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PRODUCTION WITHIN THE HOUSEHOLD

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Arleen Leibowitz*

Dramatic changes over the last thirty years in the amount of time married women spend in the labor force are well documented. Census data indicate, for example, that while only 15 per cent of married women were in the labor force in 1940, the comparable figure for 1950 was 24 per cent, for 1960, 31 per cent, and for 1972, 41.5 per cent.[1] This increase in labor force participation has been accompanied by changes in allocation of time to various activities in the household as well, which have only recently come under detailed scrutiny.

A comparison of time budget studies over a 50-year period shows that while the total amount of time spent in household work by urban non-employed women has remained virtually constant at approximately 53 hours per week, the proportion of time spent in cooking and cleaning has decreased, while the proportion spent in child care has increased (see Vanek). Today, as in the past, employed women devote less time to household production than non-employed women. Since the proportion of women in the labor force has been rising, the average time input to household tasks by all women has been declining over the last 50 years.

Valuable insights into the labor supply of married women have been gained by analyzing the problem in the household production context. Jacob Mincer pioneered this approach in which women are seen as choosing not simply between work and leisure, but between work in the home, work in the market and leisure. While income affects the total amount of work, its division 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.

The educational attainment of women has increased considerably in the last 50 years, raising their productivity in

the market relative to the home, and therefore, drawing them into the labor force. But what has been the effect of schooling on production within the home? Grossman has recently found that a married man's health is positively related to his wife's schooling level. Benham finds evidence to support this hypothesis that the earnings of married men are positively related to their wives' schooling. Michael finds that education affects the efficiency with which contraception is carried on. In contrast to these papers, which relate a woman's education to various household production outputs, the present paper will try to determine how schooling affects one of the inputs of household production. Time budget data will be used to determine how time allocation to various activities vary with schooling level.

I. Household Production and Education

A striking relationship found consistently by students of female labor force behavior, (e.g., Cain, Bowen and Finegan) is that more educated women are more likely to be in the labor force. This is true in a classification of participation rates by education and the relationship is even stronger when family income is held constant (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 has the nonneutral effect of raising the productivity of labor market time more than that of time spent in home production. Thus the "cost" of not being in the labor market rises, inducing women to work outside the home.

Moreover, better-educated women can also the expected to consume more leisure, if family income other than the wife's earnings is positively correlated with the wife's education. It follows that because women with more schooling spend a greater proportion of their lifetime in the labor market, they must

normally spend a smaller proportion of their time in home production, as household production analysis would predict from their greater opportunity costs of time. As a result, other inputs (purchased goods and others' time) will be substituted for the wife's time in the production of all commodities and, since the relative price of time-intensive commodities rises, consumption will shift to less time intensive commodities.

Figure 1 verifies that the supply of labor to the market is greater, the higher the level of schooling attained by the woman, except that between the ages of 25 and 40 all women supply nearly the same amount of labor to the market. (See Leibowitz, 1972.) This implies that education does not cause market productivity to exceed productivity in the home equally for all activities, since during the ages when young children are in the home, more educated women supply no more labor to the market than other women.

The labor supply profiles imply that if labor supply is determined as the result of process which optimizes the utility of household production over the lifetime, child care must differ from other kinds of household activities carried on throughout the entire lifetime. If home production behavior is consistent with known labor force behavior, child care must be characterized by:[2]

1. Smaller price elasticity and elasticity of substitution between time and goods relative to other household production, given that the increase in market price of time exceeds the increase in home productivity due to rising education;
2. greater income elasticity; and/or
3. greater increases in home productivity relative to market productivity, given price and substitution elasticity.

First, I will use time budget data to show that household production data is consistent with the labor force data--that is, more educated women do have smaller time inputs to household production carried on throughout the life cycle, but greater time inputs to child care. Secondly, I will try to examine the factors causing this difference.

II. Average Time Inputs to Household Activities by Education

Time inputs to various domestic activities were calculated by the author from time budgets of 1,296 families collected by Kathryn Walker.[3]

Average time inputs to various household activities are shown in Table 1 for women with up to four years of high school and for women who had attended at least one year of college. The low education group spent as much or more of their own time as the high education group in the two kinds of home production carried on throughout the life cycle--meal preparation and laundry work. 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 more educated women.

Table 1

Time Inputs to Household Activities

Activity	High Education Group	Low Education Group
A. Time Inputs to General Household Production (minutes over two days)		
By Wife	153.41	154.39
By Husband	12.85	10.53
Laundry-Wife*	27.26	31.12
B. Total Time Inputs to Child Care		
Physical Care		
By Wife	129.51	116.40
By Husband	14.90	12.26
By Others	5.67	4.41
Educational Care		
By Wife	90.96†	79.17
By Husband	40.77†	31.51
By Others	44.74	36.38
C. Per Child Time Inputs to Child Care (minutes over two days)		
Physical Care		
By Wife	59.6	48.3
By Husband	6.9	5.1
By Others	2.6	1.8
Other Care		
By Wife	41.9	32.9
By Husband	18.8	13.1
By Others	20.6	15.1
D. Number of Children	2.17	2.41
E. Wife's Preference Rating		
Physical Care	6.78	6.84
Other Care	7.43	7.28

†Significantly greater at 1% level than low education group.

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

"Physical care" includes time spent in bathing, feeding, and dressing children and in caring for a sick child. "Other care" was defined 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." Preference ratings are averages of ratings of activities by homemakers on a scale from a low of 1 (extreme dislike) to 9 (like exceptionally).

*minutes over one day

In spite of their greater price of time, however, more educated mothers spent more time in child care, both over-all and per child. This is particularly striking in educational care. This is not due to a substitution of the mothers' time for the fathers' or other persons', since husbands of more educated women also spent more time with their children.

A study of time use in Indiana families in 1961-62, also shows that the greater the education of the wife, the more time she spent in child care. (See Leibowitz, 1973.) Women with college degrees spent more than twice as many hours in child care as women with less than 12 years of schooling, 83 per cent more time than high school graduates, and 59 per cent more time than women with one to three years of college completed. The greater time expenditures of more educated women are seen within age categories of children as well as over all families.

Stafford and Hill (1973a) report that the increase in home production time caused by the presence of a pre-school child is twice as great in high SES families as in low SES families. In addition, they find that education had a positive impact on mothers' time inputs to children. 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).[4] In the next section, the allocation of time within the household is examined to understand these differences by schooling level.

III. Regression Analysis of Time Inputs

If all home production activities had unitary income elasticity, and equal elasticities of substitution between time and goods and if schooling had a neutral effect on the productivity of time at home and in the market, we would expect to find neither a positive nor a negative relation between schooling and child care time inputs. However, if schooling augments the productivity of time in the labor market relative to time at home--and this would be consistent with greater labor supply by more educated women--the relative price of time intensive goods would rise to more schooled women.

It is widely believed that care of pre-school children is a time intensive activity as compared to other forms of home production. Thus the home production price of child care is greater for more educated women, due to their higher opportunity cost of time. This is one rationale for the lesser number of children desired (and produced) by more educated women. (See Willis and Michael.) Yet in spite of the higher relative cost of child care faced by more educated women, they spend more time in child care, both in total and per child. Child care must be characterized by one or more of the above three factors--smaller elasticity of substitution among inputs, greater income elasticity or greater increases in home productivity relative to market productivity with increases in schooling, as contrasted with other home production that is not concentrated in the child rearing years.

To determine how these factors operate to counteract the relatively greater cost of child care for more educated women, more detailed analysis of the Cornell data was undertaken. For each of four activities, time inputs were regressed on demand factors (such as income and number of children in various age classes), which increase the marginal

productivity of time in the home, and should be positively related to time inputs; productivity factors (such as wife's education and age); and presence of substitutes (such as capital goods and time inputs by others).

In Table 2 we see that time inputs to meal preparation depend on demand factors with time inputs decreasing monotonically with increasing age of children. The income proxies, rooms per capita and husband's education are positively but not significantly related to time inputs. Time spent by the husband in preparing meals acts as a substitute for the wife's time reducing it by five minutes for each ten minutes of the husband's time. Among the productivity variables, education has no significant impact on time inputs to meal preparation, but older women spend more time at this activity.

In laundry work, capital goods significantly affect the time required for a given number of loads washed or a given family size.[5] For example, the housewife who used a non-automatic washer spent 39 minutes more in washing than one who used an automatic washer. More educated women have more and better quality capital goods, but even holding these factors constant in the regression, the net effect of education was to decrease time inputs to laundry work.

Table 2

Regression Analysis of Time Inputs to Household Production

Time Spent in: (minutes over two days)	Meal Preparation	Laundry Work*
# of children under 1 year	22.73 (4.67)	
# of children 1 year old	20.39 (4.13)	
# of children 2-5	18.28 (7.58)	
# of children 6-11	16.14 (8.52)	
# of children 12-18	6.52 (2.78)	
Wife's education	.02 (.01)	-2.29 (1.96)
Husband's education	1.16 (.70)	-.75 (-.81)
Age of wife	.92 (3.95)	
Husband's time input	-.51 (-5.74)	
Rooms per capita	1.61 (.40)	.35 (.23)
Non-automatic washer used*		38.53 (7.8)
Dryer used*		-9.69 (-4.51)
Washer-dryer used*		8.01 (.95)
# of loads of wash		13.69 (21.7)
Laundromat used*		6.59 (1.89)
C	94.72 (7.61)	11.92 (2.40)
R^2	.14	.46

Note: t-values in parentheses.

*Dummy variables equal to 1 if statement is true, zero otherwise. The omitted categories are automatic washer and line drying.

In Table 3, we see time inputs to physical care of children are closely related to the number and ages of children. While each child under one year, requires an additional 208 minutes of care over a two-day period from his mother, a one-year old adds 112 minutes, and each 2-5 year old adds only 26 minutes. Older children may reduce the demands on the mother's time, presumably by helping with the feeding and dressing of younger siblings.

The productivity effect, measured by the wife's education, is positive but not very significant. Since education is also a proxy for the value of time in the market, weak coefficients may be caused by a substitution effect due to the rise in the price of time partially offsetting the positive substitution effect due to increased home productivity.

The income proxies, husband's education and rooms per capita, are not significantly different from zero. The latter has the wrong sign which may be due to the fact that greater numbers of rooms indicate not only greater income, but also greater demand for time in such activities as cleaning. Women who prefer physical care spend more time at it than women who rate it less highly.[6]

Husband's time was shown to be a substitute for the wife's in meal preparation, but this is not the case in physical care. The significantly positive coefficient on husband's time inputs indicates that for each ten minutes the husband spends in physical care, the wife puts in an additional four minutes. This is not merely an indication of the family's tastes (since these are controlled for by the "preference" variable, but may indicate true complementarity--increased inputs of husband's time increasing the marginal productivity of the wife's time inputs. Time spent by others in the care of children had no significant effect on the mother's time inputs.

Table 3

Regressions on Time Inputs to Child Care

	Physical Care			Other Care		
Schooling Group:	All	High	Low	All	High	Low
# of children under 1	207.6 (26.24)	214.8 (19.02)	204.9 (19.97)	23.42 (3.50)	6.62 (.71)	46.84 (4.84)
# of children 1 year	111.6 (14.52)	114.88 (9.99)	114.81 (11.63)	30.53 (4.52)	36.70 (3.71)	29.78 (3.19)
# of children 2-5	26.34 (6.92)	19.81 (3.59)	36.55 (7.55)	18.03 (5.40)	15.13 (3.26)	21.96 (4.55)
# of children 6-11	-4.91 (-1.25)	-4.03 (-.96)	-.48 (-.13)	15.47 (5.84)	17.99 (4.77)	14.14 (3.78)
# of children 12-18	-6.99 (-1.88)	-5.00 (-.93)	-4.41 (-.99)	.91 (.28)	-.73 (-.15)	3.27 (.74)
Wife's education	2.96 (.91)	6.90 (.97)	5.70 (.85)	.35 (.12)	-5.45 (-.95)	-2.95 (-.48)
Husband's education	1.62 (.64)	.60 (.05)	2.08 (.66)	3.48 (1.57)	-2.19 (-.65)	-3.54 (1.20)
Age of wife	1.45 (1.82)	.7? (.5?)	2.03 (2.08)	.32 (.46)	-.79 (-.72)	1.23 (1.36)
Husband's time input	.389 (4.18)	.53 (3.91)	.27 (2.05)	.287 (7.46)	.25 (4.73)	.344 (6.24)
Rooms per capita	-11.84 (-1.41)	.25 (.34)	-.42 (-.66)	6.17 (.84)	3.08 (.29)	9.47 (.93)
Husband's age	-1.65 (-2.21)	-1.63 (-1.31)	-1.74 (-1.87)	-.68 (-1.05)	.22 (.22)	-1.44 (-1.67)
Care by others	-.005 (-.05)	.20 (1.18)	-.14 (-1.07)	-.04 (-1.74)	.010 (.33)	-.123 (-3.40)
Preference	3.94 (3.03)	3.96 (1.99)	3.83 (2.20)	.55 (.38)	-.78 (-.36)	1.14 (.57)
C	68.92 (2.45)	71.52 (1.70)	46.53 (1.170)	53.27 (2.04)	84.01 (2.11)	32.28 (.55)
R^2	.65	.68	.63	.15	.163	.179

Note: t-values in parentheses.

The sample was next divided into a high education group including 493 women with some college training, and a low education group including 591 women who had not gone beyond high school. Columns 2 and 3 refer to the high and low schooling subsamples respectively, they indicate that husband's time is more complementary for the high education group. Time inputs by others--older children and adults other than the parents--seem to act as a substitute for own time in the low education group, but not for those with more schooling.

The next three equations deal with time inputs to other care--which includes time spent in social and educational activities with children. As with physical care, time inputs are clearly related to the number and ages of children. Again the husband's time inputs are complementary to the wife's time, while time inputs by others are only weak substitutes for the wife's time. For each 100 minutes of care by others, the wife reduces her own time inputs by only three minutes. The positive coefficient on husband's education may reflect a positive income effect, but rooms per capita, the second income proxy, is not significantly related to time inputs.

When the data is again split into high and low schooling subsamples, differences in the age pattern of time inputs appear--the low schooling group spends decreasing amounts of time as the children age, whereas time inputs peak for one year old children of the higher education group.

Time inputs by others have a negative impact on time spent with children by less schooled mothers (which is significant at the one per cent level), but they have no effect on time inputs by mothers with more schooling. That is, mothers with less schooling act as if time inputs by older children and other adults are a better substitute for their own time than do the more educated mothers.

The substitutes--baby sitters, grandmothers, other children over six, are more similar in education and ability to the mothers with little schooling. However, if education increases the productivity of time in child care, more educated women would find these other workers relatively unsatisfactory substitutes. In fact, mothers in the high education group spend the same amount of time in child care whether or not other workers also care for their children.

Consistent with these results is Stafford and Hill's finding (1973b) that in high status families (defined by husband's education or occupation) time inputs to pre-school children are invariant with the number of other children in the family, while in low status families, mothers reduce their time inputs to pre-school children as family size increases. This behavior on the part of more educated mothers in addition to their greater price of time increases the "cost" to them of children and acts to reduce their demand for children. Further, since the mother's time inputs will not be reduced when older children care of their younger siblings, there is less incentive for wide spacing of children on the part of more educated mothers. In fact, Sue Ross has found that more educated mothers have shorter intervals between births.

The fact that more educated women spend more of their own time in child care in spite of the higher price of their time is due partly to the low substitution elasticity with other factors, as contrasted with two other household activities. In addition, there may be high income elasticity for spending own time or increased productivity of time in child care with increased education. There is evidence for the income effect, since greater productivity of more educated women's time in child care could not alone account for the greater time inputs by husbands and other adults in families where the wife is highly educated.

The historical evidence also supports the hypothesis of high income elasticity for using own time in child care. Vanek (1973) finds in samples ranging back to 1926 that higher SES women spent more time in child care, and that "contemporary non-employed women spend about ten hours a week more in family care than women in earlier samples." That the income elasticity of child care exceeds that for other housework can also be imputed from Vanek's finding that contemporary women lower their standards for housework when child care demands are highest.

Although more educated women have greater labor supply and spend less time in home production over most of the life cycle, they spend more time in child care. This time devoted by parents represents substantial investment in the human capital of their children. Evidence is beginning to accumulate that these investments do affect the early achievement of children as well as their ultimate level of schooling. (See Leibowitz, 1974b.) The finding that time investments are greater for more educated mothers helps to explain the observed positive correlation between children's achievement and their mother's schooling. (See Kagan and Moss.)

The time allocations of more educated women in the 1920's foreshadowed the allocation decisions of all women in the 1960's. If the contemporary sample also forecasts the future, we can cautiously predict that when the average woman has more schooling and higher income than today, she will indeed spend a greater proportion of her lifetime in the labor force. Although she will probably spend less of her increasingly valuable time in most home production activities, she is likely to spend even more of it with children.

FOOTNOTES

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[1]Estimates for married women, husband present, in March of the year cited. U.S. Bureau of Labor Statistics, Special Labor Force Reports, Nos. 94, 13, 130 and 153. U.S. Bureau of the Census, Current Population Reports, Series P-50, Nos. 22 and 29.

[2]For the derivation of these results, see Leibowitz (1972).

[3]The data were collected for the research project on Use of Time for Household Work in the Department of Consumer Economics and Public Policy, New York College of Human Ecology, Cornell University. I am indebted to Dr. Walker and Mrs. Irma Telling for providing these data.

[4]I am grateful to Sarah L. Manning, Purdue University, Agricultural Experiment Station, Lafayette, Indiana, for providing me with these unpublished results.

[5]Regressions not shown.

[6]See Table 1 for a definition of the preference variable.

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