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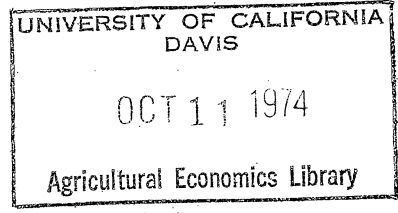
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A B S T R A C T

FACTORS AFFECTING WORK TIME SUPPLIED
BY WOMEN AGE 30 TO 44 YEARS

Marlys Knutson and Dean Schreiner

The female work force increased 320% between 1940 and 1970, as evidenced in both urban and rural areas. This study analyzes the time a woman is willing to supply in the labor market and factors influencing that supply - wage rate, residence, education, family income, and others. Results indicate that the wage in SMSA-nonfarm areas must exceed that in nonSMSA-nonfarm areas by \$.85 for women to work an equal number of hours.

Keywords: female labor force: "consumption time"; labor supply; residence; education.

Contributed paper, AAEA meetings, College Station, Texas, Aug. 1974.

FACTORS AFFECTING WORK TIME SUPPLIED
BY WOMEN AGE 30 TO 44 YEARS*

Marlys Knutson and Dean Schreiner**

Introduction

The influences of society have always played a large role in the determination of human behavior. A woman's decision to enter or not to enter the labor force is no exception. Society's attitudes toward women working have been changing over the years. With the advent of the women's liberation movement more women are becoming aware of the alternatives to working in the home. Their reasons for entering the labor force are varied - to augment the family income, for personal satisfaction, to keep busy now that the children have grown up and left home - but, nevertheless, they are entering.

The very nature of the work force is changing with the increasing participation of women, in general, and married women over thirty years of age, in particular.

Today nearly 2 out of every 5 American workers are women. Most of these women are married, and half are over 39 years old. Since 1960, nearly half of the increase in the labor force was accounted for by married women. In early 1970, over 18 million married women were working or looking for work, representing about 60 percent of the female labor force. In 1940, these figures were 4.2 million and 30 percent. The 30-year increase of about 320 percent in the number of working wives far outstrips the 50 percent increase in the size of population.¹

Recent studies of working women have attempted to determine

factors that are of major importance in their labor force decisions. As suggested above, changes in the labor force participation rates have occurred for all women, but are more pronounced for married women, particularly older married women. The key questions related to the growth in the supply of womanpower therefore have to do with the factors accounting for the increased labor force activity of married women. The most important variables - the woman's age and education, and her husband's income - seem to account for most of the variation in her willingness to work. Many of the recent studies have included family structure variables, attitudinal measures, and work experience to explain a woman's labor force decision. Place of residence or distance to job opportunities appear in some. This type of analysis, however, leaves out some of the factors that economic theory would seem to indicate as greatly influencing a labor force decision - wage rate and its interactions with family income, distance to job, and residence.

Objective of the Study

The general purpose of this study, then, is to take the factors that others have found important in a woman's labor force participation decision with the added variables of wage rate and the interactions occurring between it and other variables to analyze how they influence the time a woman is willing to supply in the labor market. The data are from the National Longitudinal Surveys administered by the Ohio State University's Center for Human Resource Research on the labor market experiences and work attitudes of 5,083 women 30 to 44 years of age.² For this group of women the major concern is the problem of

reentry to the labor market after the children are grown or in school [4, 5]. Whether this is viewed as a second work career or merely a continuation of the first, it is important from a policy point of view to be aware of the problems of readjustment that frequently are encountered. Moreover, irrespective of departure from - and reentrance to - the labor market, the fact that most married women have careers as homemakers in addition to whatever roles they may play in the labor market means that their labor market decisions are likely to reflect a very complex set of forces.

The Household as a Decision-Making Unit

The household has come to be regarded in recent years as a "small factory" where both consumption and production take place. In the past these activities were rigidly separated - production occurring in firms and consumption in households.

Undoubtedly the fundamental reason for the traditional separation is that firms are usually given control over working time in exchange for market goods, while 'discretionary' control over market goods and consumption time is retained by households as they create their own utility.³

The usual income-leisure analysis, seen in this framework, is an oversimplification of the relationship between hours of labor supplied and the wage rate. The implicit assumption of a strictly dichotomous relationship between the time spent in gainful employment and leisure or, alternatively, the implication that all time not spent in "pleasurable leisure" represents time spent in gainful employment is the primary short-coming of this analysis. Failure to

recognize that there exists a range of activities constituting neither gainful employment nor pleasurable leisure leads to overstatement of the possibility of a negatively sloped labor supply curve.

To overcome this short-coming, Gary S. Becker [1] introduced the concept of "consumption time" to a household decision-making unit model. The assumption is that households are both producing units and utility maximizers. Households, then, are assumed to combine time and market goods to produce more basic commodities that directly enter their utility functions.

This type of analysis is particularly applicable to the situation of women and their time which can be divided among leisure activities, home production, and market participation. By the determination of the amount of "consumption time" a woman has and what effects changes of various factors - income, earnings, market prices - affecting its determination will have, the effects on hours available for work can be seen.

In addition, because the theory concerns all members of a household, instead of a simple allocation problem of dividing time efficiently among commodities, multi-person households must also allocate the time of different members. Members who are relatively more efficient at market activities would use less of their time at consumption activities than would other members. Moreover, an increase in the relative market efficiency of any member would effect a reallocation of the time of all other members towards consumption activities in order to permit the former to spend more time at market

activities. In short, the allocation of the time of any member is greatly influenced by the opportunities open to other members.

If the income of the husband is not quite sufficient to support his family, the member of the household next most efficient at market activities oftentimes is the wife and therefore she will enter the labor force to help make ends meet. This, of course, will decrease the time she can spend at "consumption". As the market wage increases the wife is willing to supply more and more of her time in the market, placing more and more consumption duties on other family members. At some point, though, the income effect dominates the substitution effect ^{4/} - the backward - bending segment of the supply curve of labor is reached - and some income is foregone so that more "leisure" (actual leisure or time to be spent in the production of home goods) can be had.

The Estimation Model

Consumption hours per week is used as the dependent variable. If the woman is not working outside the home this variable is automatically valued at 168. When the woman is in the labor force, however, her hours at work per week are subtracted from 168 to arrive at the time that woman spent in "consumption" activities. With the definition of

HOURS = actual hours worked per week of a woman
in the labor force,

it follows that

CHOURS = 168 - HOURS actual number of hours
of consumption time per week of the
respondent.^{5/}

The independent variables for this model are summarized in Table 1. RACE is hypothesized to affect consumption time in this manner: if the woman is white ($RACE = 1$) she will be spending more of her time in consumption activities and, thus, supplying less time in the labor market. The single woman ($MS = 0$) will be spending less time in consumption activities, either due to fewer home responsibilities or because her marital status forces her to give up consumption time in favor of working time since she is supporting herself. Past studies have shown that the woman who pursues higher education possesses a stronger desire to participate in the labor force. In fact, education has been used as an efficiency parameter under the premise that education makes a woman more efficient which causes her to use less time in doing her household chores and, therefore, have more time available for work outside the home. Thus the expected relationship between education and consumption time would be negative and, in fact, each advancement by levels of education would cause a greater decrease in the time the woman spends in consumption activities.

Besides the variables discussed above, this model incorporated some additional ones that are important in the determination of a woman's time at home and, thus, her time available for the labor market. As the market wage increases the incentive to give up consumption time and supply more hours to the job is reinforced. The labor-leisure model, however, says there is some wage at which the woman will give up the income of an extra hour for one more hour of leisure (time off the job) - the supply curve becomes backward bending at this point. For this reason the square of the wage variable was

Table 1

Description of Variables for the Consumption Time Model

Variable Name	Unit	Description
WAGE	\$	amount of the hourly wage of the woman
WAGE 2	\$	WAGE squared
OFI	\$1,000	other family income; 1966 dollar amount of husband's income and income of other family members, excluding the wife
PUBLIC	1,0	public assistance; "1" indicates respondent or some family member receives some type of public assistance
CTIME	minutes	actual time spent in commuting to the job (one way)
CTIME2	minutes	CTIME squared
(WAGE)(OFI)	-	WAGE times OFI
(WAGE)(CTIME)	-	WAGE times CTIME
(OFI)(CTIME)	-	OFI times CTIME
RACE	1,0	race; "1" indicates a white woman
MS	1,0	marital status; "1" indicates woman never married, or is separated, divorced, widowed, or married with spouse absent
CHILD	1,0	children under six years of age; "1" indicates presence of one or more young children in household
CHILD	1,0	children over five and under nineteen; "1" indicates presence of one or more in household
NCHILD	no.	children under six years of age; actual number
NCHILD	no.	children over five and under nineteen; actual number
EDUCA	1,0	education; "1" indicates respondent is high school graduate
EDUCB	1,0	education; "1" indicates respondent has either had some college or some technical training
EDUCC	1,0	education; "1" indicates respondent is a college graduate
FARM	1,0	SMSA-farm; "1" indicates respondent living in an SMSA with land usage as farm
NFARM	1,0	SMSA-nonfarm; "1" indicates respondent living in an SMSA with land usage as nonfarm
NSFARM	1,0	nonSMSA-farm; "1" indicates respondent not living in an SMSA with land usage as farm
(WAGE)(FARM)	-	WAGE times FARM
(WAGE)(NFARM)	-	WAGE times NFARM
(WAGE)(NSFARM)	-	WAGE times NSFARM

included (WAGE2). For those women not working the wage variable takes on a zero value.^{6/}

The distance to the job as evidenced by the amount of time spent in commuting is hypothesized to affect the supply of a woman's working time and, thus, her consumption time. If the woman indicates she is not presently in the labor force (HOURS = 0) this variable enters with a value of zero. Otherwise, it is the number of minutes spent in commuting to the job. All women who do work spend some of their time commuting. Thus, initially the relationship between CTIME and CHOURS will be negative. However, there is postulated to be some level of commuting that, when reached, will discourage the woman from supplying more time in the labor market and, thereby, increase her consumption hours. At higher wage levels this limit will be reached at higher amounts of commuting time since women may be willing to extend their time in commuting because of the wage increase involved.

Residence of the woman is expected to affect time spent at home and, therefore, the time supplied in market activities. As it enters into this model it is a proxy for the availability of jobs in the area, the ease for the woman of getting a job, labor market information and a woman's willingness to work. Thus, a woman residing in an SMSA with its postulated greater number of job opportunities and greater availability of information concerning them should be able and willing to give up time in consumption activities and offer more time to work outside the home. The farm woman with her greater home responsibilities is likely to be less willing to give up some of her time at home. Also, job information is usually less readily

available to farm residents. The nonSMSA resident will find jobs less readily available than the SMSA resident and information concerning those available as hard to come by. Therefore, the SMSA-nonfarm dweller should be willing to supply more time at work than her counterparts in any of the other areas.

Empirical Results

Empirical results estimated from ordinary least squares are presented in Table 2. The first model shows the results of the demand for consumption time and, thus, the supply of working time of women in the age group 30 to 44 years corrected for other family income, education, number of children, race, and marital status. The coefficients of the wage variables, in accordance with economic theory, indicate that at higher wage rates women are willing to give up more consumption time (supply more work time) but at a slightly decreasing rate.

Model 1 employed all 5,083 observations. Model 2, 3, and 4, using commuting time (CTIME) as an independent variable, had 85 invalid responses leaving 4,998 observations on which the regression was run.^{7/} The models that did use CTIME had R^2 -values which were considerably higher than those that did not correct for commuting time, indicating that a greater proportion of the variation about the mean was explained.

Wage Rate

The performance of WAGE in all the models, as well as the

TABLE 2

Results of the Demand for Consumption Time (Supply of
Work Time) Model, Women Age 30-44, 1967
CHOURS Dependent Variable

Independent Variable ^a	Model 1	Model 2	Model 3	Model 4
Intercept ^b	148.029 (191.865)**	157.876 (192.820)**	156.985 (164.815)**	157.749 (193.923)**
Economic				
WAGE	-4.296 (-19.16)**	-2.731 (-12.98)**	-4.006 (-10.78)**	-3.793 (-8.78)**
WAGE2	.007 (18.92)**	.004 (12.86)**	.006 (10.97)**	.005 (8.24)**
OFI	.513 (8.18)**	.356 (6.26)**	.510 (3.95)**	.476 (7.84)**
PUBLIC		.876 (1.70)*		
CTIME		-1.031 (-37.72)**	-.928 (-29.69)**	-.906 (-28.90)**
CTIME2		.008 (24.26)**	.008 (24.27)**	.008 (23.64)**
(WAGE) (OFI)			.164 (4.89)**	.150 (4.48)**
(WAGE) (CTIME)			.025 (1.36)	.026 (1.43)
(OFI) (CTIME)			-.034 (-8.64)**	-.033 (-8.51)**
Social				
RACE	2.948 (4.86)**	-1.677 (-3.04)**	-2.365 (-4.38)**	-1.693 (-3.09)**
MS	-4.322 (-5.84)**	-2.555 (-3.73)**	-2.860 (-3.97)**	-3.438 (-5.12)**
CHILD			4.366 (4.55)**	

TABLE 2 (Continued)

Independent Variable ^a	Model 1	Model 2	Model 3	Model 4
CHILD2			-.211 (-.26)	
NCHILD	4.557 (13.27)**	2.360 (7.68)**		2.211 (7.24)**
NCHILD2	1.070 (6.02)**	.585 (3.71)**		.614 (3.93)**
Education				
EDUCA	-1.717 (-3.16)**	-1.446 (-3.03)**	-1.629 (-3.43)**	-1.515 (-3.20)**
EDUCB	-2.382 (-4.43)**	-1.608 (-3.39)**	-1.666 (-3.53)**	-1.609 (-3.42)**
EDUCC	-2.632 (-2.64)**	-1.935 (-2.21)**	-1.981 (-2.28)**	-2.056 (-2.37)**
Residence				
FARM		-.318 (-.13)	.006 (.002)	-.798 (-.29)
NFARM		2.398 (4.75)**	2.478 (4.93)**	2.505 (4.75)**
NSFARM		-.157 (-.15)	-.117 (-.11)	.717 (.63)
(WAGE) (FARM)				1.262 (.47)
(WAGE) (NFARM)				-.094 (-.24)
(WAGE) (NSFARM)				-3.525 (-2.05)**
R ²	.164	.372	.378	.383
N	5,083	4,998	4,998	4,998

^a Values in parentheses below the predicted coefficient for each variable are computed t-values.

*t-value indicates coefficient significantly different from zero at the 10 percent level.

**t-value indicates coefficient significantly different from zero at the 5 percent level.

^bFor all models the intercept describes the base individual who is nonwhite, married with husband present in the household, and living in a nonSMSA-nonfarm residence. In Model 2 the base individual does not receive any public assistance. In Model 3 the base individual has no children in the household below nineteen years of age.

Source: [3]

square of the wage rate (WAGE2), would indicate that consumption hours decrease for higher wage rates; i.e., at higher wage rates working hours increase. The magnitude of the squared term indicates that, within the range of the data, a backward bending supply curve would not exist. The elasticity of individual supply of working hours for Model One evaluated at the mean wage rate and the mean of working hours is .15. This indicates that when the wage increases from its mean by one percent, time at home will decrease by .016 percent or time at work will increase .15 percent.

Family Income

OFI maintains its positive sign throughout the various models, indicating an increase in time at home as the income of family members increases. If someone in the woman's family is receiving some type of public assistance (PUBLIC = 1) there is a significant increase in her time at home, as seen by the coefficients of this variable in Model 2. It should be noted that causation may also run in the opposite direction indicative that because the individual is not able to work, the family is receiving public assistance.

Commuting Time

The hypothesized negative relationship between CTIME and CHOURS, at least in the lower amounts of CTIME, is shown to be true in the models run with correction made for commuting time. When the square of CTIME is included the model indicates that commuting actually discourages women from supplying more time at work.

In Model 3 it is found that, for the data used in this study,

CHOURS are at a minimum - working hours are at a maximum - when commuting time is 58 minutes. Results of the interaction of WAGE CTIME indicate that, for a given wage rate, women are willing to offer more working time only at reduced commuting time. At higher wage rates, however, the reduction in commuting time is less important.

Education

Results of the education variables indicate that education of high school or greater causes an increase in the time the woman is willing to supply in the labor market. Each increase in level from high school graduate to some college and/or technical training to college graduate, in fact, is seen to decrease a woman's time at home, thereby increasing the time she is willing to supply in the labor market.

Family Members

When children under six years of age are present in the household (CHILD = 1) there is a significant increase in the time the woman respondent spends in the home. When CHILD2 = 1, children from six to eighteen years of age are present, there is a slight decrease in CHOURS; the computed t-value indicates that the hypothesis that the predicted coefficient is equal to zero cannot be rejected.

When the variables for actual number of children in the age groups under six years (NCHILD) and six to eighteen years (NCHILD2) are used their predicted coefficients are positive and significantly different from zero. The effect of a younger child however is substantially larger than the effect of an older child. Of all the

variables concerning family members these give the most consistent results in the regression runs.

Race

The results in terms of this variable are very interesting. In the model uncorrected for commuting time there is a positive relationship between RACE and CHOURS indicating that white women spend more time in consumption activities than nonwhite women. When CTIME is included in the model, though, the sign of the race variable becomes negative. This would seem to be resulting from the fact that nonwhites tend to live closer to their jobs than whites and, thus, when the models are corrected for commuting time, the nonwhites are spending more time at home.

In an effort to determine if this really was the case, a variable for residence in the SMSA-central city was used in the analysis. Even when the central city distinction was included under the premise that more jobs are located in the central cities of SMSA's, The coefficient of RACE remained negative. This would seem to imply that no matter where the jobs are located, nonwhites always live closer to their work than whites and hence commuting time is less. Thus, the white woman is spending more time away from home.

Marital Status

The models consistently suggest that the single woman (MS=1) is spending less time at home than the married woman. In Model 4, which corrects for commuting time and the numbers of children both under six years of age and between six and eighteen years of age,

the single woman is willing to supply almost three and one-half more hours per week in the labor market than the married woman.

Place of Residence

Conditions may vary among residence categories such that women are willing to offer the same amount of work time at different locations but only at different wage rates. Conditions may reflect differences in cost of living among locations, accordance with the husband's decision as to where he wants to work, and certain non-monetary factors such as may constitute differences in quality of living. Results in Table 2 have adjusted individual work time supplied for differences in such social and economic factors as race, marital status, family structure, education, and other family income. When commuting time is included in the linear and quadratic forms, the coefficient of NFARM is statistically different from nonSMSA-nonfarm, accounted for in the intercept. It is interpreted as meaning that, all other factors the same, an SMSA-nonfarm woman is willing to offer fewer hours at work than a nonSMSA-nonfarm woman.

To determine the joint product effects of wage rate and residence on consumption hours, interaction terms were included in Model 4. An additional residence variable becomes significant and indicates that nonSMSA-farm women are willing to offer more hours of work than nonSMSA-nonfarm women, all other factors equal.

Looking at the estimated equation of Model 4, Table 2, adjusted so that hours at work is the dependent variable and all variables not containing WAGE or NFARM are included in the constant term, c , as well as the intercept value, we have:

$$\begin{aligned} \text{HOURS} = & c + 3.793 \text{ WAGE} - .005 \text{ WAGE}^2 - .150 (\text{WAGE})(\text{OFI}) \\ & - .026 (\text{WAGE})(\text{CTIME}) - 2.505 \text{ NFARM} + .094 (\text{WAGE})(\text{NFARM}) \end{aligned}$$

These results indicate that a higher wage rate is needed in the SMSA-nonfarm areas to entice a woman residing there to supply the same number of work hours as a woman in a nonSMSA-nonfarm area. This is observed in metropolitan labor markets where higher wages must be offered to increase the supply of labor. When the wage level is initially high in both areas, it will take a smaller increase in wage rate for the SMSA-nonfarm woman to encourage her to offer the same number of hours at work as her counterpart in the nonSMSA-nonfarm area. This results since the interaction term has a positive sign.

Evaluating this function at the mean values of OFI and CTIME we have:

$$\text{HOURS} = c + 2.788 \text{ WAGE} - .005 \text{ WAGE}^2 - 2.505 \text{ NFARM} + .094 (\text{WAGE})(\text{NFARM})$$

To find the change in the wage rate for a change in residence from the "base" (nonSMSA-nonfarm), but holding hours supplied constant, we can take the partial derivatives so that

$$\frac{d \text{ WAGE}}{d \text{ NFARM}} = - \frac{\frac{\partial \text{HOURS}}{\partial \text{NFARM}}}{\frac{\partial \text{HOURS}}{\partial \text{WAGE}}} = - \frac{-2.505 + .094 \text{ WAGE}}{2.788 - .010 \text{ WAGE} + .094 \text{ NFARM}}$$

If the wage rate is set at \$1.50 evaluating $\frac{d \text{ WAGE}}{d \text{ NFARM}}$ indicates that residents of SMSA-nonfarm areas must be paid \$.85 more than nonSMSA-nonfarm residents to encourage them to supply the same number of work hours. As the overall wage rate increases, however, this differential decreases slightly.

The results also indicate that a higher wage rate must be offered

the nonSMSA-nonfarm women to encourage them to supply the same amount of work hours as the nonSMSA-farm women. Comparing the SMSA-farm and nonSMSA-nonfarm residence areas, it seems that these labor markets are somewhat comparable. At least these data indicate no significant differences in coefficients for FARM (SMSA-farm) and (WAGE)(FARM).

Conclusions

The household production - consumption model provides a strong theoretical foundation for analyzing the demand for consumption time and, thus, the supply of working time [1]. For the woman, many of the factors that enter into her decision concerning labor force participation affect the amount of time she spends at home - race, marital status, children, residence, other family income, and education, but additional factors are important influences in her decision as to the number of hours she is willing to supply in the labor market - market wage rate and commuting time, notably.

Empirical results from this analysis of the demand for CHOURS and, reciprocally, the supply of working time of the individual woman, using survey results of women in the 30 to 44 year age range, allow the following conclusions to be made:

1. The empirical specification of the household production-consumption model possesses a fairly strong power for explaining the variations in the individual woman's demand for consumption time (Supply of working time). This lends support to the premise that decisions concerning the hours the woman is at home are made in a family context where production is one of the household activities.

(For data supporting a similar conclusion see Huffman [2]).

2. Within the range of the data, a backward bending supply curve of time at work does not exist. An estimate of the elasticity of the supply of working hours with respect to wage (from Model 1) evaluated at the mean wage rate and the mean of hours worked is .15; i.e., as the wage rate increases by one percent, time at work will increase by .15 percent, holding all other things equal.

3. There is a level of commuting time at which working hours are at a maximum - 58 minutes for the data used in this study. Increasing the wage rate will increase this level of commuting time to a new value at which working hours will be at a maximum for the new wage rate.

4. The empirical results imply that the woman with more years of formal education is willing to supply more time in the labor market.

5. Children in the household are a definite deterrent to the woman working outside the home. Young children, especially, increase the demand for the woman's time in the home.

6. No matter where jobs are available the results imply that the nonwhites live closer to them, reducing their commuting time. The white woman, therefore, is spending more time away from home.

7. A higher wage rate is needed in the SMSA-nonfarm areas to entice a woman there to supply the same number of work hours as a woman in a nonSMSA-nonfarm area. This implies that higher wage rates must be offered in metropolitan-labor markets to increase the supply of labor. Within the nonSMSA categories, it takes a higher

wage rate to entice the nonSMSA-nonfarm woman to work as many hours as the nonSMSA-farm woman. Comparing the SMSA-farm and nonSMSA-nonfarm, it seems that these labor markets are comparable in terms of conditions influencing the willingness of women to supply working time.

FOOTNOTES

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**Marlys Knutson is former research assistant and Dean Schreiner is associate professor of Agricultural Economics at Oklahoma State University, Stillwater.

¹"Women at Work: Changes in the Labor Force Activity of Women," Monthly Labor Review. 93:11-11, June, 1970.

²Data are available from the Chief, Demographic Surveys Division, Bureau of the Census, U.S. Department of Commerce, Washington, D.C.

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⁵As specified here, either HOURS or CHOURS could be used as the dependent variable. In fact, results are later discussed in terms of both variables.

⁶The real value of time for a nonworking woman is not zero since she is performing tasks with her consumption time not generally done by working women. However, no means were available for measuring these activities.

⁷Missing data can lead to biased results if CTIME is correlated with those individuals not responding but no existed whereby part of the non-respondents could be interviewed in a follow-up survey.

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FOOTNOTES

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³Becker, Gary S., "A Theory of the Allocation of Time." Economic Journal, Vol. LXXV (September, 1965), p. 496.

⁴Friedman, Milton, Price Theory: A Provisional Text (Chicago, 1962), p. 204.

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