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7. Education and the Allocation of Women's Time

by Arleen Leibowitz

INTRODUCTION

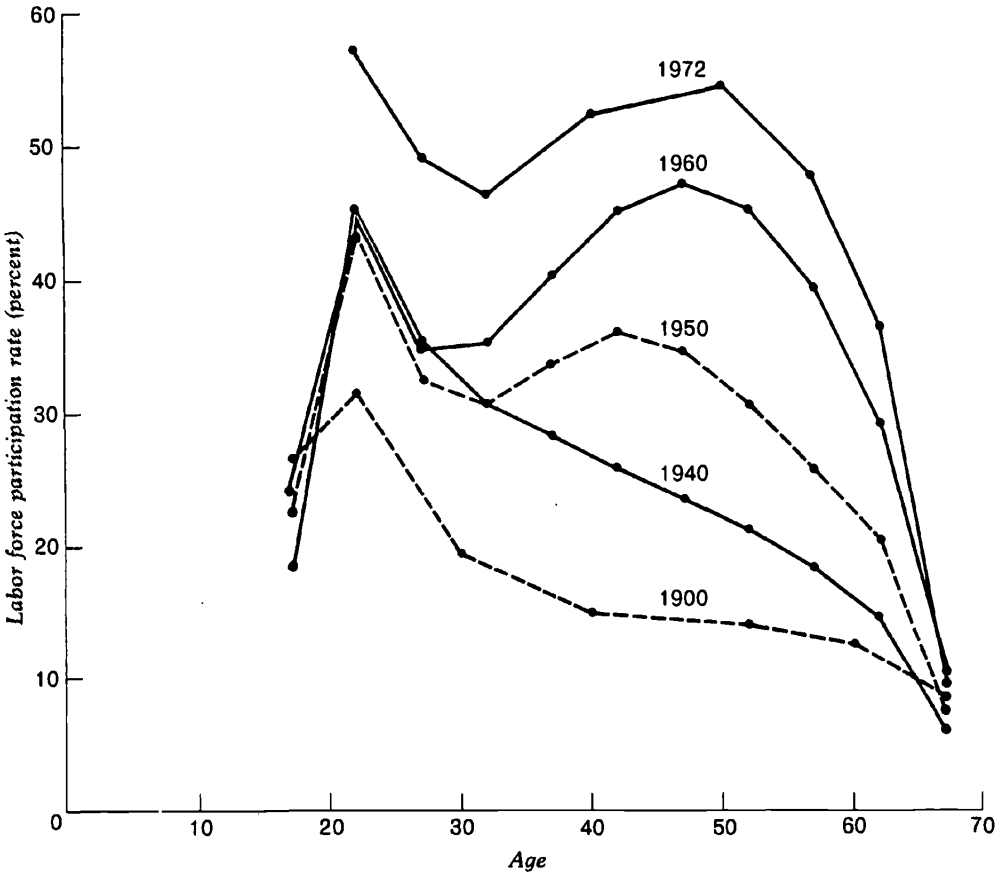
Dramatic changes over the last 30 years in the amount of time married women spend in the labor force are well documented. Census data indicate, for example, that whereas only 15 percent of married women were in the labor force in 1940, the comparable figure was 24 percent for 1950, 31 percent for 1960, and 41.5 percent for 1972.[1] These changes in labor force participation have necessarily affected the allocation of time to various activities in the household as well.

The overall increase in labor force participation rates by married women has been accompanied by a change in the age profile of participation. Before World War II, women tended to drop out of the labor force permanently when they married and began to have children. Thus labor force participation rates peaked around age 25 and declined steadily thereafter, as seen in the profiles for 1900 and 1940 in Figure 7-1. During the last 30 years, however, women have reentered the labor force in increasing numbers when family responsibilities lessened, leading to a second peak in the participation profile between ages 45 and 55. Indeed, by 1960, participation rates at 45 to 55 exceeded those at 20 to 24. These changes have caused a pronounced shift in the age and sex composition of the labor force.

In recent years there has been renewed interest in the analysis of labor force participation of married women. Jacob Mincer (1962) took a pioneering step by placing the problem in the household production context: women are seen as choosing not simply between work and leisure, but between work in the home, work in

[1] Estimates are for married women, husband present, in March of the year cited. See U.S. Bureau of the Census, *Current Population Reports,* ser. P-50, nos. 22 and 29; see also Bogen (1968), Hayghe (1973), Schiffman (1961), and Waldman (1968).

FIGURE 7-1 ***Female labor force participation by age (all women), 1900–1972***



SOURCE: Oppenheimer (1970, p. 8) and Hayghe (1973).

the market, and leisure. Although income affects the total amount of work, the division of work between home and market depends on wage rates, productivity in the home, and the price and availability of substitutes for the wife's labor in the home. Recent studies by Cain (1966) as well as by Bowen and Finegan (1969) have updated Mincer's findings on income and wage effects and have documented the importance of color, schooling, occupation, and the presence of children.

A striking relationship, found consistently by these authors and by other students of female labor force behavior, is that women with more education are more likely to be in the labor force.[2] This

[2] See also, for example, Bancroft (1968); Cohen, Rea, and Lerman (1970); Garfinkle (1967); Lester (1958); Mahoney (1961); Oppenheimer (1970); Perrella (1968); Rosett (1958); and Waldman (1970).

is true in a classification of participation rates by education, and the relationship is even stronger when family income is held constant in the comparison (since women with more education tend to have higher family incomes, which, *ceteris paribus,* reduces labor supply). The most widely accepted explanation for this association is that education raises productivity in the labor market more than productivity in the home, so that the "cost" of not being in the labor market rises and women are induced to seek employment outside the home.

The greater market labor supply of women with more schooling is seen in the labor supply profiles shown in Figures 7-2 and 7-3.[3] These profiles, which have observations for age groups more closely spaced than previously available, show a second effect of education: It varies not only the level but also the lifetime pattern of labor supply.

These profiles reveal that the higher the level of schooling attained by the woman, the greater the supply of labor to the market, except between the ages of 25 and 40, when all women supply nearly the same amount of labor to the market. This seeming paradox may indicate that education does not cause market productivity to exceed productivity in the home equally for all activities and for all ages, since it appears that during the years when young children are in the home, the more educated women are, too.

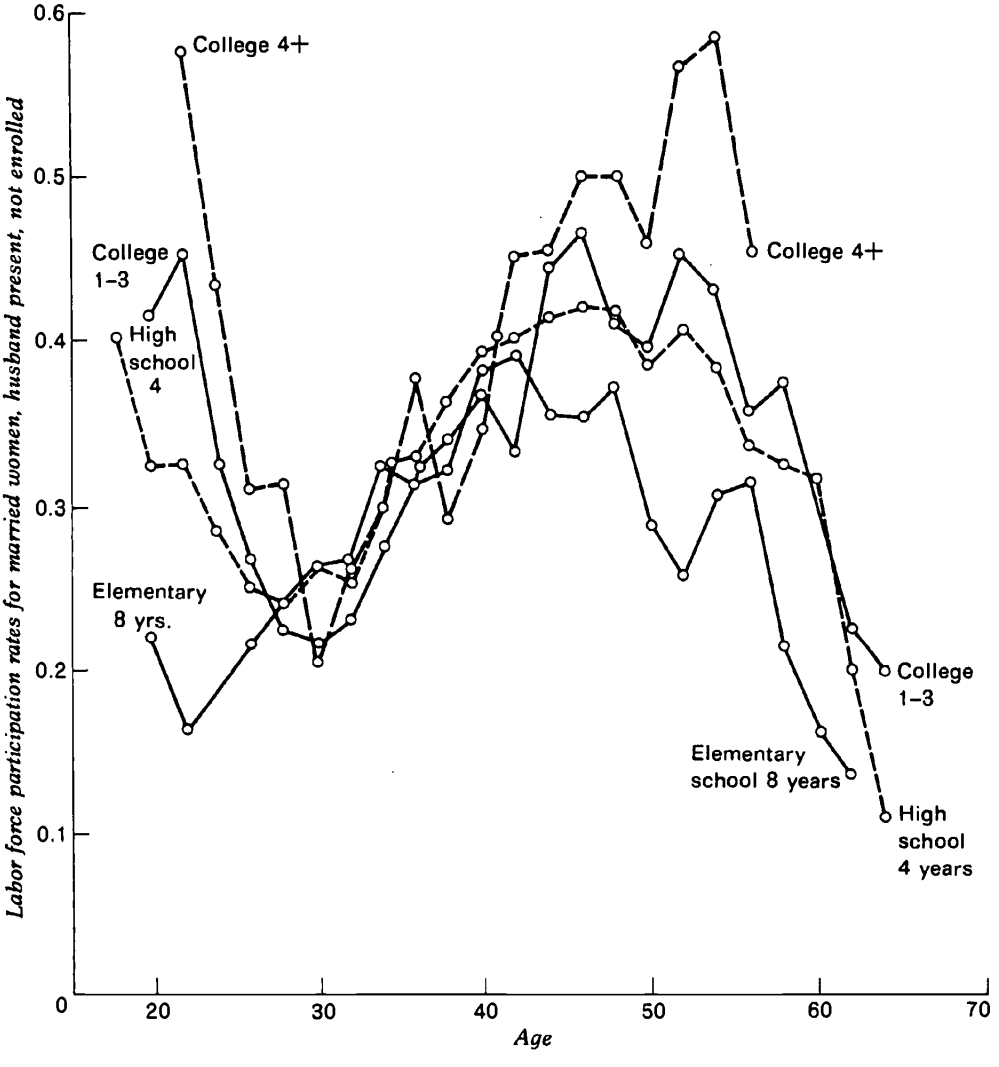
Since both the shape and level of the labor supply profile of married women differ according to educational attainment, previous regression models that insert education linearly on the assumption that it raises productivity in the market by a greater amount than it raises productivity in the home, and that the relative change in productivity does not change with age, may be misspecified.[4]

Following Mincer, Cain, et al., the difference in the overall level of labor supply by women of different educational attainment may be traced to differences in the productivity of their time. Figures 7-2 and 7-3 seem to indicate, however, that these differences disappear—or at least are not manifest in different labor supplies to

[3] These profiles were calculated by the author from the 1/1,000 sample of the 1960 census. Only women who are not enrolled in school, who have been married only once, and who are living with their husbands are included in the calculations.

[4] The manner in which education is treated, for example, in Bowen and Finegan's study (1969) is that education affects the intercept of the labor force participation curve, but not its shape (p. 119).

FIGURE 7-2 ***Labor force participation rates by age and education, 1960***



SOURCE: Calculated from 1/1,000 sample of the 1960 census.

the market—during the ages of between 25 and 40. The causes of this change can be traced to the presence of children in the home.

Between the ages of 25 and 40, a woman's life is most often devoted to child rearing. It has recently been estimated that for women born in the 1920s, the median age of the wife at the birth of the last child is 30.5 years (Glick and Parke, 1965, p. 190). Thus most women will have young children in the home until they reach the age of 40.

The importance of the presence of children in altering the labor

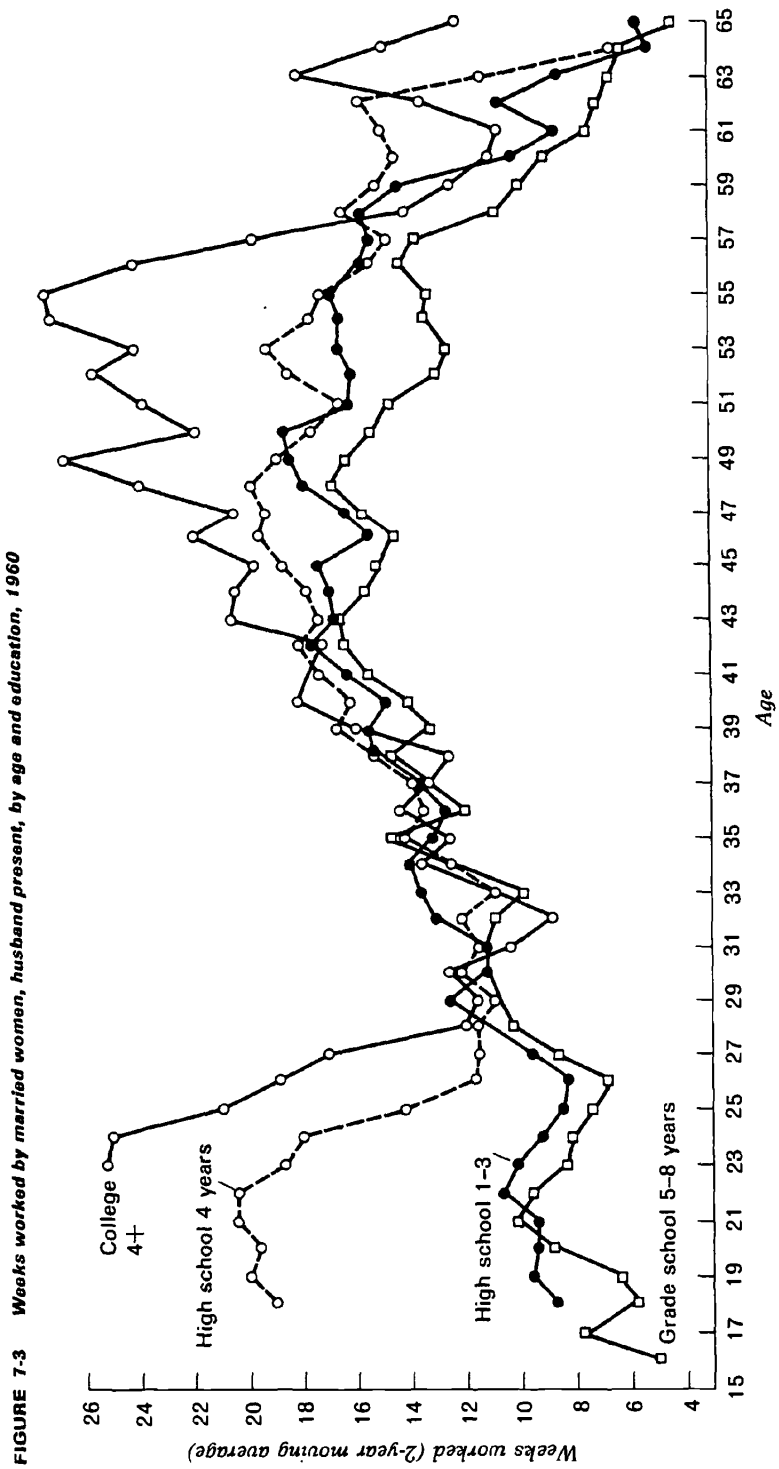


FIGURE 7-3 *Weeks worked by married women, husband present, by age and education, 1960*

SOURCE: Calculated from 1/1,000 sample of the 1960 census.

supply of the mother can be demonstrated by looking at the "adjusted" labor force profiles calculated by Bowen and Finegan on the assumption that married women of all ages have the same number of children (i.e., that the presence of children is evenly spread over the mother's lifetime, so that each woman has, for example, 0.25 children under six in any year). Under these assumptions, the labor force participation profile would be of the shape shown in Figure 7-4. This profile is in sharp contrast to the actual double-peaked participation profile, which clearly reflects the decline in market productivity relative to home productivity during the childbearing and child-rearing years. The "adjusted" profile, however, has the same shape as the participation profile for males and for single women, but at a lower level.

In this chapter the differences in labor supply by education class will first be documented with data from the 1960 census. Then time-budget data will be employed to show that the higher the educational level of the mother, the greater the time inputs to child care, and that these differences can be used to explain the shape of the labor supply profiles.

EFFECTS OF EDUCATION ON TIME ALLOCATION

In the theoretical model of household behavior developed by Becker, utility is derived from the consumption of commodities, and thus the commodities consumed (or produced) are the objects of choice. The general properties of a pure change in income, compensated price changes, and equiproportionate changes in home and market productivity are well known.[5]

Two basic constraints which must be satisfied by any optimizing solution are:

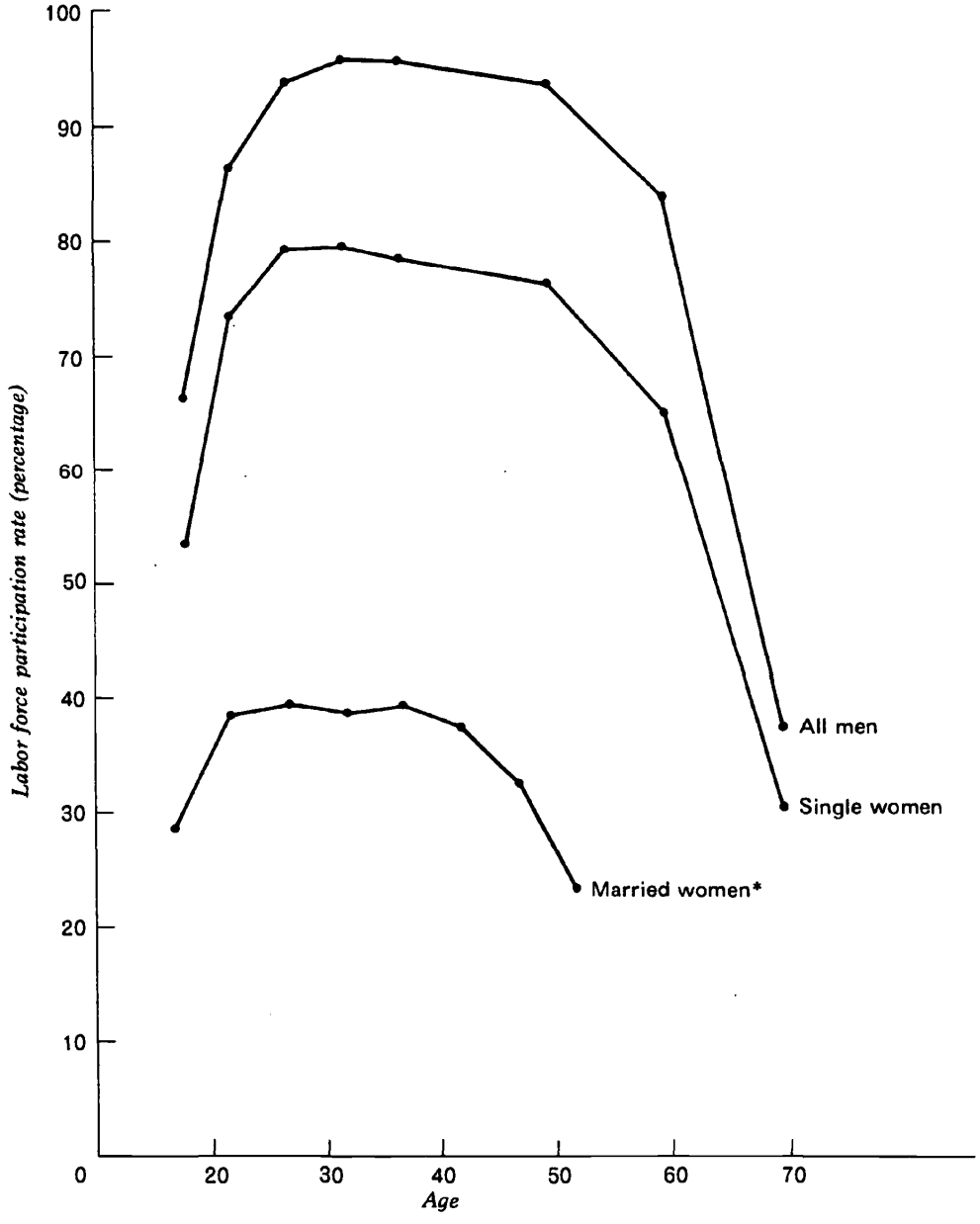
1 The ratio between the marginal productivity of time in home production of any two family members in any two periods of time must be equal to the ratio of the price of their time in these periods.

2 The ratio of the marginal productivity of time and goods in producing any commodity must equal the ratio of the cost of the time and goods inputs.

In this chapter education is postulated to have several effects that influence the choice of commodities and labor force decisions. First, education raises the productivity of time in market work, as attested to by the higher wages paid to more educated workers,

[5] See Becker (1965).

FIGURE 7-4 ***Labor force participation rates, 1960***



* Adjusted for the effects of color, presence of children, schooling, other family income, and employment status of husband.

SOURCES: U.S. Bureau of the Census (1963, Table 6) and Bowen and Finegan (1969, Table 5-4, p. 109).

which in turn raises the opportunity cost or price of time in home production. Second, education may increase the productivity of time spent in home production: women with more education may get more output for given amounts of time inputs. Because of these two effects, full income will also rise with education.

Given these two effects and the two basic constraints outlined above, we can see that education will work in several ways to alter commodity consumption. First, the more highly educated women have greater family income, because of both their own greater earnings and those of their husbands,[6] and thus they will demand more consumption time. Second, since the opportunity cost of time rises with education, goods will be substituted for time in the production of all commodities, which will tend to increase hours of work. Third, the relative price of time-intensive commodities will rise, which will also tend to cause the demand for consumption time to fall. However, if education increases the productivity of time in the home as well as in the market, the demand for time in home production might increase.

It is proved elsewhere (Leibowitz, 1972) that if education increases the productivity of time in the market more than time in the home, an increase in education will tend to decrease the amount of time used to produce a unit of a given commodity. This decrease in time inputs will be greater (1) the higher the percentage by which the increase in market productivity caused by education exceeds the increase in home productivity, (2) the greater the ease of substituting other factors for time in producing the commodity, and (3) the steeper the rise in home productivity in producing this commodity.[7]

[6] The correlation between wife's education and family income other than her earnings is .27 for a random sample of the 1960 census.

[7] Assuming a production function which is homogeneous of degree one, the percentage change in time inputs to producing a unit of a given commodity is shown to be

$$\tilde{t} = S_x\sigma(\tilde{f}_t - \tilde{P}_t) - \frac{t}{\pi}\left(1 - \frac{1}{\pi}\right)\tilde{f}_t$$

where $\sim$ = percentage change
t = time input per unit of commodity
π = price of a unit = $p_j x_j + tP_t$
$\tilde{P}_t$ = percent change in market price of time
$\tilde{f}_t$ = value of time in home production
S_x = expenditures on goods as a percent of total price, $S_x = \frac{p_j x_j}{\pi}$, and
σ = elasticity of substitution between time and other factors in production of the commodity (Leibowitz, 1972)

The total amount of time spent in producing this commodity[8] will decrease more (1) the smaller the income elasticity for this commodity and (2) the smaller the price elasticity, if the share of time costs in price is below the average for all commodities (i.e., if the relative price of the commodity falls with a change in education) or the greater the price elasticity for commodities with greater-than-average time intensities.

Summing the changes in time inputs over all commodities, one derives the amount of time released for market work as a result of an increase in education. The reduction in total time spent in consumption (or the increase in time supplied to the labor market) is likely to be greater (1) the greater the extent to which commodities with high income elasticities are also characterized by small time costs as a percentage of price (π_i), by greater substitution among factors, and by greater increases in home productivity relative to market productivity and (2) the smaller other family income is, since families with higher income will demand more commodities and therefore more consumption time.

Another way of putting this is to recognize that the marginal utility of goods relative to the marginal utility of time will be lowered by high incomes (since all income must be spent on goods over the course of the lifetime) and that, in order to reestablish the equilibrium conditions described at the beginning of this section, time spent in home production must increase.

ESTIMATION OF LABOR SUPPLY EQUATIONS

Education affects labor supply primarily through changes in wages, home productivity, and elasticity of substitution with other factors of production in the home. In this chapter the market productivity of the wife (or the price of time) at a given point in time was considered to be predetermined by prior investment decisions. Following Mincer (1970), expected wages were estimated as a function of schooling and training investments. These expected wages were then treated as exogenous variables in the labor supply equation.

[8] The total effect on time reduction is described by the following equation:

$$\tilde{t} = \left[(S_x - \bar{S}_x)\varepsilon + S_x\sigma\right](\tilde{f}_t - \tilde{P}_t) - \frac{t}{\pi}\left(1 - \frac{1}{\pi}\right)\tilde{f}_t + \eta\tilde{Y}$$

where $\bar{S}_x$ = expenditure on goods as a percent total expenditures for all commodities
$\tilde{Y}$ = percent change in real full income due to a change in education
η = income elasticity of demand for Z_i, and
ε = price elasticity of demand for Z_i (Leibowitz, 1972)

Home productivity is also largely fixed at a given time and is assumed to depend largely on the stock and age structure of children produced in previous periods. The larger the size of the family and the younger the children, the greater the demand for home production by the wife and the greater the marginal productivity of her time in home production. Data on the presence and age of children are used as a gauge of home productivity, although no attempt is made to specify the exact relationship between them in this section.

Since the allocation of time between home and market by one family member is influenced by the relative productivity in home and market of other family members, the difference between the education of the husband and wife is used as a measure of the relative cost of their time in home production.

Family income, other than the wife's earnings, was considered here as an exogenous income variable. Although the income tax is not explicitly considered in this analysis, it should be noted that the earnings of more highly educated women are, on the average, subject to higher marginal tax rates because of the higher incomes of their husbands and the progressive nature of our tax structure. These women could be expected to supply even more time to the labor force relative to less-educated women, if both groups' income were subject to the same tax rate.

The age variable is included to capture the effect of differential rates of depreciation in home and market productivity.[9] If home productivity increases relative to market productivity as women grow older, age will have a negative effect on the supply of labor, assuming an optimum distribution of working time over the lifetime. In the life-cycle context, age will also have a negative effect on weeks worked if the rate of interest exceeds the rate of time preference for the present, thereby shifting consumption time to later ages. It may also pick up a cohort effect if the quality of education has changed over time or if older women have less market experience.[10]

Cain (1966) as well as Bowen and Finegan (1969) have shown that black women have higher labor force participation rates than white women. Race was included in the regressions to test whether the greater supply of labor by black women could be "explained"

[9] See Chap. 8 of this volume.

[10] See Becker and Ghez (1972).

by racial differences in economic variables or whether race continued to have a significant net effect on weeks worked.

Weeks worked per year was chosen as the dependent variable because it is a measure of labor supply that covers a long enough period to be unaffected by seasonality (in contrast to hours worked per week), because it has better statistical properties with greater likelihood for homoscedasticity than in the case of labor force participation rates, and because it is a better measure of labor supply than membership in the labor force.[11]

A linear model incorporating these variables can be written:

$$\text{Weeks} = a + (b_1 + b_8 T) W_w + \sum_{i=2}^{4} b_i C_i + b_5 \text{Young} + b_6 A + b_7 \text{Dif} + b_8 (V + TW_h) + b_9 \text{Race} \qquad (7\text{-}1)$$

where W_w = wife's wage, estimated from Eq. II-1 in Leibowitz (1972)
W_h = husband's wage
C_i = number of children in three age ranges
Young = age of the youngest child in years
A = age of the wife, in years
Dif = wife's educational level minus husband's educational level
V = nonwage income; and
Race = dummy variable equal to one for black and zero for white. Other nonwhites were excluded from the sample.

Here "other family income" is composed of husband's full income plus nonwage income. The total effect of wife's wages on weeks worked is comprised of a substitution effect (b_1) and an income effect ($b_8 T$), since an increase in wages not only increases the value of time but also raises full income. It is expected that b_1 will be positive, since the higher the wage, the more labor will be supplied to the market. Since higher family income will lead the wife to reduce the amount of labor supplied to the market, the sign of b_8 is expected to be negative. Thus the direction of the total effect of wages on weeks worked cannot be predicted a priori, since it is composed of a positive substitution effect and a negative income effect.

[11] A fuller discussion of the desirable characteristics of a variable measuring labor supply is found in Leibowitz (1972, pp. 44–49).

It is expected that the greater the number of children in the family, the greater the marginal productivity of the wife's time will be in the home and the less time she will supply to the labor market. The younger the child, the greater the expected impact on weeks worked. The older the youngest child in the family, the lower the marginal productivity of time in the home and the more labor the mother is expected to supply to the market. Thus it is anticipated that b_5 will be positive.

The higher the wife's education is relative to her husband's, the greater her market wages are relative to his and the greater the likelihood of her working outside the home. Thus b_7 is expected to be positive. The household production model does not give unique predictions about the effects of age and race on labor supply, and so we have no prediction about the signs of b_6 and b_9.

The data used to estimate the parameters of this equation are 1,730 observations selected from the 1/1,000 sample of the 1960 census.[12] Women who had completed 9 to 12 years of school were selected by a one-in-forty random sampling of the census tape to form the group called *high school women.* Women who had completed at least one year of college were selected by a one-in-ten random sampling and called *college women.* Women with one to eight years of school completed were selected by a three-in-forty sampling and were labeled *grade school women.* The samplings were unequal in size to assure a larger working sample of the grade school and college women, who are found at a lower frequency in the general population.

Wage and Home Productivity Effects

The results of estimating such a model of labor supply separately on each of three schooling groups and on a pooled sample of the groups are presented in Table 7-1. These equations show an average wage elasticity at the mean of 1.10 for college women, 1.65 for high school women, .334 for grade school women, and .946 for the pooled sample. That is, a 10 percent increase in wages will induce the average college woman to work 11 percent more weeks

[12] The sample is restricted to white and black women (other nonwhites are excluded) over 14. Only women who were married once, living with their husbands, and not currently enrolled in school were included in the sample. In recoding noncontinuous variables, medians were used in most cases, and estimates were made for open-ended intervals. The specifics are available upon request. A description of the sample is contained in U.S. Bureau of the Census, *Description and Technical Documentation; 1/1,000, 1/10,000, Two National Samples of the Population of the United States,* United States Census of Population and Housing, 1960.

TABLE 7-1
Supply of labor: 1959—weeks worked by married women

Independent variable	*Grade school, 708 observations*	*High school, 450 observations*	*College, 572 observations*	*All, 1,730 observations*
Weekly wage ($)	.07214 (.806)	.3655 (3.44)	.2297 (3.30)	.2026 (6.10)
Husband's income	−.00208 (−1.00)	−.00754 (−3.24)	−.00594 (−3.97)	−.00505 (−4.89)
Education difference	.0428 (.17)	.5917 (1.91)	.2679 (.99)	.3067 (2.02)
No. of children under 3	−8.084 (−4.66)	−3.494 (−1.96)	−5:940 (−3.32)	−6.037 (−6.01)
No. of children 3–5	−3.457 (−2.14)	−4.670 (−2.77)	−6.529 (−4.44)	−5.273 (−5.84)
No. of children 6–11	.3210 (.29)	−1.286 (−1.19)	−1.405 (−1.18)	−.7252 (−1.13)
Age of youngest child	.2901 (2.86)	.5116 (4.48)	.4646 (4.16)	.3975 (6.39)
Race	6.6228 (1.85)	6.757 (1.46)	1.457 (.32)	7.371 (3.84)
Age	−.5119 (−7.70)	−.4049 (−4.85)	−.6954 (−8.09)	−.5718 (−14.04)
Constant	28.425 4.89	7.9858 (1.03)	29.273 (5.31)	24.767 (8.68)
R^2	.1107	.2126	.2419	.1780

NOTE: *t*-values in parentheses.
SOURCE: Calculated from 1/1,000 sample of the 1960 census.

a year, while the average high school woman will increase weeks worked by 16.5 percent, and the average grade school woman will increase weeks worked by 3.3 percent. Income elasticity at the mean is −.38 for high school women, −.32 for college women, and −.09 for grade school women, although in the last case the coefficient is not significantly different from zero. Thus a 10 percent increase in income would cause a reduction in weeks worked of 3.8 percent for the average college woman, 3.2 percent for the average high school woman, and 0.9 percent for the average grade school woman. For each educational level, the results are consistent with Mincer's finding, on the basis of Standard Metropolitan Statistical Area (SMSA) data, that the absolute value of the own wage elasticity exceeds the absolute value of the income elasticity (Mincer, 1962, p. 93).

The home productivity effect comes through quite strongly in

the variables representing presence of children. The younger the children, the more market productivity falls relative to home productivity. In the regressions, the negative effect on weeks worked of having children under 5 is stronger than the negative effect of having children 6 to 11. Bowen and Finegan point out that the presence of older children in the family may actually facilitate participation in the labor force by the mother, since older children can look after younger ones.[13] However, this effect cannot account for the greater participation of more highly educated women, since they are more likely to space their children closely.[14] The variable representing the age of the youngest child is also quite significant in all four cases.

The difference in education between husband and wife, which reflects differences in market productivity, is significant in the pooled equation but less so in the separate equations. The fact that college-educated wives have, on the average, 0.961 more years of schooling than their husbands—in contrast to high school-educated wives, whose education exceeds their husbands' by only 0.32 years, and grade school women, who have 0.49 fewer years

[13] Bowen and Finegan (1969, p. 99) find that among women with children under 6, the added presence of children aged 14 to 17 raises adjusted participation rates by a statistically significant amount.

[14] See Ross (1972). Her calculations from the 1960 census 1/1,000 sample of the mean interval between first and last child for white women aged 35 to 39, married once, and with husband present are shown below.

	Mean interval between first and last child (in months)
Women with two children	
College graduates	40
High school graduates	52
Elementary school graduates (eight years)	56
Women with three children	
College graduates	74
High school graduates	85
Elementary school graduates (eight years)	88
Women with four children	
College graduates	99
High school graduates	110
Elementary school graduates (eight years)	120

of schooling than their husbands—helps to explain why college-educated wives supply more labor than high school-educated wives. But this variable does not explain much of the difference in participation within education groups.

Other Environmental Variables

Cain (1966) as well as Bowen and Finegan (1969) found race to be very significant in their studies of the labor supply of married women. It was also highly significant in a labor supply equation fitted over all education groups, with wages estimated by the same equation for all groups (Leibowitz, 1972). However, in the regressions for separate education groups, race was not significant. Intrafamily substitution may be an important cause of the greater labor supply of married black women, since black women have more schooling relative to their husbands than white women.[15] Thus the educational difference variable may be absorbing some of the effects attributed to race in previous studies.

An F-test ($F = 1.81$) reveals that the three labor supply equations can be said to differ significantly from one another at the 10 percent level. In order to determine whether a significant difference exists among the variables relating to the presence of children, t-tests are used. In particular, the hypothesis to be tested is that better-educated women are deterred more than less-educated women from supplying labor to the market by the presence of young children.

The effect of children on weeks worked can be obtained from the regression coefficients relating to the presence of children in the labor supply equation. Table 7-2 shows t-tests for two-by-two comparisons of these regression coefficients from equations estimated separately for the three education groups. The coefficients themselves are negative, indicating that the presence of children reduces the number of weeks worked. Applying the appropriate

[15] The difference between wife's and husband's education by level of education and race is shown below.

Schooling level of wife	*Black women*	*All women*
College	3.278	0.961
High school	1.175	0.320
Grade school	0.257	−0.489
All women	0.831	0.201

SOURCE: Calculated by the author from the 1/1,000 sample of the 1960 census.

one-tailed test, we note no significant differences between high school and college women. Further, children under 3 seem to be an equally forceful deterrent to the market labor supply of women in all three education classes. Table 7-2 shows, however, that college-educated women supply significantly less time to the labor market than grade school women when children of 3 to 5 and 6 to 11 years are in the home. High school women are significantly more deterred from the labor force by the presence of children 6 to 11 than grade school women are.

These differences arise because of a difference in the rate at which women increase their supply of market labor as their children

TABLE 7-2
The effect of children on weeks worked; comparisons by schooling level of women

Groups compared	*t-values*		
	Children under 3	*Children 3–5*	*Children 6–11*
I.			
College–grade school	.016	−2.02*	−1.95*
High school–grade school	.08	−1.13	−2.01*
College–high school	−.68	−.77	−.4936
II.			
College–grade school	−.065	−2.03*	−1.68*
High school–grade school	.95	−1.19	−1.84*
College–high school	−1.05	−.73	1.147
	Regression coefficients		
I.			
College	−9.5506*	−8.6604†	−3.8845†
High school	−8.0459†	−6.9942†	−3.1747†
Grade school	−9.9037†	−4.4213†	−1.0774
II.			
College	−9.8947†	−8.6686†	−3.5655†
High school	−7.5829†	−7.0899†	−3.7207†
Grade school	−9.7470†	−4.3838†	−1.1503

NOTES: I—Regressions where weeks worked was regressed on wage, educational difference, race, age, husband's income, urban, children under 3, children 3 to 5, children 6 to 11, constant. II—Equations where weeks worked was regressed on education, husband's education, race, age, husband's income, urban, South, children under 3, children 3 to 5, children 6 to 11, constant.

*Significant at 5 percent level.

†Significant at 1 percent level.

SOURCE: Calculated by the author from 1/1,000 sample of the 1960 census.

grow up (since the presence of children under 3 does not have a significantly different effect on the labor supply of women with different schooling levels and since older children inhibit labor supply less than younger ones for all three groups of women).

For grade school women the coefficient on children 3 to 5 is only half that for children under 3—a difference of 5.5 weeks—but for college women the comparable difference is a mere 0.9 weeks. Although the presence of school-age children has no statistically significant effect on the labor supply of grade school women, it does for college and high school women.

Thus we can conclude that college and high school women supply significantly less labor to the market than women with less schooling when children 3 and over are in the home.

CHILD CARE AND EDUCATION

Since women with more education can generally realize higher wages than those with less education, they spend a greater proportion of their lifetime in the labor market. As a result, they normally spend a smaller proportion of their time in home production, and time inputs to producing most commodities at home can be expected to fall with increasing education. Since women of higher educational attainments have been shown to be more deterred from market work by the presence of children, child care must differ from the kinds of household production carried out throughout the entire lifetime. If home production behavior is consistent with known labor force behavior, the discussion above implies that child care must be characterized by (1) smaller price elasticity and smaller elasticity of substitution between time and goods relative to other household production, given a greater increase in market price of time than in home productivity due to rising education; (2) greater income elasticity; or (3) greater increases in home productivity relative to market productivity, given price and substitution elasticity.

These factors will be investigated on the basis of time-budget data. The latter will also be used to demonstrate that more highly educated women tend to provide relatively smaller time inputs to the kinds of household production carried on throughout the life cycle, but relatively greater time inputs to child care.

The Cornell Sample

Time inputs to various activities were calculated by the author (see Table 7-3) from time budgets collected by Dr. Kathryn Walker

of Cornell University.[16] The time budgets were based on time spent in various household activities and other work recorded in 10-minute intervals for two days by 1,296 husband-wife families (all residents of the Syracuse, New York, area) in 1967–68.

Table 7-3 presents average time inputs to various domestic activities by women of differing schooling attainments. The low-education group consisted of women who had not gone beyond

[16] The author is indebted to Dr. Walker and Mrs. Irma Telling for providing these data, collected for the research project *Use of Time for Household Work* in the Department of Consumer Economics and Public Policy, New York State College of Human Ecology, Cornell University.

TABLE 7-3
Time inputs to household activities (minutes over two days)

Activity	*High-education group*	*Low-education group*	*Total*
Meal preparation (wife)	153.41	154.39	153.92
Meal preparation (husband)	12.85	10.53	11.65
Laundry (wife)*	27.26	31.12	29.25
Physical care of children			
By wife	129.51	116.40	122.36
By husband	14.90	12.26	13.46
By others	5.67	4.41	4.98
Other care of children			
By wife	90.96	79.17	85.86
By husband	40.77	31.51	36.77
By others	44.74	36.38	41.12
Number of children	2.17	2.41	2.29
Physical care per child			
By wife	59.6	48.3	53.4
By husband	6.9	5.1	5.9
By others	2.6	1.8	2.2
Other care per child			
By wife	41.9	32.9	37.5
By husband	18.8	13.1	16.1
By others	20.6	15.1	18.0

* Minutes in *one* day.

NOTE: Sample sizes for meal-preparation and laundry-time inputs are 627 and 667 for high- and low-schooling groups, respectively. Since child-care averages are calculated only for families with children, sample sizes are 493 and 591, respectively.

SOURCE: Calculated by author from time budgets collected by Dr. Kathryn Walker of Cornell University.

high school graduation; the high-education group included women who had at least one year of college or training beyond high school. Two household activities carried on throughout the lifetime—meal preparation and laundry work—are represented in this table. Two kinds of child care are distinguished as well: "Physical care" includes time spent bathing, feeding, and dressing children and administering first aid or caring for a sick child. "Other care" is defined by Walker as "all activities related to the social and educational development of family members, such as: helping with lessons, reading to children, taking children to social and educational functions" (K. Walker, 1967). The time accounting allowed both parents' time to be allocated to the same activity if they were engaged in it simultaneously. It should be noted that activities were very narrowly defined in the Cornell sample; for example, driving children to an activity would be included in the category "chauffeuring" rather than "child care."

Table 7-3 shows that the amount of time spent by the low-education group in meal preparation and laundry work was the same as, or greater than the amount spent by the high-education group. This, and the fact that husbands of women with more schooling spent greater amounts of time in meal preparation, substituting their own time for their wives', is consistent with the greater price of time of the more educated women.

In spite of the greater price of their time, however, better-educated mothers spent more time in child care than those in the lower education group, particularly in the investment activity—"other care." This is not due solely to a substitution of the mothers' time for the fathers' or other persons', since husbands of the more highly educated women also spent more time with their children—most significantly in the "other care" activity. These mothers also used more of the time of other adults in providing care for their children. The bottom panel of Table 7-3 shows time inputs per child and verifies that the greater time inputs are not the result of better-educated women having more children: it is simply that children of the higher schooling group receive more hours of care—both in total and per child—than children whose mothers had less schooling.

The Purdue Sample

A study of time use among Indiana families in 1961–62 reveals the same pattern of greater time inputs to child care by the more educated women (Manning, 1968). Families recorded the time

they spent in child care and other household activities during an entire week at four different seasons. Child care was defined in this survey as:

> . . . bathing, dressing, feeding and putting children to bed; helping children with lessons; chauffeuring children; caring for sick children; preparing formulas for babies and special food for small children and the sick. This task excluded reading to and playing with children, supervising them at the same time other activities were being done, and general concern or responsibility for children (p. 30).

Table 7-4 shows child-care time for women of differing schooling levels by family composition. Again, in all families with children, the greater the education of the wife, the more time she spent in child care. Small sample sizes within the groupings of families by age of children preclude any firm conclusions about the way in which time inputs vary by age structure of the family and education of the mother. However, the fact that the differential in time inputs by schooling level appears to be greatest for families with preschool-age children is consistent with the findings from the census data.

TABLE 7-4 ***Child-care time by family composition and education of wife (hours per week)***

		Years of schooling of wife							
	No. of	*Less than 12*		*12*		*13–15*		*16+*	
Age of children	*records**	*Wife*	*Help†*	*Wife*	*Help†*	*Wife*	*Help†*	*Wife*	*Help†*
11–17 only	90	1.2	0.1	2.1	0.1	0.7		3.3	
6–10 only	16			5.9	‡	4.3			
2–5 only	33	0.4	‡	7.4	0.4	9.5	0.8	10.1	0.1
Under 2 only	24			11.2	0.8	13.4	0.8		
11–17 and 6–10	79	1.8		4.5	0.1	4.4	0.6	6.1	
2–5 and under 2	31			16.7	0.3	17.4	2.2	17.5	3.2
Mixed ages	112	10.7	0.5	7.2	0.7	15.5	1.3	13.0	1.5
All families with children	385	5.4	0.3	5.9	0.4	7.7	0.7	10.8	1.1
Number of families in sample		9		45		29		17	

* Families completed four weeks of record keeping, but some had children home during the summer only, whereas others moved from one family category to another as children were born or left home.

† Time inputs by persons other than the wife.

‡ Less than 0.05 hours a week.

SOURCE: Manning (1968).

Once again, it is important to note that the more educated wives are not substituting their own time for that of other workers, since both kinds of time inputs are greater in families where the wife has more education. Table 7-5 compares child care to other forms of household production: We see that time inputs to child care rise with education, so that women with college degrees devote more than twice as many hours to child care as women with fewer than 12 years of schooling, 83 percent more time than high school graduates, and 59 percent more time than women with one to three years of college. However, time inputs to other household tasks tend to fall with education (although there is a tendency for time inputs to rise slightly at the highest level).[17]

TABLE 7-5
Time spent on household tasks by women of various schooling levels (hours per week)

	Years of schooling of wife			
	Less than 12	*12*	*13–15*	*16+*
Meal preparation	10.4	9.0	9.0	9.4
Washing	4.3	4.3	3.5	4.0
Physical care of children	4.8	5.3	6.1	9.7
All tasks	49.70	48.10	46.9	54.3
Number of observations	10	47	35	19

SOURCE: Manning (1968).

The French Sample

The finding that more highly educated women devote more time to child care and less to other household tasks is also consistent with the results of a study of 174 Parisian households with working wives (Guilbert, Lowit, & Creusen, 1967). In this study, time budgets were recorded for 15-minute periods on both a working and a nonworking day. The sample was divided among three classes of workers—professional (corresponding to a high-education group), employees (white-collar workers), and workers (blue-collar workers). As seen in Table 7-6, professional women devoted the least amount of time to housework and the most to child care, on both working and nonworking days. This pattern also holds for professional men on Sundays. The fact that this was true for women on Sundays as well as on working days indicates that it

[17] The author is grateful to Sarah L. Manning for providing these unpublished results.

TABLE 7-6
Median hours per day spent at each activity by three kinds of French working families

	Wednesday					
	Women			*Men*		
Activity	*W*	*E*	*P*	*W*	*E*	*P*
Housework	2.80	2.31	1.35	0.14	0.17	0
Total time spent with children	0.95	1.27	1.46	0	0.15	0.04
Total time spent in professional activities, transportation, and domestic duties	13.87	13.06	11.70	10.93	11.18	10.98

NOTE: W = workers; E = employees; P = professional workers.
SOURCE: Guilbert, Lowit, and Creusen (1967).

is not simply the result of the shorter workday for professional women.[18] Although professional women devoted fewer hours to home production (housework and child care) during the week, they spent more time with their children, both absolutely and relatively (to the entire home production time).

Since professional families can be expected to have greater incomes and more schooling than white- or blue-collar families, these data support the hypotheses that child care has greater income elasticity than other household activities and that differential productivity for child care increases with education.

Regression Analysis of Cornell Data

To determine which of the three factors outlined at the beginning of this section on child care and education is primarily accountable for the greater time inputs to child care on the part of the more educated women, despite the greater price of their time, further analysis of the Cornell data was undertaken. In regressions relating time inputs to demand factors, prices, and substitutes, the price of the wife's time (as gauged by hours worked) was found to have a strong negative relationship to time inputs in all four kinds of home production considered (physical care, other care, meal preparation, and laundry work). Time inputs to all activities were found to be positively and significantly related to demand factors.

In laundry work, capital goods and others' time proved to be good substitutes for the wife's own time. In meal preparation, the hus-

[18] Professional women spent 8.89 hours in paid work and transportation, while workers spent 10.12 hours and employees spent 9.48 hours in the same activities.

Sunday					
Women			*Men*		
W	*E*	*P*	*W*	*E*	*P*
5.81	4.81	3.96	0.78	1.20	0.48
0.93	1.87	2.82	0	0.29	0.79
7.12	6.87	6.87	2.18	2.29	3.62

band's time was a good substitute for the wife's. For each 10 minutes her husband spent in meal preparation, the wife reduced her time input by 4 minutes. In both types of child care, however, the husband's time input proved to be a complement to rather than a substitute for the wife's time, since she increased the amount of time she devoted to child care when the husband did.

When the sample was again divided into two schooling groups, the husband's time was found to be more complementary for the high-education group. In addition, time inputs by others were, quite significantly, only a good substitute for the low-education group. Women whose last year of school was not above high school reduced the amount of time spent in other care by 11 minutes for each 100 minutes spent by others, and they reduced the amount of time spent in physical care by 14 minutes for each 100 minutes spent by others.[19] The high-education group did not cut back their time inputs when other workers spent more time with their children. The explanation proposed is that other workers (baby-sitters, grandmothers, other children over six) are more similar in education and ability to the mothers with little schooling and are therefore good substitutes for them. However, if education increases the productivity of time spent in child care, better-educated women would find these other workers relatively unsatisfactory substitutes. In fact, mothers in the high-education group spent the same amount of time in child care whether or not other workers also cared for their children.

[19] None of the families included in the sample had other adults living in the household.

Since better-educated women spend more time in child care, other factors are at work in addition to the smaller possibilities for substitution in other household activities. The quality of child care produced by the less-educated women is surely within the production-possibility frontier of the more educated women (e.g., they could spend as much time in child care as women with less schooling and could employ substitutes to the same extent). The fact that they do not, but spend more of their own time in child care, implies that at least one of the two other factors discussed above is at work: high income elasticity for child care or increased productivity of time spent in child care with increased education. And it is not solely the greater productivity of the more educated women's time spent in child care that leads to their greater time inputs, since that could not account for the greater time inputs to child care by husbands and other adults in families where the wife is highly educated. Increased time inputs by all family members most probably reflect the greater income elasticity for child care.

An alternative explanation of the data involves looking at the demand for time spent in child care rather than at supply factors, as in the above discussion. This alternative hypothesis is that women with more education have a greater time preference for the future (as evidenced by their own investments in human capital) and are thus more willing to make large investments of time in young children and collect the returns in the future.[20]

However, given the result on substitutability of time inputs, the demand hypothesis will not be a satisfactory explanation of the data unless we also postulate that only parents' time, and not that of others, yields returns in the future. This is an extreme form of the productivity argument. Thus, even when demand factors are taken into account, we must still rely on supply factors to explain highly educated women's greater time inputs to child care.

SUMMARY One inference to be drawn from the greater market labor supply of more educated women than of less-educated women is that the former spend less time in producing commodities at home. We have shown that women with a greater price of time are able to reduce time inputs to household activities, such as meal preparation and laundry work, by the use of capital goods or the substitution of

[20] I am indebted to F. T. Juster for pointing this out.

other workers' time for their own. This is not done, however, in child care. In child care, women with more schooling show even lower elasticities of substitution than the average, since available substitutes cannot provide as high-quality care as they themselves can. In addition, the husband's time is a complement to, and not a substitute for, the wife's time, as in the other activities. Probably, high income elasticities for child care as well as a differential productivity effect further induce better-educated women to devote more time to child care.

In summary, the higher price of time of better-educated women leads to their greater labor force participation and their smaller family size. The difference in the shape of labor supply profiles can be accounted for largely by the finding that the elasticity of substitution of time for other factors of production is smaller in child care than in household activities carried on throughout the life cycle. The substitutability of time and goods in the two kinds of activity has been shown empirically to be the most important cause of the differences in the labor supply profiles. However, it has also been argued that differential productivity and high income elasticities are additional factors in explaining why the labor supply of the more educated women does not exceed that of the less-educated women during the 25-to-40 age period.

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