357
1971	17433	7064	13221	1.18	1.40	853	1848	2701	7815
1972	18014	7327	12839	1.13	1.39	857	1812	2670	7823
1973	18720	7436	12918	.95	1.37	869	1759	2629	3820
1974	19000	8474	16120	.94	1.40	896	1723	2620	2427

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 4.2 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / TOTAL-OUTLAY. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7665	3053	11530	.97	1.07	706	2581	3287	1798
1956	7961	3210	12041	.93	1.02	729	2513	3242	1063
1957	8383	3442	12558	.92	.96	749	2459	3208	662
1958	8837	3702	11705	.94	.90	761	2409	3170	838
1959	9354	4175	11873	.95	1.10	796	2347	3144	1114
1960	9963	4286	12235	.99	1.05	823	2294	3118	1693
1961	10612	4487	12171	1.01	1.07	847	2234	3082	2176
1962	11325	4926	12438	1.01	1.13	873	2177	3050	2151
1963	12020	5270	12477	1.03	1.13	900	2120	3020	2578
1964	12765	5731	13442	1.03	1.20	922	2064	2987	2852
1965	13399	5740	12994	1.10	1.20	940	2023	2963	4194
1966	14166	6405	13629	1.09	1.29	945	1979	2924	3908
1967	14911	6736	13772	1.11	1.28	935	1943	2880	4717
1968	15699	7297	14956	1.11	1.29	932	1907	2839	5162
1969	16423	7515	15099	1.10	1.23	917	1874	2791	4971
1970	16893	7719	14523	1.16	1.29	907	1855	2763	6711
1971	17488	7682	14376	1.15	1.36	917	1813	2730	6341
1972	17885	7936	13906	1.22	1.32	927	1791	2719	8402
1973	18320	7857	13650	1.18	1.26	941	1759	2700	7070
1974	18786	8790	16721	1.06	1.31	973	1707	2680	3891

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 4.3 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE USING ESTIMATED VARIABLES. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7762	3150	11956	.86	1.08	708	2572	3281	851
1956	8004	3246	12113	.88	1.02	732	2508	3241	658
1957	8464	3464	12522	.90	.96	753	2456	3209	468
1958	8895	3741	11800	.88	.90	766	2402	3169	298
1959	9403	4216	11976	.91	1.10	803	2341	3144	640
1960	10028	4338	12383	.92	1.05	833	2285	3118	1052
1961	10704	4562	12315	.93	1.07	859	2223	3082	1258
1962	11427	5022	12529	.93	1.12	888	2163	3052	1132
1963	12174	5351	12693	.94	1.12	918	2105	3023	1516
1964	12856	5826	13615	.96	1.19	944	2049	2994	1893
1965	13594	5883	13348	.95	1.20	968	1996	2964	2142
1966	14408	6617	14108	.92	1.29	981	1946	2927	1383
1967	15063	6837	13980	1.00	1.26	979	1914	2893	3104
1968	15872	7444	15295	1.00	1.27	982	1873	2956	3285
1969	16563	7616	15293	1.01	1.19	975	1840	2816	3467
1970	17067	7835	14769	1.05	1.25	976	1815	2791	4778
1971	17573	7710	14461	1.09	1.29	995	1777	2772	5394
1972	18174	8070	14195	1.04	1.27	1019	1732	2752	5221
1973	18874	8076	14056	.87	1.22	1053	1674	2727	1589
1974	19140	9196	17522	.88	1.23	1105	1628	2733	165

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING ACTUAL VALUES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 5.1 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7784	3240	12235	.83	1.05	702	1963	2665	595
1956	8023	3304	12393	.86	.99	720	1981	2601	449
1957	8395	3416	12453	.91	.93	734	1841	2576	650
1958	8884	3680	11637	.89	.84	737	1829	2566	563
1959	9409	4240	12058	.90	1.13	768	1720	2489	570
1960	10027	4340	12386	.92	1.07	791	1678	2470	1085
1961	10709	4583	12431	.92	1.08	809	1620	2429	1225
1962	11449	5088	12849	.91	1.17	830	1524	2355	857
1963	12153	5474	12961	.92	1.17	851	1465	2316	1137
1964	12887	5953	13963	.94	1.27	871	1393	2264	1462
1965	13593	5863	13273	.96	1.28	884	1332	2217	2220
1966	14404	6607	14059	.92	1.42	893	1224	2117	1440
1967	15058	6814	13934	1.01	1.36	884	1257	2141	3204
1968	15868	7423	15213	1.00	1.37	878	1244	2123	3403
1969	16569	7635	15340	1.01	1.29	861	1208	2069	3441
1970	17064	7796	14668	1.05	1.35	849	1230	2079	4938
1971	17577	7732	14469	1.09	1.44	855	1189	2044	5391
1972	18182	8115	14221	1.03	1.41	861	1105	1967	5177
1973	18892	8220	14280	.87	1.37	873	998	1871	1353
1974	19169	9340	17768	.86	1.46	906	968	1875	-222

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 5.2 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / TOTAL-OUTLAY. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7659	3025	11425	.98	1.05	702	1989	2691	1909
1956	7957	3192	11976	.94	.99	720	1894	2615	1153
1957	8382	3435	12532	.92	.93	735	1843	2578	722
1958	8835	3693	11679	.94	.84	739	1835	2574	934
1959	9351	4161	11835	.96	1.12	770	1731	2501	1163
1960	9960	4274	12200	.99	1.06	792	1690	2483	1768
1961	10609	4472	12129	1.02	1.08	809	1639	2449	2267
1962	11321	4906	12389	1.02	1.16	830	1551	2381	2239
1963	12015	5249	12428	1.03	1.16	849	1495	2344	2683
1964	12761	5710	13394	1.04	1.26	866	1423	2289	2928
1965	13394	5718	12943	1.11	1.27	878	1374	2252	4290
1966	14160	6376	13567	1.09	1.41	882	1276	2158	3988
1967	14909	6725	13751	1.11	1.36	871	1291	2162	4767
1968	15697	7286	14934	1.11	1.37	862	1284	2147	5222
1969	16423	7515	15099	1.10	1.29	841	1245	2086	5016
1970	16894	7723	14531	1.16	1.36	824	1273	2098	6749
1971	17493	7708	14424	1.14	1.46	826	1217	2044	6289
1972	17883	7930	13896	1.22	1.41	826	1180	2006	8484
1973	18312	7822	13590	1.18	1.35	824	1125	1950	7281
1974	18787	8793	16723	1.06	1.45	844	1069	1913	3927

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 5.3 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE USING ESTIMATED VARIABLES. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7765	3167	12018	.85	1.05	701	1968	2670	830
1956	8006	3254	12142	.88	.99	719	1885	2605	669
1957	8405	3468	12538	.89	.93	734	1838	2573	495
1958	8897	3750	11828	.88	.84	738	1824	2562	344
1959	9405	4227	12007	.90	1.13	769	1721	2490	623
1960	10031	4352	12423	.92	1.06	791	1677	2468	1044
1961	10708	4581	12368	.93	1.08	808	1620	2429	1244
1962	11432	5045	12585	.92	1.17	829	1529	2359	1089
1963	12130	5377	12754	.94	1.17	849	1472	2322	1473
1964	12862	5855	13680	.96	1.27	868	1401	2270	1827
1965	13603	5932	13448	.95	1.28	881	1330	2212	2045
1966	14420	6675	14231	.91	1.43	889	1221	2111	1235
1967	15072	6881	14069	1.00	1.38	882	1254	2136	2986
1968	15883	7500	15412	.99	1.37	876	1241	2117	3165
1969	16573	7664	15391	1.00	1.30	858	1207	2066	3367
1970	17079	7896	14883	1.04	1.36	847	1225	2073	4652
1971	17581	7748	14534	1.09	1.45	853	1189	2042	5314
1972	18192	8160	14354	1.03	1.41	860	1103	1963	5019
1973	18900	8200	14273	.86	1.39	873	997	1870	1295
1974	19159	9299	17718	.87	1.46	906	970	1877	-97

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 6.1 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7787	3252	12281	.93	1.09	709	1945	2654	536
1956	8025	3311	12418	.86	1.02	734	1859	2594	401
1957	8305	3419	12474	.90	.96	757	1815	2572	612
1958	8883	3578	11631	.89	.85	769	1800	2569	544
1959	9409	4234	12041	.90	1.14	811	1693	2495	549
1960	10025	4330	12359	.93	1.07	847	1632	2480	1082
1961	10705	4565	12381	.93	1.08	880	1568	2449	1239
1962	11443	5060	12779	.91	1.15	918	1465	2383	893
1963	12145	5435	12870	.93	1.14	959	1393	2352	1195
1964	12875	5895	13927	.95	1.22	1001	1313	2314	1570
1965	13579	5797	13121	.97	1.20	1039	1242	2281	2364
1966	14387	6522	13877	.93	1.33	1077	1114	2192	1583
1967	15036	6704	13709	1.02	1.23	1100	1136	2237	3457
1968	15839	7269	14899	1.02	1.19	1128	1113	2242	3785
1969	16535	7463	14994	1.03	1.07	1147	1060	2208	3921
1970	17022	7586	14272	1.07	1.08	1174	1070	2245	5541
1971	17531	7513	14059	1.12	1.14	1224	1009	2234	6051
1972	18124	7834	13728	1.07	1.05	1278	907	2186	6019
1973	18829	7927	13771	.90	.97	1344	772	2116	2202
1974	19097	8963	17050	.90	.98	1433	726	2160	873

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 = 0 WHILE T2 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 6.2 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / TOTAL-OUTLAY. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7658	3024	11421	.98	1.09	709	1971	2680	1889
1956	7957	3192	11974	.94	1.02	735	1873	2608	1130
1957	8382	3435	12532	.92	.96	758	1816	2574	695
1958	8835	3693	11679	.94	.85	770	1806	2577	910
1959	9351	4162	11836	.96	1.14	813	1694	2507	1127
1960	9960	4274	12200	.99	1.07	849	1644	2493	1724
1961	10609	4472	12130	1.02	1.07	881	1586	2468	2220
1962	11321	4907	12391	1.02	1.14	919	1488	2408	2180
1963	12016	5251	12432	1.03	1.13	959	1420	2379	2615
1964	12762	5713	13401	1.04	1.21	999	1337	2337	2843
1965	13394	5721	12950	1.11	1.19	1035	1277	2313	4202
1966	14161	6380	13577	1.09	1.32	1071	1159	2230	3855
1967	14910	6731	13762	1.11	1.23	1093	1161	2254	4640
1968	15699	7294	14950	1.11	1.20	1119	1141	2261	5090
1969	16424	7523	15114	1.10	1.08	1136	1083	2220	4902
1970	16895	7733	14548	1.16	1.09	1162	1095	2258	6620
1971	17494	7714	14435	1.14	1.16	1212	1016	2228	6134
1972	17886	7943	13918	1.22	1.04	1262	956	2219	8345
1973	18316	7838	13617	1.18	.93	1318	873	2191	7174
1974	18789	8807	16753	1.06	.96	1399	794	2193	3835

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 = 0 WHILE T2 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 6.3 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE USING ESTIMATED VARIABLES. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7766	3167	12019	.85	1.09	708	1950	2659	806
1956	8005	3254	12142	.88	1.02	734	1864	2598	644
1957	8405	3468	12538	.89	.96	757	1812	2569	467
1958	8897	3750	11328	.88	.85	769	1795	2565	321
1959	9405	4227	12007	.90	1.14	812	1684	2496	583
1960	10031	4352	12423	.92	1.07	848	1631	2479	1000
1961	10708	4581	12367	.93	1.08	880	1567	2448	1199
1962	11431	5045	12584	.92	1.15	919	1467	2386	1035
1963	12129	5377	12753	.94	1.14	960	1397	2357	1411
1964	12862	5854	13678	.96	1.21	1001	1316	2317	1754
1965	13603	5931	13444	.95	1.19	1039	1234	2273	1974
1966	14419	6672	14225	.91	1.34	1078	1104	2183	1092
1967	15071	6878	14064	1.00	1.25	1104	1124	2228	2885
1968	15882	7497	15404	.99	1.20	1133	1098	2232	3075
1969	16572	7661	15385	1.00	1.08	1155	1046	2201	3294
1970	17079	7892	14876	1.04	1.09	1185	1048	2234	4576
1971	17581	7748	14532	1.09	1.14	1239	988	2227	5202
1972	18191	8152	14338	1.03	1.05	1297	880	2177	4964
1973	18897	8185	14246	.86	.97	1366	746	2113	1302
1974	19157	9289	17693	.87	.97	1461	698	2159	-77

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 = 0 WHILE T2 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 7.1 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7787	3252	12280	.93	1.09	709	1945	2654	537
1956	8025	3310	12418	.86	1.02	734	1859	2594	402
1957	8395	3419	12473	.90	.96	757	1815	2572	613
1958	8883	3678	11630	.89	.85	768	1800	2569	545
1959	9408	4234	12041	.90	1.14	811	1684	2495	549
1960	10025	4329	12357	.93	1.07	846	1634	2480	1085
1961	10705	4564	12380	.93	1.07	878	1570	2449	1243
1962	11443	5060	12778	.91	1.15	917	1466	2383	892
1963	12145	5435	12869	.93	1.14	957	1395	2353	1200
1964	12875	5894	13826	.95	1.22	998	1315	2314	1576
1965	13579	5796	13119	.97	1.20	1036	1245	2282	2372
1966	14387	6522	13878	.93	1.33	1073	1118	2191	1586
1967	15036	6703	13705	1.02	1.23	1095	1142	2238	3473
1968	15837	7263	14896	1.02	1.19	1121	1121	2243	3799
1969	16535	7462	14993	1.03	1.07	1139	1069	2208	3933
1970	17021	7584	14269	1.07	1.08	1163	1083	2246	5561
1971	17531	7512	14058	1.12	1.14	1210	1024	2235	6072
1972	18125	7836	13731	1.07	1.05	1260	923	2184	6023
1973	18832	7937	13789	.89	.99	1324	782	2107	2167
1974	19100	8978	17079	.90	1.00	1412	735	2147	814

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 = 0 AND T2 = 0 .

TABLE 7.2 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / TOTAL-OUTLAY. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7659	3024	11419	.98	1.09	709	1972	2681	1893
1956	7956	3192	11973	.94	1.02	734	1874	2609	1132
1957	8382	3435	12533	.92	.96	757	1817	2574	695
1958	8835	3693	11679	.94	.85	769	1807	2577	911
1959	9351	4162	11836	.96	1.14	812	1695	2507	1129
1960	9960	4274	12200	.99	1.07	847	1646	2494	1727
1961	10609	4472	12129	1.02	1.07	879	1589	2469	2225
1962	11321	4907	12391	1.02	1.14	916	1492	2408	2185
1963	12016	5250	12431	1.03	1.13	955	1424	2379	2621
1964	12762	5713	13401	1.04	1.21	994	1342	2337	2847
1965	13394	5721	12950	1.11	1.19	1029	1285	2314	4212
1966	14161	6380	13576	1.09	1.32	1063	1167	2230	3867
1967	14910	6732	13765	1.11	1.23	1082	1171	2254	4647
1968	15699	7297	14955	1.11	1.20	1107	1153	2260	5095
1969	16425	7526	15121	1.10	1.08	1121	1095	2217	4903
1970	16896	7736	14555	1.16	1.10	1144	1112	2256	6622
1971	17495	7719	14445	1.14	1.17	1190	1033	2224	6132
1972	17886	7945	13922	1.22	1.05	1236	979	2216	8356
1973	18315	7836	13613	1.18	.94	1286	897	2184	7194
1974	18790	8910	16759	1.06	.99	1363	814	2178	3820

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T1 = 0 AND T2 = 0 .

TABLE 7.3 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE USING ESTIMATED VARIABLES. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7766	3167	12021	.85	1.09	708	1951	2659	805
1956	8006	3254	12143	.88	1.02	734	1864	2599	644
1957	8405	3469	12537	.89	.96	757	1812	2570	468
1958	8897	3750	11828	.88	.85	769	1796	2565	321
1959	9405	4227	12007	.90	1.14	811	1684	2496	584
1960	10031	4352	12423	.92	1.07	847	1632	2479	1001
1961	10708	4581	12368	.93	1.07	879	1569	2449	1200
1962	11431	5045	12585	.92	1.15	917	1468	2386	1036
1963	12130	5377	12754	.94	1.14	958	1399	2357	1413
1964	12862	5853	13678	.96	1.21	999	1319	2318	1759
1965	13603	5931	13445	.95	1.19	1035	1238	2274	1977
1966	14419	6673	14228	.91	1.35	1074	1107	2182	1091
1967	15071	6877	14062	1.00	1.24	1099	1129	2229	2895
1968	15882	7495	15400	.99	1.20	1128	1104	2232	3078
1969	16572	7658	15378	1.00	1.08	1148	1053	2202	3314
1970	17078	7888	14868	1.04	1.09	1176	1059	2235	4600
1971	17580	7742	14521	1.09	1.14	1227	1001	2229	5238
1972	18190	8149	14334	1.03	1.05	1282	894	2176	4990
1973	18897	8187	14249	.86	.98	1349	755	2105	1290
1974	19156	9283	17688	.87	.99	1443	705	2148	-77

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T1 = 0 AND T2 = 0 .

TABLE 8.1 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7784	3240	12234	.83	1.05	701	1964	2666	598
1956	8023	3304	12392	.86	.99	720	1891	2601	450
1957	8395	3416	12462	.91	.93	734	1842	2576	651
1958	8884	3680	11636	.89	.84	737	1829	2567	564
1959	9409	4240	12058	.90	1.13	768	1721	2489	571
1960	10027	4339	12385	.92	1.07	791	1679	2470	1088
1961	10709	4583	12430	.92	1.08	808	1621	2430	1229
1962	11449	5089	12849	.91	1.17	829	1526	2355	859
1963	12153	5474	12961	.92	1.17	849	1467	2317	1141
1964	12887	5953	13962	.94	1.27	868	1396	2265	1466
1965	13593	5863	13271	.96	1.28	881	1336	2218	2229
1966	14404	6603	14060	.92	1.42	889	1228	2117	1443
1967	15058	6813	13930	1.01	1.36	879	1253	2143	3218
1968	15868	7422	15212	1.00	1.37	872	1251	2124	3416
1969	16569	7635	15340	1.01	1.29	853	1216	2069	3452
1970	17064	7795	14665	1.05	1.35	833	1241	2080	4957
1971	17577	7731	14468	1.09	1.44	841	1203	2045	5414
1972	18183	8113	14225	1.03	1.41	845	1120	1965	5190
1973	18894	9232	14301	.86	1.39	854	1007	1862	1331
1974	19172	9360	17805	.86	1.49	886	975	1861	-269

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES; T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 8.2 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / TOTAL-OUTLAY. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7658	3025	11422	.98	1.05	702	1990	2692	1914
1956	7957	3192	11975	.94	.99	720	1895	2615	1155
1957	8382	3435	12533	.92	.93	734	1843	2578	722
1958	8835	3693	11679	.94	.84	738	1836	2575	934
1959	9351	4161	11835	.96	1.12	769	1732	2501	1170
1960	9960	4274	12200	.99	1.05	790	1693	2483	1771
1961	10609	4471	12128	1.02	1.08	807	1642	2450	2271
1962	11321	4906	12388	1.02	1.16	827	1554	2381	2245
1963	12015	5248	12427	1.03	1.16	845	1499	2345	2691
1964	12761	5710	13394	1.04	1.26	861	1428	2290	2934
1965	13394	5717	12942	1.11	1.27	872	1381	2253	4299
1966	14160	6375	13565	1.09	1.41	874	1284	2159	4004
1967	14909	6726	13753	1.11	1.36	861	1301	2163	4778
1968	15698	7288	14936	1.11	1.37	850	1296	2146	5233
1969	16423	7518	15104	1.10	1.29	826	1258	2084	5025
1970	16894	7726	14536	1.16	1.36	806	1290	2096	6762
1971	17494	7713	14434	1.14	1.47	804	1236	2040	6303
1972	17894	7931	13898	1.22	1.42	799	1204	2003	8513
1973	18312	7819	13583	1.18	1.36	793	1150	1944	7321
1974	18787	8795	16731	1.06	1.48	808	1090	1898	3955

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

TABLE 8.3 ESTIMATED VALUES BASED ON PRODUCTION COEFFICIENTS DETERMINED BY INPUT-OUTLAY / GROSS-REVENUE USING ESTIMATED VARIABLES. *

YEAR	QUANTITY OF OUTPUT (REAL $)	QUANTITY OF CURRENT OPERATING INPUTS (REAL $)	QUANTITY OF CAPITAL STOCK (REAL $)	PRODUCT PRICE INDEX (INDEX NO.)	FARM WAGE RATE (REAL $)	HIRED LABOR (HRS)	HOUSEHOLD LABOR (HRS)	TOTAL LABOR (HRS)	NET INCOME (REAL $)
1955	7766	3167	12021	.85	1.05	701	1969	2670	829
1956	8006	3254	12142	.88	.99	719	1886	2606	669
1957	8405	3469	12537	.89	.93	734	1839	2573	496
1958	8897	3750	11929	.88	.84	737	1825	2562	344
1959	9405	4227	12009	.90	1.13	768	1722	2490	624
1960	10031	4353	12423	.92	1.06	790	1679	2469	1045
1961	10708	4582	12368	.93	1.08	807	1622	2429	1245
1962	11432	5046	12587	.92	1.16	827	1531	2359	1093
1963	12130	5378	12756	.94	1.17	847	1474	2322	1474
1964	12862	5855	13691	.96	1.27	865	1405	2270	1831
1965	13603	5933	13450	.95	1.28	878	1333	2212	2034
1966	14420	6676	14234	.91	1.43	886	1224	2110	1205
1967	15071	6879	14056	1.00	1.37	877	1259	2137	2997
1968	15893	7498	15407	.99	1.38	871	1247	2118	3171
1969	16572	7661	15383	1.00	1.29	852	1215	2068	3390
1970	17079	7892	14875	1.04	1.36	839	1236	2075	4680
1971	17580	7742	14521	1.09	1.45	842	1202	2044	5357
1972	18192	8157	14348	1.03	1.41	846	1116	1963	5052
1973	18900	8202	14276	.86	1.40	857	1006	1863	1305
1974	19158	9292	17706	.87	1.48	888	978	1866	-70

* BASED ON SIMULTANEOUS LABOR SYSTEM INCLUDING FIRST STAGE ESTIMATES OF NET INCOME AND PRODUCT PRICE AS EXPLANATORY VARIABLES: T2 = 0 WHILE T1 IS SET EQUAL TO THE APPROPRIATE TAX RATE.

APPENDIX D

BASIC DATA

Table D1. Basic data.

Year	Number of farms in U.S. 1000	Total labor requirements million hours	Cash farm wages paid million $	Cash farm wages less social security taxes million $	Value of perquisites million $	Cash farm wages plus perquisites less social security taxes million $	Farm wage rate $
1955	4654	12808	2307	2261	308	2569	.82
1956	4514	12028	2336	2289	305	2594	.86
1957	4372	11059	2422	2368	312	2680	.88
1958	4233	10548	2529	2472	313	2785	.92
1959	4097	10301	2567	2503	339	2842	.95
1960	3963	9795	2701	2620	361	2981	.97
1961	3825	9400	2811	2727	381	3108	.99
1962	3692	8979	2902	2811	397	3208	1.01
1963	3572	8664	2980	2872	420	3292	1.05
1964	3457	8194	3069	2958	414	3372	1.08
1965	3356	7338	3194	3078	410	3488	1.14
1966	3257	6863	3256	3119	427	3546	1.23
1967	3162	6680	3298	3153	425	3578	1.33
1968	3071	6424	3488	3335	432	3767	1.43
1969	2999	6198	3694	3517	458	3975	1.55
1970	2954	5983	3879	3693	470	4163	1.64
1971	2909	5901	3864	3663	503	4166	1.73
1972	2870	5659	4071	3859	523	4382	1.84
1973	2844	5605	4619	4349	613	4962	2.00
1974	2830	5478	5344	5031	687	5718	2.29

Table D1 (continued)

Year	Index of prices received for all farm products	Index of prices paid for all commodities including production and consumption	Feed purchased million $	Livestock purchased million $	Petroleum fuel and oil purchased million $	Other motor vehicle operation costs million $	Repairs on other machinery million $
1955	91	81	3880	1539	1403	1002	456
1956	91	81	3894	1610	1434	1145	463
1957	92	84	4035	1934	1464	1231	468
1958	98	86	4541	2702	1447	1246	504
1959	95	87	4744	2693	1447	1292	542
1960	94	88	4552	2506	1484	1247	495
1961	94	88	4763	2729	1508	1184	456
1962	96	90	5187	3104	1512	1182	462
1963	96	91	5690	2926	1535	1149	447
1964	93	92	5512	2419	1549	1117	433
1965	98	94	5674	2912	1567	1116	439
1966	105	98	6401	3544	1616	1213	457
1967	100	100	6646	3431	1657	1292	498
1968	103	104	6357	3676	1662	1333	513
1969	108	109	7100	4225	1717	1337	509
1970	110	114	8028	4324	1711	1352	558
1971	112	120	8049	5123	1722	1455	574
1972	126	127	8397	6668	1688	1524	584
1973	172	145	13237	8063	1870	1562	659
1974	183	168	14996	5154	2683	1674	740

Table D1 (continued)

Year	Building repairs and operation million $	Fertilizer and lime purchased million $	Seed purchased million $	Miscellaneous expenses less interest on non-real estate debt million $	Total outlay for operating inputs million $	Index of prices paid for livestock	Index of prices paid for feed	Index of prices paid for fertilizer
1955	450	1185	566	2044	12525	80	100	101
1956	455	1166	519	2169	12855	74	97	99
1957	462	1166	510	2242	13512	83	95	100
1958	445	1206	508	2506	15105	102	93	100
1959	547	1332	491	2916	16004	102	94	99
1960	499	1344	519	3074	15720	96	92	100
1961	511	1437	545	3178	16311	96	93	100
1962	545	1544	565	3345	17446	100	94	100
1963	542	1712	619	3472	18092	94	98	99
1964	524	1888	661	3652	17755	84	97	99
1965	540	1994	720	3829	18791	92	98	100
1966	568	2219	760	3988	20766	103	102	99
1967	642	2429	814	4348	21757	100	100	100
1968	598	2434	831	4633	22037	104	95	97
1969	618	2312	871	4798	23487	117	97	93
1970	674	2390	927	4997	24961	121	102	97
1971	675	2633	1072	5565	28868	125	106	101
1972	632	2690	1115	6051	29349	147	108	104
1973	851	3050	1598	6713	37603	188	164	114
1974	915	5606	2032	7331	41131	144	192	180

Table D1 (continued)

Year	Index of prices paid for seed	Index of prices paid for motor supplies	Index of prices paid for building and fencing supplies	Index of prices paid for all commodities used in production	Index of prices paid for motor vehicles	Index of prices paid for farm machinery	Gross capital expenditures for service buildings and land million $	Gross capital expenditures for motor vehicles million $
1955	100	91	87	87	72	68	853	1482
1956	88	92	91	87	74	71	863	1245
1957	91	96	94	90	79	74	874	1377
1958	90	95	95	92	83	77	841	1606
1959	86	96	97	93	85	81	1115	1686
1960	89	96	97	92	84	82	1201	1344
1961	89	97	96	93	84	84	1156	1413
1962	92	97	96	94	87	86	1283	1650
1963	97	97	96	95	90	88	1321	1746
1964	97	96	95	94	91	90	1331	1868
1965	100	97	96	96	93	92	1387	1940
1966	98	98	98	99	96	96	1484	2113
1967	100	100	100	100	100	100	1702	2129
1968	106	102	106	102	105	105	1598	2060
1969	108	105	114	106	109	110	1689	2003
1970	114	107	115	110	114	116	1875	2030
1971	122	112	124	115	122	124	1916	2137
1972	130	114	135	122	127	133	1785	2464
1973	176	121	154	146	135	144	2460	2972
1974	225	165	195	172	157	172	2670	3039

Table D1 (continued)

Year	Gross capital expenditures for other machinery and equipment million $	Interest paid on non-real estate debt million $	Non-real estate debt million $	Value of farm service buildings million $	Value of equipment and machines million $	Social security tax rate on wages and salaries %	Social security self-employment tax rate %
1955	1278	442	7196	14210	18600	2.0	3.00
1956	1161	469	7900	15333	19300	2.0	3.00
1957	1135	499	8000	16226	20200	2.25	3.375
1958	1544	565	8800	15865	20200	2.25	3.375
1959	1728	650	10000	14385	21800	2.50	3.75
1960	1458	719	11528	14528	22700	3.00	4.50
1961	1453	746	11929	14243	22200	3.00	4.50
1962	1540	824	12701	14523	22500	3.125	4.70
1963	1779	928	14164	14653	23500	3.625	5.40
1964	1902	994	15657	15061	23900	3.625	5.40
1965	2239	1075	16366	15532	24800	3.625	5.40
1966	2498	1207	18062	16297	26000	4.20	6.15
1967	3003	1385	19792	17085	27400	4.40	6.40
1968	2490	1513	20834	18015	29800	4.40	6.40
1969	2522	1716	20387	19156	31300	4.80	6.90
1970	2888	1982	21168	17774	32300	4.80	6.90
1971	2736	2085	22262	17990	34400	5.20	7.50
1972	3231	2261	24644	19160	36600	5.20	7.50
1973	4581	2744	27994	21486	39300	5.85	8.00
1974	4720	3280	32134	26662	44200	5.85	7.90

Table D1 (continued)

Year	Average monthly payment under aid to families with dependent children $	Consumer price index	Interest paid on real estate debt million $	Taxes on farm property million $	Net rent excluding government payments million $	Average number of acres per U.S. farm	Real estate assets billion 67$	Deposits and currency billion 67$
1955	85.50	80.2	402	1141	1028	247	173.6	11.6
1956	91.50	81.4	442	1178	1041	253	174.5	11.9
1957	95.15	84.3	482	1242	904	260	175.4	11.3
1958	100.40	86.6	521	1306	1060	266	176.1	11.2
1959	103.70	87.3	572	1429	1010	288	176.7	11.5
1960	108.35	88.7	628	1529	1054	297	177.9	10.4
1961	114.65	89.6	686	1609	1177	305	178.6	9.9
1962	119.10	90.6	759	1677	1260	314	179.1	9.9
1963	122.40	91.7	846	1737	1415	322	179.8	10.1
1964	131.30	92.9	952	1798	1372	332	180.5	10.0
1965	136.95	94.5	1075	1874	1566	340	181.2	10.3
1966	150.10	97.2	1198	2002	1617	348	181.6	10.4
1967	161.70	100.0	1325	2122	1506	355	182.3	10.3
1968	168.15	104.2	1472	2298	1567	363	182.5	10.7
1969	176.05	109.8	1625	2456	1586	369	182.7	10.7
1970	187.95	116.3	1764	2596	1670	373	183.0	10.5
1971	190.20	121.3	1905	2704	1850	377	183.2	10.5
1972	191.20	125.3	2132	2815	2984	381	183.5	10.6
1973	196.93	133.1	2487	2886	5366	383	183.5	10.2
1974	217.73	147.7	2986	2980	5844	384	183.6	9.4

Table D1 (continued)

Year	U.S. savings bonds billion 67$	Investment in cooperatives billion 67$	Farm real estate debt million $	Average wage rate for factory workers $	Average nonfarm work week hours	U.S. nonfarm unemployment rate %	Cash receipts from livestock and livestock products million $
1955	6.1	3.7	8245	1.88	40.7	4.4	15967
1956	6.5	4.0	9012	1.98	40.4	4.2	16363
1957	6.1	4.2	9822	2.07	39.8	4.3	17376
1958	6.0	4.3	10382	2.11	39.2	6.8	19227
1959	6.1	4.5	11091	2.19	40.3	5.5	18904
1960	5.3	4.8	12082	2.26	39.7	5.5	18989
1961	5.3	5.1	12820	2.32	39.8	6.7	19514
1962	5.0	5.5	13899	2.39	40.4	5.6	20158
1963	4.9	5.5	15168	2.46	40.5	5.7	20047
1964	4.6	5.8	16804	2.54	40.7	5.2	19948
1965	4.5	6.0	18984	2.61	41.2	4.5	21886
1966	4.2	6.1	21187	2.72	41.3	3.8	25026
1967	3.9	6.2	23077	2.83	40.6	3.8	24383
1968	3.7	6.4	25142	2.85	40.7	3.6	25487
1969	3.5	6.4	27397	3.04	40.6	3.5	28573
1970	3.3	6.4	29183	3.22	39.8	4.9	29563
1971	3.0	6.5	30346	3.43	39.9	5.9	30583
1972	3.0	6.5	32208	3.65	40.6	5.6	35670
1973	2.9	6.3	35758	3.89	40.7	4.9	45824
1974	2.6	6.0	41253	4.22	40.0	5.6	41424

Table D1 (continued)

Year	Value of livestock and livestock products consumed in farm households million $	Cash receipts from all crops million $	Value of crops consumed in farm households million $	Government farm production subsidies million $	Net change in farm inventories million $	Other farm income million $	Index of prices received for livestock and livestock products
1955	1111	13523	567	229	215	123	.84
1956	1044	14038	541	554	-456	141	.82
1957	999	12338	485	1016	618	169	.88
1958	1011	14229	494	1089	825	222	.99
1959	850	14743	439	682	14	227	.93
1960	786	15259	419	702	397	244	.91
1961	738	15650	371	1493	336	243	.91
1962	668	16310	325	1747	620	257	.92
1963	610	17430	311	1696	629	285	.89
1964	549	17378	286	2181	-817	336	.85
1965	535	17479	276	2463	1042	387	.94
1966	573	18409	251	3277	-83	416	1.05
1967	504	18434	232	3079	657	484	1.00
1968	494	18696	225	3462	124	521	1.04
1969	522	19606	209	2794	99	559	1.17
1970	535	20976	216	3717	6	543	1.18
1971	506	22276	226	3145	1397	641	1.16
1972	580	25520	251	3961	861	663	1.34
1973	782	41051	323	2607	3627	811	1.79
1974	910	52097	389	530	-1635	882	1.63

Table Dl (continued)

Year	Index of prices received for crops	Index of farm real estate values	U.S. Population thousands of people
1955	1.02	.57	165275
1956	1.04	.57	168221
1957	.99	.61	171274
1958	.99	.65	174141
1959	.98	.66	177073
1960	.99	.68	180671
1961	1.00	.69	183691
1962	1.03	.73	186538
1963	1.06	.77	189242
1964	1.06	.82	191889
1965	1.03	.86	194303
1966	1.05	.93	196560
1967	1.00	1.00	198712
1968	1.01	1.07	200706
1969	.97	1.13	202667
1970	1.00	1.17	204875
1971	1.07	1.22	207045
1972	1.15	1.32	208842
1973	1.64	1.50	210410
1974	2.13	1.87	211894