ESTIMATES OF THE VALUE OF HOUSEHOLD WORK
CANADA, 1961 and 1971*

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The paper presents some estimates of the imputed dollar value of household work (HW) for Canada in 1961 and 1971, finding this to be about $16 and $38 billion respectively, equal to 40 percent of GNP. From the results we derive some implications about five questions raised in the relevant literature. First, no clear evidence of a downward trend for the ratio HW/GNP is found, contrary to U.S. results. Second, addition of HW to GNP as a welfare measure does not affect the general pattern of past growth estimates. Third, a cost-by-function method of estimating HW is found superior in its theoretical support and the detail it provides, but the opportunity-cost method, despite doubts on its theoretical validity, gives a good approximation in the aggregate, and, being simpler, is likely to remain popular. Fourth, disaggregation does matter if detail by region or family type is required, in which case data by number and ages of children and market-employment status of females are needed; for the total, a reasonable estimate (6–7 percent error) is given by further aggregated data. Fifth, sensitivity of HW to accuracy in the data used is large only for female wages chosen, in particular for the function "cooking". Finally, though available data must be manipulated to fit the needs of HW, especially for earlier years, the extent of this is not all that much more than is commonly found for GNP estimations.

I. INTRODUCTION

Though Nordhaus and Tobin were by no means the first to present an estimate of the dollar value of work in households,[1] they legitimized such imputations by demonstrating their impact upon the issue of economic growth and welfare. Since then, the number of estimates has continued to grow, as has the list of questions about the value of household work (HW henceforth). At least four important ones are identifiable in the literature. First, what has been the rate of productivity growth in the household sector in relation to the market sector? (Nordhaus–Tobin [13]). Second, does the ratio of HW/GNP decline over time and why? (Weinrobe [19], Hawrylyshyn [5]). Third, how does inclusion of HW affect estimates of growth over time (in effect the other side of question 2); and fourth, what is the proper method of calculating HW: labour's opportunity-cost or individual function replacement cost? (Sirageldin [15], Walker–Gauger [18], and Hawrylyshyn [5], [7]).

Three additional issues arise in considering methodology, ignoring here the purely theoretical issue of the nature of utility maximization in the household

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[1]For a review of the key studies, see Hawrylyshyn [5]; an important omission there is the study of Margaret Reid, "The Economic Contribution of Homemakers", *The Annals of the American Academy of Political and Social Science*, Vol. 251, 1947, pp. 61–69.

production function.[2] Thus, a fifth issue is: what degree of disaggregation of family units by type, and of time-use by category, is appropriate? (This really is a question about the nature of the household production function.) Sixth (probably more important than the preceding), what are the "correct" market-occupations and market-wages to apply to each task in the household? Here we must decide whether an hour of cooking in the household is equivalent to the work of a chef or that of a short-order cook. A seventh issue that recurs is the very practical one of data compatibility (and even availability), going back in time. This is not, of course, unique to HW imputations, but it may be particularly acute for such estimates because the form in which census and occupational data appear has changed considerably, and often retrieval costs may far exceed the resources any agency is likely to devote to this exercise.

Of the seven questions noted, we do not consider here the productivity change problem because of data limitations. The paper thus addresses itself to the following six issues:

1. the time trend of HW/GNP;
2. the effect of HW inclusion on growth estimates;
3. the choice of methodology;
4. the degree of disaggregation in the estimates;
5. the problem of choice of wages in the "cost by function" method, and
6. the practical problem of manipulating available data from earlier years to fit the requisite format of estimation.

The remainder of the paper is divided as follows: section II outlines the methodology used in estimation, while section III describes the data and related procedures (addressing issue number 6), presents the figures for 1961 and 1971, and compares them to other (non-Canadian) studies. In section IV, a number of issues dealing with the methodology of measurement are discussed, with particular focus on items 3, 4 and 5. Issues related to trends over time (1 and 2 above) are the concern of section V. Finally, section VI summarizes the principal conclusions of the paper.

II. METHODOLOGY OF ESTIMATION

The conceptual framework for the estimates has been discussed in an earlier paper by one of the authors.[3] Here, it will suffice to note that the estimates of economic activity are based on the "third-person criterion" defined there: *an economic activity is one which can be done by a third person without reducing its final utility value.* This rationale leads to the general market replacement formula:

$$\text{HFC} = 52 \sum_{j=1}^{10} \sum_{a=1}^{8} \left[F_{ja} \cdot \sum_{f=1}^{8} (T_{jaf} \cdot W_f) \right]$$

[2]On this, see Pollak & Wachter [14], Muellbauer [12], for general views, and Gronau [3], Hawrylyshyn [7], for views relating the theory to measurement of HW. The key problems at this level are the jointness of time-use, and the distinction between activities that produce utility directly and indirectly.

[3]Hawrylyshyn [7].

where HFC = annual value of HW; F_{ja} = number of families in category ja (see below); T_{jaf} = time use per week in HW activity f by household of type ja; and W_f = hourly wage for market occupation equivalent to f.

In Hawrylyshyn [5] the principal family factors affecting variation in the value of HFC are found to be marital status, market employment status of wife, number of children, and the age of the youngest child. Thus, ten categories of family size and age structure are used, along with eight categories of the other characteristics noted; these are shown in Table 1, which also lists the eight functions of household

TABLE 1

SUBSCRIPTS CODING TABLE

	j	a	f
No.	Number and Ages of Children	Family Status and Wife's Market Status	Household Work Functions
1.	No children	2 parent wife not on market	Food preparation
2.	YC* < 6, 1 child	2 parent wife on market	Cleaning
3.	YC < 6, 2/3 children	1 parent female not on market	Clothing care
4.	YC < 6, 4 + children	1 parent female on market	Repairs and maintenance
5.	YC 6–12, 1 child	1 parent male	Marketing and household mgt.
6.	YC 6–12, 2/3 children	1 person male	Physical child care
7.	YC 6–12, 4 + children	1 person female	Tutorial child care
8.	YC 13–18, 1 child	Multi-person household	Other child care
9.	YC 13–18, 2/3 children	—	—
10.	YC 13–18, 4 + children	—	—

*YC means youngest child

work that are treated separately. Finally, we note that the estimates are done for both males and females in each relevant household group, and the Canadian total is built up from ten provincial values which allows for regional variation in the wage variable and the families variable; the time-use variable is the same for all provinces due to data limitations.

Estimates are also made using the opportunity-cost method (HOC) for which the formula uses total time use undifferentiated by function, and average wages (males and females separately) net of income taxes.[4]

III. HW ESTIMATES FOR 1961 AND 1971

A. Data

The data for 1971 on family units for each province by the disaggregations shown in Table 1 (j and a) were specially prepared by the Census Division of Statistics Canada, except for single persons and non-family multi-person units (a = 6, 7, 8), which were obtained from published Census sources [26]. We should

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[4]A more detailed discussion of the methodology is to be found in Hawrylyshyn [8].

note here a slight quirk in our definition of females who are "on the market" and "not on the market": the former comprehends those who worked on the market twenty or more hours per week, and the latter encompasses the remainder, including unemployed females normally counted as being in the labour force. The rationale for this is that conventional "labour-force" definitions do not discriminate as well as ours for the purposes of assigning time-use values. Thus, we assume time-use of unemployed females and those working few hours is more like that of women not in the labour force than that of women working full time or nearly full time.

Data on time-use for two-parent families are based on two separate surveys: one in Halifax, the other in Toronto. Our figures were a simple average of the two studies, except in a few cases where the sample sizes were very small in the Toronto study; here, Halifax values were used. For the other categories certain assumptions were made. For single-parent females, we formed the ratio (time-value of two parent females)/(time-value of single-parent females) for each task (f) in Table 1 from a study by Lyerly [11]. This was applied to our data on time-use by females in two-parent families. For single-parent males, we assumed first that all worked in the market, and second that they did the same amount of work as single-parent females who work in the market. Single persons were assumed to use time in the same amount as females working on the market, in two-parent families with no children ($a = 2, j = 1$).

Wages for appropriate occupations were obtained from Census data on income of full-time employees, converted to hourly equivalents by assuming a 50-week year and applying data on hours per week from a Labour Canada publication [20]. Appropriate occupations for each of the household functions noted in Table 1 were chosen from the 1971 Census *Dictionary of Occupational Classifications* [27]. At least two or three occupations at the three-digit level of this document were equated to each function. The wage applied to each function was the average of the wages in equivalent occupations. For the opportunity-cost approach, an overall average wage for males and females by province was obtained from [29] and [21]. Income tax netting factors were computed from tax tables at a level approximating an average income for each province.

For 1961, though the data sources were generally the same, a greater number of assumptions was needed because the data were far less detailed relative to our disaggregation characteristics, a difficulty which exemplifies the problem noted in the introduction as issue number 6: the need to manipulate data of earlier years to fit the more precise details of later estimates. We derived 1961 values by applying to 1961 Census data several assumptions based on 1971 data. The 1961 Census provided data on the number of married women with husbands present, in the labour force and not in the labour force, by age groups. We assumed that the age group distribution of the youngest child at home for each married-women age group was similar in 1961 and 1971. We also assumed that the total number of children at home in each of the "age of youngest child" groups was similar for 1961 and 1971.

As noted above, our definition of "on market" and "not on market" differs from conventional labour force definitions, but in 1961 the available data were split only on the latter basis. We adjusted these data by assuming the ratio of

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"labour force participation" to "market participation" concept was the same in both 1971 and 1961.[5]

Wage rates were calculated from average annual incomes for full-time employees in "equivalent" occupations by provinces, from the 1961 Census, by assuming a 50-week year and then taking the standard hours for the appropriate occupations from [20]. The same source for 1971 also provided indexes of appropriate occupational wage rates from 1961 to 1971, and we developed an alternative set of 1961 data from these indexes. When the two sets of 1961 wage rates thus derived were compared, the rates calculated from the standard hours seemed excessively low. Particularly in view of the fact that 1961 was not a boom year, we felt that dividing by standard hours probably gave too low wage rates, and therefore adjusted the standard hours to a uniform rate of 40 for men and 38 for women.

Another difficulty we encountered was that whereas the two Census income estimates appeared similar, the definitions embodied in the occupational classifications had been changed drastically between 1961 and 1971. Apart from any basic technical difficulties, time limitations precluded any formal reclassification of the data on either the 1961 or 1971 basis. The 1971 choice of occupations which we defined to constitute the household functions was a judgmental one based on the description of the occupational classification. Therefore, we applied the same judgment to 1961 categories to select the occupations constituting the household functions for 1961 also.[6]

Since no time-use data for 1961 were available, we used 1971 values; it has been demonstrated in a number of time-use surveys that variations in the use of time are much more significant over groups of population having different social and demographic characteristics than over populations living in different countries, or in not-too-widely separated time periods.[7]

Summarizing our methodology, then, it may be stated that the variables for which we had independent data in 1961 were labour force and wage rate data, that the demographic data were a combination of data derived from the 1961 Census with certain assumptions from the 1971 Census built into the estimates, and that the time factor was assumed to be the same as prevailed in 1971.

B. Results for 1961 and 1971

Table 2 presents the results of the estimates for 1961 and 1971 using both the detailed market replacement approach and the opportunity-cost approach, and compares these to GNP. The values shown for the HFC method were those calculated by identifying separately in each year census occupations "equivalent"

[5]Because of weighting effects, the resulting total "market force" thus calculated was different from the actual 1961 labour force. We eliminated this weighting effect by adjusting the market and non-market components by the relationship which pertained between the total labour force and the total market in 1961.

[6]It might be further noted that the occupational classification in the Department of Labour source giving hours and wage index was not changed between the two dates and was similar for both years to the classification employed in the 1961 Census.

[7]Robinson, John P.; Converse, Philip E.; Szalai, Alexander, "Everyday Life in Twelve Countries"; Ch. 6 in Szalai [16], esp. pp. 113 and 115.

TABLE 2

VALUE OF HOUSEHOLD WORK (HW), CANADA 1961 AND 1971

	1961		1971	
	$ Million	(%)	$ Million	(%)
GNP	39,646	(100.0)	94,115	(100.0)
Market Replacement Method				
Females	10,537	(26.6)	26,102	(27.7)
Males	5,124	(12.9)	12,656	(13.5)
Total	15,661	(39.5)	38,758	(41.1)
Opportunity Cost Method				
Females	11,551	(29.1)	25,644	(27.2)
Males	5,759	(14.5)	11,989	(12.8)
Total	17,310	(43.6)	37,633	(40.0)

to the eight functions of household work, and using an hourly wage derived for each occupation from the income data in the census of that year. In Section V we also discuss the alternative estimate for 1961, which keeps the same occupations as in 1971 and projects the wages back to 1961.

The various issues concerning measurement methods and trends over time are discussed in Sections IV and V; here we remark only on the relative shares of females and males, and on the magnitude of HW in comparison to earlier studies. The bulk of HW is produced by females, all four of our estimates yielding a share very close to two thirds. This is very much in line with other estimates, most of which give a share close to two thirds also, as noted earlier in the survey by Hawrylyshyn [5].

When it comes to the size of HW, the Canadian estimates are on the high side judged by the ratio HW/GNP, as shown in the first column of Table 3. The explanation appears to be attributable to three factors. First, our hourly wage figures are generally somewhat higher than those of three U.S. studies done for 1964, 1965, and 1967 respectively.[8] Secondly, the Halifax–Toronto averages for time-use in household work that we employ in our estimates are higher than the values employed in the three U.S. estimates, particularly for females employed on the market.

The third important difference between our study and the others is the low participation rate of married women in Canada for both 1961 and 1971. Even in 1971 this was about 32.5 percent, compared to values ranging from 35.0 percent to 37.5 percent in the United States. Lower participation by married women would suggest that the importance of the "not-on-market" groups of married women has increased. Since their time-use is much higher than that of "on-market" married women, the result would be a much higher aggregate value for HW. This may suggest that in the United States the equilibrating process of people allocating themselves between household and market work (see Gronau [3]) has gone further in achieving economically efficient allocation. By 1971, the

[8]The hourly wage figures in Table 3 have been adjusted to 1971 levels for approximate comparability by the GNP implicit price deflator.

TABLE 3

COMPARISON OF FOUR HW ESTIMATES

| Study and Year | HW/GNP % | Range of Wages at 1971 Levels | Range of Time-Use (Hr/Wk) | | | Married-Women Labour Force Participation % |
			Males	Females on Market	Females at Home	
U.S.A.						
Sirageldin, 1964	28	$2.20–2.90	7–9	16–25	40–54	35.0
Nordhaus–Tobin, 1965	34	$1.95–3.25 ($1.60–2.70 net)*	15.4	15.4	46.9	35.7
Walker–Gauger, 1967	31	$1.90–2.90	14–15	25–40	40–55	37.5
Canada						
Adler–Hawrylyshyn, 1961	39–43	$1.08–3.70	12–24	20–37	35–60	22.0
Hawrylyshyn, 1971	40–41	$2.60–3.40	12–24	20–37	35–60	32.5

*Since Nordhaus–Tobin use the HOC (method) their wages should be taken net of taxes (about 20%) to compare with the other studies shown.

Source

Data for earlier studies from Hawrylyshyn [5]. Wages adjusted to 1971 prices by GNP implicit price index. Data for 1971 from Hawrylyshyn [7]; data for 1961 from Appendix Table 5, price adjusted to 1971.

Labour Force Participation Rates for U.S. in years of studies from U.S. *Social Indicators, 1973*; for Canada, from N. Skoulas, *Determinants of the Participation Rate of Married Women*, Statistics Canada, Catalogue No. 71-522, 1974.

participation rate for married women in the United States had reached 40 percent—far above the Canadian value of 32.5 percent. However, judgment on such allocation efficiency issues is not our concern in this paper; what matters here is that the far lower participation rates result in a higher ratio of HW/GNP.

IV. SOME MEASUREMENT ISSUES

A. *Choice of Methodology*

In an earlier paper, one of the present authors suggested that the HOC method tends to be upward-biased.[9] The argument then was as follows: if the value of the marginal hour at home is set equal to the market wage by a rational Beckerian household, and if that hour includes production of both direct and indirect utility, the indirect component we wish to measure as HW must be worth less than the market wage. We no longer believe that logic, for households do not, in our view, maximize in quite that fashion, but are more likely to make economic and non-economic decisions without a calculus of optimization, as discussed in Hawrylyshyn [7]. Consequently, it is no longer clear to us what the values for an HOC method mean except possibly the foregone cost of market production— which is not necessarily equal to the value of HW produced in those hours.

Having said this, we note that for the Canadian case, though both HOC and HFC yield generally similar results, neither one is consistently higher. This is even more evident in the case of the results by province (not shown here). In 1961, HOC exceeded HFC in five of ten provinces, as well as for the Canadian total; in 1971, HOC was higher in only three of ten provinces, and was lower for the Canadian total.

What can one conclude from this? First, that little evidence exists for a consistent bias. Second, that despite its weakened theoretical foundation, HOC nevertheless yields a reasonable approximation of HW. Why it does so is a matter worth a few lines of speculation. We suggest that average female wages, having been kept low by social factors (a euphemism for male chauvinism?), tended to approximate wages of the low to medium-skill occupations equivalent to house-hold functions. In the detailed background study for Statistics Canada (Hawryly-shyn [8]), the 1971 estimates were redone under various "equality of wages" assumptions; in all cases, as average female wages approached average male wages, the value of HOC increased considerably more than the value of HFC. The fuller implications of wage equality are discussed in Section (c) below.

As a final note on the choice of method, we should point out that a third method—Housekeeper Cost—was used in the 1971 studies. This concept is based also on a market-replacement cost. It assumes all the work is done by a hired housekeeper, obviating the need for time-use and wages data, but requiring information on market-costs of housekeepers. Such data are extremely soft (at least in Canada) and highly questionable, but for what it is worth, they give an estimate of HW ($31,935 million, or 34 percent of GNP in 1971) which is significantly lower than the other two. Even inadequate data were not available for 1961.

[9]See Hawrylyshyn [5], pp. 112–114.

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B. *Sensitivity of HW to Level of Aggregation*

Early in the project, a crude estimate of HW was made with the opportunity-cost method, without regional disaggregation and with only six family types instead of the fifty three used eventually. The resulting value was $35,198 million (37.4 percent of GNP)[10] compared to $37,633 million (40.0 percent of GNP) as shown in Table 3; this is an error of about 6.5 percent. The effect on HFC is quite similar with an underestimate of 6.0 percent (see Hawrylyshyn [8], p. 60, for details). Though this does not seem very large, there may be offsetting errors in aggregation, which hide the importance of disaggregation for each type of characteristic. Thus, when disaggregation is maintained for family types but regional wage differences are not considered, the HOC estimate is 9 percent lower. Clearly, the family-type aggregation alone causes an error in the upward direction, offsetting this 9 percent underestimate.

C. *Choice of Appropriate Wages*

Perhaps the most important variable in the HFC estimate is the set of wages by occupation. Given the lack of knowledge on household production, there exists a potential for judgmental errors in the procedure, described in section III, of choosing market occupations equivalent to household functions. For example, how is one to equate the work of a household cook, whose range of skills varies from that of assistant vegetable cutter to that of head chef, with one specific market occupation? For this reason, it was thought that a sensitivity analysis on wages might be in order.

To this end, we estimated HW not only with the average wage for each function (Appendix Table 5), but did so also using the minimum and maximum wage in each of the eight household function categories. The meaning of this is clearer when it is understood that in choosing occupations for each function, we attempted to include a range covering very low to very high degrees of skills. Thus, for example, for the function, Clothing Care, we included the following occupations: personal service, janitors, charworkers and cleaners, sewing machine operators, and tailors and dressmakers.

The results of this sensitivity test are presented in Table 4 for the female components of HW only, because this is the major part and because it is with respect to female wages in particular that most criticism of the choice of occupation occurs. The effect on total HW is two thirds of that shown if we assume that wages for males are approximately correct at the average levels used in the base estimate.

Table 4 demonstrates that only wages in food preparation have a significant effect on HW. This is so not only because food preparation accounts for such a high percentage of total time-use (Table 5), but also because the variation in wages among the market occupations we consider as equivalents is largest for food preparation. Thus, the largest effect on total HW would be about +20 percent

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[10]Hawrylyshyn [6]. The value shown there is $39,387, but this is for a larger 1972 population base estimated from a survey source. Adjustment to the 1971 Census base population yields the value in the text.

TABLE 4

SENSITIVITY OF 1971 HFC ESTIMATES TO ACCURACY OF DATA ON WAGE BY
OCCUPATION: FEMALES

| | Percentage Change from Base Estimate of HFC, Female Share | |
Function	Minimum of Wage Range	Maximum of Wage Range
Food preparation	−7.2	+31.8
Cleaning	−0.3	+0.3
Clothing care	−0.4	+0.4
Maintenance	−0.8	+1.2
Marketing	−3.3	+3.3
Physical child care	−1.6	+2.3
Tutorial child care	−0.3	+0.3
Other child care	−0.7	+1.2
Cumulative effect, female share of HW	−14.6	+41.0
Cumulative effect, total HW*	−9.8	+27.5
1961 cumulative effect, total HW	−24.4	+37.9

*Assuming male wages are kept at average as used in base estimate.
Source: Table 12, p. 54 in Hawrylyshyn [8].

(two thirds of 31.8 percent) if we used the wages of dietitians ($4.55 hr.) for food preparation, or −5 percent (two thirds of −7.2 percent) if we used the wages of waitresses and hostesses ($2.00 hr.). In other functions, the effects are far smaller, the next highest being 2 percent (two thirds of 3.3 percent for marketing).

In the worst of cases, if *all* our simple-average wages were inappropriate, and the *maximum* wages in each group were to be used, the cumulative effect would

TABLE 5

FEMALE–MALE WAGE RATIOS BY OCCUPATION, PROVINCE OF ONTARIO, 1971

Function	% Total Female Time-Use F_{i6}[1]	Ratio of Female Wage to Male Wage—Ontario	
1. Food	37.0*	0.72	
2. Cleaning	17.5	0.62	
3. Clothing	12.5	0.62	
4. Maintenance	4.7*	0.71	
5. Marketing	14.2*	0.70	
6. Physical child care	8.9*	0.70	
7. Tutorial child care	3.2*	0.88	
8. Other child care	2.0*	0.83	
	100.0	0.69	(weighted average)
Economy-wide average (for HOC estimate)		0.67	

[1]Family with 2 parents, wife not on market, 2/3 children with youngest child between 6–12 years of age.
*Functions in which the equivalent occupation female-male wage ratio is above the ratio for average wages in all occupations.
Source: Table 11, p. 50 on Hawrylyshyn [8].

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be +27 percent (two thirds of 41 percent). The cumulative effect of using the minimum for all functions would be −10 percent (two thirds of −14.6 percent). Either of these two extremes is unlikely, however, for errors in choice of occupations would probably be random and the effects of errors in different occupations should be offsetting.

For 1961, the relative effects by occupation are similar, though the total effect shown is considerably greater. This may be due to the fact that data in 1971 are available for a higher degree of detail in occupational classifications. The most important conclusion is, therefore, that accuracy in the choice of wage for food preparation is quite significant. For other functions, it is far less so.

As noted earlier, it may be argued that female wages are downward biased relative to true economic productivity value of the labour because of discrimination in job markets. In the extreme, this would mean that female wages, instead of being as presently about two thirds of male wages, would in a non-discriminatory situation equal male wages. This entails a 50 percent increase in the wage figures we used, and a consequent 34 percent increase in HW using the HOC method. The increase for HFC is slightly less because the male-female differential is lower for the selected occupations than for the economy-wide wages. This is demonstrated by the figures of Table 5 for the province of Ontario, where we see that while for all wages the female-male ratio is exactly two thirds (0.67 percent) it is above this for the wages in occupation equivalents for six of the eight time-use functions, accounting for 70 percent of time-use by a woman in a "typical" household ($a = 1, j = 6$). Inasmuch as we believe more in the theoretical underpinnings of the HFC approach, this result demonstrates the importance of doing a detailed occupational-function disaggregation in estimates, because the weighted average wage of the appropriate occupations may not be the same as an economy-wide average of male and female wages.

The results of the sensitivity analysis are presented in Table 6. We may note that a more realistic move of female wages towards equalization, say to 90 percent of male wages,[11] results in an overall increase in HFC of about 20 percent. Thus, whereas full equality of wages implies an HW of nearly $50 billion (or 53 percent

TABLE 6

SENSITIVITY OF 1971 HW ESTIMATES TO ACCURACY OF WAGE
DATA AGGREGATE WAGES

Description	Percentage Change from Base Estimate	
	HOC	HFC
Female W = Male W	+34.1	+29.1
Female W = 0.9 Male W	+23.9	+19.5

Source: Table 10, p. 49, in Hawrylyshyn [8].

[11]Labour economists sometimes argue that full equality is not to be expected because of some discounting for females' shorter work life as a result of child-care absences from the labour market. See, for example, the discussion on human capital investment in J. Mincer, *Schooling, Experience and Earnings*, New York, NBER, 1974.

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of 1971 GNP), a 90 percent equality implies an HW of $46 billion (or 48 percent of GNP). However, an important qualification must be made at this point. We have changed the female wages without increasing female participation in the labour force, an unlikely turn of events. If female wages were to achieve 90 percent parity with male wages, it is probable that participation rates for women would increase considerably.

In Hawrylyshyn [8] it is calculated that for each 25 percent participation rate increase for married women, HW decreases by 2 percent. Hence, if participation rates were to double from about 30 percent in 1971 to 60 percent with the 90 percent wage-parity scenario, HW would be lowered by 8 percent, from $46 billion to about $42 billion: but GNP would have increased as a result of the additional labour in the market. There were about 1.5 million married women in the labour force in 1971, and if we take a rough value-added figure of $5,000 per female worker ($3.00 hr. and a 36-hour week gives $5,400), this would yield a GNP increase of $7.5 billion, from $94.5 billion to $102 billion. Hence, we would have a ratio HW/GNP of about 41 percent, very much the same as what we have estimated with the current low female wages and low female participation rates. Therefore, we conclude that the value of HW (and also HW/GNP) would be far greater if we were to apply "equal wages for equal work" under *ceteris paribus* assumptions. But the more likely situation is a *mutatis mutandis* one in which wage equality occasions increased market participation of females, which reduces the HW increase while raising GNP, so that on balance HW/GNP is not greatly affected.

V. TRENDS OVER TIME

A. *Effect of HW Inclusion on GNP Growth Estimates*

Table 7 shows values for 1961 and 1971 GNP, and three estimates for HW; first, HFC-AV using cost by function and applying 1961 occupations and wages; second, HFC-indexed, using the same method but with wages projected back to 1961 as described in III(a); and third, using the HOC method. The other computations in that table permit one to make some observations on the growth effects of incorporating HW into national accounting, the issue raised by Nordhaus–Tobin's attempt to provide a measure of economic welfare.

Over the ten-year period, GNP itself grew by 237.4 percent, while HW on the HFC-AV method grew by 247.2 percent, and the other estimates had a growth rate lower than that of GNP. Combining the GNP and HW, we obtained a growth rate on the basis of HFC-AV of 240.2 percent and, on the other bases, of approximately 231.0 percent. In other words, the inclusion of HW raises the overall growth rate of GNP over the whole period by three percentage points on the one basis, and lowers it by six percentage points on the basis of the other methods. In terms of annual growth rate, the effect is again fairly minimal and changes the annual growth rate of GNP itself from 9.0 percent to 9.2 percent at one extreme, and to 8.7 percent at the other. These findings are more or less in line with those of Nordhaus and Tobin, where from 1954 to 1965, the annual growth

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TABLE 7

EFFECT OF HW INCLUSION UPON GROWTH RATES OF NATIONAL PRODUCT

	1961		1971		Ratio 1971–1961 %	Annual Rate of Growth %
	$ Million	% GNP	$ Million	% GNP		
GNP, HW Values						
GNP	39,646	(100.0)	94,115	(100.0)	237.4	9.0
HFC-AV	15,661	(39.5)	38,758	(41.2)	247.5	9.5
HFC-indexed	17,894	(45.1)	38,758	(41.2)	216.6	8.1
HOC	17,310	(43.7)	37,633	(40.0)	217.4	8.2
Summation GNP+HW						
GNP+(HFC-AV)	55,307	(139.5)	132,873	(141.2)	240.2	9.2
GNP+(HFC-indexed)	57,540	(145.1)	132.873	(141.2)	230.9	8.8
GNP+(HOC)	56,956	(143.7)	131,748	(140.0)	231.3	8.7
Average of 3 estimates	56,601	(142.8)	132,498	(140.8)	234.1	8.9

rate of GNP was only altered from 3.8 percent to 3.6 percent (in real terms) when the value of HW was included in GNP.[12]

Clearly, the inclusion of the value of housework in a national income measure seems to make little difference to economic growth analysis. Admittedly, we have made no attempts at this stage to deal with the question of estimating the value of housework in constant-dollar terms—which involves the very thorny issue of productivity—but there is little reason to suspect that the movement in such an estimate would be very much different from the movement of constant-dollar GNP as a whole, and, at least for the time being, one can make the case that the above conclusion would not be significantly altered. This finding supports Beckerman's recent conclusion that "the standard GNP measure is still a jolly good indication of changes in economic welfare",[13] and conforms to the view that the "building-block approach" procedure (measuring welfare components but not adding them to a total measure of economic welfare) is perhaps the best approach for national income accountants to take in the face of criticisms of modifying GNP.[14] Thus, the fact that the value of housework does not alter the rate of growth may therefore be taken as an important conclusion in the Holmesian sense of the dog that didn't bark! The inclusion of HW in GNP does not invalidate previous findings.

B. Trends in HW/GNP Over Time

In terms of movement over time, the value of HW on the HFC basis increased slightly as a proportion of GNP from 39.5 percent in 1961 to 41.2 percent in 1971, as shown in Table 7. This movement is contrary to that observed for U.S.

[12]Calculated from Table 1 in Nordhaus and Tobin [13].
[13]Time, June 6, 1977.
[14]As outlined in Hawrylyshyn [4].

estimates in the survey by Hawrylyshyn [5], although it does not necessarily invalidate the theoretical point made there that HW/GNP would decline as female participation rates increased *ceteris paribus*. Indeed, we attempted to estimate this effect by revaluing HW-HFC for 1961 using 1971 market participation rates which, as Table 8 shows, were higher. The results of this calculation gave an ultimate HW/GNP ratio of 38.1 percent for 1961. Other factors must have counterbalanced this participation effect to the amount of 3.1 percent of GNP. Since the time factor was identical for all estimates, this would be attributable to a combination of the demographic composition and the relevant wage rates in the two years. Unfortunately, time did not permit us to disentangle the complex effect of these two factors.

We concentrated our analysis on HW-HFC because, as previously elaborated, we believe it to be the more valid estimate. To the extent that our preference for HFC is questioned, we admit that some doubt may also be cast on conclusions about the rise of the HW/GNP ratio, since the estimates using HOC show a decline from 43.7 percent to 40.0 percent.

Whatever the truth of the matter on this, an important related finding is that the trend of female participation is not the sole, nor even the overwhelming explanation for movements in the ratio HW/GNP, as seems to have been suggested by Weinrobe [19]. The latter, in his 1974 study, presents estimates of HW over an approximately similar time period for the United States, finding a decline in the ratio HW/GNP and attributing it largely to increasing participation rates of females.[15] Our calculations show that one cannot reach such a conclusion simply on the basis of a decline in the ratio—it is necessary to isolate the unique impact of participation rate changes on the ratio. As Table 9 shows, regardless of

TABLE 9

CHANGES IN HW/GNP 1961–1971 AND THE EFFECT OF CHANGES IN PARTICIPATION RATES

	HW-HFC-AV %		HW-HFC-Indexed %	HW-HOC %
1. 1971 HW/GNP ratio	41.2		41.2	40.0
2. 1961 HW/GNP ratio	39.5		45.1	43.7
3. Difference between lines 1 and 2		+1.7	−3.9	−3.7
4. 1961 HW/GNP ratio on basis of 1971 participation rates	38.1			
5. Difference between lines 4 and 2		−1.4	−1.4*	−1.4*
6. Effect of other factors on changes in HW/GNP ratio: line 3 + line 5		+3.1	−2.5	−2.3
7. Weight of change in participation rate: line 5 ÷ line 6		−0.45	+0.56	+0.61

*Assumed not to vary with the method used

[15]"Since market-oriented production by wives has increased, *and home production has presumably fallen off* (our italics), we are overstating growth of total output during the period that women enter the market labour force." [19], p. 90.

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TABLE 8
MARKET PARTICIPATION RATES OF FEMALE PARENTS IN 2-PARENT FAMILIES

	No Children	Age of Youngest Child at Home 6 or Under			Age of Youngest Child at Home 7–12			Age of Youngest Child at Home 13–18		
		1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children
	%	%	%	%	%	%	%	%	%	%
2-parent family: wife in labour market										
% of total in 1961	15.1	12.8	7.5	4.7	24.8	14.6	6.9	19.5	11.7	4.2
2-parent family: wife in labour market										
% of total in 1971	34.4	25.9	16.1	10.5	35.3	22.0	11.0	20.4	12.3	4.7

which of the three estimates one uses, the impact of changes in participation rates *alone* by no means explains the overall change in the ratio of HW/GNP. Indeed, it is only approximately half as large as the other unexplained changes, and of opposite sign in one case. More care must be taken to explain all the factors that affect the value of HW—participation, demographic composition, wage rate changes, time-use changes, and finally, productivity.

VI. CONCLUSIONS

In terms of the problems which we stated that we would address in this paper, what conclusions can we finally reach?

1. No clearcut conclusions on the time trend of the ratio HW/GNP emerge from this paper, since, to some degree, whether that ratio increased or decreased depends on the valuation one chooses for HW. However, there are some important subsidiary conclusions one can reach, the first one being that it is important to isolate the effects of changes in participation rates of married females, for they may be counterbalanced by other effects. Secondly, on the whole, the ratio HW/GNP is fairly stable over time, and at all times forms a significant proportion of GNP. As a matter of fact, it may be noted that since we only dealt with the labour portion of the household production function and did not include any production arising from capital investment, it might be fair to compare the value of HW to the salaries and wages component of national income. If one does that, the value of HW assumes even more significance for it is slightly over two thirds of the value of salaries and wages in both 1961 and 1971.

2. We have found, like other researchers, that the effect of including HW in growth estimates does not alter previous analyses to any significant extent.

3. With respect to the choice of methodology, it is obvious from the paper that we prefer, for the reasons outlined, the cost-by-function method for estimating the value of HW. However, the opportunity-cost method will probably be around for some time to come because it is a much simpler method of estimation and does yield an excellent approximation of the value of HW.

4. It is evident from the paper that the higher the number of variables which are used in the estimation (and hence the higher the degree of disaggregation), the more stable the results are. The one variable that has a significant impact on these estimates is wages, and it is, therefore, imperative that these values be chosen with circumspection; this is particularly true for female wages in food preparation.

5. It may be suggested that the methods we have used show sufficient stability over time in relation to GNP to obviate the necessity of making estimates every year. This, of course, also assumes that our time factor (one of the more important variables) remains stable over time. For future estimates, one cannot assume that this will always be the case. While the other variables—i.e. the participation rates, the demographic composition, and the wage rates—will always be available, and probably in improved form, the availability of a good time-use survey for estimates of this kind is not guaranteed. Good and broadly-based time-use surveys are, therefore, a *sine qua non* in future estimates and would improve the choice of wages for the cost-by-function method. One may add, incidentally, that when the demands for time-use studies relating to leisure

time use, other types of quality of life estimates, educational investment estimates, etc, are taken into account, the need for such studies assumes a fairly high degree of priority for statisticians.

6. Lastly, we wish to assure the reader that the assumptions which we have made in our estimates and the manipulation required to fit data from earlier years to the form of estimation are—at least based on the experience of one of the authors of this paper—qualitatively not much worse than many well-established historical national accounts estimates.

APPENDIX TABLE 1

NUMBER OF HOURS PER WEEK SPENT IN 1972 ON HOUSEHOLD WORK BY TYPE OF FAMILY: FEMALES

		Age of Youngest Child at Home 6 or under			Age of Youngest Child at Home 7–12			Age of Youngest Child at Home 13–18		
	No Children	1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children
2-parent family: wife not in labour market	35.049	52.248	57.302	60.9	44.975	49.441	60.858	40.824	54.845	28
2-parent family: wife in labour market	19.012	32.13	35.112	37.548	27.72	27.979	31.528	26.761	27.566	27.566
Female parent: not in labour market[1]	19.012	45.668	49.287	52.087	37.009	40.768	51.275	32.060	42.966	19.782
Female parent: in labour market	19.012	29.33	30.66	33.663	23.968	23.849	26.782	21.322	22.407	22.407
Male parent	0	0	0	0	0	0	0	0	0	0
Male households	0	0	0	0	0	0	0	0	0	0
Female households	19.012	0	0	0	0	0	0	0	0	0
Multi-person households	14.63	0	0	0	0	0	0	0	0	0

[1] In the calculation of our estimates, erroneous data were used for this row. Since, however, an almost exactly offsetting error was made in the No-Children column, the calculations were not revised at this stage.

APPENDIX TABLE 2

NUMBER OF HOURS PER WEEK SPENT IN 1972 ON HOUSEHOLD WORK BY TYPE OF FAMILY: MALES

	No Children	Age of Youngest Child at Home 6 or under			Age of Youngest Child at Home 7–12			Age of Youngest Child at Home 13–18		
		1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children
2-parent family: wife not in labour market	10.514	15.757	12.803	14.91	11.207	12.943	16.38	16.051	20.09	14.007
2-parent family: wife in labour market	10.269	15.036	23.044	17.031	11.83	15.225	13.867	14.14	12.103	4.767
Female parent: not in labour market	0	0	0	0	0	0	0	0	0	0
Female parent: in labour market	0	0	0	0	0	0	0	0	0	0
Male parent	*19.012	29.33	30.66	33.663	23.968	23.849	26.782	21.322	22.407	22.407
Male households	19.012	0	0	0	0	0	0	0	0	0
Female households	0	0	0	0	0	0	0	0	0	0
Multi-person households	14.63	0	0	0	0	0	0	0	0	0

*See footnote, Appendix Table 1.

APPENDIX TABLE 3

NUMBER OF HOUSEHOLDS WITH SPECIFIED CHARACTERISTICS: CANADA 1961

		Age of Youngest Child at Home 6 or Under			Age of Youngest Child at Home 7–12			Age of Youngest Child at Home 13–18		
	No Children	1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children
2-parent family: wife not in labour market	853,646	298,900	611,305	300,176	96,388	465,788	253,752	245,699	180,146	14,067
2-parent family: wife in labour market	151,276	43,746	49,688	14,887	31,723	79,731	18,911	59,454	23,789	620
Female parent: not in labour market	77,438	13,051	15,041	9,397	12,068	25,663	13,694	32,758	14,238	1,179
Female parent: in labour market	7,945	6,794	3,948	801	8,503	8,641	1,388	10,179	2,392	35
Male parent	24,229	4,582	5,211	2,943	5,878	8,278	3,819	12,414	3,767	289
Male households	187,165	—	—	—	—	—	—	—	—	—
Female households	236,639	—	—	—	—	—	—	—	—	—
Multi-person households	180,700	—	—	—	—	—	—	—	—	—
TOTAL	1,719,038	367,073	685,193	328,204	154,560	588,101	291,564	360,504	224,332	16,190

APPENDIX TABLE 4

NUMBER OF HOUSEHOLDS WITH SPECIFIED CHARACTERISTICS: CANADA 1971

	No Children	Age of Youngest Child at Home 6 or Under			Age of Youngest Child at Home 7–12			Age of Youngest Child at Home 13–18		
		1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children	1 Child	2–3 Children	4 or More Children
2-parent family: wife not in labour market	955,435	292,015	595,490	291,920	109,675	530,585	288,300	248,740	182,530	14,115
2-parent family: wife in labour market	501,790	102,115	114,400	34,190	59,840	149,740	35,475	63,615	25,495	690
Female parent: not in labour market	64,365	17,235	24,615	16,230	14,900	41,345	23,335	45,725	24,155	1,950
Female parent: in labour market	8,300	12,850	8,820	1,850	16,530	19,560	3,245	19,580	5,380	80
Male parent	16,585	6,995	10,510	5,800	8,920	16,560	7,220	18,830	7,450	510
Male households	320,460	—	—	—	—	—	—	—	—	—
Female households	489,025	—	—	—	—	—	—	—	—	—
Multi-person households	295,365	—	—	—	—	—	—	—	—	—
TOTAL	2,651,325	431,210	753,835	349,990	209,865	757,790	357,575	396,490	245,010	17,345

APPENDIX TABLE 5

HOURLY WAGE RATES FOR SPECIFIED CATEGORIES OF HOUSEWORK IN 1961 AND
1971 AS USED IN HOUSEHOLD WORK ESTIMATES

Household Work Category	Male		Female	
	1961	1971	1961	1971
	$	$	$	$
1. Food preparation	1.63	3.43	1.12	2.47
2. Cleaning	1.28	2.86	0.78	1.78
3. Clothing care	1.55	2.98	1.05	1.83
4. Repairs & maintenance	1.75	3.52	1.14	2.48
5. Marketing & household management	2.18	4.56	1.63	3.16
6. Physical child care	1.27	2.77	0.78	1.91
7. Tutorial child care	2.68	4.66	2.04	4.09
8. Other child care	1.78	3.56	1.41	2.95

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