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# IMPUTATION OF A RESIDUAL FARM LABOR WAGE RATE AND COMPARISON TO SELECTED WAGE RATES

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## Abstract

Returns to the farm sector have often been computed based upon a return to assets. This analysis shifts the focus from returns to assets to returns to farm labor. An imputed return to farm labor is compared with labor wage rates paid to various sectors of the U.S. economy, including the hired farm wage rate, retail wage rate, and the composite wage rate for all nonfarm work. Over the period examined, 1984-1985, the two most important results are (1) that the imputed farm wage rate averages below the other wage rates and (2) that the volatility in wage rates has increased for all sectors, but has increased proportionally more in farming. One explanation for the low return is that farm operators did not earn their opportunity cost of labor; thus there was net economic cost to participation in the farm sector.

Returns to the farm sector have often been computed based upon a return to assets. These returns are composed of income and real capital gains and are generally thought to be on par with other sectors in the U.S. economy (Irwin, Froster, and Sherrick). Yet farmers continue to complain that they are economically depressed. What explains this paradoxical situation? An answer will be sought in this analysis.

The focus of this analysis was shifted from returns to assets to returns to farm labor. In other words, the focus becomes the farmer as an operator, rather than the farmer (or others) as an investor in farm assets. An imputed return to farm labor is compared with labor wage rates paid to various sectors of the U.S. economy, including the hired farm wage rate, retail wage rate, and the composite wage rate for all nonfarm work. Over the period examined, 1948-1985, the imputed farm wage rate averaged below the other wage rates studied. One explanation for this result is that the farm operator did not earn the opportunity cost of labor; thus there was net

economic cost to participation in the farm sector. The imputed wage rate was also volatile from year to year.

The research procedure will first be presented, primarily focusing on the imputation of the farm labor wage rate. Discussion of the data will follow. Next, the results will be discussed; last, the summary, conclusion, and implications will be presented.

## Procedure and Data

The research objective was to compare an imputed farm wage rate to national average wages paid for hired farm workers, manufacturing, construction, retail trade, and total private nonfarm labor. Wages were highest for construction, followed in descending order by manufacturing, total private nonfarm labor, retail trade and hired farm workers. Wage rates were collected from the Economic Report of the President and U.S. Department of Agriculture's (USDA's) annual publication, Agricultural Statistics.

The imputed wage rate for farm labor was calculated using the following equation:

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While the idea for and work necessary to complete this paper originated with myself, a final product would not have been possible without the valuable advice and guidance of Drs. Carl Zulauf and Gary Schnitkey, Ohio State University. The advice of Dr. Thomas Burns and Dr. Laurence McCulloch also proved useful to the report's formation. The author wishes to sincerely thank these individuals.

|   |   |                          |   |                                 |   |                                      |   |                        |   |                                     |
|---|---|--------------------------|---|---------------------------------|---|--------------------------------------|---|------------------------|---|-------------------------------------|
| Farm income<br>to assets,<br>labor, and<br>management | + | real<br>capital<br>gains | + | hired<br>farm<br>labor<br>wages | - | imputed<br>manage-<br>ment<br>charge | - | interest<br>on<br>debt | - | imputed<br>interest<br>on<br>equity |
|---|---|--------------------------|---|---------------------------------|---|--------------------------------------|---|------------------------|---|-------------------------------------|

total hours of farm work

A brief explanation of each term in this calculation follows:

- Farm income to assets, labor, and management:  
"Returns to operators plus net rent received by non-operating landlords plus interest on real estate and non-real estate debt." (United States Department of Agriculture (USDA), 1986, p. 70).
- Real capital gains:  
"Measure the amount by which nominal capital gains exceed the loss in purchasing power from inflation-induced price increases as measured by the personal consumption expenditure index. Nominal capital gains measure changes in the value of net investment in farm production assets (capital expenditures less capital consumption allowances and transfer of assets)." (USDA, p. 7)
- Hired farm labor wages:  
The sum of contract labor plus cash wages plus employers' contribution to social security plus perquisites; this is included here because the total data on farm hours worked includes hired labor hours. (USDA, p. 33)
- Imputed management charge:  
Five percent of the sum of cash receipts plus net inventory charges plus government payments minus livestock and feed purchases (USDA, p. 70). This computation is removed from farm income to assets, labor, and

management because management hours are not represented in total labor hours.

- Interest on debt:  
Both real estate and non-real estate interest charges paid to borrow capital.
- Imputed interest on equity:  
Calculated using selected interest rates multiplied by the December 31 USDA equity valuation of the previous year. This assumes the opportunity cost to a farmer's equity is an interest bearing instrument.
- Total hours of farm work:  
Includes operator, hired, and unpaid family labor.

All of the data needed for this calculation are contained in USDA's Economic Indicators of the Farm Sector, except for the imputed interest on equity, whose interest rates can be found in the Federal Reserve Board Bulletin and the Economic Report of the President. Imputed interest on equity, the only data not given by USDA, deserves further clarification as follows. A farmer is assumed to sell the underlying assets at the stated value on December 31 and to invest this money in a interest-bearing instrument. This calculation ensures that the foregone interest is recalculated each year. While many interest rates were applied to the data set, three were chosen for this report: a one year treasury bill rate, the corporate Aaa composite long term bond rate, and the Corporate Baa composite long term bond rate. Since the treasury bill rate is paid by the U.S. government for the money it borrows, it is a relatively riskless interest rate. The corporate Aaa rate has more risk associated



with it, while the Baa rate is associated with greater risk than either of the other two rates.

The period analyzed is from 1948 to 1985. Farm labor wage rates are not available prior to 1948, and farm labor hours are not available after 1985. It should also be noted that, since the imputed wage rate is a function of income, interest on equity, and total hours worked, the wage rate per hour is inaccurate to the extent that any of these data are incorrectly estimated.

## Results

The two most important results are the low farm wage rate relative to other sectors and the volatility of the imputed farm wage rate (Table 1, Figures 1 through 3). Both hired farm labor and the imputed farm wage rate are below the other sectors' rates over the period examined. The differences do not appear significant through the 1950s; but when examined carefully with regard to percentage differences, farming exhibited a considerably lower wage rate. In addition, construction wages have been equal to or greater than farming wages for the entire period examined, including the 1970s. Furthermore, the rate for hired farm labor tends to be below the imputed farm wage rate, except during the 1980s. These trends can be observed in Table 1.

The low farm wage rate has many possible explanations, and each will be briefly discussed here. First, the differential may exist because the skills of farming's composite labor force, which included children and family members, may not be as valuable as the other sectors' participant skills. Second, the differential may imply that farmer's skills are not as highly valued by the market as skills in retail trade and other sectors. Third, the data may not be accurate, or may have been incorrectly manipulated. Fourth, transportation from the home to the place of work may explain the wage differential. This cost is not incurred by farmers residing on the farm. Fifth, the rural sector in general may receive a low wage rate in comparison to the non-rural sector; this differential would represent an opportunity cost to rural living. An opportunity cost to being a farmer is the final possible explanation for the wage differential. Farmers may accept a lower wage rate due to the utility gained from farming. This does not assume non-

monetary utility. This argument can also be used to explain farmers' willingness to accept volatility in their wage rates. Followed to its logical conclusion, this explanation implies that farmers are not as economically motivated as workers in other sectors.

The second conclusion is the volatile imputed farm wage rate compared with other sectors or even with hired farm labor (Figures 1 through 3). Over the period analyzed, the farming wage rate has a standard deviation of 7.13, contrasted with the total private non-agricultural labor's wage rate standard deviation of 2.07. This volatility has increased among all sectors but has increased proportionally more in farming. For example, from 1948 through 1969, farming's imputed wage had a standard deviation of .41, as opposed to a .50 standard deviation in the total non-agriculture labor wage rate.

Many factors contribute to the volatility of the imputed wage rate, but the two most important are variation in real capital gains and income to assets, labor, and management. Revenue to the farm sector is volatile, in part because of farming's market structures. The inelastic demand for food products and short run inelasticity of farm supply are major determinants of income volatility (Houthakkar). Furthermore, since the value of assets is partially determined by discounted future returns, capital gains will fluctuate with changing income. Therefore, in periods of income volatility, similar volatility will be imparted to capital gains.

Risk, being assessed by volatility of returns, therefore is comparatively high in farming. This high risk argues that the opportunity cost for equity is higher than the one-year treasury bill. The corporate Aaa and Baa rates are used to approximate the higher risk. Effects of different interest rates on the imputed rate and its volatility are presented in Figures 2 and 3. The higher interest rates result in a lower wage rate and increase volatility compared with the treasury bill calculations, although the differences are not large.

## Summary, Conclusions, and Implications

This study found that the imputed wage rate for farm labor was low compared to other wage rates, including the hired farm wage, over

the period 1948 to 1985. The imputed wage rate was negative during the 1980s, and this period is a major contributor to the overall lower return over the longer time period studied. Nevertheless, the imputed wage rate exceeded the average retail wage, the lower of the non-farm wage rates, only during the period 1971 - 1975. The imputed wage was also subject to wide fluctuations.

One explanation for these findings is farmer's willingness to pay for the non-economic

tradeoff for enjoying farming as a way of life. If farm operators are willing to take a wage less than their opportunity cost, a barrier to entry is created for the economically motivated individual and the economically motivated among current farmers are encouraged to exit. Another result is that consumers pay less for their food. Under this analysis, consumer benefit, and an explanation is provided for farmers' complaints of depressed conditions.

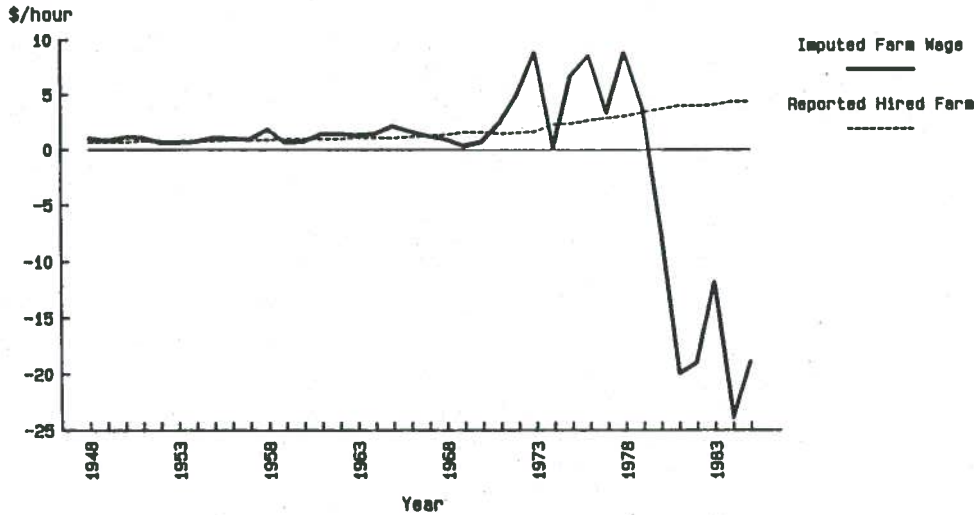
Table 1. Comparison of Selected Average Wage Rates and Imputed Farm Wage Rates, U.S., 1948-1985.

| Period            | Non-Ag <sup>1</sup> | Retail <sup>1</sup> | Hired<br>Ag <sup>2</sup> | Imputed Agr. Wage   |                  |                  |
|-------------------|---------------------|---------------------|--------------------------|---------------------|------------------|------------------|
|                   |                     |                     |                          | T-Bill <sup>3</sup> | Aaa <sup>4</sup> | Baa <sup>4</sup> |
| -----\$/hour----- |                     |                     |                          |                     |                  |                  |
| 1948-50           | 1.28                | 0.95                | 0.70                     | 0.95                | 0.88             | 0.85             |
| 1951-55           | 1.59                | 1.15                | 0.81                     | 0.83                | 0.74             | 0.70             |
| 1955-60           | 1.95                | 1.42                | 0.92                     | 1.00                | 0.92             | 0.84             |
| 1961-65           | 2.29                | 1.69                | 1.05                     | 1.50                | 1.36             | 1.28             |
| 1966-70           | 2.87                | 2.16                | 1.44                     | 0.95                | 0.78             | 0.59             |
| 1971-75           | 3.97                | 2.95                | 1.89                     | 4.61                | 3.93             | 3.48             |
| 1976-80           | 5.72                | 4.21                | 3.13                     | 3.44                | 2.38             | 1.37             |
| 1981-85           | 7.97                | 5.65                | 4.19                     | -18.74              | -21.88           | -23.94           |
| <hr/>             |                     |                     |                          |                     |                  |                  |
| 1948-85           |                     |                     |                          |                     |                  |                  |
| Avg.              | 3.44                | 2.51                | 1.75                     | -0.28               | -0.90            | -1.39            |
| Std. Dev.         | 2.07                | 1.48                | 1.14                     | 7.13                | 7.81             | 8.40             |
| <hr/>             |                     |                     |                          |                     |                  |                  |
| 1948-79           |                     |                     |                          |                     |                  |                  |
| Avg.              | 2.79                | 2.06                | 1.40                     | 2.24                | 1.93             | 1.70             |
| Std. Dev.         | 1.34                | 0.99                | 0.74                     | 2.49                | 2.23             | 2.08             |
| <hr/>             |                     |                     |                          |                     |                  |                  |
| 1948-69           |                     |                     |                          |                     |                  |                  |
| Avg.              | 2.01                | 1.48                | 0.98                     | 1.07                | 0.97             | 0.89             |
| Std. Dev.         | 0.50                | 0.39                | 0.23                     | 0.41                | 0.40             | 0.41             |

Sources:

1. Economic Report of the President, 1987.
2. Agricultural Statistics, 1957, 1972, 1986.
3. Economic Indicators of the Farm Sector, 1985 and 1986; and Economic Report of the President, 1987.
4. Economic Indicators of the Farm Sector, 1985 and 1986; and Economic Report of the President, 1987.

Figure 1. Imputed Farm Wage Using 1 Year Treasury Bill Versus Reported Hired Farm Wage, U.S., 1948-85.



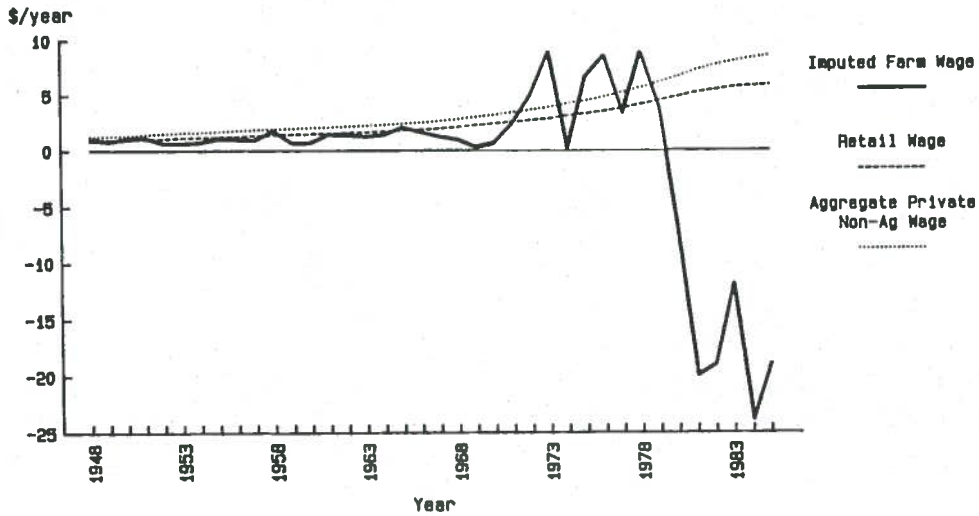
SOURCES:

Agricultural Statistics. 1957, 1972, 1986.

Economic Indicators of the Farm Sector. 1985, 1986.

Federal Reserve Bulletin, 1948-1986.

Figure 2. Imputed Farm Wage Using 1 Year Treasury Bill Versus Selected Non-Farm Wages, U.S., 1948-85.



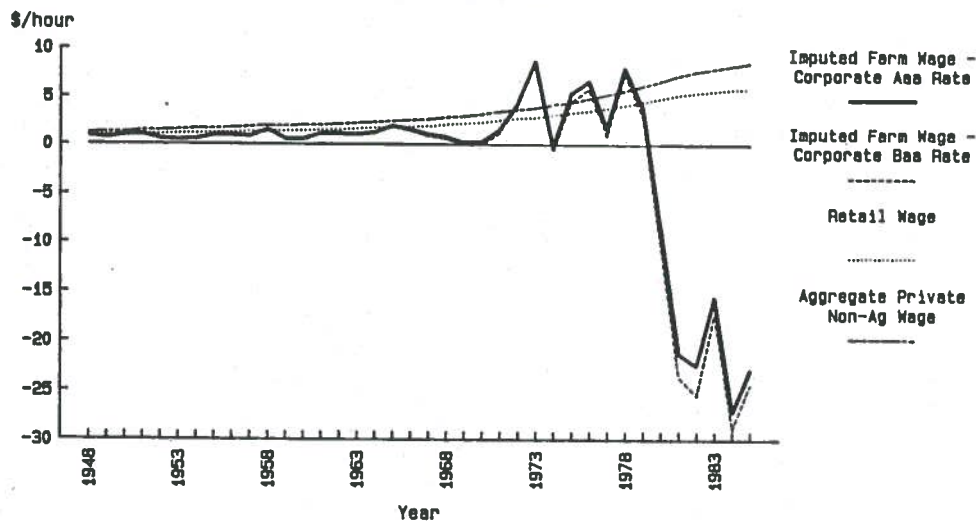
SOURCES:

Economic Indicators of the Farm Sector. 1985, 1986.

Economic Report of the President, 1987.

Federal Reserve Bulletin, 1948-1986.

**Figure 3. Imputed Farm Wages Using Corporate Interest Rates Versus Selected Non-Farm Wages, U.S., 1948-85.**



**SOURCES:**

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