RECENT CHANGES IN THE LABOR SUPPLY BEHAVIOR OF MARRIED COUPLES

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In the past thirty years, there has been a dramatic change in women's labor market behavior. Women in general, and married women in particular, have been entering the labor force in large numbers and simultaneously increasing their attachment to the labor market [Smith, 1983; Smith and Ward, 1985; Killingsworth and Heckman, 1986]. Coupled with the increase in female participation has been the decline of male labor force participation, although among men, the changes have not been as dramatic and have been concentrated among older men [Pencavel, 1986; Smith, 1983; Parsons, 1980]. These changes in the time spent in market work, would be expected to have an impact on the amount of time allocated to other uses, namely home production and leisure. Due to the dramatic changes in married women's labor market commitment, the changes in the allocation of time would be expected to be most evident among married couples. In fact, recent surveys reveal that married men have dramatically increased the amount of time they spend in home production [Juster and Stafford, 1991; Robinson, 1988; Juster, 1985]. In 1965, married men were responsible for about 13 percent, or 4.5 hours per week of household work, but by 1985 that figure had more than doubled to 34 percent, or 11.1 hours per week [Robinson, 1988]. During this same period, wives were decreasing the amount of time spent in work at home by about 30 percent, which is the equivalent of 9.2 hours per week [Robinson 1988]. The result of these changes, is that married men and women are becoming more alike with regard to their uses and allocation of time.

This paper analyzes the changes in the labor supply behavior of married couples. The paper is empirical in nature, and its primary interest is to identify the changes over time in the relationship between several key variables that impact the labor supply decisions of households. The current research will focus on the same questions that have concerned previous authors, namely, estimating the various wage elasticities of labor supply. The main contribution of this paper is its focus on changes over time.

Empirical research on the topic of labor supply has been extensive, and the study of family labor supply, in particular, has received its fair share of effort among economists [Ashenfelter and Heckman, 1974; Kneiser, 1976; Wales and Woodland, 1976; 1977; Blundell and Walker, 1982; Lundberg, 1988].[1] In a majority of the previous family labor supply studies, the time period under consideration has been relatively short, and most have been cross-sectional analyses. The fact that these studies used a variety of samples and estimation techniques has prohibited an evaluation of the changes in family labor supply parameters over time. By using

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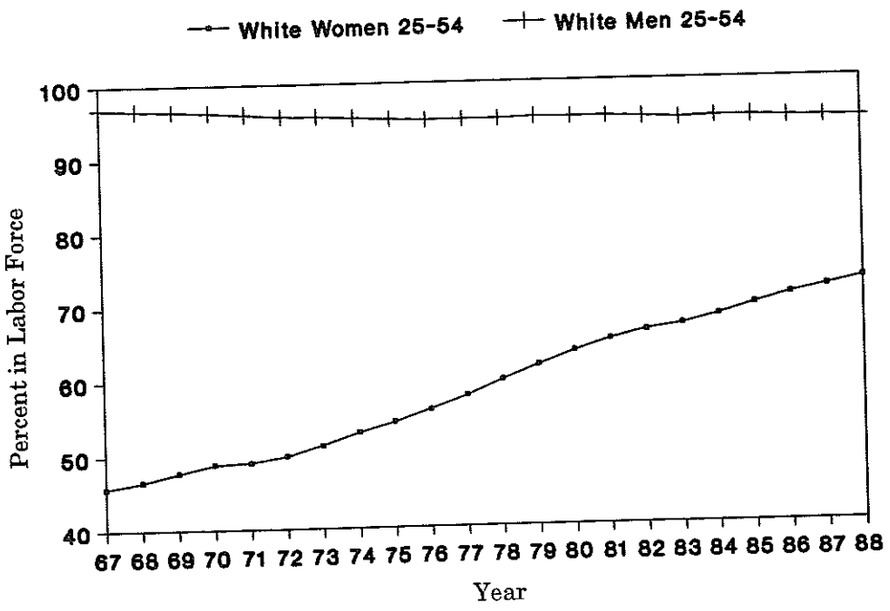
FIGURE 1
Labor Force Participation Rate

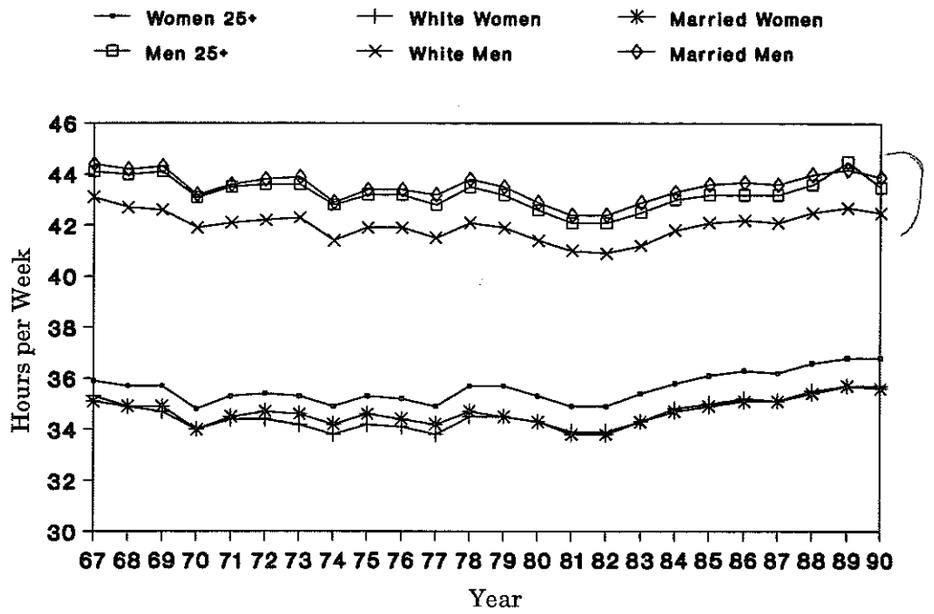


identical statistical procedures and similarly constructed samples that are twenty years (1968-89) apart, this paper will furnish a set of results that will aid efforts to evaluate and explain changes in the relationships among important variables affecting labor supply.

THEORY AND ANALYTIC FRAMEWORK

This paper will examine the labor supply behavior of married, white couples between the years 1968 and 1989. During this period, the labor force participation rate of married, white women has increased by almost 30 percentage points (45-72 percent), as Figure 1 illustrates.[2] The labor force participation of married, white men, however, has decreased by approximately 2.5 percent (97-94.5 percent) during this period. The convergence of the labor force participation rates of married men and women is dramatic, but a similar pattern is not observed for a measure of average hours worked per week. Figure 2 illustrates the changes in the average hours worked per week by employed persons for several demographic groups. During this period, women have increased their hours worked per week by approximately 2 hours (6 percent), while men's hours have remained relatively constant. This pattern is observed for all three of the different groups within each gender classification in Figure 2.[3] Taken as a whole, Figures 1 and 2 suggest that the changes in the labor supply behavior of married couples can be characterized as a

FIGURE 2
Average Hours Worked per Week

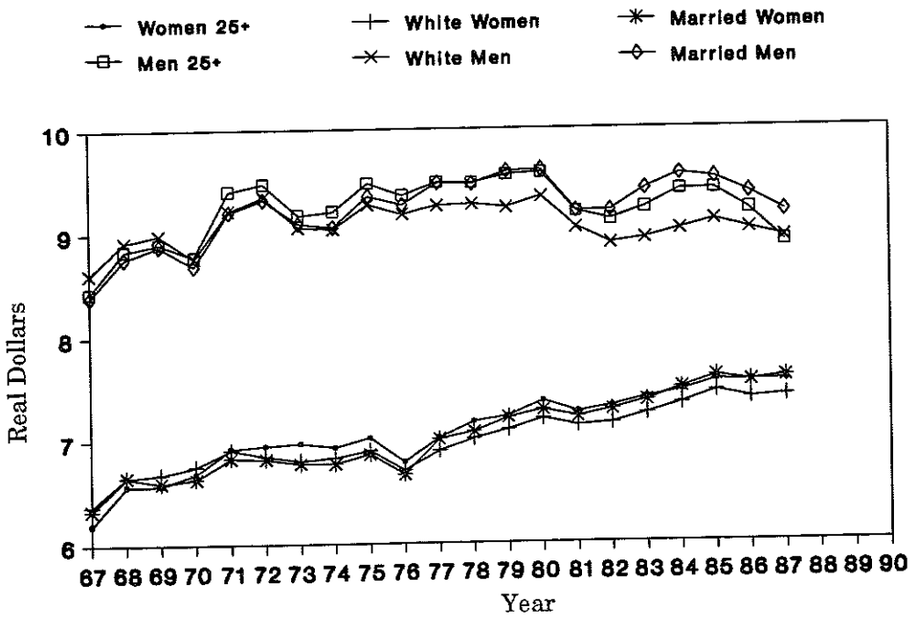


change in wives' behavior. Married women have dramatically increased their participation, while also increasing their hours of weekly work.

These findings are not new and are often explained by noting that a common empirical finding of much of the previous research on labor supply has been the large wage elasticity of supply of females, relative to that of males [Killingsworth and Heckman, 1986]. This empirical regularity has been a welcomed finding, since it also has some theoretical support [Mincer, 1962; Gronau, 1973; Gronau 1977; Killingsworth and Heckman, 1986]. The basis of the theoretical support comes from the fact that women are responsible for a majority of home production. Given that women spend more time in home production than men, it can be shown that under certain conditions their own wage elasticity of supply of labor will be larger than that of males [Gronau, 1973; Killingsworth and Heckman, 1986]. Thus, the increase in labor supply observed for married females would be consistent with rising real wages for females. Since the male own wage elasticity is smaller, we would not expect to observe large changes in married male labor supply. This is particularly true if the real wage for males has not grown significantly.

Figure 3 illustrates changes in real wages for men and women between 1968 and 1989, and as can be seen, there has been a narrowing of the wage differential between men and women. The ratio of female to male wages rose from approximately .73 in the late 1960s to .84 by the end of the 1980s, with most of the narrowing due to an increase in female wages.[4] The increase in female wages over

FIGURE 3
Real Average Hourly Earnings



this period is consistent with both the increase in labor supply, and the decrease in non-market work observed over the same period.

The fact that married women have been increasing their time in the market and decreasing their time in home production would be expected to have reduced their own wage elasticity of supply over time. Their ability to substitute home time for market time, in response to a wage change will have diminished. Conversely, since men have been spending more time in home production and have slightly reduced their time in the market, it would be expected that their own wage elasticity of supply would have grown over time. The empirical strategy of this paper is to examine these hypotheses by estimating the own wage elasticity for married couples at the beginning and end of a recent twenty-year period.

The cross wage elasticity of labor supply between husbands and wives is positive or negative, depending on whether the husbands' and wives' non-market times are complements or substitutes [Ashenfelter and Heckman, 1974; Browning, et al., 1985; Lundberg, 1988]. It is important for analytic purposes to separate non-market time into pure leisure and work at home [Gronau, 1977]. It is more likely that the spouses' non-market times will be complements when the household's preferences are for pure leisure-intensive commodities, as opposed to goods, particularly home produced goods-intensive commodities. The assumption is that married couples prefer the company of each other when consuming leisure activities.[5] Increases in

the amount of pure leisure the household consumes increases the probability that total non-market time will be complementary.

The introduction of children, especially young children, into the family will increase the household's preference for a goods-(i.e. home goods) intensive commodities bundle [Gronau, 1977]. Thus, the cross wage elasticity of supply should be more negative for families with children than otherwise similar families [Lundberg, 1988; Wales and Woodland, 1976].[6] The cross wage elasticity of supply would also be expected to be more negative for families in which the husbands spend more time in home production, such as families in the more recent period. This assumes, however, that the total amount of home production has stayed constant or increased. But given the rising real wage of both males and (particularly) females over the past twenty years, the amount of home production should have decreased.[7] Thus the non-market time of husbands and wives would consist of more pure leisure, and the cross wage elasticity of supply would be more positive. The notion that the amount of pure leisure time consumed by the family has increased is supported by recent time-use studies [Juster and Stafford, 1991; Robinson, 1989; Manchester and Stapleton, 1991]. The empirical implication of this discussion is that the cross wage elasticity should be more negative for families with young children, as compared to childless families, and more positive for families in the recent time period compared to previous periods. These predictions are based on two assumptions: (1) husband's and wife's leisure time are complementary, and (2) there has been an increase in the amount of leisure.

As noted above, families with children in the household have a greater preference for a goods-intensive consumption bundle. Thus, these family members would be expected to have less pure leisure than other similar individuals, and for any given wage, supply more hours to the market [Gronau, 1977]. These same individuals would also be expected to have greater own wage elasticities of supply, since a wage change will affect the allocation of time between work at home, work in the market and leisure. This hypothesis can be tested by estimating the own wage elasticity separately for families with and without children.[8] This strategy is different than the predominant one of testing whether the level of labor supply differs among households with and without children.

The effect of children on the husband's and wife's labor supply should also be changing over time, if child care responsibilities have become more equal among married couples, as indicated by time-use surveys [Robinson 1988; 1989]. The expectation would be that the presence of children would have less of an effect on the labor supply of the wife in the 1980s versus the 1960s. For men, the expectation would be reversed.

EMPIRICAL MODEL

The empirical model used in this paper will be based on that found in Browning, Deaton and Irish [1985] (BDI), which uses a family utility function, and which lends itself easily to standard estimation methods.[9] A brief exposition of that model

follows. In the BDI model, utility is assumed to be additive over time, and per period, or age specific, utility is specified as follows:

$$U = U(L_h, L_w, C) \tag{1}$$

where L_i is the quantity of leisure for household member i, where i equals h for the husband and w for the wife (i=h,w), and C is household consumption. The family maximizes the above preference function subject to a life-cycle budget constraint in which the income of all family members has been pooled and all prices (e.g. wages) have been discounted to their present value. Using the consumer's per period profit function, BDI derive the Frisch demand functions for leisure, and the corresponding labor supply functions:

$$H_i = f(W_h, W_w, P, R). \qquad i = (h,w) \tag{2}$$

The labor supply functions are dependent on current period wages (W_i), prices (P), and the price of lifetime utility (R). In order to estimate equation (2), a specific functional form is necessary, and BDI suggest the following, which is a flexible first-order approximation:

$$H_i = a_0 + a_1 \ln W_i + a_2 W_j^{.5} W_i^{-.5} + a_3 \ln R + e_i. \quad i = (h,w) \tag{3}$$

Equation (3) assumes that leisure and consumption are separable within periods and that the relevant cross-price effects are equal to zero. In addition, equation (3) is based on a certainty model where the log price of utility, R, is constant over the life cycle, and as such can be easily treated as a fixed effect in the empirical analysis.

An individual's hours of work and market wage are observed only for those who work, and thus, equation (3) will be estimated for families in which both the husband and wife work. As is well known, this type of "sample selection" criteria tends to result in biased estimates of the true parameters of equation (3) [Heckman, 1979]. Thus, an appropriate estimation strategy that will address this problem needs to be implemented. In this paper, the method used by Card [1990], which is based on the selection model of Olsen [1980], will be used to correct for the possible bias due to "sample selection". The basics of this procedure is to estimate a linear probability model of labor force participation for both the husband and wife and include the predicted probabilities of participation as additional regressors in equation (3). Specify the following labor force participation model:

$$D_i = c_i + c_1 \mathbf{X} + v_i, \quad i = (h,w) \tag{4}$$

where D is an indicator equal to 1 if the husband (h) or wife (w) works, and 0 otherwise, $\mathbf{X}$ is a variable(s) that determines whether the person works, the c's are parameters to be estimated, and the v's are uniformly distributed error terms. Equation (4) also contains an unobserved person and or family-specific fixed effect

(c_i) that is the price of lifetime utility (R). Equation (4) can be thought of as a reduced form of a structural labor force participation model. In this paper, $\mathbf{X}$ is a vector, identical across equations, that contains the age (age squared) and education (education squared) of both the husband and the wife, the number of children of various ages (1-2, 3-5, 6-17), and geographical dummy variables. In addition, a complete set of interaction terms between age and education, age and children, education and children, husband's and wife's age, and husband's and wife's education is included in the model.[10] The next step to implement this procedure is to use the predicted values of D_i from equation (4) as regressors in equation (3), which now becomes

$$H_i = a_0 + a_1 \ln W_i + a_2 W_j^{.5} W_i^{-.5} + a_3 \ln R + a_4 D_h + a_5 D_w + e_i, \quad i = (h,w). \tag{3a}$$

The use of this type of procedure, as opposed to the more often applied Heckman [1979] correction method, allows for the straight forward estimation of a fixed effects model, since equation (4) is also easily estimated by fixed effect methods.[11]

In practice, equation (3a) will contain two types of unobserved effects: a family effect that is related to the price of lifetime utility (R) or wealth, and a person-specific effect related to the individual's unobserved taste for work. Thus, we can rewrite equation (3a) using two separate terms for the unobserved effect, or

$$H_i = a_0 + a_1 \ln W_i + a_2 W_j^{.5} W_i^{-.5} + a_3 R + a_4 P + a_5 D_h + a_6 D_w + e_i. \tag{3b}$$

In equation (3b), R represents the family-specific effect and P represents the person-specific effect. Different empirical procedures will be used to estimate the model, and the distinction between the two types of unobserved results will have important implications related to the interpretation of the findings.

DATA

The data to be used in the analysis are from the monthly (March file) *Current Population Survey* collected by the Bureau of Labor Statistics. The *Survey* is a representative sample of U.S. households which contains a variety of economic and demographic variables. The years selected for analysis were 1968, 1969, 1988 and 1989. This represents the twenty-year period during which the dramatic changes that have motivated this paper occurred. An appealing attribute of these data is their comparability across years. The data were not gathered for any particular demographic group or economic class and do not suffer from the biases associated with such sampling techniques. The most important aspect of the data, however, is the fact that the same household can be observed across contiguous survey years. Thus, it is possible to build a longitudinal record for a subset of households which is essential to the identification of unobserved household characteristics that would otherwise lead to confounding results. Although these data have been used in past

analyses of labor supply, no previous research has exploited the longitudinal nature of the data for these purposes.

The analysis will focus on married, white couples between the ages of 25 and 55 in order to eliminate as much heterogeneity as possible in the sample. The sample was restricted further to include married couples who were not self-employed, or in school during the year or week, prior to the interview. These restrictions resulted in samples of approximately 12,000 married couples each year. The measure of labor supply to be analyzed is the number of hours worked the week before the survey. The CPS surveys in 1968 and 1969 did not include the more often used variable, usual hours worked per week in the previous year, nor did it code weeks worked per year as a continuous variable, thereby prohibiting the use of annual hours of work. The Appendix contains the mean values and other simple statistics for the variables used in the paper.

ESTIMATION

The empirical implementation of equation (3b) gives rise to several difficulties. The first is that wage rates are not observed and have to be calculated from data on annual earnings, weeks of work, and hours of work per week. This problem is further complicated by the fact that in the 1968 and 1969 *Surveys*, the weeks of work were interval coded, and the hours worked per week refer to the actual number of hours worked in the week prior to the *Survey*, not the usual hours worked per week during the past year. For a sample of individuals who had positive earnings in the previous year and who had positive hours the week prior to the *Survey*, an hourly wage rate was calculated. The midpoints of the intervals used to code weeks worked per year were used to calculate annual hours. The potential measurement error embodied in this variable is likely to be great, and its inclusion in equation (3b) would lead to serious biases as previous authors have noted [Altonji, 1986; Abowd and Card, 1989]. To avoid the bias associated with measurement error, an instrumental variables technique is used, in which the predicted value from a wage regression is used in place of the actual wage. The instruments used to estimate the wage are the age, education and occupation of the individual, with age and education being entered as quadratic terms with complete interactions between these variables. The occupation of the individual will serve as the primary identifying variable, a reasonable choice given data availability. It is also necessary to estimate the cross wage terms of equation (3b), which are functions of the wage ratio of the husband and wife. The same general method is used to estimate this measure, but the age, education and occupation of both spouses are included in the model. It should be noted that all of the wage regressions specified above include the correction for "sample selection" outlined above for the hours equations. In addition, since the *Surveys* in 1988 and 1989 include a continuous weeks of work measure and a variable measuring the number of usual hours worked per week in the past year, a more standard calculation of wages is made for these years, and the models are re-estimated in 1988 and 1989. The results reported in the text are for a wage that could be calculated in a consistent manner for all four years, and based on the additional results for 1988 and 1989, are not sensitive to the particular form of wages chosen.

Estimates of the parameters of equation (3b) are obtained by using two types of estimators. The first method uses data for a husband and wife pair. This method is equivalent to a standard fixed effects model that takes the difference of equation (3b) with respect to the spouses, except that it allows for the identification of separate spouse-specific effects for variables that are identical across spouses, such as the number of children. The procedure is referred to in the literature as a random effects estimator, with the random effect specified as a linear combination of the right-hand side variables. Mundlak [1978] and Chamberlain [1984] demonstrate that in a linear model, this procedure will yield estimates of the parameters identical to those obtained using the standard fixed effects method. The only difference is that instead of estimating one parameter for the difference in the coefficients on the spouse- (or time) invariant variable, separate spouse-specific estimates are obtained. The following is an illustrative example, using hours of work as the dependent variable:

$$H_h = a_0 + a_1 W_h + a_2 R + a_3 P + e_h, \tag{5}$$

$$H_w = b_0 + b_1 W_w + a_2 R + b_3 P + e_w, \tag{6}$$

$$R = c_1 W_h + c_2 W_w + v \ . \tag{7}$$

In order to obtain the etimates, we first substitute equation (7) which specifies the unobserved effect to be a linear combination of all right-hand side variables, into equations (5) and (6). Next, estimate the resulting reduced form, with cross equation restrictions on the parameters c_1 and c_2. The estimates obtained in this fashion are identical to those obtained using the actual differences [Chamberlain, 1980; 1984]. Note that separate estimates of a_0 and b_0 are obtained, as opposed to an estimate of $a_0 - b_0$, which would result using the standard fixed effect estimator. This method does not, however, eliminate the unobserved person-specific effect, and therefore the results obtained through use of this procedure may still be biased.[12]

The second estimator will use a pair of individual observations from the two consecutive years of data, and the model will be estimated on the first-differences within individuals in order to eliminate the unobserved person and family effect. Thus, this estimator may be the preferred estimate, since it eliminates both sources of unobserved heterogeneity. In this second method, the participation model will also be estimated in first-difference form, and thus a consistent estimate of the change in the probability of participation can be estimated and used in the first-difference hours and wage equations [Card, 1990].

In summary, the central question of this paper is whether the labor supply behavior of husbands and wives have converged over time as would be expected in light of some recent evidence and the popular perception of rapidly changing gender

TABLE 1
Own and Cross Wage Effects on Husbands' Hours Worked per Week
Parameters (standard errors)

Family Type / Effect	1968	1969	1968-69	1988	1989	1988-89
All Families						
Own Wage	11.46[a]	19.28[a]	-13.91	6.30[a]	7.29[a]	-16.29[a]
	(3.50)	(3.87)	(8.92)	(2.33)	(3.39)	(6.03)
Cross Wage	50.36[a]	45.32[a]	-0.45	2.14[a]	32.55[a]	-6.36[c]
	(6.10)	(7.37)	(4.10)	(0.71)	(5.49)	(3.60)
Sample Size	4170	4223	1024	7154	6256	1619
Families with Young Children						
Own Wage	15.09[b]	4.25	-8.60	19.44[b]	13.37[c]	-16.63[b]
	(7.33)	(7.79)	(10.07)	(7.74)	(7.84)	(7.06)
Cross Wage	37.43[a]	9.28	-1.94	40.22[a]	23.96[a]	0.94
	(6.73)	(8.96)	(4.13)	(8.20)	(7.80)	(2.27)
Sample Size	851	809	197	1752	1522	425
Families without Young Children						
Own Wage	4.29	13.19[a]	-19.75[b]	4.89[b]	8.57[a]	-12.80[c]
	(3.66)	(4.02)	(9.61)	(2.33)	(3.13)	(7.82)
Cross Wage	28.05[a]	28.55[a]	0.05	2.50[a]	18.13[a]	-7.79
	(6.95)	(7.56)	(3.87)	(0.64)	(5.67)	(5.97)
Sample Size	3319	3414	827	5402	4734	1194

Elasticities

Family Type / Elasticity	1968	1969	1968-69	1988	1989	1988-89
All Families						
Own Wage	.46	.44	-.31	.14	.16	-.36
Cross Wage	.48	.43	-.00	.02	.30	-.06
Families with Young Children						
Own Wage	.33	.10	-.19	.43	.30	-.37
Cross Wage	.40	.09	-.02	.41	.25	.01
Families without Young Children						
Own Wage	.10	.30	-.45	.11	.19	-.28
Cross Wage	.26	.26	.00	.02	.16	-.07

[a] Significant at the 1 percent level.
[b] Significant at the 5 percent level.
[c] Significant at the 10 percent level.

roles. To examine this question, this analysis focuses on changes in the effects of wages and children on the labor supply of married couples. The null hypotheses for the empirical analysis have been derived from a simple version of the neoclassical model of labor supply that places particular emphasis on household production.

RESULTS

Table 1 lists the parameter estimates associated with the wage and cross wage measures of the labor supply model for the sample of husbands. These parameters are estimates of the effect of "anticipated" wage changes on the hours of work per week, or what has become known in the literature as the "intertemporal" wage effect [MaCurdy, 1981]. The top half of Table 1 lists the parameter estimates, and the bottom half lists the elasticities derived from these estimates using the mean values of wages and hours.[13] The columns labeled with individual years (e.g. 1968) are estimates from a fixed effect model in which the difference in husbands' and wives' hours of work form the units of observation. In these models only the family-specific unobserved effect is eliminated. The columns labeled with consecutive years (e.g. 1968-69) are estimates from a fixed effect model in which first-differences over individuals are the units of observation. In this model, both the family and person effect is eliminated by taking differences. All models are estimated on three separate samples — all families, families with children less than 6 years old, and families without children less than 6 years old. A complete set of results for several of the models is contained in the Appendix.

The wage elasticities in the bottom half of Table 1 do not appear to be consistent with the expectations previously noted regarding the male labor supply parameters. There is no evidence that the husband's own or cross wage effects are becoming larger (more positive) over time. If anything, it appears that the own and cross wage effects are becoming smaller over time, although no real discernable pattern emerges. Also, the cross wage effect is not more negative in families with young children, as compared to families without young children. Again, if anything, the pattern suggests the opposite, that the non-market time of husbands and wives is more complementary for families with young children, and that observation is most evident in the 1980s when men are supposedly taking on a greater share of household work and child care responsibility. Finally, the own wage effect does appear to be larger for husbands in families with young children, but the results are not robust across years and types of estimators.

In general, there does not appear to be any systematic pattern identifiable in Table 1, either as it pertains to changes over time in the wage effects or differences in wage effects across family types. One result that stands out somewhat are the negative own wage elasticity estimates from the fixed effect model, in which individual first differences are the units of observation (columns labeled 1968-69, 1988-89). Although not uncommon in the literature, the negative sign of this effect is the opposite of what theory predicts. The "intertemporal" effect is in one sense a "compensated" elasticity since the price of lifetime utility is being held constant, and

TABLE 2
Own and Cross Wage Effects on Wives' Hours Worked per Week
Parameters (standard errors)

Family Type / Effect	1968	1969	1968-69	1988	1989	1988-89
All Families						
Own Wage	20.26[a]	28.97[a]	-4.71	13.20[a]	5.15	-9.56[c]
	(3.40)	(3.51)	(8.01)	(1.62)	(3.90)	(5.75)
Cross Wage	-18.86[a]	1.41	-8.92[b]	-0.43	-28.88[a]	-13.99[a]
	(4.21)	(0.93)	(3.68)	(0.30)	(6.20)	(3.43)
Sample Size	4170	4223	1024	7154	6256	1619
Families with Young Children						
Own Wage	18.74[a]	16.66[a]	1.16	20.01[a]	13.56[c]	-4.61
	(4.55)	(6.68)	(10.14)	(4.24)	(7.46)	(6.27)
Cross Wage	-13.77[a]	-3.20	-4.39	-2.74[c]	-14.28	-12.16[a]
	(5.83)	(2.89)	(4.16)	(1.45)	(9.83)	(2.02)
Sample Size	851	809	197	1752	1522	425
Families without Young Children						
Own Wage	15.73[a]	23.44[a]	-12.21	13.26[a]	10.78[a]	-8.94
	(3.83)	(3.61)	(8.41)	(1.70)	(3.30)	(7.58)
Cross Wage	-12.56[a]	1.36	-10.26[a]	-0.09	-13.90[a]	-10.39[c]
	(4.50)	(0.85)	(3.39)	(0.27)	(4.86)	(5.79)
Sample Size	3319	3414	827	5402	4734	1194

Elasticities

Family Type / Elasticity	1968	1969	1968-69	1988	1989	1988-89
All Families						
Own Wage	.60	.84	-.14	.37	.14	-.27
Cross Wage	-.33	.02	-.15	-.01	-.48	-.23
Families with Young Children						
Own Wage	.60	.53	.04	.62	.42	-.14
Cross Wage	-.23	-.06	-.07	-.05	-.24	-.20
Families without Young Children						
Own Wage	.45	.67	-.35	.36	.29	-.24
Cross Wage	-.22	.02	-.18	-.00	-.23	-.17

[a] Significant at the 1 percent level.
[b] Significant at the 5 percent level.
[c] Significant at the 10 percent level.

thus should be positive. Table 1 illustrates that the estimates of the wage effects are quite sensitive to the econometric specification, and that the two methods used in this paper to control for unobserved life-cycle effects are quite different. In the cross section, only the unobserved family effect is being eliminated, while in the longitudinal analyses both the family and person effect are accounted for. The differences in these estimates do not arise from differences in the samples. The cross-sectional estimates were replicated using the sample of households matched across survey years, and the same basic results emerged as those reported for the full sample. The use of true panel data, as opposed to a husband and wife pair, is preferred since the assumptions that underlie the use of a husband and wife pair, and cross-sectional data are quite restrictive.

Table 2 lists the results for the sample of wives and is similar in presentation to Table 1. It is expected that the own wage elasticities of the wives would become smaller over time, as the wives' ability to substitute home and leisure time for market work diminishes. The cross wage effect should become more positive over time as a greater proportion of the non-market time of husbands and wives consists of leisure in the more recent period. The estimates listed in Table 2 provide no support for these hypotheses. The estimates of the own wage effect for the complete sample of wives, does decrease substantially between the two time periods, when the model is estimated using husband and wife pairs, but the estimates using individual panel data are inconsistent with these other estimates, and as was the case among the husbands, the own wage effect is negative. The own wage effect is, however, greater for wives in families with young children as compared to families without young children in 5 out of the 6 cases reported in Table 2.

In general, the own wage effects for both the husbands and wives are quite similar in magnitude, and there is no tendency for the wives effect to be greater than the husbands. The cross wage effects, however, are quite different across spouses. The cross wage effect for the wives is usually negative, indicating that the spouses non-market times are substitutes, while for the husbands, the cross wage effect is usually positive indicating the complementarity of non-market times. The symmetry condition is clearly violated by these results.

The results listed in Tables 1 and 2 are not supportive of the notion that married women's own wage effect is larger than that of their husbands, nor are they supportive of the explanation for the increased labor supply response of married women that relies on changes in real wages. Furthermore, there is no observable evidence in Tables 1 and 2 that would support the idea that an individuals share of, or role in, household production plays an important part in determining the size of the own wage effect on labor supply. The results of Tables 1 and 2 are also at odds with the results of recent time-use surveys that report increases in the amount of pure leisure enjoyed by recent families, compared to families of twenty years ago. The cross wage effect has not become more positive as would be expected if this were the case. The same surveys also report that men are doing more household work, but again no support for this finding is found in Tables 1 and 2. If the husband is working more around the house in 1989 than in 1968, then less of the families non-

TABLE 3
Effect of Children on Husbands' Hours Worked per Week
Parameters (standard errors)

Family Type Effect	1968	1969	1968-69	1988	1989	1988-89
All Families						
Children	-0.96	-3.37[a]	1.10	1.37	-0.74	-1.41
Less Than 3	(0.87)	(1.03)	(1.98)	(1.01)	(0.92)	(1.34)
Children	-1.48[b]	-1.77[a]	-0.38	0.18	0.19	-0.60
Aged 3 to 5	(0.58)	(0.65)	(1.15)	(0.66)	(0.56)	(1.01)
Children	-0.06	-0.20	-1.62[b]	0.78[a]	0.26	0.47
Aged 6 to 17	(0.15)	(0.17)	(0.67)	(0.21)	(0.22)	(0.71)
Sample Size	4170	4223	1024	7154	6256	1619
Families with Young Children						
Children	0.26	-0.03	-0.60	1.87	-2.47[b]	-1.97
Less Than 3	(1.25)	(1.35)	(2.12)	(1.60)	(1.25)	(2.33)
Children	-0.46	0.14	-2.12	0.73	-0.42	-2.33
Aged 3 to 5	(0.89)	(0.85)	(1.33)	(0.99)	(0.75)	(2.07)
Children	0.30	0.58[b]	-3.27[a]	0.60	-0.13	-2.82
Aged 6 to 17	(0.32)	(0.30)	(1.24)	(0.57)	(0.53)	(2.39)
Sample Size	851	809	197	1752	1522	425
Families without Young Children						
Children	0.13	-0.40[c]	-0.97	0.92	0.34	1.63[c]
Aged 6 to 17	(0.20)	(0.22)	(0.81)	(0.24)	(0.29)	(0.94)
Sample Size	3319	3414	827	5402	4734	1194

[a] Significant at the 1 percent level.
[b] Significant at the 5 percent level.
[c] Significant at the 10 percent level.

market time would be leisure in 1989 compared to 1968, and the cross wage effect would become more negative, which is not the case. In fact, Tables 1 and 2 provide evidence that not much has changed in the last twenty years in regard to the labor supply response of married couples to changes in wages. These results suggest that the conclusions from recent time-use studies are not generalizable to the sample

TABLE 4
Effect of Children on Wives' Hours Worked per Week
Parameters (standard errors)

Family Type Effect	1968	1969	1968-69	1988	1989	1988-89
All Families						
Children	-0.23	-0.48	2.36	-2.47[b]	-1.33	-1.22
Less Than 3	(0.94)	(1.13)	(1.78)	(1.09)	(0.97)	(1.27)
Children	-0.47	0.07	-0.52	-2.12[a]	-2.31[a]	-0.47
Aged 3 to 5	(0.63)	(0.72)	(1.03)	(0.71)	(0.60)	(0.96)
Children	-0.60[a]	-0.43[b]	-1.36[b]	-1.32[a]	-1.01[a]	-0.14
Aged 6 to 17	(0.16)	(0.19)	(0.61)	(0.22)	(0.23)	(0.67)
Sample Size	4170	4223	1024	7154	6256	1619
Families with Young Children						
Children	2.48[c]	-2.55	0.66	-4.61[b]	-1.15	-3.69[c]
Less Than 3	(1.43)	(1.62)	(2.14)	(1.97)	(1.45)	(2.07)
Children	1.95[c]	-1.14	-0.94	-3.20[a]	-1.89[b]	-2.68
Aged 3 to 5	(1.02)	(1.02)	(1.34)	(1.22)	(0.87)	(1.83)
Children	-0.34	-0.45	-1.48	-2.00[a]	-1.57[a]	-3.61[c]
Aged 6 to 17	(0.36)	(0.36)	(1.24)	(0.70)	(0.60)	(2.12)
Sample Size	851	809	197	1752	1522	425
Families without Young Children						
Children	-1.26[a]	-1.29[a]	-0.98	-1.34[a]	-1.54[a]	0.93
Aged 6 to 17	(0.21)	(0.24)	(0.71)	(0.24)	(0.30)	(0.92)
Sample Size	3319	3414	827	5402	4734	1194

[a] Significant at the 1 percent level.
[b] Significant at the 5 percent level.
[c] Significant at the 10 percent level.

used in this paper, and/or that an individual's share of, or role in, household production does not determine the size of wage elasticities.

The effect of additional children on the labor supply of husbands and wives was also examined, and the parameter estimates of these effects are listed in Tables 3 and 4. Table 3 contains the results for the husbands, and Table 4 the results for the wives. Examining Table 3 first, the results suggest that additional children do not

have much of an effect on the number of hours worked per week by married men. Although a few of the parameter estimates are significantly different from 0, the majority are not, and there are significant estimates that are both positive and negative. There is no tendency for children to have a more negative effect on the husband's hours of work per week in the later time period as compared to the earlier period. If the husbands are really sharing more of the child care responsibility, it would be expected that additional children would result in fewer hours worked per week as the husbands adjust their labor supply to accommodate the increased child care responsibilities.

Not surprisingly, children appear to have a greater effect on the hours worked per week by married women, as Table 4 illustrates. The effect of an additional child is almost always negative, and often significant. There are a few anomalous estimates from the 1968-69 samples, in which an additional child leads to an increase in the number of hours worked per week. This could be the result of the special nature of the sample under examination. For example, in 1968, among families with young children, an additional child under the age of 3 leads to an increase of almost 2.5 hours of work per week, but at that time, very few married women with children under 3 actually worked. Those that did work were atypical, and their labor supply response might also be expected to be quite atypical. The surprising finding which comes out of Table 4, however, is that an additional child seems to have a more negative effect in the 1988-89 period, as compared to the 1968-69 period. Exactly the opposite of what is expected.

CONCLUSIONS

This paper has attempted to document empirically the changes over time in the labor supply behavior of married couples. In particular, estimates of the effects of wage changes and additional children on the annual hours of work were provided for the beginning and end of a recent twenty-year period, for both husbands and wives, and by three family types. The paper develops expectations regarding the changes in labor supply parameters for these groups that are based on two related pieces of information. First, an often cited explanation for the increased hours of work by married females is the relatively large size of their own wage elasticity of supply, with the large relative magnitude being attributed to their unique role in household production. Secondly, there have been reports of dramatic increases in married men's participation in household production. Thus, the uniqueness of the wife's role in household production has diminished, and it would be expected that married men and women would have more similar labor supply responses to changes in wages and the number of children in the more recent period as compared to earlier times.

The results of this paper do not support the expectations noted above, and with some important qualifications suggest that one or the other, or both, of the pieces of information cited above are incorrect. First, this is not the first paper to report relatively small, or even negative, "intertemporal" own wage elasticities for married women [Killingsworth and Heckman, 1986; Mroz, 1988]. Thus, this paper provides

additional evidence that calls into question the simple household production model often cited to explain the changes in married women's labor supply behavior. Secondly, the popular perception of changing gender roles, and the increased participation by husbands in household production and child care, is not reflected in the estimates provided in this paper. There is no evidence that married men are responding differently to their wives labor supply decisions and no evidence that men are more involved with household production. If men are picking up the kids at school when they get sick, it is the same type of man who always exhibited this behavior, and not a general increase in the husband's role in child care or household chores. The estimates provided in this paper portray a static picture of the labor supply responses of married couples over the past twenty years.[14] This result is consistent with evidence presented by other researchers [Shaw, 1992].

Several qualifications of the above conclusions are in order, First, as Card [1991] has noted, the lifecycle model of labor supply frequently used in empirical studies, in general, has failed to explain adequately variation in the age profile of hours and suggests that alternative models incorporating hours restrictions would improve the explanatory power of the model. A partial explanation of the failure noted by Card [1991] is due to poor wage data and measurement error that is not completely eliminated by the use of instrumental variables. Second, there are the usual empirical problems associated with estimating labor supply models. No labor supply analysis to date has been able to eliminate effectively more than a few of the myriad of problems associated with estimating labor supply models, and this paper is no exception. The empirical model used in this paper is based on a simple life-cycle model with perfect foresight, and thus, uncertainty and its consequences have been ignored, as are the implications associated with bargaining models of family labor supply. Furthermore, both wages and children are assumed exogenous, and it is also assumed that leisure and consumption are separable within periods. All of these assumptions have been questioned previously in the literature. The paper does correct, however, for sample selection, measurement error in wages and estimate a fixed effect model controlling for family and/or person-specific effects. In addition, since the emphasis of the paper is identifying changes over time in the parameter estimates, all of the estimates across the years suffer from the same biases and, as such, serve to diminish the severity of the above mentioned problems. Finally, this paper has analyzed only the response of hours of work, conditional upon labor force participation, to changes in wages and children.

APPENDIX I
Descriptive Statistics for Variables Used in Analysis, Full Sample

Variable	1968 Mean	1968 Std Dev	1969 Mean	1969 Std Dev	1988 Mean	1988 Std Dev	1989 Mean	1989 Std Dev
Husband's Age	40.64	8.18	40.44	8.25	39.43	7.97	39.37	7.94
Wife's Age	38.07	8.19	37.89	8.17	37.24	7.67	37.27	7.65
Husband's Educ.	11.89	3.07	11.97	3.08	13.59	2.64	12.55	2.59
Wife's Education	11.63	2.42	11.70	2.45	13.22	2.26	12.20	2.25
Children 0-2	0.22	0.48	0.21	0.47	0.20	0.45	0.20	0.46
Children 3-5	0.33	0.59	0.31	0.57	0.23	0.48	0.22	0.47
Children 6-17	1.41	1.38	1.42	1.39	0.86	1.00	0.86	1.00
New England	0.07	0.25	0.07	0.25	0.10	0.30	0.11	0.31
Mid Atlantic	0.21	0.41	0.21	0.41	0.16	0.36	0.15	0.36
West N. Central	0.07	0.26	0.07	0.26	0.10	0.30	0.10	0.30
South Atlantic	0.14	0.35	0.13	0.34	0.16	0.37	0.17	0.38
East S. Central	0.05	0.22	0.05	0.22	0.05	0.22	0.05	0.23
West S. Central	0.07	0.26	0.08	0.27	0.08	0.27	0.08	0.27
Mountain	0.04	0.20	0.04	0.19	0.09	0.28	0.09	0.28
Pacific	0.13	0.34	0.13	0.34	0.09	0.29	0.07	0.26
Central City	0.25	0.43	0.25	0.43	0.15	0.35	0.14	0.34
Suburban	0.45	0.50	0.45	0.50	0.39	0.49	0.37	0.48
Sample Size	12122		12250		11875		10336	

APPENDIX II
Parameter Estimates from Husband and Wife Pair Samples for 1968 and 1988

Variable	1968 Husbands Coeff	1968 Husbands Std Err	1968 Wives Coeff	1968 Wives Std Err	1988 Husbands Coeff	1988 Husbands Std Err	1988 Wives Coeff	1988 Wives Std Err
Husband's Age	-0.05	0.07			-0.08	0.06		
Wife's Age			0.04	0.07			0.02	0.07
Husband's Education	-0.02	0.18			-0.07	0.18		
Wife's Education			-0.97	0.27			-0.93	0.26
Children 0-2	-0.96	0.87	-0.23	0.94	1.37	1.01	-2.47	1.09
Children 3-5	-1.48	0.58	-0.47	0.63	0.18	0.66	-2.12	0.71
Children 6-17	-0.06	0.15	-0.60	0.16	0.78	0.21	-1.32	0.22
New England	0.72	0.69	-1.68	0.75	-0.92	0.55	-2.38	0.59
Mid Atlantic	-1.17	0.54	-2.77	0.59	-1.97	0.53	-0.17	0.58
West N. Central	1.73	0.71	0.87	0.77	-0.71	0.68	1.75	0.73
South Atlantic	0.39	0.62	1.78	0.67	0.27	0.50	2.14	0.54
East S. Central	0.27	0.90	1.23	0.98	-3.06	0.96	1.55	1.03
West S. Central	0.41	0.77	3.64	0.84	0.78	0.60	1.81	0.64
Mountain	-0.04	0.86	0.85	0.93	-1.53	0.55	1.17	0.60
Pacific	-0.40	0.63	-0.46	0.68	-2.04	0.53	-1.13	0.57
Central City	-0.58	0.50	-1.14	0.54	-1.79	0.46	-0.70	0.50
Suburban	-0.28	0.60	0.72	0.65	-0.90	0.43	-2.25	0.46
Log Husband's Wage	11.46	3.50			6.30	2.33		
Log Wife's Wage			20.26	3.40			13.20	1.62
Cross Wage	50.36	6.10	-18.86	4.21	2.14	0.71	-0.43	0.30
Selection (husband)	-5.35	15.41	55.71	16.70	9.07	7.32	36.31	7.87
Selection (wife)	8.72	3.51	-4.42	3.81	-4.04	4.06	-8.12	4.37
Sample Size	4170		4170		7154		7154	

Note: All wages are predicted values from wage regressions which include age(squared), education(squared), occupation, geographical measures, selection terms, and interaction terms between age and education. The selection terms are the predicted values from a reduced form labor force participation model, estimated with a linear probability regression(OLS). See the text for variables included in this regression.

APPENDIX III
Parameter Estimates from Panel Data on Individuals for 1968-69 and 1988-89

	1968-69				1988-89			
	Husbands		Wives		Husbands		Wives	
Variable	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err
Children 0-2	1.10	1.98	2.36	1.78	-1.41	1.34	-1.22	1.27
Children 3-5	-0.38	1.15	-0.52	1.03	-0.60	1.01	-0.47	0.96
Children 6-17	-1.62	0.67	-1.36	0.61	0.47	0.71	-0.14	0.67
New England	-1.44	1.22	1.03	1.09	-0.18	1.12	-0.24	1.07
Mid Atlantic	0.53	0.91	0.70	0.81	-0.70	0.95	0.23	0.90
West N. Central	-1.23	1.31	1.66	1.17	-0.96	0.95	-0.32	0.91
South Atlantic	0.09	1.01	1.12	0.91	0.01	0.87	-1.00	0.83
East S. Central	1.84	1.91	1.91	1.71	-0.54	1.34	-0.05	1.28
West S. Central	0.01	1.66	1.11	1.49	-1.20	1.21	1.01	1.15
Mountain	0.58	1.58	1.63	1.42	-0.03	1.11	0.59	1.06
Pacific	1.81	1.24	0.18	1.11	0.01	1.27	-0.43	1.21
Central City	0.70	1.02	-0.17	0.92	0.77	0.82	0.16	0.78
Suburban	-0.29	0.76	-0.72	0.68	0.27	0.58	0.08	0.56
Log Husband's Wage	-13.91	8.92			-16.29	6.03		
Log Wife's Wage			-4.71	8.01			-9.56	5.75
Cross Wage	-0.45	4.10	-8.92	3.68	-6.36	3.60	-13.99	3.43
Selection (husband)	36.23	25.59	18.65	22.98	8.08	9.24	-3.25	8.80
Selection (wife)	-24.52	13.66	-13.13	12.26	2.79	8.87	3.57	8.45
Sample Size	1024		1024		1619		1619	

Note: All wages are predicted values from wage(change) regressions which include age(squared), education(squared), occupation, geographical measures, selection terms, and interaction terms between age and education. The selection terms are the predicted values from a reduced form labor force participation model, estimated with a linear probability regression (OLS) on changes in participation indicator. See the text for variables included in this regression.

APPENDIX IV
Descriptive Statistics for Variables Used in Analysis Employed Husband and Wife Pairs

	1968		1969		1988		1989	
Variable	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Husband's Age	41.72	8.21	41.69	8.05	39.41	7.89	39.23	7.78
Wife's Age	39.10	8.15	39.08	7.96	37.18	7.51	37.23	7.47
Husband's Educ.	11.71	2.94	11.78	2.96	13.75	2.58	12.67	2.53
Wife's Education	11.85	2.40	11.88	2.43	13.51	2.24	12.45	2.23
Children 0-2	0.09	0.30	0.08	0.29	0.14	0.37	0.14	0.39
Children 3-5	0.18	0.45	0.17	0.43	0.18	0.42	0.17	0.43
Children 6-17	1.28	1.32	1.32	1.32	0.82	0.97	0.82	0.98
New England	0.08	0.27	0.08	0.27	0.11	0.31	0.11	0.32
Mid Atlantic	0.18	0.38	0.19	0.39	0.14	0.35	0.14	0.35
West N. Central	0.07	0.26	0.07	0.26	0.11	0.31	0.11	0.32
South Atlantic	0.17	0.37	0.15	0.36	0.17	0.38	0.18	0.38
East S. Central	0.05	0.22	0.05	0.22	0.05	0.21	0.05	0.22
West S. Central	0.08	0.26	0.08	0.27	0.07	0.26	0.07	0.26
Mountain	0.04	0.20	0.04	0.20	0.09	0.28	0.08	0.28
Pacific	0.12	0.33	0.13	0.33	0.09	0.29	0.06	0.25
Central City	0.25	0.43	0.26	0.44	0.15	0.36	0.14	0.34
Suburban	0.41	0.49	0.42	0.49	0.39	0.49	0.37	0.48
Wife's Hours	34.06	11.24	34.44	11.13	35.58	11.70	35.85	11.43
Wife's Wage	2.72	3.51	2.82	3.38	10.09	9.75	10.23	10.02
Husband's Hours	44.47	9.98	44.30	9.78	45.32	10.52	44.88	10.33
Husband's Wage	3.76	2.32	4.06	3.15	14.53	13.83	14.70	9.51
Husband's Occupation								
Professional	0.15	0.36	0.16	0.37	0.23	0.42	0.23	0.42
Manager	0.14	0.35	0.14	0.35	0.15	0.36	0.14	0.34
Sales	0.07	0.25	0.06	0.23	0.13	0.33	0.11	0.32
Operative	0.21	0.41	0.21	0.41	0.13	0.34	0.15	0.36
Clerical	0.09	0.28	0.09	0.28	0.05	0.22	0.06	0.24
Laborer	0.03	0.18	0.03	0.17	0.03	0.18	0.04	0.18
Service	0.05	0.22	0.05	0.23	0.06	0.23	0.06	0.23
Craft	0.26	0.44	0.26	0.44	0.21	0.41	0.22	0.41

APPENDIX IV (Cont.)
Descriptive Statistics for Variables Used in Analysis
Employed Husband and Wife Pairs

Variable	1968 Mean	1968 Std Dev	1969 Mean	1969 Std Dev	1988 Mean	1988 Std Dev	1989 Mean	1989 Std Dev
Wife's Occupation								
Professional	0.16	0.37	0.16	0.36	0.29	0.45	0.29	0.45
Manager	0.04	0.19	0.04	0.19	0.08	0.28	0.08	0.27
Sales	0.07	0.26	0.08	0.26	0.10	0.31	0.10	0.31
Operative	0.19	0.39	0.19	0.39	0.06	0.24	0.06	0.24
Clerical	0.40	0.49	0.40	0.49	0.34	0.47	0.33	0.47
Laborer	0.00	0.06	0.00	0.06	0.01	0.11	0.01	0.11
Service	0.12	0.32	0.12	0.33	0.10	0.30	0.10	0.30
Craft	0.01	0.11	0.01	0.12	0.02	0.13	0.02	0.13
Sample Size	4170		4223		7154		6256	

NOTES

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1. See the surveys by Killingsworth [1983], Pencavel [1986] and Killingsworth and Heckman [1986] for an extensive review of the literature.
2. The data used in Figures 1, 2, and 3 come from the *Current Population Survey* [Bureau of Labor Statistics, 1989].
3. It seems reasonable to assume that the same pattern of results also would be observed for married, white couples between the ages of 25 and 55, which are the characteristics of the sample under study in this paper. The published data from the Bureau of Labor Statistics [1989] does not break out the numbers by the desired grouping.
4. These ratio's are higher than those reported in Smith and Ward [1989]. The data in Figure 2 are for whites and based on the average weekly earnings and hours worked for employed persons. The earnings figures are deflated using the GNP deflator. The female/male wage ratio calculated from the current sample data — white, married couples between the ages of 25 and 55 which is not one of the groups illustrated in Figure 3 — show no such narrowing of the wage.
5. In support of this assumption is a finding by Hill and Juster [1985] that the most important determinant of the time spent in a particular leisure activity by a husband or wife is the amount of time their spouse spends in that activity.
6. Whether the cross wage elasticity of supply becomes more negative over time depends on the changes in the proportion of non-market time comprised of pure leisure, and there exists conflicting pieces of evidence related to this idea. On the one hand, men are spending more time at home engaged in home production, but the family as a whole is increasing their total amount of leisure.

7. The quantity of home production would also be expected to decline due to a decline in fertility, but quantity of children are being held constant in the empirical analysis.
8. In papers by Lundberg [1988], and Wales and Woodland [1976] the elasticities are estimated separately and do not appear to exhibit the expected relationship.
9. The empirical expectations derived from this type of augmented neoclassical model may differ from those implied by the household bargaining models. An analysis based on these models is beyond the scope of this paper.
10. The model represented by equations (3) and (4) is identified only through its functional form, a weak form of identification.
11. See Card [1990] for details on implementing this procedure. The Heckman procedure is also used where feasible, and the estimates from those analyses are virtually the same as those reported.
12. In addition, the estimates of the participation probabilities come from a cross-sectional analysis that does not explicitly control for the unobserved person or family-specific effect. Thus, the predicted probability might not be a consistent estimate of the true probability.
13. The own wage effect is the effect of a one unit change in the natural logarithm of the wage, holding constant changes in the wage ratio. The elasticity is calculated by dividing the coefficient by the mean number of hours. The cross wage effect is a function of the husband and wife wage ratio (see equation (3b)), and the elasticity is calculated as the partial derivative of equation (3b) with respect to the wife's wage, multiplied by the ratio of the mean wife wage to mean husband hours.
14. This paper focuses on hours of work conditional upon working, and does not examine the structural labor force participation decision. This fact might explain the static nature of the results for women, but not for men, since men have not changed their labor force participation noticeably during the period under study. Future work will examine this area.

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