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ABSTRACT

The federal personal income tax allows married couples to split their income and be taxed as if each spouse earned half the income. As a result of income splitting, the first dollar a married woman earns working outside the home is taxed at the same marginal tax rate as the last dollar earned by her husband. This study uses data extracted from the 1979 Michigan Survey of Income Dyanmics to test the effect of income splitting on the labor force participation of wives. The results of the probit estimation show that a move away from income splitting would significantly increase the labor force participation probabilities of married women.

THE EFFECT OF INCOME SPLITTING ON LABOR FORCE PARTICIPATION

In the United States, the federal personal income tax of 1913 adopted the individual as the unit of taxation. It was not until 1948 that income splitting was introduced into the income tax. Under income splitting, the incomes of the husband and wife are added together for tax purposes and taxed as if each spouse earned half the income. In practice, this is accomplished through the joint return whose brackets are twice as wide as those of the single return.

The introduction of income splitting gave a major tax advantage to married couples who found their tax liabilities substantially less than those of single persons with the same incomes. Under pressure from single voters, Congress changed the tax law in 1969 to lower the tax rate on single persons so that the tax liability of a single taxpayer is never greater than 120 percent of the liability of a married couple of similar economic standing. Since married couples were not given the privilege of filing as single persons if they so choose, married couples with two earners often found their tax liabilities higher than they would have been had it been possible for them to file as singles. This difference in tax liability, known as the marriage penalty, can reach as high as $4,800 in the highest tax bracket.[1]

The practice of income splitting raises questions of equity and efficiency. If the objective of tax policy is to tax equals equally, then horizontal tax equity is achieved with income splitting if one defines equals in terms of married couples rather than single individuals. This implies that married couples should be considered the basic economic unit. However, since single persons have opportunities similar to those

of married couples to live together and pool their incomes, some would argue that horizontal tax equity is better achieved under a system of individual taxation. A growing literature explores this interesting area of tax equity.[2]

The efficiency of income splitting has been called into question with respect to both the marriage decision and the labor supply decision. Income splitting appears to be nonneutral with respect to the marriage decision. If one views marriage in the Becker (1973) framework, the gains from marriage are positive under the current income tax, assuming you marry an impecunious person. The gains become negative, the more equally distributed the income of the potential marriage partners. The empirical importance of this tax incentive has not been tested to date.

The effect of income splitting on labor supply has received little attention in the literature. The only study addressing this question is by Rosen (1976) in which he calculates the gain in welfare and efficiency from a move away from joint filing. Rosen uses 1967 data from the National Longitudinal Survey for women ages 30-44 years to estimate an hours worked equation. He finds hours worked to be highly responsive to the marginal tax rate, leading to large efficiency gains from a move away from joint filing. He also finds that high income families benefit most from eliminating joint filing.

The present study focuses on another dimension of the labor supply decision, labor force participation. Although the majority of married women today work outside the home, the decision whether or not to enter the labor force, whether or not to specialize in home production when children are young, and whether or not to reenter the labor force when

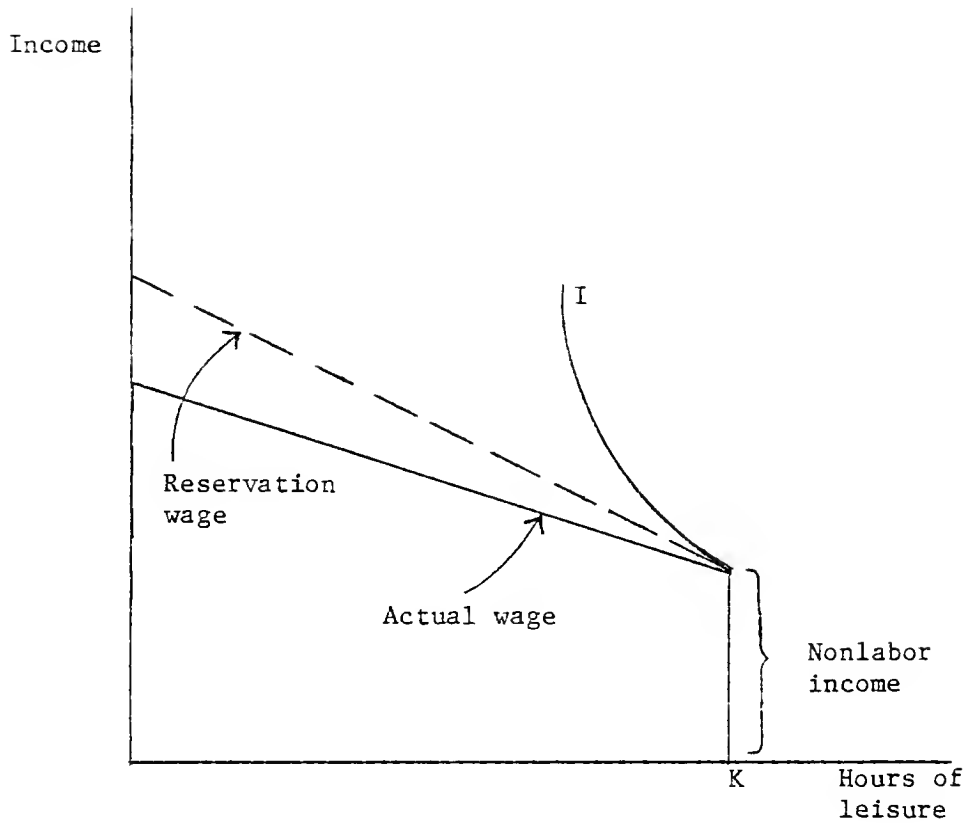
children are grown are still important decisions for women. Under income splitting, the first dollar a woman earns working outside the home is taxed at the same marginal tax rate as the last dollar earned by her husband. Consequently, income splitting has a potentially important effect on the labor force participation of married women. The purpose of this study is to measure the importance of this effect.

This study uses data from the 1979 Michigan Survey of Income Dynamics to estimate a labor force participation function for married women. Probit analysis is used to estimate the probability that a woman works outside the home given various tax and non-tax influences. A two-stage procedure developed by Heckman (1979) is employed to impute a wage to women who do not work in the market. The results of the probit estimation are used to calculate the probability of working outside the home with and without income splitting. The implications for tax policy and directions for future research are discussed.

I. The Model

In the absence of taxation, a person decides whether or not to participate in the labor market by comparing the market wage with the reservation or shadow wage. The reservation wage is the minimum market wage necessary to induce a person to work positive hours and reflects the monetary value of time in the home when all time is spent at home. If the market wage exceeds or equals the reservation wage, it is optimal for the person to work outside the home. Otherwise, the person will choose not to participate in the labor market. As seen in Figure 1, the reservation wage depends on the slope of the indifference curve at zero hours of work with a given nonlabor income.

Figure 1 The Labor Force Participation Decision



The reservation wage is the absolute value of the slope of the indifference curve at zero hours of work or K hours of leisure. If the reservation wage exceeds the actual wage, the person will not participate in the labor force.

An income tax modifies the labor force participation decision through its effect on both the market wage and on the reservation wage. If the income tax taxes earnings, it reduces the disposable wage rate by a factor equal to one minus the marginal tax rate. If the income tax taxes nonlabor income, it reduces nonlabor income by the same factor, lowering the reservation wage if leisure is a normal good. Since the effect of the income tax is to lower both the actual and the reservation wage, the resulting effect of the tax on labor force participation cannot be determined a priori. Empirical evidence is needed.

In our model, we assume that the earned income of the husband is fixed and independent of the behavior of the wife. Although not true in some families, this is a common assumption in labor supply research. The welfare of a representative family is defined by the following utility function:

$$U = U(Y_1 + w_2(K - L_2) + N - T, L_2)$$

where Y_1 is the earned income of the husband, w_2 the hourly wage of the wife, K is the time endowment, L_2 is the leisure of the wife, N is nonwork income, and T is the tax function.[3] Assuming income splitting, the tax function can be written:

$$T = T(Y_1 + w_2(K - L_2) + N)$$

whose slope, T', is the marginal tax rate. The utility function is assumed convex with positive first derivatives with respect to income and leisure, U_Y and U_L, and negative second derivatives.

The first order condition for utility maximization is:

$$-(1 - T')w_2U_Y + U_L \leq 0$$

with equality holding when there is an interior solution. Setting the wife's leisure, L_2, equal to the time endowment, K, and solving for the wage yields the reservation wage, w_R:

$$w_R = \frac{U_L(Y_1 + N - \hat{T}, K)}{(1 - \hat{T}')U_Y(Y_1 + N - \hat{T}, K)}$$

where the hats over the tax variables indicate that they are evaluated at zero hours of work; that is, at $L_2 = K$. Hence, $\hat{T} = T(Y_1 + N)$ and $\hat{T}' = T'(Y_1 + N)$ are the tax and the marginal tax rate on the sum of the husband's earnings and nonwork income, respectively.

The wife will participate in the labor market if her market wage is greater than or equal to the reservation wage:

$$\text{if } w_2 \geq w_R, \quad \text{then LFP} = 1$$

and

$$\text{if } w_2 < w_R, \quad \text{then LFP} = 0$$

where LFP is the probability of labor force participation by the wife.

Thus, the labor force participation function for wives can be written:

$$\text{LFP} = f(w_2(1 - \hat{T}'), Y_1 + N - \hat{T}, Z)$$

where Z is a set of taste and preference variables. We expect labor force participation to be positively related to the disposable wage rate

and negatively related to after-tax income. The problems of estimating the LFP function are discussed in the next section.

II. Estimation Problems

In this study, multivariate probit analysis is used to estimate the parameters of the LFP model. The use in earlier studies of ordinary least squares in estimating a model with a dichotomous dependent variable leads to inconsistent estimates that may fall outside the zero-one interval required by utility theory. The probit technique yields consistent and asymptotically efficient estimates of the probability parameters.[4]

A major problem in applying probit analysis to the labor force participation decision is that the wage variable, w_2, is not observed for wives not in the labor market, and for those in the labor market, the wage variable may be observed with error. A first line of approach is to estimate a wage function of the form:

$$w_2 = g(X)$$

where X is a set of variables such as age, education, and experience that explain the wage. Using ordinary least squares to estimate this equation and then using the estimated equation to impute a wage to all women in the sample is a common practice, but leads to biased estimates of the wage because of selectivity bias.

This study adopts a two-stage procedure suggested by Heckman (1979) which provides a computationally efficient way of solving the problem of selectivity bias. As a first step, a probit estimate is made of:

$$LFP = f(X, Y_1 + N - \hat{T}, Z)$$

and the residuals from this equation are used to compute a probit λ which is known as the inverse of the Mill's ratio.[5] Then the following subsample regression is estimated for employed wives:

$$w_2 = g(X, \lambda).$$

This estimation can then be used to impute a wage to each wife in the sample and the probit technique can be used to estimate the LFP function. This approach yields consistent and asymptotically efficient parameter estimates.

The data for the estimation were drawn from the 1979 Michigan Survey of Income Dynamics. Only taxpaying white households were selected for the estimation. Excluded from the sample were female headed households, unmarried households, and households in which the wife was not present. Further exclusions were made if the household head was over 60 years or less than 18 years of age, unemployed, receiving transfer payments, or had negative taxable income. This reduced the sample size to 1,465 households.

The dependent variable, labor force participation of the wife, was set equal to one if the wife's annual hours of work were greater than 100 and equal to zero otherwise. The other variables were defined in the usual way. The wife's pretax wage rate, which was input to the two-stage estimation process, was available for working wives as average hourly earnings. Education was measured as number of years of school, age was measured in years, experience as the number of years worked

since age 18, and the number of children was given by age brackets. The husband's earnings plus nonlabor income was computed by subtracting the wife's earnings from total family income.

A measurement problem arose with respect to the tax variables, $\hat{T}$ and $\hat{T}'$, since these are not observed except in families where $L_2 = K$; that is, in families where the wife does not work outside the home. Data on the family's federal personal income tax liability and marginal tax rate were used to estimate the tax liability and tax rate as a function of family taxable income, number of dependents, and whether or not the family owns a house. The results of this estimation are shown in Table 1. Taxable income is by far the most important determinant of tax liability and marginal tax rate. Dependents and homeownership both lead to a lower tax liability. The tax functions were used to impute $\hat{T}$ and $\hat{T}'$ to each household by setting taxable income equal to the sum of the husband's earnings and nonlabor income.

III. Results

The two-step procedure followed in this study first involved using multivariate probit analysis to estimate a linearized version of the LFP function. The parameters of the probit estimation were then used to adjust the wage equation for selectivity bias. Finally, the wage equation was used to impute a wage to each woman in the sample, and the probit estimation was repeated using the imputed wage as one of the explanatory variables.

The results of the first probit estimation are shown in Table 2. The variable "other after-tax income" is the sum of the husband's earnings plus nonwork income minus the tax on this amount. Using earlier

Table 1 The Tax Functions (t-ratios in parentheses)

Variable	Federal Income Tax Liability	Marginal Tax Rate
Constant	-2594.6 (-9.912)	11.390 (20.666)
Taxable Income	.315 (32.685)	$.873 \times 10^{-3}$ (43.023)
Number of dependents	-429.0 (-7.310)	-.656 (-5.311)
Home ownership	-1281.3 (-6.114)	.912 (2.066)
Income squared	$.190 \times 10^{-6}$ (8.077)	--
Dependents x income	.010 (5.659)	--
Home ownership x income	.038 (4.525)	--
R^2	.961	.890

Table 2 Probit Estimate of the Probability of Labor Force Participation, Unadjusted

Variables	Maximum Likelihood Estimate	t-ratios
Constant	1.291	4.393
Other after-tax income ($000)	-.014	-4.119
Age	-.060	-11.532
Education	.082	4.302
Experience	.142	8.508
Experience squared	-.002	-3.840
Children 1-2	-.707	-8.624
Children 3-5	-.533	-7.033
Children 6-13	-.090	-2.029
Children 14-17	.044	.630
Minus two times log likelihood	362.026	
Critical Chi-squared (α = .05)	16.92	

terminology, this variable equals $Y_1 + N - \hat{T}$. The next four variables, age, education, experience, and experience squared, are entered to proxy for the wage, while the children variables capture the important influence of children on the labor force participation of married women. The major purpose of this estimation was to calculate λ which was then used to adjust the wage equation.

Together with λ, the explanatory variables in the wage equation are age, education, experience, and experience squared. The results of the ordinary least squares estimation appear in Table 3. As the results show, education and experience both have a positive influence on the wife's wage, although the magnitude of the experience effect declines with increasing experience. The estimation also shows that older wives can expect a lower wage.

The coefficient of the probit λ in the wage equation turns out to be positive and significantly different from zero, testifying to the importance of selectivity bias in estimating a wage only over working wives. The positive sign of the coefficient indicates that working women on the average receive higher wage offers than do nonworking women. The wage equation with λ equal to zero was used to impute a wage to each woman in the sample. The imputed wage was adjusted by one minus the marginal tax rate, $\hat{T}'$, and then entered as an explanatory variable in the final probit estimation.

The final probit results are presented in Table 4. The results confirm our expectation that the labor force participation of married women is positively related to their disposable wage rate and negatively related to other after-tax income. In addition to the economic variables,

Table 3 OLS Estimate of the Hourly Wage Rate

Variable	Coefficient	t-ratio
Constant	-4.156	-5.782
Age	-.036	-2.176
Education	.656	14.193
Experience	.202	3.924
Experience Squared	-.003	-1.904
Probit λ	1.372	3.180
R^2	.208	

Table 4 Probit Estimate of the Probability of Labor Force Participation, Adjusted

Variable	Maximum Likelihood Estimate	t-ratio
Constant	-.173	-1.369
Wife's imputed disposable wage	.382	11.753
Other after-tax income ($000)	-.014	-4.380
Children 1-2	-.510	-6.788
Children 3-5	-.372	-5.160
Children 6-13	-.069	-1.604
Children 14-17	-.090	-1.395
Minus two times log likelihood	263.261	
Critical Chi-squared (α = .05)	12.59	

the number and ages of children are also shown to be important influences on the labor force participation decision. As expected, younger children have a larger negative effect on participation than do school age children. Teenage children do not appear to have a significant effect on the wife's working.

The log likelihood ratio, reported at the bottom of the table, provides a test of the significance of the explanatory variables as a group.[6] Since minus two times the log likelihood ratio is greater than the critical Chi-squared, we can conclude that the set of explanatory variables has predictive power in explaining labor force participation.

IV. The Effect of Income Splitting

The impact of taxation on the labor force participation of wives can be inferred from the results presented in Table 4. The higher the tax rate on the first dollar the woman earns, the lower her disposable wage, and the lower the probability of her participating in the labor market. Further, the greater the tax on her husband's earnings and nonwork income, the lower other after-tax income, and the greater the probability of labor force participation. A tax system placing a heavier tax burden on other income and taxing the wife's first dollar earned at a lower rate would encourage the labor force participation of wives.

As already pointed out, income splitting results in the first dollar earned by the wife being taxed at the husband's highest bracket rate. Moving to a system of individual filing would lower the tax rate on the wife's first dollar earned to the first bracket rate or 14 percent. To see the effect of this on labor force participation, we computed the

probability of labor force participation using the coefficients of Table 4, first, assuming income splitting and, second, assuming individual taxation.[7] The results for three alternative wage rates are shown in Table 5.

As seen in the table, the probability of labor force participation by wives is significantly greater without income splitting than with income splitting. When the wife's gross wage is $4.00, for example, eliminating income splitting increases the probability of her working from .430 to .610. According to the results of this study, eliminating income splitting would increase female labor force participation and enhance the efficiency with which tax dollars are collected.[8]

In recent years, there as been a strong trend among OECD countries away from family taxation and towards individual taxation. As of 1977, individual taxation was allowed in 17 OECD countries and compulsory in 13.[9] In this country, tax reform has taken the form of a deduction for two-earner families. The tax act of 1981 allows couples a tax deduction equal to 5% of the first $30,000 of earnings of the spouse with the lower earnings in calendar year 1982. In 1983 and thereafter, the deduction increases to 10%. The deduction, by lowering the effective tax rate on the first dollar earned by the wife, encourages labor force participation, although at the current deduction level, the effect is minimal.

Many considerations other than efficiency are important in ultimately deciding between income splitting and individual taxation. In addition to the equity question, legal and administrative problems are involved with a change to individual taxation. Income splitting was introduced

Table 5 The Probability of Labor Force Participation With and Without Income Splitting

	Probability of Labor Force Participation	
Wife's Gross Wage	With Income Splitting	Without Income Splitting
$3.00	.147	.282
$4.00	.430	.610
$5.00	.713	.938

in 1948 partially because families living in community property states could effectively split their incomes and lower their tax liabilities. A successful income tax on individuals would depend on the enactment of legislation providing taxation of income according to economic origin.

Another concern with individual taxation is the allocation of nonlabor income (dividends, interest, and profits) between the spouses. Transfers of property could be used to reduce tax liabilities, although it is difficult to know whether this effect would be important. One possibility would be to attribute nonlabor income to the spouse with the higher earnings, it could be allocated in proportion to earned income, or it could be divided equally. In Canada, where there is individual filing, either spouse may declare the income of jointly held assets. An evaluation of these alternatives is beyond the scope of this paper.

V. Future Research

On the basis of a probit model of labor force participation, this study concluded that labor force participation of married women could be increased by elimination of income splitting and a return to individual taxation. As with all econometric studies, simplifying assumptions were made that could affect the model and its conclusions. Relaxing these assumptions suggests some directions for future research.

One assumption which greatly simplified the analysis was the assumption that the husband's labor supply is exogenous and independent of the wife's work decision. This assumption permits the use of single equation estimation techniques where simultaneous estimation would otherwise be required. While there is little current empirical evidence that the

husband's labor supply depends on the wife's, this may change in the future and suggests the need for further exploration.

Another simplification of the present study was to focus exclusively on the personal income tax and to disregard all other tax and transfer programs. This was done in part because of the uncertainty surrounding the incidence of various programs, and in part to avoid the problem of nonconvexities in the budget set. Hausman (1980) has shown that nonconvexities created by programs such as AFDC imply that a unique reservation wage no longer exists. Analysis requires that the labor force participation model be extended to include wage and hour combinations rather than hours alone. Using maximum likelihood techniques, Hausman estimated a labor force participation model for black female headed households. He found that nonconvexities in the budget set cause serious estimation problems, suggesting another area for future research.

Finally, the interdependence of labor force participation and other family decisions need to be recognized. Decisions such as the timing and spacing of children, investment in human capital, and savings decisions are clearly not independent of the labor supply decision. While the present study does not address these issues, it is hoped that it provides a basis for additional research in the area.

Footnotes

[1]See McIntyre and Oldman (1977) for a calculation of the marriage penalty at different income levels.

[2]See Rosen (1977), Brazer (1980), Munnell (1980), and McIntyre (1980) for a discussion of the issues.

[3]Leisure includes all types of nonmarket activities such as home production, volunteer work, education, as well as recreation.

[4]See Goldberger (1964) pp. 248-51 for a discussion of the problems of estimating a model with a dichotomous dependent variable.

[5]$\lambda = \frac{f(Z)}{1-F(Z)}$ where f and F are, respectively, the density and distribution functions for the standard normal random variable and $Z = \frac{X_2\beta_2}{(\sigma_{22})^{1/2}}$.

[6]See Theil (1971), p. 385.

[7]The probabilities were computed for a hypothetical mean woman with $18,108 of other after-tax income, .25 children ages 1-2, .24 children ages 3-5, .54 children ages 6-13, and .25 children ages 14-17. The marginal tax rate on the last dollar earned by the husband was 26% with income splitting and 14% without.

[8]This assumes that it is not a goal of social policy to discourage the labor force participation of wives. It also assumes that jobs will be available for those who seek to join the labor force.

[9]Organization for Economic Cooperation and Development (1977), p. 15.

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