Shadow Wage Assessments of the Value of Home Production: Patterns from the 1970's

Cathleen D. Zick
University of Utah

W. Keith Bryant
Cornell University

ABSTRACT: When measuring economic well-being, household income figures are routinely adjusted for nonwage income, taxes, and government transfers. Rarely are the figures adjusted to reflect the value of household work. An opportunity cost methodology is used in this article to expand the operationalization of household income so that it includes not only money income but the economic value of home production activities as well. The analysis indicates that the average married couple in the United States increases its access to goods and services dramatically by engaging in home production. While the average economic contribution stemming from spouses' home production is sizable, its distribution is somewhat uneven. Gini ratios calculated using income figures that include home production reveal greater distributional differences than do the Gini ratios calculated using only money income.

KEY WORDS: Home Production; Income Distribution; Shadow Wages.

An earlier version of this paper was presented at the 1987 Joint Statistical Meetings in San Francisco, CA. The research reported here was supported in part by the University of Utah Research Fund. Helpful comments were given on an earlier draft of the manuscript by E. Scott Maynes, Ken R. Smith, the members of the Department of Home Management and Housing Seminar at Ohio State University, and three anonymous reviewers. Excellent research assistance was provided by Jutta Joesch and Daniel Aldershoff.

Cathleen D. Zick is an Associate Professor in the Department of Family and Consumer Studies, University of Utah, Salt Lake City, Utah 84112. Dr. Zick's current research assesses the impact of household composition changes on economic well-being. W. Keith Bryant is a Professor in the Department of Consumer Economics and Housing, MVR Hall, Cornell University, Ithaca, New York 14853. Dr. Bryant's current research focuses on the relationship between married women's labor supply and family ownership of durable goods.

Introduction

How does one accurately assess the distribution of economic resources across households? On a conceptual level, one would want to measure the variation in total access to goods and services. On an empirical level, this has generally been translated into measuring the variation in money income. During the past decade considerable attention has focused on the question of how standard income measures and their corresponding distribution statistics might be improved. Researchers have demonstrated that when money income is adjusted for taxes, transfers, family composition, and life cycle, stage one gets a much more accurate picture of the variation in households' real access to goods and services (Duncan, 1984; Hoffman & Podder, 1976; Moon & Smolensky, 1977; Sirageldin, 1969).

Noticeably absent from this measurement discussion are empirical attempts to adjust income and the corresponding distribution statistics for the economic value of productive activities that household members engage in outside of the marketplace. The only exceptions have been the work done by Murphy and Peskin (Murphy, 1982; Murphy & Peskin, 1981; Peskin, 1983). Yet, it has long been recognized that individuals increase their access to goods and services by devoting time to productive activities in the home as well as in the marketplace. Time-use surveys provide empirical evidence that Americans allocate considerable time each day to home production activities, such as preparing meals, washing clothes, and caring for children (Gauger & Walker, 1980; Juster, 1985; Robinson, 1985; Sirageldin, 1969). Is home production an important vehicle for increasing a household's access to goods and services? If so, are the economic resources provided through home production evenly distributed across all households? Or do certain income classes, such as the poor, make greater use of home production than others?

Researchers have generally ignored the value of household work in their empirical calculations because of the practical difficulty of assigning dollar values to goods and services that are not exchanged in the marketplace. However, in the past decade, techniques used to assign an economic value to household work have been greatly improved and their use has spread considerably (Chiswick, 1982; Ferber & Birnbaum, 1980; Gauger & Walker, 1980; Gronau, 1973; Hawrylyshyn, 1976; Murphy, 1982, 1980; Peskin, 1983; Zick & Bryant, 1983). This article exploits a recently developed opportunity cost method of valuing home work time to (a) examine the extent to which household work increases access to goods and services, and (b) ascertain how the distribution of economic resources is altered if one adds the value of household work to the standard income accounting scheme.[1]

The Valuing of Household Work Time

There has been a lively debate during the past decade about the strengths and weaknesses of several competing conceptual and operational definitions of the price of household work time. The competing concepts have been the market alternative cost approach and the opportunity cost approach for valuing household work time, with each of these concepts having two or more operational variants.

Market Alternative Cost Approach

The market alternative cost concept has been based on the argument that time spent by a family member in home production could be valued by identifying what the household would have had to pay someone in the markeplace to do the tasks. Operationally, this has been done using either the market alternative housekeeper function or the market alternative individual function (Gauger & Walker, 1980; Hawrylyshyn, 1976; Murphy & Peskin, 1981; Peskin, 1983). The former examined what it would cost to hire a housekeeper to perform the specified activities while the latter required that one decompose the household tasks and assign the appropriate wage rate that would be paid in the marketplace for each particular type of labor.

If the housekeeper function approach was used, then once the appropriate hourly wage was identified, the researcher simply multiplied this wage by the reported hours of household work to obtain the total value of home production. Variation in the total value of home production was, thus, completely dependent on hours spent in home production given the constant price of time assumed when using this methodology. In contrast, if the individual function approach was used, there were two sources of possible variation in the value of home

[1]In this article, income refers to the sum of the dollar value of the spouses' market earnings, nonwage income, and home production. In contrast, money income refers to the spouses' market earnings plus nonwage income.

production. When using this approach, the researcher first matched the reported hours spent in each activity to the appropriate market wage rate. Then the two were multiplied together and the products were summed across all household work activities to obtain the total value of home production. Although the price of time was still constant for a given activity, the total value of home production was now dependent on the composition of the work that was done as well as on the amount of time spent in each activity.

Assessments of the market alternative concept for valuing household work have yielded several criticisms (Chiswick, 1982; Ferber & Birnbaum, 1980; Peskin, 1983; Zick & Bryant, 1983). First, no theory of household behavior underlay the market alternative concept, making both modes of operationalization *ad hoc*. Second, if the household valued home production at the cost of the market alternatives, then it followed that households would be indifferent between purchasing the market alternatives and producing the output themselves. The fact that some households had not been observed purchasing all of these services suggested families perceived that (a) they could perform these tasks themselves at lower costs (i.e., family members were more efficient because they usually did two or more household work activities simultaneously), and/or (b) the market alternatives were not perfect substitutes. Third, since workers hired to do housework must be managed, the market alternative cost concept ignored an important home production activity, the management of individuals doing the tasks. Finally, the market alternative cost concept ignored any utility value reaped by household members who did the work themselves. Taken in combination, these conceptual limitations made the choice of the replacement cost methodology untenable for the work proposed here.

The Opportunity Cost Approach

The opportunity cost concept as applied to housework flows out of neoclassical economic theory (Becker, 1965). It is based on the theoretical argument that in equilibrium, household members allocate their time across all activities so as to equate the value of their time in each activity at the margin. Thus, if the marginal value of someone's time in one activity (e.g., market work) is known, then one could impute the value of his/her time in other activities (e.g., household work). Inherent in the opportunity cost approach is the notion that households attempt to maximize satisfaction by their consumption and work decisions subject to the resources at their disposal. This means that for any individual, the opportunity cost of home production time is influenced by household preferences, the quantities of various resources possessed by the household, and the price of these resources. Since these factors vary from individual to individual and household to household, so too do the opportunity costs of household work. Thus, in contrast to the market alternative approaches, when opportunity cost estimates are used to obtain the value of home production, the answer varies depending on the reported hours of household work and the individual's opportunity costs of time.

Criticism of the opportunity cost concept revolve around several issues. First, although household members may attempt to allocate their time so as to equate its marginal value in all activities, structural time barriers (e.g., a job where one works 40 hours per week or not at all) may prevent people from doing so in reality. While this may be true in any short-run situation, this objection is less valid if the researcher has information on usual or long-run behavior. Second, opportunity cost estimates measure the price of home production time only at the margin. Thus, unless household production functions are linear homogeneous, the value of intramarginal units of time will have been understated when opportunity cost estimates were used. However, this same argument can be made with respect to the market alternative cost approach. This means that if the eventual goal is to value *all* household production time, both techniques may understate its total value to the household.

The most serious criticism of the opportunity cost technique is centered on the actual estimation procedure. Specifically, while the logic of utility maximization implies that the opportunity cost of household work time will be the market wage rate (net of taxes) for those who are employed, no opportunity cost measure readily existed for individuals who are not employed. Some researchers have attempted to resolve this problem by assigning wage rates to nonemployed individuals based on the reported wages of employed individuals who have similar characteristics (e.g., age, education, years of work experience, etc.) (Sirageldin, 1969). Researchers using this strategy presume that the employed person's wage rate equals what the nonemployed individual can earn if he/she enters the labor market (Ferber & Birnbaum, 1980; Ferber & Green, 1985).

The problem with such a wage imputation strategy is that otherwise identical individuals are not identical in reality simply by virtue of the fact that one is employed and the other is not. More specifically, if employment status is a choice that the individual makes, then the choice must be based on factors that, although unobservable to the researcher, are nonetheless present (Heckman, 1979). Gronau (1978) hypothesized that unobserved productivity differences in household and/or market work are the key. Indeed, in the neoclassical economic model, those individuals who are not employed must perceive the value of their marginal productivity to be greater at home than in the market, otherwise they would have sought market employment. Thus, while the market wage provides the appropriate opportunity cost measure of home work time for employed individuals, it is at best only a lower limit estimate of the value nonemployed individuals have placed on an hour of their time (Ferber & Birnbaum, 1980; Ferber & Green, 1985).

In the neoclassical theory of time allocation, the true opportunity cost of home work time for a nonemployed individual is the value of the last hour he/she has spent in household work, sometimes called the shadow wage. In essence, the shadow wage is the lowest wage that would make a nonemployed individual indifferent at the margin, between entering the labor market and working at home (Zick & Bryant, 1983). In general, the shadow wages of nonemployed individuals have been unobservable or poorly approximated by imputed market wages. However, econometric advances have made the estimation of shadow wages for nonemployed individuals possible (Heckman, 1977). In the work that follows, this statistical method has been exploited to calculate the appropriate hourly prices of home work time for both employed and nonemployed individuals.

Procedures

The Model

Estimates of the shadow wages for both employed and nonemployed individuals were obtained by using a two-equation system first suggested by Heckman (1977) to obtain unbiased labor supply estimates. The first equation of the system was a labor demand equation and the second was a labor supply equation. The system had the following mathematical form:

$$\text{In}(W) = X\alpha + e_1 \quad (1)$$
$$\text{In}(W^*) = Z\beta + H\kappa + e_2 \quad (2)$$

where,
W = the market wage rate,
X = a vector of market productivity determining characteristics,

W^* = the shadow wage,
Z = a vector of home productivity determining characteristics, and
H = hours of market work.

It was assumed in this model that in equilibrium, $W^* > W$ for those individuals who were not employed outside of the home, while $W^* = W$ for those individuals who were employed. Using this formulation, the shadow wage of an individual who was not employed outside of the home was no longer constrained to be equal to the wage the individual could have earned in the market. Rather, the estimate of the shadow wage represented the hourly wage that would have made individuals who were not currently employed in the markeplace indifferent between his/her last hour of home production and an hour of market work.

The model also presumed that the wage offered in the market (W) was invariant to the number of hours one worked in a job. In contrast, the shadow wage (W^*) explicitly varied with the number of hours worked. This formulation reflected a theoretical model where the marginal productivity of time in the home varied with the amount of time spent in home work while the value of one's marginal product in the market did not respond to variations in hours worked.[2]

As has been noted, the shadow wage could not have been directly estimated because it was unobservable. However, a labor supply function that was estimable was derived by solving (1) and (2) for H as follows:

$$H = \frac{1}{\kappa}(X\alpha - Z\beta + e_1 - e_2). \quad (3)$$

Once equations (1) and (3) were estimated, W^* could be retrieved provided that at least one element of X was not included in Z (see Zick & Bryant, 1983, for further details). Thus, it was possible to obtain an estimate of the shadow wage for both employed and voluntarily nonemployed individuals using this technique.

The Data

Data used in the estimation of the model came from the Panel Study of Income Dynamics (PSID). Several characteristics made the PSID an optimal set for this work. First, the PSID contained information about the amount of work done at home by each spouse in the household. Second, the PSID had detailed data on the various components of each household's money income including the current market earnings of each spouse. Third, the panel nature of the data allowed examination of the income distribution consequences of household work at more than one point in time. Finally, although the PSID oversampled low income and minority households, when the data were

[2]The logic here is that in a firm, the marginal productivity of labor depends on the sum total of all hours of given education and experience used by the firm, of which the hours supplied by any individual are a minor part. Such an assumption, of course, cannot be maintained for the household.

weighted, as they were in all of the analyses reported here, they were representative of a random sample of United States households (Survey Research Center, 1972). Thus, the results of the work done here were generalizable beyond the sample.

The samples came from the 1970-71, 1975-76, and 1979-80 interviewing waves of the PSID. Taken in combination, each consecutive pair of interviews provided all of the information needed to calculate each sample household's income for the first calendar year in the pair. Only white, married-couple households where the husband was employed were included in the 1970-71, 1975-76, and 1979-80 samples. In addition, while husbands could have held one or two jobs, wives were limited to holding either one or none. In this analysis, these sample restrictions were purposely made to help minimize estimation complications. Specifically, the elimination of households with unemployed husbands allowed for concentration on the problems of measuring the opportunity costs of time for nonemployed wives without the statistical complications introduced by the possibility of nonemployed husbands as well. Furthermore, single heads of household and nonwhite families were excluded to control rigorously for the possibility of structural differences in the parameters faced by these households in the labor market.

The Estimation of the Model

The market and shadow wage equations (equations (1) and (2)) were formulated in terms of the PSID data as follows:

$$\begin{aligned} \text{In (W)} &= a_0 + a_1\text{ED} + a_2\text{EXP} + a_3 + \text{EXPSQ} + \\ &\quad a_4\text{UNEMP} + a_5\text{SIZE} + a_6\text{LAMBDA} \qquad (4) \end{aligned}$$

$$\begin{aligned} \text{In (W*)} &= b_0 + b_1\text{ED} + b_2\text{EXP} + b_3\text{EXPSQ} + b_5\text{SIZE} + \\ &\quad b_6\text{LAMBDA} + b_7\text{YRSMD} + b_8\text{OWN} + \\ &\quad b_9\text{NONWAGE} + b_{10}\text{HMARWAGE} + \\ &\quad b_{11}\text{HINTMRHRS} + b_{12}\text{INTMRINC} + \\ &\quad b_{13}\text{NKIDS} + b_{14}\text{AGEYKID} + b_{15}\text{RMS} + \\ &\quad b_{16}\text{WHRS} \qquad (5) \end{aligned}$$

The empirical specification of equations (4) and (5) were derived from human capital theory (Ben-Porath, 1970). Equation (4) was specified so that a wife's market wage rate was a function of:

(1) her educational attainment measured in years (ED),
(2) her market work experience measured in years; entered linearly (EXP) and squared (EXPSQ)
(3) the local area unemployment rate measured as a fraction (UNEMP),
(4) a dummy variable that took on a value of 1 if the household was in an urban area (SIZE), and
(5) a sample selection correction factor (LAMBDA).[3]

---

[3]The Heckman procedure to correct for sample selection bias requires that one first estimate a probit function of the probability of being employed using all of the exogenous variables in the model. The instrumental variable labeled LAMBDA is calcu-

Equation (5) specified that a wife's shadow wage rate was a function of factors that affected the value of her marginal product in home work including her:

(1) education (ED),
(2) experience (EXP, EXPSQ),
(3) family's geographical location as measured by a dummy variable that took on a value of 1 if the family lived within an SMSA, and 0 otherwise (SIZE),
(4) the sample selection correction factor (LAMBDA),
(5) years of marriage (YRSMD),
(6) family's housing tenure status as measured by a dummy variable that took on a value of 1 if they owned or were purchasing a home, and 0 otherwise (OWN),
(7) nonwage income (NONWAGE),
(8) husband's opportunity cost of time as measured by his wage on his marginal job (HMARWAGE),[4]
(9) husband's hours worked per week on his first job, if he had two jobs (HINTMRHRS),[4]
(10) husband's earnings from intramarginal hours worked per week if he had two jobs (INTMRINC),[4]
(11) number of children (NKIDS),
(12) youngest child's age if she had a child (AGEYKID),
(13) house size as proxied by the number of rooms in the home (RMS), and
(14) average weekly hours worked in the labor market (WHRS).

Because W = W* for women who worked in the market, equations (4) and (5) could be equated arithmetically and solved for hours of market work (WHRS). This yielded:

$$\begin{aligned} WHRS = {} & c_0 + c_1ED + c_2EXP + c_3EXPSQ + c_4UNEMP \\ & + c_5SIZE + c_6LAMBDA + c_7YRSMD + c_8OWN \\ & + c_9NONWAGE + c_{10}MARWAGE + c_{11}INTMRHRS \\ & + c_{12}INTMRINC + c_{13}NKIDS + c_{14}AGEYKID + c_{15}RMS \end{aligned} \quad (6)$$

Equations (4) and (6) were estimated directly via OLS using only the subsample of employed wives. From these equations the parameters of equation (5) were retrieved.[5] In this analysis the model was estimated separately for each year to allow for any structural changes in the labor market over time. In

---

lated from the probit results. This variable is then entered in any regression equation that uses only the subsample of employed individuals to correct for the possibility of sample selection bias (Heckman, 1979).

[4]These variable specifications are those suggested by Nordin (1976) and Pollak (1969) to handle a segmented budget constraint.

[5]Given that one can use the estimated coefficients on unemployment (i.e., a_4 and c_4) in equations (4) and (6) to identify b_{16}, the coefficients for equation (5) may be retrieved as follows: $b_0 = a_0 - c_0{*}b_{16}$; $b_1 = a_1 - c_1{*}b_{16}$; $b_2 = a_2 - c_2{*}b_{16}$; $b_3 = a_3 - c_3{*}b_{16}$; $b_5 = a_5 - c_5{*}b_{16}$; $b_6 = a_6 - c_6{*}b_{16}$; $b_7 = -c_7{*}b_{16}$; $b_8 = -c_8{*}b_{16}$; $b_9 = -c_9{*}b_{16}$; $b_{10} = -c_{10}{*}b_{16}$; $b_{11} = -c_{11}{*}b_{16}$; $b_{12} = -c_{12}{*}b_{16}$; $b_{13} = -c_{13}{*}b_{16}$; $b_{14} = -c_{14}{*}b_{16}$; $b_{15} = -c_{15}{*}b_{16}$.

addition, the model was estimated both before and after adjusting for federal income taxes for 1975 and 1979. Data on the respondents' marginal tax rates were not collected in the 1971 interview and so only before-tax estimates were computed for 1970. The results of equations (4) and (6), along with the results of the probit equations that were used to construct LAMBDA, are available from the authors upon request.

The calculated parameters of the shadow wage equations appear in Table 1. Because both the market wage equation and the shadow wage equation were specified in natural logs, a calculated coefficient was interpreted as the change in the natural log of the shadow wage given a one unit change in the corresponding exogenous variable; that is, the percentage change in the shadow wage given a one unit change in the exogenous variable. The predicted values from these shadow wage equations were converted into dollars per hour in the analyses that follow.

Most of the calculated shadow wage parameters supported the standard household production arguments. For instance, the positive coefficient associated with wife's education (ED) indicated that part of the return to educational investments took the form of increased marginal productivity in home work. (See Zick & Bryant, 1983, for a more complete discussion of these

TABLE 1

Derived Estimates of the Parameters of the Wives' Shadow Wage Equations

	1970	*1975*		*1979*	
Variables	*Before taxes*	*Before taxes*	*After taxes*	*Before taxes*	*After taxes*
CONSTANT	0.00774	0.53607	0.60994	0.06997	0.05476
ED	0.06071	0.10071	0.08483	0.10613	0.09643
EXP	0.00129	0.03921	0.02580	0.08485	0.12663
EXPSQ	−0.00006	−0.0004	−0.00012	−0.00169	−0.00268
SIZE	0.10300	0.06152	0.05690	0.23072	0.24829
LAMBDA	−0.26793	−0.00504	−0.06759	0.48445	0.84595
YRSMD	−0.00105	−0.00930	−0.00924	−0.00111	−0.00374
OWN	−0.00101	−0.02997	−0.04550	−0.02885	−0.11117
NONWAGE	0.00020	−0.00072	−0.00119	−0.00026	−0.00104
HMARWAGE	0.00920	−0.00170	−0.00550	−0.00591	−0.03354
HINTMRHRS	0.00068	0.00245	0.00347	−0.00041	−0.00098
INTMRINC	0.00002	−0.00074	−0.00101	−0.00011	−0.00018
NKIDS	0.01848	−0.02756	−0.02758	−0.03050	−0.07014
AGEYKID	−0.00015	0.01376	0.01443	−0.00008	0.01335
RMS	−0.00322	−0.03150	−0.02967	0.02089	0.03124
WHRS	0.00779	−0.01922	−0.01756	−0.02698	−0.04431

Note. These coefficients have been computed from OLS estimates of the parameters of equations (4) and (6) that are available from the authors upon request.

TABLE 2

Mean Dollar Income per Week by Component

Income component	1970	1975		1979	
	Before taxes	*Before taxes*	*After taxes*	*Before taxes*	*After taxes*
E_H + U	200.21	274.07	198.54	406.09	285.97
E_W	34.73	50.58	36.60	89.24	60.19
VA_W	69.06	152.56	121.89	235.96	244.36
VA_H	9.62	82.44	63.36	66.52	46.41
T	5.11	9.72	9.72	12.79	12.79

Note. $E_H(E_W)$ is husband's (wife's) average weekly earnings; U is nonwage income excluding transfers; $VA_W(VA_H)$ is value added per week by wife's (husband's) household work; T is transfer income. Transfer income is defined as AFDC, SSI, other welfare payments, Social Security, retirement and annuity income, Workmen's Compensation, Unemployment Insurance, child support, help from relatives, and other transfer income.

household production arguments.) However, the one notable exception was the negative coefficient associated with nonwage income (NONWAGE). In the literature, researchers had generally assumed that households viewed the wife's home work time to be a normal good. The negative signs on nonwage income in four of the five shadow wage equations suggested that this assumption was incorrect.

With opportunity cost estimates of the wives' home production time in hand, the next step was to derive the analogous variable for the husbands. Because all husbands in the sample were employed, each husband's wage rate was used as a measure of the opportunity cost of an hour of his home work time. Next, the average weekly dollar value of household work done by each spouse was calculated by multiplying the spouse's hourly opportunity cost by his/her average weekly hours of household work. These figures along with average market earnings, nonwage income, and transfer income are reported in Table 2.

The Results

Mean Income Components

Several observations could be made upon comparing the mean income components of the various categories shown in Table 2. First, the data indicated that home production (VA_H + VA_W) augmented the average household's money income (E_H + E_W + U + T) substantially. The economic contributions of household production ranged from a low of 33% of money income (in 1970, before adjusting for taxes) to a high of 81% of money income (in 1979, after adjusting for taxes). These figures clearly showed that home production was an important means of increasing access to goods and services for the average household.

Second, the value of home production as a percentage of dollar income rose for the average household when the estimation was adjusted for taxes. This conformed with *a priori* expectations. Taxes decreased the real market wage rate, and hence, the total value of both market work and household work for those who were employed. However, taxation had no impact on the shadow wages of those individuals who did not work outside of the home. Thus, the relative economic value of household work should have increased after adjusting for the effect of taxes.

Finally, these data provided insights about the relative ranking of the various sources of income in the United States. The husband's earnings plus nonwage income ($E_H + U$) was the largest source of income for the average household and the wife's household work (VA_W) was the second most important income source. These findings held across years and both before and after adjusting for the effects of taxation. In contrast, the relative contributions of the husband's household work and the wife's market earnings exhibited unstable rankings. In both 1970 and 1979, the average married woman contributed more market earnings to the household than the average husband contributed in terms of home production. But in 1975 the relative rankings of these two items were reversed.

Married women's market earnings climbed steadily during the 1970's and the figures presented here reinforced the growing economic importance of women's employment outside of the home. Yet, while married women were contributing more through market work, the economic contributions of married men via household work exhibited a curious pattern, first increasing between 1970 and 1975, and then decreasing between 1975 and 1979. This decline occurred despite the fact that during the same time, the husbands in these samples were increasing their household work participation rates from .354 in 1970, to .759 in 1975, and to .798 in 1979.

The Distribution of Income Across Households

There have been many different summary measures of economic inequality used in the income distribution literature. Ideally, researchers should have used a summary statistic that (a) had scale invariance (so that one need not have worried about such things as correcting for inflation when comparing inequality measures across time), and (b) satisfied the principle of transfers (i.e., the indicator of inequality increased whenever income was transferred from one household to another household that was relatively richer). Three statistics have met these criteria: the Gini ratio, the coefficient of variation, and Theil's information measure (Allison, 1978). The Gini ratio has been chosen for the analyses presented here because it has been the most commonly used measure in the literature. Thus, it has afforded more comparisons with past analyses. The one disadvantage of using a Gini ratio has been that it is more sensitive to changes that have occurred in the middle of the income distribution as opposed to changes that have occurred at either extreme (Allison, 1978). However, the general homogeneity of these samples (i.e., white, married-couple households where the husband was employed) should have helped to keep this problem to a minimum in the analyses that are presented below.

The Gini ratios of the various components of households' average weekly income were calculated for 1970, 1975, and 1979. The calculations were done with and without transfer income as well as both before and after adjusting for taxes for 1975 and 1979. The standard Gini ratios, the ones based solely on money income, and all of their permutations are presented in Table 3. A Gini ratio near "1" indicated a large degree of income inequality while a Gini ratio near "0" indicated a very even distribution of income across households.

Initially, several observations could have been made by simply comparing the standard Gini ratios. First, these ratios all fell within the range of .26 to .37, indicating considerably greater equality within the samples than had been found in past research (Foley, 1977; Hoffman & Podder, 1976; Treas & Walther, 1978). This was not surprising considering the sample selection criteria. Recall that blacks, single-headed households, and couples where the husband was unemployed were all excluded from the analysis. The exclusion of such alternative family types was quite likely to reduce the size of the Gini's (Hoffman & Podder, 1976; Treas & Walther, 1978).

Second, the traditional modifications to household income, adjustments made for transfers, and taxes led to categorical reductions in income inequality. This, too, was not a surprising result. If the federal tax system was progressive, then it should have taxed the rich more than the poor. Similarly, if the goal of most transfer programs was to augment the resources of households in economic distress, then most transfer monies should have been targeted for the poor rather than the rich. Thus, on balance, one would have expected that

TABLE 3

Gini Ratios of the Components of Average Weekly Household Income

Income component	*1970*	*1975*		*1979*	
	Before taxes	*Before taxes*	*After taxes*	*Before taxes*	*After taxes*
	Without transfers				
$E_H + U$	0.352	0.369	0.312	0.350	0.301
$E_H + E_W + U$	0.331	0.352	0.294	0.325	0.267
$I + VA_W$	0.265	0.294	0.252	0.266	0.282
$I + VA_H$	0.330	0.422	0.380	0.319	0.261
$I + VA_W + VA_H$	0.266	0.352	0.317	0.266	0.273
	With transfers				
$E_H + U + T$	0.348	0.355	0.298	0.338	0.289
$E_H + E_W + U + T$	0.321	0.339	0.281	0.315	0.259
$I + VA_W + T$	0.256	0.286	0.243	0.261	0.276
$I + VA_H + T$	0.321	0.410	0.367	0.310	0.252
$I + VA_W + VA_H + T$	0.259	0.344	0.309	0.260	0.268

Note. Gini ratios are calculated by the method described by Morgan et al. (1962). Definitions: $E_H(E_W)$ is husband's (wife's) average weekly earnings; U is nonwage income excluding transfers; VA_W (VA_H) is the value added per week by wife's (husband's) household work; $I = E_H + E_W + U$; T is transfer income. (See Table 2 for a full description of transfer income.)

taxes and transfers would have helped equalize the distribution of money income.

Finally, across time changes in the distribution were observed. If one focused on the Gini ratios calculated using before-tax money income and including transfers, it appeared that the level of money income inequality rose marginally between 1970 and 1975, and then dropped marginally between 1975 and 1979. This change may have been partly attributed to sampling variability among the three years. In addition, the slightly more favorable macroeconomic conditions that existed in 1970 and 1979 may have played a role. Specifically, while unemployment in the United States was at a decade high of 8.3% in 1975, it was around 5% in both 1970 and 1979.[6]

[6]Recall that while households with unemployed husbands have been purposely excluded from the analyses, the samples used here may include households with unemployed wives.

Effects of Home Production

Adding the dollar value of household work to money income altered measures of resource inequality. Once transfers were accounted for, but before adjusting for taxes, the Gini ratios indicated that the inclusion of spouses' home production slightly raised the level of economic inequality across households in 1975. However, home production appeared to have reduced the distribution of economic inequality in 1970 and 1979. The addition of the value of both spouses' home work increased the 1975 Gini ratio by a mere 1.5%. In contrast, in 1970 and 1979, the addition of the value of both spouses' home work decreased the Gini ratios by 19% and 17%, respectively.

Before it could have been concluded that home production was used effectively by poor households more than the rich to increase access to goods and service, it was important to look at the after-tax Gini computations. After accounting for both transfers and taxes, the addition of the value of each spouse's household work increased both the 1975 and 1979 Gini's by 10% and 3.5%, respectively. These figures indicated that once taxes were netted out, high money-income households made greater use of household production to improve their economic positions than did their low money-income counterparts. This suggested that standard economic inequality calculations that had excluded the value of home production had understated the true variation in access to goods and services that had existed across households in the United States.

The distributional impact of household work was further examined by turning to the relative contributions of each spouse. Table 3 includes Gini ratios that were calculated before adjusting for taxes, but after adjusting for transfer income. These Gini's indicated that in all three years, the household work of poor married women helped to improve their households' economic resources relative to households with higher levels of money income. However, these equalizing effects were more than offset by the unequal distribution of the value of the home production done by married men.

While married men made substantial contributions to family economic well-being via market earnings, their contributions via household work were much smaller and they appeared to be unevenly distributed. Evidently, males in high money-income households made greater household work contributions than did their counterparts in low income households. This seemed like an obvious finding given that males from high income households would in all likelihood have had high shadow wages by definition. However, the unequalizing effect of men's household work was also reinforced by previous research (Farkas, 1976) that found young, highly educated males spent more time in household production activities than did older, less educated males.

Summary and Conclusions

In the past two decades, measurement of the level and distribution of economic well-being within a society has grown considerably in its sophistication. Income figures have come to be routinely adjusted for nonwage income, taxes, and government transfers. Yet historically, conceptual and methodological problems have prevented most researchers from adjusting income measures so that they also reflect the value of productive activities done in the home. The analysis done here indicates that the average married couple in the United States increases its access to goods and services dramatically by engaging in home production. Yet while the average economic contribution that stems from spouses' home production is sizable, its distribution is somewhat uneven. An examination of the Gini ratios calculated using after-tax income figures that include the value of home production, reveals greater differences in households' access to goods and services than do the Gini ratios that had been calculated using only after-tax money income. This finding suggests that high money-income households make relatively greater use of home production to increase their access to goods and services than do low money-income households.

To what extent would these conclusions change if a different method of valuing home work time is used in the analysis? It is difficult to say. Past work that directly compares (individual function) replacement wage estimates with shadow wage estimates find the estimated shadow wage rates to be higher (Zick & Bryant, 1983). Thus, there is some reason to believe that if a replacement cost methodology is used in this work, the estimated total value of household work might be more conservative. However, it is unclear that the estimates of the distributional impact of household work would be very different if a replacement cost methodology had been used.

Murphy and Peskin (1981) computed the replacement cost value of *married women's* household work using the 1976 Time Use in Economic and Social Accounts data and found that the value of women's household work is fairly evenly distributed across different income levels. They conclude that women's home production serves as an equalizing factor, helping poorer families increase their access to goods and services relative to the rich. In contrast, the research reported here shows that (after accounting for transfers and taxes) the household work contributions of married women have equalizing effects in 1975 and unequalizing effects in 1979. In essence, the analyses neither confirm nor counter the findings of Murphy and Peskin (1981).

What the analyses presented here show is that there is no clear trend in the mean value of home production. Rather, the level and distribution of home production appear to vary from year to year. Duncan (1984), using the PSID data to explore year-to-year changes in household money income, found great variations in families' dollar income across time. It would appear that the same thing may be true of the value of home production. Indeed, these analyses show that both the averages and distributions of home production are imbued with variation through time. Home production contributions appear to have an equalizing effect in one year and an unequalizing effect in another. If this is true, the next task is to discover what factors influence the year-to-year variations in household work.

References

Allison, P. (1978). Measures of inequality. *American Sociological Review, 43*, 865-880.

Becker, G. (1965). A theory of the allocation of time. *Economic Journal, 75*, 493-517.

Ben-Porath, Y. (1970). The production of human capital over time. In W.L. Hansen (Ed.), *Education, income and human capital* (pp. 129-147). (Studies in income and wealth Vol. 35, by the Conference on Research in Income and Wealth) New York: Columbia University Press.

Chiswick, C. (1982). The value of a housewife's time. *Journal of Human Resources, 17*, 413-425.

Duncan, G. (1984). *Years of poverty, years of plenty: The changing economic fortunes of American workers and families.* Ann Arbor: University of Michigan, Institute for Social Research, Survey Research Center.

Farkas, G. (1976). Education, wage rates, and the division of labor between husband and wife. *Journal of Marriage and the Family, 38*, 473-483.

Ferber, M., & Birnbaum, B. (1980). Housework: Priceless or valueless? *Review of Income and Wealth, 26*, 387-400.

Ferber, M., & Green, C. (1985). Homemakers' imputed wages: Results of the Heckman technique compared with women's own estimates. *Journal of Human Resources, 20*, 90-99.

Foley, J. (1977). Trends, determinants and policy implications of income inequality in U.S. counties. *Sociology and Social Research, 61*, 441-461.

Gauger, W., & Walker, K. (1980). *The dollar value of household work* (Information

Bulletin No. 60, revised). Ithaca: Cornell University, New York State College of Human Ecology.
Gronau, R. (1973). The effect of children on the housewife's value of time. In T. Schultz (Ed.), *Economics of the family: Marriage, children, and human capital* (pp. 457-488). Chicago: University of Chicago Press.
Gronau, R. (1980). Home production—A forgotten industry. *Review of Economics and Statistics, 62*, 408-416.
Hawrylyshyn, O. (1976). The value of household services: A survey of empirical estimates. *Review of Income and Wealth, 22*, 101-103.
Heckman, J. (1977). Sample selection bias as a specification error (Working Paper No. 172). Washington, DC: National Bureau of Economic Research.
Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica, 47*, 153-161.
Hoffman, S., & Podder, N. (1976). Income inequality. In G.J. Duncan & J.N. Morgan (Eds.), *Five thousand American families—Patterns of economic progress: Vol. IV. Family composition change and other analyses of the first seven years of the panel study of income dynamics* (pp. 333-356). Ann Arbor: University of Michigan, Institute for Social Research, Survey Center.
Juster, F. (1985). A note on recent changes in time use. In F.T. Juster & F.P. Stafford (Eds.), *Time, goods, and well-being* (pp. 313-332). Ann Arbor: University of Michigan, Institute for Social Research, Survey Research Center.
Moon, M., & Smolensky, E. (Eds.). (1977). *Improving measures of economic well-being*. New York: Academic.
Morgan, J., David, M., Cohen, W., & Brazer, H. (1962). *Income and welfare in the United States*. New York: McGraw-Hill.
Murphy, M. (1980). The measurement and valuation of non-market economic activities. In C. Hefferan (Ed.), *The household as a producer—A look beyond the market* (pp. 139-194). Washington DC: American Home Economics Association.
Murphy, M. (1982). Comparative estimates of the value of household work in the United States for 1976. *Review of Income and Wealth, 28*, 29-43.
Murphy, M., & Peskin, J. (1981, August). *Women at work in the home*. Paper presented at the meeting of the American Statistical Association, Detroit, Michigan.
Nordin, J. (1976). A proposed modification of Taylor's demand analysis: Comment. *Bell Journal of Economics, 7*, 719-721.
Peskin, J. (1983). The value of household work in the 1980's. In the *American Statistical Association Proceedings of the Social Statistics Section* (pp. 266-271). Washington, DC: American Statistical Association.
Pollak, R. (1969). Conditional demand functions and consumption theory. *Quarterly Journal of Economics, 83*, 60-78.
Robinson, J. (1985). Changes in time use: An historical overview. In F.T. Juster and F.P. Stafford (Eds.), *Time, goods, and well-being* (pp. 289-311). Ann Arbor: University of Michigan, Institute for Social Research, Survey Research Center.
Sirageldin, I. (1969). *Non-market components of national income*. Ann Arbor: University of Michigan, Institute for Social Research, Survey Research Center.
Survey Research Center. (1972). *A panel study of income dynamics: Study design, procedures, available data* (Vol. 1). Ann Arbor: University of Michigan, Institute for Social Research, Survey Research Center.
Treas, J., & Walther, R. (1978). Family structure and the distribution of family income. *Sociological Forces, 56*, 866-880.
Zick, C., & Bryant, W. K. (1983). Alternative strategies for pricing home work time. *Home Economics Research Journal, 12*, 133-144.