

# COMPARATIVE ESTIMATES OF THE VALUE OF HOUSEHOLD WORK IN THE UNITED STATES FOR 1976\*

BY MARTIN MURPHY

*Bureau of Economic Analysis, Washington*

This paper uses five valuation methods to derive aggregate and per person estimates of the value of household work in the United States. Two general questions are posed: (1) what is the relationship between the aggregate estimates and the valuation method used, and (2) how do per person estimates vary by sex and earnings?

The main observations of the paper are as follows: First, the aggregate value of household work is sizable regardless of the valuation method used. Second, aggregate estimates are extremely sensitive to the method of valuation. For example, the highest estimate is \$475 billion greater than the lowest estimate. Third, contrary to earlier findings, opportunity cost valuation methods generally produce significantly higher estimates than market cost valuation methods. Fourth, per person estimates vary significantly by sex and level of earnings across valuation methods. Generally, market cost estimates decline as earnings rise while the reverse is true for opportunity cost estimates.

## 1. INTRODUCTION

Household work such as cooking, cleaning, home repairs, and child care, augments the flow of market goods and services, hence national product and economic welfare. The value of such work is not included in the U.S. National Income and Product Accounts (NIPA's).<sup>1</sup> Studies show that the value of such work is sizable and that its inclusion in the NIPA's could have far reaching effects on the level, structure, distribution, and growth rates of income and product. However, due to differences across studies in concepts, definitions, valuation approaches, and demographic-economic parameters, value estimates vary widely. For example, previous estimates for the United States range from as low as 15 percent to as high as 47 percent of the Gross National Product (GNP).<sup>2</sup> This variability raises important questions about the sensitivity of such estimates to the estimation methodology and to the distribution of demographic and economic characteristics across populations.

This study derives estimates of the value of household work in the United States for 1976 and addresses two broad questions. First, how sensitive are the estimates to the method of valuation? Second, how do they vary by sex and level of earnings? The study first discusses various conceptual issues related to definition and valuation of household work and then presents the estimates and describes the methods and sources used. Five valuation methods are used, three

\*Paper prepared for the Seventeenth General Conference of the International Association for Research in Income and Wealth, Gouvieux, France, August 16-22, 1981. The views expressed in this paper do not necessarily reflect those of the Bureau of Economic Analysis or the U.S. Department of Commerce.

<sup>1</sup>Some portion of such work may, however, be indirectly accounted for. For example, household work related to home repairs and maintenance may be reflected in the imputed rental value of owner occupied housing.

<sup>2</sup>For a review of these and other estimates, see Murphy [10].

of which have never been used before. Each method is defined and discussed in the section on valuation issues. The basic data source for the study is a 1975–76 time-use study by the Survey Research Center, University of Michigan (SRC).<sup>3</sup>

## 2. CONCEPTUAL ISSUES

Implementing measures of the value of household work raises issues related to (1) defining economic activity and household work activities, (2) measuring the quantity of such work, and (3) valuing this quantity. Each is discussed in turn.

### *Defining Economic Activity and Household Work*

The definition of economic activity underlying the NIPA's is, by and large, based on market transactions. Household work is a nonmarket activity, hence by NIPA standards, a noneconomic activity. However, there are alternative definitions of economic activity. The most comprehensive alternative defines economic activity to include virtually all household activities both market and nonmarket, including leisure. A less comprehensive alternative defines economic activity to include market activities and a limited number of nonmarket activities, a subset of which are generally referred to as household work. This definition has been used in several studies and is based on a criterion which says that economic activities are those resulting in income or product rather than direct utility.<sup>4</sup> A variant of this criterion is adopted here and used to define and identify household work as a subset of economic activity. Specifically, household work is defined as nonmarket uses of household time that result in the production of a good or service that could be purchased in the market.

This definition permits identification of thirty activities in the SRC study as household work. These activities, grouped into nine types of household work, are as follows:

- (1) Meal preparation;
- (2) Meal cleanup;
- (3) Cleaning and gardening (e.g. indoor and outdoor cleaning, gardening and pet care);
- (4) Laundry;
- (5) Home repairs and hobbies;
- (6) Childcare (e.g. baby care, reading and talking to children, playing with children, and related travel);
- (7) Helping and teaching children;
- (8) Medical care (e.g. medical care to children and adults in the household);

<sup>3</sup>See Juster [7].

<sup>4</sup>See Adler and Hawrylyshyn [1] and Kendrick [8]. This definition excludes time spent in activities where the individual's presence is required during the act of production to obtain the output. Time spent receiving personal care services in the market as well as self-administered services are therefore viewed as noneconomic activities.

- (9) Other (e.g. paying bills, recordkeeping, shopping for real estate, consumer durables, groceries, and services; related travel, and volunteer work).<sup>5</sup>

The above groupings were judged useful for valuation purposes.

### *Measuring the Quantity of Household Work*

The quantity of household work can, in principle, be measured as a flow of inputs or a flow of outputs. There are little or no data on outputs. Indeed, apart from tangible goods such as homegrown vegetables or homemade clothes, there is no agreed upon definition of what measurable outputs should consist of. Consequently, researchers have usually measured the quantity of household work in terms of the input of hours. There are two problems with this approach. First, the contribution of nonlabor inputs such as consumer durables is ignored. Second, errors of measurement may arise because two or more activities, for example dishwashing and babysitting, occur simultaneously. The Survey Research Center data accounted for the latter problem by having respondents report only the primary activity they were engaged in. In this study the quantity of household work is measured as the number of hours spent in the nine types of household work identified above.

### *Valuing Household Work*

There are three general approaches to valuing household work. Two are based on the cost of labor inputs and one on the value of household output.<sup>6</sup> Due to the exploratory nature of the latter approach, only the two labor input approaches are discussed and implemented. These approaches are: (1) market cost—the cost to the household of substituting paid market labor for its own labor as an input to household work, and (2) opportunity cost—the actual or potential earnings foregone by allocating time to household work. There are variants within each approach. In this study, two market cost variants and three opportunity cost variants are implemented. Each valuation approach and its variants is discussed below.

#### *The Market Cost Approach*

When a household substitutes paid labor for its own labor as an input to household work there is a cost—the prevailing market wage rates of the workers hired. Thus, quality problems aside, if the household is about as efficient as the market a basis of valuation is established. This approach is preferred by Kendrick [8], Eisner [3] and others interested in adding production-oriented measures of household work to the NIPA's.

<sup>5</sup>With minor differences in terminology the above list has been used by Eisner [3], Kendrick [8] and others. For a similar but shorter list see, United Nations [14]. That report recommends that certain activities be omitted either because they are quantitatively unimportant or no feasible market alternatives exist for most people. The activities are: making clothes and household textiles, record keeping and bookkeeping, repairing and servicing motor vehicles, shopping and night care of children.

<sup>6</sup>The output approach utilizes a household production function framework which includes labor and nonlabor inputs. See Gronau [5].

A household can substitute paid labor for its own labor in two ways: (1) by hiring a market replacement such as a housekeeper to replace a particular family member, or (2) by hiring a variety of specialists—cooks, gardeners, plumbers, and so on—to replace the specific services of a family member. This leads to two variants of the market cost approach. The first variant, which will be called replacement cost, uses the wage rate for a market replacement. The second variant, which will be called service cost, uses wage rates for a variety of market specialists. Problems with each variant are discussed in turn.

*Replacement cost.* There are several problems with this variant. First, because of specialization both in the household and in the market, there are types of household work a single market replacement could not undertake. Second, the estimates are highly sensitive to the choice of a market replacement occupation. Moreover, if wages in that occupation are lower relative to other occupations, productivity in household work is understated. Third, market wages do not reflect differences in quality and efficiency between the household and the market. In this study, private household workers are designated as the market replacement occupation.

*Service cost.* In theory, this variant overcomes the problem of specialization inherent in the replacement cost approach but presents other specific problems. First, it assumes households substitute specific types of paid labor for specific types of household work. In practice they might not since workers are generally not available for irregular short periods of time. An additional deterrent for households might be the higher time costs of searching for several workers rather than one. Second, there are problems in determining the appropriate market equivalent occupations and their associated wage rates. Typically, household work activities require skills found in more than one market occupation. Moreover, even when a one-to-one link can be made between a household work activity and a market occupation the appropriate wage rate can still pose a problem. For example, should painting the house be valued at the wage rate of experienced union painters, non-union painters, or painter's apprentices? Finally, even if the appropriate occupation and wage rate are fairly obvious the requisite data may not be available. Third, again, the estimates are highly sensitive to the choice of market equivalent occupations. Here, twenty-seven occupations are designated as market equivalents to the nine types of household work.

### The Opportunity Cost Approach

The model underlying the opportunity cost approach assumes that the rational individual allocates time till its net return is equalized at the margin. One use of time is paid work. In equilibrium, to the individual, the marginal value of an hour of household work equals the foregone net return to a marginal hour of paid work. Ignoring nonpecuniary returns, the net return to a marginal hour of paid work is the marginal hourly compensation rate minus the marginal costs of work. The opportunity cost approach is preferred by Nordhaus and Tobin [12] and others interested in measuring economic welfare.

Previous applications of the opportunity cost approach have used two variants, (1) average market wages and (2) after-tax wages, to value household work. These two variants are of interest in their own right but neither is the

theoretically correct value to the individual, given the assumptions of the opportunity cost model. The theoretically correct valuation is the net return to paid work. This study, therefore, implements three variants of the opportunity cost approach: (1) average compensation or simply compensation, which is average hourly wages plus supplements to wages and salaries, (2) after-tax compensation, which is compensation minus marginal taxes, and (3) net compensation, which is after-tax compensation minus certain work-related costs.<sup>7</sup> Net compensation is a rough estimate of the net return to paid work.

Regardless of variant, there are four general problems with the opportunity cost approach and average wage rates or compensation as its measure. First, it is an equilibrium concept. It may not apply, therefore, to employed persons desiring more or fewer hours of work, the involuntarily unemployed, and others in disequilibrium situations. It could be argued, for example, that the unemployed have a lower opportunity cost than the employed. This issue takes on added significance in times of rising unemployment or, more generally, when hours of market work decline, since household work can be expected to rise.

Second, the opportunity cost of persons in equilibrium but not working for pay, for example, those voluntarily unemployed or not in the labor force, is unknown. Third, marginal rather than average values should be used in calculating the net return. At the same time, if household work is subject to diminishing marginal productivity its total value is greater than hours times the marginal return. Fourth, nonpecuniary benefits and costs of paid work are not included in wages or compensation.

In addition to these general problems, specific problems arise in estimating marginal tax rates and work-related costs. For example, compensation is based on wage and salary earnings whereas taxes are based on income. Assumptions are required, therefore, about the relationship between earnings and income. Work-related costs pose problems of definition and identification. Moreover, it is not always clear when such costs are fixed and when they are marginal.

The above problems are essentially ignored here. Specifically, it is assumed first that everyone is in equilibrium. Second, for all persons, regardless of labor force status, the value of time at the margin is assumed equal to opportunity costs. Third, opportunity cost estimates are based on reported earnings for those with paid employment and are imputed for others. In effect, the value of time of persons with no reported earnings is set equal to their potential wage.<sup>8</sup>

<sup>7</sup>Compensation measures the social opportunity cost of household work, that is, the value of lost market output. As such, compensation is preferred to wages. After-tax compensation is an alternative approximation of the net return when data on work related costs are unavailable or problematic.

<sup>8</sup>Although the value of time of such persons is unknown it appears reasonable to set it equal to potential wages. Gronau [4] has developed an estimating technique based on the relationship between labor force participation rates and the observable joint distribution of time values and potential wages. The technique produces estimates of time values that bracket both the potential wage rate and the average wage of employed persons. The Gronau technique was applied in the present study with similar results.

### 3. HOUSEHOLD WORK IN 1976

Table 1 presents five estimates for 1976: (1) replacement cost estimates (RCE), (2) service cost estimates (SCE), (3) compensation estimates (CE), (4) after-tax compensation estimates (ATCE), and (5) net compensation estimates

TABLE 1  
AGGREGATE ESTIMATES OF THE VALUE OF HOUSEHOLD WORK IN 1976

Population Group	Annual Hours of Household Work (Billions)	Valuation Method				
		Market Cost		Opportunity Cost		
		Replacement Cost Estimate (RCE)	Service Cost Estimate (SCE)	Compensation Estimate (CE)	After-Tax Compensation Estimate (ATCE)	Net Compensation Estimate (NCE)
Billions of Dollars						
All persons	188.8	540.0	752.4	1015.4	865.0	751.8
Men	53.7	153.6	237.4	407.3	342.5	318.6
Women	135.1	386.4	515.0	608.1	522.5	433.2
Percent of GNP						
All persons		31.6	44.1	59.5	50.7	44.1
Men		9.0	13.9	23.9	20.1	18.7
Women		22.6	30.2	35.6	30.6	25.4
Percent Distribution						
All persons	100.0	100.0	100.0	100.0	100.0	100.0
Men	28.4	28.4	31.6	40.1	39.6	42.4
Women	71.6	71.6	68.4	59.9	60.4	57.6

(NCE). In each case, the estimate is derived as the product of hours of household work as previously defined and the relevant valuation variant. The population basis of the estimates is all persons 18 years of age and older in the civilian noninstitutional population. A summary description of methods and sources appears in the Appendix.

The estimates are discussed in the context of the two broad questions stated earlier and rephrased below:

- (1) How sensitive are aggregate estimates to the method of valuation and how does this vary by sex?
- (2) How do per person level estimates vary by sex and earnings?

#### *Sensitivity of the Aggregate Estimates*

The discussion below focuses on the magnitude as well as the sensitivity of the estimates.

## Magnitude

From Table 1, aggregate hours of household work for all persons were 188.8 billion in 1976. The value of this work ranged from \$540.0 billion to \$1,015.4 billion or, respectively, 31.6 percent to 59.5 percent of the GNP.

These estimates are not only sizable, they are larger than any previous estimates using similar valuation methods. The highest previous estimate for the United States appears in Nordhaus and Tobin [12]. They estimated the value of household work to be 47 percent of the GNP in 1965. The estimates presented here are higher than previous estimates for three basic reasons: (1) SRC estimates of hours spent in household work are higher, (2) wage rates were estimated for each person from micro level survey data rather than published wage averages for all persons, and (3) supplements to wages and salaries were added to wages.<sup>9</sup> These differences are offset to some extent by the smaller population base of the present study. The estimates in Table 1 decline substantially and are more in line with previous estimates when they are adjusted to take account of the above differences. Table 2, for example, compares the present estimates—before and after adjusting for the above differences—with several previous studies including Nordhaus and Tobin. As Table 2 shows, the adjusted estimates range from 29.7 percent to 47 percent of the GNP compared to a range of 26.3 percent to 47 percent for previous estimates.

## Sensitivity

From Table 1, two points may be noted. First, aggregate estimates for all persons are highly sensitive to the method of valuation. For example, the CE, which is the highest estimate, is 188 percent of the RCE, which is the lowest and 135 percent of the SCE. This result hardly supports the view that only minor differences exist between market cost and opportunity cost valuations.<sup>10</sup> Second, it is not generally true that the market cost approach produces lower estimates than the opportunity cost approach. For example, the SCE and NCE are virtually identical. There is no *a priori* reason to expect this latter result and it should perhaps be viewed with caution. It may simply be due to the specific way these variants were implemented rather than some underlying theory. Still, it is sufficiently intriguing to warrant further investigation, but not here.

*Variations by sex.* From Table 1, aggregate hours of household work by men were 53.7 billion and ranged in value from \$153.6 billion to \$407.3 billion.

For men, four points may be noted. First, estimates are much more sensitive to the method of valuation than the estimates for all persons. For example, the CE is 265 percent of the RCE and 172 percent of the SCE. Moreover, the SCE is substantially lower than the NCE. Second, unlike the results for all persons, the market cost approach produces lower estimates than the opportunity cost approach regardless of variant. Third, their relative share in household work varies considerably by valuation variant. For example, it is 28.4 percent by the

<sup>9</sup>For example, average wages in the SRC survey were roughly 10 percent higher than average wages published by the Bureau of Labor Statistics.

<sup>10</sup>See, for example, Adler and Hawrylyshyn [1] and Murphy [9].

TABLE 2  
COMPARISON OF SELECTED ESTIMATES OF HOUSEHOLD WORK

Author and Year	Method of Valuation				
	Replacement Cost Estimate (RCE)	Service Cost Estimate (SCE)	Compensation Estimate (CE)	After-Tax Compensation Estimate (ATCE)	Net Compensation Estimate (NCE)
Billions of Dollars					
Murphy, 1976: adjusted <sup>1</sup>	507.0 <sup>2</sup>	665.8	801.8 <sup>3</sup>	688.4 <sup>4</sup>	
Eisner, 1969	279.3				
Kendrick, 1973	344.2				
Nordhaus and Tobin, 1965			321.4		
Adler and Hawrylyshyn, 1971		38.8 <sup>5</sup>		37.6 <sup>5</sup>	
Percent of GNP					
Murphy, 1976: adjusted <sup>1</sup>	29.7	39.0	47.0	40.4	
Eisner, 1969	29.9				
Kendrick, 1973	26.3				
Nordhaus and Tobin, 1965			47.0		
Adler and Hawrylyshyn, 1971		41.1		40.0	

<sup>1</sup>Adjusted to reflect differences between the present study and various other studies due to differences in hours, population base, and method of valuation.

<sup>2</sup>Adjusted for comparison with Eisner [3].

<sup>3</sup>This estimate is based on gross wages rather than gross compensation for purposes of comparison with Nordhaus and Tobin [12].

<sup>4</sup>This estimate is based on net wages rather than net compensation for purposes of comparison with Adler and Hawrylyshyn [1].

<sup>5</sup>Canadian estimates.

RCE and 42.4 percent by the NCE.<sup>11</sup> Fourth, opportunity cost variants produce higher relative share estimates than market cost variants.

Women's aggregate hours of household work were 135.1 billion and ranged in value from \$386.4 billion to \$608.1 billion. Again, four points may be noted. First, estimates are less sensitive to the method of valuation than those for all persons and much less sensitive than men's estimates. For example, the CE is 157 percent of the RCE and 118 percent of the SCE. Contrary to the results for men, the SCE is higher than the NCE. Second, as is the case for all persons, it is not generally true that the market cost approach produces lower estimates than the opportunity cost approach. Third, as with men, relative shares vary considerably by valuation variant but in the opposite direction to men's. For example, women's relative share is 57.6 percent by the NCE and rises to 71.6 percent by the RCE. Fourth, market cost variants produce higher relative share estimates than opportunity cost variants.

<sup>11</sup>In previous studies, men's relative share has ranged from 20 percent to 37 percent. See, Hawrylyshyn [6] and Murphy [9].



### *Per Person Estimates*

From Table 3, average annual hours of household work were 1300 and ranged in value from \$3,718 to \$6,991. Since per person estimates follow the same general pattern as aggregate estimates with respect to the points noted above, only variations by sex and earnings are discussed below.

*Variations by sex and earnings.* For persons with reported earnings, average hours of household work declined continually as earnings rose, suggesting a tendency to substitute other activities, including paid work, for household work.<sup>12</sup> For example, at earnings of \$25,000 and over the NCE is \$5,520 greater than the SCE. This provides an incentive to supply additional hours to the labor market and with the resulting income purchase the market-equivalent labor inputs for household work. By contrast, in the earnings class \$1–4,999 there is no such incentive to substitute market labor for one's own labor in household work since the NCE is virtually the same as the RCE and actually below the SCE.

For men with reported earnings, average hours of household work declined from 902 in the earnings class \$1–4,999 to 598 for earnings of \$25,000 and over. At this earnings level the NCE is \$4,876 greater than the RCE and \$3,992 greater than the SCE. The NCE is greater than the RCE, and to a lesser degree the SCE at all earnings levels except \$5,000–9,999. Men, therefore, appear to have a substitution incentive at virtually all earnings levels.

For women with reported earnings, average hours of household work declined from 1652 in the earnings class \$1–4,999 to 940 for earnings of \$25,000 and over. At this earnings level, the NCE is \$9,475 greater than the RCE and \$8,595 greater than the SCE. This pattern holds for earnings above \$10,000 but is reversed below that earnings level. Thus, at earnings levels above \$10,000 there appears to be an incentive for women to substitute market labor for their own labor in household work but no incentive to do so at earnings levels below \$10,000.

#### 4. SUMMARY OF FINDINGS AND CONCLUDING REMARKS

First, the paper presents several new estimates:

- (1) Opportunity cost estimates using average compensation to value time;
- (2) Opportunity cost estimates using average compensation net of taxes to value time;
- (3) Opportunity cost estimates using average compensation net of taxes and certain work-related costs to value time;
- (4) Estimates by earnings by sex.

In addition to these new estimates, the questions posed earlier lead to the following observations:

- (1) The value of household work is sizable no matter how valued. It ranges from roughly 32 percent to 60 percent of the GNP.
- (2) The high estimate is substantially larger than the previous high estimate of 47 percent of the GNP.

<sup>12</sup>As earnings rise, there is both a substitution effect and an income effect. Thus, individuals may be substituting leisure for both paid work and household work.

TABLE 3  
ESTIMATES OF THE VALUE OF HOUSEHOLD WORK PER PERSON, BY EARNINGS CLASS, 1976

Annual Earnings	Household Work Hours Per Year	Valuation Method				
		Market Cost		Opportunity Cost		
		Replacement Cost Estimate (RCE)	Service Cost Estimate (SCE)	Compensation Estimate (CE)	After-Tax Compensation Estimate (ATCE)	Net Compensation Estimate (NCE)
(Dollars)						
Adults:						
All earnings classes	1,300	3,718	5,180	6,991	5,955	5,176
No earnings <sup>1</sup>	1,611	4,608	6,325	7,935	7,342	6,315
\$1-4,999	1,504	4,301	5,800	6,199	5,295	4,306
\$5,000-9,999	1,118	3,197	4,467	5,046	3,895	3,384
\$10,000-14,999	834	2,384	3,486	5,323	3,990	3,601
\$15,000-19,999	779	2,227	3,346	6,508	4,744	4,342
\$20,000-24,999	702	2,008	3,142	6,908	4,772	4,289
\$25,000 and over	645	1,845	2,731	12,353	7,889	7,365
Men:						
All earnings classes	786	2,248	3,475	5,961	5,012	4,663
No earnings <sup>1</sup>	891	2,547	3,962	6,652	6,487	6,093
\$1-4,999	902	2,579	3,806	6,010	5,573	5,168
\$5,000-9,999	732	2,092	3,246	3,179	2,527	2,298
\$10,000-14,999	721	2,061	3,141	4,670	3,562	3,289
\$15,000-19,999	736	2,105	3,329	6,049	4,445	4,102
\$20,000-24,999	657	1,880	2,974	6,533	4,517	4,058
\$25,000 and over	598	1,711	2,595	11,008	7,030	6,587
Women:						
All earnings <sup>1</sup> classes	1,756	5,023	6,694	7,905	6,792	5,631
No earnings	1,969	5,632	7,500	8,572	7,766	6,426
\$1-4,999	1,652	4,723	6,279	6,246	5,227	4,094
\$5,000-9,999	1,417	4,053	5,412	6,491	4,954	4,224
\$10,000-14,999	1,130	3,231	4,391	7,041	5,117	4,419
\$15,000-19,999	969	2,772	3,585	8,562	6,080	5,416
\$20,000-24,999	1,178	3,368	4,931	10,884	7,488	6,736
\$25,000 and over	940	2,689	3,569	20,653	13,189	12,164

<sup>1</sup>This includes persons with don't know and not available responses and is not, therefore fully representative of persons with no actual earnings.

- (3) Estimates are extremely sensitive to the method of valuation. For example, the high estimate, produced by the opportunity cost approach, is almost 90 percent greater than the low estimate, produced by the market cost approach.
- (4) Estimates for men are much more sensitive to the method of valuation than are estimates for women.
- (5) The large difference between the high and low estimates contradicts earlier findings that the market cost and opportunity cost approaches do not produce significantly different estimates. At the same time, there are variants within each approach (e.g. service cost and net compensation) that produce nearly identical estimates.
- (6) Men's relative share in household work ranges from about 28 percent to 42 percent. This result is consistent with previous findings that men account for roughly one-third of household work by adults. Still, opportunity cost variants produce higher relative share estimates than do market cost variants. The reverse is true for women.
- (7) Variations by earnings suggest men have an incentive to substitute the market's time for their own time in household work at virtually all earnings levels. This may explain, in part, why men do less household work than women.
- (8) Women with earnings above \$10,000 have a similar incentive whereas those with earnings below \$10,000 do not.

The above findings, particularly those relating to the sensitivity of the estimates, raise perplexing questions about the "appropriate" method for valuing household work. What is appropriate depends, of course, on one's objective. For example, I have suggested elsewhere, and others seem to agree, that market cost is more appropriate than opportunity cost if the objective is to measure product. The reverse is more appropriate for measuring welfare. In other cases the choice is less clear. For example, there have been social security and tax reform proposals to add the value of household work to earnings. Given the variations by valuation method across earnings classes, advocates of such proposals face a critical choice in deciding on the appropriate method. Unfortunately, it is far from obvious what that method should be.

#### APPENDIX: METHODS AND SOURCES

As noted, the basic data source for hours of household work and opportunity wages is the SRC study referenced earlier. That study collected time use and economic-demographic data from a nationally reliable sample of households representing the civilian noninstitutional population 18 years of age and older in the contiguous United States. There were 1,519 respondents and 887 spouses who were treated as supplemental respondents. Respondents and spouses used time diaries to record the previous day's activities which were then categorized into various groups of activities including those defined here as household work. Data for different weekdays and Saturday and Sunday were collected in four waves between October 1975 and September 1976. These data were used to create a time use profile for a typical (synthetic) week including a Saturday, a

Sunday, and one weekday. This synthetic week data, weighted to reflect differences between sample and census parameters for age, sex, education, and urbanicity, is the basis of the estimates presented here. Since the SRC survey is a basic source for every component, only additional sources are noted.

### *Hours of Household Work*

*Method.* Aggregate annual hours of household work for all persons 18 years of age and older in the civilian noninstitutional population ( $H$ ) were estimated by

$$H = h_m N_m + h_w N_w$$

where  $h_m$  and  $h_w$  are, respectively, average hours of men and women, and  $N_m$ ,  $N_w$ , the numbers of each in the population.

Average annual hours of household work for all persons ( $h$ ) were estimated by

$$h = k_m h_m + k_w h_w$$

where  $h$  is average hours per person and  $k_m$ ,  $k_w$  are the percentages of men and women in the population.

Average annual hours for men and women for each of the nine household work activities and for all household work were computed from the SRC data tape.

*Sources.* Population: U.S. Department of Commerce, Bureau of the Census, unpublished data.

### *Replacement Cost Estimate*

*Method.* The aggregate value of household work for all persons and for each person using the replacement cost variant was estimated as,

$$\text{RCE} = \sum_{i=1}^N h_i w_p$$

where  $N$  is the number of persons in the population,  $h_i$  is average hours of household work for person  $i$ , and  $w_p$  is average employee compensation for private household workers in 1976. Average compensation equals total employee compensation divided by total hours worked by full-time and part-time employees. Since households can replace family members with a person of either sex, average market compensation rates for all workers rather than separate male-female rates were used.

*Sources.* Wages: U.S. Department of Commerce [18], Tables 6.5 and 6.10.

### *Service Cost Estimate*

*Method.* The aggregate value for all persons and for each person using the service cost variant was estimated as,

$$\text{SCE} = \sum_{i=1}^N \sum_{j=1}^9 h_{ij} w_j$$

where  $h_{ij}$  is average hours of household work of type  $j$  for person  $i$ ,  $w_j$  is a weighted average of wage rates in the various market occupations equivalent to household work of type  $j$ . The weights for  $w_j$  are the number of workers in each market equivalent occupation. From two to eight occupations were selected as equivalents to each type of household work. In all, thirty-four wage rates ranging from \$2.04 to \$6.82 and covering twenty-seven occupations were used. Wage rates rather than compensation are used on the assumption that most households would not provide supplements to hired workers other than private household workers.

Data necessary to calculate average wage rates by occupation were not available for 1976 but were available for 1969. Wage rates were calculated for 1969 and projected for 1976 using an index of average hourly earnings. The index was calculated as average hourly earnings in 1976 divided by average hourly earnings in 1969 for various industry divisions and agriculture. Wages for 1969 were calculated by dividing average annual earnings by average weeks worked and average hours per week.

*Sources.* Wages: U.S. Department of Commerce [15], tables 11, 24, and 45. Wage index: U.S. Department of Labor [19], Table 14; U.S. Department of Agriculture.

#### *Compensation Estimate*

*Method.* For all persons and for each person, the aggregate value of household work using the compensation variant was estimated as,

$$CE = \sum_{i=1}^N h_i(w_i + s)$$

where for each person on the SRC data tape with reported hours and earnings  $w_i$  is average wage and salary earnings for May 1976 divided by 4.33 times average weekly hours, and  $s$  is wage and salary supplements equal to 16.6 percent of  $w_i$ .

For persons with no reported earnings or hours ( $w_i + s$ ) was imputed by age, sex, and education characteristics of those with reported earnings.

*Sources.* Wage supplements: U.S. Department of Commerce [18], table 1.13.

#### *After-Tax Compensation Estimate*

*Method.* For all persons and for each person, the after-tax compensation variant yielded

$$ATCE = \sum_{i=1}^N CE_i - t_i$$

where  $t_i$  is the marginal tax on an additional hour of work. Marginal tax is the product of actual or imputed wages and the marginal tax rate ( $t_r$ ).

That is,

$$t_i = w_i t_r.$$

The marginal tax rate is the sum of federal and state marginal tax rates. Federal rates are based on Adjusted Gross Income (AGI). For each AGI class, they are a weighted average of marginal rates for four types of returns with taxable incomes: (1) joint, (2) married filing separately, (3) heads of households, and (4) single. Weights are the total number of returns filed for each AGI class. State rates were estimated as 18.9 percent of federal rates, the ratio of federal government personal income tax receipts to state and local personal income tax receipts.

Marginal tax rates were assigned to wage and salary earnings classes on the assumption that each such class is comparable to the corresponding AGI class. For husbands and wives, rates were assigned to joint earnings. Consequently, the marginal rate on either spouse's earnings is subject to the rate on their joint earnings. Thus, if one spouse did not work for pay, the tax rate applied to their imputed wage rate was based on the other spouse's earnings. For single persons, the tax rate was based on own earnings.

*Sources.* Federal rates: U.S. Department of the Treasury [22], Tables 1.4, 3.14–3.17. State rates: Department of Commerce [18], Tables 3.2 and 3.4.

### *Net Compensation Estimate*

*Method.* For all persons and for each person, the net compensation variant yielded

$$NCE = \sum_{i=1}^N ATCE_i - C_i$$

where for each person  $C_i$  is work-related costs. These costs consist of average expenditures per hour of work for day care ( $d$ ) and commuting ( $c$ ) and the value of commuting time ( $v$ ). For each person in the SRC survey with reported earnings and hours of work,  $d$ ,  $c$ , and  $v$  were calculated as described below and deducted from actual hourly after-tax compensation. For persons with no reported hours and earnings  $C_i$  was imputed as for ( $w_i + s$ ) above and deducted from imputed after-tax compensation. The components of  $C$  were calculated as follows:

$d$ : Annual expenditures for women with children under 14, divided by annual hours worked. Men were assumed to have zero day care expenditures. Data are from a 1975 survey updated to 1976 and adjusted for the 20 percent tax credit. The all items component of the Consumer Price Index was used to update 1975 expenditures.

$c$ : For men and women, annual expenditures divided by hours of work. Expenditures are a weighted average for three modes of travel: driving alone, carpooling, and public transportation. Weights are the percentage of persons using each mode. The estimated cost of driving alone is the product of trip length and average cost per mile. For carpooling, it is the product of trip length and one-half the average cost per mile of driving alone, the implicit assumption being that most car pools involve only two people. Public transportation costs were estimated at 72 cents per day.

$v$ : The literature suggests, and it was assumed here, a value equal to one-third the individual's wage rate.

*Sources.* Day care expenditures: Rodes and Moore [13], pp. 8–17; U.S. Department of Labor [20], pp. A28–A29; U.S. Department of Commerce [16], p. 1. Commuting expenditures: U.S. Department of Commerce (17), Tables N, O; U.S. Department of Transportation [21]; American Public Transit Association [2], Table 12. Value of commuting time: Nelson [11].

#### REFERENCES

- [1] Adler, Hans, J. and Hawrylyshyn, Oli, Estimates of the Value of Household Work, Canada, 1961 and 1971, *Review of Income and Wealth*, December 1978, 333–355.
- [2] American Public Transit Association, *Transportation Fact Book 1978–79*, Washington, D.C., 1979.
- [3] Eisner, Robert, Total Incomes in the United States, 1959 and 1969, *Review of Income and Wealth*, March 1978, 41–70.
- [4] Gronau, Reuben, The Intrafamily Allocation of the Housewives' Time, *American Economic Review*, September 1973, 534–651.
- [5] ———, Home Production—A Forgotten Industry, *Review of Economics and Statistics*, August 1980, 408–416.
- [6] Hawrylyshyn, Oli, The Value of Household Services: A Survey of Empirical Estimates, *Review of Income and Wealth*, June 1976, 101–131.
- [7] Juster, F. Thomas, Courant, Paul, Duncan, Greg J., Robinson, John P., and Stafford, Frank P., *Time Use in Economic and Social Accounts*, Ann Arbor, Survey Research Center, Institute for Social Research, University of Michigan, 1978.
- [8] Kendrick, John W., Expanding Imputed Values in the National Income and Product Accounts, *Review of Income and Wealth*, December 1979, 349–364.
- [9] Murphy, Martin, The Value of Nonmarket Household Production: Opportunity Cost Versus Market Cost Estimates, *Review of Income and Wealth*, September 1978, 243–255.
- [10] ———, The Measurement and Valuation of Household Nonmarket Time. Discussion Paper, Bureau of Economic Analysis, U.S. Department of Commerce, March 1980.
- [11] Nelson, Jon P., Accessibility and the Value of Time in Commuting, *Southern Economic Journal*, January 1977, 1321–1329.
- [12] Nordhaus, William and Tobin, James, Is Growth Obsolete? *Economic Growth*, Fiftieth Anniversary Colloquium V, New York, National Bureau of Economic Research, 1972.
- [13] Rodes, Thomas W. and Moore, John C., *National Childcare Consumer Study: 1975*, Vol. 2, Arlington, Va., Unco, Inc.
- [14] UN Statistical Office, Future Directions for Work on the United Nations System of National Accounts, March 1980, E/CN.3/AC.9.
- [15] U.S. Department of Commerce, Bureau of the Census, *U.S. Census of Population: 1970, Subject Reports, PC(2)-7A, Occupational Characteristics*.
- [16] ———, *Current Population Reports*, Series P-60, No. 115.
- [17] ———, *Current Population Reports*, Series P-23, No. 99.
- [18] ———, Bureau of Economic Analysis, *Survey of Current Business*, July 1979.
- [19] U.S. Department of Labor, Bureau of Labor Statistics, *Monthly Labor Review*, February 1980.
- [20] ———, Special Labor Force Report No. 206.
- [21] U.S. Department of Transportation, Federal Highway Administration, *The Cost of Owning and Operating an Automobile, 1976*.
- [22] U.S. Department of the Treasury, Internal Revenue Service, *Statistics of Income—1976, Individual Income Tax Returns*.